

**Addis Ababa University
College of Development Studies
Department of Environment and Development**

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**Assessing the Role of Indigenous Knowledge in Natural
Resource Management: The Case of Mareka Woreda,
Dawro Zone, South Ethiopia**

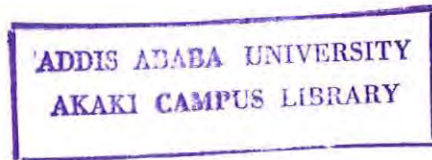
**By:
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**In Partial Fulfillment of the Requirements for the Masters
Degree in Environment and Development**

**Addis Ababa University
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Addis Ababa University
College of Development Studies
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This is to Certify That the Thesis Prepared by Taybela Waje, Entitled: “Assessing the Role of Indigenous Knowledge in Natural Resource Management: The Case of Mareka Woreda, Dawro Zone, South Ethiopia”.



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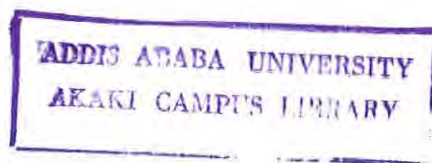


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Glossary

Bega: Dry season

Belg: Spring

Dega: Altitude between 2500-3500m above sea level

Equb: Traditional social institution for saving money

Enset: A root- crop widely grown and used in preparation of “*kocho*” and other food items

Fig: Manure (animal residual/waste)

Geyuwa: A traditional place of ceremony for elderly women

Idir : Traditional social institution with some kind of purpose

Kashsha: Traditional home garden of witchdoctors where ‘spirits dwell’

Kebele: The lowest government administration unit in the Ethiopian government structure

Kiremt: A season from June to September (rainy season)

Kola: Altitude between 500-1500m above sea level

Maresha: Traditional iron plough

Sherechuwa: A witchdoctor or person with ‘magic power’

Teff: With a binomial name ‘*Eragrostis tef*’ is a native grain, from its flour *injera* – fermented bread is made

Woreda: Administration unit between kebele and zone (district)

Woynadega: Altitude between 1500-2500m above sea level

Zeruwa: A traditional dam

List of Abbreviations (Acronyms)

ARDO – Agricultural and Rural Development Office

BoA – Bureau of Agriculture

DA – Development Agent

EC – Ethiopian Calendar

ETB – Ethiopian Birr

FGD – Focus Group Discussion

HHs – Households

IK – Indigenous Knowledge

IKS – Indigenous Knowledge System

KPA – Kebele Peasant Association

NGO - Non Governmental Organizations

NR – natural Resource

NRM – Natural Resource Management

SNNPR - Southern Nations Nationalities and Peoples Region

SPSS – Statistical Package for Social Science

UNDP – United Nations Development Program

WB – World Bank

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Abstract

Knowledge has always been an essential force in development. In today's increasingly knowledge-based world, many countries are embracing knowledge and innovation-related policies to spur growth and competitiveness. The basic component of any country's knowledge system is its indigenous knowledge. Indigenous knowledge (IK) encompasses the skills, experiences and insights of people, applied to maintain or improve their livelihood. It is unique to a particular culture and society and the basis for local decision-making in agriculture, health, natural resource management and other activities. This study attempted to identify different indigenous knowledge and practices of Dawro Zone in natural resource conservation. Field observations, focus group discussions and key informants interviews were the main tools developed for data collection. The study was conducted in Mareka Woreda and from where six kebeles were randomly selected. About 120 households were selected with simple random selection procedure and the study was conducted among those households. Soil erosion, water scarcity and loss of plant cover were the environmental problems of the study area. Local people have been employing various indigenous practices against the problems. Different indigenous practices in soil and water conservation, and also plant and livestock management of people in the area were identified. There were also traditional beliefs and social values that contribute to natural resource management besides their main purpose in the area. The study asserted that farmers have valuable knowledge of natural resource conservation in the area; however, their practice needs some kind of improvement for sustainability. Providing an extensive awareness and training on sustainable utilization and conservation of natural resources to the indigenous people and, designing and implementing culturally appropriate and integrative development programs can preserve both natural resource and indigenous knowledge.

Chapter 1

Introduction

1.1. Background

Knowledge has always been an essential force in development. In today's increasingly knowledge-based world, many countries are embracing knowledge and innovation-related policies to spur growth and competitiveness. According to World Bank (2007), however, many developing countries are struggling to find ways to produce relevant knowledge and transform it into wealth, as well as to adapt and disseminate existing knowledge for their development. Knowledge is associated with practical experience and skill in solving a particular problem while holding information does not necessarily endow one with solving a particular problem (Tesfahun, 2008).

World Bank (2007) indicates that the basic component of any country's knowledge system is its indigenous knowledge. Indigenous knowledge (IK) encompasses the skills, experiences and insights of people, applied to maintain or improve their livelihood. It is one of the knowledge sources and has been attracting many researchers' attention across the world. One of the most common areas of this concept is indigenous knowledge in natural resource management. According to Charles (2003), Indigenous Knowledge is generally a product of indigenous people's learning and adaptation to specific local environments that has evolved through centuries. It provides the basis for indigenous communities to meet their needs from the natural environment on which they derive wellbeing and sustenance. Indigenous people in local community have been using and managing natural resources and they have developed, and continue to develop indigenous knowledge systems which encompass sustainable management of natural resources.

Natural resource management involves achieving a balance between use and maintenance of the resources, and hence, indigenous knowledge has its own contribution to this objective. However, Rohana (2008) argue that in the past scholars have been looking indigenous knowledge (IK) as an obstacle to development and efficient resource management. But today it is seen as pivotal for

sustainable resource use and balanced development. It is unquestionable that indigenous knowledge systems can constitute different concepts, principles, strategies, practices and technologies which can be put into sustainable management of local resources.

When we look at the world experience of indigenous knowledge in natural resource management, it is an emerging area of study with increasing attention to land management, agriculture, animal husbandry, medicine, soil and water management, among many other categories. The development professionals treasure this local knowledge, finding it extremely useful in solving complex problems both in developed and in developing countries (Peter, 2008). They agree with the importance of indigenous knowledge particularly in the era of globalization, a time in which intellectual property is taking new significance in the search for answers to many of the world's most vexing problems: disease, famine, ethnic conflict, poverty, and environmental degradation.

Ivan (2002) confirms that the science of natural resource management is based on the ecologically sound traditional wisdom of farmers and its contribution in increasing productivity is highly important. Hence, traditional values which are sustainable need to be compared with values of modern systems in terms of resource management. In this case, indigenous knowledge in resource management has value not only for the culture in which it develops, but also for scientists and planners seeking solutions to community problems.

However, indigenous knowledge in any practices (including natural resource management) may disappear unless they are preserved and their values are promoted. Today, many indigenous knowledge systems are at risk of becoming extinct (Ivan et.al, 2002) because of rapidly changing natural environments and fast pacing economic, political, and cultural changes on a global scale. Practices vanish, as they become inappropriate for new challenges or because they adapt too slowly. According to Ivan (2002), many indigenous knowledge and practices disappear because of the interference of foreign technologies or development concepts that promise short-term gains or solutions to problems without being capable of sustaining indigenous practices. Disappearance of indigenous knowledge is a tragedy for those who have developed it and have been making a living through it. The implication for others can be depressing as well, when indigenous skills, artifacts, problem solving strategies and know-how are lost.

Even though indigenous knowledge in natural resource management is still exists among indigenous (local) communities in many parts of Africa, lack of awareness of their treasure is not yet fully addressed (Charles, 2003).

There are many reasons to say African indigenous knowledge has not been recognized to the significant level. As study by Peter (2008) indicates that many indigenous communities are not concerned about the appropriation of their knowledge by researchers, within and outside Africa. Their indigenous practices in natural resources management such as growing medicinal plants have been taken without permission or respect for customary law and with little benefit to them. Therefore, in shaping the future development agenda for Africa, it must be recognized that for the continent to meet its development challenges, especially in natural resource management, it is vital to integrate indigenous knowledge in the development process.

In Ethiopia, early civilization serves as an evidence for the extent and rationality of indigenous knowledge and practices in different areas. In many parts of the country there are various indigenous knowledge systems of natural resource management. For instance the domestication of certain crops like coffee, teff and enset and the development of bench terrace system by the people of Ethiopia such as Konso are among important cases of achievements in natural resource management as well as in agriculture (Tesfahun, 2008). Here with regard to natural resource management, the terrain of the Konso area of mountainous and stony, causing many hundreds of kilometers of a highly developed dry stone contour bench terrace systems to manage natural resources and to enable sustained agriculture is one of the invaluable examples.

Many local and traditional communities in Ethiopia conserve natural resources such as rare medicinal plants in home gardens. They select and conserve specific species of plants whose medicinal values and properties are known. Mathewos (2013) in his study on Ethnobotany of Medicinal Plants in Dawro Zone, Southern Ethiopia indicated that the indigenous people of Dawro have many indigenous knowledge systems that contribute to natural resources of the local community. In the same source he noted the existence of multiple medicinal plant species in home gardens of local people but not documented and promoted yet. Tesfahun (2008) explained that in Ethiopia some scattered efforts have been made to record and document indigenous knowledge. For example, Farm Africa, Ministry of Agriculture, and Ethiopian Society of

Chemical Engineers have attempted to record and document indigenous knowledge and practices in their respective field of interest, but it was not well organized, widely planned, and sufficient enough in capturing the most important ones. Accordingly, special efforts are, therefore, needed to understand, document and disseminate indigenous knowledge.

Dawro (study area) is endowed with ample natural and cultural resources. However, various forms of environmental degradations such as land degradation, deforestation, soil erosion, water scarcity, wildlife loss and others become the challenges in the area. This may consequently impair natural resource based livelihood activities among the rural communities. This is to mean that local community suffers disproportionately when environmental conditions deteriorate or when their access to these resources is limited or denied.

On the other hands, to manage these environmental problems, people in the study area have been employing their own indigenous knowledge systems and practices in their locality for ages. They have developed knowledge and traditional practices for sustainable use and management of natural resources in their area through rules, beliefs and cultural values. They possess systematic knowledge of plants, animals and natural phenomena of the ecosystems and their surroundings. This knowledge, attached with their close relationship to their lands, has enabled them to live in harmony with nature.

Therefore, considerations of local views, indigenous knowledge, traditional values and cultures, etc. in development planning for particular setting have long become imperative. Based on this background this study intended to examine indigenous knowledge in natural resource management in the study area.

1.2.Statement of the Problem

As natural resources are fundamental for improving livelihoods and achieving sustainable development, efforts of different knowledge systems should be made in management of these resources. Especially those of land, soil, water, forest, plant and animal diversity, climate and ecosystems services are closely connected with human daily lives and they need regular management. According to Ivan (2002), all nations of the world with all knowledge systems were issued with a mandate to protect the environment for the benefit of present and future

generations. Hence, Protection of the Earth's life support systems requires all sorts of knowledge and coherent information.

In the study area (Dawro) land inhabited by local community is rich in natural resources (Dawro Profile by Zone Administration, 2009). People of Dawro, have been living with a traditional knowledge of managing natural resources to improve livelihoods, reduce poverty and advance economic growth. However, this area is suffering from environmental problems such as land degradation, deforestation, soil erosion, floods, water scarcity, and loss of wildlife. Even though local people employ their indigenous practices against such environmental degradations in order to harness the occurrence of severe environmental and socio-economic consequences, on the other hand there is a necessity to exploit these natural resources to sustain their lives. This has become a challenge of the study area. Boven (2002) by his study indicates that understanding and tackling this complex challenge demands creative, integrative and holistic approaches by multiple stakeholders, to bring multiple and complementary perspectives, knowledge and skills to facilitate a socially equitable, economically efficient and environmentally sound development.

However, the contribution of indigenous knowledge and practices in natural resource management of the area has not been clearly set. Its capability in enabling the local people to balance conservation and consumption trend is not yet evaluated. This traditional knowledge in the study area even seems has not been given weight or significant attention so that it is being declined and even disappeared. The impacts (positive as well as negative) of indigenous knowledge in natural resource management of the study area have not yet been documented. Lack of clear information on the impacts of indigenous knowledge in natural resource management in the study area resulted in lack of recognition that local and indigenous people have their own ecological understandings, conservation practices and resource management goals.

This has its own implications. It has been creating a perception gap between modern technology and/or development agents and local communities. Indigenous people are perceived as merely resource users, but they are not recognized as essential partners in environmental management. People with modern knowledge and technologies have difficulties to communicate with farmers. They more focus on their conventional training and vision of development through transfer of

modern/improved technologies than involving local people in the development programs. They tend to regard themselves as the teachers of farmers, as the agents of change to draw farmers out of the stagnancy of tradition. Most of them can not imagine that they can also learn from (illiterate) farmers. This difference between scientific and indigenous worldviews continued to create barriers to meaningful collaboration in the study area. But a wealth of traditional knowledge can be harnessed through their cooperation and also their experiences can be shared and discussed to promote modern technology for resource management.

Thus, studies on the relationship between indigenous knowledge and natural resource management and possible remedies for the ongoing situations in the study area need to be established before the situation becomes worse. The current study on the dynamics of indigenous knowledge in natural resources management is one such initiative.

1.3. Objective of the Study

1.3.1. General Objectives

The general objective of the study is to assess the role of indigenous knowledge in natural resource management among the Dawro people.

1.3.2. Specific Objectives

- a. To assess the distribution and current status of natural resources (soil, water, plant, and livestock) in the Dawro Zone.
- b. To identify the traditional natural resources (soil, water, plant, and livestock) management knowledge and practices in the Dawro Zone.
- c. To examine merits of employing indigenous knowledge in natural resources management.
- d. To study the limitations of Indigenous Knowledge

1.4. Research Questions

The research attempts to provide answer for the following questions

1. What does natural resource composition as well as its current condition in the study area looks like?
2. What are the indigenous practices people employ in natural resource management in the study area?

3. Does the indigenous knowledge in natural resource management have significant impact (negative/positive)?
 - 3.1. What are the constraints and opportunities in natural resource management through indigenous knowledge?
4. What does the practicability of indigenous knowledge in natural resource management in the study area currently look like?
 - 4.1. What are the factors that determine the current condition of indigenous knowledge in natural resource management in the study area?
5. What are the limitations of indigenous knowledge in natural resource management in the study area?

1.5. Significance of the Study

The linkage between environment and rural livelihood is very strong because the environment matters for the people living in rural area for they depend on the capacity of the ecosystems to provide the basis for food production and other productive activities. However, the potential of indigenous knowledge to cope with environmental problems and manage natural resources in the area is not well documented. On the other hand the federal as well as regional governments of Ethiopia have been undertaking the concept of utilizing indigenous knowledge as one of the important elements for sustainable development.

Thus, the findings of the study provide some insights about the indigenous practices, its contribution and constraints in resource management to stakeholders (researchers, practitioners, policy makers, regional, zonal and woreda government authorities, and NGOs) for any further intervention. They also bring out the way people in the study area interact with their environmental resources in various socio-cultural, political and economic settings.

1.6. Scope of the Study

Initially, this study confines itself to observing, interviewing, and discussing with indigenous people about problems related to natural resources and their indigenous reactions to the environmental problems in Dawro zone. The study focuses on identifying indigenous practices related to natural resource management, assessing their current status and contribution to NRM, and finding factors that determine their current condition. It focuses on the investigation of the role, constraints and opportunities of indigenous knowledge in sustainable natural resource

management in the study area. Other indigenous practices of the study area which are not related to natural resource management are not the concern of the study.

1.7. Limitation of the Study

The main limitation of this study is that it does not deal with the detail technical aspects of each indigenous natural resource management practice. Rather attention has been given to identifying indigenous practices in management of different natural resources in the study area. There was a need to assess widely the whole woreda in order to get various kinds of indigenous practices in natural resource management, but time, facilities and financial constraints limited the researcher not to stay long and assess widely in the study area.

1.8. Organization of the Paper

This thesis is organized in to five chapters and there are interrelated sub topics under each section. Chapter one deals with the introduction of the study, chapter two is the literature review part, and chapter three deals with the materials and methods. Chapter four presents results of the study and chapter five is conclusions and recommendations.

Chapter 2

Literature Review

2.1. Definitions of Terms and Concepts

Natural Resources:

Natural resources are gifts of nature and fundamental for improving livelihoods and achieving sustainable development. Especially those of land, soil, water, forest, plant and animal diversity, vegetation, renewable energy sources, climate and ecosystems services are closely connected with human daily lives. Different authors define natural resources in different ways. However, they all include in their definition land, forest, water, animals, wild resources (flora & fauna), energy (renewable & non-renewable), and minerals and other main elements of it.

Barry (2003) defines natural resources as all non-artificial products situated on or beneath the soil, which can be extracted, harvested, or used, and whose extraction, harvest, or usage generates income or serves other functional purposes in benefiting mankind. People classify natural resources into different categories: flow or renewable and stock or nonrenewable. The flow resources are those that can be naturally renewed within a short time, such as plants, water, and animals. The process of renewal may either depend on human activity or on natural processes. The stock resources are those with fixed supply (Ivan & Elizabeth, 2002).

Natural Resource Management:

Natural resource management refers to the management of natural resources such as land, water, soil, plants and animals, with a particular focus on how management affects the quality of life for both present and future generations. Natural resource management is congruent with the concept of sustainable development. It is a scientific principle that forms a basis for sustainable global land management and environmental governance to conserve and preserve natural resources (Wikipedia, the free encyclopedia, 2013). It involves achieving a balance between exploitation and conservation of natural resources.

Indigenous People:

Indigenous people are those who have inhabited and made their living directly of the same land for many of years. Studies show the relationship between the indigenous people and natural

resources like this: Indigenous people often exclusively depend on the natural resources available within the ecosystems where they live, and commonly manage their resources sustainably. They have developed, and continue to develop indigenous knowledge systems which encompass sustainable management of natural resources. (Rohana and Garth, 2008)

Indigenous Knowledge:

Indigenous Knowledge (IK) is the local knowledge. It is the Knowledge that is unique to a given culture or society and basis for local-level decision making. It is the sum of the total knowledge and skills which people in a particular geographical area possess, and which enable them to get the most out of their natural environment.

Indigenous or local knowledge refers to a complete body of knowledge, know-how and practices maintained and developed by peoples, generally in rural areas, who have extended histories of interaction with the natural environment. These sets of understandings, interpretations and meanings are part of a cultural complex that encompasses language, naming and classification systems, practices for using resources, ritual, spirituality and worldview. It provides the basis for local-level decision-making about many fundamental aspects of day-to-day life: for example hunting, fishing, gathering, agriculture and husbandry; food production; water; health; and adaptation to environmental or social change. It is a Non-formal knowledge handed over orally, from generation to generation, and is therefore seldom documented (Karin & Jun, 2002)

Again Louise (1998) says that Indigenous knowledge (IK) refers to the unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographic area. The development of IK systems, covering all aspects of life, including management of the natural environment, has been a matter of survival to the peoples who generated these systems. Such knowledge systems are cumulative, representing generations of experiences, careful observations, and trial -and- error experiments.

