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LIST OF ACRONYMS AND ABBREVIATIONS

ACZ	Agro Climatic Zone
ANNOVA	Analysis of Variance
ANRS	Amhara National Regional State
BoA	Bureau of Agriculture
BoEPLAU	Bureau of Environmental Protection and Land Administration and Use
CAT	Content Analysis Technique
CBNRM	Community-Based Natural Resource Management
CC	Carrying Capacity
CFL	Communal Forest Land
CGL	Communal Grazing Land
CHH	Community Household
CL	Communal Land
CLA	Communal Land Administration
CLAC	Community Land Administration Committee
CLM	Communal Land Management
CLM	Communal Land Management
CLR	Communal Land Resource
CLRU	Communal Land Resource Use
CLRUM	Communal Land Resource Use Management
CV	Coefficient of variation
DA	Development Agents
DP	Design Principle
EPRDF	Ethiopian Peoples' Revolutionary Democratic Forces
GD	Group discussion/Discussant
FHH	Female House Hold
HH	House Hold
KA	Kebele Administration
KII	Key informant Interview
KSDP	Key sustainability design priciples
LAU	Land Administration and Use
MHH	Male House Hold

MoANR	Ministry of Agriculture and Natural Resources
MoEF	Ministry of Environment and Forestry
NRM	Natural Resource Management
PCA	Principal Component Analysis
PCI	Precipitation Concentration Index
SD	Standard Deviation
SRAI	Standardized Rainfall Anomalies Index
TLU	Tropical Livestock Unit
UBNB	Upper Blue Nile Basin
WS	Watershed

CHAPTER ONE

INTRODUCTION

1.1 Background

Ethiopia is a landlocked country in the horn of Africa and lies within the tropics between 3°24` and 14°53` north and 32°42` and 48°12` east covering 1,120,000 square kilometres. About 80-85% of the people are employed in agriculture, especially farming. Communal land resources, particularly communal wet lands, forest and grazing land resources are important sources of food, water, timber, fuel wood, and grazing in developing countries. This communal holding land contributes much of the income generated by the rural households (Berhanu *et al*., 2014-b). For instance, communal forests contribute 27% of the total household income in Northern Ethiopia, Tigray Region (Bedru *et al.,* 2009). As a result, the management of communal land resources by the local community has gained momentum in some developing countries owing to its positive contributions to rural livelihoods, biodiversity conservation, and economic development (Adhikari and Falco, 2009). Recent estimates indicated that 98% of forests and almost all of pastures in Africa are owned by the public (Barrow *et al*., 2009). If managed in a sustainable manner, these public owned communal lands can be a key factor for climate change mitigation, adaptation and livelihood improvements for the rural poor (Steins and Edwards, 2009).

In most parts of Ethiopia, as in many other developing countries, communal grazing lands are important sources of livestock feed (Berhanu *et al*., 2012) and 80-85% is mainly from communal lands (Alemayehu, 2014). The author further described that Ethiopia's livestock population is still the largest in Africa, with a total area of common grazing and browsing land that covers 54-39% out of the total country land mass. Of this, only 12% is found in the highland mixed farming areas above 1500masl where about 70% of the cattle and sheep and 30% of the goat population are grazing. Besides to the high stocking density, there is also high intensity of cultivation in the higher altitude that describes the high proportion of both the carrying capacity of livestock and also the human population. On the other hand, about 11.2% (12,296,000 ha) of Ethiopian land is

forested. Of this, only 4.2% (511,000 ha) is classified as primary forest with the highest in biodiversity and carbon-dense form of forest (FAO, 2010). It is also indicated that out of the total forest/open bush land cover, 96% is within the communal land.

1.2 Statement of the problem

In Ethiopia, communal land resources are relatively primitive and mostly are in a state of either exhaustion or stress, reflecting the low level of agricultural development (Bereket, 2012). Many studies have indicated that in Ethiopia the communal lands in general and grazing lands in particular are in a weak to very weak condition and will deteriorate further unless there is immediate action (Betru *et al.,* 2009). They further described that the main causes of communal land degradation in Africa are inappropriate land use systems, overgrazing, and expansion of agricultural lands. 10-20% of all grasslands is degraded, mainly due to overgrazing which, in turn, is the symptom of bigger socio-economic and policy application problems. Moreover, there was a more series decline in forest cover in low-income countries and dry land regions (MEA, 2005). Besides, in Ethiopia, encroachment in the expansion of crop cultivation resulted in diminishing the communal lands (Mengistu, 2006).

Besides, the degradation of communal grazing lands has led to ethnic conflicts due to grazing resource scarcity and increasing compition (FAO, 2010). However with same author, it was mentioned that the scarity of this resource also led them to decline in the overall livestock numbers, particularly in Borana, Ethiopia. On the other side, with steady growth in population, clearing of woodlands for agriculture has been a continuous process at an estimated rate of 140,900 ha or 0.93% of forest/bush land per year. In total, between 1990 and 2010, Ethiopia lost 18.6% or around 2,818,000 ha of its forest/bush land cover within the communal lands (FAO, 2010; EFAP, 2003; Berry, 2013). The growing scarcity of fuel wood is also the result of further over exploitation of communal forests.

According to Pielke (2012), change and variability in land use by humans and the resulting alterations in surface features particularly in the communal lands are major but poorly recognized drivers of climate change. Degradation of communal land and its misuse and poor management are fundamental problems confronting the efforts to increase agricultural production, combat climate change and food insecurity in a sustainable way (Berhanu and Swinton, 2012). This problem in Ethiopia stems largely from weaker land-use and management practices and population pressure, especially in the highlands (Shibru, 2010). The government of Ethiopia has recognised that land degradation is one of the main causes of unsustainable natural resource conservation. However, up to this point, there has not been a comprehensive national land use policy in Ethiopia to guide land use planning at national and partly at regional level. Inadequate land policies and policy applications are a serious constraint on economic and social development. On the one hand, inefficient land institutions discourage overall economic growth (UNESC, 2015; Bekele *et al.,* 2011). The previously mentioned authors also described that inadequate policy and institutional arrangements also hindered the prevention of over exploitation and depletion of communal lands such as grazing lands and forests lands.

Thus, addressing the problem of communal land degradation becomes an important step to enhance a sustainable climate and resilient communal land management practices. Therefore, this study focused on the current communal land management practices and policies that are exercised by different actors at various levels.

1.3 Significance of the study

Land related policies are important ingredients in the climate change and sustainable land management process scenario in the rural areas of the country. Communal land resources also play a crucial role for livelihood security, climate change adaptation and ecological stability (Andrew, 2009). According to this author, in Africa in general and Ethiopia in particular, communal land use management and climate change issues are top of the

agenda for the government. Nevertheless, several communal land use and management issues are still often complex, politically contentious, and unresolved (Brian, 2009). In order to address the above mentioned issues and problems, various land management practices, policy and strategy formulations have been undertaken in Ethiopia. However, despite the efforts and positive changes made so far, inadequate results have been observed on the ground and communal land has remained poorly managed (Andrew, 2009). The author further stated that the reasons for the poor common land use management and subsequent environmental degradation are likely to be the weaker technical applications, and more in policy setting and policy application matters. To this end, Benin and Pender (2006) described that there are few communal land management interventions and also few studies in the country that investigated the role and the how of sustainable communal land management. Above and beyond, there is limited scientific evidence and information that enable feasible development and policy interventions that strengthen the sustainable and climate resilient development using communal land resources that are available at local level (Berhanu *et al.,* 2012). Therefore, it is imperative to ask why the different efforts made so far did not make a difference in addressing the problem. To fill this gap, in-depth investigations of the communal land management systems for achieving sustainable and climate resilient communal land management (CLM) are imperative. Thus, taking these assumptions as a way in point for advance verification, there is a great need to empirically scrutinize and recognize the fundamental root causes of the problem that are pertinent to communal land use management practices, policy, settings and application in attaining sustained and climate resilient land management practices in the country.

Hence, the study focusing on communal land use practices and policies that gear towards climate resilient and sustainable management have a vital function in filling some of the scarce information gaps. The findings also help academics, researchers, policy makers and planners to meticulously understand CLM practices and associated policy matters. Besides, the findings have an input for the government of Ethiopia in undertaking CLM strategies on both technical and policy matters that could bring positive synergies towards sustainability. This

has a significant role in attaining the over-all better practices and policies in securing the best possible productive use of CLM for meeting the needs of the rural community in enhancing sustainable and climate resilient land use management in Ethiopia.

1.4 Aim and objectives of the research

The overall aim of this research is to examine the status, gaps and strength in communal land use management practices and existing policy, setting and applications to enhance sustainable and climate resilient communal land management in the upper Blue Nile basin of Ethiopia. Under this general aim, the following specific objectives were formulated.

Specific objectives:

PART ONE: Climate change/variability trend, impact, adaptation practices and their impediment factors:

1.1. To analyse rainfall variability and trends across years
1.2. To identify community insights on climate change/variability impact manifestations
1.3. To scrutinize community perceptions on climate change/variability adaptation practices and impediment factors in relation to communal land resource use and management

PART TWO: Assessing the pressure caused by grazing and fuel biomass collection: practices over communal grazing and forest lands.

2.1. To estimate the carrying capacity for communal grazing lands and quantifying the available feed and demand gap
2.2. To assess fuel biomass utilization and the demand gap from communal forest land

PART THREE: Review of communal land use and administration policy/legislative setting and application:

3.1. To assess and review communal land use and administration related policy setting and applications in the study area.

PART FOUR: Assessing sustainability of communal land related institutional practices:

4.1. To examine institutional sustainability practices in managing communal land and resource uses

1.5 Basic assumptions and research questions

Basic assumptions

It is obvious that the government of Ethiopia recognized the extent of land degradation and its subsequent negative impact on climate change and sustainability. A number of policies and legislation elements have also been enacted to reverse the problems associated with land and environmental management. Besides, there is also evidence that some communal land management institutional practices have been implemented at grassroots level. However, there are still unresolved communal land use management limitations, inadequate policies and applications, and institutional setting and mechanisms issues.

Therefore, the basic presumption of this research was that there exists rainfall variability and community adaptation exercises with little attempt at institutional sustainability of communal land use and management practices. Besides, the researcher also presumed that there would be a good policy/legislative setting but with weak policy applications towards attaining a sustainable and climate resilient intervention.

Research questions

The study, therefore, attempted to fulfil its objectives by investigating the following specific research questions:

PART ONE:

1.1. How are the rainfall variability and trends across different Agro Climatic Zones (ACZ) in the study area?
1.2. What are the key climate change/variability impact manifestation types?
1.3. What are the existing community climate change/variability adaptation practices through managing communal land resource use?
1.4. What are community perceptions on the impediment factors on adaptation practices in enhancing communal land resource resilience?

PART TWO:

2.1. What was the carrying capacity of Communal Grazing Land (CGL) in different ACZ settings in the study area?

2.2. How was the feed balance in terms of feed demand and availability across different ACZ setting in the study area?

2.3. What was the status of fuel biomass utilization and the demand gap in different ACZ setting in the study area?

PART THREE

3.1. What is the status legistlative setting and implementation interms of communal land tenure and administration?
3.2. How was the situation with regard to legistlative setting and application of communal land use plans and resource use management?
3.3. How communal land valuation and expropriation set in the legistlation and applied on the ground?

PART FOUR:

4.1 What was the status of institutional sustainability on communal land administration scheme?

4.2. What were the situations in the area of communal land use and management institutional prctice?

4.3. What was the institutional implementation practice interms of communal land resource use and control? and

4.4. How was the condition of communal land resource controlling system in terms of legistlative setting and practicing them at grassroot level?

1.6 Structure of the thesis

Chapter 1 is the introduction part that provides background to communal lands in general. Then, it provides the statement of the problem, the significance of the study, the research objectives and research question that was explored during the study. Chapter 2 is the literature review part that assesses and presents different previous research related to communal land use management and policy aspects towards climate change resilience and sustainability. Chapter 3 presents the research design and methodology. In this chapter the study area where the study took place, the sampling method, how data was collected and the method of data analysis are described.

Chapters 4 to 7 start with a brief introduction, results and discussion with conclusions. Chapter 8 summarises the outstanding findings under chapters 4 to 7 and provides the summary, conclusion and recommendations based on the findings of the study.

1.7 Definition of terms

Under Section one, article 2 of the Federal Land Administration and Use Proclamation 456/2005, communal land holding means “rural land which is given by the government to local residents for common grazing, forestry and other social services”. On the other hand, from the Amhara Regional Proclamation No. 133/2006, communal land holding was defined as: “Rural land which is out of the ownership of the government or private holding and used by the local people in common for grazing, forestry and other social services“.

Therefore, the working deffination of ‘communal lands’ for this study broadly covers those land use types that are under communal use. These are: area closures (for both forest and grass land), communal forest lands and communal grazing lands that are outside state or private management. The common features that make these communal lands to be communal resources is due to those house hold members who live in the nearby community/communities in the Kebele (lowest administration level) that have the right to access and use it. Hence, ‘communal land user’ in this study means community members vested with the power to use the rural communal land and its resources for production.

Land Use Plan means “the system of making practical the better chosen alternatives to use land without degradation and environmental pollution based on physical, economic and social information and includes strategic and area development plans” (Amhara Regional Proclamation No. 133/2006).

Rural Land Administration is: “a process whereby rural land holding security is provided, land use planning is implemented, disputes between rural land holders are resolved, and the rights and obligations of any rural land holder are enforced, as well as information on farm plots and grazing land of holders are gathered, analysed and supplied to users” (Amahara Regional Proclamation No. 133/2006).

The term and definition of Institutions were recognized as regularized pattern of behaviors that emerge from underlying structures of sets of "rules in use" and

they are remade through people's practices (Watson, 2013). However, an "institution" in this study refers to the definition of Quinn *et al*. (2007): "*An institution is an established organization or a place where an organization takes care of people for a usually long period of time with all custom, practice, or law that is accepted and used by many people as a significant practice, relationship, in a community or culture. It is an established organization or corporation especially of a public character*".

1.8 The scope of the study

The term "communal land resource" for this research refers to natural or people-made resource systems that are shared by multiple users and/or user groups. This land use type could include communal forest land, grazing land, water body fisheries, wetlands, and the like. However, due to time and resource limitation, this study delimited its scope to investigate only communal grazing and bush/forest lands that exist only in the selected study area of Bir-Temicha watershed of the upper Blue Nile basin in Ethiopia. The study did not cover all the climatic zones of the lowland areas that are below 1500masl. Thus, the research was limited to only one site in each of the remaining four ACZs. These were: Warm semi arid, cool sub humid, cool and humid and very cool/alpineACZ. These ACZ here after called with their local name as: Kolla, Woyina dega, Dega and Wourch ACZs respectively. On the other hand, temprature data in the study area were not adequate enough to process the analysis. Hence, this study was limited to analyse rainfall variability only.

This research was limited to assess policies and institutional sustainability practices that are related to communal land administration, use and management only. Besides, in terms of policy analysis, the scope of study was also limited to analys only land administration and used the proclamations, regulations and directives of the Amhara National Regional State (ANRS) and the Federal Forest Protection and Development proclamations. In both proclamations, the study focused on assessing and analysing only the matters related to communal land use and resource management.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

According to Mengistu (2012) every parcel of land on the earth's surface is unique in the cover it possesses. Land use and land cover are distinct yet closely linked characteristics of the earth's surface. The use to which we put land could be grazing, agriculture, urban development, logging and mining, among many others, while land cover categories could be such things as cropland, forest, wetland, pasture, roads and urban areas. The term 'land cover' originally referred to the kind and state of vegetation, such as forest or grass cover, but it has broadened in subsequent usage to include other things such as human structures, soil type, biodiversity, surface and ground water (Milley *et al*., 2012).

Alemneh (2011) described land use management practices as the term that is used to describe human uses of the land, or immediate actions modifying how the land is used. It includes such broad categories as human settlements, communal lands, protected areas and agriculture. Within those broad categories are more refined categories, such as urban and rural settlements, irrigated and rain fed fields, national parks, communal and private pasture and forest reserve areas. In the Ethiopian rural land administration proclamation Number 133, 2005, land use management is explained as "a process whereby rural land is conserved and sustainably used in a manner that gives better benefits."

The most significant historical change in land use management practices has been the expansion of agricultural lands. Today close to a third of the earth's land surface is devoted to pastures or cropland, which amounts to approximately one half of all land suitable for agriculture (Alemneh, 2011). The past century witnessed over half of the worldwide increase in agricultural lands, and in the developing world half the land use management practice change occurred in just the past 50 years (Hulme *et al*,., 2008).

2.2 Climate change, vulnerability and adaptation

Extreme weather events are now on the rise worldwide and are more likely to happen in the future (Easterling *et al*., 2010). These climate change/variability events are predicted to be characterized by extreme droughts and very wet periods due to flood events. The number of areas that are affected by extreme drought and excessive rains are increasing. Since most livestock productive activity in Africa takes place in fairly confined communal areas, which are often vulnerable to drought and heavy rains, the potential losses due to such disasters have been quite significant (Easterling *et al*., 2010). The combination of generally increasing temperatures and shifting rainfall patterns will clearly have impacts on grazing land management and livestock production. Feed is predicted to remain a critical constraint on livestock production in the tropics and crop productivity is a useful proxy for feed availability in most regions (IPCC, 2007).

In Africa in general, as in many other parts of the continent, the probability of occurrence of extreme events is predicted to increase in the year-to-year variation in rainfall (IPCC, 2007). It is further explained that the vulnerability of a socio-economic and environmental system to climate change is conceptualised as a function of a system's exposure to climate change effects and its adaptive capacity or resilience to deal with those effects. There is now a general consensus on the reality of climate change (Stern, 2006). with scientific evidence of its anthropogenic drive getting stronger (Stern, 2006). Climate change resilience, according to Adger *et al.* (2013), is the adjustment of a system to moderate the impacts of climate change, to take advantage of new opportunities or to cope with the consequences. According to this author, an understanding of the connection between climate on the one hand and livestock grazing management on the other is of great importance if economic growth is to be sustained in developing countries.

Climate change vulnerability is defined as "the degree to which a system is susceptible and unable to cope with adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a

system is exposed, its sensitivity, and its adaptive capacity" (IPCC, 2007). By understanding the components of climate change vulnerability for a given resource of concern, resource managers and decision makers are better positioned to evaluate alternative actions to respond to climate change, even in the face of considerable uncertainty. These alternative actions are known as climate change adaptation strategies (Nichols *et al*., 2011).

The earth's changing climate is forcing reconsideration of strategies for conserving natural resources. Managers need to understand where and when the resources they manage might be vulnerable to climate change. They also need a better understanding of the factors that contribute to that vulnerability. This knowledge is essential to determine which management actions will be suitable over the coming decades (Young *et al*., 2013).

Climate change represents a globally pervasive stress on natural ecosystems. Temperature and precipitation regimes drive ecosystem productivity and natural dynamics, such as the rate of plant growth, the frequency of natural wildfire, and the seasonal flow of streams. Paleoecology has shown that past episodes of climate change triggered ecosystem change at regional and local levels with varying speed and intensity (Wells, 2003; Betencourt *et al*., 2010). As the current rate of global change increases, society can expect profound shifts in key ecological processes to cascade through natural systems, resulting in altered productivity, changes to species composition, local extinctions, and many instances of ecological degradation or collapse (IPCC, 2007).

As Fagre *et al*., (2009) pointedout, we are scarcely prepared for these changes. While the modern scientific study of ecosystems dates back over a century, we do not sufficiently understand the many linkages between key climate variables and ecosystem dynamics across diverse landscapes; nor do we fully understand the effects of other stressors, such as those tied to land use, that have already reduced the resiliency of many natural ecosystems. One certain conclusion that we can draw from our experience is that ecosystems will not simply 'move' as climate changes, but will instead transform in unprecedented ways because of the controlling link between climate and many ecosystem processes including the individualistic responses of species (Finch, 2012).

Climate change adaptation includes actions that enable species, systems and human communities to better cope with or adjust to changing conditions. These strategies may take a number of forms. Some have categorised strategies into three areas, including resistance, resilience, and facilitated transformation ((Milly *et al*., 2012; McLachlin *et al.,* 2007). Same authors also indicated that resistance strategies for adaptation aim to prevent the direct effects of climate change. Frequently cited examples include building sea walls and coastal hardening to prevent the effects of coastal sea-level rise (Klein and Nicholls, 1999). Preventive measures to head off effects of invasive species, or uncharacteristic landscape-scale fires could also fall into this category.

As McLachlin *et al*. (2007) describe resilience strategies aim to secure the capacity to cope with the effects of climate change by ensuring that critical ecological processes as currently understood are restored to a high level of function or integrity. For example, by securing large and interconnected natural landscapes, patterns of species dispersal and migration are secured to protect food-web dynamics. Facilitated transformation strategies anticipate the nature of climate-change induced transitions and, working with these anticipated trends, include actions that facilitate transitions that are congruent with future climate conditions, while minimising ecological disruption (Milly *et al*., 2012).

Somewhat radical expressions of these strategies might include assisted migration of sensitive community segments from current habitats to locations where changing climates might provide new habitats into the future (McLachlin *et al*., 2007). Some have characterised these resistance and resilience strategies as ‘retrospective’ because they emphasise utilisation of knowledge about historical or current ecological pattern and processes, i.e. protection and restoration of natural conditions as they are currently understood. Facilitated transformation is therefore a ‘prospective’ set of strategies in that they are based on the hypothesis of future conditions (Magnuss *et al*., 2011). On top of this, there is a critical temporal dimension also to adaptation strategies. Conservation decisions are made often within the existing policy and law institutional constraints (McLachlin *et al*., 2007), while traditional natural resource management has been utilising knowledge of past and current

conditions to inform today's management actions and forecast future conditions (Comer *et al*., 2012).

According to Comer *et al*. (2012):

> *"This forecasting must strive to determine the nature and magnitude of change likely to occur, and translate that knowledge to current decision-making. It is no longer sufficient to assess how are we doing?' and then decide what actions should be prioritized for the upcoming 15 year management plan. One must now ask 'where are we going, and by when?' and then translate that knowledge back into actions to take in the near-term, or medium-term, or those to monitor and anticipate taking over multiple planning horizons. Considerable new science and policy will be required to support this new type of natural resource decision making".*

Coping with uncertainty is another dimension for adaptation. Uncertainty is inherent in climate change vulnerability and adaptation planning. It is important to clarify areas of uncertainty so that efforts by users to appropriately interpret and invest in new knowledge to reduce uncertainty can be effectively focused (Risbey and Kandlikar, 2012; Swart *et al*., 2009).

2.3 Communal land use change and its impact on environmental degradation

Land use in general can affect land cover and changes. Although changes in land cover by land users do not necessarily imply degradation of the land, many shifting land use patterns driven by a variety of social causes result in land cover changes that affect biodiversity, water and radiation budgets, trace gas emissions and other processes that come together to affect climate and the biosphere (Riebsame *et al.,* 2014). The author also noted that communal land use land cover can also be affected by forces other than anthropogenic ones. Natural events such as weather, flooding, fire, climate fluctuations, and ecosystem dynamics may also initiate modifications upon land use land cover. Communal land use is affected principally by direct human use: by agriculture

and livestock raising, forest harvesting and management and urban and suburban construction and development. There are also incidental impacts on land cover from other human activities such as forests and lakes damaged by acid rain from fossil fuel combustion and crops near cities damaged by tropospheric ozone resulting from automobile exhaust emissions (Meyer, 2015). According to this author, in order to use land optimally, it is not only necessary to have the information on existing land use land cover but also the capability to monitor the dynamics of land use resulting out of both the changing demands of increasing population and the forces of nature acting to shape the landscape.

In some instances, communal land use land cover change may result in environmental, social and economic impacts of greater damage than of benefit to the area (Moshen, 2009). Therefore, data on the status of communal land use change are of great importance to planners in monitoring the consequences of land use change on the area. Such data are of value to resources management and agencies that plan and assess land use patterns and in modelling and predicting future changes.

The strong interest in land use and land cover results from their direct relationship to many of the planet's fundamental characteristics and processes, including the productivity of the land, the diversity of plant and animal species, and the biochemical and hydrological cycles. Land cover is continually moulded and transformed by land use changes such as, for example, when a forest is converted to pasture or crop land. Land-use change is the proximate cause of land-cover change (Alemneh (2011). According to this author, the underlying driving forces, however, can be traced to a host of economic, technological, institutional, cultural and demographic factors.

According to Alex (2002), impacts of communal land use land cover change elaborated as by altering ecosystem services, changes in land use and cover affect the ability of biological systems to support human needs, and such changes also determine, in part, the vulnerability of places and people to climatic, economic or socio-political perturbations. Take, for example, conversion of forested areas to crop lands, pasture or human settlements. The above writer further explained that deforestation can result in the loss of

biodiversity, especially in the tropics; biodiversity loss results in declines in ecosystem integrity, and also genetic losses that may impede future scientific advances in agriculture and pharmaceutics.

Alemneh (2011) described that deforestation can also impact hydrological processes, leading to localised declines in rainfall, and more rapid runoff of precipitation, causing flooding and soil erosion. Finally, scientists have come to a better understanding of the role that forests play in the carbon cycle, and how forest burning in certain parts of the world is an important contributor to greenhouse gases that contribute to climate change. Clearly, all of these changes impact society (Alex, 2012).

Molla (2004) explained that the effect of communal land use on ecosystem degradation is not a new phenomenon; and it dates back for the last thousands of years. But the magnitude and significance of the effects are by far greater today than any time before. The main causes of these are: the rapidly growing population seeking food, shelter, clothing, the expansion of croplands and urbanization, etc. Every country in the world reports some sort of impacts of communal land use on the environmental degradation (Mather, 2006). According to this author, one of the fundamental causes of environmental degradation under the Ethiopian conditions is that land use decisions made at private household level are based on economic factors. This author further pointed out that there are several economic factors, for instance, that influence a farmer's decisions to conserve or deplete the soil:

- *"The value the farmer attaches to future assets may reflect the farmer's attitude to risk and uncertainty and the level of household poverty and access to credit and off-farm income.*
- *The costs of current soil conservation efforts to the farmer which in developing countries like Ethiopia may reflect the availability of labor, purchased inputs and credit for conservation efforts.*
- *Relative input costs and output prices which determine the current profitability of erosive versus less erosive cropping systems including fluctuations in these prices overtime.*

- *The future returns of the farming system as affected by technological improvements and by the impact of current cultivation techniques and crops on soil fertility and future yields. In the other words, it means that poverty-environment linkages in developing countries like Ethiopia are not one-way relationships and thus affect the perception of the value of soil and water conservation as one aspect of environmental management".*

Furthermore, a worrying trend in many developing countries like Ethiopia is the concentration of the poorest groups in "ecologically fragile" zones, i.e. areas where environmental degradation or severe environmental hazards constrain and even threaten economic welfare and sustainable development (Mengisteab, 2009). He described that, by and large, there are some important issues to be considered as causes of environmental degradation when looking for possible solutions in the form of development policy regarding land management in general and that of the fragile zones. These, in particular, are: remedies for market imperfections, avoiding distorting policies and avoiding institutional failures.

In a predominantly agrarian country like Ethiopia, one of the major threats to the food supply and thus to sustainable development is environmental degradation. Environmental degradation in Ethiopia, other than crop land deterioration, is evidenced also by the deterioration of grasslands and forests (Alemneh, 2011). Accordingly, outside over cultivation, there are another two predominant human activities identified as contributing to the vicious cycle of environmental degradation, drought and famine: overgrazing and deforestation.

Alemneh elaborates further that in the famine-ridden areas of the Ethiopian highlands, the impact of human activity on the environment is so striking owing to intensive cultivation, overgrazing, deforestation, and overpopulation. Also, the political and economic forces that relate to the peasant agriculture have exerted enormous pressure on the ecosystem.

As UNCCD (2014) stated, under Ethiopian conditions the amount of vegetative cover is greatly affected by the utilisation of the land for cropping, livestock grazing and forestry activities to meet the dietary requirements of peasant

farmers. Soil erosion as a core factor in environmental degradation in Ethiopia is attributed primarily to the cultivation practices and human pressure on the land. Alemneh estimated also that 2/3 of the Ethiopian highlands have a slope exceeding 30% and are not suited for intensive cultivation as currently practiced. Lacking proper soil and water conservation strategies and the absence of detailed land use law for such steep slopes will definitely aggravate the problem of land and environmental degradation.

The problem of land degradation in Ethiopia "stems largely from poor land-use practices and population pressure (especially in the highlands). Inappropriate farming practices, overgrazing, deforestation and the use of crop residues and dung for fuel in rural households are among the main causes" (UNCCD, 2014). As indicated in the various strategic documents and food security strategic papers, the government of Ethiopia has recognised that land degradation is one of the main causes of poor agricultural productivity and unsustainable natural resource conservation (MoA, 2008). However, there has not been a comprehensive land use planning policy in Ethiopia to guide land use planning at national and regional level except in the Amhara region.

Many individuals and households depend directly on non-marketed communal land resources for their livelihood. They sustain the well-being of rural communities and are especially useful for marginalised societies such as the landless and for women who are taking animals to graze and collecting firewood out of common forests and fetching water (Shepherd, 2008). Adhikari and Falco (2009) describes that the rural poor are heavily dependent on communal resources for their livelihood. Singh Katar (2008) also indicated that these communal land resources are used as sources of food, fuel wood, and fodder significantly. Yeraswork (2011) indicates that communal lands in the Wello highlands are sources of green fodder, thatching material, fuel wood, and of cash income these lands being used sustainably by local people. Berhanu *et al.* (2012) showed that communal grazing lands are important sources of livestock feed and areas of bee keeping for local communities. Samuel and Pender (2012) also refer to the same fact in the Amhara region. Pastoralists in all parts of the country depend directly on their respective rangelands. 35 to 40% of total

household income in Southern Zimbabwe (Cavendish, 2008 and 2010), and communal forests contribute 27% of the total household income in Northern Ethiopia (Bedru *et al*., 2009). As a result, the management of CLR by the local community has gained momentum in many developing countries owing to the positive contributions of those resources to rural livelihoods, biodiversity conservation, and economic development (Adhikari and Falco, 2009). Therefore, the availability, quality and sustainability of these resources measure the well-being of rural communities.

Many rural communities living near protected areas depend on the land for their livelihoods (Hartter and Southworth, 2009). Among others, two of the direct causes of land degradation are deforestation and overgrazing. However, the degradation of CLR is one of the fundamental problems confronting the efforts to increase agricultural production, and to reduce poverty and food insecurity (Berhanu and Swinton, 2012). The Millennium Ecosystem Assessment estimated that 10-20% of all grasslands is degraded mainly due to overgrazing. Moreover, there was a decline in forest cover in low-income countries and dry land regions (MEA, 2005). The main causes of CLR degradation in Africa are deforestation, overgrazing, and expansion of agricultural lands over CLRs (Betru *et al.,* 2009). The lack of policy and institutional arrangements also hindered the prevention of over exploitation and depletion of CLRs such as grazing lands, forests, ground water, and fisheries (Bekele *et al*., 2011). Besides, the encroachment in the expansion of crop cultivation resulted in diminishing the communally managed grazing lands (Mengistu, 2006). With steady growth in population, clearing of woodlands for agriculture has been a continuous process at an estimated rate of 150,000 ha per year in the past decades (EFAP, 1994). The forest cover has reduced from the original 65% to 2.2% (Berry, 2013). For instance, the degradation of communal grazing lands has led to ethnic conflicts and a decline in total livestock numbers in Borana, Ethiopia (FAO, 2010). Moreover, the growing scarcity of fuel wood resulted in the further over exploitation of communal forests (Bereket, 2012). Thus, addressing the problem of CPR degradation becomes crucial in the efforts of rural poverty reduction.

The negative consequences of unsustainable CLR management include: the loss of biodiversity that would have crucial importance in reducing rural poverty by managing trade-offs in ways that maintain and/or restore the capacity of ecosystems to provide the full range of services to human beings, and the threat to livelihoods of the CLR users (Berhanu and Swinton, 2012). Moreover, the degradation of CLRs threatens the value of CPRs as insurance against risk and also aggravates the pressure on the remaining CLRs, and results in conflicts among users. For instance, Chabwela and Haller (2008) indicated that communal pastures in the Kafue flats of Zambia faced degradation due to poor flooding regime and loss of habitat caused by the proliferation of weeds. This resulted in declining range capacity and the consequent shortage of feed for livestock

2.4 Indegenious communal land resource management and institutional practices

The issue of “The Tragedy of the Commons" has become a universal phrase used by people concerned with indeginous communal natural resource management practice and associated problems. The concept has been raised to explain overutilization of communal land resources, the depletion and degradation of resource and the environment (Stevenson, 2011).

The literature documented revealed that some indigenous practices and property right systems were capable of avoiding the dilemma of the ‘tragedy of the Commons’ (Berkes et al., 2009). The alternative parallel suggested was state control of the communal holding resources. Since the 1980 there has been renewed optimism about the prospects for effective Community based management practices (FAO, 2010). It was understood that Hardin assumed communal land resources as open access. In so far as this conceptualization, a practices attempted to change the ownership status of communal land resource has yielded negative result to the resource condition and beneficiaries (Adhikari *et al.,* (2009)

Yeraswork (2011) identifies three categories of attributes that are sustaining communal land resources management practices.

> "*The first is those resources that are partly sustained because of their physical attributes and the merits that common resources provide for the community around. The second and perhaps the most important determinant factors are indigenous management institutions with customary rules and enforcement mechanism. This above author further explained that enforcement mechanisms are undertaken by traditional judicial system and the rules are part of the indigenous tenure system. Another important thing related with the second factor is the nature of the community who claims the ownership or use right of resources. The cohesiveness, homogeneity and insulation from external forces such as commercial interest are the third decisive factors for collective action of managing the communal land resources".*

As Wouter (2005) states, both modern and indegineous communal land management practices is based on two necessary conditions; successful internal management and defence against outsiders. The weakening of existing institutions and the looseness of social ties among the user groups and the intrusion of the outsiders leads to shrinkage, destruction or open access of local communal resource management systems. Internal threats on communal lands may happen due to failure of users to manage themselves or their inability to enforce existing rules. Ostrom (1990) and Adhikari and Falco (2009) mentioned that collective action for communal resource management will be long lasting and successful under conditions of well-defined boundaries, congruence between appropriation, provision of rules, graduated sanctions, conflict resolution mechanisms and effective monitoring. It was further explained that the effectiveness of rules becomes loose under situations of heterogeneity of a previously homogenous community (Wouter, 2005).

2.5. Indegenious communal land management institutions and policy

Although communal lands have been proposed by many scholars and international institutions like the World Bank to be either privatised or state controlled, some countries have taken careful practical steps for their existence. In China, large tracts of mountain areas in the southern part of the country have been managed by villages or households for their advantage (Steve *et al.,* 2013). In Africa, Tanzania registered village lands including forests and other communal lands in the name of villages or uses and it is a successful practice (Moyo, 2014). Recent estimates revealed that 80% of the global forests and much of the global pastures are publicly owned (FAO, 2010). In Ethiopia, there has not been sufficient debate about the formal and informal institutions. Yet, there is a general consensus among the national scientific community that the informal institutions have a resilient nature in connection with CLR management and play an important role in enabling individual users to establish solidarity with their neighbours towards achieving common goals in CLR management (Zelealem and Leader-Williams, 2005; Spielman *et al.,* 2009). Informal institutions operate and co-exist with the formal institutions throughout Ethiopia (Spielman *et al.,* 2009). However, the interplay between formal and informal institutions is complex in the country. For instance, when conflicts arise among residents, conflict resolution processes are managed by both formal and informal institutions.

Watson (2013) and ERSS (2005) stressed that development agencies in Borana, Ethiopia, have seen the informal institutions of natural resources management as a means to address the needs of people and the environment in a way that is also participatory. Many of the informal institutions can be strengthened and transformed to assume various development roles (Berry, 2013). Church, mosque, *‘”Iqub”* (informal rotational savings), and*”idir”* (informal burial institutions) are some of the most common informal institutions in Ethiopia, with varied influences on CLM (Yeraswork, 2011). In line with this, various informal institutions such as the rules, norms, and taboos were also involved in addressing the communal land degradation problem in Ethiopia. The assumption by local experts behind the various informal institutions is that they

will facilitate active involvement of communities in managing CLRs (personal communication with local agricultural experts in Tigray).

After the downfall of the 'Derg', although the land continued under the entitlement of the state, community based approaches have been considered as options by the state. Customary communal land resources management institutions, which previously served the communities relatively well, were broken down because of administrative modernisation; and yet how to practically manage the resources is not so clear (Rahimato, 2005). Land-use and management policy that is created to protect biodiversity often creates conflict between authorities and residents because the local people have not been consulted. Land management policy can only succeed by encouraging, or even facilitating, exchange amongst the diverse groups of stakeholders to give voice to concerns, to manage conflict and to bridge policy and practice (Homewood, 2014).

2.6 Reviewing Ethiopian land tenure, policy and legislation historical setiing

Land tenure and land holding rights have been the most controversial and politicised issues in Ethiopian history. Besides, as Burns (2007) pointed out, land is one of the most important assets for sustainable rural development all over the world in general and very significantly so in Ethiopia. Hence, the then imperial government made certain attempts to address the problem of land tenure in the country.