Scientific Knowledge:

Scientific Knowledge is a knowledge accumulated by systematic study and organized by general principles. It is cognizance of a fact or phenomenon acquired through scientific method. It is a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe. Scientific knowledge is a branch of knowledge or study

dealing with a body of facts or truths systematically arranged and showing the operation of general laws. It includes observation, identification, description, experimental investigation, and theoretical explanation of natural phenomena. It has a scientific Method that is a method of research in which a problem is identified, relevant data are gathered, a hypothesis is formulated from these data, and the hypothesis is empirically tested (Webster's Dictionary, 2008).

2.2. Theoretical and Empirical Review

2.2.1. Natural Resources and Management

The management of resources from nature has been of growing concern throughout the world, particularly over the past half century, when their rapid destruction was brought to public attention. This concern has been driven by the increasing awareness of the damage that is inflicted upon the environment through human use of nature as a resource. The damage occurs at local and global levels and is not only immediate in some of its effects but also persistent, even irreversible, in others. Regarding this concept, international anxieties culminated in the Earth Summit convened in Rio de Janeiro in 1994. All nations of the world were issued with a mandate to protect the environment for the benefit of present and future generations (Ivan and Elizabeth 2002).

However, on the one hand there is a concept of managing natural resources to improve livelihoods, reduce poverty and advance economic growth; on the other hand there is a necessity to exploit these resources to sustain lives. This becomes a daunting challenge for research, teaching, development practice, community actions and policy. Accordingly, understanding and tackling this complex challenge demands creative, integrative and holistic approaches by multiple stakeholders, to bring multiple and complementary perspectives, knowledge and skills to facilitate a socially equitable, economically efficient and environmentally sound development (Ivan & Elizabeth et al..., 2002).

Resource management is needed to proceed with the task of finding and implementing guidelines for the patterns of resource use that accompany development. What this really means is that environmental management is needed to manage people and their diverse and potentially damaging activities that take place, either within the context of ownership rights or of the use and misuse of shared resources. It clearly involves the management of human behavior, but the terms of reference for such a mandate are complex. In order that these may be clarified over time

and before time runs out, it is essential that the problem be addressed from every perspective. The continued search for criteria to determine appropriate actions, and the mechanisms for achieving agreed behaviors in future is needed. This is because even though it has become a widely held view in most societies that the preservation of the environment is good, the concept does not meet with agreement in terms of meaning, motives, and the nature of the ultimate good as the goal (Berhanu, 2006).

Regarding the importance of management of natural resources the World Bank (2008) summarizes that natural resources contribute directly to economic incomes, employment and fiscal revenues. They underpin the livelihoods of many among the poorest. They also generate a wide range of positive externalities at the local, national and global levels. With sound management, natural resources can provide the basis for long-term sustainable pro-poor growth. Some fundamental facts deserve more attention from policy makers if growth is to unfold its full potential for lasting poverty reduction. First, poor countries are much more dependent on natural resources as economic assets than are rich countries. Second, natural resources are a major - if not the major - asset of the poor. Third, the international context of natural resource management is changing. Many emerging economies are major importers of natural resources. This increased demand for natural resources makes improved resource management even more urgent (World Bank, 2008).

Natural resource management specifically focuses on a scientific and technical understanding of resources and ecology and the life-supporting capacity of those resources. Sustainability of natural resource management relies on not only on suitable technology and prices, but also upon the institutions involved in resource management at the local level. Policies of transferring management responsibility from the state to users have become increasingly widespread in response to the performance deficiencies of government agencies, the economic crisis of the state, and broader policies of decentralization. The success of natural resource management policies depends upon the local capacity for collective action, but the factors that encourage or inhibit the collective action are insufficiently understood by different people (Rasmussen and Dick, 1995).

According to Ali (2010), the world's greatest concentration of biological wealth is found in tropical developing areas including Africa that are overwhelmed by acute poverty. In these regions, the loss of biodiversity is accelerating as poverty is increasing. African tropical forests represent one of the world's great remnant blocks of closed canopy habitat. This forest and other forms of biodiversity are under increasing pressure from population growth, unsustainable resource use, hotter and drier climate, poor management, clearing of natural habitats for agriculture especially for cash crop production and urban expansion, the demand for fuel wood and charcoal, oil and mining exploitation, excessive timber production and political instability. Excessive deforestation and loss of biodiversity again led to permanent loss of soil fertility. The loss of fertile soil is also aggravated by slash-and-burn practices, over grazing, and natural climatic events.

2.2.2. Indigenous Knowledge System

As many writes agree, in the emerging global knowledge economy a country's ability to build and mobilize knowledge capital is equally essential for sustainable development as the availability of physical and financial capital. The basic component of any country's knowledge system is its indigenous knowledge. It encompasses the skills, experiences and insights of people, applied to maintain or improve their livelihood (World Bank, 1997).

Thus, knowledge is being put to work to accelerate and deepen the development process. Applied to all types of innovation, including the more modest ones in the use of basic technology, it becomes a major resource for generating wealth and jobs. Clearly, various types of knowledge, including the most traditional, can be of use; at the same time there is a need to invest in the most advanced technologies to be part of the global economy. Knowledge has been of decisive importance in mankind's development. Early man's ability to make fire was a tremendous advance transmitted within and among tribes. Later, primitive societies accumulated knowledge about plants, animals, and minerals essential to their survival for thousands of years. Knowledge matters—understanding how people and societies acquire and use knowledge is essential to improving people's lives, especially the lives of the poorest (World Development Report 1998).

The development of IK systems, covering all aspects of life, including management of the natural environment, has been a matter of survival to the peoples who generated these systems.

Such knowledge systems are cumulative, representing generations of experiences, careful observations, and trial -and- error experiments (Louise, 1997).

When Louise continues to discuss about the indigenous knowledge, he puts the character of the knowledge in the following way. “IK systems are also dynamic: new knowledge is continuously added. Such systems do innovate from within and also will internalize, use, and adapt external knowledge to suit the local situation. All members of a community have traditional ecological knowledge: elders, women, and children. The quantity and quality of the IK that individuals possess vary. Age, education, gender, social and economic status, daily experiences, outside influences, roles and responsibilities in the home and community, profession, available time, aptitude and intellectual capability, level of curiosity and observation skills, ability to travel and degree of autonomy, and control over natural resources are some of the influencing factors. IK is stored in peoples’ memories and activities and is expressed in stories, songs, folklore, proverbs, dances, myths, cultural values, beliefs, rituals, community laws, local language and taxonomy, agricultural practices, equipment, materials, plant species, and animal breeds. Indigenous knowledge is shared and communicated orally, by specific example, and through culture (Louise, 1997).

Regarding the concept of Indigenous Knowledge in NRM, many studies and researchers say a lot of supportive ideas regarding its importance. Indigenous knowledge is an emerging area of study that focuses on the ways of knowing, seeing, and thinking that are passed down orally from generation to generation and these ways of understanding reflect thousands of years of experimentation and innovation in topics like agriculture, animal husbandry, child rearing practices, education systems, medicine, and natural resource management—among many other categories. These ways of knowing are particularly important in the era of globalization, a time in which indigenous knowledge as intellectual property is taking new significance in the search for answers to many of the world’s most vexing problems: disease, famine, ethnic conflict, resource management, and poverty. Indigenous knowledge has value, not only for the culture in which it develops, but also for scientists and planners seeking solutions to community problems. Development professionals treasure this local knowledge, finding it extremely useful in solving

complex problems of health, agriculture, education, and the environment, both in developed and in developing countries (Karin & Jun, 2002).

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Indigenous knowledge on its part refers to what indigenous people know and do, and what they have known and done for generations – practices that evolved through trial and error and proved flexible enough to cope with change. This definition draws attention to the colonial racist idea that indigenous knowledge is a monopoly of trials and error while western (modern) knowledge is science characterized by experimentation. Hence, while the former is presumed clogged, concrete, and inaccurate, the latter is painted as intangible, weighty, right, and imbued with universal reasoning. IKS were also developed by experimentations though these experiments were not documented and the knowledge systems were legitimized and fortified under suitable institutional frameworks, culture and practices. They have been passed on to other generations (though discriminatorily) and have enabled indigenous people to survive, manage their natural resources and the ecosystems surrounding them like animals, plants, rivers, seas, natural environment, economic, cultural and political organization (Charles, 2003).

According to Costanza & Erik (2002), significant contributions to global knowledge have originated from indigenous people. For instance, in medicine and veterinary medicine with their intimate understanding of their environments indigenous people are important. They developed and adapted their knowledge continuously to gradually changing environments and passed down from generation to generation and closely interwoven with their cultural values.

Indigenous knowledge is also the social capital and part of the lives of the rural poor. It is their main asset to invest in the struggle for survival, to produce food, to provide for shelter and others though many this knowledge systems are at risk of becoming extinct because of rapidly changing natural environments and fast pacing economic, political, and cultural changes on a global scale. Practices vanish, as they become inappropriate for new challenges or because they adapt too slowly. However, many practices disappear only because of the intrusion of foreign technologies or development concepts that promise short-term gains or solutions to problems without being capable of sustaining them. The tragedy of the impending disappearance of indigenous knowledge is most obvious to those who have developed it and make a living through it. Their livelihood depends almost entirely on specific skills and knowledge essential for their survival.

Accordingly, for the development process, indigenous knowledge is of particular relevance for the following sectors and strategies: agriculture, animal husbandry and ethnic veterinary medicine, use and management of natural resources, primary health care (PHC), preventive medicine and psychosocial care, saving and lending, community development, and poverty alleviation (Peter, et al. 2009).

2.2.3. Indigenous Knowledge in Development

The World Bank, which launched the Indigenous Knowledge for Development Program, documented several cases to illustrate how IK can play a crucial role in development. The examples include: improving primary education by using local language as a means of instruction in West Africa; provision of primary health care to help reduce child mortality in Eritrea and maternal mortality in Uganda; empowering women in Senegal to facilitate the eradication of female circumcision; helping communities in Mozambique to manage coastal natural resources; and using traditional medicinal plants in Zimbabwe to treat malaria. IKS can also serve as an important tool to assist Africa in coping with climate change. In Nigeria, for example, indigenous methods of weather forecasting are used by farmers to complement crop-planning activities (World Bank, 2007).

The strong attempt of all these authors is to show that IK can provide problem solving strategies for local communities. As studies show up to 2/3 of the world population depend on foods provided through IK of species and farming systems. Not only this but also learning from IK can improve understanding of local communities, understanding IK can increase responsiveness to clients, building on local experiences, judgments and practices can increase the impact of a development program beyond cost effective delivery of stages, indigenous approach to development leads to sustainability creating sense of ownership and also it can provide a building block for the empowerment of the poor. Therefore, protecting indigenous people along with their knowledge is important just to preserve Indigenous Knowledge, to increase awareness of its value, to commercialize it where appropriate with equitable benefit sharing, to prevent from possible abuse and also to conserve biodiversity (Charles, 2003).

However, practically, this Indigenous knowledge is not yet fully utilized in the development process. Conventional approaches imply that development processes always require technology transfers from locations that are perceived as more advanced. This has led often to overlooking the potential in local experiences and practices (et al...2003).

Indigenous knowledge is relevant on three levels for the development process: It is, obviously, most important for the local community in which the bearers of such knowledge live and produce. Development agents (NGOs, governments, donors, local leaders, and private sector initiatives) need to recognize it, value it and appreciate it in their interaction with the local communities. Before incorporating it in their approaches, they need to understand it – and critically validate it against the usefulness for their intended objectives. Lastly, indigenous knowledge forms part of the global knowledge. In this context, it has a value and relevance in itself so it can be preserved, transferred, or adopted and adapted elsewhere. When designing or implementing development programs or projects, three scenarios can be observed: The development strategy either relies entirely or substantially on indigenous knowledge, or overrides indigenous knowledge, or incorporates indigenous knowledge. Planners and implementers need to decide which path to follow and get into rational conclusions based on determining whether indigenous knowledge would contribute to solve existing problems and achieving the intended objectives (Kajembe, 1994).

In Africa there are many ingenious and effective ways through which indigenous and other local communities are rising to these challenges. Unfortunately, their innovations remain largely unknown. Whether for food, medicine, or income generation, these groups are using their biological resources in a sustainable way to improve livelihoods. Now it is important to mobilize the local communities and nongovernmental organizations to promote local initiatives for natural resource management, which involve for example tree planting, nurseries development, and other means of generating income that do not harm wildlife or the environment. Sustainable natural resource management should focus on activities that conserve and protect the local environment and that contribute to alleviate poverty through increase natural resource base for food security for the welfare of the poor (Ali, 2010).

The World Conference on Science (Budapest, 1999) recommended that scientific and traditional knowledge be integrated in interdisciplinary projects dealing with links between culture, environment and development in areas such as the conservation of biological diversity, management of natural resources, understanding of natural hazards and mitigation of their impact. Local communities and other relevant players should be involved in these projects. Development professionals consider indigenous knowledge as an invaluable and under-utilized knowledge reservoir, which presents developing countries with a powerful asset. The development of traditional knowledge systems, covering all aspects of life, including management of the natural environment, has been a matter of survival to the local communities who generated these systems. The oral and rural nature of traditional knowledge has made it largely invisible to the development community and to modern science. Indigenous knowledge has often been dismissed as unsystematic. As a consequence, it has not been captured and stored in a systematic way, with the implicit danger it may become extinct (Ali, 2010).

African traditional knowledge is unique to a given African community, culture or society. It is seen to contrast with the knowledge generated within the modern learning system. Traditional knowledge is used at the local level by communities in Africa as the basis for decision-making pertaining to food security, human and animal health, education, natural resource management, and other vital activities. Various experience portrayed that secure access to natural resources for users, helps to bring effective and sustainable uses of the resources if it coupled with strong policies and institutional frameworks.

But IKS in Africa face several threats. First, indigenous knowledge is always passed by words of mouth from one generation to another. Many of the bearers of indigenous knowledge are from the older generation and now find it difficult to communicate their beliefs and practices to the scientifically educated younger generation; once the older generation passes away, the knowledge disappears with them. Second, there is still reticence in the use of IKS, which is considered anecdotal and not scientific, in the development process. Third, there is a real danger that IKS in Africa are being wiped out as a result of the rapid changes occurring from imported economic, cultural and political development models through globalization. It is imperative

therefore that, without delay, IKS in Africa be protected, documented, studied, modified if necessary and then widely disseminated to promote development (Christian, 2004).

The features described above suggest that indigenous knowledge is an integral part of the development process of local communities. According to the 1998/99 World Development Report, knowledge, not capital, is the key to sustainable social and economic development. Building on local knowledge, the basic component of any country's knowledge system, is the first step to mobilize such capital. Moreover, there is a growing consensus that knowledge exchange must be a two way street. A vision of knowledge transfer as a sort of conveyor belt moving in one direction from the rich, industrialized countries to poor, developing ones is likely to lead to failure and resentment. Governments and international institutions can certainly help countries with the daunting task of sifting through international experience, extracting relevant knowledge and experimenting with it. But they will have the most success if they help developing countries adapt knowledge to local conditions. Sharing knowledge with the poor is most effective when we also solicit knowledge from them about their needs and circumstances. Therefore, development activities, especially those that aim to benefit the poor directly, need to consider IK in the design and implementation stages of the process (Donald, 2002).

IK is a key element of the social capital of the poor and constitutes their main asset in their efforts to gain control of their own lives. For these reasons, the potential contribution of IK to locally managed, sustainable and cost-effective survival strategies should be promoted in the development process. However, it is important to note, however, that not all indigenous practices are beneficial to the sustainable development of a local community; and not all IK can *a priori* provide the right solution for a given problem. Typical examples are slash and burn agriculture and female circumcision. Therefore, before adopting IK, integrating it into development programs, or even disseminating it, practices need to be scrutinized for their appropriateness just as any other technology. In addition to scientific proof, local evidence and the socio-cultural background in which the practices are embedded also need consideration in the process of validation and evaluation (Carl, 2002).

2.2.4. The Role of Indigenous Knowledge in Natural Resource Management

Over the years, scholars dealing with indigenous knowledge and natural resources management have said many things that could help in analyzing and explaining the dynamics of indigenous knowledge in natural resource management.

It is generally recognized that IK plays an important role in sustainable management of ecosystem; however, IK has its own limitations. IK is not in itself capable of addressing all the issues in sustainable development. In the same agro-ecosystem, farmers' indigenous knowledge leads to co-existence of both sustainable and sustainable management. Not all natural resource management strategies based on IK are sustainable and not all-indigenous knowledge practices are environmentally friendly. Many indigenous people have extensive knowledge in management of natural resources in their traditional landscapes. Indigenous peoples have experimentation and ways of research, of knowing, which allow the local knowledge to be innovated in the local practices and systems. Recognizing, empowering and incorporating indigenous knowledge in participatory rural development projects have been considered a means of ensuring socially, environmentally and economically sustainable natural resources management. Protection of indigenous people and their environment as potential resource managers is a solution toward of threatened ecosystems. 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 (Abebe, 2000).

In Ethiopia, there are numerous indigenous resource management practices contributing to sustainability of ecosystem management. Ethiopia is a tropical country with varied macro and micro-climatic conditions in diverse ecosystems and inhabited with a great bio-diversity and has over 80 ethnic groups. With such diverse agro-ecology, richness of bio-diversity and existence of multi-ethnic groups, each ethnic group has unique way of managing its ecosystem. In past development effort in Ethiopia, less attention was given to indigenous practices and farmer's competence to solve their problems. In Ethiopia, in spite of government and partners' conservation effort, the past decades have witnessed the severe ecological degradation in Ethiopia. The role of indigenous knowledge system in current land management practices and its

contribution in reducing land degradation and ecosystem management has been undermined (Abebe, et al...2000).

2.2.5. Integrating Indigenous Knowledge and Modern Knowledge

The main challenge for development partners is to integrate IK practices in the design and implementation of development activities that they support. This will require: awareness raising among those who offer development advice; listening to and hearing clients to learn from local communities about what they know; and combining local knowledge with experience from around the world to find relevant and realistic solutions to the development problems of local communities. According to Alan W. Ewert (2004), indigenous knowledge can serve as valuable basis for interpreting information and data, and for solving problems identified by scientists, policy makers and resource managers. This knowledge is, however, not well documented or easily accessible to others including those in the same area with similar problems and challenges. One of the important challenges is to find ways and means that provide the linkages between traditional knowledge of natural resource management systems and modern scientific methods and technologies. The development of information systems where indigenous and scientific knowledge is integrated into a single expert knowledge system will go a long way in contributing towards greater awareness, education, training and capacity building of stakeholders in agriculture and natural resource management and conservation (Ewert, 2004).

Indigenous knowledge is the missing link between development agencies and the rural communities, and that NRM projects recognize the local knowledge systems yield better results compared to those that undermine the knowledge and practices of the local communities. While in the past indigenous knowledge (IK) was typically seen as an obstacle to development and efficient resource management, today IK is seen as pivotal above all in discussions on sustainable resource use and balanced development (Louise (1998). He also argues that recognition of traditional techniques and practices would not only restore the confidence of the local communities in their own traditional knowledge and skills but also lead to the preservation of unique indigenous knowledge. Accordingly, recording and use of IK is a key to conserving Knowledge and experience for the coming generation.

Knowledge integration is defined on Wikipedia as the process of synthesizing multiple knowledge models (or representations) into a common model (representation) and the process of

incorporating new information into a body of existing knowledge. This requires determining how the new information and the existing knowledge interact, how existing knowledge should be modified to accommodate the new information and how the new information should be modified in light of the existing knowledge (en.wikipedia.org/wiki/Knowledge_integration).

Regarding the integration of indigenous knowledge and scientific knowledge, some researchers elaborated that it is too often viewed mainly as a technical problem, ignoring the role of power relations between indigenous people and the state and ultimately creating products that serve scientists and the state rather than indigenous knowledge holders (Donald (editors), (2002). Moreover, according to Donald (2002), scholars have resisted integration on the grounds that the conceptual models and ontologies of traditional knowledge and science are sufficiently distinct to make these knowledge systems incommensurable and that some forms of integration can have unintended and undesired consequences.

Nevertheless, interest in integrating indigenous, local, or traditional knowledge and science is steadily growing along several lines of argument. One is that these forms of knowledge are essential for maintaining global cultural diversity and the biological diversity with which it is intricately connected and will only be appropriately valued and protected through integration that brings benefits to both scientists and local people interested in maintaining that diversity. A second argument is that these types of knowledge contribute invaluable information for science and natural resource management; indeed, they often fill gaps in understanding that science cannot. A third argument is that recognition of traditional knowledge in natural resource management has importance beyond scientific or broader societal merit: it is tantamount to social justice, sovereignty, autonomy, and identity of indigenous peoples. These different motivations for integrating knowledge are neither mutually exclusive nor mutually exclusive. Arguments for knowledge integration also revolve around resilience, the ability of a social-ecological system to withstand disturbance without changing structure, function, feedbacks, and identity and to remain flexible in response to changing environmental and social contexts. The resilience view holds that management of complexity and uncertainty in social-ecological systems can benefit when diverse types of knowledge are combined. Furthermore, co management arrangements that allow knowledge to

be integrated through collaboration can build social as well as ecological resilience (<http://www.ecologyandsociety/vol16/iss4/art6/>).

2.3. Conceptual Framework

This study explores the dynamics of indigenous knowledge (IK) in natural resource management and the challenges and opportunities in the midst of participatory and deliberative governance of natural resources. The over arching issue in the study is how sustainability in natural resource management is shaped, influenced and determined by deliberative interfaces among diverse knowledge systems associated with diverse groups of social agents engaged in the practice of natural resource governance in Dawro zone.

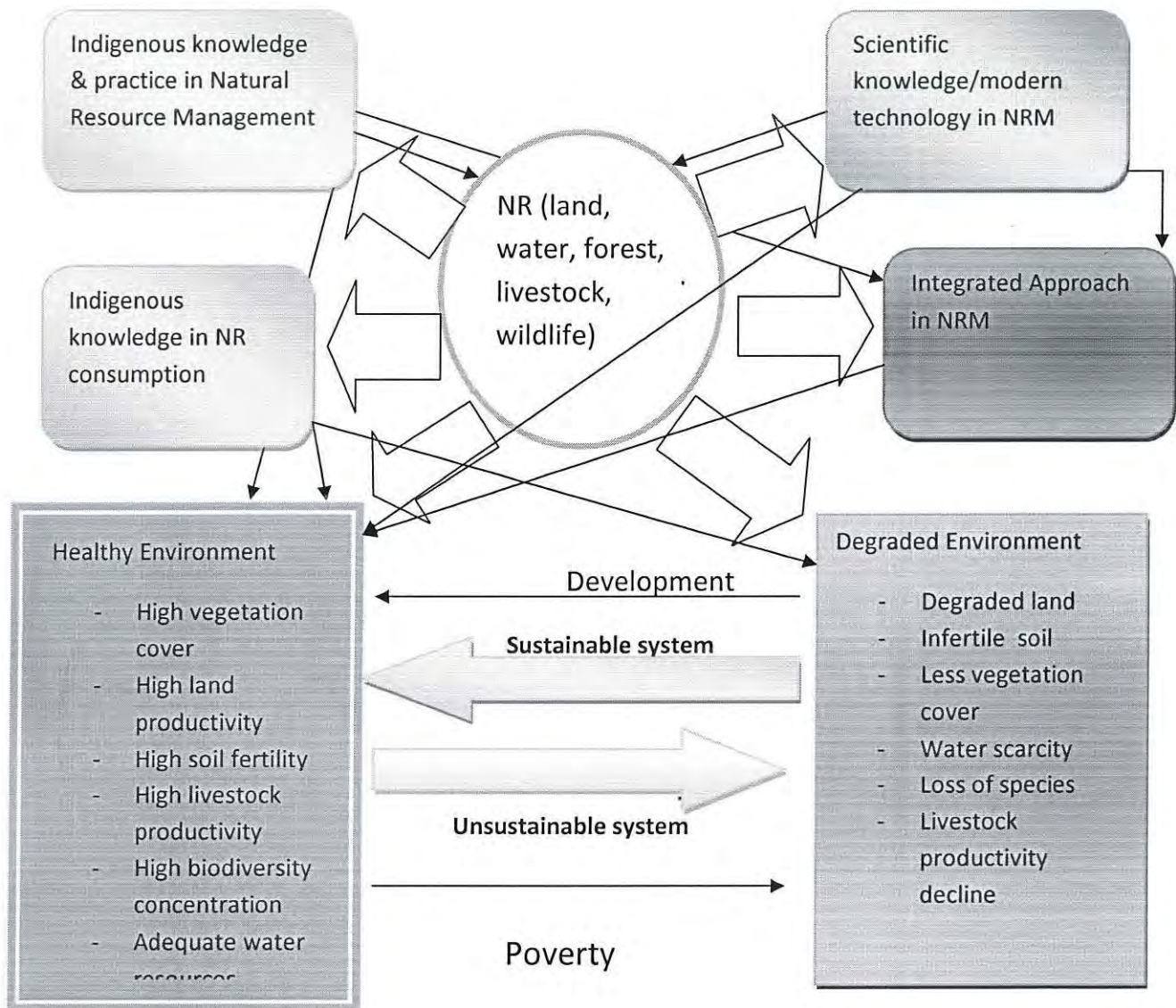
This is in part related to the idea of Ojha (2008) that how and to what extent diverse groups of social agents, often with different and competing systems of knowledge, deliberate over decisions and practices of natural resource governance determines its sustainability. In other words, the challenge of achieving equitable governance of natural resources is related to the ways through which diverse knowledge systems come into deliberative interface to transform or reproduce relations of power and rules of practices. According to Ojha (2008) the challenge of achieving equitable impact from natural resource management is even more critical in view of the expanding frontiers of knowledge and consequent inequity in distribution of knowledge resources at local, national and global levels. The emerging diversity of stakeholders has also given rise to the potential for pooling of diverse knowledge traditions in the practice of natural resource governance.

All citizens share an interest in conservation of natural resources as their livelihoods are closely linked to natural resources. The people best placed to conserve and manage the resources are those living with and using the resources. The people those are likely to lose the most when it comes to negative changes in natural resource dynamics are also those living with or closest to natural resources. It is clear that for communities to effectively contribute to sustainable management of natural resources, they need to be encouraged, supported and empowered by the development agents and other concerning groups to participate along with their knowledge in management of natural resources.

The dynamics of sustainable natural resources management comprises both indigenous knowledge and modern technology. There are inter-linkages between the indigenous practices adopted by indigenous people in a particular locality and the cause-effects of sustainable and unsustainable systems. While sustainable resource management systems promote development and poverty reduction, the reverse (environmental degradation and food insecurity) would take place with unsustainable systems (Knight, 1995).

This study presents a schematic representation of conceptual framework in the following figure (Figure 1). It is to demonstrate that how different elements such as indigenous knowledge of the local society, modern technology, and indigenous practices in resource utilization as well as management interlinked and determine sustainable natural resource management. It indicates that sustainable resource management system results in healthy and favorable environment full of vegetation cover, high land productivity, soil fertility, livestock productivity, biodiversity concentration, and adequate water resources. On the other hand, unsustainable systems result in degraded environment which contains degraded land, infertile soil, less vegetation cover, water scarcity, extinction of species, jumbled climate, and livestock productivity decline. Local livelihood dependence on natural resources, consumption trend of local community, and contribution of different knowledge systems as well as different stakeholders' interaction play role in natural resource management.

Figure 1: Conceptual Framework of the Study



NRM – Natural resource management NR – Natural Resource IK – Indigenous Knowledge

Note: this figure of conceptual framework is designed by the researcher.

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Chapter 3

Research Methodology

The methodological part of this research deals with the study design, description of the study area and target population, sources of data, the way of sample selection, and data collection instruments development.

3.1. Description of the Study Area

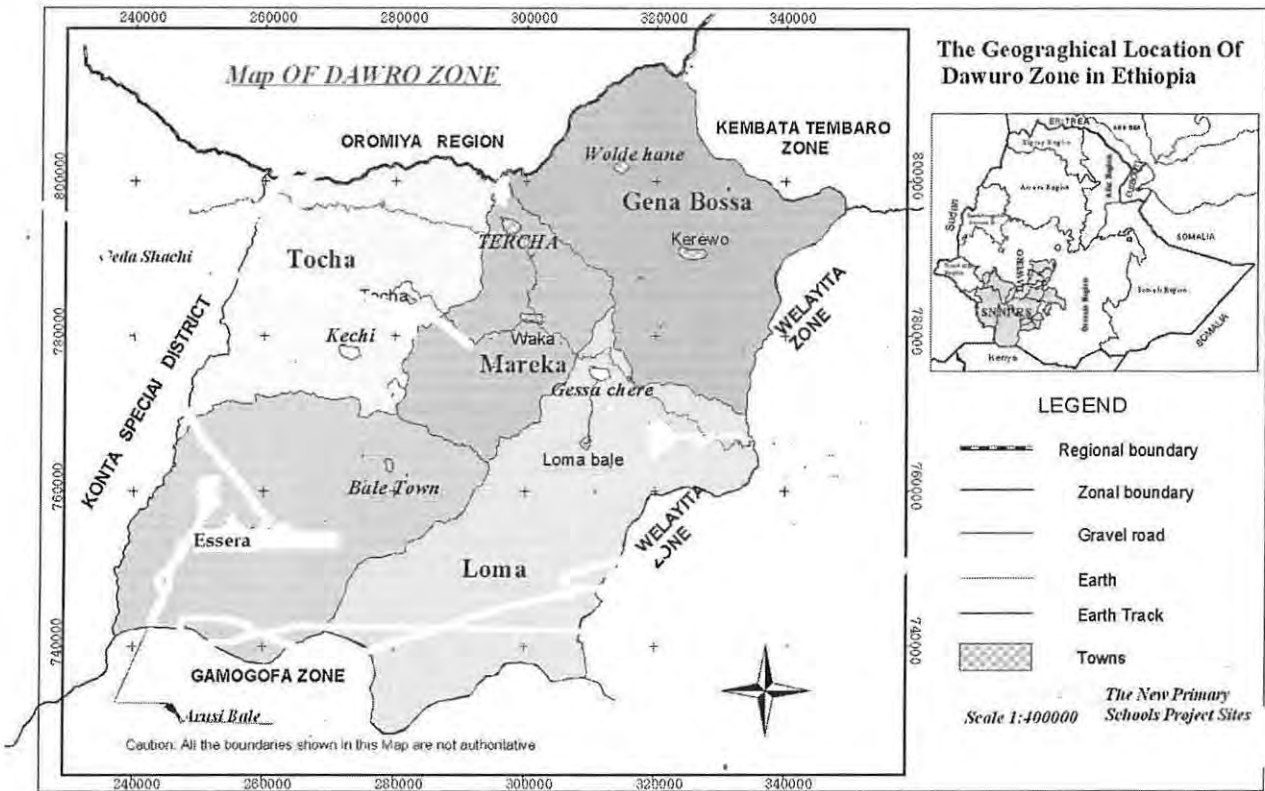
3.1.1. Description of Dawro Zone

A. Location

Dawro Zone is one of the 14 Zones in Southern Nations, Nationalities and Peoples Region (SNNPR) of Ethiopia. The administrative center (capital) of the Dawro Zone is Tarcha, which situated at about 528 Kms South west of Addis Ababa and 282 Kms a way from Hawassa - capital of SNNPR. Dawro is bordered on the South by Gamo Gofa, on the West by the Konta special woreda, on the North by the Gojeb River which defines its boundary with the Oromia Region, on the Northeast by Hadiya and Kembata Tembaro, and on the East by Wolayita; the Omo River defines its Eastern and Southern boundaries(Dawro Zone Administrative Office).

Figure 2: Map of Dawro Zone

The Geographical Location of Dawro Zone in Ethiopia



Source: Dawro Zone Agriculture and Rural Development Bureau

B. Area and Population

Dawro Zone has five woredas namely: Mareka, Loma, Gena Bossa, Tocha, and Issera and in addition one city-administration-Tarcha City Administration. The total area of Dawro zone is about 4431.52 squ.km and it lies between 6.59-7.34 latitude and 36.68 to 37.52 longitudes. Its altitude ranges from 550m at the south western corner at the confluence the Omo and Zigna rivers to 2820m above sea level at Tuta, Tocha. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), this Zone has a total population of 492,742, of whom 457,711 (93%) live in rural area whereas only 35,031 (7%) live in urban area. Form the total number of population, 250,742 are men and 242,000 are women. Concerning the population number at each woreda, it is about 126,661 in Mareka, 109,158 in Lomma, 103,419 in Tocha, 87,753 in Genabosa, and 65,751 in Isara woreda.

C. Climate and Land Utilization

Regarding the Agro – Ecology of the zone, out of the total land size 55.6% is kola (500-1500m), 41.4% is Woynadega (1500-2500m) and 3% Dega (>2500m). The annual mean temperature ranges between 15.1-27.5 °c and the annual mean rainfall ranges 1201-1800mm. The soil in the study area has good physical properties and uniform profile, porous from clay to clay loam in texture and low base saturation less than 5.5PH Values which have agricultural potentialities. According to the land utilization data of the region, 38.4% is cultivated land, 13.39% grazing land 16.81% forest bushes and shrub land, 17.09 % cultivable, and 14.31 is covered by others.

D. Economic Source

Agriculture is the most dominant sector of Dawro like other rural areas of the country. More than 92% of the populations live in rural area. Their economy is largely dominated by subsistence agriculture, and crop and livestock farming are the principal practices. Mixed farming dominated the areas, with crop and livestock farming practiced in the same management unit. Crops such as barely, wheat, beans, and pea are grown in the higher altitudes, while sorghum, teff and maize are the principal crops in the mid and low altitudes. Various vegetables, fruits and groundnuts are extensively cultivated in the area.

E. Cultural Resources

Traditional methods of dispute solving, cultural music and local natural resources conservation techniques are mentioned as extended structure of traditional administrative system in Dawro. According to the Cultural Values and Heritages Preservation and Promotion Profile of Dawro, the people of ancient Dawro were also known in their own creativities. Some of the most important innovations of Dawro include *Manchala* – a mat like item made of skin of an ox and used for sleeping, *Dinke*- which has been argued as the longest breathing musical instrument in Ethiopia. *Halala Kella*- the graet wall of King Halala is another indicator of the innovation of people of Dawro. It is believed that the construction took three hundred years (16th century AD. to 18th century AD.) and it was named after king Halala who had finalized its construction. Its height ranges from 2 to 3.5m and its width ranges from 2 to 5m depending on the suitability of the area for defense and the total length is estimated to be more than 1000km. *Katti Huluqua* – a cave which has entry and exit and used for ‘purification purpose’, and *Katti Dubusha* – Palace located in 32ha of land and includes varieties of items made of rocks are other historical and cultural resources of Dawro.

3.1.2. Description of Mareka Woreda

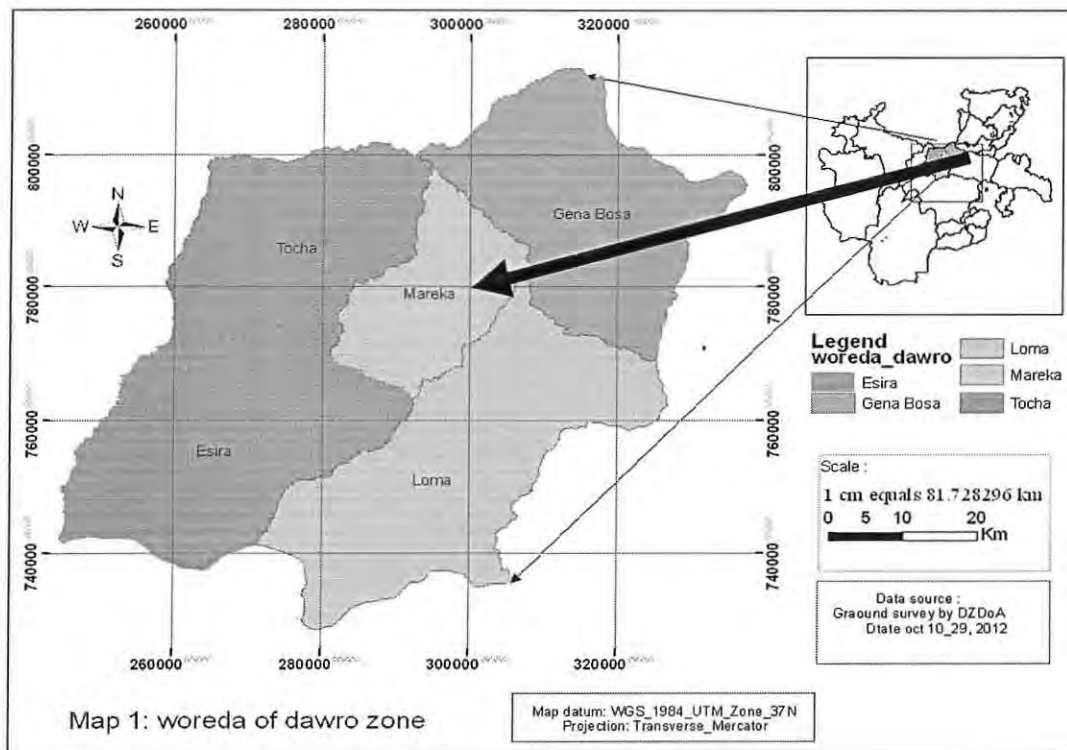
The study area -Mareka woreda- is at the center of the Dawro zone. According to the Zone Agricultural Office, the majority of the farmers and resources of the zone is located in this woreda. The total area of Mareka Woreda is about 46,220 ha. From the total area of the woreda, about 12834 ha is utilized for agriculture, 200 ha is covered by forest and 11,550 ha is pasture land. The average land owned by individuals in the woreda is about 2ha per household. According to the information from Agricultural Office of the Woreda, above 90 % of the land of this woreda is occupied by farmers.