Mulatu (2012) described that:

> *"In 1961 a Special Land Reform Committee was constituted to study the different land tenures in Ethiopia by the order of His Imperial Majesty. After conducting its study, this Committee recommended that ceilings or a maximum limit on individual ownership be fixed; a tenancy legislation that governs the relationship of the tenant and the landlord be ratified; antiquate tenure systems like the gult (a tenure system that was prevalent in the Erist or communal system in the northern part of the*

country) be eliminated and the land tax system be improved. In 1964 a Land Reform Authority was established and instituted to apply these restructuring actions proposed and ordered by the Special Land Reform Committee. However, the Land Reform Authority could not even put in to practices the reforms suggested and recommended by the Special Land Reform Committee. The pressure for land reform was forcing the then government to establish a Ministry of Land Reform and Administration in 1966 that had the authority to come with a reference proposal to put land reform measures in to action. The Ministry undertook an intensive review of the imperial land tenure systems and came with an optional procedure of action for modifying it. The Ministry then came with an inclusive program of action that was supposed to address issues of landlessness, productivity, arbitrary eviction, etc".

To achieve these objectives the Ministry of Land Reform and Administration prepared a draft Agricultural Tenancy Relationships Proclamation and submitted it to Parliament during the 1971/1972 session. But while the drafts were pending in Parliament until 1974, mass uprisings and revolution broke out and the government was deposed in 1974 by a military coup. Several causes have been cited of the 1974 revolution but many writers agree that the land issue was the most significant cause (Adal, 2012).

The military government, called the *dergue*, declared socialism as its guiding principle and took a radical step in land reform. In 1975 it proclaimed the Public Ownership of Rural Lands Proclamation No. 31/1975. Under the Public Ownership of Rural Lands Proclamation all forms of traditional land tenure except pastoralist land tenure were abolished. All rural lands came under state ownership. All rural lands that were owned by landlords were distributed to tenants (Rahmato, 2005). Previous land owners were also given a right to retain the maximum amount of land allowed under the proclamation where they preferred to engage in farming. The maximum size of land holding a person could hold was limited to 10 hectares.

All rural lands in the *rist (*communal land tenure system) eras also came under private holdings except some lands used communally by the community for

grazing, wood collection, and other purposes. The military government gave land administration and redistribution powers to peasant associations that were formed in every *kebele* (Proclamation No. 31/1977).

As Rahmato (2005) described, the main achievement of the reform was first and foremost the expropriation of vast tracts of rural lands from landlords and distributing them to the landless tenants. Secondly, tenants who were paying tributes and fees and who were under constant threat of eviction by the landlords were free and were producing for their own benefit. Subsequent policy measures, however, failed to address the needs of farmers and production was not increasing. The redistribution of land holdings after the first redistribution of lands to tenants and farmers was one of the major drawbacks that resulted in tenure insecurity. Redistribution of holdings was used to accommodate the unemployed and landless youths. Furthermore, the redistribution was not systematic and there was no regulation that guided the actors. Fragmentation of land holdings and natural resource degradation, loss of productivity and other related issues emerged as new land reform cases (Alemu, 2015). Finally, that military government was overthrown in 1991 by the Ethiopian Peoples' Revolutionary Democratic Forces (EPRDF).

2.7 Federal and Amhara National Regional State land administration and use legislative setting

2.7.1 Federal land administration and use related legislative setting

In 1995 the Federal Democratic Republic of Ethiopia Constitution was promulgated (Rahmato, 2005). Under the constitution land remained under state ownership with the constitution creating a federal system of government and federated regional states (Ambaye, 2013). The constitution has also given regional states the power to administering lands in their areas under Art.52 (2, d).

The Federal government has issued several laws and regulations. Amongst them, those ones that are most related to communal land administration, use and management practices are the following:

Proclamation number 89, later on amended by proclamation 456, was the result of the constitutional provision. In proclamation 456/2005, it is proclaimed that land is not subject to sale or any other type of exchange in Ethiopia (Adal, 2012). The ownership of land is exclusively vested in the state and the peoples of Ethiopia. It is only the holding right that is given to individual citizens. Under this framework law, power is given to the regional states to enact their own land administration and use the proclamation in accordance with the federal law (Rahmato, 2005). Besides, FDRE (1995) stated that the regional laws were supposed to take into account the site specific conditions and to achieve the regional objectives. The proclamation also enables regional states to establish their own institutions pertinent for the implementation of the proclamation.

After the federal government issued the Federal Rural Lands Administration and Use Proclamation 456/2005, the Amhara Regional State and the other three regional states also harmonised their land administration laws with the federal land law. This legislation is not fundamentally different from the previous one but it provides for the registration and certification of land holders, and also it informs the regions to prepare land use plans. However, it still did not prohibit redistribution of rural land holdings as the regional states did. Expropriation of lands has also become one of the major sources of insecurity as a result of the government's free market policy and the encouragement of investors (Ambaye, 2013). Government agencies were expropriating land without paying compensation since land is said to be the property of the state (Study Report, ELTAP, 2007).

To address this problem, the federal government issued the Expropriation of Land Holdings for Public Purposes and Payment of Compensation Proclamation No.455/2005. According to Adal (2012), under this proclamation, land holders whose lands are expropriated are entitled to get compensation for the property they lose and displacement compensation for the land they lose. In practice, however, many expanding towns and regional government agencies are still

taking land (particularly communal land) without payment of displacement compensation or making substitute land available to the farmers whose land is taken (Ambaye, 2013).

2.7.2 Amhara regional state communal land administration and use management practices policy and legislation setting

The ANRS rural land administration and use proclamation 133/2006 (ANRS, 2006) was developed based on the provisions given by FDRE rural land administration and use proclamation proclamation (456/2005) (FDRE, 2005). Different consultation procedures at various levels were made with the major stakeholders before ratification. Proclamation 133/2006 (ANRS, 2006) is an improved version of proclamation no 46/2000 (ANRS, 2000). The law was amended based on the experiences gained during the implementation of proclamation No. 46/2000 (Mulat, 2005). It attempts to resolve the problems encountered during the implementation and it guarantees better rights for landholders. The ultimate objective of the current proclamation is to attain tenure security and to enable sustainable development. Following FDRE rural land administration and use proclamation 456/2005, subsequently, the Federal Expropriation of Lands and Payment of Compensation Proclamation No. 455/2005 and Rural Lands Administration and Use Regulation No. 135/2007 were enacted.

The Amhara regional state, unlike other regional states, had developed and issued land administration and use policy in 2000. The policy emphasises that, in addition to a growing population, the prevailing inappropriate land use practice has resulted in poor agricultural productivity. The policy stipulates that the main goal of the policy is protection, conservation and sustainable use of natural resources. To achieve this goal, the policy stresses the need for an enforceable planned land use; and a strong land administration that ensures tenure security of the rural communities.

With regard to communal land, Proclamation 133/2006 defines the communal holding as rural land not under the ownership of the government or of any private holding; rather it was used by the local people in common for grazing, wood collection and other social services. In most cases, communal holdings are governed by customary law/rules and by-laws. During Group discussion (GD) held with experts, the traditional administrative mechanisms are supported by the rural land administration and use law of the ANRS (No. 133/2006) to reduce conflicts caused by resource competition. According to the regulation, the local community members are entitled to establish by-laws considering the local circumstances. The decisions based on these local rules are legally valid if not in contradiction with established formal law.

2.8 Conclusion

Generally, climate change/variability events can be characterised by extreme droughts, very wet periods and flooding events. Studies indicated that the number of areas that are affected by extreme drought and excessive rains are increasing and the probability of occurrence of extreme events, particularly from rainfall variability events, is predicted to increase from year-to-year variation in rainfall.

Climate variability and/or change adaptation includes actions that enable communities to better cope with or adjust to changing conditions. These strategies may take a number of forms. Some have categorised strategies into three areas, including resistance, resilience, and facilitated transformation. Uncertainty is inherent in climate change vulnerability and adaptation planning, so it is important to clarify areas of uncertainty so that users may appropriately interpret and invest in new knowledge to reduce uncertainty.

Communal land use is affected principally by direct human use through agriculture and livestock raising, forest harvesting and management and urban and suburban construction and development. Therefore, data on the status of

communal land use change are of great importance to planners in monitoring the consequences of land use change on the area.

Collective action for communal resource administration and management will be long ending and successful under conditions of well-defined boundaries, congruence between appropriation, and provision of legislations, graduated sanctions, conflict resolution mechanisms and effective monitoring. In Ethiopia, there has not been sufficient debate about the formal and informal institutions. Yet, there is a general consensus among the national scientific community that the informal institutions have a resilient nature in connection with CLR management. Nevertheless, the interplay between formal and informal institutions is complex in the country.

In the history of formal land administration related legislation in Ethiopia, it was started in 1961 where a Special Land Reform Committee was constituted to study the different land tenures in Ethiopia by the order of His Imperial Majesty. Following this, in 1975 it proclaimed the Public Ownership of Rural Lands Proclamation No. 31/1975. After the federal government issued the Federal Democratic Republic of Ethiopia (FDRE) rural lands administration and use proclamation 456/2005, the Amhara regional state and other three regional states also harmonised their land administration laws with the federal land law. This legislation is not fundamentally different from the previous one but it provides for the registration and certification of land holders, and also it informs the regions that they must prepare land use plans. In the ANRS, where this this study was conducted, the Land Administration and Use proclamation 133/2006 was developed based on the provisions given by FDRE rural land administration and use proclamation (456/2005). Proclamation 133/2006 was an improved version of proclamation no. 46/2000.

CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY

3.1 Study area description

The country has twelve major river basins. These are: the upper Blue Nile, Awash, Ayisha, Baro Akobo, Denakil, Genale Dawa, Mereb Gash, Ogaden, Omo Gibe, Rift Valley, Tekeze and Wabi Shebe river basins. Upper Blue Nile River Basin in one hand is the most proxy and where the researcher had sufficient acquentance in the area. On the other hand, it is one of the basins with most diversified interms of agro climate and altitude and where the highest altitude in the country is located. The Upper Blue Nile/"Abbay" basin is situated in the north-central and western parts of the country. It forms generally a trapezoidal shape that extends for about 400 kms from north to south and about 550 kms from east to west (Figure 1). It is one of the most important river basins in Ethiopia (World Bank, 2010). It covers an area of about 199 812 square kilometers (km^2), which is 20% of the country's land mass that accommodates 25% of the population, 40% of the nation's agricultural products, most of the hydropower, including the Ethiopian renaissance dam and other significant portions of irrigation potential of the country (World Bank, 2010).

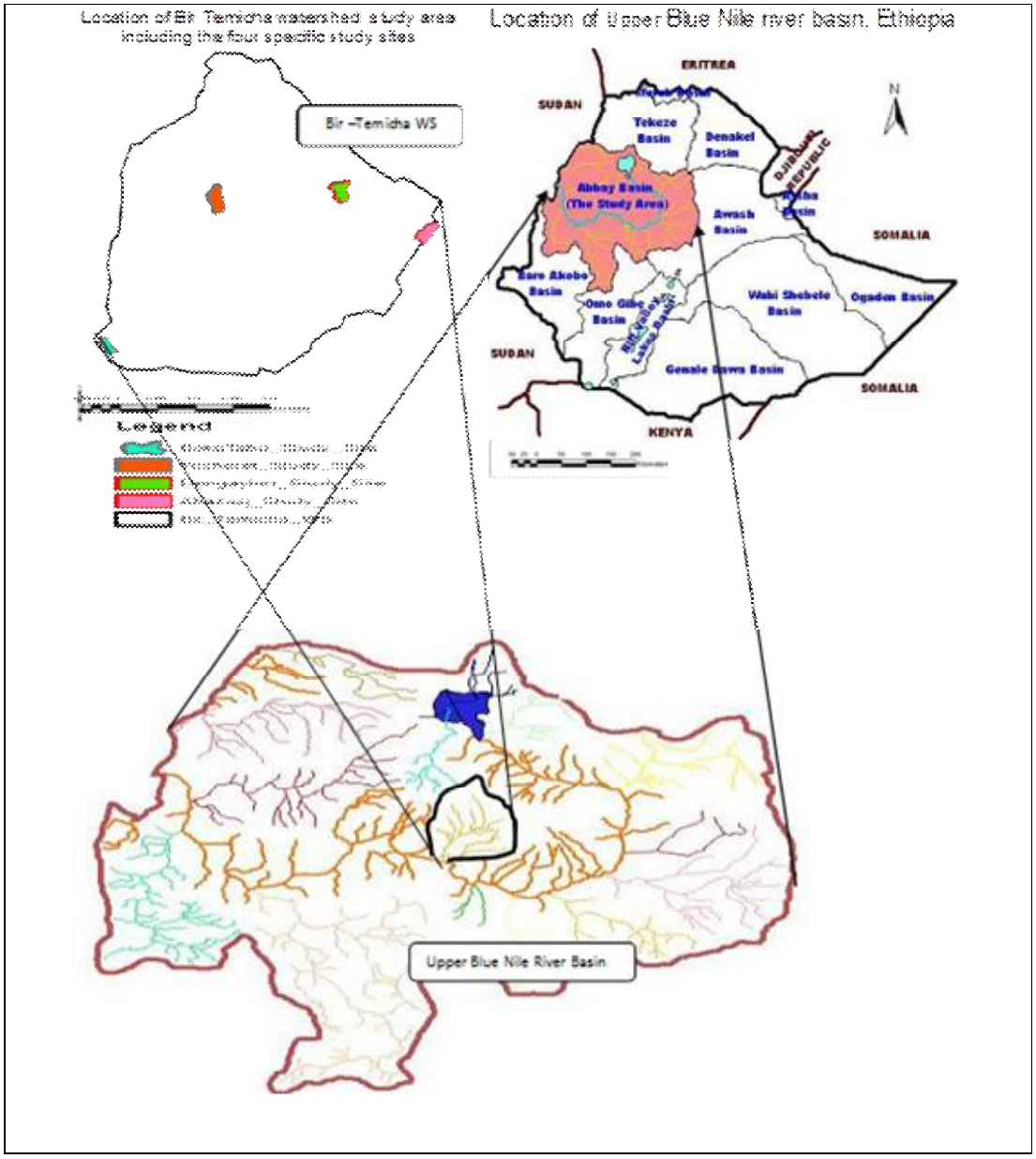

Figure 1 ***: Indicative Map for the Study Area***

The specific study site, Bir-Temicha watershed with an area of 7, 256 km^2, is located within the Upper Blue Nile Basin (UBNB). It lies between 37P 264745.75 to 383813.5 metres east and 1132986.5 to 1235341.5 metres north or between 10^{0}47'05" to 10^{0}58'38"N latitude and 37^{0}20'40" to 37^{0}40'19" E longitude. comprising two major rivers: Bir and Temicha. With all their tributaries, it drains the watershed area and feeds the Upper Blue Nile. The

watershed in general includes seven districts (hereafter called 'woredas') and two administrative zones. Machakel and Sinan woredaa were from East Gojjam and Denbecha, Degadamot, Quarit, Sekella and Bure woredas were from West Gojjam administrative zones. With in Bir Temicha watershed four sample micro watersheds were selected for specific investigation. These were Boko tabo; Yesheret, Dengayber and Abazazj site with an area of 5192, 2995, 1939 and 3170 ha respectively (Figure 16).

The road from Addis Ababa to Bahirdar cross the study area at the middle of the watershed and covers an overall width around 90km from east to west. Vertically, the watershed is 70 km in length from north to south.

Topography

Topographically, over a distance of about 70 km, the elevation extends upward from 1000 metres above sea level (masl) in the south, to 4050 masl in the northern side. The study area comprises of mountainous terrain in the extreme north eastern and southern reaches. In general, a mountain chain is located in the upper part and a hilly plain undulates in the middle. Further down towards the south a rolling plain land forms with a dissected mountain and escarpments situated around the outlet.

Climate

From the researcher finding and observation, a strong altitudinal variation makes for strapping local contrasts in precipitation and climate variation. Rainfall intensity in the middle and upper part of the watersheds is characteristically intense and erosive. The average annual rainfall record ranges from 1106 mm/year in the lower altitude to 1700 mm/year in the upper region. The overall temperature distribution ranges from 8-14^{o}C and 17-30^{o}C mean daily minimum and maximum temperature respectively. The area generally is a uni-modal type where the summer season prevails with dominant rainfall distribution. The rainfall regime is a uni-modal type that extends mainly from May to September with a sharp break in the beginning of June and the end of August.

Vegetation

The natural vegetation of the study area is categorised into four depending on the ACZ where they fall. Generally, there is hilly ragged terrain in the lower part of the watershed area with broad leaved, woody vegetation. It mainly comprises Myrsine *africana,* Jasminum *grandidlorum*, Dodonia *angustifoia,* Pterolobium *stellatum*, Cadia *perpurea, Calpurnia aurea,* Rhus *natalensis* and Diospyros *abyssinica*. The ground layer of the vegetation unit is generally marked by dense growth of herbs dominantly with Hypoestus *forskalei.* Further up, at the middle of the watershed, land forms with plain to undulated plateau are dominated with more crop cover with minor similar types of scattered broad leaved forest and bushes. The extreme upper Dega ACZ is a zone of mixed type of conifer and broad leaved vegetation appeared rarely with an intense cultivated crop cover dominated. The upper most part is covered with afro alpine grass vegetation like *Euryops antinorii* which is the dominant species with wide distribution. Woody vegetation types that are rarely found are *Erica hypericum*, *Erica arborea* and Lobelia *rhynchopetalum*.

Geology and soil

Geologically, the UBNB in general, including the study area, fits into the Trapp series of tertiary volcanic eruptions. It is a classic volcanic landscape, which was cut by river stream lines, resulting in the current diversity of landforms. The geology is composed of quaternary basalts and alluviums. The soils are dominated by clays and 'clayey' loams (BECOM, 1999). The soil units covering the majority of the watershed are predominantly *Nitosols, Eutric Vertisols, Eutric Cambisols, Vertic Cambisols*, and *Eutric Leptosols*. However, Nitosols are the dominant soil type on undulating to relatively steeper slopes. As a result of degradation, the soils on steep slopes appear to have been downgraded to Regosols and Cambisols (Bekele et al., 2011); Awlachew *et al*., 2009). According to these authors, apparently, these soils have various productivity limiting characteristics such as acidity, depth and permeability (particularly in Dega and Wourch ACZ).

3.2 Theoretical framework

Communal land resources are potentially subject to congestion, depletion, or degradation, i.e. using it in a way which pushes it beyond the limits of sustainable yields (Blomquist and Ostrom, 1995). Stevenson (2011) pointed out that a communal resource property study was first undertaken by an international association for the study of communal property (IASCP) in the late 1980s. However, the study of communal resource property originates back to the publication in 1968 written by G. Hardin'es: *The theory of the failure of the commons or communal property.* Hardin's theory expressed the view that a communal resource exploited by rational economic agents is bound to disappear because of over-exploitation (Ostrom, 1985; Hardin, 1968).

Critics of Hardin's article have demonstrated that the failure is not due to the communal nature of the resources but to the fact that there is free access. For this, a number of insights were presented to show that a community can manage a communal resource sustainably. Several authors, such as Ostrom (1994 and 1999) and Berkes *et al*. (2010) disagree with Hardin's view that successful collective action is impossible. They presented the principles of an institutional approach based on formal or informal regulatory mechanisms that govern the viability of ecosystems.

Meanwhile, different solutions have subsequently been put forward to solve the problem of managing the access to communal resources, i.e. to control it by using economic or administrative management tools (Stevenson, 2011). Research is now focusing on how the concept of co-management is executed between the government and the community (Cay and Jones, 2012). Hence, academics and policymakers are calling out for more research to clarify the issues and impacts on communal land management approaches, practices and associated policy implementations (Gruber, 2010).

On the other hand, climate change is one of the major threats facing the Ethiopian high lands that it is now seen as a pressing challenge to sustainable climate resilience and development. Ethiopia comprises extensive high land as well as drylands, unpredictable patterns of rainfall and lack of economic

capacity to anticipate the adverse effects of climate change have a negative impact on environmental sustainability and that of livelihoods (IPCC, 2011). Accordingly, the the attempt on climate change adaptationppractices have been given little attention and rehabilitation and conservation of degraded communal landscapes is at infant stage (Yeraswork, 2011).

Many rural households depend directly on common resources for their livelihood. Communal resources sustain the wellbeing of peasant societies and are especially useful for marginalized societies such as pastoralists the land less and for women who are taking animal to graze and collecting firewood out of common forests (Yeraswork, 2011). By mentioning many research findings, James, (2011) also proves that rural poor are heavily dependent on communal resources for their livelihood. This author added that these communal resources are used as sources of food, fuel wood, and fodder is highly significant in Ethiopia. Therefore, its availability interms of adequacy and quality, strength of its resilience to withstand climate change and sustainability of these communal land resources measure the wellbeing of rural communities (IPCC, 2011). To attain these all, appropriate policy setting and application, effective and efficient communal land management institutional set up and sustainable CLM practices has to be in place.

Therefore, the study focused to address the problem through analysing communal land management and use practices and policies in the context of sustainability and climate resilience. In particular, this study attempted to work out on problems pertinent with the natural pressure on how climate variability and how communities practiced to adaptat the change/variability. On the otherhand, the study also tried to answer the extent of human induced pressure and abuse over communal land in both communal grazing and forest resources. The research also sees problems related wth institutional sustainability practices and policy to manage communal lands.

As seen in the conceptual framework (Figure 2) below, vertically it shows what are the different factors affecting the sustainability and climate resilience of communal land use and management practices (research Problem area), what sort of research questions should be answerd by indicating the necessary

action area for this research. Horizontally for each factors of research problem, it shows the type of research questions and action areas that helped to analyse research question inorder to get the over all research out put (Figure 2).

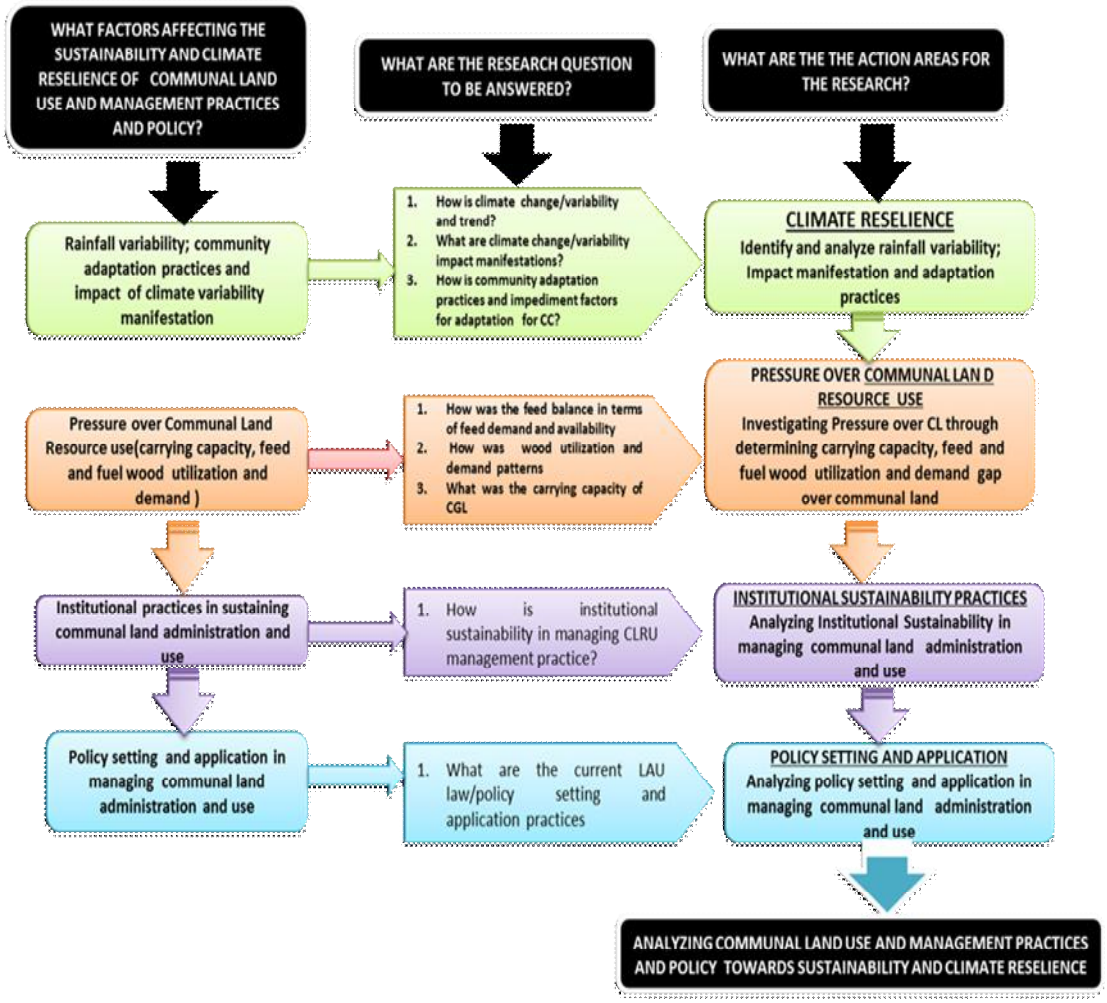

Figure 2*: Conceptual Framework*

3.3 Validity and reliability of measuring instruments

3.3.1 Validity and reliability

Measuring validity and reliability was taken as an important procedure. To do this, a standardised questionnaire was prepared and tested during the piloting phase. A one day orientation to assistant enumerators was given before extensive field data collection was conducted.

Moreover, a pre-test questionnaire was given before conducting the actual study. The questionnaire was pre-tested with 12 interviewees in the selected study site (three in each of the selected ACZs). During the pre-test, the reliability and validity of the questionnaire were checked to know the time it took to fill out the questionnaires and also to check the flow and sequencing of questions. In addition, after the pre-test, a correlation test was calculated in order to have a comparison of measurements at two points in time and to check its reliability. Having this in mind, following Marija and Norusis (2012), Kappa value (Observed Agreement – Expected Agreement due to Chance) was calculated. Then, the value for assessment was found (0.87). This value was considered as adequate reliability. Notes were taken where the respondents found the questions obscure, repetitive or irritating. The questionnaire then was revised accordingly. Moreover, during the HH survey, KII and GD, effort was made to make respondants actively involved during survey question, KII and GD to clarify some of the questions and thereby avoiding/minimising their bias in understanding the idea of the survey.

Taking care of determining the sample size was also the other important point that was considered in maintaining validity. To do this, following Nayak, (2010) empirical formula and sample size calculater G /power soft ware was used to determine appropriate sample size as described under classification of respondents.

3.3.2 Replicability

One important point considered in enhancing replicability is triangulating the findings with multiple studies. Following Yin and Robert (2010), to substantiate the findings, a necessary comparison and cross checking mechanism with other similar studies was considered with appropriate citation. The other procedure used was employing a random sampling technique in selecting one major watershed among the fifteen within the upper Nile basin. Similarly, in selecting community household respondents, the stratified random sampling technique was also used. On top of this, to enhance replicability, sample areas were categorised and stratified in different agro climatic zone settings. This kept the

sample sites and HH respondents as heterogeneous samples that represented different agro climatic zones and different community groups for proper generalisation.

3.4 Approach

The basic approach and method for conducting this study was mainly an exploratory survey for chapters 4, 6 and 7. For chapter 5 both explorative and measurements on fuel biomass consumption were used. Besides, a review and analysis of the existing relevant documents on communal land use and management (CLUM), institutional sustainability and climate change resilience and related ones was also conducted.

Moreover, the study used both quantitative and qualitative methods. A household (HH) survey, a key informant interview (KII) and Group discussions (GD) were employed as instruments. A questionnaire was designed with structured and semi- structured type of questions. For the structured questions, a likert scale, yes-no check list and multiple choices were used. For GD and KII, open ended and semi-structured questions were formulated and conducted.

3.5 Population and sampling procedures

To determine the study sites, a systematic sampling approach was used. First the Upper Blue Nile Basin (UBNB) was categorised into 15 bigger watersheds. Each watershed was given a number from 1 to 15. Then, one watershed was selected through random sampling technique using the lottery method. This selected watershed was found within the eastern and western Gojjam Administrative Zone called Bir-Temicha watershed. After selection of the watershed, the total area was categorised in to four Agro Climatic Zones (ACZ) settings as mentioned in the scop of the study (P 33).

Then, from Google Earth, the availability of communal grazing land (CGL) and communal forest lands (CFL) was assessed and mapped. Sorting out of communal lands was also supported with a field reconnaissance visit. After

that, systematic sampling was used to choose a sample study micro watershed (MW) site that consisted of one CFL and one CGL site in each of the four ACZ setting. The systematic choice in selecting specific study sites depends upon factors like: its conveniences in terms of geographical location, its accessibility, availability and closeness of CGL and CFL sites. Based on these, (1 CGL + 1 CFL) in each micro watershed per ACZ were selected per District (here after called Woreda) as a sample study site.

These selected Woredas were: Bure, Jabitehinan and Dega damot Woreda from West Gojjam Administrative Zone and Sinan Woreda from East Gojjam Administrative zone. In these four Woredas, those four micro watersheds were correspondingly nominated representing different ACZ setting. One was Bokotabo area (Bure Woreda) located on 1550 ± 100 meter above sea level(masl) representing warm semi-arid ACZ traditionally called "*Kola"*. The second was Yesheret area (Jabitehinan Woreda) situated between 2050 ± 250 masl representing cool sub-humid and locally termed as *"Weyna Dega"ACZ* . The third one was Dengay ber silasse area (Degadamot Woreda) found between 2750 ± 450 masl representing a cool and humid which, traditionally called "*Dega*" ACZ and the forth one was Abazazj area (Sinan Woreda) located at 3500 ± 200 masl representing very cool/ alpine vicinity which, is known traditionally as *"Wourch"* ACZ (MoA, 2008).

After identifying these four micro watersheds (MWS), the selected communal forest and grazing land use (CLU) types were delineated. This made the total number of sample study sites to be four CGL and four CFL. Then, "Kebele" administrations (KA) that are fully using the selected CGL and CFL resources in those four study sites were considered as sample Kebele administration units.

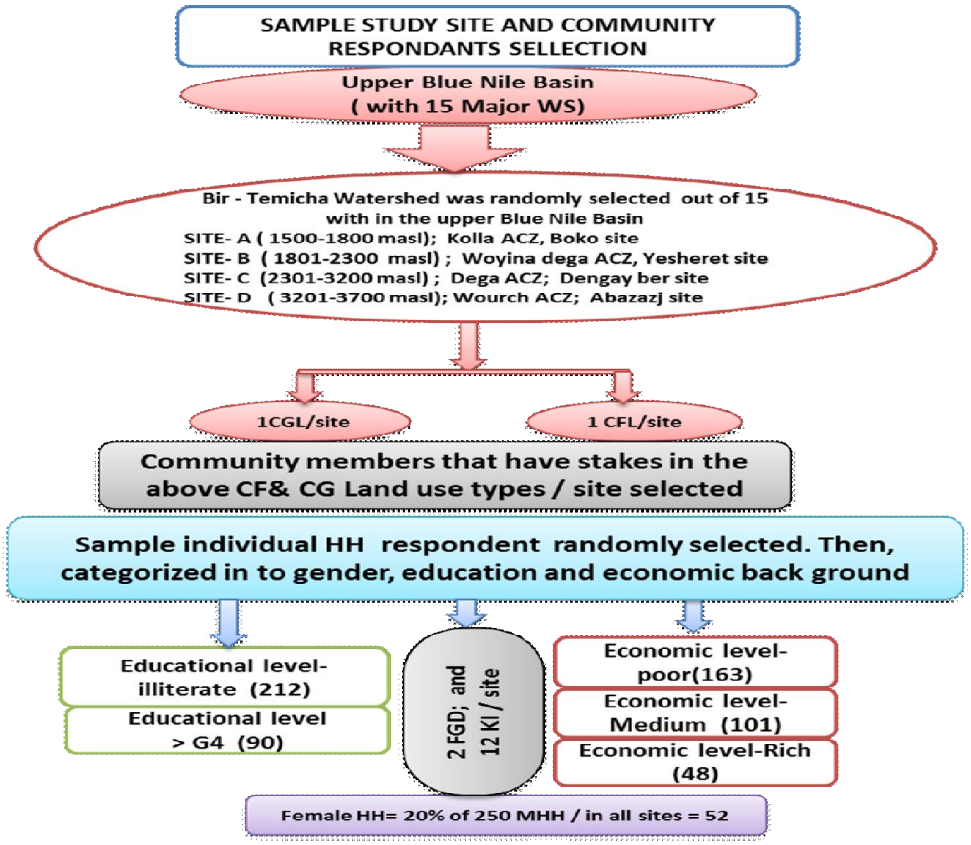

Figure 3*: Layout of Study Site Selection and Sampling of Household Survey*

3.6 Classification of respondents

3.6.1 Community household selection

Community members who have a stake in the selected CLU types were considered as the sample population. Based on this, 290, 445, 440 and 335 HH from Kolla, Woyina Dega, Dega and Wourch ACZ were found as total population size respectively of each ACZ. Based on this, the total population who had a stake with the identified communal land resource in the four ACZ settings of the selected KA was found to be 1510 HH.

Factors like confidence interval (P) and level of confidence were determined. Hence, 95% was taken as the confidence level while the confidence interval (limit of error) was taken as a maximum of $\pm$ 4 of 50%. Then, based on the total population size found in the study area, a sample size was established using

Sample Size Calculator/G Power software (Nayak, 2010). Then, using the above sample size calculator, the number of sample HH respondants in Kolla, Woyina dega, Dega and Wourch ACz were determined to be 39, 89, 88 and 67 respectively. Based on this, the total sample size for the HH survey was found to be 302 (Table 1). Then, the above sample respondents were then randomly selected and taken as individual community household (CHH) respondents (Figure 3).

In each ACZ, these CHH samples were recorded per their educational status, economical level and sex. Their education level was stratified into two: Illiterate (who cannot read and write), and those who are grade 4 and above. Their economic status was categorised by themselves as poor referring to those HH with one or no ox, medium, if they had two oxen and rich with three and above oxen.

Based on this classification, 90 sample CHHs were found ≥ grade 4 while the remaining 212 were illiterate. In terms of economic category, 82 were identified as poor, 184 as medium and the remaining 36 were identified as rich. Of all HH respondents, 52 or 20% of total respondents were found to be female householders (FHH). The number of respondents in each strata is presented in Table 1 below.

Table 1: Number of Respondents per Sex, Economy and Education Category

Economic strata	Boko tabo/Kolla ACZ					Yesheret/Woyina dega ACZ					Dengay ber/Dega ACZ					Abazazj/Wourch ACZ					Total				
	>gr. 4		Illitrate		Tot	≥gr. 4		Illitrate		Tot.	≥gr. 4		Illitrate		Tot.	≥gr. 4		Illitrate		Tot.	≥gr. 4		Illitrate		Tot
	M	F	M	F		M	F	M	F		M	F	M	F		M	F	M	F		M	F	M	F	
Poor	4	1	9	2	16	4	1	17	3	25	4	0	11	4	19	5	1	13	3	22	17	3	50	12	82
Medium	6	2	22	5	35	14	4	32	6	56	14	1	32	7	54	11	2	21	5	39	45	9	107	23	184
Reach	2	1	4	0	7	3	1	3	1	8	6	1	7	1	15	2	0	4	0	6	13	3	18	2	36
Total	13	3	35	7	39	23	4	52	10	89	24	2	50	12	88	18	3	38	8	67	75	15	175	37	302
sample	16		42			27		62			26		62			21		46			90		212		
Tot. Pop.	80		210		290	135		310		445	130		310		440	105		230		335	250		106		1510

3.6.2 Community focus group (FG) and key informant (KI) selection

Two community FGs were formed in each ACZ. In total, there were eight FGs conducted for a closer discussion. Group members were selected systematically and each group had 6-8 members. Members of the group were comprised of elders, youths, females, and Kebele Administration (KA) executive members. KI were also selected systematically from known knowledgeable elders (male + females), KA executive committee and communal land administration committee members. 12 key informants were selected in each site/ACZ. Of these, two were female KI. This made the number of KI to be 48, of which eight were female.

3.6.3 Selection of technical experts and practitioners as key informants

The study pertaining to communal land use and management practices and policy-oriented matters was conducted with better qualified and experienced experts and practitioners at all government administrative structural level. Selection was made systematically. Those relevant experts and practitioners from institutions like the Ministry of Agriculture (MoA), Environmental Protection Land Administration and Use Bureaus (EPLAUB), Bureau of Justice, Ministry of Environment and Forestry (MoEF) and those Non Govermental Organizations(NGO)s' that are working with tasks pertinent to the study were considered for the survey. These includes: KA, Woredas, zonal, regional and federal level structures. However, in order to get a structured analysis, the KI experts in each government strata were classified based on type of responsibility and professional background. Generally, three fields of expertise were involved. Categorisation was made for experts who were working in the area of land use and land administration, livestock, and forestry/natural resource management (NRM).

Depending on the availability of staff members, at least one concerned technical staff from each of the three fields of expertise in each administrative office level was systematically selected in the survey. This made 12

respondents from each of the federal, regional, zonal and Woreda level government administrative strata. This made the total expert KI to be 48. Out of 12 KI at federal and regional administrative level, 50% and 33% of them were from non-governmental/civil society organizations (NGO/CSO) who were working in land and environmental management affiliated organizations.

On top of this, out of four KA in the study area, natural resource management (NRM), livestock aswell as land administration technicians were selected in each KA as KI development practitioners. These made three technicians per KA. This made a total of 12 KI from development workers. In total the whole number of experts and field technicians from all administrative levels was found to be 60 (See Figure 3).

3.6.4 Selection of expert FG discussants

With regard to experts and practitioners, one focus group discussant (GD) per each administrative level was consulted. FG members were from professional back ground like: livestock expert, NRM experts, Land Administration experts who were working from bureaus of agriculture as well as EPLAU. In addition, experts from law professional back ground from bureau of justice were also considered. Depending on the availability of experts, each GD had from five to seven members. One FG was formed in each of the Woreda, zonal, regional and federal level government structure. This made four GDs at Woreda level, two FG at zonal and one FG from regional and federal level. With this, a total of eight GDs were participating in the discussion (Figure 4).