The total population of the woreda (as estimated in 2007 census report) is 126,661 of which 65,635 are male and the remaining 61,026 are female. Of the total population of the woreda about 85.3% reside in rural and 14.7% in urban.

The woreda is divided into 35 rural and two urban kebeles. Considering the climatic condition of the woreda, Dega (High land >2500m) covers 36%, Woynadega (Midland 1500-2500) 51%, and kolla (lowland <1500m) is about 13%. Like other rural woredas, the economic source of this woreda is mainly agriculture.

Figure 3: Map of Mareka Woreda in Dawro Zone

The Geographical Location of Mareka Woreda of Dawro Zone in SNNPR, Ethiopia



Source: Dawro Zone Agricultural Department

3.2. Study Design and Target Population

This study is based on primary data which was gathered through a cross sectional survey of households. Secondary data is also referred for further information. The target population of the study is therefore, farmers of the selected kebeles (Tarcha Zuria, Gozo Shasho, Gozo Bamushi, Eyesus, Daka Yeli, and Koisha) in Mareka woreda. These six kebeles are randomly selected among the 35 rural kebeles. Urban kebeles of the woreda (Marri and Waka) are not included in the selection because the target population of this study is farmers in the rural area.

3.3. Data Sampling Procedure

Purposive sampling was employed for the selection of Mareka Woreda among the five districts in Dawro Zone. First, as Mareka is the central woreda in the Dawro Zone, it shares different traditional experiences and indigenous practices with other adjacent woredas (Isara, Tocha, and Gena Bossa) of Dawro and hence it can represent other woredas that employ indigenous

knowledge in natural resource management. Second, this woreda has many kebeles and highest population number while compared to other woredas in the Dawro zone. Most of the residents (about 85.03%) are farmers and live in rural areas so that their life is strongly attached to varieties of natural resources available in their surroundings. Since there is high population pressure, there could be high resource exploitation and environmental challenges in this woreda. Hence, there is high probability of employing various indigenous practices in reaction to the environmental challenges. Finally, because of its location Mareka is the preferable woreda to access information from all possible directions efficiently.

The population number of Mareka Woreda according to the 2007 population census is about 126,661 and it has about 37 kebeles. Considering this, 6 rural kebeles (Tarcha Zuria, Gozo Shasho, Gozo Bamushi, Eyesus, Daka Yeli, and Koisha) were randomly selected out of 37 kebeles. The average family size of each household is five in the study area. Considering this, when it is calculated for average households in each kebele from the total population, it is about 745. Therefore, the total number of households of the six kebeles is about 4470. The sample size determination is calculated from 4470 HHs. To calculate the total number of households to be conducted, this study used one of the approaches to determining the sample size. The formula that the study used was a simplified formula to calculate sample sizes provided by Yamane (1967:886) is: $n = \frac{N}{1 + N(e)^2}$

Where n is the sample size, N is the population size, and e is the level of precision. When it is calculated by using the above formula: $n = \frac{4470}{1 + 4470(0.09)^2} = 120$ households. Then the study was carried among 120 households and 20 households from each kebele were selected through simple random sampling technique. This process was held taking cost, speed, accuracy, destruction of test units, and other useful information in to account.

3.4.Sources and Methods of Data Collection

3.4.1. Primary Data

To address the objectives of the research, qualitative research methods have largely been employed through qualitative descriptions. Factual field observation of the situation over the study area was made. This observation included the current conditions of land and other natural resources, vegetation cover of the area, traditional practices of the farmers, religious places and

protected areas, resources that are given special attentions and other incidents in the study area. Then key informants' in-depth interview (individuals and group) and focus group discussions were other main sources of data for the study. The researcher also conducted household survey (using simple random sampling procedure) for some overall information.

3.4.2. Secondary Data

In order to get substantial information books, published and unpublished works on this area, useful documents, records of offices regarding the issue and any reports that could contribute to the study were reviewed. Any helpful information sources from Agricultural Offices and Rural Development Agents, Culture and Tourism Offices, Natural Resource Management Departments in Zone as well as Woreda level have been conducted.

3.5. Methods of Data Collection /Instruments Development

A. Questionnaires

Individuals, mainly heads of households, from local people responded to questionnaires. As the research is more qualitative, this household survey is carried only to gather general information. The questionnaires contained both close ended and open ended questions. Questions that were raised included; household characteristics (background information), common resource use, environmental problems and its impacts on local livelihoods, indigenous practices in resource management, and others. These questions were first developed in English and later on translated in to Amharic as well as local language. Before conducting the actual survey, pre-test was made in order to identify unexpected problems in the time of actual survey. Six enumerators were recruited, trained and managed data collection process for general information part.

B. Personal Observation

Direct observation has been an important indicator or mechanism to crosscheck the data gathered through other methods and supported the whole information through eye witness. It was undertaken in the selected kebeles in order to get a clear image of the land feature, natural resources coverage, agricultural practices and land use, traditional practices, protected areas, resource management styles and other overall situations that were supposed to be helpful for the study. Different indigenous practices with regard to natural resource management by local community were given special attention during field observation and participatory transact walk.

C. Key Informants Interview

In addition to other tools, this study used key informants interview (KII) in collecting primary data. Face to face interview with some open-end questions were undertaken. The questions were with clear and simple beginning just to help the respondents understand the question easily. As the nature of the study is more tilted toward qualitative, more focus was given on this method. It gives an opportunity to extend other questions depending on the responses. In an effort to get into depth about the issue under consideration, unstructured interviews were conducted with key informants such as community (elderly) representatives, zone culture and tourism department and agriculture sector heads, woreda agricultural officials, development agents as well as experts. The total number of people participated in KII was eleven. The selection of those informants was purposive depending on the information they could provide on the issue under consideration.

D. Focus Group Discussion

Focus group discussions (FGD) were held to gain further insights on issues that were not adequately covered by the questionnaires and other means. Local community especially farmers (men and women) were the main targets under this method. Three focus group discussions containing eight to eleven people were held in three kebeles. FGD #1 was held in Gozo Shasho kebele and it contained nine people and they were all farmers. FGD #2 was carried in Daka Yeli kebele and it included about eight people. Among these people there were two model peasants and main and vice chairpersons in discussion. FGD #3 was held in Koisha kebele among eleven people. The group contained influential farmers, two DAs and chairperson of the kebele. Group members were deliberately selected from the households under study with enthusiasm to the issue. During the group discussion some leading question were raised by the researcher and the results of discussions under each topic were carefully noted. The group discussions were given primary attention as sources of qualitative data. The size of the group was determined by taking things such as accuracy, cost requirements and time allocation under consideration.

3.6. Method of Data Analysis

In the case of this study, both qualitative and quantitative data analyzing methods are used. The analysis of qualitative data collected through focus group discussion, key informants interview and personal observation has been analyzed by using predominant qualitative descriptions,

narrations, discussions and logical presentations in line with the presented data by elaboration and cross tabulations. Analysis of quantitative data obtained through questionnaire survey has been analyzed using descriptive statistics such as graphs, arithmetic means, charts, percentage, and frequencies. Logical argumentations, triangulations (cross-checking the data through different sources) are also employed during the analysis. Socioeconomic and spatio-temporal data have been analyzed by using the Statistical Package for Social Science (SPSS) and the results are displayed in various forms (e.g. tables, charts and/figures).

Chapter 4

Results and Discussion

This chapter presents the data and its analysis of realities. It has different major parts such as background information of the respondents, the existing physical environment of the study area, indigenous knowledge, attitudes and practices of local people on natural resources management, role of traditional beliefs and community values in natural resource management, indigenous people and modern technology, determinate of indigenous knowledge in the study area and other. In short the chapter, thus, provides a synthesis of the available facts obtained through different methods employed during the data collection.

4.1. Characteristics of the Studied Households

This background information of the respondents in the study area has been collected through a survey questionnaire – pointed earlier as one of the tools of data collection in this study. One of the purposes using this tool was to provide updated demographic and socioeconomic data of the study households. Accordingly, the following is a brief presentation of major demographic and socioeconomic characteristics.

4.1.1 Demographic profile

Gender, Age, Education and Marriage Status

The number of households in each kebele and the percentage in terms of total households under consideration is displayed in the Table 1.

Table 1: Number and Percentage of Households in Six Kebeles

Gender	Kebeles												Grand total	
	Tarcha Zuria		Gozo Shasho		Gozo Bamushi		Eyesus		Daka Yeli		Koisha			
	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%
Male	16	13.3	16	13.3	14	11.7	17	14.2	19	15.8	15	12.5	97	80.5
Female	4	3.3	4	3.3	6	5	3	2.5	1	0.8	5	4.2	23	19.5
Total	20	16.6	20	16.6	20	16.7	20	16.7	20	16.6	20	16.7	120	100

Source: Household Survey, 2014

Considering the proportionality of the population number of selected kebeles, this study selected almost equal number of households from each kebele. Among studied households, about 80.5% are men and only 19.5 are women. There is a huge difference between the number of men and women though it was not peaked. However, the difference is because the heads of the households in the community are most of times men so that men represent the household for any external communication. Another reason for the weighing number of men is that the issue under study mainly invites men because in the rural community there has work division between men and women, sons and daughters. Most of time men cultivate the garden, protect the environment, and provide food for the family. Whereas women are active mainly in house management like looking after children, preparing food, and take care of household even though they have part in managing natural resources in and around their home garden and also in social and cultural amenities.

Table 2: Age and Education Background of Respondents in the Study Area

Attribute	Category	Frequency	Percentage %
Age	Below 25 years	10	8
	Between 25-40 years	46	38.3
	Between 41-65 years	57	48.3
	Above 65 years	7	5.4
	Total	120	100
Education	Illiterate (no formal education.)	46	37.6
	Primary School (grade 1-4)	33	27.5
	Secondary School (grade 5-8)	29	24.2
	≥ Grade 9	12	10
	Total	120	100

Source: Household Survey, 2014

As it can be checked from the above table, among studied households, about 48.3% were between 41 to 65 years and 38.3% of the households were 25-40 years old. Since the study focused on people who have many years of experiences of indigenous practices in natural resource management, key informants interviews as well as focus group discussions mainly focused on these groups of people. This has given an opportunity to get sufficient and equivalent information for the study. As productive groups in the society, people in between 25-65 are close to natural resources in the community and have indigenous experiences and practices of

management of resources. The last group was the group of people above 65 years and it was only 5.4% studied households. Even though they are not currently strong enough in responding to the environmental situation, they participated in sharing their past experiences and practices, socio-cultural and religious activities with regard to natural resource management.

Educational level was indicates the acquisition and transfer of indigenous knowledge in the community. It is considered to determine the inheritance of indigenous knowledge and sustainable conservation and exploitation of natural resources. About 37.6% of informants were illiterate or did not attend any formal education and 27.1% were attended only primary education. According to informants, the main reason for not going to school is the absence of schools around their villages or absence of roads to school away from their villages during their teen age. The other reason is because of various social and economical problems they couldn't attend it. However, these uneducated people are running their livelihood with diverse systems of living. Some of them are traditional healers harvesting medicinal plants from the wild; others are successful farmers with their coping mechanisms to the situation they face. They acquired their knowledge from different sources: from parents, neighbors, the society, and from their own life experiences.

Table 3: Marriage Status and Family Size of Studied Households

Attribute	Category	Frequency	Percentage (%)
Marital Status	Single	22	19
	Married	80	66.4
	Divorced	10	8.6
	Widowed	5	4
	Separated	3	2
	Total	120	100
Family Size	2-4	23	18.8
	5-6	69	57.7
	≥7	28	23.5
	Total	120	100

Source: Household Survey, 2014

Among the 120 households, more than 66% are married and about 19% are single. As it can be crosschecked from Table 3, most of households' family size in the study area is greater than five.

About 57.7% of households own 5-6 family members and 23.5% of households have more than seven members. According to the observed facts in the study area most of those family members are teen agers who need protection and care. This family background of the area also indicates that there is more consumption rate than production as well as conservation of natural resources. And consequently, the effort of securing livelihood and also conserving natural resources lies on a small number of people who are at productive age.

4.1.2. Socio-cultural and Economic Profile

Ethnic composition, places of origin and religious background

Ethnic composition, places of origin and religious backgrounds of the respondents in the study is shown in Table 4.

Table 4: The respondents' socio-cultural background

Attribute	Category	Frequency	Percentage (%)
Religion	Catholic	8	6.7
	Orthodox	38	31.5
	Protestant	60	50.3
	Traditional	14	11.4
	Total	120	100
Ethnicity	Dawro	120	100
	Other	0	0
	Total	120	100
Years of living in the study area	Below 25 years	14	11.4
	25-40 years	42	34.9
	41- 65	58	48.3
	Above 65 years	6	5.4
	Total	120	100

Source: Household Survey, 2014

In terms of religion, the largest number of households are followers of protestant religion. About 31.5% of the households are from orthodox background. During the data collection, even though all household were from the same (Dawro ethnic group), religion had been a big deal among the members of focus group discussion (FGD) in terms of natural resource management. Regarding

the destruction of natural resources especially forests, people from indigenous belief or traditional religion make others responsible. They argue that the impacts of conversion to religions other than traditional extended to the destruction of natural forests and heritages in various parts of the study area.

An article - prepared by Dawro Zone 'Cultural Values and Heritages Preservation and Promotion Center - stated that Dawro Zone Administration organized a Forum in 2009 to discuss the ways to revive, preserve and promote the socio-cultural values and heritages of Dawro and thereby to contribute for socio-economic development. In this document, the Zone Administration argued that one of the tragedies of the Dawro Zone is the deterioration of indigenous natural resources conservation techniques. According to the article, cutting of some huge trees like Warka was not the tradition of Dawro. Moreover, some individuals with supposed magic powers or witchdoctors grow a number of trees in the sacred places. Such practices have their own contribution on maintaining the environment or nature. However, these indigenous customs are being destroyed and the people nowadays consider them as backward traditions.

Regarding the place of origin (years of living in the study area), among 120 households, about 48.3% have been living for forty to sixty five years in the area. Again 34.9% lived for twenty five to forty years in the study area. Even though much of the difference in years of living is because of respondents' age, there were some respondents who came to this area from other parts of Dawro Zone because of different reasons. In this case, most of the informants told that they acquired the knowledge of managing natural resource as well as sustaining their livelihood from their fore fathers and also from their own life- long toiling. They also stated that living all their lives in one place helped them identify good seasons for cultivation, different soil types and structures for different plant species and livestock for high lands and low lands. This indicates that almost all households' indigenusness and so many years experience of their environment made them competent enough to provide useful information regarding the past and present physical nature of their environment, natural resources degradation and indigenous practices they employ to cope with their environment.

Economic background of the respondents

Table 5a: The respondents' economic characteristics (occupation and landownership)

Attribute	Category	Frequency	Percentage (%)
Occupation	Cultivators/agriculturalists	106	88.6
	Pastoralists	3	2.7
	Business (petty traders)	6	4.7
	other	5	4
	Total	120	100
Land ownership	landless	15	12.6
	< 1 ha	42	34.9
	1-2 ha	52	43.6
	> 2 ha	11	8.7
	Total	120	100

Table 5b: The respondents' economic characteristics (livestock possession)

Attribute	Livestock	Category	Frequency	Percentage (%)
Livestock possessions	Cattle	More than 10	31	26
		5 to 9	49	41
		1 to 4	27	22.5
		None	13	10.5
		Total	120	100
	sheep	More than 8	12	10.05
		5 to 8	20	16.75
		1 to 4	48	40.2
		Total	80	67
	goat	More than 6	7	5.8
		4 to 6	11	9
		1 to 3	22	18
		Total	40	33
	Horse/Mule	More than 4	19	16
		2 to 3	22	18.3
		1	20	16.6
		Total	59	49
	Donkey	More than 3	5	4
		2 to 3	14	12
		1	22	18
Total		41	34	

Source: Household Survey, 2014

Many of the studied households (about 91.3%) are engaged in agricultural activities and less than 3% are pastoralists. Most of the households (except pastoralists) own a certain number of cattle

as an additional source of income though they are primarily engaged in cultivation. Their agriculture-based livelihood indicates that these people are close to natural resource in their area and they have their own knowledge system of managing as well as exploiting it. However, as it can be crosschecked in demographic profile (Table 3), because of the population pressure in the area, some of the households are suffering from less land possessions. Among the 120 households, only 8.7% possess more than 2 ha of land and 43.6% possess 1 to 2 ha of land. About 12.6% of the households are landless and they either cultivate other people's land to gain half or one third of the product or rear livestock. this profile indicates that the unbalanced household size in specific land lead to over exploitation of natural resources such as deforestation because of agriculture expansion and settlement which consequently resulted in land degradation in the study area.

According to the informants, their economic status depends on number of livestock (cattle, sheep, and goat), land ownership, self sufficiency in terms of food, house style, ability to hire casual labor and others. Hence, as it was observed during the study, there was economic background difference among the studied households in terms of such incentives. Those households whose economic background is affected by different factors are more exposed to external influences and less able to manage natural resources in their area than others.

4.2. The Current Status of Natural Resources in the Study Area

The distribution and status of natural resources of the area from past to present has been crosschecked in the study. According to the focus group discussion held in the study area, the abundance of natural resources in the area has been decreasing from time to time. Table 6 shows the summery of perception of households participated in FGD on the current conditions of natural resources in the area.

Table 6: The responses of FGD on the current conditions of natural resources in the study area

When you evaluate the abundance of natural resources from past to present, how do you see?	Frequency	Percentage (%)
Increasing	5	18
Decreasing	21	75
No change	2	7
I don't know	0	0
Total	28	100

Source: Household Survey, 2014

From households in FGD, about 75% perceived that the abundance of natural resource in their area has been decreasing. This is to mean that land has been degraded, forest coverage has been decreasing, and biodiversity loss has been increasing. The group discussion was extended to the environmental challenges in the area. Most of the informants in FGD prioritize environmental challenges by stating soil erosion (36.2%), water scarcity (24.2%), land degradation (21.5%), and threat to livestock (14.1%). Only 4% of the FGD members argued that deforestation is the serious challenge in their area and very few people dealt with wildlife loss. But according to Mr Shiferaw Mekuria –one of the development agents in the woreda- deforestation is the main challenge to the area. He extended his argument by saying that a few years ago there were high vegetation cover and different kinds of wild animals in the area. But due to human activities now the forest coverage as well as wildlife decreased very much. Mr Shiferaw said that agricultural expansion, climate condition, and settlement are factors that contributed to the current situation of natural resources in the area.

Mr Asefa Ataro – Natural Resource and Environment Protection Head- during the key informants' interview (KII) said that the presence of deforestation in Dawro is obvious and can be proved by the decrease in forest cover in the Zone. As supportive information to key informants, Dawro Zone Agricultural Office has provided the following data of forest coverage of the zone in different years.

Table 7: Forest coverage in the five *Woredas* of Dawro in hectare (from 2005 to 2010)

Year	The Five Woredas in Dawro					Total
	Essera	Tocha	Loma	Gena Bosa	Mareka	
2005	42,846	22,645	6626	4890.58	7748	84,775.58
2010	30,857.76	18,793	5736.9	4835.59	933	61,156.25
Lost	11,988.24	3852	889.1	54.99	6815	23,599.33

Source: Dawro Zone Agricultural Office

From the Table 8, it can be generally understood that all the *woredas* in Dawro showed a reduction in their forest coverage. This indicates that even if the forest coverage of Mareka is smaller than other *woredas* in the Zone, there is high rate of deforestation too. According to the interview with Natural Resource Management Officers and Development Agents of Zone and Mareka Woreda, the causes of the destruction of such a large hectare of forest is agricultural expansion, overgrazing, cutting for fuel wood, construction, and other personal uses. These informants also state that though there are deforestation and wildlife threat in the area the traditional people do not consider it because they focus more on resources that are closely attached to their personal and daily lives. Concerning the severity of the situation over there, the responses of FGD is summarized in the following Table 8.

Table 8: The responses of Focus Group Discussion with regard to magnitude of environmental degradation in terms of soil erosion and deforestation.

How do you evaluate the magnitude of environmental degradation in terms of soil erosion and deforestation in your kebele?	Frequency	Percentage (%)
High/severe	4	14.8
Medium/moderately severe	8	27.5
Low/less severe	13	45.6
As before	2	8.7
I don't know	1	3.4
Total	28	100

Source: Household Survey, 2014

Among the FGD members, about 45.6% of the households showed that the magnitude of degradation because of soil erosion and deforestation in their area is less severe, and 27.5% of the respondents agree with its moderateness. However, the magnitude of environmental degradation varies from one kebele to another and even from one place to another place in the same kebele. According to the households, this variation depends on population density, landscape, climate condition and type of plants grow, livestock farming style and social agreement in common resource use. They also stated that as experiences and practices of local people in managing natural resources vary from one community to another, the magnitude of the environmental problems vary too.

Some of the key informants mentioned that in some parts of the study area people enclosed their land with living vegetative fences and they used it by dividing for farming, grazing, and home garden plants. These people owned a few cattle such as oxen, milking cow with clear purpose of managing their small land effectively. In such area environmental degradation is low. Whereas in other areas though there is population scarcity and individuals owned sufficient land, they failed to manage it effectively. This is because their farming style was a mixed one - cultivation and livestock. They had many cattle that were not giving any product but grazed on the farming land. According to the informants these activities increased land degradation in some parts of the study area.

This indicates that the coping mechanisms to environmental situations through indigenous practices have been playing role in solving some environmental problems and/or reducing the magnitude of the problems. These indigenous practices also vary from place to place depending on different factors such as high lands or low lands and population density or scarcity. And it can be stated that the traditional practices of local people have a significant effect on the environmental condition.

4.3. Knowledge and attitude of households on the issue of natural resource management

In this part of the paper, results obtained through assessment of the overall knowledge of respondents on natural resource management are presented.

Table 9: The responses of HH on their general perceptions of soil, water, and plant management

Questions	Responses			Total
	Yes	No	I don't know	
Do you know anything about soil, water, and plant in your area?	96%	3.7%	0.3%	100
Do you think these are essential for your life to sustain?	99%	0%	0.8%	100
Do these resources need management for sustainable use?	91%	6.7%	2.7%	100
Does soil, water, plant management issue concern you?	87%	2%	11%	100
Do you employ any practice to conserve these resources in your area?	93.4%	4%	2.6%	100
Do you think that your practices are sufficient for effective management of these resources?	20.2%	79%	0.8%	100

Source: household survey, 2014

People in the study have knowledge of the importance of natural resources for their sustainable livelihood (99%) as well as that natural resources need conservation for sustainable use (91%). Most of the people have their own indigenous practices in natural resources management (93.3%) though they do not deny that their practices are not sufficient for effective and sustainable managements. Discussions carried among FGD on the importance and responsibility of natural resource management confirmed these facts. Some of them transfer the responsibility of resource management to government body or development agents and others do not know who would be responsible (above 11%). Some of the households have the attitude that natural resources will sustain whether they protect or not. They perceive that as it was given by God human exploitation can not affect its existence.

But most of the people in the discussion explain that natural resource management concerns them (87%). Regarding this, one of the FGD members' speeches is summarized as following.

“We, farmers, are toiling in farming and exploiting the resources naturally given to us by God just to feed our family. Our forefathers had been using it to sustain their life and they passed away but they passed these resources to us with full abundance. It is because of human management that natural resource does exist until now and it will be existing in the next generation if the management is sustainable. Therefore, though natural resources are the gift of God, we need to feel stewardship and employ conservation mechanisms besides exploitation. In addition to that government can control if there are people who consume resources in the protected areas and/or someone’s personal property illegally. In my point of view, farmers are responsible for cultivating and producing food as well as managing natural resources for sustainable use.”¹

This indicates that most of people in the study area have knowledge of their responsibility for resource management in the community. It is because of this that they are more concerned with resources in their area and employ different indigenous practices in resource management. The discussion also confirmed that farmers in the study area are well aware of the impact of natural resources management on the productivity of their cultivation as well as on their livelihood sustainability. Hence, the existence of indigenous practices of NRM to cope with the environmental situation is that the result of such attitudes.

4.4. Traditional Natural Resource Management Practices

As it has been defined earlier, indigenous knowledge (IK) is the local knowledge that is unique to a given society and basis for local-level decision making in agriculture, natural resource management, and a host of other activities in rural communities. In this context, this part of the paper presents indigenous knowledge and practices employed in natural resources management in the study area.

4.4.1. Traditional Soil Conservation Practices

The lives of people in the rural community are strongly attached to soil. Soil management has been temptation for farmers in the study area. Their farm plots are exposed to soil erosion and as

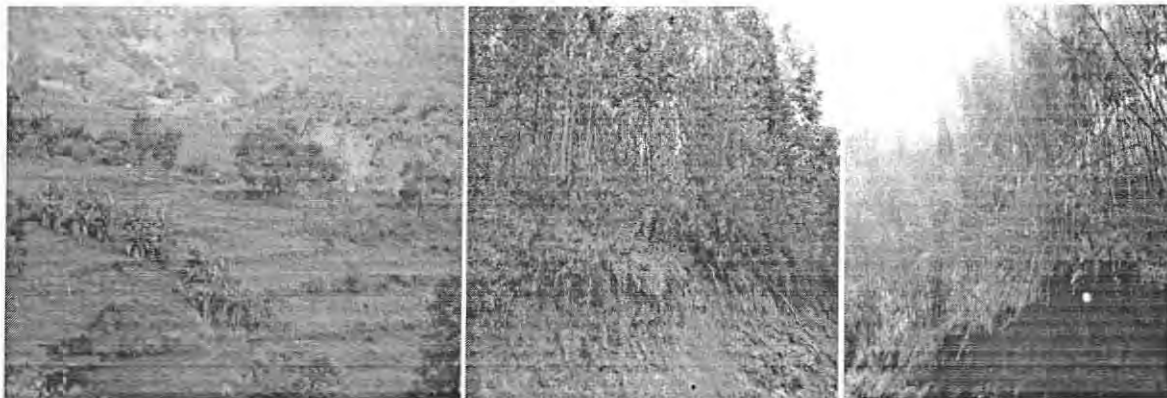
¹ This was the speech of Mr Damene Dashu taken from FGD in the field

a reaction to this end, people have been implementing their traditional knowledge to manage soil and its fertility. In different parts of the area different traditional soil conservation mechanisms were observed.

Hedge (*gata dichuwa*): Farmers in the study area grow grasses at the top, middle, and bottom in particular distance in their land. They call it *gata dichuwa* and its function is that it protects soil run off during rainy season. This hedge (*yesar sert*) is planned to block top soil movement and keep it stable on the surface and it also reduces the amount of soil that moves step by step.

According to the farmers, planting banana trees, bamboo trees, and other edible plants by line around their farm land is also another conservation method. Where there is degradation because of gully erosion, they plant trees- their roots can go deep and catch the soil- at the edge of lands degraded. They believe that this practice provides them multiple advantages: they collect the fruits of those trees and also the roots of the trees protect land degradation.

Figure 4: plants and vegetables to protect land from degradation in the study area



Source, field observation, 2014

Traditional Stone and Soil Bunds (*bitta techa*): Making soil and stone bunds on the slope of the land is one of the conservation mechanisms of the households in the study area. These bunds are made with stones where stones are sufficiently available or with soil. People traditionally practice it to reduce the speed of runoff step by step and consequently reduce soil erosion. Most of the households who employ this are people who live in *kola* and *woynadega*. They state that increasing the water and moisture retention capacity of the soil the stone bunds are helpful in allowing some crop yield even in drought years.

Figure 5: picture of stone and soil bunds in the study area



Source: field observation, 2014

Traditional cut-off drains (*diaa'uwa ogiya kesuwa*): Local people construct a cut-off drain above the farm land by using their tools such as *maresha* or *horda* to intercept and divert the surface runoff from higher slopes and protect downstream cultivated plot. This practice diverts the run-off to a broad waterway or river. By using this method traditional people not only protect their farm land but also they divert water from the river to cultivated plots or into reservoirs for irrigation and/or for domestic use.

Traditional canal (*diaa'uwa zaruwa*): Is an artificial drainage channel constructed by the local people along the steep slope to accommodate runoff and carry it outside the farm without creating erosion. Making traditional canal or water way at the top and middle of the farm plot diagonally to left and right sides of the farm is the common practice of farmers in the study area. Traditionally it is called *diaa'uwa ogiya* or *zaruwa* and constructed by ploughing with oxen. The focus group discussion confirmed that this practice contributes to increased productivity by preventing runoff from crossing through cultivated fields and maintaining fertile soil of the farm.

Traditional check dams (*diaa'uwa zeruwa*): According to the focus group discussion, most of time these traditional dams (*bahilawi kitire*) are constructed at the beginning of the rainy season. Accordingly, it is the planting of fresh stems of water loving plants (e.g. *tsema*, *maruwa*, *bortuwa*) horizontally across the gully floor or at the base of water ways and covered by soil.

Figure 6: picture traditional check dam



Source: Natural Resource and Environment Protection Office, Dawro Zone

Then other materials such as stones, tree branches and vegetative materials are collected at the base of newly planted stems to support them. There should be adequate space in between those planted stems so that it breaks the flow, reduces speed of run-off, traps sediment, and protects the floor from erosion step by step.

Farmyard manuring (oshan tua'eyusa): One of the practices observed in the study area is that people in the study area use ashes, leaves of trees, weeds, animal and crop residuals (manure, *fig*, *fandiya*) for home gardens fertility. They collect it outside the house and distribute on the farm lands and home gardens. This practice of the local people makes the soil fertile and productive during cultivation. Some of the focus group members shared their experience that how they restored some parts of their land productivity by manuring through regularly parking of livestock. According to these people when they regularly park livestock on dry and less productive land, they always leave residuals there. Because of that the soil moisture retains and after a few years the land restores its fertility. One of the farmers representative stated during the key informants' interview that this traditional soil fertility improving methods has benefited them much in increasing productivity with low cost. According to this informant, as chemical fertilizers are expensive and not always available, manure is used in most farmers' home gardens in the area

Shifting cultivation (lami gosha): shifting cultivation is another practice employed by the local community in managing the soil resource. It is a farming style that local farmers alter agricultural process by time and space. According to the farmers in the area, after 3-4 years regular cultivation land becomes depleted and need rest for further productivity. They mentioned that

when they want to restore the fertility of some part of their land, they keep it without cultivation and grazing for a few years. During that period they keep it from fire and leave with grasses and weeds just shifting their cultivation activities to other part of their land. In order to make sure the fertility of the soil they have indicators. They look for the appearance of fertility indicating plant species (i.e. 'sharapa' or 'setuwa') on the land. If they are not visible any more in the field, they wait for their appearance and until then the field was left to recover from the depleted conditions.

Fallowing (bitta modhisuwa): is another method of managing soil fertility, observed in the study area. It is a practice of abandoning land for rejuvenation when the nutrients are exhausted. In this case farmers simply plough the land once and leave it unseeded for seasons depending on land holding of the farmer and the nature of the land to recover. The farm is left for more than regular farming intervals. They believe that this practice on a particular land increases the water holding capacity of the soil, prevents soil erosion, and restores soil fertility for future crop productivity.

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Crop rotation: Crop rotation is one of the known practices that people in the study area employ for fertility maintenance, productivity increasing as well as weed and disease control. It is the process of growing different crops one after the other on the same piece of land. According to the FGDs, when they regularly grow the same crop year after year continuously for 3-4 years, the soil loss fertility and consequently the crop yield decreases and multiple weeds grow out. However, according to Mr Melaku – one of the Development Agents, crop rotation is a productive practice but nowadays is strongly influenced by farmers' economic background. He stated that most of time people want to grow crops more beneficial in terms of money or as food for home use. Even though they know the function of rotation, some farmers insist on growing the same crop on the same piece of land because they give priority for managing their current livelihood.

Intercropping (walaki zerusa): this is a kind of mixed cultivation practiced in the study area. It is a practice of growing two or more types of crops simultaneously in the same plot in a fixed pattern in one season. Farmers of the area state that they employ such practice because the own small pieces of land so that to manage it effectively. According to these farmers, the practice became effective in increasing crop production and providing protection to the soil against erosion. Most of time people in the study area grow bean, pea, yam, cotton, and sometimes teff

in the farm of maize or sorghum. They arrange the right time for crops that have different planting times and length of growing periods. They state that some of crops have more capacity to catch the soil with its moisture than others so that mixed cropping protects the soil surface and also protects those weak crops from being influenced by erosion. People in the discussion also state that in addition to harvesting combined yields from a given area of land, this practice gives them an opportunity to reduce risks even if unexpected conditions occur to their farm. This is to mean that when the climate changed suddenly those crops that can resist the change will survive in the farm. Hence, for these farmers the advantage of intercropping per unit area is greater than that of single crops.

Contour ploughing (*gede gosha*): as it was recognized during the field observation people in the study area use locally adapted tillage (cultivating) techniques depending on the landscape of the area. In order to prevent soil erosion, they plough the plot contour so that the runoff will not get erosive force on the farm. According to the FGD, in addition to contour plough, they practice *soil trample (zarexuwa)*. For this purpose the plough more than twice before seeds it has dual function in flattening the farm for the seed and in decreasing the amount of soil that could be eroded by runoff. They also select appropriate crops for different soil types arranging plants according to the favorable climate condition. For example, in high lands planting barely, wheat, enset, and in lower elevations/lands teff, sorghum, maize are experiences what the local people shared. In high lands making traditional lines (*Yippa*) in the farm in every certain meters distance using different roots and weeds from the farm is common practice. They also cut huge trees and divide the stems into pieces (2-3 meter) and lay down at certain distance on the farm plot to block soil erosion.

4.4.2. Traditional Water Conservation Practices

Water is one of the important resources for human life and one of the serious challenges in the study area is water scarcity. However, traditional people do not sit merely complaining or blaming somebody for water shortage. They have been toiling with their indigenous knowledge to overcome the problems. Their practices and mechanisms noted during observation, FGD and KII are summarized here under.

Managing spring water (Pultuwa hatha): spring is a place on the earth's surface where groundwater emerges naturally. The water source of most springs is high rainfall that moves down into the ground through soil or cracks in rock finally forced out of the ground by natural pressure. According to the people of the area, the amount of available water from springs may vary with the season and amount of rainfall in the area. Traditional people search for those springs and make well in front of it by placing flat stones in its basement and rounds for collecting flowing underground water from the spring. This is because the amount of water flowing from the spring is most of time not sufficient for direct use so that it should be stored in particular place. Then they store it and use for different purposes. When the storage gets dirty, they remove the stored water out and wash the space regularly.

Hand dug water well (olla hatha): people in the study area identify plant species such as sycamore (ficus), palm, and bamboo trees that can hold water and dig into deep for water well. When they became sure of its appearance, they make traditional fences around it to protect the well from livestock or other contaminations. They also increase its potential of water supply by planting trees that can reserve water through their roots around the well.

Traditional rain water harvesting system (era hatha): this is a system people of the study area use for the collection of rainwater for domestic water supply. This system is mostly applied in the arid and semi-arid areas where rainwater is the most accessible water source. In applying this system, local people prepare their pot - traditional water reservoir outside the house under the roof during rainy season. Then they put leaves of enset at the mouth of the pot in different directions and divert rain water into the storage. However, according to the discussion this system is limited and can't solve the water shortage in sustainable way because it depends on the coming of rainfall.

Traditional dam (Zeruwa): According to the group discussion, most of time this process is employed at the mid of rainy season. They construct a local dam by ploughing besides the farm land and divert runoff water during rainy season. Then after the rainy season they use it for human and animal consumption and for home garden irrigation. However, as the informants stated, the availability of this water is for a particular period of time and then it disappears.

Traditional ways of maintaining water cleanness (*hatha geshatetha*): Where there is sufficient water supply, local people separate wells for animal and for human consumption. By separating the water well for human use with local fences they try to manage their water resources. When women in the area fetch water, they put a clean piece of garment at the top of their jar just to filtrate the water and finally any dirty particles remain on the piece of a garment. Some women in the area shared their experience of water purification or cleaning method. They just put leaves of moringa (*shiferw*) in to the water well and after a few minutes they fetch clean water. During the rainy season, water erosion becomes another hardship for these people and they create traditional canals or water ways above the water well in order to prevent its contamination. They regularly cleaning their water well and also they have a habit of fetching water early in the morning before somebody touch and affect its cleanness. Removing dirt from its surrounding, and planting colorful grasses and flowers around the water well just to make it attractive to drink and cook foods with a water from that well is another practices observed in the area.