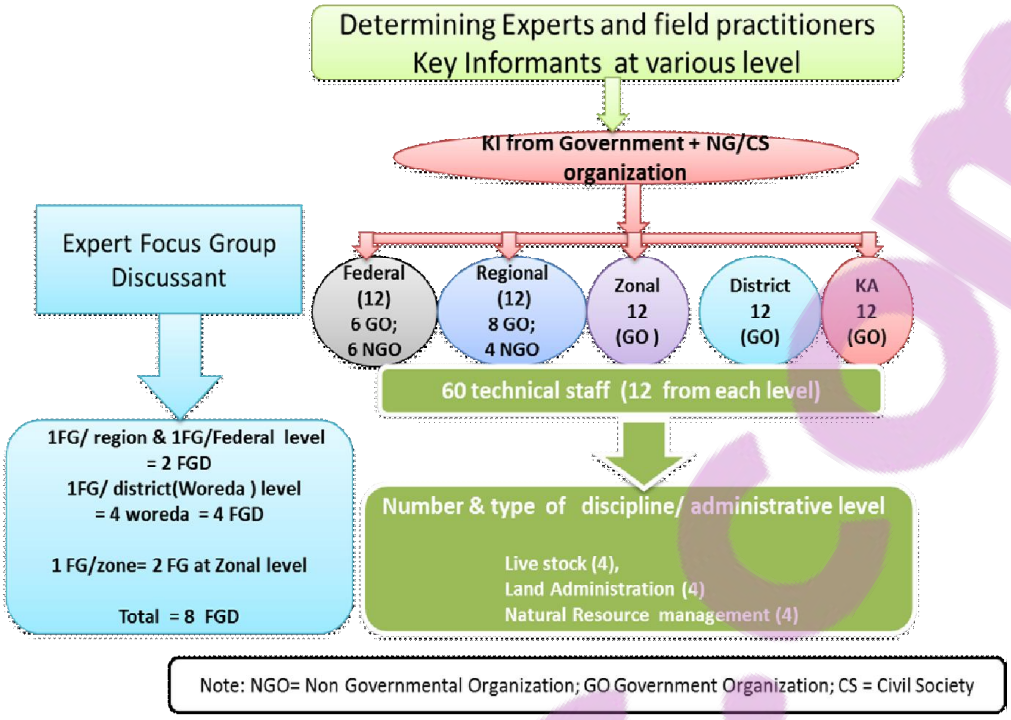

Figure 4*: Sampling Approach for Expert/Field Practitioners KI and GD in various Government Administration Strata*

3.7 Data collection methods

Generally the data collection method was designed to identify a full spectrum of complexity associated with communal land use and management related policies and practices towards enhancing sustainability and climate change resilience. The following method was used.

3.7.1 Climate variability, trend, adaptation, impact and impediment factors

To depict climate change/variability trends, rainfall data were collected from the Ethiopian National Metrological Agency of Ethiopia (NMAE). 31 years of rainfall data were collected starting from 1984 to 2014.

In each study site, occurrence of mean spatial and temporal rainfall data were examined in each of the four seasons considered in this study. One is summer called '*Kiremt*' in the Ethiopian language, referring to the months from June to August. The second is spring also named as '*Belg*' mainly referring to the

months between March and May. The third considered season is autumn, locally called '*Tsedey*' that includes the months between September and November. The fourth season is winter, called '*Bega*' and encompassing the months from March to May. Besides, mean rainfall changes trends occurring across the years was scrutinised in the above four ACZ setting.

Seasonal and annual rainfalls were derived from the monthly data of those stations. Data were carefully inspected for its quality and completeness. To determine a common period for the selected study site stations, some missing data were calculated using the INSTAT statistical programme (Stern *etal*., 2012).. Besides, homogeneity and quality of data were tested using double-mass curve; Falling of plotted points along a straight line indicates data homogeneity (Kefyalew, 2014).

To conduct a climate change/variability impact and find out the perceptions of community adaptation practices, a climate change/variability impact assessment and an adaptation tool from WOCAT (2006) were also used. To extract information on community perceptions on climate change and the impact manifestation and adaptation practices, it was made through a HHs' survey and expert based KI and GDs. Impact manifestation and adaptation practices were scrutinised from the discussion made with expert FG. Then, out of 102 WOCAT (2006) elements of climate change adaptation practices, about 21 adaptation elements were recognised as they were exercised in the study area and identified as climate change adaptation practices that contributed towards strengthening the resilience of communal land resources (CLR). Together with expert FG, those 21 elements were categorised under six major themes. These are: economic welfare, social and cultural institutions, access to information, transport alternative, ecological/environmental management and energy alternative. For each sub-theme the HH survey questions were organised as Likert type questions coded and standardized as: very strong = 5, strong = 4, moderate = 3, weak = 2, very week = 1 , not performed/existed = 0.

The annual and seasonal patterns of rainfall were analysed for the four selected study sites considering the inter-seasonal rain fall distribution.

3.7.2 Pressure over communal forest and grazing lands: feed demand, carryng capacity and fuel biomass demand and consumption

To determine feed demand and supply balance, livestock number and population data were gathered from Woreda[1] and KA[2] Agricultural Offices and also from the Central Statistic Agencies (CSA). The balance was calculated using the tropical livestock unit (TLU) factor based on the area coverage within the study site. Satellite images for 2014 data were taken from Google Earth to generate land use/land cover of the study area. This allowed the extraction of information on land cover for different major land uses like cultivated, grazing, forest and homesteads. Following Braimoh (2005), together with image processing procedure (Figure 5), field reconnaissance was taking place and ground data verification was obtained from GPS readings for each land use land cover type in the field.

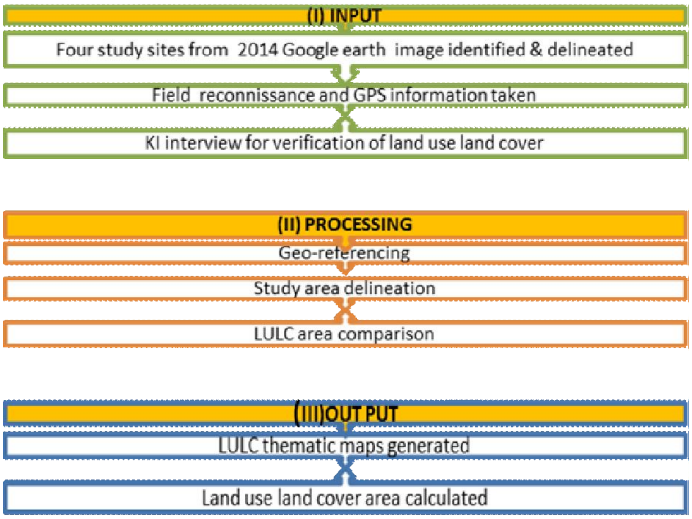

Figure 5*: Flow Chart Showing Land Use Land Cover Map Determination*

Feed demand and availability balance were analysed to estimate the proportion of feed from grazed areas, crop aftermaths, and crop residues that can contribute to the entire sum of annual dry matter (DM) necessary for livestock

[1] Woreda is the second level administration level above KA in the government structure in Ethiopia.
[2] KA is Kebele administration, which is the lowest administration unit in the governance structure of Ethiopia

survival. The number of livestock that were dependant on the study area was obtained from the Kebele Agricultural Office. This data was cross-checked with CSA (2014) data. The quantity of annual feed available was calculated based on the findings from the total grazing land in the specific four study sites. The selected four Kebele administrations in the study areas were Bokotabo (Bure Woreda) representing the Kolla ACZ, Yesheret (Woina dega ACZ) in jabi tehinan Woreda, Dengaybersillasse from Dega ACZ (Degadamot Woreda) and Abazazj woyibeyign erepresenting the Wourch ACZ from Sinan Woreda.

To assess the overall fuel wood consumption and demand, the secondary source of data was collected from the four KAs and respective Woreda Agricultural Offices and from (CSA, 2014). Besides, the primary data was collected from the HH survey that was conducted between April to June of 2014. However, for detail assessment and measurement, categorisation was made based on the ACZs, their family size and type of stove they used. Family sizes were categorised into three. These were family size of 4, 7 and 10. In each stratified family size groups 12HH/family size/ACZ were selected. Out of each family size group, in order to get the average fuel biomass consumption, half of them (6/family size/ACZ) were using traditional stoves while the other half (6) were using improved stoves. The selection method for HH samples was systematic.

With this method, in each ACZ 36 HH respondents were selected and measurements were taken. Therefore, in total there were 144 HH surveys conducted based on house to house measurement (Table 2). Out of these, 77 were those who used an open stove and the other 77 were those who used an improved stove. Weight, length and width of fuel biomass[3] were taken for measurement to determine the mean and total weight and volume of utilised fuel biomass. Measurements were taken using a 100kg balance to determine weight and a tape measure to determine volume. Each measurement of fuel biomass was categorized per woman or man bundle, basket and/or sack depending on each fuel biomass type. Following this, female HH interviews

[3] Fuel biomass in this context refers to wood, crop residue and dung that were used for fuel energy purpose.

were conducted to determine the amount utilised and the demand for fuel biomass.

Table 2: Sample Household, Fuel Biomass and Stove Type per Family size in each Agro Climatic Zone

Woreda (ACZ)	Sample HH				KA/MWS	Major Bio Fuel type
	Family size	Traditional stove	Improved stove	T. sample HH		
Sinan (Wourch)	4	6	6	36	Abazazj	Fuel Wood
	7	6	6			Dung
	10	6	6			Crop residue
Dega damot (Dega)	4	6	6	36	Dengay	Fuel Wood
	7	6	6		ber S.	Dung
	10	6	6			Crop residue
Jabi Tehinan (Woyina dega)	4	6	6	36	Yesheret	Fuel Wood
	7	6	6			Dung
	10	6	6			Crop residue
Bure (Kolla)	4	6	6	36	Boko	Fuel Wood
	7	6	6		tabo	Dung
	10	6	6			Crop residue
Total				**144**		

3.7.3 Policy setting and application

This particular study entails to identify and examine CLUM related, legislative settings and application gaps/opportunities towards enhancing sustainability and climate change resilience.

The assessment was based on Land Administration and Use (LAU) law of the Amhara region (133/2006), Regulation No. 51/2007 and its subsequent directives particularly on communal land use and administration of the ANRS. The emphasis of this study was to look at the directives set to implement the regulations. More specifically, special attention was given to those directive elements stating and referring to communal land use and management practice. In addition, the Forest Development, Conservation, and Utilization Proclamation (No. 542/2007) particularly on articles referring to the provision pertinent to communal forest management and utilisation part were also assessed.

The study deployed a HH survey of 302 respondants using a structured lykert type questionnaire to assess community perception on the application of CLUA legislative elements. The rate was labelled between -4 and 4. Very strongly

agree = 4; strongly agree = 3; Agree = 2; slightly agree = 1; Not applied/no idea/nutral = 0; slightly disagree = -1; Disagree = -2; strongly disagree = -3; Very strongly disagree = -4.

The study also focused more on qualitative data collection methods for assessing land related policy/law frameworks to enhance rural LAUM related policy systems. One of the methods used was document analysis. Within this desk work, data from the Central Statistics Agency (CSA, 2014), regional and national land administration agencies and user related legislations (proclamations, regulations and directives), strategic guidelines and official reports of the government were consulted, reviewed and synthesised. In this case, all pertinent outstanding issues were also noted and used as cross checking elements to be discussed with key informants (KI), focus groups (FG) discussants of rural community members in the study areas and relevant experts.

Community KI and FG discussants were from individual community members who were considered as knowledgeable in the subject area of this study were considered. Among these, a combination of elders, youths, women; KA, CLAC members at Kebele (lowest administration level) were involved in both GD and KII.

On the other hand, experts having expert knowledge on the subject and also very familiar with the study area were also delebrately selected and consulted for KII and GD. Expert key informants were from various levels of government structure (Kebele, Woreda, zonal, regional and federal levels) working under MoA, MoEandF, BoEPLAU and BoA. The three areas of KI expertise were from Natural Resource Management (NRM), Livestock and Land Administration and Use (LAU). The total number of KI experts/field technicians was 60. These were, 12 from four KA of the agricultural as well as land use and administration offices at Kebele level, 12 experts from four Woreda, 12 from two Zonal experts (six from each zone) and 12 KI experts each from the regional and federal levels. For community KI, a total of 48 communities KI from the four KA study sites in all ACZ settings were interviewed. This was 12 KI in each study site (ACZ).

Another expert GD that comprises discussant members from the Bureau of Justice, BoA and BoEPLAU at Woreda and zonal level were carried out to verify the findings from KII. The number of discussant members from each FG was five. These were: one from the office of justice, two from the agricultural office, and another two from the EPLAU office in each of four Woredas and in two zonal offices. These made the total number of experts GD to be six (four at woreda level and two at zonal level). The aim of KI interviews and GD for both expert and community members was to understand and assess the status of rural land administration in terms of policy and management both at regional and at operational level.

Open-ended and semi-structured interviews were used to evaluate the status of the system based on KI and FG discussants opinion. Besides, qualitative data from in-depth KI interviews, GD, and field notes were transcribed, translated into English and analysed using the content analysis method to understand views and scrutinise the differences in views between community and expert informants (Berg, 2009). Findings from synthesised documents, KII and GD were presented as a rap up meeting for the zonal level expert discussant group and debriefing was also conducted with them. Necessary comments given from this session were incorporated.

Finally, as Williamson *et al*. (2010) depicted, land administration systems in general for policy setting cannot be understood, built, or reformed unless the core processes are investigated. In line with this, for this study, the core processes were dealt with in the overall LAU related policy setting and their application in the operational functions at ground level. Therefore, to analyse the status, the study investigated the key attributes of the land administration system in general and focused on the four core processes following Dale and McLaughlin (2009) and Simon (2006). These core areas were: land tenure and administration, land valuation and expropriation, land use and management plans and development control.

3.7.4 Communal land use and management practices alignement with key sustainability designe principles

To investigate how communal land use and management practices (CLUMP) in different ACZ settings are aligned with key sustainability principles, field observation and a transect walk was conducted to observe the physical situation in each ACZ. Three hundred two HH surveys were conducted. To strength the findings a total of sixty and forty-eight experts and community KIs were interviewed respectively. On top of this, eight GD for each of community and expert group was conducted. Finally, structured Likert type questions for the HH survey and semi-structured and open ended questionnaires were prepared for KI and GD to extract their perceptions and views on the status of CLR institutional sustainability. Items that were used for the survey and KII were based on Cox *et al.* (2010) following Ostron's (1990) CBNRM key sustainability design principles.

These design sustainability principles, according Cox *et al*. (2010), means a condition that helps to account for the success of these institutions in sustaining CLR practices and gaining the compliance of generation after generation of community users to the rules applied. As Agrawal (2011) described, Ostrom crafted the design sustainability principles on the basis of lessons from various sample cases where users attempted with various degree of success. This is to create, adapt and sustain communal land institutions in managing communal resources.

Based on considerable research on the performance of those key design principles on managing communal resources with a robust, long-term institutions that can sustainably conserved communal resource use or not depends on whether most key design principles listed in (Table: 3)ffination accomplished successfully or not (Ostrom, 1998; Blomqvist *et al.,* 2009; Morrow and Hull, 2013; Singh*,* 2009).

Cox et al.'s (2010) revised version has been recognised as an effective analytical methodology to assess, compare and analyse the institutional

sustainability of existing CLRUM practices (Schweik *et al.*, 2013). Hence, based on Cox et al. (2010), after Ostrom (1990), the following key design principles (Table 3) were used to analyse the community performance.

Table 3: Description of Key Design Principles Based on Cox *et al*. (2010)

Code	Key design principles	Description
DP1A	User boundaries:	Clear boundaries between legitimate users and non-users must be clearly defined
DP1B	Resource boundaries:	Clear boundaries are present that define a resource system and separate it from the larger biophysical environment.
DP2A	Congruence with local conditions:	Appropriation and provision rules are congruent with local social and environmental conditions.
DP2B	Appropriation and provision:	The benefits obtained by users from a common-pool resource (CPR), as determined by appropriation rules, are proportional to the amount of inputs required in the form of labour, material, or money, as determined by provision rules.
DP3	Collective-choice arrangements:	Most individuals affected by the operational rules can participate in modifying the operational rules.
DP4A	Monitoring users:	Monitors who are accountable to the users monitor the appropriation and provision levels of the users.
DP4B	Monitoring the resource:	Monitors who are accountable to the users monitor the condition of the resource.
DP5	Graduated sanctions:	Appropriators who violate operational rules are likely to be punished based on graduated sanctions (depending on the seriousness and the context of the offense) by other appropriators, by officials accountable to the appropriators, or by both.
DP6	Conflict-resolution mechanisms:	Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
DP7	Minimal recognition of rights to	The rights of appropriators to devise their own institutions are not challenged by external governmental authorities

Code	Key design principles	Description
	organise:	
DP8	Nested enterprises:	Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organised in multiple layers of nested enterprises

Note: DP = Design principles

Variables under each key design principle were formulated based on revised literature (Schweik *et al*., 2013; Cox et al., 2010). Accordingly, for the HH survey, the ratings of key principle variables were valued out of four points. HH respondents rated each variable in each design principle (DP) depending on their perception on the status of the application if applied at all in the study area. The ratings were adapted from Schweik *et al.,* 2013; Cox *et al*., 2010) as follows:

- Well applied/ strong institutional sustainability (>75%) and CL gets very much better than 10 years before = 4;
- Moderately applied/institutionally moderately sustainable (50%-74%) and CL gets better than 10 years before = 3;
- Applied minimally/weak/low institutional sustainability (25%-49%) and CL got a little better than 10 years before = 2;
- Applied but application was insignificant/institutionally very low (weak) sustainability (<25%) and positive change on CLR use is insignificant from 10 years before = 1;
- Not applied/does not exist = 0

3.8 Data analysis techniques

3.8.1 Climate variability, adaptation, impact and impediment factors

To scrutinize data, different forecasting methods were used. The climate trend analysis method was employed to describe the spatiotemporal mean annual and seasonal rainfall distribution trend using SPSS-21 software. Following Marija and Norusis, (2012), Timeline Trend Analysis (TTA) was also used to test and depict season-based and annual mean rainfall change variability in time

and space across different agro climatic zones (ACZ) in the study area. Trends and patterns were depicted with a normalized times series graph. Box and Whiskers' plotting technique was also used to illustrate the inter-seasonal rainfall distribution series with respect to onset, outset and duration in each of the four seasons.

To estimate rainfall variability, the finding was based on and Kangah's and Simpson's (2007) work using the coefficient of variation (CV) to measure the relative dispersion and to compare the variation in series which differ in the magnitude of their averages. Since time series of rainfall for different years, seasons and months differ in mean across different ACZ, CV expressed as a percentage was calculated as:

CV= (Standard deviation/mean rainfall value) * 100..……1

The least square regression and the Spearman's *rho* test were used also to quantify trends and to test the statistical significance of the trends respectively.

To study mean seasonal and annual precipitation variability and the amount of rain that occurred in each season and year, the precipitation concentration index (PCI) was considered following De Luı *et al*. (2013) and modified by Nicholson (2013). To calculate PCI, the following empirical formula was employed:

$PCI=100\ \Sigma Pi^2 / (\Sigma Pi)^2$ ……..……2

Where:

Pi = the rainfall amount of the i^{th} season; and

ΣPi = summation of four seasons.

PCI is suitable to be used as a comparative index for quantifying temporal concentration of the rainfall throughout the year. It is a more appropriate expression than the other statistical indices to evaluate and compare the concentration of rainfall between stations (Michiels *et al*., 2012). Based on Oliver (2010) and Nicholson's (2013) work, if a PCI value is getting < 10, then

rainfall distribution is characterised as there exists a seasonal homogeneity across years. It indicates more or less a uniform monthly/seasonal and yearly rainfall distribution. If the value is between 10 and 20, it indicates rainfall distribution and variation across the years is moderate. If the PCI value is > 20, then seasonal variation across the years were with highest rainfall concentration with high variability. Then this value represents a high rainfall variability and concentration with no homogeneity.

On the otherhand, according to Schlenker and Roberts (2009), the Standardized Rainfall Anomalies Index (SRAI) reflects the situation of drought/dry spell and the availability of precipitation. SRAI is the most widely used index for understanding the magnitude and duration of wet or dry/drought events (Hayes, 2007). Hence, to evaluate inter-annual fluctuations of rainfall in this study, SRAI was used and graphically represented. SRAI is a measure in standard unit between precipitation data value and its mean on 31 years' of precipitation records for the observation period from 1984-2014 in different ACZ. It is calculated by subtracting the mean from each observation, then dividing by the standard deviation. For this procedure, the following empirical formula was used based on the procedure which was updated by Schlenker and Roberts (2009):

SRAI= (Pt−Pm)/ ó ……..……3

Where:

SRA = Standardized Rainfall Anomaly Index,

Pt = annual rainfall in year t,

Pm = is long-term mean annual rainfall over a period of observation, and

Ó = standard deviation of annual rainfall over the period of observation.

According to Schlenker and Robert's (2009) classification, the drought severity classes are extreme drought if SRAI >2 = extremely wet; 1.5 to 1.99 = very wet; 1.0 to 1.49 = moderately wet; 0.99 to -1 = near normal; -1 to -1.49 = moderately

dry; -1.5 to-2 = severely dry, <-2 = extremely dry. To depict annual rain fall variability trend ARIMA smoothening time series graph modeller was used

To examine the climate change and variability impact situation and community adaptation/coping practices with the current climate variability/change, the multivariate and the one way ANNOVA test were used to compare the mean and to see whether the difference between and among different fixed factors and adaptation practices in different ACZ were significant or not (Maddison, 2007).

The other statistical analysis used was Principal Components Analysis (PCA). As Marija and Norusis (2012) stated, PCA was used to transform the given set of variables on climate change/variable adaptation, *X1, X2, … Xk*, into a condensed set of composite variables that were orthogonal to or uncorrelated with each other. According to this above author, the purpose of PCA was also to differentiate and rank the inter-correlated adaptation variables in order to decide the most important ranked factors amongst given adaptation practices. Thus, the PC analysis was conducted to make a ranking decision on the most important adaptation practices and to summarise the nature of inter-correlation amongst different climate change adaptation variables. In this study, PC analysis was targeted to adjust the original set of variables, Xj (j = 1, 2, k) into a new set of uncorrelated variables called *principal components.* Then, employing the original idea of Koutsoyiannis (1988) and updated by Marija and Norusis (2012), the following mathematical relation was used in the study:

PCi (I = 1, 2 ..., k), which were linearly combined with the original variables

PC1 = a11X1 + a12X2 + ... + a1kXk

PC2 = a21X1 + a22X2 + ... + a2kXk

. . . .

PCk = ak1X1 + ak2X2 + ... + akkXk

Where PCi = the *i*th principal component, aij = component loadings (coefficients) and Xj = original variables. As to Koutsoyiannis (2011), care was

given in that principal components were extracted from their standardised values. This method was employed as the units used to measure the original variables differed (Marija and Norusis, 2012). Following this, during analysis, the component loadings (aij) were chosen so that the principal components satisfied the following two situations:

(a) Principal components were uncorrelated (orthogonal); and

(b) First principal component (PC1) accounts for the maximum possible proportion of the total variation in the Xj's, the second principal component (PC2) accounts for the maximum of the remaining variation (var) in the Xj's and so on.

Thus, as per Marija and Norusis (2012) , var (PC_1) ≥ var (PC_2) ≥ var (PC_3) ≥var (PC_4), where var (PCi) expresses the variance of PCi in the data set being considered. Var (PCi) are also called the *eigenvalues* of PCi. Besides, during PC analysis, if the eigenvalues of most of the PCs was so low then it was considered negligible. To assess the number of PCs whether sufficient to consider or not, the eigenvalue criterion, also known as the 'Kaiser criterion' was used (Marija and Norusis, 2012). In this case only the PCs where eigenvalues were ≥ 1 were considered, retained and accounted as a meaningful amount of variance. Based on this the number of PCs to be hold on to the subsequent process was determined. On top of this, to decide the number of PCs to be retained the scree graph, also known as 'scree plot', was assessed. In this scree plot, eigenvalues were plotted against PC numbers. The principal components that were retained were those on the slope of the graph and they appeared before the decrease of eigenvalues levels to the right of the plot (Manly, 2010). Besides, for sampling adequacy, Kaiser's Measure of Sampling Adequacy (MSA) was conducted based on the following Karl (2012) empirical formula:

$$MSA = \frac{\sum r_{ij}^2}{\sum r_{ij}^2 + \sum p r_{ij}^2}$$

In addition, to strengthen the quality of the findings, the qualitative content analysis (QCA) technique was conducted. Following Manly (2010), qualitative data from KI interviews were coded and indexed through an intensive content analysis technique in order to identify major themes. Factor ratio was used to identify and examine the most important elements with various loading ratio and characterising groups of inter-correlated variables amongst different parameters in different ACZ settings (Maddison, 2007). Moreover, descriptive statistical tools such as mean, percentages and standard deviations were used to summarise and categorise the information gathered.

3.8.2 Pressure over communal forest and grazing lands: feed demand, carryng capacity and fuel biomass demand and consumption

Using the existing area of grazing land and the Tropical Livestock Unit (TLU), the annual requirement of dry matter in the study sites was quantified and identified. To determine carrying capacity (CC) of the overall grazed lands, Robinson *et al.* (2010) and Quinn *et al*. (2007) empirical formula was used:

$$CC\,[lu] = \frac{A[ha] * PEB\,[kg/ha] * PUF}{I[kg/lu] * D} \qquad \ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where:

CC = carrying capacity expressed as livestock units (LU), usually expressed in sheep equivalents

A = Area available for grazing

PEB = Total productivity of edible biomass in all grazing lands per year (DM/A)

PUF = Proper use factor, the off take of edible biomass which may be sustained from one year to the next without affecting PEB in future years. Usually 30% could be taken for tropical countries like Ethiopia (Robinson, 2010).

I = Intake per livestock unit in kg per day (assuming for the Ethiopian high lands as 16% of feed demand = 1kg DM/day/LU (Robinson *et al.,* 2010).

D = Number of grazing days on the pasture.

The total livestock number was standardised using conversion factors and changed into tropical livestock units. The current productivity of the livestock feed was assessed mainly using the total grazing land areas. In addition, crop residues and crop aftermath were also considered using their respective conversion factors. The value difference was taken as the feed balance of the Bir-Temcha watershed four woredas included in the study.

To determine feed balance in terms of feed demand and availability, it was calculated using XL STAT and Tropical Livestock Unit (TLU) conversion factor using the model following (Steirs and Edward, 2013):

$$Xij=Cj+Gk + Eijk+\mu \quad \text{.....(2)}$$

Where:

Xijk = the effect of sum of dry matter yield obtained from dry and wet grazing land as well as shrub/bush /forest lands

Cj = the effect of j^{th} number of individual land for grazing,

Gk = the effect of k^{th} livestock size in tropical livestock unit (TLU),

Eijk = the random error

μ = overall mean

$$Yijk = Hj + Ik + Eijk +\mu \quad \text{……..……..(3)}$$

Where:

Yijk =the effect of sum of dry matter content obtained from crop residues production

Hj = the effect of j^{th} number of crop land parcels in tropical livestock unit (TLU)

Ik = the effect of k^{th} parcel crop land production in tons per annum

Eijk = the random error

μ = over all mean

$Zijk = Jj + Kk + Eijk + \mu$ ……..……...(4)

Where

Zijk = total dry matter yield obtained from crop land aftermath of the household

Jj = the effect of j^{th} parcel cropped land total

Kk = the effect of k^{th} of each crop area in hectare

Eij = the random error

M = over all mean

The overall sum of the outcome from the above three equations in total gives the total demanded and required dry matter (DM) for the survival of livestock in the study area. From the Ethiopian context, the value of the conversion factor (CF) was calculated following FAO (2011) and Fekadu (2011) study as follows:

Table 4: Crop Residue and Tropical Livestock Unit (TLU) Conversion Factor Used in the Study Area

Crop residue	Grass land	Teff	Barely	Rice	Wheat	maize	Sorghum	Finger millet	Tritic ale	Bean	Pea	Crop aftermath
CF	2	1	0.7	1.3	0.7	0.9	0.9	0.7	1	0.7	0.6	0.6
TLU conversion factor for each livestock type			Cattle		Sheep/Goat			Horse	Mule		Donkey	
			0.7		0.1			0.8	0.7		0.4	
DM demand /TLU/annum	**2.28 t = 6.25Kg/day/LU**											

Note: CF=conversion factor; DM= dry matter; TLU= tropical livestock unit

Measurements were taken in each ACZ to determine the weight and volume of each bundle/sack for different fuel biomass type. After measurements taking place, further analysis on fuel biomass consumption and demand, the following empirical formula were used following FAO (2010) and Steins and Edwards. (2013).

- Total consumption /demand (kg)/HH/week = nb/HH/week* wb(s)…….i
- Consumption/demand weight (kg)/HH/year = tc (d)w /HH/year* nm*nw…ii
- Total consumption/demand weight (kg/HH/year/unit area) = tc(d)w/HH/yearnm*nw*n……..…..…….iii

Where:

l = length of bundle

a = area of one end of bundle; b = area of the other end of bundle

nb = Number of bundle (sack) consumed or demanded

wb(s) = Weight of single bundle/sack in (kg)

nm = number of months in use

nw = number of weeks in a month = 4

tc (d)w = Total consumption or demand in kg

nhh = number of households that depends on specific communal forest areas.

After finding the value of fuel biomass consumption/demand/HH across time for each fuel type in different ACZ in Excel sheet, each value was transferred to SPSS. Then, ANNOVA was utilised to analyse variation between and among different ACZs. In addition, statistical descriptions like mean and percentage were used.

3.8.3 Policy setting and application

To analyse policy and legislative settings and application, the content analysis technique (CAT) was used. Following Norušis (2012), CAT was employed to identify, categorise and analyse the opinions of communities, practitioners and experts in the area of policy/legislation setting and application. Besides, following Norušis (2012), CAT was also used to make inferences about the antecedents of finding from the subject interviewees and secondary documents to describe and sort out the characteristics of the findings. Moreover, load factor ratio, descriptive statistics like percent, mean and median were also used to depict the findings.

3.8.4 Sustainability of institutional practices

To analyse institutional practices and assess whether the land management systems that were applied in different ACZs were in line with key sustainability and organisational principles or not, the analysis of variance test was used following Addams and Proops (2010) to see whether there existed a significant

difference between and among different practices in different ACZ settings or not.

For making priority for the identified problems under each lot of key sustainability design principles (DP), principal components analysis (PCA) were used as a decision making tool based on Manly's (2010) work. PCA was used to transform set of variables on the perception of rural community HHs on having decision based ranking among different CLR management design sustainability principal factors, *X1, X2, …Xk* into a condensed set of priority. The purpose of using PCA was to prioritized, differentiate and evaluate interrelationships amongst different institutional practices. Thus, PCA was conducted to find out and summarise the nature of inter-correlation amongst different institutional practices through ranking according to their order of priority.

In this study, PCA was targeted to adjust the original set of variables, Xj (j = 1, 2, k) into a new set of uncorrelated variables called *principal components.* Then, employing the original idea of Marija and Norusis (2012), the following relation was used in the study:

PCi (i=1, 2 ..., k), which were linearly combined with the original variables

PC1 = a11X1 + a12X2 + ... + a1kXk

PC2 = a21X1 + a22X2 + ... + a2kXk

Etcetra

PCk = ak1X1 + ak2X2 + ... + akkXk

Where

PCi = the *i*th principal component, aij = component loadings (coefficients) and

Xj = original variables.

As to Koutsoyiannis (1988, 2011), care was given in that principal components were extracted from their standardised values. This method was employed as

the units used to measure the original variables differed (Marija and Norusis (2012). Following this, during analysis, the component loadings (aij) were chosen so that the principal components satisfied the following two situations:

(a) Principal components were uncorrelated (orthogonal); and

(b) First principal component (PC1) accounts for the maximum possible proportion of the total variation in the Xjs, the second principal component (PC2) accounts for the maximum of the remaining variation (var) in the Xjs and so on.

Thus, var (PC_1) ≥ var (PC_2) ≥ var (PC_3) ≥var (PC_4), where var (PCi) expresses the variance of PCi in the data set being considered. Var (PCi) are also called the *eigenvalues* of PCi. To assess if the number of PCs are sufficient or not, the eigenvalue criterion, also known as the Kaiser criterion, was used following Manly (2010). In this case only the PCs where eigenvalues were ≥ 0.75 or >1 and RSSL>1 were retained. Any component that displayed an eigenvalue of > 0.75 was therefore accounting for a meaningful amount of variance, and was important to retain. Otherwise, during PC analysis, if the eigenvalues of most of the PCs was found so low (<0.75), then it was considered negligible.

Besides, for sampling adequacy, Kaiser's Measure of Sampling Adequacy (MSA) was conducted using the formula following (Karl, 2012):

$$MSA = \frac{\sum r_{ij}^2}{\sum r_{ij}^2 + \sum pr_{ij}^2}$$

In addition, to strengthen the quality of the finding, the Qualitative Content Analysis (QCA) technique was also conducted. Following Manly (2010), qualitative data from KI interviews and GDs were coded and indexed through intensive content analysis techniques in order to identify major themes. Factor ratio was used to identify and examine the most important elements with various loading ratios and characterising groups of inter-correlated variables amongst different parameters in different ACZ settings (Maddison, 2007). Moreover, descriptive statistical tools such as mean, percentages and standard deviations were used to summarise and categorise the information gathered.

In addition, Cobweb was also used to depict and present the findings. Particularly, Sustainability Polygons/Cobwebs were used to display the scores over a number of indicators for more than one case. Besides, content analysis method was also employed to configure the fundamental pattern between different KI and individual HH categories that have broad shared values and to capture structure and arrange connotations based on (Brewerton and Millward, 2011).

CHAPTER FOUR
CLIMATE VARIABILITY TREND AND COMMUNITY ADAPTATION PRACTICES

4.1 Introduction

African countries are among the most vulnerable to the impacts of climate change (IPCC, 2011). Many studies indicated that one of the most widespread and potentially devastating impacts of climate change in East Africa will be changes in the frequency, intensity, and unpredictability of rainfall (Hulme *et al.*, 2011). The probability of occurrence of extreme events is predicted to increase in the year-to-year variation in rainfall and temperature (IPCC, 2011). According to the same report, dry spells and droughts will be more frequent, rainfall will be more inconsistent, and torrential down pours will be heavier, all phenomena that increase the risk of soil erosion and vegetation damage through run-off. In Ethiopia where the national economy is dependent on sectors that are vulnerable to climate conditions, such as crop and livestock agriculture, forestry and tourism, it is inevitable that the adverse effects of climate change will be great on community livelihood where people are dependent on communal resources. Currently, there is a general agreement on the reality of climate change with scientific evidence of its anthropogenic drive getting stronger (Stern *etal.,* 2012). In most of the Ethiopian highlands, rainfall is often erratic and unreliable; rainfall and temperature variability and associated droughts have historically been major causes of livelihood crises and famines (Yeraswork, 2011). According to Braun *et al.* (2011), for instance, a 10% decrease in seasonal rainfall from the long-term average generally translates into a 4.4% decrease in the country's food production.

In order to better understand the situation, different researchers studied the spatial and temporal patterns of rainfall in different parts of the country. For example, Wing *et al*. (2008), Woldeamlak and Conway (2010) argued that there has been a decline in annual rainfall in most parts of north western and central Ethiopia. In contrast, Sileshi and Zanke (2014) didn't find such a trend over central, northern, and north-western Ethiopia including the Upper Blue Nile

Basin (UBNB). On the other hand, generally, Wing *et al*. (2008) in many parts of Ethiopia, including the UBNB, Woldeamlak, (2009) in drought prone areas of Amhara region (north-western Ethiopia), and Conway *et al*. (2010) in the central Ethiopian highlands agreed that there was no significant change and clear trend in the annual rainfall pattern. In general terms, climate extremes of particular significance in the UBNB and the rest of the north-western highlands of Ethiopian are variable in rainfall, temperature and associated impact like drought and flooding. Assessing changes in rainfall conditions has got due attention because of its importance for economic activities such as agriculture, drinking water supply, management and utilisation of natural resources and due to their role in natural hazards such as droughts, floods, landslides and severe erosion (Workineh *et al.,* 2011).

Communities in the study area *have* been traditionally responding to climate variability and change through various strategies. However, there was no experiential data in research that substantiates or supports the existing adaptation strategies practiced by them. The information obtained in various studies was insufficient and general. Nevertheless, as adaptation strategies vary contextually and spatially from one community to another, the available few pieces of literature on climate change adaptation strategies were too general and not specific (Mahmud *et al.,* 2008).

Furthermore, literature on climate change/variability, its impact assessment and community adaptation practices on communal land resource use and management in line with understanding the stress has been paid little attention (Deressa, 2008). Besides, the same study described that there is no sufficient research evidence on the impact of these changes and community adaptation to such climate stressing events. In this aspect, as far as literature is concerned, there have been limited research efforts to address climate change and variability adaptation (Woldeamlak *et al.,* 2011). Thus, this study contributes by bridging the above mentioned gaps and inconsistency of knowledge in the area of climate change variability and community adaptation.

Therefore, understanding the state of variability in climate elements and community coping practices on communal land resource use in the study area

provide better site specific insight. In addition, it also helps in generating additional information relevant to planners, policy and intervention options to address the challenge of climate resilient and sustainable communal land management.