4.4.3. Traditional Practices in Plant Management

Field observation, key informants interview, and also discussions of focus groups all confirmed the existence of traditional practices of local community in plants or vegetations management. Different species of crops, vegetables, and fruits are available in the farmers' home gardens in the study area. People in the study area grow plants for different purposes. Some are grown for food, others as income sources, and still other for construction and domestic purposes. They manage those plants by applying different indigenous knowledge.

Plant growing system (*mitha dichuwa*): First they plough the land where they propose to grow plants. Then they plant those plants such as vegetables, fruits, medicinal plants and others like *bahirzaf* and *wanza* in fertile soil. They cultivate them regularly placing manure and *fig* on their roots for fertility and removing weeds using traditional instrument so called *goma*. As it was discussed in group, they make traditional fences around those plants and protect them from animals and people entrance until they grow and become strong enough to resist external challenges.

When some plants in the home garden are attacked by plant diseases, they remove it away from healthy ones, and also they grow plant species that can protect other plants in the garden from

disease. For example, “olomuwa” – a tree that has unpleasant odor and its leaf is bitter if tasted. It can prevent ‘uutha wolla’uwa’ – a disease of onset. These practices of local people have inevitable value in increasing vegetation coverage of the area.

Cutting style and season (*c’eggena*): When people of the study area want to cut trees for different purposes, they take many things into account. First, they identify the right season to cut trees. This is to prevent a plant disease locally called ‘*c’oina*’ - a disease attack plants when they are cut at inappropriate season. This inappropriate season is also locally called ‘*c’eggena*’ and during *chegena* cutting trees is totally prohibited. If they were cut in this season, according to the informants, the products of those plants (e.g. lumber, furniture, or anything made of it) would not serve long because it was already attacked by *c’oina*.

Second, local people apply different cutting styles when they want to use some of their plants. They let some part of stem (about 20-30cm) remain to the root and cut diagonally. This process has its own function: it prevents entrance of rain water into the remaining stem through the top of the cut surface. They stated that if water entered into the remaining part through the cut surface, it would get died and no reappearance of the new buds. In order to facilitate the reappearance of buds in the surface, they have a habit of burning the remains with fire. This is after they cut trees and the aim is to let it reproduce in the place.

Figure 7: Traditional practice of reproducing plants in surface

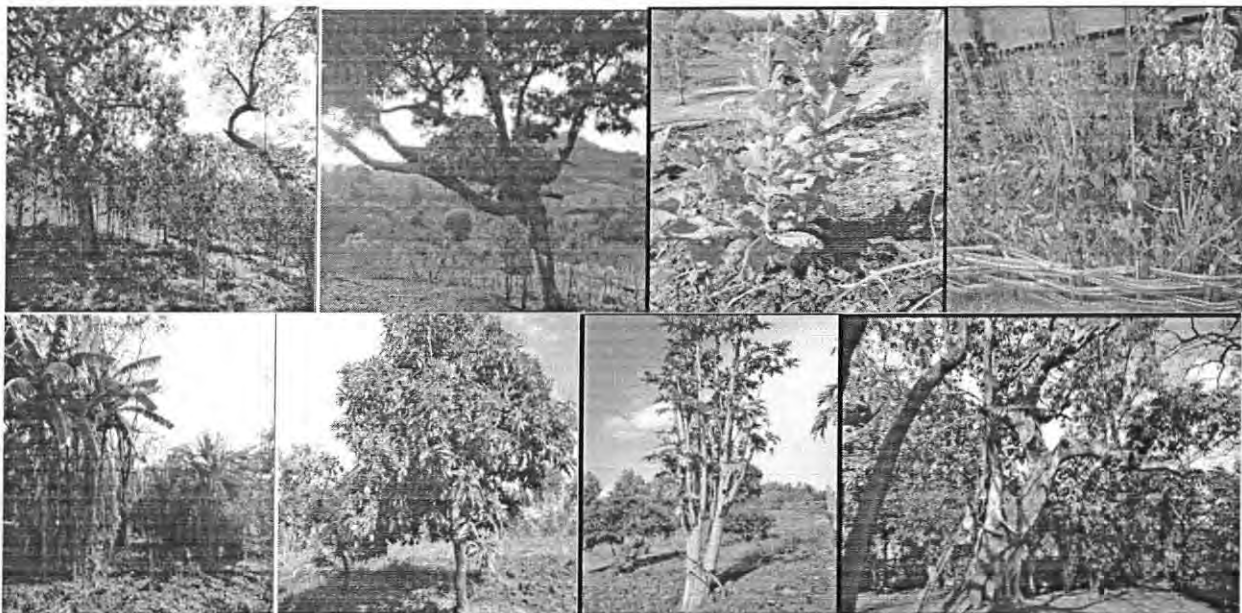


Source: field observation, 2014

Intermixing of multipurpose plants in home gardens: this was another practice observed in the study area. As local people stated, by intermixing multipurpose plants in home gardens and in the farm field the indigenous people benefited much. Some of those plants are medicinal plants collected from wild and planted in the home gardens and includes trees, shrubs and herbaceous species. Home gardens of farmers in local area also consist of some kinds of trees for fruits production, hive hanging, soil fertility, shade provision, storing harvested crops temporarily, and as landmarks to their boundary. Under some big trees in the garden, people plant different kinds of plant species such as coffee, chat, and others.

According to the discussion, in this case they harvest much from a particular land. Regarding the point, Mr Legesse – a Development Agent and one of the key informants said that management of home gardens with its agro biodiversity has been benefiting local people by improving microclimates as it sustains plant cover, improving soil and water conservation potential. According to Mathewos, it also plays role in reducing carbon emissions and increasing sequestration, and reducing vulnerability in the area. Some of the plant species in the home garden of the local farmers are demonstrated in the following Figure 8.

Figure 8: Intermixed multipurpose plants in farmers' home gardens



Source: field observation, 2014

Traditional vegetative (living) fencing practices: Vegetative fencing is commonly practiced in the study area along farm plot boundaries using different plant species. They prefer living fence for its durability and multi function. According to the studied households, most of them used to fence their boundary with dry woods such as bamboo products however, after a few months it became out of use and needed to be modified and strengthened every time. But nowadays they are widely practicing enclosing their boundary with living fences by planting trees around their land. The most commonly used plant species for this purpose are Pigeon pea, grasses, and other local species (*i.e. maruwa, faranjiya tsemma, bortuwa, gammo gadiya*). They are planted at the beginning of the rainy season and grow and become resistant during dry season. According to the informants, in addition to serving as a defense against animal interference these vegetative fences give other many advantages. Some species give edible parts while others are used to construction or other purpose when they get old. For the people in the area living fence develops sense of ownership and gives rest from every time modification of fences of their boundary.

Traditional medicinal plants management: As it was seen during field observation, most of the farmers' home gardens in the study area are full of different species of plants. The farmers were asked about it and their response was that most of those species are medicinal plants used for human and animal treatment. Most of those plant species were brought from wild by men and planted in home garden for different purposes. According to the households, each and every plant species in the garden have its own case to be treated with. Some are used for more than one disease and some are used for treating both human and domestic animals. The most common plant species in the study area and types of diseases treated with them are summarized below.

Table 10: Medicinal Plants, their parts used, its preparation, treatment for, and type of disease treated through in the study area.

Scientific name	Family name	Local name	Parts	Preparation	Disease	Treatment for
<i>Artemisia absinthiu</i>	Asteraceae	Naatiruwa	L	Pounded; Chewed	Hypertension; stomach ache, severe abdominal cramp	Hu
<i>Artemisia afra</i>	Asteraceae	Agupiya	L	Chewed	Stomach ache, ascaris	Hu
<i>Calpurnia aurea</i>	Fabaceae	Mayiluwa	L	Chopped and Pound	Diarrhea, vomiting; Loosen/kill lice	Hu Ca
<i>Citrus aurantifol</i>	Rutaceae	Loomiya	LFr	Chopped; Squeezed	Stomachache, anthrax; Germ killing (wound)	Hu Ca
<i>Clusia abyssinica</i>	Euphorbiaceae	C'ac'awuwa	LR	Chopped, Pounded	Epileptic shock; Evil eye	Hu Ca
<i>Coronopus didymus</i>	Brassicaceae	Sibika	WL	Chopped, Pound	Intestinal problems, rheumatism, stomachache; Swelling of body, toothache	Hu Ca
<i>Cyperus articulata</i>	Cyperaceae	Biddaara	L	Pound; chewed	Stomach ache, intestinal problem	Hu
<i>Echinops keberich</i>	Asteraceae	Burssa	R	Pound	Stomachache; headache; Typhoid; Snake repellent	Hu
<i>Ocimum lamifolium</i>	Lamiaceae	Damakasiya	L	Smashed/ Pounded	Eye disease/eye allergic	Hu
<i>Piper capense</i>	Piperaceae	Tunjaa	Fr R L	Pound, heated; Chewed	Stomachache, intestinal cramp; Headache	Hu Ca
<i>Ruta chalepen</i>	Rutaceae	S'alotiya	L	Chopped, Pounded; Chewed	Stomachache, severe abdominal cramp; Trypanosomiasis; Evil eye	Hu Ca
<i>Zingiber officinale</i>	Zingiberaceae	Yenjeluwa	Rm	Pounded; Chewed	Urethral infection; Leach expel Stomachache, all intestinal problems	Hu

Source: Adapted from Ethnobotany of Medicinal Plants in of Dawro Zone, (Mathewos Agize, 2013)

Bb represents bulb, Bk=bark, L= leaf, Sd=seed, Fl=flower, Fr=fruit, Sm=stem, Sp=sap, R=root, W represents whole parts, Treatment for (Tf): Ca= cattle, Hu= human,

Above table indicates different types of plant species people in the study area have been using to treat different human and domestic animal diseases. Those people that have the knowledge of plant species for disease treatment are called traditional healers. Because of the medicinal functions of plants, local people bring different plant species from wild and plant them in their home garden. According to Mathewos Agize (2013) who conducted the study on Ethnobotany of Medicinal Plants in Loma and Gena Bosa Districts (Woredas) of Dawro Zone:

About 62.92% (112) of the medicinal plants were used to treat humans while 25.84% (46) were used to treat both human and cattle while 9.55% (17) were used to treat cattle diseases only. Medicinal plants in the study area were more for the treatment of humans than cattle or other domestic animals. Some traditional healers use the same plant species for treating different diseases of human and domestic animals. The preparation of these and other plants were kept in the house or in the pocket for immediate usage of accidental illness or otherwise they were cultivated or allowed to grow in home gardens for immediate access. The variation in know-how among healers depends on the interest of individuals, age, education status, availability of plants and occurrence of diseases. However, there was no documented Indigenous knowledge of the use of traditional medicines. These were transferred verbally and secretly between the healer and his inheritor with strong oath training²

And the study states that indigenous knowledge and practices of local people in medicinal plants conservation and exploitation has valuable contribution in natural resources management in the area as well as in scaling up the adaptation capacity of local livelihood. However, in some parts of the study area these medicinal plants are at risk because of cultural transformation, population pressure, and agricultural expansion.

4.4.4. Indigenous Practices in Livestock Farming

Livestock farming is one of the common livelihood activities in the study area. Cattle, sheep, goats, horses, mule, donkey are the common domestic animals. In high lands sheep, horses and

² Mathewos Agize, (2013). Ethnobotany of Medicinal Plants in Loma and Gena Bosa Districts (Woredas) of Dawro Zone, Southern Ethiopia

oxen and in low lands goats, donkey, mule and cattle are usually farmed. Livestock are the sources of food, income and traditional fertilizers of farmers in the study area. However, according to the respondents, livestock productivity has been declining in the area because of disease and climate effects. In response to this problem people in local community implement their traditional knowledge through practices. Some of the traditional practices in the case of livestock management in study area are explained in this part.

Graze land identification: As it was observed, some of the farmers keep a particular part of their land separately for livestock grazing. They round it with traditional fences to protect from entrances of others' livestock and manage as range land by protecting and growing pastoral plants such as *muchu* and *daliesha*. Then they stock only their own cattle. According to Mr Dersema— one of the farmers, this practice has been useful in preventing their cultivation land from degradation because of grazing and it also has given opportunity for livestock to be effectively postured. However, most of time this practice is employed by people who can afford land for cultivation and grazing separately. As information gathered in different forms, farmers in the study area also burn grazing land with fire right before rainy season so that new grass would appear for livestock during rainy season and also the number of tsetse fly would decrease.

Feeding system: In dry season the local condition becomes harsh for livestock farming. They suffer from food shortage and water scarcity. However, when there was serious drought in the society, traditional people feed their cattle grains from the store, roots, stems and leaves of crops, vegetables and fruits (banana, enset, papaya, yam and sugarcane) are common foods for cattle during dry season there. Local people employ various methods to supply water for their livestock. They dig water well, or divert rain water into their traditional dam, and/or drive their livestock to the river. Most of the times they grow pasture around their farm plot in rainy season and finally they collect it and keep for livestock food at dry season (*menno*).

Parking system: Farmers in the study area possessed various practices in coping with the situation over there. In dry season, they release their cattle early in the morning to the pastoral field and at noon they bring either to home or to river bank and park under trees until the warm temperature gets down. According to the households in the area, this practice plays role in protecting animals from some insects (e.g. tsetse fly) that suck up blood from animals. Taking to

the river bank gives an opportunity for drinking water as well as resting under the shades of the trees.

Health care: When one of their cow or oxen gets sick, they treat it traditionally using different medicinal plant species. As it was discussed earlier, the home gardens of farmers are full of medicinal plants for treatment of human and animal diseases. Therefore, when they observe any strange symptom on the domestic animal, they bring the relevant medicinal plant for the disease they identified and treat the patient with it. As it was discussed in group, local people also employ other traditional treatments for sick animals. When they see the symptoms of some disease such as anthrax, they commit something such as burning some parts of the animal with a metal became too hot in the fire. They also sometimes separate patients from other livestock groups and feed in home soda ash and salts with water until it becomes resistant.

Selectiveness in farming: Because of living many years in the area, local people had the knowledge of suitable climate for different domestic animals. Therefore, as it was stated during the group discussions, being selective and farming animals that can resist particular climate condition of the area, local people became able to reduce risks. In this case, in the higher ground they farm domestic animals like horse, sheep, and ox, or in the lower elevation animals like donkey, mule, goat, and cow. According to the informants, being selective in farming domestic animals was another adaptation mechanism of local people and contributed in reducing animal death and increasing productivity.

As it is indicated in the presentation above, indigenous people practice various activities in terms of natural resource conservation. The study area is vulnerable to environmental degradation like soil erosion and water scarcity. The consequence of these natural resources degradation in the area affects local people as they are highly dependent on it for their livelihood. And it also affects the sustainable development of the country. To safeguard themselves from the consequence, people of the study area employ their indigenous knowledge in soil and water conservation as well as plants and animals management practices. They have a valuable knowledge in arranging their livelihood to their environment. For example people of the study area traditionally divide soils based on fertility, color, depth, erodibility, capacity to hold water and others. The common categories of the soils in the study area are: 'Tue'sa' (fertile), 'Ladasaa/shafesaa' (semi-fertile), 'Otsasaa' (sandy) and 'Anc'c'osaa' (infertile). Therefore, soil

type is another factor for erosion besides other causes. The study carried by Yilkal Tariku (2007) in East Gojam on indigenous knowledge in soil and water conservation has also confirmed that farmers have important knowledge about the type of slopes, soil conditions, vegetation cover, and socio-cultural settings of their environment. As it was examined because of the study, even though their practices need some kind of improvement, indigenous knowledge in soil conservation, water resource improvement and plant management has part in decreasing land degradation, improving local livelihood and sustaining development of the area.

4.4.5. Traditional Beliefs and Community Values in NRM in the Study Area

The present study observed that people of the study area have their own belief systems as well as community values. These values include cultural, social, and religious amenities. Some of the beliefs and practice related to natural resource conservation are picked up and summarized in this part.

Sherechuwa kashsha: This is a living place of witchdoctors and/or people with ‘magic power’ locally called ‘*sherechuwa kashsha*’ in the study area. These people are respected and supposed to be able to bless, heal or tell fates of the followers of the religion. They have followers that serve them in ploughing farm plot and planting trees in their home garden. These people traditionally planted different plant species and huge pig trees in their home garden and kept it for ages without any destruction. They call it ‘*kashsha*’ - a place where spirits dwell. It has been protected for many years and entrance of people or animals was not allowed. But sherechuwa – a person who is supposed to be with magic power has right to go in to the forest. The reason of its protection was because spirit dwells there in the trees and it becomes disappointed if others cross along the forest. Another reason is that there are medicinal plants in the forest that should not be known to others. It is also considered as one of the special indications of the residence of ‘people with magic power’. When people who have somebody sick in their home come and ask *sherechuwa* for help, he/she (*sherechuwa*) brings some part of plants from *kashsha* and order to use it in the form he/she explained.

Though such practices are continued in some parts of the study area, according to the informants this practice has been declining because of cultural transformation. Nowadays most people in the area have been converted into protestant and orthodox religions. Consequently, these new

converts, who were once witchdoctors or from that family, destroy *kashsha* on the next day of their conversion. The reason was to avoid the spirit in the *kashsha* not to come again and influence their lives. Another reason was that *kashsha* destruction was the indication for genuine conversion among the society.

Socially protected place of sacrifices: There was socially protected area in one of the kebeles this study covered. It was in Gozo Shasho kebele and was protected and reserved purposely for traditional worship, celebrations and rituals. They kept it from livestock grazing, cultivation as well as any human activity because the place was 'sacred' and where they offer sacrifices for their religious purpose. Regarding such places, there was social agreement not to pick up even a single branch of tree unless it was dry and fell down by its time. But regarding the place and sacrificial activity, one of the farmers in KII argued that though the practice was long aged, currently is going to stop because of cultural transformation as well as low interest of the community members. He extended his speech saying that the next generation would not remember the practice as well as the place.

Traditional perception on gigantic trees: People in the study area commonly perceive that huge and long aged trees in their area are blessings from God and they protect it. They gather under those trees for any social stuff such as *equb*, *idir*, *kircha*, *erk*, *awuchachin*...etc. Because of these common uses they keep the areas clean and make traditional seats under those trees and also fences around them. In individual level, some people grow and keep trees in front of their houses perceiving those trees would indicate that they are indigenous (lived all their ages) in that community and their compound is respected. Some other people believe that some birds are messengers from God to deliver good news or bad news for people. In this case they take care of some huge trees because those birds with message (e.g. *gutato*, *harappya*, *dogomato*) inhabit on them.

Traditional implications of diversified home garden: before they make close relationship with others in terms of marriage or *abalij*, they take various things to account. Diversifying the home gardens with different crops, trees of fruits and medicinal plants has a traditional implication in the study area (Dawro). In addition, as farmers they have to own a number of livestock and huge farm yard. Those people who achieve these requirements are considered as powerful, strong,

hard worker and respected ones among the society. They select people who have the same lifestyle for friendship and/or to let their sons and daughters get married with theirs. Therefore, people who have interest to get married with somebody from that family have to build himself economically, socially, traditionally before going to ask their daughters. This indigenous knowledge or attitude of the people have been driving people to cultivate much, diversify their garden with plants and consequently contribute to resource conservation in the area.

Traditional burial places: It was observed that in the study area burial places in the community were planted with species of trees. Planting in graveyards as well as over tombs was a common traditional practice implying that the dead is from a famous family. According to Mathewos, spices, condiments and medicinal plants were planted on the tombs of women symbolizing the effort made by women to grow those plants species in their home gardens when they were alive. Cutting Plants on graveyards and tombs for any purpose has been forbidden. People (relatives and families) visit the graves within a few months interval. They plant additional plants and protect it by removing weeds.

From the presentation we can consider that traditional beliefs, practices and celebrations have contributions to conservation activities in the area besides their main purposes. When people plants trees, diversify their garden with varieties of plant species and enclose are for social and cultural purposes, their practice contribute to soil conservation as well as preservation of plant species. According to elderly informants, one of the traditional ceremonies called '*geyuwa*' – carried out by elderly women – was another conservation method for some plant species like spices, condiments and medicinal plants in the study area. The same finding was reported by Mathewos (2013) in Dawro Zone. In his study also '*geyuwa*' was the ceremony in which women/wives aged over 40 years would go and participate in traditional ceremonies far away from their residence with spices, medicinal plants, fragrances and scent-producing plants, as a result, these plants were established around the house for the purpose of the ceremonies. This indicates that in most cases of traditional practices there is an opportunity to conserve natural resources. With this regard, the Dawro Cultural Values and Heritage Promotion Profile (2009) stated that when traditional beliefs and/or practices are examined in light of NRM, it has meaningful contribution in plant species preservation.



5. Effectiveness of Indigenous Knowledge in Natural Resource Management

In the case of present study, the respondents have been asked the source of their knowledge in natural resource conservation. They affirmed that their knowledge was the outcome of individuals' experiences of many years and also transferred from family as well as from the society at large. Even though they have been employing this knowledge in every room of their livelihoods including natural resources management, some of the respondents were not bold enough to affirm its effectiveness in resource conservation. The result of FGD regarding the effectiveness of indigenous practices in NRM has been summarized in following (Table 13).

Table 11: The summary of FGDs on effectiveness of their traditional knowledge in NRM

How much effective are your indigenous practices in NRM in your area?	Very effective	Effective	Less effective	Ineffective	I do not know	Total
Number of Households	3	12	9	2	2	28
Percentage (%)	11	43	32	7	7	100

Source: FGD, 2014

Though others confess the effectiveness of their knowledge in resource conservation, about 32% of the people in the discussion were hesitating with the effectiveness of their knowledge in all areas of natural resource management. They asserted that soil erosion, decline of livestock productivity, and climate change have been challenges in spite of the application of their indigenous knowledge. However, others insisted on its effectiveness as much as they sustained despite the harsh situations in their community.

The existence of environmental degradations and the gradual decrease of natural resource abundance (Table 6) in the middle of indigenous practices are the indicators for less effectiveness in conservation. According to the key informants' interview with household representatives, some of the informants are not fully employing their indigenous practices at present. Less effectiveness of their traditional practices was additional cause to interference of modern technology and lack of encouragement for the interruption.

6. Indigenous People and Modern Technology in the Study Area

It was observed that modern natural resource conservation technologies are being employed in the study area. Some of the most common practices being conducted in the area included graded stone bunds, hill side terraces, water ways (vegetative and stone paved), grass strips along the contour, modern check dams, and half moon. Area closure and agro forestry were also the practices given attention by development agents in the area. Some of the informants among agriculture experts stated that agro-forestry has been providing multiple usages to the farmers by integrating trees and crops. According to these informants, products from agro-forests could be used for food, timber, fodder, medicine and this practice improves soil fertility through recycling of nutrients. Modern soil fertility improvement practices such as application of artificial fertilizers and compost making process were also being carried out in the area. Tree Planting and Conservation Program of Agricultural and Rural Development Sector was also working hard in the area. Its purpose was to meet the needs for fuel wood, construction, and fodder and in that to reduce pressure from the remaining natural forests and conserve biodiversity. It was also to reduce soil degradation and improve agricultural land productivity.

At the beginning of the implementation of modern technologies in the area, according to Mr Assefa - Head of Natural Resource Conservation office, Dawro Zone, - local people were not willing to accept it. He stated that making farmers understand the concept of modern technology in resource conservation has taken more than five years (2003-2009). People of the community perceived the idea as something development agents want to do for their benefit and they were not voluntary to apply it.

According to Mr Assefa, since 2010, it has been implemented in depth and widely through the whole zone. He said that at present people developed their perception through regular teaching in social meetings and watching the advantage in their area. They became motivated and applying it willingly in their farm lands. It was also observed that in the study area local farmers have been trained and given an opportunity to apply modern soil fertility improvement practices (i.e. applying chemical fertilizers, terracing, grass mulching and composting) in their lands.

Figure 9: Modern Soil and Water Conservation Methods in the Study Area



Source: Dawro Zone NRs and Environment Management Bureau, 2014

Some of the farmers responded that they have been applying modern resource conservation methods in addition to their indigenous practices and increased the product. These people claimed that even though they were increasing productivity using modern knowledge, merely modern knowledge could not be sufficient for sustainable productivity in their context. Some of the households in focus group discussions repeatedly expressed their belief that if they could get improved ways of applying their indigenous knowledge, they would be producing much and conserving their environment in a sustainable manner.

The above result indicates that local people are strongly attached to their indigenous knowledge and practices. They need improvement of their indigenous practices through the help and useful comments of development agents besides introducing new one. The discussion with households also indicates that though product improvement by applying modern technology is obvious, for sustainable use of the resources local farmers prefer contextualization of the approach.

7. Merits in Indigenous Knowledge and Practices of Natural Resource Management

Efforts were made in attempting to see different opportunities in indigenous knowledge and Practices of the community. Some of the main characteristics are summarized in this part.

Flexibility and/or adaptability: is one of the characteristics of indigenous knowledge in the study area. As the knowledge was the output of many trial and errors, people have been modifying their knowledge on different practices based on its effectiveness. Whenever they get a better method to accomplish a particular practice in any case, they tend to adapt it or improve the

former method. Most of the farmers in the area stated that their farming style, ploughing and sowing season and also life styles are all adapted to the agro-climatic zone and socio-cultural settings of the community.

Dependence on local resources: as it was observed in the field, indigenous people highly depend on local resources for the conservation practices. As it was discussed in indigenous natural resource management practices part of this paper, for soil as well as water conservation, their primary resources are locally available materials such as stone, plants and tools made of local materials. In the case of treatment for human and livestock diseases also they use different medicinal plants from their home garden and wild.

Practices with multipurpose: Another opportunity in the indigenous practices of local people is that it provides more than one benefit through a single conservation practice. When they grow grasses on sides of their farm land, it prevents soil erosion and also used as food for livestock. Planting trees around their farm boundary served as a living fence to prevent animals' entrance as well as sources for firewood, construction wood, source of food, and it also prevents degradation. Planting diversified plant species in home garden served the local people as sources of food and medicine, shade provision and maintaining soil fertility.

Efficiency in labour utilization: As it was informed in the discussion with elderly people in the community, local people were known by doing things in group. Some of the farmers in the study area told that they have been accomplishing different indigenous practices regarding conservation with their neighbors in group. However, most households accomplish their resource conservation practices individually and in family level. In this regard, indigenous practices in terms of resource conservation can be said relatively efficient in labour utilization.

Affordability: People of the study area believe that most of their traditional practices along natural resource management are economical, environmentally friendly, and less risky for labours' health. As they use materials from local resources (except metal tools like *maresha* for cultivation) and accomplish in individual or family level, they confirm its low financial requirement. According to Mokonen Deshela (the informant among studied households), one of the reasons farmers insisted on using indigenous knowledge for soil fertility improvement (preferring manure to chemical fertilizer) was that its affordability in terms of cost and also

environmental friendliness. He also stated that indigenous practices needed no specialized training; with the help of knowledge and experience obtained from family or the society one could get things done.

The above characteristics are some of the many behaviors that can be seen in the indigenous practices of people of the community. These characteristics of the knowledge under consideration can be perceived as opportunities to modify, improve and integrate it in appropriate technology implementation for sustainable development of the community.

8. Limitations of Indigenous Knowledge in Natural Resource Conservation

Most of the indigenous practices of natural resource conservation in the study area exist with limitations though they are useful assets in resource management. The limitations are observable in terms of their focus, implementation, effectiveness, and vulnerability.

Limited focus: as it was obtained through field observation and group discussion, when people in the study area implement conservation practices, their primary focus was on conserving resources closer to their self interest and daily lives than resources for common use. As it was identified from the focus group discussion, they are sensitive for soil and water conservation as well as livestock management and securing food for their family.

For instance, deepest intention for forest management or wildlife conservation was not observed among the farmers of the area. As it was discussed earlier, the information of Dawro Zone Rural Development has confirmed that the forest cover has been declining. This is mainly due to: expansion of human settlement, livestock population, clearance for agriculture, and increased demand for firewood, commercial timber production. They also cut forests in their surrounding for extension of building poles and traditional tools.

However, according to Mr Fikire (Chairperson in Gozo Shasho kebele), in the middle of this fact, the local people were not concerned for forest management except consuming it for their livelihood all the time. Regarding this, one of the FGD members stated in such way:

We are not concerned about the common resources in our area except to exploit it.

We have not been responding for the last many years even though we were seeing the reality that forest coverage in the community has been declining because of

grazing, firewood, and wildfire. But currently because of the government interference we have been getting awareness for its management. Now we have known that deforestation has negative impact on our livelihood through climate change and soil erosion in our environment (emphasis is mine).³

Wildlife conservation is another area ignored by the people of the study area. Most of the households interviewed told that they are not concerned about wildlife management. They also stated that whenever they get access, they want to kill wild animals. The reason is either for food or because some animals harm their crop on the farm plot.

Regarding this, interview was carried out with Mr Assefa (Natural Resource Management Office Head). Accordingly, the perception of local people on the forest or wildlife management was low however; it has been increasing from time to time through teaching by experts. He stated that nowadays people began to understand that soil erosion, disruption of soil nutrient cycling systems, river dry up sooner after rainy seasons were all because of the catchments being cleared through deforestation. He also said that currently people in the area began to participate in protection of natural forests from grazing, wildfire, and cutting for personal use.

This indicates that before the intervention of the agents, people with indigenous knowledge were not aware of forest and wildlife conservation. Therefore, limited focus on conservation of particular resources and less concernment of the farmers about other resources such as forest and wildlife has consequences. It might have influenced the abundance of natural resources and also sustainability of development in the past.

Vulnerability to changes: As indigenous knowledge of the local community was transmitted orally, it has been vulnerable to rapid change especially when people are displaced or when young people acquire values and lifestyles different from those of their ancestors. Most of the elderly households of the study stated that youths in the society were no longer interested in, or did not have the opportunity for learning traditional methods. In this case it became harder for the older generation to transmit their knowledge to young people. According to the elderly informants in the area, more and more knowledge has been being lost as a result of the disruption of traditional channels of oral communication. And also they said that when a knowledgeable old

³ This is the speech of Mr Desta Ute-one of the farmers and FGD member.

person died, multiple indigenous knowledge systems became disappeared. This indicates that the consequence of lack of documentation and promotion of indigenous knowledge systems is that loss of this precious asset of the community.

Imprudent implementation: The fact that was recognized in the study area was that, unwise reactions of local people to their environment have been affecting the well being of natural resources as well as the livelihood. For example, according to the community members, hunting wild animals (such as *Genieya*, *Gara*, *Washsha*, and *Dogiya*) for food and also killing others (like *Qariya*, *Geleshuwa*, *Babarqiya*) for the reason they harm the crop in the field or domestic animals, is the common practice in the area. For this purpose they clear forests. However, the consequences of this activity can be extended to deforestation as well as wildlife loss.

Some practices in livestock as well as range land management in the study area are also not appreciated. When they assume that an ox or a cow is sick of *tsoka* (anthrax), they sometimes burn a particular body part of the animal with a metal got extremely hot in the fire. However, its impact on animal health as well as leather product could be negative. Uncontrolled burning system of range lands to let reemerge fresh grass and burning the surface from where they cut trees have also negative impacts resulting in biodiversity loss and land degradation. Others also burn crop residuals and dry weeds on the farm land during clearing the plot for cultivation with no sense about soil nutrient loss as well as carbon emission in the atmosphere. Some of the people in the study area also informed that they use dung and other crop residuals for fuel to solve fuel wood problem. This practice has also impact by reducing the probability of soil fertility through animal and crop residuals.

Therefore, the reality that can be discussed from the presentation is that when people with traditional knowledge try to mitigate some factors that affect their livelihood, their reactions become causes (and even increase the magnitude) of other environmental degradations. They fail to consider the consequence or side effect of any action and opportunities for short term gain were selected over environmentally sound practices, and the solution proposed for particular problem became cause for another. These and other points create possibility to judge on the limitedness as well as insufficiency of indigenous knowledge of the local people.

Less effectiveness: As it has been observed from the study area most of indigenous practices failed to solve environmental problems in a sustainable way. The presence of degraded land, soil infertility and erosion, and water scarcity are still unsolved fully in spite of the traditional conservation practice in the area. However, as it was presented in Table 8, most of the households believe that the magnitude of environmental problem is moderate and there is a contribution of indigenous knowledge to the result.

The respondents' summary in Table 11 also indicates that more than 40% of the studied households confess that indigenous knowledge alone is less effective and insufficient in sustainable resource conservation. As it was crosschecked through group discussions, people with indigenous knowledge told that they were doing no reaction against periodic drought, topographic constraints, growth of population. This fact can be an indication for the limited potential of indigenous knowledge and the possibility to be upgraded.

Less efficiency: Indigenous knowledge of the local community also fails in using resources effectively and efficiently. Some farmers in the study area shared that they plough a large volume of farm and finally harvest below average. Their expectation is to harvest much from a large volume area of farm yard. But finally the result becomes less than expectation in spite of much time and labour force consumption. The reason was that they could not manage the farm as much as those who focus on their small plot of farm.

Some of the people in the study area were also not wise enough in balancing the number of cattle they own with the total area (volume) of land they have for grazing. Some of the cattle are giving no service except for manure. This people have been influenced by the traditional attitude of having many livestock is one of signs of respected people among the society. However, they suffer from land degradation, less crop production as a result of over grazing in farm land. Unsafe exploitation of medicinal plants for treatment of diseases also has been influencing the abundance of plant species of the area. However, failing to balancing consumption with conservation and also to use the resources efficiently, by maximizing the product, can result in less sustainability of the livelihood.

Less pervasiveness: It was assessed in the study that the distribution of indigenous knowledge and practices was also limited. People with indigenous knowledge have no plain access to share

experiences to/from others. Some of the households in the study area asserted that some people especially innovative farmers are not voluntary to promote their innovation to others freely. They are selective to transfer the knowledge to their family members and close relatives. For example, according to the informants, some men of medicinal plants do things secretly and they do not want to show some plant species and the place where they are available. This is because they want to be paid or retain the knowledge in individual or family level. This indicates that no matter how effective they are, some indigenous knowledge do not cross over the region in terms of prevalence. This is one of the characteristics for undocumented and promoted system of knowledge of the area – indigenous knowledge.

Chapter 5

Conclusion and Recommendation

5.1. Conclusion

Indigenous or local knowledge refers to a complete body of knowledge, know-how and practices maintained and developed by peoples, generally in rural areas, who have extended histories of interaction with the natural environment. It provides the basis for local-level decision-making about many fundamental aspects of day-to-day life

Indigenous knowledge system in the study area consist an integrated body of knowledge. There is much to learn from the IK system of people living in local community. They have learning systems — indigenous methods of imparting knowledge, innovation and experimentation; local organizations - traditional institutions for environmental management; traditional decision-making processes; conflict-resolution practices; and traditional laws. Traditional knowledge is vital to local people because it is feasible, efficient and cost effective to learn and practice.

Farmers have valuable knowledge about the type of slopes, soil conditions, vegetation cover and socio-cultural settings of their local environment. They are well equipped with traditional water-management and conservation systems, soil conservation and fertility enhancement practices and indigenous indicators to determine favorable times to prepare, plant, and harvest gardens. They also have knowledge with regard to human and animal health — disease classification systems; traditional ethnoveterinary medicine and the use of herbal remedies in treatment of diseases; the locations of medicinal plants, and the proper times for collection.

However, in the study area, natural resource degradation continued and natural resource abundance has been declining. These environmental problems can be categorized into biophysical, socio-economic, and demographic. Continued environmental degradation would lead to sever environmental and socio-economic consequences resulting in crop yield decline, perpetuating food insecurity and poverty among the rural community. This happens because the traditional knowledge system is not incorporated with the modern knowledge significantly. As indigenous resource conservation measures are well adapted to the study area, the sustainability of natural resources management of the study area needs invaluable contribution of indigenous

knowledge and traditional practices. However, lack of appreciation and recognition of farmers' traditional knowledge in modern resource management design and implementation, has been one of the factors to determine its contribution as well as level of confidence in implementation.

Some of the indigenous practices of natural resource conservation in the area are consistent with other practices found in different parts of the country (Yilikal, 2007; Mathewos, 2013; Yonas, 2005), while others are probably to be unique to the area. Some of the practices such as treatment with traditional medicine and diversifying home gardens with plant species and also practices for soil fertility improvement (fallow, crop rotation, and shifting cultivation) are widely used in the areas and appreciated by the farmers. Most farmers want to continue to use them alone or integrating with modern technology. There is a plenty of potential that needs to be exploited from this system. Hence, these practices can be adapted or adopted in to other areas with similar biophysical and socio-economic situation.

Though farmers in the study areas have a wealth of knowledge and practices about the natural resources in the locality, their knowledge and practices need improvement and modification in order to advance its contribution as well as shrink the limitations.

As most of the indigenous knowledge of the area was transferred through oral communication from generation to generation, they are at risk of scarcity. As a result of lack of documentation and preservation, indigenous knowledge of the local community has been declining through cultural transformation and young generation appearance.

5.2. Recommendation

The following recommendations have been forwarded based on the findings of the study.