4.2 Results and discussion

4.2.1 Annual temporal precipitation trend analysis

The spatial distribution of rainfall shows that the annual rainfall varied from 586.0 mm/annum in warm semi-arid ACZ to 2078 mm/annum at Dega ACZ. Generally, minimum mean annual precipitation was found in Kolla areas (1250mm/annum) while the maximum attained in the Dega ACZ was 1526 mm in a year. Regardless of spatial variation, the overall mean rainfall amount across 194 frequencies of events in all selected ACZ settings was found to be 1438.02mm/year.

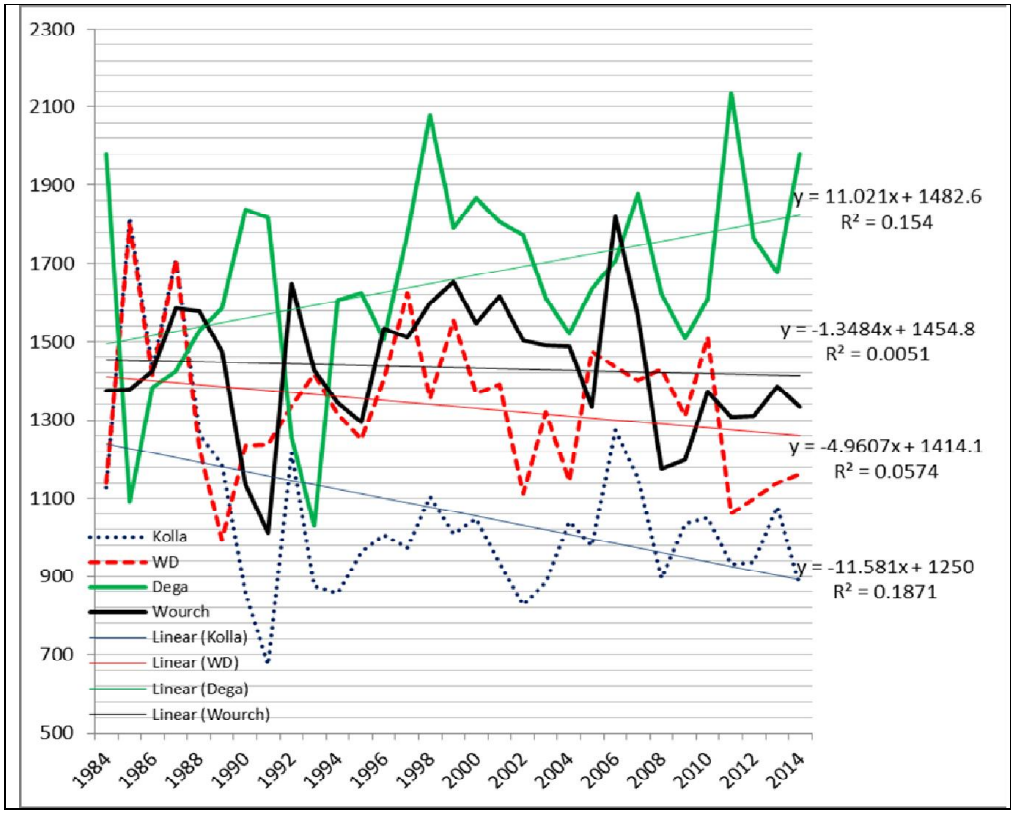

Figure 6*: Rainfall Distribution Trend across Different ACZ Settings*

The annual range of rainfall amount was found to be about 2075 mm/year between the minimum and maximum precipitation with a standard deviation of 394.84 (Figure 5). Temporal and spatial variation was, therefore, found statistically highly significant between and among different ACZs across the observation time (0.002; P=0.05).

The trend line as indicated in Figure 5 showed that that there was a decreasing trend in all ACZ setting except in Dega ACA, which showed an increasing trend across years. However, the distribution of rainfall in all ACZ with in the study area was with high rainfall variability during the observation period (Figure 6). On the other hand, the annual rainfall variability for mean annual rainfall distribution between and among different ACZs across the observation period was estimated. The finding depicted that although Kolla ACZ had the lowest precipitation recorded, the variation of annual precipitation amount across years was highly variable and inconsistent compared to other ACZs (CV=25.72 %).

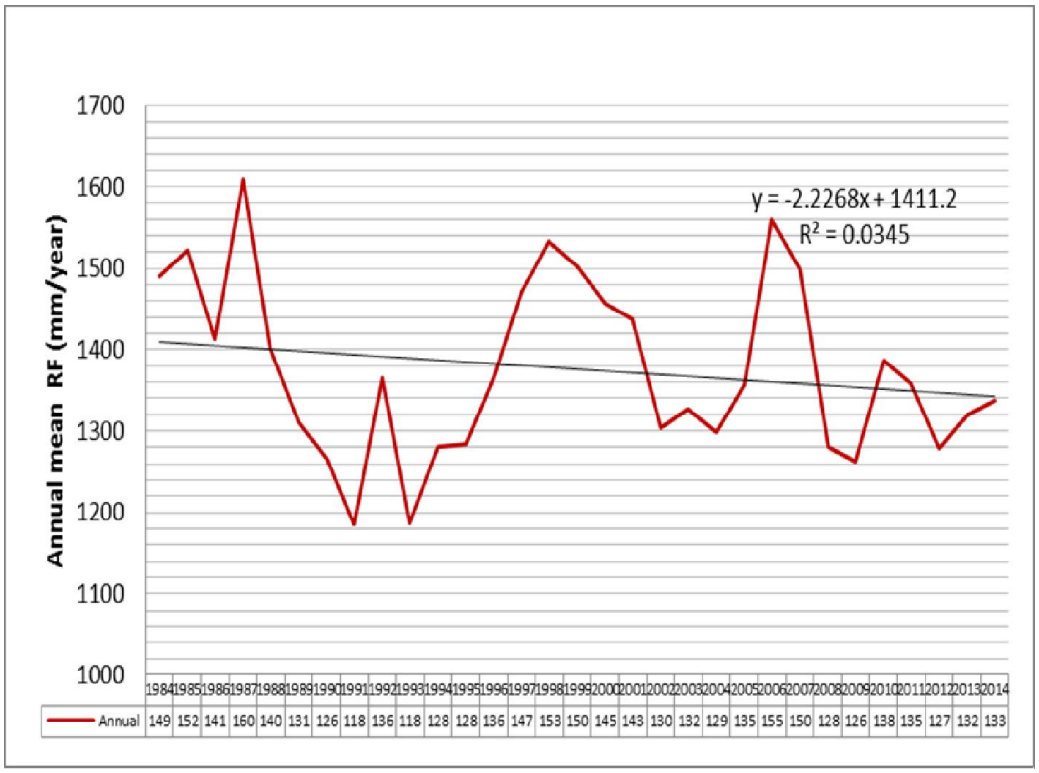

Figure 7*: Normalized Annual Temporal Rainfall Distribution Trend*

Conversely, the least rainfall variability or better annual rainfall consistency pattern was found in Wourch ACZ (CV = 12.01) (Table 5).

Table 5: Annual Mean Precipitation across Different ACZ Settings

ACZ	Stat	Annual
Kolla(N=31)	Std. Deviation	433.39
	Mean	1064.68
	Cof. Variation	25.72
Woyina dega(N=49)	Std. Deviation	212.44
	Mean	1333.92
	Cof. Variation	15.93
Dega(N=83)	Std. Deviation	243.44
	Mean	1685.25
	Cof. Variation	22.86
Wourch (N=31)	Std. Deviation	172.07
	Mean	1433.19
	Cof. Variation	12.01
Total(N=194)	Std. Deviation	394.85
	Mean	1438.07
	Cof. Variation	27.098

Source: Own survey, October, 2016

With regard to the annual precipitation trend in different ACZ settings, the finding varies accordingly depending on different ACZ settings. For example, in Kola, Woyinadega and Wourch areas, there was a significant declining trend at a rate of 11.6mm, 5mm and 1.34mm per annum respectively. However, it was only in Dega areas where precipitation received with an increasing trend (8.98mm per annum) (Figure 8).

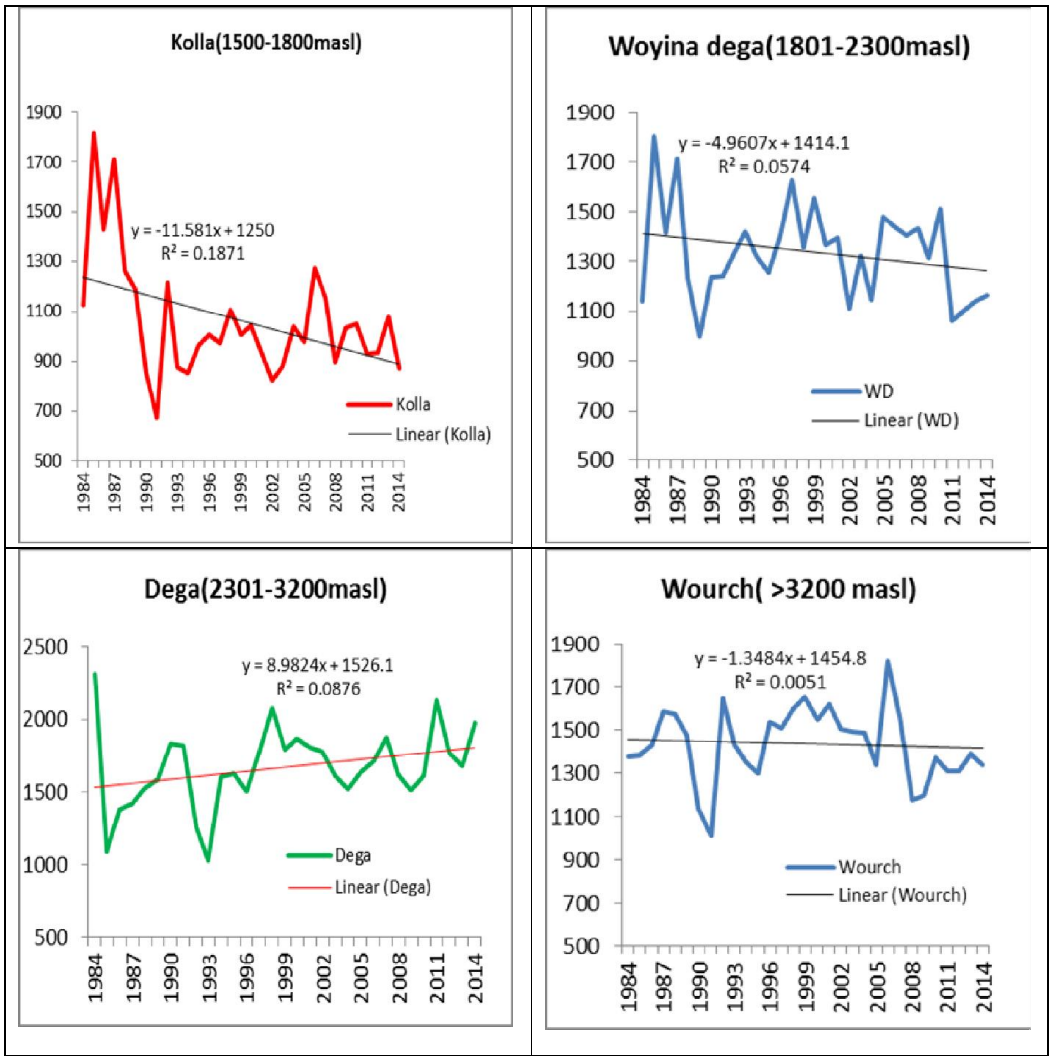

Figure 8*: Mean Annual Rainfall Distribution Trend Across the Observation Years in Different Agro Climatic Zones*

However, by smoothing the findings that are coming from different ACZ settings and taking the overall mean rainfall distribution, the annual precipitation trend across the observation period was generally found with a slightly declined trend (2.22mm of precipitation per annum). Based on the time-series graph modeller, the annual time-series trend line across time was portrayed. Both the upper and lower control line and the fit curve showed a declining trend starting from 1984 to 1988. However, from 1988 onwards to 2008 there was an increment trend. Following 2008 till 2014, it was found again with a declining trend (Figure 8). This clearly showed that there was no clear rainfall pattern and trend across time.

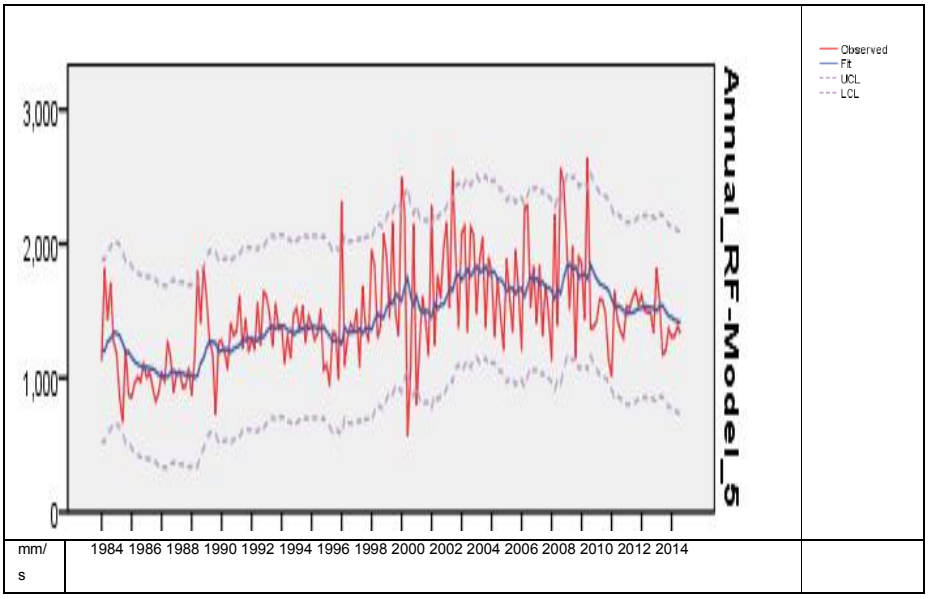

Figure 9*: ARIMA Smoothing Time Series Graph Modeller Plot for Annual Rainfall Trend*

On the other hand, in the overall annual trends in the study area regardless of ACZ setting few outliers were also detected. 1985, 2001 and 2009 were years that extreme low level precipitation occurred even below the low control line. This indicated that in those years there was a critical shortage of rainfall. From the KII conducted 93% and 87% from Kola and Woyinadega respectively responded that during those years rainfall was short to the extent it affected grazing land vegetation to the level that feed became critical.

Table 6: ARIMA Model Statistics for Annual Rainfall Distribution

Model	Model Fit Statistics			F	DF	Sig.
	R^2	MAE	MaxAPE			
Annual_RF-Model_5	0.17	279.38**	167.46*	71.38	18.00	0.001

** Max APE (Maximum Absolute Percentage Error); * MAE (Mean Absolute Error)

4.2.2 Intra-annual precipitation concentration index (PCI) in different ACZs of the study area

Based on Oliver (2010), the value of PCI for inter seasonal rainfall variability varies depending on the nature of the ACZ setting. The overall PCI value ranges from 4.26 in the Kola to 27.8 in the Dega ACZ (Table 7). In general seasonal rainfall variability and precipitation concentration was found less in two extreme ACZs (Wourch and Kolla) ACZ.

Table 7: Precipitation Concentration Index across Different Agro Climatic Zones within the Observation Period (1984-2014)

ACZ	No Station	Frequencies of events	Missing data (%)	ΣPi	ΣPi2	(Σpi)2	ΣPi2/ (ΣPi)2	PCI= 100*(ΣPi2/ ΣPi)2
Wourch	1	31	6.5	23143	535626776	7917430612	0.068	6.77
Dega	3	93	8.4	46923	220179918	7917430612	0.278	27.81
Woyina dega	2	49	8.2	29739	885388261	7917430612	0.112	11.19
Kolla	1	31	19.4	18154	329389806	7917430612	0.042	4.26
				88980				

Source: Own survey, October, 2016

In the Wourch and Kolla ACZs, the value of PCI was <10. Variation in precipitation concentration was ranging from 4.26% in Kolla and 6.77% in Wourch ACZ. This means that seasonal rainfall distribution across years in these two ACZ was characterised as homogeneous rainfall distribution in their respective seasons. However, in Dega and Woyinadega ACZ, the PCI value was found to be 27.81 and 11.19 respectively. Therefore, seasonal rainfall distribution in four seasons across years in Woyinadega ACZ was not homogeneous across years and showed moderate rainfall concentration and variability across the observed period (Table 4). On the other hand, the highest PCI value (27.81%) was found in the Dega ACZ. This PCI value showed that this ACZ exhibited very high rainfall variability across the same seasons across the years with the highest rainfall concentration and variability in the study area.

This finding also supports the result found by calculating the coefficient of variation to estimate the rainfall variability.

Similar studies were conducted in a wider area where this study watershed was located. Sileshi and Zanke (2014) conducted a study in central, northern, and north-western Ethiopia and he found that there is no significant and clear trend in the annual rainfall pattern. On the other hand, Wing *et al.* (2008) also noted in his study that there were declining trends of annual rainfall distribution in the areas where he conducted his research in 13 watersheds where this study site was partly included. Similarly, Getachew (2009) reported that the amount of rainfall received was more irregular across time investigated from 1980 to 2010. On top of the above studies, another study conducted in the same region has also showed that there was a continual reduction from year to year, creating more scarcity of precipitation over the last three decades (Bewket, 2011).

As *Hulme et al. (2011)* described, the high annual coefficient variation represents highly fluctuating rainfall across the years, while the very low coefficient of variation rainfall shows the relative stability of rains in the main rainy season. This result agrees with the findings of Conway (2010), Sileshi and Demar´ee, (2012), Cleaver (2009) and Hulme et al. (2011) that indicate the overall declining trend but with high annual rainfall variability with a non-significant trend of annual and seasonal rainfall totals in northern Ethiopia.

Conway (2011) and Alemneh (2011) had also reported similar results, where the direction and magnitude of the annual precipitation trend in the Amhara regional state of Ethiopia varies from station to station.

In support of this, Bewket (2011) studied the annual rainfall trend in the Amhara region, Ethiopia, where rainfall data was collected for the period from 1975 to 2003. From his study, it was reported that the annual rainfall trend showed a negative trend in four and positive trend in eight of the stations out of the 12.

As to Sileshi and Zanke (2014), the major driving factors that influence rainfall patterns in Ethiopia are the equatorial eastern Pacific sea level pressure, the southern oscillation index and the sea surface temperature (SST) over the

tropical eastern Pacific Ocean. Besides, Seleshi, (2014) and Conway (2010) described that within the regions of Ethiopia, rainfall is governed by elevation and mountain land form. According to those studies, this inconsistent trend of the stations might also be the main reason for the annual and seasonal rainfall trend and variation over Ethiopia in general and in the Amhara region (where this study was located) in particular.

A study was conducted by Tilahun *et al.,* (2011) in the north-western highland of Ethiopia including the upper Blue Nile basin but without considering the extreme ACZ. He noted that PCI values were found between 12 and 20. This finding supports this study, particularly the Dega and Woyina dega ACZs. Smaller variation in the extreme range was simply because this study included the two extreme ACZs (Wourch and Kolla).

4.2.3 Standardized rainfall anomality index (SRAI) across different ACZ in the study area

Based on Schlenker and Roberts's (2009) equation, of all 194 frequencies of events about 112 (38.73%) were where the SRAI value had fallen from near normal to moderately wet events. Areas fall under very dry and extremely dry spells where there were only eight frequencies of events accounting for 4.12%. However, very wet and extremely wet events were found with 59 frequencies of events accounting for 30.41% of all the frequencies of events. However, both extreme dry and extreme wet events comprised only 2.06% and 9.28% or four and 18 occurrences respectively (Table 8).

Table 8: Descriptive Statistics on the outcome of SRAI and Drought Conditions

Condition	Value	Frequency /events	Cum. frequency	Percent	Cum. percent
Extreme dry event	< -2	4	4	2.06	2.06
Very dry event	-1.5 to 2	4	8	2.06	4.12
Moderately dry event	-1 to -1.49	15	23	7.73	11.86
Near normal	0.99 to -1	43	71	22.16	36.60
Moderately wet event	1 to 1.49	69	140	35.38	72.16
Very wet event	1.5 to 2	41	181	21.13	93.30
Extreme wet event	>2	18	194	9.28	100.00
Total		194		100	

Source: Own survey, October, 2016

As depicted in Figure 10, the first extreme dry event occurred in 1989 in the Woyina dega ACZ (SRAI value = -2.86). Following this, in two subsequent years (1990 and 1991) another extreme dry event was recorded (SRAI = -2.454) in the Wourch ACZ. Another very dry spell was also noted in the Kolla and Dega ACZs in the years 1992 and 1993. After 18 years again two subsequent years (2013 and 2014) were the time when a very dry event happened in Woyina dega ACZ (SRAI= -1.826 and -1.595 respectively) (Table 9).

Although there were continuous five year dry spell events from 1989 to 1993, no very dry and extreme dry event occurred until 2012 in the study area. In general, there was not any trend found for the occurrence of dry events across this ACZ, even though some of the ACZs discussed above experienced haphazard dry spells.

Table 9: Dry and Wet Event Summary in Different ACZ and Years

Extreme wet event

ACZ	Year	SRAI value
Wourch	2006	2.12
Dega	1998	2.345
	2007	2.142
	2011	3.113
Woyina Dega	1989	2.112
	1987	4.103
	1997-2000	2.501-4.103
	2006-8	2.856-3.013
Kola	1986	5.132
	1988	7.011
	2006-2008	3.111-3.972

Very dry and extreme dry event

ACZ	Year	SRAI value
Wourch	1990	-1.727
	1991	-2.454
Dega	1992	-2.388
	1993	-2.047
Woyina Dega	1985	-2.862
	2013	-1.826
	2014	-1.595
Kolla	1991	-1.6089

Source: Own survey, October, 2016

On the other hand, the overall inter annual extreme wet precipitation events were recorded for three subsequent years starting from the year 1986 to 1988 (SRAI = 4.10 to 7.01). Both events happened in the Kola and Woyina dega ACZs. After nine years, another six continuous very wet events occurred in different ACZ areas. Generally there was a series of six years of extreme wet events found in Woyina dega, Dega and Kolla ACZs (Figure 9). The last extreme wet events happened after five consecutive years after 2001 and were in 2006 and 2008. These were in Wourch and Kola ACZs. The last extreme wet event occurred in 2011 in the Dega ACZ (SRAI = 3.113).

In all 194 rainfall frequencies of events, 18 events that occurred in 12 different years (out of 31 observation years) were found extreme wet events. Of these 18 events, 50.4% were in Woyina dega ACZ and 26.55% in Kolla and the remaining 23.05% in Dega and Wourch ACZs.

From this, it was possible to deduce that extreme wet events were experienced more frequently in Woyina dega and the highst range of variability of SRAI =8.61 (derived from Table 9) inKolla ACZs than the other ACZs. This showed the exisance of highest rainfall variability in kola ACZ. In support of this Conway (2010) also described the highest variability of rainfall renging from maximum to almost none was recorded particularly in lower ACZ than the higher ones. However this does not mean that much of wet events occurred in Kolla and Woyina dega ACZ. In this regard, 88.21% of wet and very wet events occurred

in Dega and Wourch ACZs (derived from Table 9). Of those years, it was confirmed from KI data in each respective ACZ that there were frequent heavy storms with severe land degradation which occurred on CL during 1986 and 1988 in Kola, 1987 in Woyina dega, 2011 in Dega and 2006 in the Wourch ACZ (0.67; 0.87, 0.77; and 0.64 load factor ratio respectively). Moreover, about 88.14% metrological records in the study area fall from nearly normal to wet events.

On the other side, extreme dry spell events occurred in eight events out of 194 frequencies of events (4.12% observation). These happened in seven different years in 31 years' time (22.39 % of observed years). These years were 1990 and 1991 in Wourch, 1992 and1993 in Dega, 1985, 2013 and 2014 in Woyina Dega and 1991 in Kola ACZ (Table 7). In support of this, from KI results, it was learned that the year 1990 in Wourch, 1992 in Dega, 1985 and 2013 in the Woyina dega and 1991 in Kola ACZ was noted that there was a critical shortage of rainfall where communal grazing feed resources were seriously constrained (load factor ratio = 0.63; 0.73, 0.38; and 0.69 for respective years).

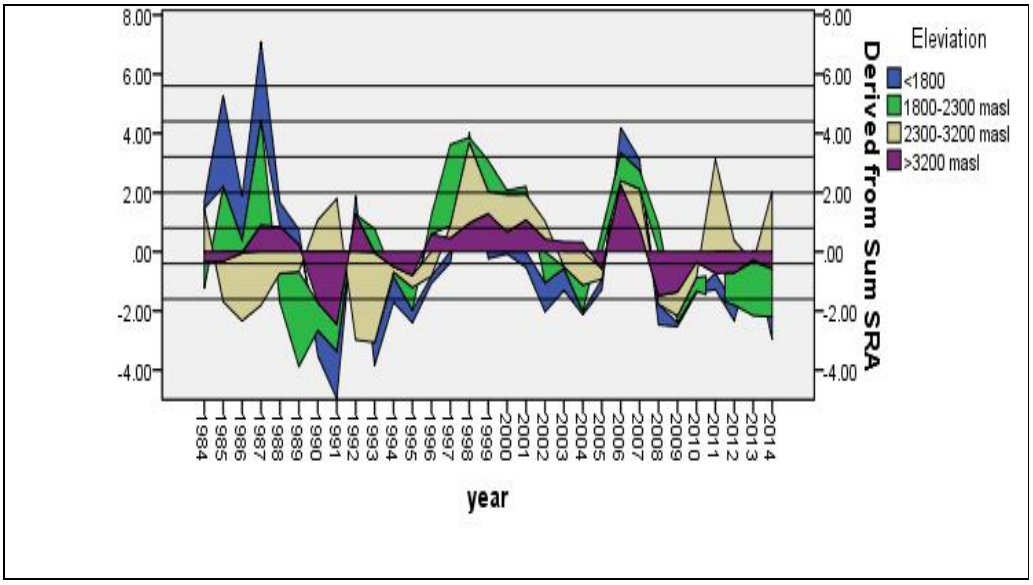

Figure 10*: Standardized Rainfall Annomality Index across the Observation Period in Different Agro Climatic Zones*

The overall finding on both extreme dry and wet events showed a cyclical-random pattern of rainfall which denotes peak high and low values.

Nevertheless, it's difficult to draw a conclusion on whether the cyclic-random nature of the rainfall follows a distinct trend or not. From this it was also concluded that the periodicity for extreme dry or wet events was not predictable. This finding contradicts the result by Conway (2010) where he found that the temporal and spatial variability of rainfall in the drought-prone areas of Amhara region of Ethiopia indicated that rainfall in the region showed significant decadal variability, where a positive anomaly tends to be followed by negative anomalies in a decadal manner.

4.2.4 Seasonal precipitation variability

4.2.4.1 Mean seasonal precipitation pattern and variability

There was an increasing trend in the mean summer (June to August) and autumn (September to November) precipitation within the period of 2000-2008. Similarly, from 2008 until 2014 both seasons showed a declining trend.

Seasonally, precipitation trend characteristics in the period of observation showed that the yearly average rainfall in general deceases over time in both summer and autumn seasons (Figure 10). About 82.5% of precipitation was contributed from the summer and autumn seasons in the study area. Of these, about 39.6% was from summer (Table 11). Furthermore, the scope of spatial rainfall variability between and among different metrological observation sites was not found statistically significant particularly for winter and spring seasons (P=0.48 and P = 0.13) respectively.

Table 10: ARIMA Model Statistics for Spatial Variability

Model	Model Fit Statistics			Statistics(F)	DF	Sig.
	R^2	MAE	Max APE			
Winter(Dec-Feb) Model	0.27	24.46	2690.97	1.08	18.00	0.48
Spring(Mar-May) Model	0.11	84.98	1216.67	1.62	18.00	0.13
Summer(June-Aug) Model	0.11	168.48	206.96	81.65	18.00	0.03
Autumn(Sep-Nov) Model	0.05	121.49	398.06	39.51	18.00	0.02

Source: Own survey, October, 2016

However, for summer and autumn seasons, variation was found significantly high (P=0.03 and 0.02) respectively at 95% confidence interval (Table10). This

showed that there existed a higher spatial variability in rainfall distribution during the summer and autumn seasons. On the other hand, there were no low outliers detected below the control line with extreme shortage of rainfall in winter and spring seasons. According to key informant respondents, this was evidenced by 93%, 77%, 45% and 66% of KI from Kola, Woyinadega, Dega and Wourch ACZs respectively. Particularly, the 1985 and 2005 impact of these seasons were severe and semi drought conditions were exhibited (Figure10)

From Kefyalew's (2014) study, statistically significant increasing trends of annual and summer rainfall were noted in Bahir Dar, Gondar (mainly representing Woyina dega) and Metema (Kolla area), while, Sirinka and Debre Tabor (both representing Dega area) showed a significant increasing trend during Kiremit and Belg rainfalls, respectively.

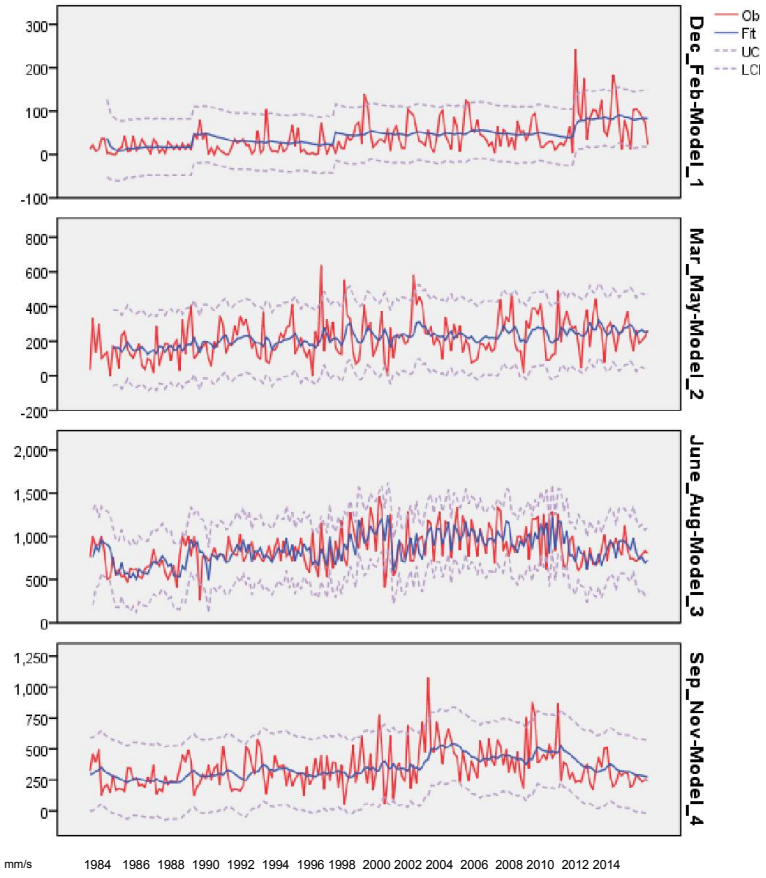

Figure 11*: ARIMA Smoothing Time Series Modeler Plot for Seasonal Rainfall Trend*

In the study area, the mean rainfall distribution from 1984 to 2014 indicated that the highest precipitation and range of variability was recorded in different seasons and ACZ setting (Figure 11). During winter and spring seasons, the highest rainfall was recorded in the Wourch ACZ. This was about 262 and 83.8 mm/season respectively. In summer and autumn, the highest precipitation was recorded in the Dega ACZ. The mean value of precipitation gained during those seasons were 974.87 and 425.28 mm/season respectively (N = 84).

Table 11: Seasonal Based Rainfall Distribution

Season	Range	Mini.	Maxim.	Mean	SD	Variance	%
Winter(”*Bega”)*	243.0	.0	243.0	40.309	38.3910	1488.495	2.8
Spring(”B*elg”)*	640.0	.0	640.0	215.603	115.8399	13418.883	14.7
Summer(”Kiremit”)	1204.0	262.0	1466.0	853.727	220.4236	48396.562	39.6
Autumn(”*Tsedey”)*	1029.0	50.0	1079.0	347.433	161.6272	26123.345	23.9

No of Station = 194; No of years = 31

Source: Own survey, October, 2016

A multivariate analysis test was conducted to analyse variation in precipitation between and among different study sites across seasons. In autumn and summer rainfall variability was highly significant across different ACZs (P=0.000 at 95% confidence interval). However, between and among Wourch and Woyina dega P=0.98. Similarly, in the spring season although there were high significant variations across different ACZs (at P = 0.00), no significant variation was found between and among the Wourch and Dega ACZs. In winter season significant variation was not also observed between and among Kolla and Woyinadega ACZ.

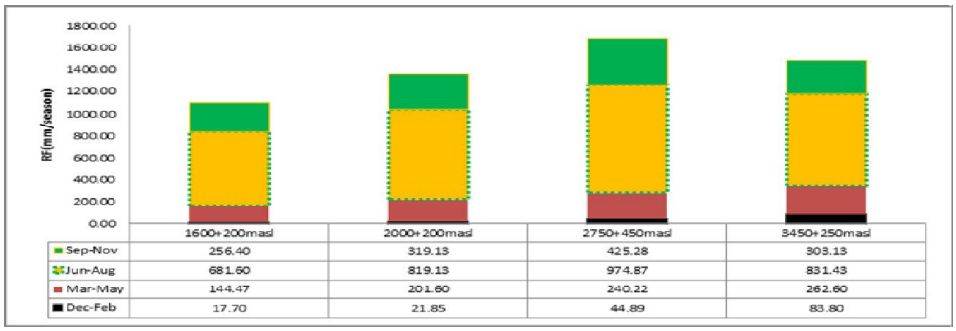

Figure 12*: Mean Seasonal Rainfall Distribution across Different Agro Climatic Zones*

According Gutu *et al*. (2012), the overall precipitation variability study on ten stations in the Amhara regional state also showed a high variability across seasons in different spatiotemporal elements.

4.2.4.2 Intra seasonal variability based on the coefficient of variation (CV)

For winter and spring, the highest and lowest precipitations occurred in Wourch and Kolla ACZs with a value of 81.1 and 254.13 mm/season respectively. Besides, for summer and autumn, the highest precipitation occurred in Dega ACZ with the value of 974.87 and 425.28 mm/season.

As shown in Table 9, CV was determined after calculating SD and mean rainfall value for each season. In winter the highest CV was observed in Woyina dega ACZ (105.63) while the minimum was recorded in Wourch ACZ (66.99). During autumn season, the maximum CV was recorded in the Kolla ACZ while the minimum was observed in Wourch ACZ (59.78, 34.49). In summer, it was noted that the range of CV across different ACZ was ranging from 16.14 in Wourch to 24.33 in Dega ACZ. Similarly, during spring the maximum CV occurred in Dega (44.79) and the lowest in Wourch with a value of 28.67 (Table 11).

From the above finding, it was observed that the minimum CV was recorded in Wourch ACZ in all seasons. This showed that seasonal rainfall variability was the lowest in Wourch ACZ compared to other ACZs. Besides, among all seasons, the lowest range of CV was recorded during summer season in all ACZs. On the contrary, coefficient of variation with the highest value was found in winter ranging from 66.99 from Wourch ACZ to 105.63 in the Woyina dega ACZ (Table 12). This indicated that rainfall variability was lowest during summer and highest in winter in relation to other seasons across different ACZs. This means that the spatial rainfall distribution pattern during summer was similar in all ACZ settings while distribution varies spatially from one ACZ to another during winter season.

Table 12: Season Based Mean Rainfall Distribution Statistics

ACZ	Stat	Dec-Feb	Mar-May	June-Aug	Sep-Nov
Kolla <1801 (N=31)	Std. Deviation	13.11	83.39	153.31	93.09
	Mean	17.13	139.81	659.61	248.13
	Cof. Variation	76.56	59.78	23.24	37.51
Woyinadega 1800-2300 masl(N=49)	Std. Deviation	22.61	97.81	141.73	115.11
	Mean	21.41	197.49	802.41	312.61
	Cof. Variation	105.63	49.53	17.66	36.82
Dega 2300-3200 mas l(N=83)	Std. Deviation	31.54	130.67	237.17	190.47
	Mean	44.89	240.22	974.87	425.28
	Cof. Variation	70.26	54.40	24.33	44.79
Wourch >3200 masl (N=31)	Std. Deviation	54.32	87.66	129.83	84.12
	Mean	81.10	254.13	804.61	293.35
	Cof. Variation	66.99	34.49	16.14	28.67

Source: Own survey, October, 2016

4.2.5 Community perceptions on climate change/variability impact manifestations

From the GD, it was learned that the most common climate change stressing events were found to be drought, flooding, and intense storms and severe soil erosion. Regardless of different ACZ settings, these events caused different climate change/variability impact manifestations. As reported by the majority expert GD, the most outstanding climate change and variability impact manifestations in study area were grouped into six major themes. These were water scarcity, migration, feed scarcity and livestock diseases/death, invasion of unwanted plant species in communal lands and lack of shading scattered trees.

The case reported by 75% of KI in all ACZs was that rivers and springs in some years were getting dry and some even disappeared. From KI in all studied ACZs, water scarcity was pointed out with 0.239, 0.241, 0.21 and 0.31 load factor ratio respectively (Table 10). Besides, it was reported that two extreme events were manifested in the Dega and Wourch ACZs. These were: run off came with sediments and filled sources of springs and on the other hand, due to invariable rainfall delay and scarcity, rivers and spring water became scarce. Due to this, most women spent their time and energy by going great distances to fetch water. For 100% of all KI, the most extreme dry event that occurred was

in the year 1985. However, as an extreme dry year 1990, 1993, 1995 and 2013 were reported by 72%, 68%, 83% and 72% of HH survey respondents from Wourch, Dega, Kolla and Woyinadega respectively.

All KI from all ACZ study sites also pointed out that any peculiar years with extreme wet events were not easily recognised. Rather, they reported that extreme wet events were a year after year experience, particularly in summer season with high manifestation of floods, severe erosion and sedimentations that cause sever and massive communal land degradation and affect commujity lively hood.

The other climate change/variability impact manifestation in the study area was migration. About 82% of KI respondents from Wourch and Dega ACZs were stressed that some community members migrated to other regions (Wollega and Chit areas in Oromia region). There were no KI reported in this case from Kolla and Woyina Dega ACZs. The most important reason that was mentioned by 64.39% of KI was due to excess and severe surface erosion coming from degraded communal uplands which uprooted their crops and also filled the downstream areas of communal grazing lands with sediment. This forced them to leave the area and migrate to other regions (load factor = 0.56 and 0.44) in Wourch and Dega ACZs respectively (Table 10).

The results on labour migration confirm several studies suggesting that people migrate in response to harsh climate conditions as an adaptive mechanism (Rademacher-Schulz and Mahama, 2012). Adger (2013) also observed that environmental factors including shifts in rainfall seasons and increased intensity and frequency of droughts are among the key drivers of migration of farmers. Migration, however, also was cited as a key coping mechanism by the majority of households that participated in this study and also indicated by Naess (2013).

In the study area, temporary migration has been used as both reactive and anticipatory responses to drought-induced livelihood insecurity. For instance, in support of this, Bekele *et al.* (2011) observed that labour migration was one of the principal strategies indicated by rural households in the north-western part of Ethiopia as a climate adaptation strategy.

From the KI, it was reported that the magnitude of stress was high to the extent where grasses for feed were dried to the extent that grazing was quite in adequate where most cattles were highly starved. This significant stress and feed insecurity was reported in Wourch and Kolla ACZs (load factor = 0.53 and 0.41) respectively (Table 13).

Table 13: Climate Change/Variability Impact Manifestation in Different ACZ Setting

Impact Manifestation	Cause	Respondent No	Respondent %	Load factor in each ACZ N=48			
				Wourch	Dega	Woyina Dega	Kolla
Water scarcity	ED	36	75.00	0.239	0.24	0.21	0.31
Migration	ED+EW	31	64.39	0.56	0.44	0	0
Feed scarcity	ED	29	60.42	0.41	0	0.06	0.53
Livestock diseases and death	ED	28	39.33	0.22	0.1	0.9	0.59
Invasion of unwanted shrubs on CGL	Ed+EW	26	54.17	0.61	0.11	0.27	0
Lack of shading scattered trees	d+EW	25	52.08	0.48	0.39	0.13	0

Note: ED = Extreme Dry (drought); EW = Extreme wet (Flood/severe erosion)

On top of feed scarcity, another associated climate change/variability impact manifestation mentioned by 39.33% of KI was livestock diseases and death. This problem was most prevalent in Kolla and Wourch ACZs (0.59 and 0.22) load factor ratio respectively. Another manifestation mentioned and which can still be related to feed scarcity was invasion of shrub species on CGL. From the researcher's field observation, *"Yahiya eshoh"* from Woyina Dega ACZ and *"nechat" and "gimido*" from Wurch ACZ area were the most common shrubs that were invading communal grazing lands. This type of infestation was reported by 54.17% of KI with the highest load factor exhibited in Wourch and Woyina Dega ACZs (0.61 and 0.27) respectively (Table 10).

Besides, from the HH survey, respondents were asked how communities perceived climate variability patterns and associated impacts. In this regard, (41.72%, N = 126) was found that they have no understanding of climate change and associated impacts. From the KI interviews, 74.9%; N = 36) was

described that there were some community members who do not know about climate change and associated impacts. As suggested by one KI, the reason he forwarded was that it is "*ye amilak kutta new"* which simply means it is "an act of God". Besides, HH respondents (39.38%, N =186) responded that they have at least practical understanding on climate change/variability and its impact. Out of these respondents who had prior understanding, 68% (N = 127) reported that the climate pattern has already changed and disturbed their livelihood pattern. Moreover, they also noted that this changing climate pattern and sudden flooding and severe erosion destroy and affect the effectiveness of communal land management practices.

The other point was about the predictability of climate pattern (particularly rainfall pattern). 82% of respondents in all ACZs strongly agreed that climate events didn't match with what they predicted. In strengthening this, 98% of KI respondents agreed with this point and pointed out that this climate variability affected most communal land management practices, specifically those practices stabilized through biological measures like seedlings, sod and split grass planted on communal forest and grazing land areas.

On top of this, KI also reported that deforestation of communal forest and encroachment on communal grazing lands for additional farm land was a common practice. These anthropogenic effects interlinked with climate change impact consequences, lack of scattered trees for cattle shading became a series manifestation where livestock are in trouble. This case was reported by 52.08% of all KI respondents from all ACZs except Kolla ACZ. However, the case was found high in Wourch and Dega ACZs with a load factor ratio of 0.55 and 0.39 respectively.

4.2.6 Community perception on climate change adaptation practices

"Adaptive capacity is the potential or capability of a system to adjust to climate change, including climate variability and extremes, so as to moderate potential damages, to take advantage of opportunities, or to cope with consequences" (IPCC 2007).

Improving adaptation practices to current climate variability is an important step that strengthens the resilience of communal land and its management system in withstanding future adverse climate change and variability situations. Under this concept, community perceptions and experience on their adaptation practices towards enhancing communal land resilience was extracted.

Among 102 climate change adaptation practices formulated by WOCAT, (2006), 21 were identified with expert FG and were grouped in tosix major themes.Based on this, these six major themes were identified and analysed. The six identified major themes were: economic welfare, social and cultural institutions, access to information, transport alternatives, ecological management and use of energy alternatives.

Table 14: Economic Welfare Arena across Different ACZ Settings

Economic welfare	Mean	Median	Std. Deviation	Std. Error	Type III Sum of Squares(a)	Mean Square	F	Sig.
Use of credit	1.409	1	0.538	0.031	.294	0.098	0.336	0.009
Selling family labour	2.498	2	0.646	0.037	3.490	1.163	2.838	0.038
Selling of assets	2.867	3	0.846	0.049	.681	0.227	0.315	0.815
Off farming business	1.492	1	0.609	0.034	5.203	1.734	4.839	0.003
Tot.	2.067							

Note: a = Covariates appearing in the model are evaluated (N = 302, CI = 95%)

Under economic welfare adaptation arena, the overall mean was found as 2.067 out of 5 standard points. This signified that the status of adaptation practices under this theme was found to be below average. However, under this category, moderate adaptation practices exercised in the study area was selling of assets (median = 3; mean = 2.87). See Table 14.

Use of credit was found to be low (mean = 1.49; median = 1). Variation between and among respondents was highly significant (P = 0.009). On top of this, from the analysis of variance, it was found that HH respondents who were grade four and above were rated that they use credit moderately (mean = 3.05; median = 3). See Table 14.

From GD results, it implied that institutional support in terms of providing credit was an important factor in promoting adaptation options to reduce the negative effects of climate change. Group discussants also pointed out that the availability of financial resources would enable rural communities to improve their grass land and to buy improved livestock and other important inputs that they might require for the adaptation choices in managing their communal land to make it more resilient. As Nichols (2012) state in their study, access to credit had a positive impact on climate change and adaptation. Having access to credit increased the likelihood of adaptation by rural communities. Other studies have also shown that access to credit by farmers is an important determinant of the adoption of various technologies (Deressa et al., 2011).

Selling of assets was recorded as there was moderate exercise on selling assets. Besides, there was no significant difference found across different HH respondents in the study area. On the other hand, variation between and among respondents was found to be significantly different, particularly in using selling of labour and doing off farm business (P = 0.038 and P = 0.003 respectively: Table 11). In support of this, during HH survey it was responded on whether they use credit, selling of family labour, selling of assets and doing off farm business or not. Based on this, it was reported that 32%, 21%, 82% and 18% of them exercised the above four adaptations respectively.

Table 15: Social and Cultural Institution Arena

Social/cultural institution in using	Mean	Median	Std. Deviation	Std. Error	Type III Sum of Squares (a)	Mean Square	F	Sig.
Kebele Early Warning social committee	0.41	1	0.385	0.030	17.902	5.967	21.83	0.000
"*Edir* " and other social inst.	2.93	3	0.815	0.047	1.156	0.385	0.386	0.631
Watershed users' associations	2.92	3	0.754	0.042	9.468	3.156	5.824	0.001
Tot. mean - Social/cultural institution	2.09							

Note: a = Covariates appearing in the model are evaluated; (N = 302, CI = 95%)

Adaptation practices in the area of the social/cultural institution dimension were also assessed. As shown in Table 15, the overall mean for this theme was found below average (2.09). However, community engagement with Edir and watershed associations' activities were recorded moderate with a mean and

median value of 2.9 and 3 respectively. The lowest mean point was recorded in using of the early warning social committee (mean = 1.1).This means that this social committee was weak in exercising climate change adaptation practices. However, variation between and among respondents under this theme was found highly significant in working with the early warning social and watershed committees (P = 0.000 and 0.001 respectively) (Table 15).

In addition, during GD it was reported that the early warning social committee was not practiced in most of the ACZs in the study area except in Kolla ACZ. Even if the early warning social committee was established, it was noted that the functionality of this committee was found to be weak.

Table 16: Access to Information in Different ACZ Settings

Access to information through:	Mean	Median	Std. Deviation	Std. Error	Type III Sum of Squares (a)	Mean Square	F	Sig.
Religious institution	3.226	3	1.038	0.06	13.449	4.483	4.306	0.01
Social/cultural institution	3.156	3	1.090	0.06	19.827	6.609	5.810	0.01
Radio programmes	1.085	1	0.981	0.07	3.030	1.010	1.073	0.36
Gov. development teams	3.693	4	0.780	0.04	13.784	1.554	1.828	0.31
Tot. mean	2.232							

Note: a = Covariates appearing in the model are evaluated; N = 302, I = 95%

The key source of information was found from the use of government teams with the median and mean value of 4 and 3.6 respectively. Besides, religious and cultural institutions like “Edir” was found moderately exercised in accessing information on climate change adaptation while use of information on climate change and adaptation through radio was found very weak (mean and median = 1). In exercising radio programmes and use of government development teams no significant variation was observed between and among respondents in different ACZ settings (Table 16).

From the discussion made with KI respondents, 73% of them noted that issues of climate change adaptation were discussed once in a year during mass mobilization movements. During GD, it was described that even though most farmers have access to radio, listening to related programmes was not the custom. On the other hand, the use of information exchange on climate change through development teams, religious and other cultural institutions like the one

traditionally called “Edir” were found to be commonly exercised in the study area.

From KI results, road networking enhancement was a recent phenomenon that has been executed since 2009 by the regional governments. On average, 72% of KI in the study area were emphasising that rural road network connected one rural Kebele (lowest government administration level) to the other.

Table 17: Transport Alternatives

Transport alternatives	Mean	Median	Std. Deviation	Std. Error	Type III Sum of Squares(a)	Mean Square	F	Sig.
Availability of feeder road	2.97	3	0.693	0.04	.331	0.110	0.23	0.88
Access to major road in < 10 KM	2.97	3	0.710	0.04	4.927	1.642	3.32	0.02
Access to market connected <10KM	3.06	3	0.662	0.04	1.138	0.379	0.86	0.46
Tot. mean	3.00							

Note: a= Covariates appearing in the model were evaluated; N = 302, CI = 95%

In support of this, from the HH survey results it was found that the overall status of rural networking in all ACZs was found moderate (mean, median = 3). On accessing major roads, variation was found to be significant between and among different HH respondents in different ACZs of the study area (P = 0.02) (Table 17).

Nichols (2012) pointed out that road network or distance to market and other social services had a negative significant impact on climate change adaptation. His results indicated that long distances decreased the likelihood of adaptation and adaptation choices by 8.8%. Besides, distance from market access has been found to be an important factor in determining technology adoption choices among farmers (Nichols *et al.*, 2011). They further noted that the nearer access to input markets let farmers get inputs needed easily for adaptation choices such as planting of supplementary feed on communal lands or on their private grazing plots, and purchase of grass and multipurpose tree species.

The other key parameter for climate change adaptation measures to boost the resilience of communal land (CL) was the aspect of ecological/environmental management. Six major elements were scrutinised under this major theme in

the HH survey question. One was controlled grazing that includes cut and carry, zero grazing and stall feeding exercise. The other was the status of establishing private grazing and wood lot areas from their own farming plot. The third element was on the application of conserved feed system like the use of silage, hay, crop residue, etc. The fourth point was the implementation of physical measures on communal lands (CL). In support of these physical measures, use of biological measures on CLM through planting drought resistant and multipurpose seedlings, legumes and grass on CL was taken as an independent factor. The sixth element considered under this theme was communal forest area closure management with integrating income generation alternatives and by-law administration.

Table 18: Ecological/ Environmental Management Arena

Ecological/environmental management	Mean	Median	Std. Deviation	Std. Error	Type III Sum of Squares(a)	Mean Square	F	Sig.
Controlled grazing /cut and carry exercised	0.83	1	0.561	0.04	.218	0.073	0.223	0.88
Establish private grazing and wood lots areas	2.25	2	1.007	0.07	1.766	0.399	0.392	0.68
Conserved feed (silage, hay) system	0.85	1	0.396	0.04	1.312	0.437	1.167	0.32
Conserved feed (crop residue) system	2.85	3	1.561	0.04	0.312	0.477	0.167	0.32
Biological measures on CLM	3.28	3	0.981	0.07	3.030	1.010	1.073	0.36
Area closure management	3.20	3	0.968	0.06	.714	0.238	0.251	0.86
Physical CL M practices	3.11	3		.069	.714	.238	.251	.861
Tot. Mean Ecol/Env. Management	2.07							

Note: a = Covariates appearing in the model are evaluated; N = 302, CI = 95%

In general terms, the overall mean for ecological/environmental management intervention as climate change adaptation practices was found below average (mean = 2.07). However, practices like biological and physical CLM practices and area closure management interventions and conserved feed/use of crop residue were found to be moderately exercised in all ACZ settings. Nevertheless, application of the controlled grazing and conserved feed system (silage and hay preparation) was found to be very weak (median = 1; mean < 1). Besides, in all types of elements under the ecological/environmental management theme, no significant variation was observed between and among HH respondents at $\alpha = 0.05$ (Table: 18).

Based on KI interviews, 45% of them suggested that conserved feed like silage and hay were used in rare cases. However, in exercising conserved feed by doing crop residue reserve during drier and/or in any feed scarcity period was found a common exercise in all ACZs. In line with this, 92% of KI responded that half of rural HH were using crop residue as conserved feed while the other half were not.

In addition, GD from the Wourch, Dega and Woyina Dega ACZ areas explained that grazing management was exercised by controlling livestock on half of the grazing area from grazing during the summer season (June-September) and allowed cattle to graze on it during the dry season. However, 74% of KI from those three ACZs indicated that this kind of exercise was implemented in areas where there are extensive communal grazing lands with strong by-laws.

Many researchers in the area working in different parts of the north-western part of Ethiopia described in detail about the seriousness of free grazing problems and poor community practices like control grazing and conserved silage for feed as climate change/variability adaptation measures. Deresa, (2008); Conway et *al*., (2010) and Sileshi and Zanke (2014) also conducted research on adaptation practices during climate variability in the upper Blue Nile area. He clearly depicted that one of the most frequent adaptation practices for the high and low land farmers during feed scarcity was the use of crop residue reserves. In Workineh's (2011) study conducted in Tana sub basin of the Upper Nile basin, he recorded that crop residue reserving for feed was a kind of traditional practice experienced for a long time by most of the rural farmers in the Amhara region of Ethiopia.

With regard to ecological/environmental management adaptation practices implemented on communal lands, two extreme adaptation practices were analysed and depicted. Analysis was made in terms of looking at standard deviation and mean spread across the three covariant (education, economic and ACZ) gradients.

Among all adaptation practices, biophysical soil conservation measures on communal lands were comparatively found the most common and highly

exercised in all ACZs. As depicted from the spread plot, mean distribution was ranging from 2.5 to 4 with a standard deviation falling between 0.39 and 1.43. This showed that most mean distribution appeared above the average (Figure 13).

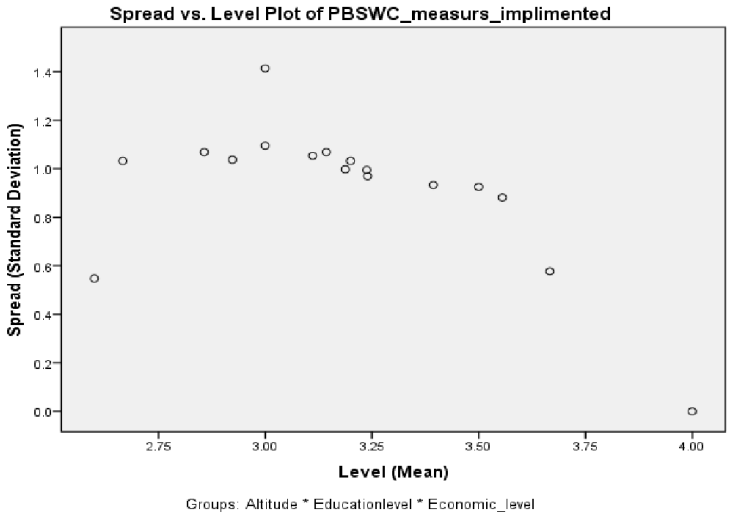

Figure 13*: Major Distribution of Responses in the Area of Bio Physical Soil Conservation Measures Implemented*

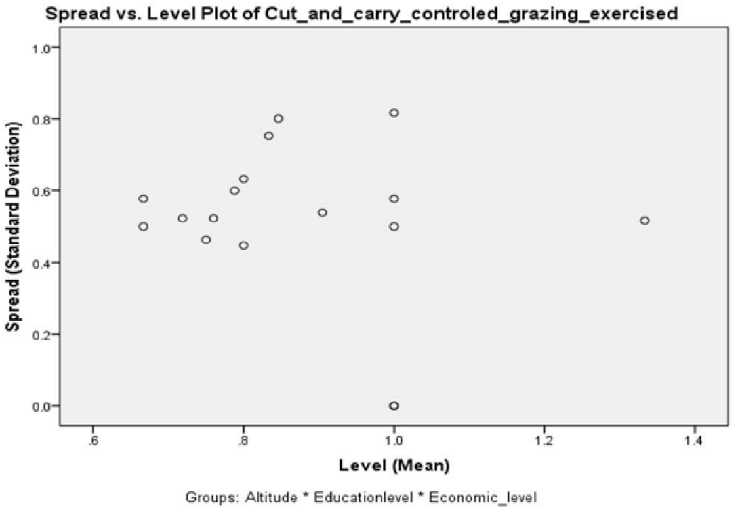

Figure 14*: Major Distribution of Responses in the Area of Cut and Carry Measures*

This finding was supported by Kefyalew (2014) that the north-western high lands of Ethiopian communities were recently exercising biophysical measures

like trenches and check dams on communal lands that were strengthened by biological measures. On the contrary, Deressa *et al*. (2011) reported that climate change adaptation practices, particularly biological measures on communal lands, were hardly done compared to the physical measures. Adaptation practices on controlled grazing together with cut and carry systems were the least exercised ones. The spread plot mean level distributions were clearly depicted as being located between 0.65 and 1.33 out of 4 points (Figure 14).

In support of this, Kefyalew (2014) and Deressa *et al*., (2011) both reported that particularly in the northern and north-western part of Ethiopia, controlled grazing and cut and carry system as climate change adaptation practices were hardly implemented. As the reason found from their study, it was because of little community awareness on climate change impact and adaptation practices to manage and use communal grazing resources in one hand and on the other, due to communities little attempt in pocessing their own grazing plot.

Based on the HH survey, the status of using alternative energy like using an improved stove was assessed. 65.56% of respondents reported that they were using an improved stove. The use of solar and biogas energy, however, was found as low as 3.9% and 0.3% respectively. Out of these, eight and four HH respondents were found in the Woyinadega and Kola ACZs of the study site respectively. In Dega and Wourch ACZs, HHs responded that they were not using biogas energy alternatives.

Table 19: Use of Energy Alternatives in Different Agro Climatic Zones

Energy alternative N = 302, CI = 95%	Mean	Median	Std. Deviation	Std. Error	Type III Sum of Squares(a)	Mean Square	F	Sig.
Availability use of improved stove	3.175	3	1.024	0.059	6.599[f]	2.200	3.211	0.024
Availability use of solar energy system	0.925	1	0.733	0.055	1.076[g]	0.359	0.597	0.618
Availability use of biogas	0.245	0	0.740	0.053	1.243[h]	0.414	0.735	0.532
Tot. mean - energy alternative	1.148							

Source: Own survey, October, 2016 . Note: a = Covariates appearing in the model are evaluated;

HH respondents were also asked about their feeling on the general use of different energy alternatives by the surrounding community. They pointed out that communities moderately used improved stoves (mean = 3.15; median = 3). The variation between and among respondents in different ACZs was found significant (P = 0.024) (Table: 19). From GD, the lowest and very weak use of improved stove was found in Kolla ACZ compared to other ACZs. Those GDs in Kolla ACZ described the reasons for the low rate of using improved stove in their area. The given reason was: in Kolla ACZ, fuel wood resource was not a series problem and, besides, communities were not conscious of their health in using traditional open stoves. Therefore, due to the above reasons, women paid little attention in constructing and using improved stove.

Table 20: Statistical Variation across Educational Level in Different Adaptation/Coping Practices

Sub theme adaptation practices (N=302; CI=95%)	Educational level	N	Mean	Median	SD	Std. Error	F	Sig.
Use of credit	Illiterate	206	1.39	1	.536	.037	317.35	.000**
	≥Grade 4	95	3.05	3	1.085	.111		
Use of radio	Illiterate	207	2.04	2	1.047	.073	77.75	.006
	≥Grade 4	95	3.41	3	1.144	.117		
CC and CG exercised	Illiterate	207	1.82	2	.1.052	.108	84.52	.002
	≥Grade 4	95	2.88	3	.874	.061		
Use of solar energy	Illiterate	206	1.39	1	.536	.037	317.36	.000**
	≥Grade 4	95	3.05	3	1.085	.111		
Use of improved stove	Illiterate	207	2.50	2	.645	.045	42.48	.003
	≥Grade 4	95	3.02	3	.635	.065		

Note: CC = Cut and carry; CG= controlled grazing

With regards to access to information, illiterate HH respondents use radio rarely while grade four and above use it moderately. The variation between and among these two groups was statistically highly significant (Table 17) With regard to the ecological/environmental management theme, significant variation was also found between two educational categories (P = 0.002). However, the source of variation was found in using cut and carry. In this case, illiterate HH respondents used it rarely while grade four and above used it moderately. Similarly, the use of the alternative energy of the improved stove and solar energy were found highly significant. Grade four and above moderately used both energy sources. Illiterate HH respondents were using solar energy and improved stove very rarely (Table 20). On top of the above findings, a Chi-square test was conducted to examine the mean differences on dependant variables under each of the above four selected major themes across fixed factors like educational level, socio-economic and altitudinal (ACZ) variation.

From the HH survey, significant variation was recorded between and among different educational and economic categories of HH respondents in terms of using different options under economic welfare and alternative energy themes. This means that using credit, selling of assets and family labour were highly variable between respondents who were illiterate and above grade four and between poor, medium and rich HH respondents. In this regard, 72% of KI suggested that better use of credit and use of better alternative energy systems were high for community members who are literate and with better economic status.

Regarding the use of different alternatives under ecological/environmental management, significant variation was found in all independent variables (educational, economical and ACZ levels). According to the study conducted with KI, 63% of them indicated that particularly feed reserve and establishing individual grazing and wood lot areas were commonly exercised by community members with better economic and educational status. From GD, it was also revealed that Kolla ACZ was exceptionally different from the rest of the ACZs. Grazing control, feed conservation, establishing private grazing and wood lot areas were poorly implemented.

Table 21: Chi-Square Test: Between and Among Major Adaptation Practices in Different Covariant Factors

a) Economic welfare theme (Use of: credit*selling family labour *selling asset)				**b) Use of Alternative energy theme** (Use of improved stove * Solar energy * Bio-gas)		
Effect	-2 Log Likelihood of Reduced Model	Chi-Square	Sig.	-2 Log Likelihood of Reduced Model	Chi-Square	Sig.
Educational level	77.23	1.34	0.031	85.336	1.35	0.013
Economic level	86.541	0.545	0.009	66.401	0.526	0.02
ACZ/Altitude	107.672	21.677	0.611	102.72	20.234	0.51
c) Ecol. /Env. Management theme use of : (CG * CC * FC* establish private feed and wood lot)				**d) Accessing Information:** use of (radio*social/cultural institutions* gov. devlopment team)		
Effect	-2 Log Likelihood of Reduced Model	Chi-Square	Sig.	-2 Log Likelihood of Reduced Model	Chi-Square	Sig.
Educational level	82.246	1.44	0.042	79.216	1.24	0.052
Economic level	89.541	0.865	0.034	76.221	0.755	0.729
ACZ/Altitude	115.232	23.347	0.01	107.672	19.217	0.38

Note: CG = Controlled grazing; CC = Cut and carry; FC = Feed conservation (N=302, P=0.05)

Conversely, no significant variation was recorded in all independent variables in using different possibilities in accessing information and communication (Table 21). However, for 78% of KI, radio listening on climate related programmes was exercised by those community members with better education.

Deresa et *al*. (2008) conducted a study in different parts of the region in Ethiopia and reported that information access and credit facility were better utilised among non-illiterate community HHs and were better adaptive. On the other hand, Conway *et al*. (2010) also did similar research on community adaptation and concluded that cut and carry and using of alternative energy practices were used significantly better by literate community member than other illiterate farmers. The findings from KII results (61% of respondents) suggested that access to information and level of education and economy had positive impacts on the communities' likelihood to adapt to climate change and do their own effort in improving communal land. Access to information services was positively related to climate change. The results from GD indicated that having access to information and communication services increased the likelihood of communities' adaptation to climate change through doing different types of communal land management practices like area closure, cut and carry and feed conservation. It was also discovered that access to information was one of the

important determinant factors of farm-level adaptation (Nhemachena and Hassan, 2012). Using Principal Component Analysis (PCA), out of 21 selected adaptation practices, the nine most commonly exercised one to enhance the resilience of communal land resources was selected.

Table 22: KMO and Bartlett's Test for the Adequacy of Sample Size

Kaiser-Meyer-Olkin Measure of Sampling Adequacy =		**.677**
Bartlett's Test of Sphericity	Approx. Chi-Square	1675.396
	Df	22
	Sig.	.000

Kaiser Sampling Adequacy (*MSA)* indicated that the correlations between X_i and the other variables were measured and found to be 0.67. According to Kaiser Classification, sampling adequacy falls under the mediocre category and remains acceptable (Table 22).

Table 23: Total Variance Explained as Extraction Method for PC Analysis for Different Adaptation Practices

Component	Initial Eigenvalues (Total)	% of Variance	Cumulative %	Extraction Sums of Squared Loadings (Tot)	% of Variance	Cumulative %	Rotation Sums of Squared Loadings (Tot)	% of Variance	Cumulative %
1	2.039	22.653	22.65	2.039	22.653	22.653	2.027	22.521	22.521
2	1.800	20.005	42.65	1.800	20.005	42.639	1.789	19.879	42.399
3	1.140	12.671	55.33	1.140	12.671	55.329	1.153	12.812	55.212
4	1.086	12.071	67.40	1.086	12.071	67.400	1.097	12.188	67.400
5	.921	10.230	77.63						
6	.845	9.388	87.01						
7	.715	7.946	94.96						
8	.445	4.941	99.90						
9	.009	.095	100.0						

Source: Own data N = 302; CI = 95% (October , 2016)

Following Marija and Norusis (2012)'s criterion, PCs with eigenvalue >0.75 and above could be considered and four PCs were retained in the analysis of this study. The different factors extracted represented different patterns of adaptation practices implemented over communal lands in the study area.

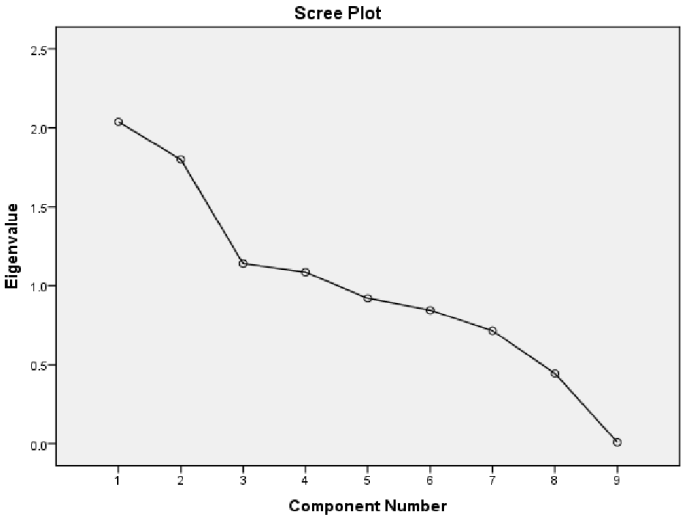

Figure 15*: Scree Plot for Nine Climate Change Adaptation Practices Contributing towards Communal Land and Resource Resilience*

The first principal component (PC_1) considered was the one with the largest eigenvalue of 2.039 with a variation that contributed 22.653% of the total variation. The second PC up to the fourth PC was also considered and encompassed a larger percentage of the total variation (67.4 %). All the first four PCs with eigenvalue >1 were positive coefficients indicating a positive correlation among the variables. PC1 was found with 2.039 of the initial eigenvalues and shared 22.6% of the variations that included and represented the choice of applying bio-physical soil and water conservation measures (PBSWC) on communal lands (Table24).

Table 24: Main Principal Component Matrix across the Nine Adaptation Practices

Practiced climate change /variability adaptation	Principal Component			
	1	2	3	4
BPSWC measures implemented	.989			
Planting drought resistant multi-purpose tree, shrub and grass	.987			
Availability and/or use of improved stove		.821		
Area enclosure managed by community by-laws		.819		
Conserved feed system silage, hay, etc established		.771		
Establish private grazing and woodlot areas			.755	
Cut and carry controlled grazing exercised			.694	
Availability use of solar energy system				.681
Use and availability of Bio gas				.642

Extraction Method: PCA; 4 components extracted; N = 302; CI = 95%)

The second principal component (PC2) also takes an initial eigenvalue of 1.8 and a share of 20.005% of the variations that made cumulative variation to be of 42.639% in the variables. This was planting of drought resistant/multi-purpose trees, shrub and grass for enhancing the resilient nature of communal grazing and forest lands. Principal component 3 (PC3) also shares 12.67% of the variations with an eigenvalue of 1.140. This was included and represented by the availability and use of the improved stove as adaptation and mitigation practices. The last component (PC_4) with an eigenvalue >1 (1.086) was found with 12.071 percentage of variance that made the cumulative percentage of variance to be 67.4%. This component was represented by area enclosure adaptation practices managed by community by-laws (Table 24). In summunig up, biophysical conservation measures and plantation with area enclosure were found better ranked and commonly used adaptation and mitigation practices that contribute towards enhancing communal land resilience.

4.2.7 Major barriers to climate change adaptation practices

Barriers are defined as factors, conditions or obstacles that reduce the effectiveness of adaptation strategies (Hulme *et al.*, 2011). The identification and assessment of barriers to climate adaptation measures by rural communities is an aspect of adaptive research that has been comprehensively researched with detailed KI interviews to identify what are the impediment

factors that restricts rural communities from implementing climate change adaptation practices in the study areas (Table 25).

85% of KI suggested that the most commonly identified barrier was found to be low level community awareness. The second important point perceived as an important impediment factor was lack of strong institutional capacity in supporting and facilitating the effectiveness of implemented adaptation practices with strong by-law enforcement. The third point which was mentioned by about 71% was the shortage of information where communities lack in getting information in time about the fluctuating climate change behaviour (Table 25). Thus, access to information from different sources has significant impact on the adaptation to climate variability.

Table 25: KI Responses on Impediment Factors for Adaptation across Different Agro Climatic Zones

Identified adaptation impediments	SUM Resp	Respondent (%)	Load ratio factor			
			Wourch	Dega	Woyina dega	Kolla
Shortage of credit facility/financial constraint	22	55.83	**0.32**	**0.31**	**0.25**	**0.12**
Low level community awareness	41	85.42	**0.29**	0.23	0.21	0.27
Lack of strong institutional capacity and support	36	75.00	**0.35**	0.15	0.12	0.38
Lack of information on climate change behaviour	34	70.83	**0.27**	0.22	0.1	0.41

Source: Own survey, October, 2016 (N = 48)

Indeed, it is an important precondition for farmers to take up adaptation measures (Madison, 2006). The finding of this result was also similar with the finding of (Tarekegne, 2011 a). They reported that credit facility, access to information, awareness of the impact and variability of climatic factors are the most important barriers in implementing correct adaptation measures at the right time. Deressa *et al*. (2011) also described that sharing of experiences among rural communities is very important to build up their knowledge and help them to take the adaptation measures. Adaptation methods to counter climate change need money to purchase important inputs for adaptations like purchasing of seedlings and sods/grass split as well as better tree and grass

seeds (Nichols *et al*., 2011). In this study, 45.82% KI also reported that there exists a shortage of credit options and facilities to run out biological adaptation measures and create income generation activities on closed communal land.

The result of this study on the impediment factors for adaptation was also similar with Deressa et al., (2008) work. They mentioned some other additional barriers like market situation, proximity and cultural setting. Community level of income appeared in their study as an additional outstanding barrier for communities to implement adaptation practices. Nevertheless in this study those above impediment factors mentioned by the above authors were excluded as they were found as low lying outliers in the study area.

Generally, as Menghestab, (2009) described, climate change is one of the major threats facing the Ethiopian high lands. It is now seen as a pressing challenge to the sustainability of land management in general. In addition, Ethiopia experience unpredictable patterns of rainfall and consequently made it with lack of capacity to anticipate the adverse effects of climate (IPCC, 2011)

The overall finding particularly on adaptation practiced in the study area indicated that there was little effort so far achieved in terms of a sustainable type of adaptation practices that enhance the resilience of CLR. However, the effort made with regard to area closure, bio physical measures, road network, use of energy alternative have its own contribution in augmenting the resilience capacity of communal land. Despite of this, it is also a concern as long as there is the existence of a free-grazing system, encroachment on communal grazing and forests lands that will be persistent challenges to withstand in the face of climate change. Similarly, the sustainability of CLM practices will still be under question.

4.3 Conclusion

Realistic findings on rainfall distribution and trend across space and time are important input parameters for revitalizing sustainable climate resilient communal land resource management. To this end, the findings of this study were concluded as follows:

Based on annual and seasonal time-series trend analysis, regardless of different ACZ settings, spatiotemporal rainfall variability across the study area existed. Spatially across all ACZs, the rainfall pattern was not also consistent and dependable. Both 12 extreme dry and 6 wet events also depicted a cyclical-random style of rainfall pattern. This means that the periodicity for extreme dry or wet events was not predictable and it was difficult to draw a conclusion on whether the cyclic-random nature of the rainfall follows a distinct trend or not.

Extreme dry event were experienced most in Kolla ACZ and extreme wet event were depicted most in Dega ACZ. Shortage of water, feed scarcity and livestock diseases generally emanated from extreme dry spill events and affecting more of Kolla ACZ compared with other ACZ. Shortage of water, scarcity of feed and migration were also serious climate change/variability impact factors.

In all study areas, feeder road construction in connections to market areas was found good in general and considered as fundamental means for adaptation. Besides, application of BPSWC measures, planting drought resistant and multi-purpose tree, shrub and grass, and exercising area enclosure implementations were moderately exercised as community adaptation practices. These practices were a good attempt to enhabce communal land resilience in the face of climate change and contribute to its sustainablity. In addition, use of improved stove by most community members in all ACZ with in the study area was found encouraging in reducing the pressure on communal forest lands and contributes to climate change mitigation. However, establishment of private grazing land and woodlot development cut and carry as wll as controlled grazing system were found as an area of improvement.

Among all impediment factors, low level community awareness, lack of strong institutional capacity and support were the two most outstanding impediment factors hampering the degree of sustainability and resilience capacity of CLR in the study area. Due to communities' limited knowledge on climate change dynamics and their impact, there was a high level of limitation and uncertainty for better community adaptation responses.

As a final statement, rainfall variability is one kind of nature driven pressure over communal lands to which communities should develop adaptation practices to minimise the impact and enhance the reseliance nature of communal lands. However, human induced pressure was also another aspect that has to be investigated. Particularly, overgrazing and excessive fuel biomass exploitations are the two most important anthropogenic pressures affecting communal land and aggravate climate change behaviour. Hence, the next chapter deals with communal land pressure analysis through determining carrying capacity and fuel biomass utilisation versus demand gap over the study area.