- As the role of local communities in conservation of natural resources is invaluable, it will be beneficial if the knowledge, practice, social administrative set ups and traditions of the local people are incorporated in the effort of conservation of natural resources. This can be done by building partnerships for joint problem resolution and systematically improving and modifying indigenous knowledge through technology integration.
- Providing an extensive awareness and training on sustainable utilization and conservation of natural resources to the indigenous people can preserve both natural resource and indigenous knowledge. This is because communities receiving the most externally driven development assistance become less capable of handling their own affairs.
- Resource conservation measures depend on their sustainability to the local ecology and the farming systems. Therefore, designing and implementing culturally appropriate and participatory development programs would avoid costly mistakes, whereas top-down planning fails to promote effective natural-resource management at the local level.
- Greater efforts should be made to strengthen the capacity of local people for developing their own knowledge base, and to develop methodologies that promote activities for improving livelihoods in a sustainable way. For example, supporting innovative farmers (such as men of medicinal plants) and their experimentation would strengthen their capacities to seek out new ideas. By that they can be encouraged to be better able to experiment, to test new possibilities and to adjust to changing conditions. This can be carried out through Participatory Technology Development (PTD) that refers to the collaboration between farmers, development agents and scientists (formal researchers) in a manner that combines the knowledge and skills of these various actors.
- Proper recording and documentation of indigenous knowledge would be helpful for sustainable protection and use of it. Central and local governments, environmental

community and universities could become components of valuing, preserving and protecting the indigenous knowledge resource of the area.

References

- Abebe, Shiferaw, (2000). Farmers' knowledge of soil fertility and local management, strategies in Tigray, Ethiopia.
- Abebe, Shiferaw (2013). The role of Indigenous Knowledge in Land Management for Carbon Sequestration and Ecological Services in Southern Ethiopia
- Badege, Bishaw (2001). Deforestation and land degradations in Ethiopian high lands: a strategy for physical recovery, Oregon state university, Corvallis.
- Bahru Shikur, (1993), Farmer Perception of Soil Erosion Problems and their Attitude Towards Soil Conservation in the Gurage Highlands of Butajira Awraja, South Shoa, M. A. Thesis, Department of Geography, School of Graduate Studies, AAU.
- Berhanu Gebremedihin (2006). Community Natural Resource Management, The Case Of Woodlots In Southern Ethiopia, International Food Policy Research Institute 2033 K Street, N.W. Washington, D.C. U.S.A.
- Berry, Leonard (2003). Land Degradation in Ethiopia: Its Extent and Impact, Commissioned By the Gm with Wb Support
- Bohensky L. Erin and Maru Yiheyis, (2011). Indigenous Knowledge, Science, and Resilience: What Have We Learned from a Decade of International Literature on "Integration"? Published under license by the Resilience Alliance.
- Boven, Karin & Morohashi, Jun (Editors), (2002). Best Practices Using Indigenous Knowledge, a Joint Publication By: Nuffic, The Hague, the Netherlands, and UNESCO/MOST, Paris, France.
- Byers, A. Bruce, (2003). Behaviors in Conservation and Natural Resources Management, Biodiversity Support Program, Washington.
- Castellanet, Christian & Jordan, F.Carl, (2002). Participatory Action Research In Natural Resource Management:United States Of America.
- Costanza, Robert & Jorgensen, Sven Erik, (2002). Understanding and Solving Environmental Problems in the 21st Century: ELSEVIER Amsterdam.
- Dereje, W/Yohannes (2005). Diversity, Distribution and Relative Abundance of the Avian Fauna of Chebera Churchura National Park, Ethiopia; A Thesis Presented to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Biology, Addis Ababa, Ethiopia

- Diop, Jean-Marie (2002), Main components of the Indigenous Soil and Water Conservation Phase II Project ETC Ecoculture, Leusden, Netherlands
- Eshetu, Mengesha, (2009). Resettlement and Conflict over Land use in Resettlement Areas: The Case of Dawuro Zone Resettlement Areas, Ethiopia, submitted to Addis Ababa University, Department of Regional and Local Development Studies In partial fulfillment of the requirements for the Masters Degree in (RLDS)
- Ewert, W. Alan, (2004). Integrated Resource and Environmental Management: The Human Dimension, CABI Publishing
- Falola, Toyin, (2007). Natural Resources And Conflict In Africa, University Of Rochester Press 668 Mt. Hope Avenue, Rochester, NY 14620, USA.
- Federal Democratic Republic of Ethiopia Population Census Commission, (2008). Summary and Statistical Report Of 2007 Population and Housing Census, Addis Ababa, pp 78-79
- Feseha Kebede, (2002), Integrated Rural Development Approach as a Strategy for Rural Poverty Alleviation: The Case of Kemashi WIBS Program, M. A. Thesis in Regional and Local Development Studies, School of Graduate Studies, AAU.
- Gadgil, Madhav & Berkes, Fikret, (1993). Indigenous Knowledge for Biodiversity Conservation:
- Goodbody, Ivan & Thomas-Hope, Elizabeth, (2002). Natural Resource Management For Sustainable Development: The Environmental Management Unit, Canoe Press University Of The West Indies Kingston 7 Jamaica.
- Grenier, Louise (1998). Working With Indigenous Knowledge: A Guide for Researchers, Published By the International Development Research Centre, Canada
- Hemant, R. Ojha & Chhetri, B Ram, (2008). Knowledge Systems and Natural Resources Management: International Development Research Centre, Canada
- Homann, Sabine (2004). Indigenous Knowledge Of Borana Pastoralists In Natural Resource Management: A Case Study From Southern Ethiopia, Justus Liebig University Giessen, Germany.
- Knight, L. Richard & Bates, F. Sarah, (1995). A New Century for Natural Resources Management: Island Press Washington DC.
- Mathewos, Agize, (2013). Ethnobotany of Medicinal Plants in Loma and Gena Bosa Districts (Woredas) of Dawro Zone, Southern Ethiopia, Topclass Global Journals.

- Michel, Henry and Gayton, V. Donald (editors), (2002). Linking Indigenous Peoples' Knowledge and Western Science in Natural Resource Management: Southern Interior Forest Extension and Research Partnership
- Million, Tadesse, (2004). Factors Influencing Adoption of Soil Conservation Measures in Southern Ethiopia: The Case of Gununo Area, Hawassa, Ethiopia.
- Mulugeta Lemenih And Melaku Bekele, (2008). Participatory Forest Management Best Practices, Lesson Learnt And Challenges Encountered: The Ethiopian And Tanzanian Experiences, FARM-Africa/SOS-Sahel.
- Mushir, Ali (2012). Soil And Water Conservation Management Through Indigenous And Traditional Practices In Ethiopia: A Case Study Conducted In Siliti Woreda, Snnpr.
- Mwaura, Peter (Editor), (2008). Indigenous Knowledge in Disaster Management in Africa: United Nations Environment Program, Nairobi, Kenya.
- Sayer, Jeffrey & Campbell, Bruce, (2004). The Science of Sustainable Development: Local Livelihoods and the Global Environment. United States of America Cambridge University Press, New York.
- Scher J. Sara & Mcneely A. Jeffrey, (2008). Biodiversity Conservation and Agricultural Sustainability: Ecoagriculture Partners, Washington, DC, USA
- Takoyoh, Charles Eyong, (2003). Indigenous Knowledge and Sustainable Development in Africa: Case Study on Central Africa, Eolss Publishers.
- Teklu Erkossa,& Gezahegn Ayele, (2003). Indigenous Knowledge And Practices For Soil And Water Management In East Wollega, Ethiopia; Universitaet Hohenheim, Soil Science And Site Ecology, Germany And Debre Zeit Agricultural Research Centre (DZARC), Ethiopia
- Tesfahun Fenta (Coordinator), (2008). Indigenous Knowledge in Ethiopia: The Untapped Resource, Prolinnova-Ethiopia, pp 11-16.
- World Bank, (1998). Indigenous Knowledge for Development a Framework for Action: Knowledge and Learning Center, Africa Region
- Ulluwishewa, Rohana & Harmsworth, Garth, (2008). Indigenous Knowledge for Natural Resource Management, Published Online Springer Science+Business Media, New Zealand
- Wren, Susan (2009). Summary Report On The Potential For Plant Based Rangeland Enterprises In The Dry lands Of Ethiopia: Improving Pastoral Livelihoods And Natural Resource Management Through Plant Based Rangeland Products Enterprise In Borana And Guji Zones, Addis Ababa, Ethiopia.

Yeshambel, Mulat (2013). Indigenous Knowledge, Practices in Soil Conservation at Konso People, South western Ethiopia; American Research Institute for Policy Development.

Yilikal Tariku, (2007). Integrating indigenous Knowledge with Modern Technology for Sustainable Land Management: The Case of Soil and Water Conservation and Soil Fertility Improvement Practice in Enerata KPA, East Gojjam. A thesis Submitted to School of Graduate Studies Institute of Development Research Addis Ababa University.

Yonas Abate, (2005). Community Values and Natural Resource Management: The Case of Indigenous and Settler Communities in Kafa, With Particular Reference to Forest Resources, Addis Ababa University School of Graduate Studies.

Household Survey Questionnaire

INSTRUCTION: Dear sir/madam I, Environment and Development student, am undertaking a research project to determine the dynamics of indigenous knowledge in natural resource management in the study area. To this end I kindly request that you would complete the following short questionnaire regarding your knowledge, practices and attitudes towards natural resource management. It should take no longer than 20 minutes of your time. Your response is of the utmost importance to the study. Please do not enter your name or contact details on the questionnaire. It remains anonymous. Thank you in advance for your willingness to complete this questionnaire faithfully and confidentially.

Section A: Background Information (fill blank spaces or circle your choices where you get alternatives).

- ❖ Date ____ / ____ /2013(2006)
- ❖ Kebele _____
- ❖ Age _____
- ❖ Sex : A. male B. female
- ❖ Marital status : A .Single B .Married C .divorced D. widowed
E. separated
- ❖ Family size _____
- ❖ Years of living in this area _____
- ❖ Educational background:



Education background	Tick (*)
A. illiterate (no formal education)	
B. primary (Grade 1-4)	
C. secondary (Grade 5-8)	
D. high school (Grade ≥ 9)	
E. college/university	

❖ How would you describe your economic status?

economic status	Pick (*)
A. Poor (< 35 ETB/day)	
B. below average (35-100ETB/day)	
C. Average (100-200ETB/day)	
D. Above average (>200ETB/day)	

❖ Religion A. Orthodox B. Muslin C, Protestant D. catholic E. Other

❖ Occupation: A. Farmer (a. agriculturalist b. pastoralist) B. Merchant C Gov. Employee D. Daily laborer F. other

Section B: This section of the questionnaire explores your knowledge, attitude and practices with regard to the natural resource and its management (fill blank spaces or circle your choices where you get alternatives).

1. Do know anything about natural resources in your area? A. yes B. no

2. Would you list natural resources those are available in your area?

_____	_____
_____	_____
_____	_____
_____	_____

3. Do you think these natural resources essential for your life to sustain? A. yes B. no

4. For what purposes do you use natural resources in your area?

Purposes for using NRs	Tick (*)
Food	
Construction	
Income source	
Tools & furniture	

Social and cultural amenities	
Medicine	

5. When you critically compare the status of natural resources in your area, it is: A. increasing B. decreasing C. the same in the past and present D. unknown
6. What are the problems related to natural resources in your area? (please tick them from the following table)

Environmental problems	Tick (*)
A. Land degradation	
B. deforestation	
C. soil erosion	
D. Water scarcity/pollution	
E. domestic animals' death	
F. air pollution	
G. Threat to wildlife	

7. How do you evaluate the magnitude of environmental degradation in your kebele?

Magnitude	Tick (*)
High/sever	
Medium/moderately severe	
Low/less severe	
The same before and now	
Unknown	

8. What are the consequences you observe in your area because of the environmental problems?

_____	_____
_____	_____
_____	_____

9. What are the causes (driving factors) that result in the above natural resource degradation and its consequences in your perception?

_____	_____	_____
_____	_____	_____

10. Who is responsible for the above factors in your understanding? A. government
B. society C. every individual D. all E. I do not know

11. Natural resources management is an important issue. A. agree B. disagree C. neutral

12. Does natural resource management concern you? A. yes B. no C. not known

13. Do you implement any practice with regard to natural resource management in your area?

14. If "Yes", what are the practices you do for the following natural resources management?

14.1. Soil management:

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

14.2. Water management:

- f. _____
- g. _____
- h. _____
- i. _____
- j. _____

14.3. Plant management:

- k. _____
- l. _____

m. _____

n. _____

o. _____

p.

14.4. Livestock management:

q. _____

r. _____

s. _____

t. _____

u. _____

15. Mainly from where did you get knowledge for the above natural resource management practices? A. education B. government training C. life experiences D. family & society F. all

16. How much effective your practices are in managing natural resources around you? A. very effective B. effective C. less effective D. ineffective

17. Are you currently practicing all your experiences of natural resource management? A. yes B. no

18. If "No", what is the reason for not practicing your early experiences? A. because not effective B. because government interference C. because getting other means (modern technology) D. no encouragement E. no reason

19. If "Yes" for question 15, what is the reason for practicing it until now? A. because it is effective B. because there is no better option C. because of encouragement by the government D. because it a trend of the society E. unknown

20. Does the government (development agents) identify and comment on your experiences? A. yes B. no

21. If "Yes", what was their comment? A. to keep on B. to modify it C. to give up and take their technology D. to mix it with the modern technology

22. Have you ever attended any governmental training regarding natural resources management and conservation? A. yes B. no

23. If yes, are you applying the knowledge you got from those governmental trainings practically? A. yes B. no

24. Are you successful with that knowledge you got from governmental trainings? A. yes
B. medium C. less D. no
25. If No, what is the reason? A. not effective method B. I am not interested C. method is not clear to practice D. different from what I experienced E. I don't know
26. What if governmental training and your indigenous knowledge cooperate for natural resource management? A. strongly agree B. agree C. disagree D. strongly disagree
27. Is there any protected areas/land/forest/water body in your area? A. yes B. no
28. If "Yes", what is the case for protecting it? A. spiritual B. social C. traditional/cultural.
D. governmental E. personal F. unknown
29. How do you predict the status of natural resources in your area after 10-15 years if its management is at the same level to today? A. it will be expanded B. it will decrease C. it will stay at the same level D. can't be predicted
30. For the wellbeing of natural resources in your area, what can the following stakeholders do in your perception?

30.1. Government

30.2. Society

30.3. Every individual

Thank you for your co-operation in completing this questionnaire. Please, kindly return the questionnaire back after you accomplished it.

Checklist/ general guideline for focus group discussion

1. What does your reaction to your environment (the natural resources in your area) look like?
2. Are there environmental problems in your area? If yes, how do you understand the presence of it?
3. What are the problems you just observe?
4. Are the environmental problems in your area increasing or decreasing?
5. If they are increasing, what are the causes you consider?
6. What measures are you taking to manage those problems in your area?
7. Are you currently implementing the traditional resource management measures?
8. Would you mention those traditional practices you employ in managing different natural resources? For example, soil and water conservation, plant management, or improving livestock's productivity
9. Do you practice modern NRM measures in your area?
10. Would you mention the most widely practiced modern NRM measures in your kebele?
11. Do you have adequate support from agricultural experts such as development agents in implementing these modern as well as traditional measures?
12. Which measures (traditional/modern) are more effective in conserving natural resources in your area?
13. Do you think that your traditional measures or practices alone are sufficient to manage NR effectively?
14. If yes, how? If no, why? What are other knowledge systems that should be implemented?
15. What measure limitations do you observe when you use modern technology?
16. Have you ever tried to use your traditional knowledge of NRM with modern technology in combination?
17. How do you evaluate the effectiveness of integrating both measures/knowledge?
18. Which conservation method do you think is less costly or more affordable to implement? Why?
19. Do you observe any relation between traditional and modern resource management methods?
20. Which methods do you prefer in your resource management process?

21. Would you explain your reason for your preference?

General guideline for Key informant interview

A. For development agents (DAs) and natural resource management experts

1. Are there serious environmental problems/natural resources degradations in this area?
2. If yes, would you mention those problems?
3. What could be the causes of these problems?
4. Do community people have awareness of these environmental problems?
5. Do people implement their indigenous practices in managing NRs in this kebele?
6. Would you indigenous practices people employ in managing different natural resources?
7. Do you think they have good initiatives to manage their environment?
8. How do you evaluate the NRM efforts of local community in the kebele?
9. Do you think the local people have adequate knowledge in managing NRs?
10. Do you think people in this kebele accept and implement modern /scientific knowledge of natural resource management?
11. How do you evaluate the effectiveness of local people indigenous practices in NRM?
12. Which management practice (modern/indigenous) is more effective in resource management?
13. Do you think that people are implementing both indigenous knowledge and modern technologies successfully?
14. What are the limitations of indigenous resource management practices?
15. What are the limitations of modern resource management practices?
16. What do you think about the preference of people in managing their environment/resources: traditional or modern one?
17. What is the attitude of people towards modern technology or scientific knowledge of NRM?
18. How do you assess the people's indigenous knowledge regarding natural resource management?

B. For community representatives and elderly farmers

1. What do you think about natural resources in your area?

- a. Types
- b. Sources
2. For what purpose do you use natural resources in your kebele/area?
3. What are natural resources you use for food and as income sources and how do you manage them?
4. What are plant types you use for medicine and how you manage them?
5. What are natural resources you use for social, cultural, and religious amenities and how do you manage them?
6. What are natural resources you use for construction and/or making tools from and how do you manage them?
7. When you compare the past and present situations of natural resources in your area: it is
 - a. Decreasing
 - b. Increasing
 - c. The same status
8. Is there any problem related to natural resource in your kebele? How do you recognize it? / What are the manifestations?
9. If there are problems, what could be the causes of these problems you think?
10. What are natural resources that are more vulnerable to degradation than others in your kebele/area?
 - a. Soil
 - b. Water
 - c. Forest
 - d. Wildlife
 - e. Land
11. How could natural resources in your area sustain till now in spite of natural and human activities against them?
12. How do you perceive natural resources management?
13. Who do you think is responsible for natural resource management in your area?
14. Do you have any experience of natural resource management? If so, how do you manage the following natural resource problems?
 - a. Soil erosion

- b. Water pollution
 - c. Animal death
 - d. Deforestation
 - e. Wildlife loss
 - f. Land degradation
15. Where do you get the knowledge to manage the above natural resources from?
 16. Are your practices effective in managing natural resources in your area?
 17. Are you confidentially using and will continue to use your knowledge of natural resource management in the future? If yes, why? If no, why?
 18. How about the modern technology of natural resource management provided by government (example, development agents, experts) in your area?
 19. Are you using modern technology in your land? If yes, how much is it effective? If no, why?
 20. Are there any factors that hinder you from using your local knowledge in natural resource management?
 21. What are the limitations/setbacks of your traditional practices you think in natural resources management? How do you judge your local knowledge in light of modern technology?
 22. Is there any protected area/forest/plant in your area? What is the implication behind it?