CHAPTER FIVE

ASSESSING PRESSURE OVER COMMUNAL LAND: CARRYING CAPACITY, FEED AND FUEL BIOMASS DEMAND AND CONSUMPTION GAP ANALYSIS

5.1 Introduction

The upper Blue Nile basin in general falls under a mixed farming system, where livestock and communal grazing play a great role (ILRI, 2010). This author also pointed out that the most economically average farmers in the central highlands of Ethiopia own two oxen, a cow, a few sheep and a donkey. As Alemayehu's (2014) work indicates, the common livestock feed resources are in most cases communal grazing and bush lands and crop residue. He further described that most livestock in the high lands of Ethiopia depend mainly on communal grazing land and bush lands for their feed requirements. According to this author, these grazing areas provide more than 90% of the livestock feed, while remaining generally poorly managed. Due to poor management and overstocking, natural pastures are highly overgrazed and this results in severe land degradation, loss of valuable species and dominance by unpalatable species (ILRI, 2010).

In most studies it is revealed that one of the major reasons for communal land degradation was the pressure from over stocking (ILRI, 2010). However, quantifying load and holding capacity of communal grazed lands and estimation of available feed and demand gap is limited and scarce. Most research on the evaluation of feed resources in different parts of the country generally focused on the scarcity of feeds only without quantifying feed demand and supply, and by what amount the grazing land is pressurized due to the gap in feed and wood bio mass supply (WBISPP, 2004).

On top of this, in order to have appropriate communal land management and proper and sufficient feed, it calls for careful and integrated research work, and thoughtful consideration of grazing status and capacity in the study area. This study helps to identify gaps in the overall carrying capacity of grazing land and feed demand in the study area. This helps to recommend a possible solution to

communal land management predominantly in areas where communal land degradation is serious.

WBISPP (2004) and Bereket *et al*., (2012) pointed out that Ethiopia is a typical example where nearly all its rural population depends on biomass energy sources for cooking and other energy requirements. Because of this, fuel wood and charcoal are collected from communal areas and such high dependence on biomass has a fundamentally negative impact on the availability of fuel wood resources. It can be observed across the Upper Blue Nile Basin (UBNB) areas that the on-going communal forest land degradation and deforestation has resulted in fuel wood scarcity (Bereket, 2012).

The excessive deforestation, which led to the depletion of tree stock, caused what is known as the household fuel wood energy crisis in Ethiopia, and this crisis led to a consumption shift towards animal dung and crop residue as household energy sources. FAO (2010) noted that although there is a strong cultural preference in Ethiopia to use fire wood and charcoal for cooking, this preference has been affected by the scarcity of wood and hence people started using dung and crop residue which accounted for over half of the total households' energy use. Increased use of dung and crop residue deprives the soil of nutrients and reduces soil fertility and exposes communal land for degradation. This deprives agricultural productivity. It is estimated that nutrient loss and soil erosion as a result of deforestation, use of dung and crop residue result in agricultural production of close to 600,000 tons of grain per year and this is equivalent to 90 % of Ethiopia's food deficit (FAO (2011). The loss of soil fertility and land degradation also leads to financial loss of about 2% of GDP in Ethiopia (EFAP, 2003).

Although extra deforestation due to excessive extraction of fuel wood from communal forests is still getting worse, studies on household fuel wood energy consumption and demand are few and inadequate, particularly in the rural community of the Northern part of Ethiopia (Bereket *et al*., 2012). This holds true in the UBNB and particularly in the study area. This would have helped to plan and set appropriate strategies for the systematic communal forest land management and for the sustainable development of the energy sector. Thus, in

line with the limited amount of empirical literature and the methodological problems reported, this study will make a significant contribution to depicting and providing up to date information on the existing fuel wood energy consumption pattern in different ACZs. Recent estimations and information on fuel wood demand and consumption will significantly contribute to the existing literature and research endeavour.

To this end, Knowledge quantifying and describing the existing over grazing, fuel wood consumption and demand pattern helps in filling the gap of knowledge to academia, research, policy making and implementing exertion in the area. This will enhance understanding on the extent of the pressure and extent of traditional grazing and fuel energy utilization system towards the efficient and sustainable use and management of communal lands. Hence, it is imperative to assess and determine the already existing feed and fuel wood resources availability, carrying capacity /stocking density and fuel biomass consumption in relation to their demand on annual basis.

5.2 Results and discussion

5.2.1 Available feed, demand and carrying capacity

The total livestock, TLU and land available as a natural feed/forage source in those samples as stated by the Kebele Administration (KA) was estimated to be 30712 livestock, 12811 TLU grazed on 2878.6 ha (Table 25). For expediency and consistency, the different livestock populations were changed into Tropical Livestock Unit (TLU) by multiplying it with the conversion factors stated in (Table 24). Based on this, as a fundamental use for the agricultural sector (as means of transport, source of food and income) to rural community, cattle and draft animals were having higher TLU (Table 26).

Table 26: Livestock Number and TLU in the Study Area

No	LS type	CF (1)	Kolla (Bokotabo)		Woina dega (Yesheret)		Dega (Dengayber)		Wourch (Abazajz)		Total	
			LS No	TLU	LS No	TLU	LS No	TLU	LS No	TLU	LS No	TLU
1	Cattle	0.7	2671	1869.7	4012.	2808.4	3072.0	2150.4	4195.0	2936.	13950.0	**9765.0**
2	Sheep/goat	0.1	3807	380.7	3641.	364.1	1396.0	139.6	5320.0	532.0	14354.0	1435.4
3	Horse	0.8	0.0	0.0	20.0	16.0	410.0	328.0	1107.0	885.6	1537.0	1229.6
4	Mule	0.7	82.0	38.4	29.0	20.3	0.0	0.0	0.0	0.0	111.0	77.7
5	donkey	0.4	296.	118.4	359.0	143.6	104.0	41.6	1.0	0.4	760.0	304.0
			6856	2426.	61.0	3352.4	5172.0	2678.6	10623.	4354.	30712.0	12811.7
	Area			1259.		539.0		316.0		763.6		2878.0
	TLU			2426.		3352.4		2678.6		4354.		12811.7
	SD			1.9		6.2		8.5		5.7		4.5

Source: KA and CSA (2014) data and own data result Note: LS = livestock

The overall mean stocking density (SD) for the study was 4.5LU/ha (Table 4). However, the SD was varied in each ACZ. Stocking density could be found by dividing the total TLU by the total available grazed area (ha). Based on FAO (2010) a comparison for SD was made in different ACZs. SD in Dega and woyina dega ACZs was found to be as high as 8.5 and 6.2 TLU/ha respectively. In Kolla ACZ, although having the smallest TLU (2426), it has the largest grazing area compared to others. Therefore, stocking density was found lowest (1.9LU/ha) in the Kolla ACZ.

These results showed that the pressure on grazing land was low in Kolla ACZ and conversely the result showed that there exists high pressure over Dega and Woyina dega ACZs.

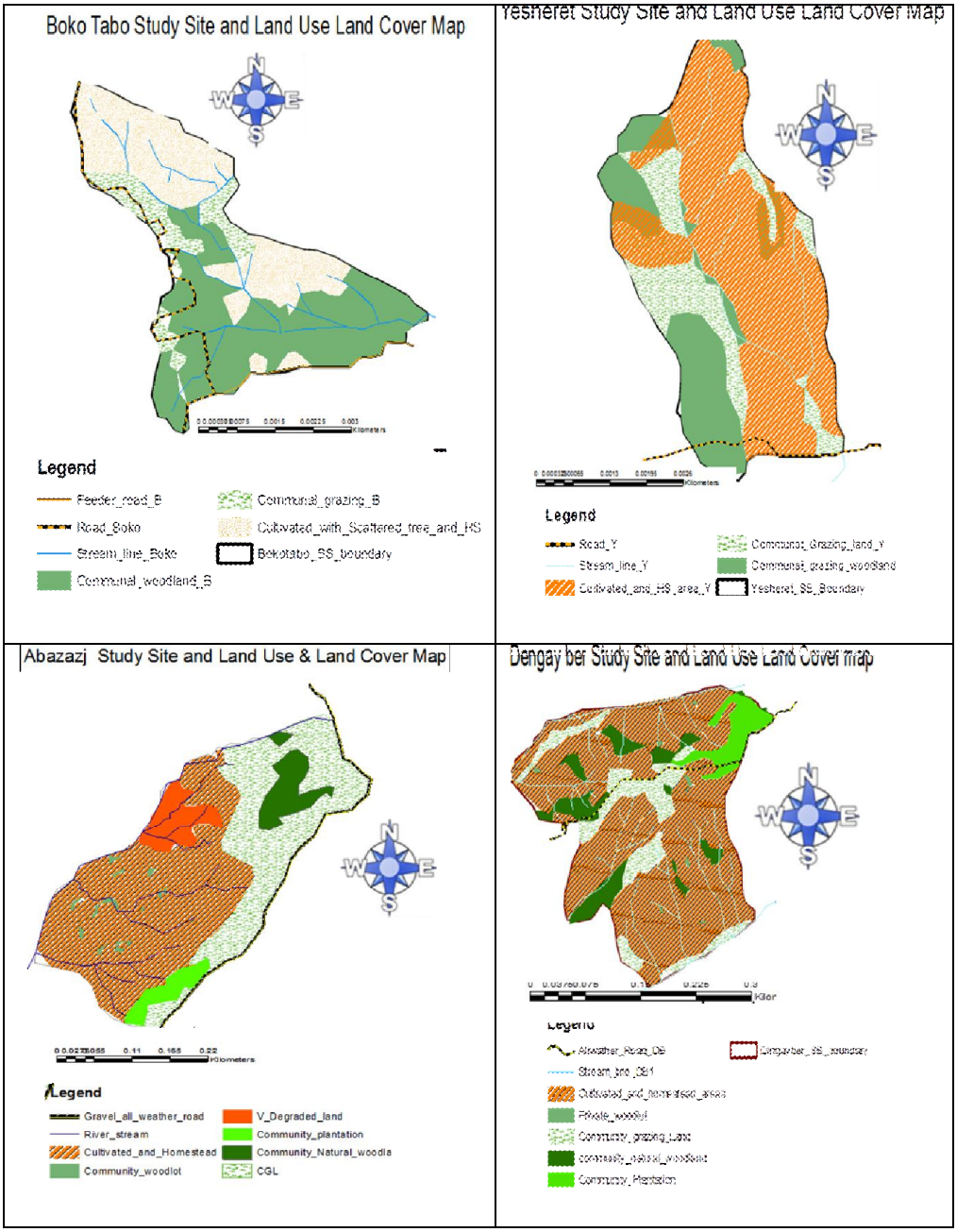

Figure 16: ***Land Use Land Cover Map of the Study Area***

Note: Bokotabo site = Kolla ACZ; Yesheret site = Woyindega ACZ; Dengayber site = Dega ACZ; Abazazj site = Wourch ACZ

As depicted on Figure 16, in order to calculate the available feed from grazing and cultivated land (crop residue), area coverage was mapped and quantified as in Table 26.

Table 27: Available Dry Matter Feed Estimation in Sellected Study Sites

No	Land use/cover	CF	Kolla (Boko)		Woina dega (Yesheret)		Dega (Dengayber)		Wourch (Abazazj)		Tot.	
			A(ha)	DM(t)	A(ha)	DM(t)	A(ha)	DM(t)	A(ha)	DM(t)	A(ha)	DM(t)
a	Grass and shrub lands	2	428	856	127	254	178	355	375	749	1107	2115
b	Forest and bush land	1	832	998	412	494	139	166	162	194	1544	1853
c	Alpine grazing	2	0	0	0	0	0	0	227	340	227	340
	Pasture SUM (a+b+c)		1260	1854	539	749	316	522	764	1284	2879	4408
d	CUL(for crop residue)	1	1731	1384	1442	1153	832	666	1059	847	5063	4051
e	Crop aftermath	1	1730	1038	742	445	632	379	1059	635	4163	2498
	Crop SUM(d+e)		3461	2422	2183	1598	1464	1045	2118	1483	9226	6548
	Total feed available PEB)(….1)		4720	4276	2723	2347	1780	1567	2882	2767	12105	10957

Source: Own survey, October, 2016

From those above feed sources, it was possible to produce 4408.3 tons of DM per year from all types of communal grazing land. This was equivalent with 1.53 DM t/ha/year from grazing areas. Crop residues and aftermaths were also an important source of feed. From these resources, it was found that 4050.7 and 2497.7 tons of DM per annum were produced from crop residues and aftermath respectively (Table 27). This means that the average DM production from crop residue and aftermath was 0.8t/ha/year and 0.599t/ha/year respectively.

Studies of Alemayehu (2014) indicated that in a smallholder farm with a size of 2.5 ha of land in the Ethiopian highlands of Ada Woreda produces a total of approximately 6 tons of DM from crop residues. This was equivalent to 2.4t/ha/year. Compared with those finding, the value found in this study was relatively smaller. From the researcher observation and experience, the reason for this was that Ada Woreda is a more productive area in agricultural crop production than those Woredas in the study area.

However, on average, the mean DM production from all pasture and crop per hectare in the study area was found to be 0.97t/ha/year. However, Getachew (2009) described that DM production in the Ethiopian high land was reported that it was ranged from 0.42t/ha/yr to 13.77t/ha/yr. On the other hand, in a

similar study area dry matter production was found between 6 and 7 t/ha/yr is easily obtained from improved and well-managed grazing land (Alemayehu, 2014). Therefore, the result in this study was found in the lower limit and indicated that the productivity of communal grazing land were at risk.

Since the total TLU was found to be 12,811.7, the total available DM was 10956.6t/year while the total DM required was 29210.7 ton/year (Table 6). This showed that there was a rate of using 0.855ton/TLU from the actual production and 2.28 ton/TLU/year remain unmated. The difference between what LU actually grazes (0.855t/TLU) while their demand was 2.28 ton/TLU/years. This showed that there was a gap equivalent with-1.42 t/LU/year (Table 27). This remains as a pressure over communal grazing land in the study area. On the other hand, the actual consumption of dry matter feed was much less compared to the required demand. Besides, as pointed out in Finch's (2012) work, DM demanded/LU/year was estimated at about 2.428 ton/year/TLU or 6.25 kg/day/TLU. This showed that the gap became even higher depicting that communal grazing areas in the study area were grazed beyond the threshold.

Table 28: Required Dry matter Feed demand estimation

No		Unit	Kolla /Boko	Woyina dega /Yesheret	Dega /Dengayber	Wourch /Abazazj	Tot
1	**T. feed available PEB)(….1) From Table 29)**	tone	4276.3	2347	1566.5	2766.8	10956.6
a	Total No of TLU	DM(t)	2426.2	3352.4	2678.6	4354.5	12811.7
b	DM demand /TLU/annum (Given)	t/LU/year	2.28	2.28	2.28	2.28	2.28
c	THH	No	444	683	764	1261	3152
d	No of TLU/HH (a/c)	TLU:HH	5.5	4.9	3.5	3.5	4.1
	Stocking density(TLU/A)	TLU/A	5.5	4.9	3.5	3.5	4.1
2	Total annual DM demand (a*b)	DM(t)	5531.7	7643.5	6107.2	9928.3	29210.7
3	Balance (1-2)	DM(t)	-1255.4	-5296.5	-4540.7	-7161.5	-18254.1
4	Feed availability and demand gap (%) (3/2)*100	%	-22.7	-69.3	-74.4	-72.1	-62.5

Source: Own survey, October, 2016

As pointed out above, the available feed from communal grazing land and crop feed resourceswas found to be 10,956.6 ton/year in total (Table 28). This showed that the available feed source can be sufficient and satisfy only 37% of the annual DM demand. In support of this, 79% of key informants (KI) were

reported, although most farmers used locally available forage from their farms and homestead areas as an additional feed, they emphasised that they have still a critical feed shortage and they usually graze their livestock on communal grazing land "*until surface soil exposed"*. Only 12% of KI depicted that few community users used cut-and-carry from protected communal forest areas.

5.2.2 Carrying capacity of communal grazing land

The definition of ecological carrying capacity (CC) is: "the mean population density of a species that can be supported by its environment in the absence of human interference" (Milner-Gulland and Mace, 2008). Here the interest under this study was to explore how the sustainability of communal grazing land management was practised in terms of scrutinising the ecological carrying capacity for the study area.

Therefore, to estimate the pressure over communal grazing land, understanding of CC through determining the number of livestock or livestock unit grazed per unit area of communal grazing land without causing degradation and damaging its resources is paramount important.

In conditions like the Ethiopian highlands, the setting of the proper use factor (PUF) was taken as 30% of the total DM production as per Robinson (2010). Based on this, the average overall CC in the four sites of the study area was found to be 3,619LU while the actual TLU was 12811 (Table 27). The gap or the overload over these grazing lands was 9,191LU. This implies that on 2,878 ha of communal grazing land, there were an extra 9,191LU. A minimum of an additional 3LU/ha rate grazed and pressurised the land and exposed to further feed deficiency, land degradation and resource depletion. On top of this, in reality the average stocking density was 4.45LU /ha while it's caring capacity was 1.26LU/ha (Table 29).

Table 29: Carrying Capacity Determination in Different ACZ Settings

	Factors	Kola (Boko)	W/Dega /Yesheret	Dega /Dengayber	Wourch /Abazazj	Total
a	A	1259.60	539.07	316.25	763.63	2878.55
b	PEB(tone) in total area	1853.92	748.61	521.54	1284.20	4408.27
c	PEB(t/ha)	1.45	1.38	1.64	1.68	1.53
d	PEB(kg/ha)	1450.00	1380.00	1640.00	1680.00	1530.00
e	PUF (30%)	0.30	0.30	0.30	0.30	0.30
f	(PEB(kg/ha)*PUF) = (d*e)	435.00	414.00	492.00	504.00	459.00
g	A*(PEB(kg/ha)*PUF)) = (a*f)	547926	223176	155594	384870.0	1321255
h	I(kg/LU) =16% of feed demand= 0.16*2.24=1	1.00	1.00	1.00	1.00	1.00
i	Days in a year	365.00	365.00	365.00	365.00	365.00
J	I*D	365.00	365.00	365.00	365.00	365.00
k	CC [lu] = A[ha]* PEB [kg/ha] *PUF/ I[kg/lu] *D = (g/j)	1501.17	611.44	426.28	1054.44	3619.88
l	Total No of TLU	2426.20	3352.40	2678.60	4354.50	12811.7
m	Total Over Load(LU)=TLU-CC = (l-k)	925.03	2740.96	2252.32	3300.06	9191.82
n	Pressure(LU/ha) = (TLU/A) = (l/a)	1.93	6.22	8.47	5.70	4.45
o	Capacity to feed(%) =(k/l)*100	61.87	18.24	15.91	24.21	28.25
p	CC(LU)/A(ha)	1.19	6.22	8.47	5.70	4.45
q	Total LS number	6856.00	8061.00	5172.00	10623.00	30712.0
r	SD(TLS/ha) = (q/a)	5.44	14.95	16.35	13.91	10.67

Source: Own survey, October, 2016

Among all four ACZs, the highest grazing pressure was found in Dega and Woyina dega ACZs. It was 8.47 LU/ha and 6.22LU/ha respectively. Correspondingly, the actual CC was as low as 1.38LU/ha and 1.13 LU/ha respectively. These implications led to the finding that the grazing capacity satisfied only 15.9% and 18.2% LU that were actually grazed in respective ACZs. The sample site found in Kolla ACZ has the lowest grazing pressure and comparatively better carrying and feeding capacity. The level of pressure was 1.93LU/ha while it's CC was 1.19LU/ha. This was satisfying about 61% of grazing capacity. The major reasons for the high pressure and less feeding capacity in Dega and Woyina dega ACZs in the above finding were the availability of a smaller grazing area and relatively higher stock density. In addition, the types of livestock were also with higher TLU in the Dega and Wourch ACZ. The number of horses in the higher ACZ (Dega and Wourch ACZ) was much more compared to the number in the Kola ACZ.

5.2.3 Status of available wood biomass consumption

5.2.3.1 Wood biomass demand and consumption

In each of the four ACZs, measurements were made for each biofuel energy type to determine the weight and volume of single bundle of fuel biomass (wood and crop residue) and a sack of charcoal and dung in each study site. Based on these measurements, it was found that the ranges of each single fuel biomass mean average weight for man and woman wood bundle were found to be between 19.92kg in Wourch to 20.17 kg in Kolla ACZ. Likewise, the range of a single weight woman bundle for crop residue was found to be 11.25 to 12.42kg by weight in Woyina dega and Kolla ACZ respectively. With regard to dung and charcoal, the mean weight for a single sack was found to be 23.42kg to 26.67kg for dung and 27.7kg to 31kg for charcoal (Table 30).

Table 30: Average Unit of Fuel biomass Consumption

Alt	BF type	Average Weight of single bundle/sack (KG	Average Volume of single bundle/sack (M3)
Wourch (Abazazj ; >3200 masl)	Fuel wood(in Bundle)	19.92	0.42
	Charcoal (in Quintal Sack)	0	0
	Dung (in Quintal Sack)	23.75	0.31
	Crop residue(in Bundle)	11.67	0.72
Dega (Dengay ber; 2450-2900 masl)	Fuel wood(in Bundle)	19.98	0.47
	Charcoal (in Quintal Sack)	27.7	0.34
	Dung (in Quintal Sack)	24	0.38
	Crop residue(in Bundle)	12.17	0.86
Woyina dega (Yesheret; 1850 - 2100 masl)	Fuel wood(in Bundle)	20.39	0.61
	Charcoal (in Quintal Sack)	29.8	0.33
	Dung (in Quintal Sack)	23.42	0.37
	Crop residue(in Bundle)	11.25	0.69
Kolla (Bokotabo; 1400-1600 masl)	Fuel wood(in Bundle)	20.17	0.38
	Charcoal (in Quintal Sack)	31	0.38
	Dung (in Quintal Sack)	26.67	0.32
	Crop residue(in Bundle)	12.42	0.89

Source: Own survey, October, 2016

In the case of the Amhara region, from Olana (2012), it was stated that in most parts of the region where this study was conducted, the area was suffering from a moderate deficit to a severe deficit of biomass energy supply. In this study also, based on the household (HH) survey finding, fuel biomass demand was exceeding its consumption, implying the deficit of fuel biomass energy supply.

In the Woyina dega ACZ, the maximum sum consumption and demand for all fuel biomass was found to be 5.52 and 7.94 bundles/HH/week respectively. The

difference between what was actually consumed and demanded was showing a deficit of -2.42 bundles /HH/week. Compared to other study sites, the lowest fuel consumption was found in Wourch ACZ (3.81 bundles/HH/week) while their demand was 7.92 bundles/HH/week. In this site the maximum gap between demand and available fuel biomass was -4.11 bundles /HH/week and the gap between demanded and consumed was more than double from Woyina dega and Kolla ACZ sites. The minimum gap between demand and available fuel biomass consumption was found in Kolla ACZ. On HH based yearly consumption, it was ranging from -234.39kg/HH/year in Kolla to -834.67kg /HH/year in Wourch ACZ (Table 35).

In parallel with the above findings, the overall mean fuel biomass consumption in terms of per capita consumption per year rate was also calculated and the uppermost value was found in the Dega ACZ. On average, communities in this site were consuming fuel biomass at a rate of 179.29 kg/per capita/year. In contrast, the lowest consumption rate was found in Wourch ACZ with a value of 106.44 kg per capita consumption per annum. In general, the overall mean consumption for all study sites was 151.71 kg per capita consumption per year (Table 31). Likewise, HH base total fuel biomass consumption was found highet in Dega ACZ (3639kg/HH/year). However, HH fuel bio mass demandwas found in both Dega and Wourch ACZ. The value recorded was 5191 and 4863kg/HH/year respectively.

In conformity with the above findings, Bereket *et al*. (2012) reported that energy demand in Wourch ACZ was high. However, it was further explained that the availability of particular fuel wood in this ACZ was scarce; the actual fuel biomass energy utilisation was low compared to other ACZs. Moreover, according to WBISPP (2004), it was indicated that the highest fuel biomass consumption was more in high altitudes than in the lower ones. It was elaborated that this was because there was a high energy demand because of the cooler temperature in the highlands.

On top of this, as it was pointed out from key informant experts who have longer experience in the study area, 85% argued that this difference could be ascribed to the variation due to the scarcity or availability of fuel wood supply from

communal forest resources. From the researcher's observation, it was noted that Kolla ACZ in the study area was relatively rich in communal forest resources. In contrast, the Wourch ACZ sites were highly constrained with communal forest resources. In this area, communities usually collect dung and fuel wood from communal grazing land and from their eucalyptus wood lot areas respectively.

Table 31: Mean Total Fuel Biomass Consumption across Different ACZ Settings

Kebele/Altitude	Stat	Av. Percapita Consumption(kg)/day	Av. Per capita Consumption(kg)/Year
Wourch (Abazazj ; >3200 masl)	Mean	0.36	106.44
	% of Total Sum	17	18
Dega (Dengay ber ; 2450-2900 masl)	Mean	0.60	179.29
	% of Total Sum	29	30
Woyina dega (Yesheret; 1850 - 2100 masl)	Mean	0.55	155.65
	% of Total Sum	26	26
Kolla (Boko tabo; 1400-1600 masl)	Mean	0.56	165.48
	% of Total Sum	27	27
Total	Mean	0.52	151.71

Source: Own survey, October, 2016

It was also stated by Bewket (2005), that it is assumed that fuel biomass energy consumption and energy requirements were higher in high altitude than the low altitude areas. Besides, FAO (2010) conducted a study on the northern alpine (wourch) part of Ethiopia and found that the actual fuel biomass consumption did not meet the desired need of the community simply because of the resource limitation. Even not to meet this demand, but at least to satisfy their basic energy demand, communities were struggling to find other energy alternatives like using dung and crop residue.

In general, the difference in consumption and demand on different fuel biomass across different ACZ settings was statistically significant ($P = 0.026$ and $P = 0.049$) respectively (Table 32).

Table 32: ANNOVA Test on Mean total Fuel Biomass Utilization in Different ACZ

Consumption across time scale (N=144)	Type III Sum of Squares	Mean Square	F	Sig.
Av. consumption(kg)/per/day	0.38	0.38	5.038	.026
Total consumption (kg)/HH/week	1414.00	1414.00	4.470	.036
Av. Consumption(kg)/per/Year	42405.91	42405.91	3.946	.049

Source: Own survey, October, 2016

On top of the above finding, this study also investigated the amount of consumption on different HH levels. The amount of fuel biomass consumption increased when the number of family size generally increased. However, the rate of increments was decreased as size increased. For example, consumption per head in the family with size of four, seven and ten were 168.13, 142.41 and 132.98 (kg/HH/year) respectively. This indicated that the rate of increments had a decreasing rate as the number of family members increased (Table 33).

Table 33: Mean total Fuel Biomass Demand and Consumption in Diffrent Household Size

Number of family	Total Consumption weight (kg/HH/year)	Total Demanded weight (kg/HH/year)	fuel biomass consumption - demand gap(kg/HH/Yr)	Consumption (kg/per/year
4	672.55	1112.75	-440.2	168.1375
7	996.87	1383.60	-386.73	142.41
10	1429.88	1906.81	-386.93	132.988

Source: Own survey, October, 2016

On top of the above, about 78% of community key informant indicated communal natural forest was already deforested. Hence, communities instead used fuel wood biomass from their private Eucalyptus wood lot areas.

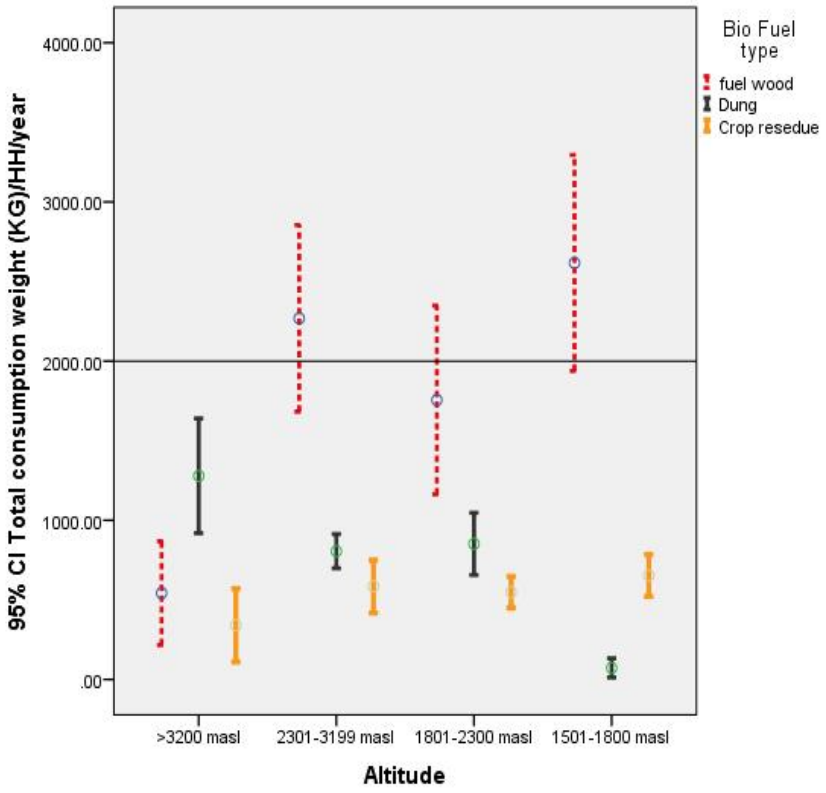

Figure 17 ***: HH level Fuel Biomass Consumption across Agro Climatic Zones***

Note: the following altitude in metres above sea level (masl) refers: >3200 = Wourch; 2301-3199 = Dega; 1801-2300 = Woyina dega and 1501-1800 = KollaACZ

Besides, HH fuel wood consumption per year was totally above the overall mean compared with other fuel biomass consumption in most ACZs. However, the lowest wood consumption was depicted in the Wourch ACZ (Abzazj kebele) compared to other sites. Moreover, HH consumption for both dung and crop residue was also found below the overall average in all the ACZs of the study sites (Figure 17).

The other most important fuel biomass source was from communal grazing lands. From this area, there were two locally grown shrubs called "*Gimdo"* and "*Nechatte"*. From field observation and measurements made, it was revealed that these two species progressively invade communal grasslands. Currently the invasion rate on average was 26% of communal grazing land in Wourch ACZ of the study area. Besides, 65% of the community KI gave their opinion

that, even though these shrubs existed a long time ago, the invasion rate was increasing from time to time. However, 92% of key informants declared that, although it hampers the productivity of grass in communal lands, they prefer its presence as it was an additional source of fuel biomass that helped to cover fuel biomass demand gap.

Table 34: Total Fuel Wood Consumption and Sell from Communal Forest land in Different ACZ (kg/year/site)

Study sites	Statistics	FWC	FWS	% of FWS /C	Charcoal Cons	Charcoal sold	Charcoal sold / consumed (%)	Tot FW utilized
Wourch	Mean HH use	542			0.00	0.00		542.0
(Abazazj)	Tot. use/site	352842.0			0.00	0.00	0.00	352842.
Dega	Mean HH use	2201.11	8.6		22.69	36.11	159.14	2268.50
(Dengay ber)	Tot. use/site	1681644.2	6380.	0.39	17331.3	27398.0	158.08	173313
Woyina dega	Mean HH use	1603.97	21.2		25.00	105.33	421.32	1755.50
(Yesheret)	Tot. use/site	1095511.51	14479.	1.32	17075.0	71940.3	421.31	1199006.
Kolla	Mean HH use	2373.18	34		52.33	156.99	300	2616.50
(Boko tabo)	Tot. use/site	1053691.92	15096	1.43	23234.5	69703.5	300	1161726.

Source: Own survey, October, 2016

Note: FWC= Fuel wood consumed; FWS= Fuel wood sold; FW= Fuel wood

The percentage of fuel wood sold from communal land was found to be much less compared to its consumption. Fuel wood sold over consumption ranged from 0.39% in the Dega site to 1.43% in the Kolla ACZ. This clearly indicated that communities used to consume than selling of fuel wood biomass they collected from communal forest lands. The maximum fuel wood was sold in Kolla at a rate of 15096 kg/year. This is about 290.3 kg/week. Taking the mean weight of a bundle to be 20.16 kg, then 14 to 15 bundles of fuel wood biomass was transported every week for sale to the adjacent market called Merkato.

Similarly, a larger amount was also sold in Woyina Dega site. This was about 14479.6kg/year or 278.5kg/week. By taking the above mean weight of a single bundle, it was found that every week 13-14 bundles of fuel wood were

transported to similar places called Jiga and Finoteselam where they sold charcoal (Table 34). From the above findings the selling of wood or charcoal was found higher in areas where the community forest resource was relatively larger in coverage.

Table 35: Mean Fuel Biomass Consumption and Demand in Different ACZ Settings

Kebele name/ACZ	Fuel biomas type	Total consumption weight (kg/HH /year)	Total demanded (kg/HH /year)	Fuel biomass consumption - demand gap (kg/HH /year)	% share for total consumption - demand gap (kg/HH /year)
Wourch; Abazazj	Wood + Charcoal	542	2376.67	-1834.67	25.08
	Dung	1279	1772.5	-493.5	59.19
	Crop residue	339.92	714.17	-374.25	15.73
	Mean sum	2160.92	4863.33	-2702.41	44.432
Dega ; Dengayber	Wood + Charcoal	2268.5	3126.17	-838.67	62.01
	Dung	805.67	1180.5	-374.83	22.02
	Crop residue)	394	884.33	-300.33	15.96
	Mean sum	3639.17	5191	-1532.83	70.47
Woyina dega; Yesheret	Wood + Charcoal	1755.5	2269.5	-514	55.64
	Dung	851.33	1304	-452.67	26.98
	Crop residue)	548	775.5	-227.5	17.37
	Mean sum	3154.83	4349	-1194.17	72.541
Kolla; Boko tabo	Wood + Charcoal	2616.5	2851.08	-234.39	78.29
	Dung	72.5	145	-72.5	2.17
	Crop residue)	653.17	839	-204.83	19.54
	Mean sum	3342.17	3854.08	-511.91	86.7177

Source: Own survey, October, 2016

The highest fuel bio mass demand gap was found in Wourch ACZ in the Abazazj area. According to the HH survey, community members in this area satisfy only 25.08% of their fuel wood demand (Table 35). Fuel wood shortage was recorded as large as -1834.67kg/year /HH. This means that on average each HH in the area needs an additional 1834.67kg/HH/year. This area was still the most fuel wood deficient one even if other fuel types like crop residue and dung are considered. In this case, community who lived in Wourch ACZ also use both crop residue and dung; but it only satisfies 44% of their fuel biomass demands (derived from Table 35).

Conversely a small gap was observed in the Kolla ACZ. The community's fuel wood demand in this area was satisfied by 78.29%. The shortage or demand gap was found to be -234.39kg/HH/year. Considering the overall fuel biomass like crop residue and dung, the total fuel biomass demand in the area was satisfied by 86.71% (Table 35).

Table 36: Daily Mean fuel Biomass Demand and Consumption

Kebele name/ACZ	Bio fuel type	Total consumption (kg/HH /day)	Total Demand (kg/HH /day)	Av. Consumption (kg/per /day)	Percent Av. Consumption (HH/day)
Abazazj / Wourch	FW(Wood + Charcoal)	1.69	7.51	0.24	24.87
	Dung	4.4	6.1	0.68	61.91
	Crop residue	1.19	2.61	0.15	13.23
	Mean sum	**7.27**	**16.21**	**1.08**	
Dengay ber S. / Dega	FW(Wood + Charcoal)	6.55	9.08	0.99	60.93
	Dung	3.08	4.49	0.47	23.13
	Crop residue)	2.24	3.43	0.34	15.94
	Mean sum	**11.87**	**17**	**1.8**	
Yesheret / Woina Dega	FW(Wood + Charcoal)	6.44	8.36	0.93	54.54
	Dung	2.65	3.98	0.42	27.03
	Crop residue)	2.01	2.79	0.3	18.43
	Mean sum	**11.1**	**15.12**	**1.64**	
Boko tabo /Kolla	FW(Wood + Charcoal)	8.35	9.05	1.26	77.87
	Dung	0.22	0.44	0.02	1.82
	Crop residue)	2.65	3.44	0.42	20.31
	Mean sum	**11.22**	**12.93**	**1.69**	

Source: Own survey, October, 2016

The argument made by Dewees (2007) was that total household-level energy consumption was not reduced because of the shortage of supply as there is a tendency to shift in using other alternative fuel energy. A major feature of the fuel wood problem is the strong mismatch between the forest resources and the concentration of the population density that is largely occupying areas which are being rapidly deforested (Mengistu, 2012). It was also stated by the same above author that the rural community by far is the largest consumer of all forms of fuel biomass energy and, of all, fuel wood is the foremost one. This study also revealed the same finding in all ACZs except the Alpine zone where dung utilisation was most dominant.

5.2.3.2 Charcoal utilization

Charcoal consumption per HH level was lowest in all study sites. It was even found that no HH respondents from Wourch ACZ sites either consumed or sold charcoal from communal forests. In support of this, 100% of KI from the same site pointed out that communities consume and sold charcoal from their own Eucalyptus wood lot areas. However, in the other three study sites, communities used to sell more than they used for their own consumption. Selling of charcoal was over riding consumption by 159.18%, 421.32% and 300.1% in Dega), Woyina dega and Kolla ACZ sites respectively (Table 34).

Other than using wood for communities' own fuel consumption, they also used wood resources for income generation in the form of fuel wood and charcoal by selling to the nearest town. Among all study sites, the maximum charcoal was sold in Woyina dega ACZ site (71940.4kg/year). This means that on average 1383. 5kg of charcoal was sold in a week. As an average, a single sack of charcoal weighed 29.75kg. This means that about 46.5 sacks of charcoal were transported every week.

According to KI from Woyina dega ACZ site, all of them confirmed that charcoal extracted from these study sites were sold to the surrounding market called Finote selam and jiga town, where both places were about 10 km distance from the communal areas. Similarly, the second biggest charcoal market among the study area was Kolla ACZ site. From this site an amount of 1340.5kg of charcoal was transported every week. This is comparable to 45.06 sacks of charcoal. As to KI from this sites, they pointed out that charcoal extracted from this study site was transported and sold to the neighbouring market place called 'Merkato' which is 5km from the site used by the community members themselves and then through middle trade men to a place called Kuch (15km) up to Bure town (42km). This clearly showed the extent of fuel wood consumption in the form of charcoal was very high even though much of the charcoal was for selling rather than for in house consumption.

5.2.3.3 Dung utilisation and demand for fuel

Compared to the other three study sites in Bir-Temicha watershed, dung represented the largest source of domestic bio fuel energy type in Wourch ACZ Abazazj kebele was recorded as 832.63t//site/year (Table 36). Besides, in Wourch ACz as derived from (Table 35 and 36), out of 319.31 kg/person/year total fuel biomass consumption, the major type was found cattle dung. Dung contributed 61.9%, which is about 197.68kg/person/year (derived from Table 35). This is much higher than the value given by Mekonnen (1997) who put the national average dung consumption at 9.3%.

It was found the reverse trend in using dung for fuel compared to fuel wood consumption at HH level. The lowest consumption was found in Kolla ACZ and the highest in Wourch ACZ (Figure 18). Communities consume about 59.19% of dung compared to other fuel biomass in this site. This was the highest share when compared with other ACZs in the study sites. In terms of percentage of share for dung utilisation as fuel biomass, it was lowest in Kolla ACZ sharing 2.17% of the other fuel biomass type (Table 35). This indicates that as there was a relatively higher availability of fuel wood and crop residue, dung was not utilised much by most of the HH respondents in Kolla ACZ.

The use of dung as fuel biomass among different surveyed communities varied from 9.05 kg/person/year in the Kola ACZ to 197.68 kg/person/year as mentioned above in Wourch ACZ. In Kolla site, the share of dung utilisation compared to other bio fuel types was only 1.8% (Table 36). The difference in using cattle dung between and among different study sites was highly significant at ($F = 6.1$, $P = 0.016$). However, the variation in dung utilisation between Dega and Woyiona dega ACZs were very small and not significant. Compared to other fuel biomass types, dung was sharing 23.13% and 27.03 % in Dega and Woyinadega ACZ respectively.

Table 37: Total Household Dung Utilization in different ACZ Settings

ACZ/kebele name	HH size	Total consumption weight kg)/HH/year	Total HH consumption/site (kg) /year	Total HH consumption/site (tons) /year
Wourch; Abazazj	651	1279	832629.00	832.63
Dega; Dengay ber S.	764	805.67	615531.88	615.53
Woyina dega; Yesheret	683	851.33	391439.39	391.46
Kolla ; Boko tabo	444	72.5	32190.00	32.19

Source: Own survey, October, 2016

In general, it was depicted that minimum dung collection was made in Kolla ACZ site. It was as low as 32.19 tons dung utilised in a year which is equivalent to 0.72tons/HH/year (Table 37). On the other hand, maximum dung was collected with a rate of 832.63 tons per year in Wourch ACZ site. Community members in this site were consuming up to an average of 1.28 tons of dung per year/HH (derived from Table 37).

As reported by all key informants, 75% of dung in all study sites was collected mainly from communal grazed areas. The remaining 25% was collected from homesteads and farm lands. However, literature depicted that dung contains essential plant nutrients such as nitrogen, phosphorus, potassium, calcium and others (Robinson *et al*, 2010). Besides, it was also pointed out by Woldamlak (2011) that the average composition (15% wet basis as burnt) of these nutrients in dry dung has 1.46% nitrogen and 1.30% phosphorus by weight and 5.7 kg potassium and 1.4 kg calcium per ton of dry dung. Therefore, based on the above author, massive extraction of dung from communal grazing lands affects the amelioration capacity of the soil that could contribute to the better productivity of communal grazing land in producing better green biomass feed production, which in turn contributes to reducing degradation and enhancing the resilience capacity of communal grazing land.

Table 38: Annual Fuel Wood Consumption and Demand in Different ACZ Settings

ACZ	Area of forest land	HH size	consumption (tone/ HH/year	T.demand (tone/HH /year	T. emand/site (tone)/year (e)	Consumed versus demand gap(tone/HH/ year (f)	T.consumption/site (ton) /year (g)	Consumption rate (tone /ha)/year= h
		(a)	(b)	(d)	e= (d*b)	f= g-e	g=b*a	h=g/(1)
Wourch	162.0	651.0	0.5	2.4	1.54	-1.8	352.0	2.17
Dega	286.0	764.0	2.3	3.1	2.39	-0.9	1733.0	4.49
Woyina Dega	412.0	683.0	1.7	2.3	1.55	-0.5	1199.0	2.91
Kolla	832.0	444.0	2.6	2.9	1.27	-0.2	1161.0	1.40
	1692.0	2542.	7.1	10.7	6.75	-3.4	4445.0	2.63

Source: Own survey, October, 2016

In summing up the finding, the highest fuel wood collection was found from the dega ACZ. This was about 4.49 tons of fuel wood per hectare in a year which was utilised for household fuel consumption and also for sale. Considering all the four ACZs, 2.63 tons of fuel wood was extracted every year per hectare (Table 38). In general, from the researcher observation, in all four ACZs in the study area there was very limited attempt in doing enrichment plantation in communal forest land. On the other hand, based on the above finding such amount of fuel biomass extraction clearly indicated the pressure on communal forest lands which are deteriorating from year to year.

This situation ultimately affects and hampers the overall sustainability and resilience of communal land management (CLM) unless some replenishment management system is in place. Besides, as described by Adkins *et al*. (2010a), it is unfortunate that the number of rural community members relying on fuel biomass for cooking is expected to increase over the next 25 years.

In support of this, as it was reported by FAO (2010), fuel wood collection together with communal forest land clearing for different purposes like illegal settlement within forests, logging, and illegal wood trade and fuel consumption have resulted in the deterioration of forests and forest resources (MoA, 2010 ; FAO, 2010).

5.3 Conclusion

The main objectives of this study were to assess the pressure over grazing practices through determining the carrying capacity of communal grazing land and quantifying the available feed balance and demand. The study also targeted to quantify the extent of fuel biomass utilisation and demand that was collected from communal forest land use.

The findings showed the study area had a relatively high livestock population while feed availability was limited. The CC of communal grazing land and stocking density were found to be beyond the treshold of communal grazing lands.

It was also concluded that the available feed and the required amount of feed were not comparable. The available feed source can be sufficient and satisfy about 1/3rd of the annual DM demand only. The highest feed balance and CC gap was observed in the Dega and and Woyina dega ACZs due to high stocking density and livestock type. The Kolla ACZ had a better CC load and feed balance as this area has a comparatively larger grazing land area and a relatively smaller stocking density per unit of area.

When considering the balance between the available feed versus demand, and also considering the existing higher CC load, it implied the existence of weak communal grazing management. This weak communal land use management practices together with the high-ceiling human and livestock population density were factors contributing to weak communal land resource productivity in the study area. This in turn was a sign of inadequate livestock and feed resources.

The total fuel biomass (wood + crop residue + dung) demand in all study sites significantly exceeds the actual consumption. The maximum fuel biomass gap was exhibited in all ACZs except in Kolla ACZ. In Kola, fuel biomass demand was comparatively lower in satisfying their demand. The possible reason for the above finding was that Kolla ACZ had better and higher fuel wood resource availability. Besides to this, the Kolla ACZ area has comparatively a lower population density. Conversely, in Dega, Wourch and Woyinadega ACZs, the

fuel wood resource was critically short but also livestock and population density per unit area was comparatively high. This signified high fuel biomass demand that was exceeding even the high fuel biomass consumption.

Of all the fuel biomass types, fuel wood per capita consumption was the most commonly used fuel biomass type. This clearly indicated the high pressure over communal forest land resources. Similarly, following fuel wood, dung utilization was found also significantly high particularly in areas where communal forest was deforstated particularly in the higher ACZ. This massive extraction of dung from communal grazing lands could affect the amelioration and resilience capacity of communal grazing lands.

This clearly illustrates the extent of the intense pressure over communal land resources and further land and resource degradation is likely. Therefore, from the finding on the existing CC and feed demand gap; huge fuel biomass consumption and utilisation together with a high demand versus consumption gap on limited available resources, it is concluded that communal grazing and forest land management practices were poorly managed, unsustainable and poor resilience capacity.

This ultimately demands efficient and effective institutional practices to manage communal land use resources. For this, it is important to investigate the institutional practices in place to sustainably manage communal land and resources. Hence, the following chapter deals with the analysis of the sustainability of institutional practices in managing communal land use resources.

CHAPTER SIX
ASSESSING COMMUNAL LAND USE MANAGEMENT RELATED POLICY SETTING AND APPLICATIONS

6.1 Introduction

In most countries land accounts for between half and three-quarters of national wealth and land is a fundamental input into agriculture production and is directly linked to food security and livelihood (FAO, 2006). This study also added that recent estimates revealed that 80% of the global forests and much of the global pastures are publicly owned. Communal forests contribute 27% of the total household income in Northern Ethiopia (Bedru *et al*., 2009). There are many demands on communal land resources: pasture, forestry, infrastructure, as well as other claims by indigenous groups for different purposes including for ecological and environmental protection. These different demands could create conflict of interest and be the source of conflict between and among user communities on the ground.

Besides, most communities could not manage these conflicting demands. Communal land has, therefore, frequently been the cause of social and economic disturbance, and much effort has been devoted in developing systems to administer land use rights and systems. Encroachment due to expansion of crop cultivation resulted in diminishing communally managed grazing and forest lands (Mengistu, 2006). This diminishing in size and aggravated degradation of communal grazing and forest lands has led to ethnic conflicts and a decline in total livestock numbers in Borana, Ethiopia (Bokel, 2008). As Betru *et al.* (2009) added, the situation on deforestation, overgrazing, and expansion of agricultural lands over CLR aggravated CLR degradation in Ethiopia and particularly in the UBNB. According to this author, to reverse this situation, looking over communal land use and the land administration policy system is important.

This policy system and application may change and improve the overall processes in managing communal lands and supporting the process of policy development. If managed properly with a fully-fledged policy framework and its

application, these communal lands could be a key factor for the betterment of livelihood and climate change mitigation for the rural community (Steins and Edwards, 2009).

The Ethiopian government has exerted an effort in issuing various polices, legislations, strategies and programmes to end poverty and put sustainable land use management in place. These include: Land Administration and Use Proclamation 456 (2005), Plan for Accelerated and Sustained Development to End Poverty (PASDEP), (2005/6-20010/11), Ethiopian Sustainable Investment Framework ESIF (2008) and Climate Resilient Green Economy (2011). These are the prominent ones. These all contributed towards utilising CLR in a sustainable manner in order to improve the livelihoods of rural communities.

However, there has not been a comprehensive national land use and grazing land management policy in Ethiopia to guide land use planning at national and partly at regional level. Inadequate land related policies and their applications are a serious constraint on economic and social development particularly in managing communal land use sustainably (Rehmato, 2011).

Nevertheless, to avoid the above stated problems, rural communities made concerted efforts in constructing different soil and water conservation and water harvesting structures, established area enclosures and tree planting programmes since the last two decades on communal lands (Mitiku and Kindeya, 2008; Fitsum *et al*., 2009). However, remedial measures in the past have focused on physical structures of land rehabilitation. Policy, institutional and participation issues were usually not highlighted in the remedial measures (Berry, 2013). The lack of CLRUM related policy and institutional arrangements also hindered the prevention of over exploitation and depletion of CLR such as communal grazing and forests lands (Bekele *et al*., 2011).

Researches and experiences have shown that communal land resource and management (CLRUM) by the state alone cannot be successful in the absence of acceptance and involvement of the local community. In spite of the fact that there are significant resources invested by the Ethiopian governments in reforming land use and administration, there is little systematic discussion on

the constitute effectiveness in communal land use and communal land administration within the varying spatio-temporal socio-economic and cultural contexts (Berry, 2013).

Mengistab (2009) stated that there are insufficient studies documented particularly in the area of communal land resource use and management (CLRUM) policy setting, application and institutional matters. Yet, there is also limited scientific evidence that enables feasible local level development and policy interventions that strengthen sustainable CLRUM. This becomes more critical in the study area as it has more complex physiographic and socio-cultural conditions that influence CLRUM.

To fill this gap, an in-depth investigation in the area of communal land use related policy setting and application aspects has paramount importance to achieve sustainable CLRUM. Hence, this study intended to assess the communal land use and administration related policy/legislation setting and application status. This ultimately contributes and helps in setting out and establishing an effective and efficient communal land use and administration systems in the country .

6.2 Results and discussion

6.2.1 Communal land tenure and administration related legislative setting and application status

According to Norušis' (2012) work, the major functions of practicing land administration are four. These are: adjudication (conventional registration versus computerised registration and participation), the second one is updating the adjudication status, and the third and fourth ones are implementing adequate boundary demarcations/monuments and ground control points and mapping/parcel index map, with unique parcel identification.

In terms of legislative setting in the ANRS where the study area was located, it was found that all the above four major functions are properly addressed with

appropriate regulations and directives. However, with different levels of success or failure, the application of those legislative elements varies from place to place.

To see the overall legislative application pertinent to status of communal land administration, five points were raised during HH survey. These were:

- Cadastral surveying and mapping,
- Communal land adjudication process,
- Establishment of CLAC and community arbiter committee,
- Policy/legislative enforcement to refrain community from abusing any activity that aggravates deforestation and land degradation, and
- Whether administration body involvement in reallocating communal lands for landless youths/user groups or for investment were following a proper legal procedure or not.

The Federal Rural Land Administration and Use Proclamation 456/2005 in article 6 provides the need for measuring landsthat are found under communal use and preparation of cadastral maps for these lands. Besides, Land Administration and Use (LAU) law of the Amhara region (133/2006) and Regulation No. 51/2007 of the ANRS have also a provision on land registration and certification including cadastral surveying and mapping of communal holdings. Besides, the Federal Forest Development, Conservation and Utilization Proclamation (542/2007) also emphasised that communal forest areas have to be demarcated; delineated and communal forest management plan shall be developed. However, from this study it was found that the application on the ground was not adequately implemented as per the above legal provisions. In line with this, the HH respondents were asked about the status on application of cadastral surveying, mapping and fixing monuments or permanent physical marks on the ground on one hand and, on the other, community participation during the communal land adjudication process. Those HH respondents were rated their view on the status from highly disagree to disagree. The mean values were found between strongly disagree and disagree (-3.7 and -2.9) with a median between -4 and -3 for cadastral surveying/ mapping and community participation during adjudication

respectively (Table 46). These showed that community participation during communal land adjudication and cadastral surveying and mapping activities were weakly exercised.

It was also noted from expert KI that these elements did not work out on communal land in the study area. It was remarked that cadastral surveying for second level registration was executed on CLU in different parts of the UBLB but still outside this specific study area. They reported that even outside the study site the effort was very limited. In line with this finding, from the study conducted in the Amhara region, it was reported that only less than 10% of the area under communal land has boundaries demarcated and surveyed (World Bank, 2010).

On top of this, community discussant groups reported in all study sites except Kolla ACZ (Boko tabo KA), that adjudication of both communal grazing and forest land were on going and first level certification was issued and titled under the name of respective Kebele Administrations (KA). Besides, about 77% of community KIs from all study sites agreed on the first level certificate issuance based on the directive and regulation set. However, they reported their fear that this first level certification book has been placed on selected individuals houses among the CLAC members. These KIs believed that this procedure gave them fear and insecurity. They suggested placing the book of certification in the Kebele Administration Office would be more comfortable and more secured to them than being placed on individual base.

When it comes to the application of the adjudication process, particularly during delineation of communal lands, expert FG discussant did not reported that it was properly applied as per LAU Proclamation No.133/2005 and Regulation No. 51/2007 art.19, and Communal Land Administration and Use (CLAU) directive No.24.1.3 stated. Int those legistlative elements it is stated that during communal land boundary demarcation and delineation, Kebele LA technicians, Kebele administrators, neighbouring landholders and communal land administration committee members shall be present during such adjudication processes. However, expert FG discussant witnessed that neighbouring landholders were not practically attending during delineation. They described

that in most cases only the Kebele administrator, CLAC and LA technicians did the delineation. Similarly, the community FG discussant also raised similar concerns in support of the above opinion mentioned by expert FG discussant.

On the other side, HH respondents were asked about thir opinion on the status of establishing and strengthening CLAC and elder arbiters. In this regard, it was found with a mean value of 3.8 and 2.4 respectively. This means that communities were rating between strongly agree and agree with regards to the establishment of CLAC and elder community arbiters. Hence, this showed that the above directive elements were properly set and applied.

In LAU proclamation of the Amhara region (133/2006), it stated that any land related conflict on the ground level shall be arbiter by the elder committee. As 78% of expert KI pointed out, there was an outstanding strong practice on elder arbitration on communal land boundary dispute resolutions and control (Table 46). On the other hand, from community GD in the Woyina dega ACZ areas, it was reported that the most common limitation of elder arbitration was that elder arbiters were reluctant. According to them, this was because of detesting grievance which they didn't want to react against any resource abuse or boundary conflicts over communal lands.

Communal Land Administration and Use (CLAU) directive No. 24.1.10 stated properly when boundary conflict arises on CL. This statement was when dispute arise at the border of two or more KA and/or Woreda Administration, then selected elders, Kebele and Woreda administrators, LAU office representatives and Kebele LAUC members from respective concerned Kebeles and Woredas administration shall solve the conflict. During this study, such cases were identified only in the Dega ACZ (Dengay ber KA). In this site, there was a case where CGL were found between two Kebeles and Woredas. However, in this site, although two Kebele LAU technicians in both Kebeles reported that there was conflict, no attempt was made by KA and Woreda administration and EPLAU office to solve the conflict as per the CLAU directive stated under article 24/regulation 51/2006. However, about 83% of key informants confirmed the existence of such conflict and stressed that the case has to be resolved (Table 46).

Moreover, even though CLAU directive No. 35.4 stated that among Kebele Communal Land Administration Committees (CLAC), at least two shall be women. In the three study sites, only one female member was selected per committee and 2 females per committee were selected only in Wourch ACZ (Abzazj KA). As mentioned by a focus group discussant, it was no matter whether to nominate two or one female as a member of CLAC. This is due to the fact that female members in most cases would not be available for work as a member of CLAC. This is simply because of the traditional/cultural feeling they have. Due to this, most women members were not able to fully participate in CLAC routine work as men did.

On the other hand, community FG discussants also added that the nature of CLAC work by itself was a practice that requires and consume a relatively higher time and energy. Most females in the local situation were unable to meet this requirement. Hence, as those discussant groups pointed out, even though the ANRS land administration and use proclamation 133/2006 stated that among CLAC members two must be female; KA replaced at least one female with another men member in those three study sites. Therefore, they emphasised that care has to be given during female committee member selection as the CLAC work demands and devours more energy and time than other committee work.

Table 39: Household Perception on the Application of Communal Land Administration and Use Related legistlations

	Type of CLM legislative application practices: N= 302	Mean	Median
1	Communal forest/grazing land surveyed, mapped, demarcated with parcel identity number.	-3.7	-4
2	During communal land adjudication process the participation of community users including adjacent individual HH	-2.9	-3
3	Communal lands administration committees established in each Kebele/sub Kebele	3.8	4
4	Elder committee established to arbiter and solve dispute arising on communal lands at Kebele/sub Kebele level	2.4	2
5	Land users “shall be obliged to refrain from activities that aggravate soil erosion, like forest clearing.” This is applied well on the ground in managing communal lands	-3.2	-3
6	Kebele and Woreda administrations involved in allocating communal lands to landless organised youths, following the legal mandate and procedure	-3.5	-4

Note: Very strongly agree = 4; strongly agree = 3; Agree = 2; slightly agree = 1; Not applied/no idea = 0; slightly disagree = -1; Disagree = -2; strongly disagree = -3; Very strongly disagree = -4

With regard to the effort made by CLAC in resolving disputes, CLAU directive No. 27.1.10 stated that a discussion forum shall be conducted at least once in a month to resolve cases related to resource use and other land related conflicts. According to this directive, members of this discussion forum shall be from Kebele LA technicians, administrators, and communal land administration committee members. In applying this, 85% of KI reported that it was practised and exercised in all study areas. However, community FG discussant reported that, although this discussion forum meeting was exercised, inadequate solution was made out of it. They suggested that no matter how frequent they conduct a discussion forum but nothing was acted per the recommendations that came out from such a discussion. They explained that only few and scant cases came out as an action to solve issues raised even though they have had frequent discussion. For example, in the Woyina dega ACZ (Yesheret KA), community GD reported that about 45 cases related to encroachment were presented in the discussion forum. Yet, no solution was found nor action was taken to reverse/minimise the problem. However, in Wourch ACZ (Abzazdj KA site) better attempt was found. From Kebele LAU technician, it was reported that CLAC meet even twice in a month trying to solve and reduce such conflicting problems. It was further reported that out of 51 cases appealed from year 2013/14, 20 cases were resolved and 31 cases were left unresolved until 2014/15.

In terms of decision exercises, under Proclamation No. 133/2006 Art. 29, it was stated that whenever boundary conflict arises, Kebele Land Administration Committee (KLAC) members have a decision role to resolve issues together with the Kebele administrator and land administration technicians. However, as 81% of community KI reported, the role of CLAC was rolled out by the Watershed User Association (WSUA) committee members in deciding on communal land administration and resource use management related matters.

From the Amhara regional state, regulation 51/2006, Art.3/13-3, stated that in any type of rural land where soil and water conservation works have been undertaken, a system of free grazing shall be prohibited and a system of cut and carry feeding shall be introduced. In line with this, during the HH survey, the

application status on whether land users were obliged to refrain from activities that aggravate communal land degradation and prohibit free grazing and forest clearing exercises was investigated. HH respondents strongly disagreed that such practices were applied in the study area. From the Likert scale it was depicted that the mean value = - 3.2 and median = - 3. The above finding showed their disagreement that implied there few of such an attempt applied on the ground to refrain land users, even if there were activities like forest clearing and overgrazing that leads to further communal land degradation.

According to FG discussant, it was mentioned that even if there is a legal provision stated under regulation 51/2006, Art.3/13-3, there were no any practices on control grazing or on cut and carry system developed under communal land areas. During GD, it was also emphasised that community members were not yet conscious of the repercussions behind over grazing and communal forest resource abuse. They indicated that communities wanted only to satisfy their immediate needs. It was mentioned that this was particularly more series for communal lands than individual farm lands. Besides, from the GD, it was described that it was good that the law stated the importance of keeping the bio physical measurement to rehabilitate communal forest and grazing lands. However, there was very limited action exerted in implementing thestatment of this law. Due to this, most of planted and/or constructed structures over communal lands were mostly destroyed. This issue was also found to be more serious by most Kebele development workers in the study area.This finding depicted with the highest load factor (0.54) that was found from Kebele development worker (Table 40).

On whether or not Kebele administrative bodies transfer a portion of CL to landless youths following their legal procedures was also examined. It was found from the HHs survey that they highly disagreed that there was an excersise for a formal procedure that was followed as provided by the law. The finding showed a high level of disagreement with mean = - 3.5 and median = - 4 (Table 39). Besides, the CLUA directive No.25.1 stated that it was allowed only if 2/3rd of the community members agreed that the authorised body could transfer a portion of CL to another holding type. However, FG a discussant

reported that there were cases that the Woreda administration office and sometimes the KA office determined for the expropriation of a portion of communal lands either for investment or for user groups without community members' participation. The researcher also witnessed this in the Dega ACZ, Dengaybersillasse KA site. In this site, there were about 3 ha of CGL that were given for an individual investor without paying compensation and community participation.

Table 40: Community Key Informants Perception on the Application of Communal Land Related Land Administration and Legistlations

Legislation elements (N=48)	legislation set and applied		Legislation set but NOT applied		Load factor ratio in each study site			
	No	%	No.	%	Wourch/A bazazj	Dega/Den gay ber	W/dega/ Yesheret	Kolla/ Boko
Boundary conflict resolution when CL found between two or more kebele/woreda administration	10	16.6	40	83.3	**0.4**	**0.35**	**0.15**	0.1
Gender setting in CLAC members	17	35.5	31	64.5	**0.38**	**0.32**	**0.16**	0.14
Resource use and boundary conflict resolution mechanism	7	14.6	41	85.4	**0.62**	**0.26**	**0.11**	0.09
Effectiveness of CLAC on their decision role and in taking measures during LAU proclamation/regulation/ by-law violations	9	18.75	39	81.3	**0.3**	**0.33**	**0.24**	0.13

Note: Load factor ratio (0 = not worked out problem/no case at all, 1 = highest application)

A community FG discussant pointed out that though communal land tenure security was getting better compared with ten years back, the fear still existed. The reason they reported for the fear was the experience they had on sporadic communal land expropriation for youth groups and other individual investors. As to these communities FG, this fear also erodes the interest of the majority of the user community to further develop, protect and manage communal lands.

Tenure insecurity in the region was related to land reallocation that happened before 1997; and is mainly the result of governments' interference (Rahmato, 2011). On the other hand, EEA (2012) reported that the proportion of individual land holders reported to have tenure security on their private possessed land

before the introduction of land administration system in ANRS was only 24%. Similarly, Deininger *et al.* (2008) also stated that with regard to private possessed land holding, the estimation of tenure security was 27%. However, compared to these findings, under this study, tenure security was more serious under communal land than the private possessed land holding system. This was indicated by a community group discussant that community members, due to the above fear, they prefer to invest natural resource management practices like developing wood lot and grass land improvement interventions on their own parcels of land rather than doing it on communal lands.

As identified by an expert focus group discussant, the major weaknesses of the land tenure and administration system in general were grouped as below:

- Very low attempt in conducting and organising spatial data and information systems for the adjudication process and updating communal land adjudication status.
- Inadequate knowledge and experience for Woreda technical staff in both technical and policy matters.
- Low level participation during communal land adjudication and CLAC involvement in the decision making process.

Based on the above overall finding, it was also remarked by the expert FG that the level of tenure security over communal land was not getting that much better compared to other previous ten years as long as insecurity over communal lands administratin still prevaild. This was evidenced by community KI that 71% of them reported that they were dissatisfied with the existing CL tenure security. This requires a better effort to be exerted by the government and community leaders to enhance tenure security and the sustainability of CLUM.

6.2.2 Legislative Application on Communal Land Use Plan and Resource Management

In both of the federal and Amhara regional state Land Administration and User Proclamation No. 456/2005; 133/2006 respectively, as the name implies, it is a proclamation referring to rural land administration and land use. According to

the proclamation, effort shall be exerted in executing land use planning in all land use types in general and in communal land use in particular. Nevertheless, about 91% of the expert KIs agreed that these laws on land use planning aspect were inadequately mentioned.Of this, the higest load factor ratio was found as (0.41) and it was from Regional and Federal experts (Table 47). On top of this, according to the expert GD, definition and categories of land use plan, procedures of land use planning process, participation of the local community who could be involved in the planning process, procedures of regulatory works, punishment against non-compliance and the like need to be sufficiently treated in the proclamation.

Table 41: Key Informant Experts Opinion on the Application of Legistlation on Communal Land Resource Use and Management

No	Legislative practices (N = 60)	No.	%	Load factor ratio		
				K	W+Z	F+R
1	According to the law Land users do not refrain from activities that aggravate soil erosion, like forest clearing (Proclamation 456/2005 and Proclamation No. 89/1997)	42	77.6	0.44	0.36	0.2
2	No attempt in applying to protect communal forest from fire and hazard (Proclamation No. 542/2007)	53	88.3	0.52	0.34	0.14
3	No community forest utilization planned, demarcated, administrated (Proclamation No. 542/2007)	49	81.6	0.51	0.37	0.12
4	Little attempt to stop free grazing and the exercise of using cut and carry practices in areas where bio physical measures practiced Proclamation (456.2005 and 89/1997)	49	81.6	0.54	0.29	0.17
5	Little effort in executing land use planning in all land use types in general and in communal land use in particular.	55	91.6	0.28	0.31	0.41

Note: K = Kebele (Lowest administrative level); W = Woreda (District) level; Z = zonal administration level; R = regional administration level and F = federal administration level

On the other side, Forest Development, Conservation and Utilization Policy and Strategy were issued at the same time. Under the Federal Forest Development, Conservation, and Utilization Proclamation No. 542/2007, there were only two types of forest tenures: government and private. An expert GD reported that the concept of developing and conserving forests by communities hardly transpires in the Proclamation. Acccording to these expert FG discussants, the Proclamation also fails to clearly define the circumstances where private individuals could apply to develop and protect forests. It rather stipulates the

obligations of private forest developers without providing their rights. Furthermore, in conformity with the above findings, Eyasu (2010) pointed out that more than three-fourths of the provisions under this proclamation were not legal provisions but mere legislative statements with little obligatory enforcement. It was pointed out that the provision in this law indicated only what may be done in the future without allocating rights and/or duties or responsibilities and/or functions.

According to FDRE land administration and use Proclamation 456/2005 and Proclamation No. 89/1997, it was clarly stated that the land users shall refrain themselves from activities that aggravate land degradation. However, abaout 88% of expert KIs argued that although the law states so, there are very limited attempt from the government side in developing appropriate guide line/directives to minimize the ongoing communal land degradation. The highest load factor ratio (0.52) supporting this was found from practioners at KA level (Table 47)

On the other hand, under Proclamation No. 542/2007, it was stated that there shall be forest demarcation and utilisation plan for both private/communal forest. About 81% of KI reported that all communal forest land in the study site did not have any demarcation and utilisation plan. The highes load factor (0.51) was reported from Kebele development workers while the list reported from Federal and Regional experts (Table 41). However, a few expert KI respondents from the zonal and federal zones reported that there was little attempt to exercise a plan outside the study site within the UBLB. Besides, as stated in the above findings, it was also evident that communal forest lands were also certified with a first level certification in the three ACZ sites except Boko tabo site (Kolla ACZ). There was a discussion with community FG respondents on whether there was an improvement on communal land management since communal land was certified or not. It was described only from Dega ACZ (Dengay ber KA), where some efforts were made to close communal land for the production of hay after certification. However, in other study sites, it was pointed out that there were no changes even after first level certification.

With the above same proclamation 456/2005 and Proclamation No. 89/1997, It was clearly stated free grazing is prohibited and cut and carry feeding system shall be excersised. Nevertheless, 81% of expert KIs with (0.5) load factor ratio from KA practitioners indicated that there was a very limited attempt in in using cut and cary feeding practice and also no effort made so far for controlling free grazing (Table 41).

In terms of communal land resource management and utilisation, development, conservation, and utilisation of the Forests Proclamation No. 542/2007, it stated the obligation of forest developers to protect forests from fire and other hazards. In this aspect, expert KI respondents were asked about the application and practices of this law on forest fires and other forest protection practices. However, regardless of professional variation at different levels, about 88% of respondents with the highest load factor (0.52) from KA practitioners mentioned that forest protection in general and for communal forest lands in particular were managed very poorly in terms of forest protection practice (Table 41). These expert KI respondents further reported that there were no attempts made to protect communal forests from fire. From the researcher's field frequencies of events it was also found that there were no fire break constructions observed at any of the communal forest areas in the study sites.

On top of this, from an expert FG discussant, it was found that communal land management with biophysical measures was practiced not following the land use requirements but mainly through a large scale mass mobilization campaign. Mostly it was described that protecting the biophysical work done over communal lands was not as successful as it was required.

From this expert GD, it was reported that in most cases communal land was like a testing area where different land management practices were tested. It was no matter whether the applied practices were according to the land use requirement or not. For example, they mentioned that they did plantation on flat CGL, construct soil bund and / or *faniya juu* rather than doing grass land improvement technologies. It was stressed that whether it suits with the appropriate land use or not it was no one's concern. What community leader/KA

development worker most concern was more to fulfil the quota given by the upper level government offices.

In conformity with the above finding, Williamson *et al*. (2010) similarly pined out that land use planning practices were weak in the Amhara region in general. According to the regional land law, the implementation of approved land use plans in all land holding types is mandatory. However, as discussed with expert FG, it was reported that, although there was a land use guide line prepared for land use planning exercises at federal level, no land use plan regulatory guide line implementation detail was prepared at federal level. However, at the regional level the Amhara regional state land use plan regulatory guide line was under preparation and it was on the way to be approved by the Bureau of EPLAU.

Besides, Proclamation No.133/2006 and regulation No.51/2007, and communal land administration directive No. 31.1(f) declared that without permission of community members, and without a proper user plan for CL, anyone among users shall not use any communal resource. On the other hand, the law further stated that those who acted positively and achieved good land management results on CL shall get an award on a competition basis. Nevertheless, in all study sites, all CFL were found with no management and use plan prepared. About 92% community KI confirmed communities utilised resources from CL without having a proper study, management and use plan. In addition, in all study sites, this proclamation was enacted since 2006/7, but 100% of all exper KI respondents reported that no action of rewarding systems was applied at even with in the UBNB level out side the specific study sites for those communities that had a remarkable achievement on CLUM.

As to the communal land administration directive No. 34.6 stated, there is a provision where communal land use could be changed for a better development option. However, there shall be a study conducted that ensures the benefit of change and a changed CLU must exceed the previous CLU. In this case, among all study sites, CLU change were found only in Dengayber site (Dega ACZ setting). In this site, all expert FG discussants remarked that only

community leaders' agreements and decisions were exercised. No such kind of study was conducted in any one of the study sites.

Article 27.1.3 also pointed out that in order to build thrust with community users on what they spent their money, time and energy, community members shall be the ones who decide on their use rights. However, in all study sites about 79% of community KI respondents reported that such kind of procedure mentioned under communal land administration directives No. 34.6, 25.1 and 27.1.3 were not exercised at all. Community FG discussant further explained that although certain communal land was needed by a certain investor or youth groups, Articles 25.1 and 27.1.3 were not respected and only Kebele administrator discussing with EPLAU officers and decided on any kind of land use change and expropriation procedure in re-allocating and transferring their user right. Mostly, CLAC was bypassed. However, only 21% of KI responded that this process was implemented according to articles 25.1 and 27.1.3 (Table42).

Table 42: Community Key Informants Perception on the Application of on Land Use Management Area

Policy/Legislative elements (N=48)	legislatives set and applied		Legislation set but NOT applied		Load factor ratio			
	No.	%	No.	%	Wourch	Dega	Woyina dega	Kolla
Resource access and study based land use management plan	4	8.4	44	91.6	0.29	0.42	0.19	0.1
Maintaining public benefit and expropriation system	2	4.2	46	95.8	0.37	0.63	0	0
Study based communal land use change for better development option	6	12.5	42	87.5	0.36	0.52	0.12	0
Application of proper communal land holding transfer to others(Individual/youth group/invester	10	21.9	38	79.1	0	0.39	0.42	0

Load factor ratio (0 = not worked out problem/no case at all, 1 = highest application)

6.2.3 Legislative application on valuation and expropriation of communal land

Land valuation in the Amhara region in general is restricted to payments of compensation for land if CL was expropriated for public purposes. Land

valuation activities in the study area were based on procedures determined in the law (Federal proclamation 455/2005). This refers to expropriation of communal lands, where communal lands were taken away from the community user by government bodies, private investors and/or users to commence development.

According to 96% of expert KIs, with the highest load factor (0.63) from Dega ACZ, keeping priority for public benefit during any communal land expropriation was not adequately implemented eventhough the law stated to do so (Table42).

According to Proclamation 455/2005, the payable amount for compensation was calculated simply by multiplying the average income of the recent past five years with the factor ten. Besides, rural communal land holders whose land holding has been provisionally expropriated shall, in addition, be paid until repossession of the land compensation for lost income based on the average annual income secured during the five years preceding the expropriation of the land provided. Such payment shall exceed the amount of compensation payable as above.

In addition, under this proclamation compensation has to be paid in advance of taking possession of the land. However, in practice, according to a community focus group discussant, it was mentioned that there were cases where communal lands are expropriated either before compensation was paid (instance from Boko/Kolla ACZ) or even remain unpaid. Such cases were explained in Dega ACZ (Dengay ber site) and also in Kolla ACZ (Boko sites). In conformity with this, about 83% of expert KIs from Kebele and Woreda described that they had rarely seen compensation paid to the community for the expropriated communal land. Moreover, experts' focus group discussants also reported that particularly when communal lands are expropriated, beyond the doubtfulness of timing in delay for paying compensation, even the paid compensation amount was unfair and very minimal.

In line with this, Van Den Brink (2012) pointed out that uncertainty about the timing and amount of compensation are more damaging signs that contribute to tenure insecurity in land administration and the user system. Moreover, as again

pointed out by expert GDs, although there is no logical valuation procedure for taxation or taxation system (which is simply based on the potential productivity of soils), government does not even have any system to get such taxation for communal land holdings. In addition, as Ambaye (2013) and Chole (2010) indicated, taxation methodologies to get figures on the productivity of communal and also private holdings were missed.

Besides to these above findings, expert focus group discussants further added on the strengths and weaknesses of land valuation. According to them, one of the major strengths pointed out was that the ANRS set a regional directive following the federal compensation law for proper implementation. On the other side, as major weaknesses the following points were reported:

- The law was not strictly followed in practice with regard to public consultation and general agreement before any form of expropriation.
- Unjustified state power exercised during expropriation on communal land use causes tenure insecurity.
- The effect of expropriation on communal land holdings without any form of compensation in the name of public benefits is the most eroding force of tenure security.

6.2.4 Communal land resource development control related legislative application

Due to lack of detail land use plans as regulatory tools/mechanisms, development control was not practiced on the rural communal lands of Ethiopia in general and in the Amhara region in particular (Rahmato, 2005). According to this author, this is the main reason for the low achievement of this defined major function for development control. Due to this fact, the following was reported by an expert focus group discussant: illegal encroachment, eucalyptus tree plantation in a place suitable for crops or other land use, extensive stretch of illegal settlements particularly around Kebele centres and along road sides over communal lands were mentioned as common phenomena that came out due to lack of detailed land use planning.

Furthermore, in communal land administration directive No. 26.1.1, it was stated that in order to make CL productive, with users' participation, woereda LU experts shall prepare communal land use plans. However, about 96% of expert KI reported preparation of land use planning at KA level was at the initial stage. In addition to this, Woreda KI experts reported also that each woreda in the study area were preparing LUP only for one KA. This was further explained by the expert FG discussants that out of all KA with in the Woreda, only 3-5% of them were preparing Kebele based land use plan.

As communal land management directive No. 27.1.5(b) stated, for taking measures on graduated sanctions for those who violate the law and community by-laws, a strategic monitoring system shall be in place. In fact, from the observation made at field level, the researcher was not able to find any monitoring system developed in all study sites. In line with this observation, about 85% of community KI confirmed that committees rarely took action for the violence against the by-laws set (Table 43).

In addition, the same directive No. 26.1.5 is one of the most important articles that enforce communal land users to respect community by-laws and participate in any communal land protection and development intervention. For those who did not obeyed the agreed by-laws and who were not volunteer to participate in CL protection and development activities, the directive declared that action should be taken to the extent of evicting individual user rights.

Besides to this, Communal land administration and use article No. 27.1.10 clearly declares that based on users' agreements, customary law/by-laws shall be set with a graduated sanction which should be effect upon violating users. However, it was observed that actions stated in the by-laws for all study areas was stretched only up to money sanctions. However, 85% of KI (Table 43) responded that no action took place, particularly for those user members who violated by-laws or for members who didn't participate in any protection and development activities. The major reasons provided by communiy FG discussants were two: one was community leaders didn't want to be a risk taker as far as all decision makers were not committed as long as less government support exist. The second reason was competition on their functional

responsibilities between the Watershed Users' Association (WSUA) and the Communal Land Administration Committee (CLAC). This competition made them neglegient to take decisions. According to these FG discussants, this overlapping function let them to look for each other in taking decision and appropriate measures when by-laws violated.

Table 43: Community Key Informants Perception on the Application of Directives on Communal Land Use and Development Controle Legistlation

Legislation elements (N=48)	Legislation set and applied		Legislation set but NOT applied		Load factor ratio			
	No.	%	Number	%	Wourch	Dega	Woyinadega	Kolla
Strategic monitoring system for resource use and control	7	14.6	41	85.4	0.42	0.34	0.24	0
Legislative/regulation and community by-law effectiveness on measures taking on sanctions	7	14.59	41	85.4	0.36	0.3	0.2	0.14

Note: Load factor ratio (0 = not worked out problem/no case at all, 1 = highest application)

With regard to the major opportunities and strengths of land administration policy and the legislative system in the region, expert FG discussant summarised as follows:

Land is identified by the government of Ethiopia as one of the country's key resources for development. Laws to govern land administration are in place and the political leadership is committed to implement the policy. This is depicted by a significant attention given in the five years' development and transformation plan for land administration. The other important opportunity which is different to other regions was the placement of a stable state structure that goes down to the Kebele, the lowest administration level, to implement land administration and use in the region.

According these FG experts, some of the points raised as a challenging gap, however, were:

- Experts at all levels have little background and knowledge about the mission, vision and strategy of their own EPLAU office,
- Very insignificant attempt in practicing land use planning and planned development control,
- No systematic and regular customer satisfaction surveys were conducted,
- Low level of attention to land administration activities by Woreda and Kebele level administrators,
- Weak community and government leaders control over CLR at grass root level, and
- Uncontrolled human and livestock population growth

6.3. Conclusion

The overall aim of investigating the CLAU related legislation/policy setting and application status was to scrutinise whether communal land use, administration and policy/legislative instruments were adequately set and properly implemented at ground level or not.

In line with this, communal land administration committee establishment and formation of elder arbitration committees to resolve communal land related dispute were already in place and legislative articles well set. However, applying the overall adjudication process as per legislative setting, updating communal land adjudication status, low level community participation during communal land adjudication, CLAC involvement in decision making processes and reallocating a portion of communal land to landless youth or investors were found to be prominent legislative elements that was properly set in the law but not adequately applied on the ground. Besides, the above mentioned legestlative elements were not strictly executed based on public consultation.

The regional and federal land administration and use proclamation/regulation and directives set an obligatory statement on the following elements: preparation of land use planning, refraining communities from activities that

aggravate land degradation, introduction of cut and carry as well as controlled grazing systems and benefiting out of communal resources. However, when it comes to the application of these provisions, very little endeavour has been made in the above elements to address communal land and resource use management. Moreover, undue state power exercise during the expropriation of communal land could also be considered as one of policy application weakness that leads towards further communal land tenure insecurity.

On the other hand, the strong part with regard to legislative setting on communal land resource development controlling instruments was well set and described modest. Besides, the availability of state structure down to the lowest KA level was an essential opportunity that contributes towards the sustainability of communal land management control. Nonetheless, very weak application of strategic monitoring system for communal land resource use on the one hand and, on the other, legislative or community bylaw functionality and effectiveness on taking measure on sanctions were found as major gaps.

Therefore it is concluded that the overall status of the communal land legislative setting was found adequately established while its application on the ground still remained as a gap. These unattempted legislative application challenges could hamper the the reseliance capacity and sustainability as well as tenure security of communal land management practices.

Nevertheless, besides to policy setting and its application status, the how institutional sustainability practices are applied on the ground will give a better view to see the other side of policy dimentions. Therefore, the following chapter deals with analysing the situation on how the sustainability of CLUM institutional practices was applied on the ground or not. Henceforth, the following chapter deals with assessing the sustainability of CLUM related institutional practices in the study area are also imperative.

CHAPTER SEVEN
ASSESSING INSTITUTIONAL SUSTAINABILITY OF COMMUNAL LAND USES AND MANAGEMENT PRACTICES

7.1 Introduction

Ostrom (1990) traces the roots of argumentation back to Aristotle, who wrote in *Politics*, Book 2, Vol 2, Ch. 3:

> *"What is common to the greatest number has the least care bestowed upon it. Everyone thinks chiefly of his own, hardly at all of the common interest"*.

Communal land property can be defined as a regulated property managed and used by community members only. It has often been used to refer to communal land resources available where access is limited only to those specific community member groups that hold rights in common (Bromley, 2012). Unless those communal land resources (CLR) are used sustainably with proper restricted entry and regulated use of resources, it will often cause an over exploitation and degradation of CLR. This is a situation often referred to as the "tragedy of the commons" (Hardin, 1968).

Ethiopia is known for fast population growth and environmental degradation. Among others, accelerated communal grazing and forest resource degradation have become the major threats to rural livelihood and sustainable land resource management in the country (Tarekegne, 2011a). Communal land degradation is very much aggravated by poor communal institutional management practices that partly lead to intensive use of communal lands, deforestation, and overgrazing (Tilahun *et al*., 2011). On top of this, free grazing and open access to the communal forest system has contributed significantly to the land degradation problem in the Ethiopian highlands. Besides, such weak institutional practices pose serious threats to the sustainability of communal land resources use and maintenance of the ecological balance. Particularly in the Upper Blue Nile Basin(UBNB), the long duration of human settlement

together with the increasing demands of the growing human and animal population, abusive land use practices, including excessive deforestation for expansion of cultivation, grazing, fuel wood and timber, have resulted in reduced protective plant cover thereby inducing land degradation (UN ECA, 2015)

Nevertheless, in Ethiopia communal land resources are sources of livelihood for rural people. It has intertwined relationships with their communal land resources (CLR) simply because they are the source of their food, medicine, construction materials, income, etc. For example, Yeraswork (2011) indicated that communal lands in the northern highlands are the source of green fodder, thatching material, fuel wood, cash income and others being used sustainably by local people. Berhanu *et al.* (2014b) show that communal grazing lands are important sources of livestock feed and areas of bee keeping for the surrounding communities. Samuel and Pender (2012) also consolidate the same fact in the Amhara region. Pastoralists in all parts of the country depend directly on their respective communal forest and grazing lands.

Therefore, in order to improve community livelihood, it is essential to engage local communities in institutionally sustainable CLRUM practices (UN ECA, 2015). ILRI (2010) also pointed out the vital importance of institutional sustainable CLRUM practices as a survival strategy for the rural communities and to halt severe land degradation problems in Ethiopia. Moreover, to tackle the problem of communal land degradation, rural communities in the Upper Blue Nile basin (UBNB) and, in particular, in Bir-Temicha watershed have been practicing many locally introduced communal land management practices. Among traditional practices: a) plantations of indigenous trees, b) constructing traditional cut off drains *('Tekebkebo'*), and c) traditional waterways *('Mafaseshia')* are widespread. In the study area, many other modern CLM practices like: cut off drains, waterways, gully rehabilitation, area enclosures, moisture retention structures including micro-basins, eyebrows, herring bones, half-moons, trenches and others have also been introduced mainly by the government through different sustainable land management programmes (SLMP) and others. Despite repeated attempts made by the government and

different NGOs to introduce these CLM measures in the highlands of Ethiopia, the adoption of the technology has not been satisfactory (Hengsdijk *et al.,* 2005). In support of this, for applied practices from 1990 to 2000, only 22% of trees planted on communal lands and 7% from the unprotected communal land use areas survived (FAO, 2011). In this same study it has been described that 16% of the hillside terraces were reported as having survived.

Nonetheless, for successful communal land resource management institutional practices, it is necessary that institutional management and user rights are vested in the community. Increasingly, however, collective community action is recognised as a liable and promising practice to managing communal land resources (Bekele *et al*., 2011). Many writers were also arguing about that tragedy of the commons since pointed out by Hardin (1968). The tragedy of the commons occurred not from any inherent failure of the commons but, rather, it occurred because of the failure of institutions to practice controlling access, and to make and enforce internal decisions for collective action with full and genuine acceptance and participation in implementing CLM practices (Bekele *et al*., 2011). However, regardless of the importance of communities' genuine acceptance and participation in all aspects of CLM, activities are limited (Mengistu, 2012). Moreover, Tilahun *et al*. (2011) pointed out also that despite the scientific accuracy and theoretical feasibility of land management technologies, various practical problems made the acceptance and adoption of these technologies difficult. This genuine acceptance and participation is highly important for sustaining CLRUM practices and happens when farmers decide to select technologies if they sense they are useful, economical and suitable to their needs to solve their own problems (Alemu, 2015).

In this regard, even if there are studies about assessing and analysing, the institutional sustainability of CLRUM practices was insufficient and also largely confined to macro analyses. These kinds of macro studies mostly failed to benefit from data generated at micro level, which provides rich information on the social and economic factors that mediate the relationship between communities and the CLR (Mebrahtu, 2009).

This study is, therefore, designed to analyse the existing institutional aspects of CLRUM practices in line with its sustainability. Those key design principles for Ostrom is an essential element or condition that helps to account for and evaluate the success of communal institutions in sustaining communal land resources (Wade, 1998; Cox *et al*., 2010; Baland and Platteau, 2010).

Hence, more specifically, the study focused on assessing and analysing the sustainability of communal land related institutional practices in line with the modified Cox et al.'s (2010) Key Sustainability Design Principles (KSDP). On KSDP, see (Table 28). The outcome of this study, therefore, will provide additional information to academia, practitioners, researchers and policymakers in the area. Ultimately, it also help in filling the existing information gaps and contributing towards putting sustainable CLM practices in place and in designing communal land resource conservation and management strategies.

7.2 Results and discussion

This study was designed to analyse institutional practices on the applications of CLRUM practices in line with the key institutional sustainability design principles. For presenting the finding those eleven DPs (Table 46) were categorised into three lots:

- Lot 1 refers to the institutional sustainability on features of communal land administration and comprising DP1 (a+b), DP7 and DP8.
- Lot 2 was on the institutional sustainability focusing on communal land use and management aspect considering DP2 (a+b) and DP6.
- Lot 3 was engrossed institutional sustainability on communal land resource use controlling practices. This lot includes three major key design principles of DP3, DP4 (a+b) and DP 5.

Table 44: Area (ha) of Communal Forest and Grazing Land in the Study Area

No	Land use/cover	Kolla(Boko)	Woina dega/(Yesheret)	Dega (Dengayber)	Wourch (Abazazj)	Tot.
1	Communal forest and bush land	832	412	286	162	1692
2	Communal grass and shrub lands - Pasture SUM (a+b+c)	1259.6	539.1	316.2	763.6	2878.6

In the four study areas, it was found that there were 2878.6 ha and 1544.2 ha of communal grazing and forest land respectively. All communal lands were found under open access except communal forest that was in Wourch ACZ (Abazazj KA site) (Table 44).

7.2.1 Role and responsibilities of formal and informal institutions in administrating communal lands

The Revised Amhara National Regional State Rural Land Administration and Use (Proclamation No. 133/2006; Art. 25-27) stated the responsible bodies of various institutions that have a stake in managing and administrating communal lands.

A. Regional and Woreda environmental protection, land administration and use offices

The then Environmental Protection land Administration and Use Bureau shall have responsibility to implement this proclamation by coordinating the pertinent bodies and providing professional support. The Woreda and Kebele Administration Councils shall have responsibility to support the implementation of the proclamation causing the clear delineation of their boundaries. Woreda office of the authority established at Woreda level shall have the following duty and responsibilities in regard to implementing this proclamation:

One is establishing land administration and use committees through public election in Kebeles and sub-Kebeles pursuant to provision of sub-Article 4 of Article 8 of the proclamation No.47/2000 that establishes the authority. The other given role is to ensures the election of women to these committees

membership be balanced to that of men. Following the land Administration and Use Committees (LAC) established at Kebele and sub-Kebele level; controls the undertaking of the activity of the land administration is being implemented as per the Proclamation. Besides they are also responsible to properly handles and keeps data concerning the land administration and use

B. Kebele land administration and use committee

Besides, in Art.27 of same proclamation, it stated that the Kebele Land Administration and Use Committee (KLAC) established at Kebele level shall, in cooperation with the professional assigned by the authority in the Kebele, have the following duty and responsibilities with regard to the implementation of this Proclamation.

Manage the Kebele land, pursuant to the proclamation and regulation set; give oral and preliminary written warnings to those users who do not properly handle their land; decide upon regarding administration and development of communal holding lands found in the Kebele in consultation with Kebele administrations and the authorities of Woreda representative office. On top of this, they receive and arrange in order land-related requests; receiveing land holding, rent, mortgage, donation and similar copies of agreements registered through the Authority's Woreda representative office, record and save same; recording land holders available in the Kebele; carefully keep and save documents. Besides, creating favourable conditions through which the Kebele resident people may get sufficient and continuing awareness raising education in relation to land related rights and obligations of the Kebele resident people is also an area of responsibility. Implement this in communicating with the Authority's Woreda representative office.

C. Kebele Communal land administration committee

On top of this, the Amhara National Regional State Rural Land Administration and Use (Proclamation No. 133/2006; regulation No.51/2007) stated the establishment of Communal Land Administration Committee (CLAC) with its role and responsibilities:

Communal land administration committee is accountable for both Kebele land administration committee and Kebele l Administration office.

- Based on Art.18.1, a preliminary written warning may be communicated to any land holder who has failed to discharge his obligations pursuant to this regulation hereof, after he has been given oral warning, shall be at least in a different harvesting year.
- Communal Land Administration Committee(CLAC), together with Kebele land administration committee and Kebele administration office Organize and facilitate a discussion forum to resolve communal land use related conflicts
- Based on proclamation No. 133/2006, Art.29 and Communal land administration directive No.48.2; CLAC is responsible to set communal land boundaries with delineation and demarcation, record the cpmmunal land area, and based on Art.48, resolve related conflicts.

D. Watershed users association

The Amhara National Regional State set also a Proclamation No. 204/2013 on Administration and Use of watersheds rehabilitated and being rehabilitated with community participation. Under this proclamation, Art.16, the following power and duties of the general assembly of the Watershed Users Association (WUA) is responsibled: Watershed users association has a power and duties pursuant to this proclamation to administer, protect natural resource in the watershed region with the ownership sense, direct superiorly, coordinate the watershed development activities and submit the issue of accountability to the pertinent justice body.

From the above given resonsibilities, both Kebele land administration committee, Kebele administration office, Kebele land administration committee, communal land administration committee and watershed user association are institutions that are legally established and are more or less functioning at the ground to administer rural communal lands in the study area. However, it is

hardly possible to see no clear distinction of power and responsibility shared between and among KA, KLAC, KCLAC as well as WUA.

7.2.2 Institutional sustainability on communal land administration practices - Lot 1

As presented above, communal land administration (CLA) - lot 1 - includes three key design principles. These are:

1. Clearly defined user group and resource boundary setting (DP1 a+b);
2. Governmental recognition of minimal rights to organise community user groups under CLR (DP7); and
3. Nested enterprises/over-lapping functions (DP8).

7.2.2.1 Clear boundary setting as an input to enhance sustainable land administration (DP1)

Under clear boundary setting (DP1 a+b), two specific practices were investigated. One was in defining user boundaries, mainly dealing with how boundaries were clearly defined between legitimate users and non-users (DP1a). The second aspect was in defining the resource use system boundaries that separate user rights from the larger biophysical environment.

a) Resource use boundary - DP1a

With respect to the resource user boundary, the result indicated that there was little attempt in defining the user boundary for individual rights to withdraw or use communal land resources (CLR) from the communal grazing or forest areas. According to the community KI interviews, about 72% of them reported that anybody within the Kebele Administration (lowest government administrative unit) and sometimes communities from adjacent kebeles usually brought their own animals to CLR areas whenever they wanted to do so. Communities lived within the KA or adjacent to the KA, also collect wood illegally from communal forest areas. In addition, according to expert KI, 81% of them suggested that day-to-day access was not systematically regulated. From the HH survey, however, it was found that the mean and median rate was 0.98 and 1 respectively (Table 43). This value indicated that DP1a is applied in the

study area but its application was very weak (<25%). According to KII, there were only about 8% of them reported from Wourch and Dega ACZ settings users' boundary definition practiced. However, from the Woyina dega and Kolla ACZ there were no attempts to define CLR user boundaries. Due to this difference, the variation in perception behind the definition of CLR use across ACZ settings was highly significant (F = 7.7; P = 0.00). However, during expert KII it was described that there were few practices that exercised a CLR user definition outside the specific study area within the UBNB. It was reported that there were community institutions with well organised watershed user associations in defining and exercising user boundaries through strong by-laws. In this case, all KI rated that only one such good case was exercised per Woreda (district).

b) Boundary demarcation and delineation – DP1b

As to 62% of expert KI, the application of communal land delineation was exercised in different Woredas. However, with regards to demarcation, about 89% of expert KI reported that it was rarely applied. More to study area specific, the status of communal land boundary demarcation and delimitation according to the researcher field observation and 100% of KI responses, physical boundaries either for communal grazing or forest areas were not found demarcated in all study sites. However, cadastral surveying was made for CL boundary delineation. As reported from the Kebele LAU technician, 11 patches of CGL were delineated using a hand held GPS in Dega ACZ (Dngay ber study site) only. Besides, it was also reported from all kebele LAU technicians that no attempt has been made so far to fix permanent physical marks for CL boundary demarcation. In wourch ACZ, Abazazj site CFL were traditionally delineated but not demarcated even though this site was a protected communal forest. This traditional delineation was made by referring to natural landmarks, standalone trees, valleys/ridges and any other peculiar permanent features.

HH respondents were rating boundary delineation as it was moderately applied (2.85 and 3) for mean and median respectively. This means that thperformance of delineation was equivalent to 50-74% application rate. This delineation status was not found statistically significant across different ACZ settings, educational

levels and economic status (Table 45).This means that perceptions on exercising delineation were more or less similar between and among different co variants.

Table 45: MANOVA on Communal Land Administration Lot (DP1a+b; DP7 and DP8)

N=302,	Descriptive Stat			Educl. level		Econ. level		ACZ	
Items	Mean	median	Std. Deviation	F	Sig	F	Sig.	F	Sig.
Defining resource user boundary (DP1a)	.98	1.00	.639	.016	.89	2.1	.143	7.70	.000
Clearly defined boundary demarcation(DP1b)	0	0	0	0	0	0	0	0	
Clearly defined boundary delineation(DP1b)	2.85	3.00	.549	1.02	.31	.11	.737	1.79	.149
Absence of encroachment(DP1a)	0.46	0.00	.510	1.00	.31	.00	.985	16.5	.000
Community participation in delineation(DP1b)	1.69	2.00	.549	.074	.78	.54	.463	3.71	.012
Workability of Bylaws(DP1a)	1.44	1.00	.598	.418	.51	1.0	.303	5.13	.002
Gov. law support in providing use right to protect CLR(DP7)	**2.83**	**3.00**	.670	.000	.99	.03	.859	1.09	.411
Gov. program/law encourage UGF(DP7)	**2.59**	**3.00**	.888	.370	.54	.009	.923	1.05	.421
Absence of overlapping gap in DMP among KA leaders WSUA, KLAC and UG/Nested enterprises (DP8)	0.76	1.00	.805	1.52	.21	.02	.877	1.01	.560

Note: DP1 = clearly defined user group and resource boundaries; DP7 = Governmental recognition of minimal rights to organise community user groups; DP8 = Nested enterprises/overlapping functions

As Agrawal (2012) noted, if the design principle on resource use and boundary definition around users' community members is weak, then it is a sign of a malfunctioning institutional land administration system. As Pinkerton and Weinstein (2012) pointed out, this user right and boundary definition helps to internalise the positive and negative externalities produced by participants so that they bear the costs of appropriation and they could receive some of the benefits out of communal resources.

On the other hand, as Quinn et al., (2007) pointed out, restricting access and use of resources like feed or wood from communal property can reduce degradation by eliminating over exploitation and thereby improve the availability and quality of feed and wood resources in a sustainable way.

Nevertheless, from the above finding, although there was communal land boundary delineation, no demarcation and very weak delimitation of user rights was practiced. Even after delineation of resource use and boundaries,

community by-laws were formulated in each site. However, when examining the workability of those by-laws, its mean and median were found to be 1.44 and 1 respectively. This implied that the application of by-laws on the adjacent community member was rated between very weak to weak (<25%). However, KI described that there is a positive change in the application of by-laws, which was found better compared with the practices exercised before 10 years ago.

The other important activity under CLA lot 1 was to look in to whether neighbouring community members who were adjacent to the CLR participated during boundary delineation or not. In this case the rate of participation was found with a mean and median of 1.69 and 2 respectively. This showed that the neighbouring community participation was low (25%-49%). With this point, about 67% of community KI replied that although it was stated in the land administration and use proclamation (No. 133/2006) of the Amhara Regional State that community members have the right to participate. However, in practice, Participation of members and adjacent communal land users during delineation and demarcation during either boundary delineation or demarcation were not adequately excersised as it should be.

By and large, the effect of all weak activities practiced in the study area under the CLA lot 1 was reflected by the existed situation of excessive encroachment (DP1a). The mean rate for absence of encroachment was 0.46 while the median was 0 (Table 45). This showed that there was insignificant attempt to strictly reduce encroachment. With this, the level of performance in minimising encroachment was <25%. With these values there was no significant variation found between and among different covariant across different ACZ. Similarly, it was strongly pointed out by 87% of community KI and 95% of expert KI that encroachment due to the malfunctioning of community by-laws and the absence of boundary demarcation, encroachment became a very serious unattempted assignment for both the government as well as community leaders.

Table 46: Summary of Sustainability Design Principle: Clear Boundary Settings

Sustainability principles; (N=302)	Items	Mean	median	Status of Sustainability performance
DP 1: Boundary setting and associated bylaws	Defining resource user boundary(DP1a)	0.98	1	very weak
	Clearly defined boundary demarcation(DP1b)	0	0	Not done at all
	Clearly defined boundary delineation(DP1b)	2.85	3	Moderately strong
	Absence of encroachment(DP1a)	0.46	0	Very weak
	Community participation in delineation(DP1b)	1.69	2	weak
	Workability of bylaws(DP1a)	1.44	1	very weak
Average performance		1.23	1.16	very weak to weak

As Turner (2009) stated, practitioners tend to expect the community to be an undeniable group of people jointly managing a delimited communal resource through uncontested and clearly defined rules of access. Likewise, Cleaver (2009) also described that a concentration on boundaries highlights the need in development for clear administrative arrangements of CLRUM. However, Mebrhatu (2009) and Meskerem (2014) conducted a study in the northern highlands of Ethiopia and clearly pointed out that there was no attempt to practice demarcating communal lands. In conformity with these studies and from the above findings, boundary demarcation was found as unattempted practice where encroachment and CLR abuse was a series challenge. On the other hand, boundary delineation activity was the only activity that was moderately practiced. Nevertheless, other activities under this key design principle, like user boundary definition, workability of by-laws and absence of encroachment, were found very weak. Therefore, the finding generally depicted that the overall performance under DP1 was not satisfactory (<2) (Table 46).

7.2.2.2 Government recognition for the right to organise community user groups (DP7)

When it comes to government recognition of community user groups (CUG), the right to organise (DP7) was analysed. Under this, it was tried to see the situation on the rights of community users or appropriators to devise their own organised group. Those practices under DP7 was rated with a mean value of

2.83, and 2 59. This DP7 referred to how the law supported in providing user rights and also how government encouraged the formation of user groups respectively. The median for both of the practices was 3. This showed that this design principle was moderately applied (50%-74%) in terms of recognising the CUG formations and supporting them. On top of this, 100% of either community or expert KIs at all levels argued that there was a good attempt from the government side in recognising and supporting CUG formations and following up their functionality.

However, on the other side, community FG discussant reported that there was an exercise where government was highly supported UG by expropriating communal land for the purpose of different development interventions without having proper compensation. They added that the government also gave a portion of CL as a special favour for landless youths by organising them as a user group. On top of this, they also explained that government did a special benefit for the above user groups without real community member participation and permission; eventhough the law states to do so. Schweik *et al.,* (2013) described that if a government agency imposes its own rules on a community managing CLR, then, it will create suffering regarding the institutional sustainability and end up with failure unless full participation and permission by the general assembly of community members practically approved.

In general terms, under DP 7, focusing on government recognition to support CUG formation was found moderately strong. However, the provisioned legislation set by the government was not properly implemented. This is particularly true in terms of community members not getting proper compensation and participation for any expropriated CL and no real community participation when such a decision was passed.

7.2.2.3 Assessing overlapping of functions in the decision making process on communal land administration (DP 8)

Cinner and Clanahan (2013) sated the following:

"Nesting may occur either between user groups and larger governmental jurisdictions, or between user groups themselves. Many traditional CLRU systems contain multiple levels of organization that showed the branching properties of CLR system. This is somewhat a management arrangement between user groups and larger government body".

On top of this, as described in the extensive publications of Berkes (2012), intercommunity connections can be thought as horizontal linkages, whereas connections between multiple jurisdictional levels can be thought of as vertical linkages. On the basis of the above idea, this study deals with nested enterprises/institutional overlapping functions (DP 8) under CLA lot-1. The focus here was to investigate how appropriation, provision, monitoring, enforcement, and governance activities are organised in multiple layers of nested enterprises. Besides, the status of the overlapping gap in the decision making process (DMP) between and among Kebele Administration (KA) leaders, Watershed Users' Associasions (WSUA), Kebele Land Administration Committee (KLAC) and user groups was treated.

During the HH survey, it was found that the practice on the overlapping function between and among decision maker institutions (KA, WSUA and KLAC) with regard to their decision making process and found with the value of mean = 0.76 and media = 1 out of 4 point. This implies that institutional practice in performing DMP without an overlapping function was low. This indicated that there exists an overlapping institutional function between and among the above decision making bodies. Besides, the high overlapping function was clearly depicted in the analysis of the variance result that there was no statistical significance variation across educational and economic status as well as in different ACZ settings (F = 1.52, 0.24 and 1.01; P = 0.28, 0.877 and 0.56) respectively (Table 45).

In conformity with this, the issue was also discussed with community development agents (DA) and woreda experts KI. About 88% of community KI reported that the rights and autonomy to manage communal lands were not clear yet. They also depicted that there was an overlapping function in the decision making process particularly by KA, WSUA and KLAC on communal

resource use and communal land administration. This situation was highly reflected by community KI from each ACZ study sites with the loading factor ratio ranging between 0.31 and 0.35. similarly, GD have also reported that even from the Land Administration and Use Proclamation No. 133/2006, regulation No.51/2007 and subsequent directive set to administer communal land was not clearly articulated and functions and responsibilities were nestedly given to both Kebele CLAC,KA and KLAC.

In line with this, Gebremendhin *et al*. (2012) conducted their study in the North Shoa area of the Amhara Regional State of Ethiopia. These authors and found a similar finding that there was an overlapping of Kebele administration leaders and the watershed/community user group association leaders in their decision making process. They further stated that community residents also did not clearly know where and for whom they can give witness and report the unauthorised clearing/ excessive tree-cutting or illegal sale of forest and grasses.

As reported by 79% of community KI, there was very minimal and insignificant changes exhibited in the last 10 years. Therefore, from both the community HH survey and KI, it was perceived similarly. The perception on the actual performances on the decision making process and the absence of the overlapping function was institutionally very weak in managing CLRU in a sustainable way. To graphically depict the level of rating on the status of activity performance under CLA, lot 1 is presented by showing the level of success and limitation points (see Figure 18 below).

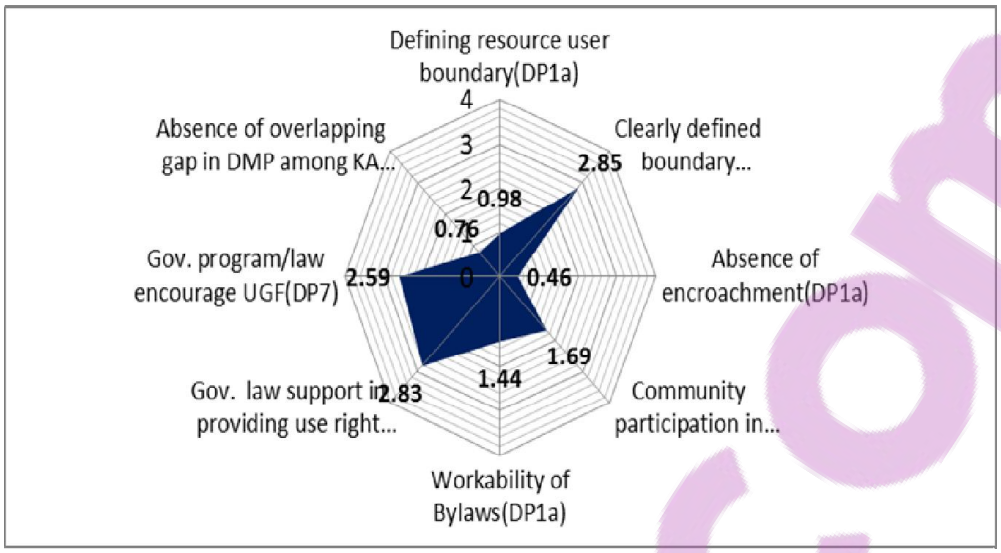

Figure 18*: Cobweb Presentation to Depict the Status of the Three Sustainability Design Principle 1, 7 and 8*

From the above figure it was possible to conclude that absence of encroachment, workability of by-laws and community participation during delineation, overlapping function between different decision making processes and demarcation practices had very weak institutional sustainability. However, both government programmes and law in supporting community user rights and user group formation were found moderately sustainable.

Therefore, as a general remark, it is not enough to only define user and resource boundaries. It is also important to exert a better effort to have a match between clear resource and use boundaries setting with that of non-overlapping institutional nesting in order to have a sustained institutional performance in CLRM practices.

7.2.3 Decsion on prioritising challenges on institutional practices under communal land administration lot 1

On the discussion made with expert FG, 8 practices were identified under the communal land administration lot 1 (DP1a+b, DP7 and DP8). To make a decision in prioritising the most challenging factors under CLA lot 1, Principal

Component Analysis (PCA) extraction method was used to decide the most outstanding problems based on factor load, rotational sum of the square and eigenvalues.

Table 47: KMO and Bartlet's Test of Adequacy for Sample Size

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		642
Bartlett's Test of Sphericity	Approx. Chi-Square	62.878
	df	28
	Sig.	.000

Values of measuring Kaiser Sampling Adequacy (*MSA)* indicated that the correlations between X_i and the other variables were measured and found to be 0.642. According to the Kaiser classification, sampling adequacy falls under the mediocre category and remains acceptable (Table 47).

Table 48: Test of Variance explained as an Extraction method for the PCA on the Sustainability Design Principles for Communal Land Adminstration Practices- Lot 1

Component N=302	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.473	23.411	23.411	1.473	23.411	23.411
2	1.174	14.680	35.091	1.174	14.680	35.091
3	1.108	13.847	51.937	1.108	13.847	51.937
4	1.027	12.843	64.780	1.027	12.843	64.780
5	.912	11.404	76.184			
6	.831	10.385	86.569			
7	.769	9.613	96.182			
8	.705	3.818	100.000			

To assess if the number of PCs are sufficient or not, any component that displayed an eigenvalue of >1 was accounting for a meaningful amount of variance, and was important to retain.

Based on this, to determine the number of PCs to hold on to the subsequent process, scree plot was also used and eigenvalues were plotted against PC

numbers (Figure. 19). The principal components retained were those on the slope of the graph that appeared before the decrease of the eigenvalue levels to the right of the plot (Manly, 2010). Using this criterion, four PCs were retained in the analysis of this study.

Figure 19*: Scree Plot for Nine Sustainability Design Principle Practices under Communal Land Administration - Lot 1*

The first four PCs with eigenvalue >1 were positive coefficients indicating a positive correlation among the variables (Table 48). Thus, all selected four PC encompass a larger percentage with the total variation of 64.78%.

Principal component 1 (PC1) that was found with 1.473 of the initial eigenvalues shared 23.411%. This was represented by clearly defined communal land boundary demarcation (DP1) (Table 48). The variance explained under this component was equal to the sum of the square loading (SSL) across rotation and was represented with the equation as below:

(PC1) = 0.438X1 + 0.567X3 + 0.3238X4 + 0.446X5 0.320X7 + 0.687X8 = 1.473

Table 49: Main Principal Component Matrix Load Factor across Sustainability design principle practices under Communal Land administration- Lot 1

Items under Lot 1- LA ; N=302	Component			
	1	2	3	4
Clearly defined boundary demarcation(DP1b)	.438	.322	.282	.536
Absence of encroachment(DP1a)		.536	.283	.502
Workability of bylaws(DP1a)	.567			
Community participation in boundary delineation(DP1b)		.359	.599	.441
Clearly defined boundary delineation (DP1b)	.325	.695		
Government law support communities providing use right protecting CLR(DP7)	.446		.287	.394
Government program encourage UGF(DP7)	.320	.340	.612	.293
Absence of overlapping gap in DMP among KA leaders , WSUA, KLAC and UG(DP8)	.687			

Note: Extraction Method: Principal Component Analysis. a. Four components extracted.

The second Principal Component *(*PC2) also found with an initial eigenvalue of 1.174. It shared 14.68% of the variationswhich, made cumulative variation to be about 35%. PC2 was represented by encroachment (DP1a). The variance described under this component was equal to SSL represented with the following equation:

$PC_2 = 0.322X1 + 0.536X_2 + 0.359X_4 + 0.695X_5 + 0.340X_7 = 1.174$ (Table48).

In addition, Principal Component 3 *(*PC3) shared 13.847% of the variations with an eigenvalue of 1.108. This made the overall cumulative variation to be 51.937%. PC3 was represented by workability of by-laws (SP7). This is the third important challenging activity hampering sustainability. The information on workability of by-laws variance expressed under component 3 was equivalent to the SSL equation as:

$PC_3 = 0.282X1 + 0.283X_2 + 0.599X_4 + 0.287X_6 + 0.642X_7 = 1.108$

The last component (PC_4) with an eigenvalue >1 (1.027) was 12.843% with cumulative percentage of variance 64.78%. This component was represented by community participation in boundary delineation (DP1b) practices. The variance pointed out under this component was equal to SSL across rotation and was represented with the following equation:

$PC_4 = 0.681X1 + 0.642X_2 + 0.642X_4 + 0.642X_6 + 0.642X_7 = 1.027$

Therefore, in the above PC analysis, out of eight factors under sustainability DP 1, 7 and 8, four challenging factors were identified as most important gaps. These were: Absence of CL boundary demarcation, encroachment problem, poor functionality of by-laws and community participation were found the most important challenges and highly prioritized problems under CL administration lot 1 (Table:50).

Table 50: Load Factor Communality Extraction on Decision Choice Ranking under Communal Land Administration- Lot1

Elements of CLRUM sustainability principles under CLA lot ; N=302;	Initial	Extraction
Clearly defined boundary demarcation(DP1b)	1.000	.729
Absence of encroachment(DP1a)	1.000	.680
Workability of bylaws(DP1a)	1.000	.678
Community participation in boundary delineation(DP1b)	1.000	.672
Absence of overlapping gap in DMP among KA leaders , WSUA, KLAC and UG(DP8)	1.000	.635
Clearly defined boundary delineation (DP1b)	1.000	.533
Government law support communities providing use right protecting CLR(DP7)	1.000	.454
Government program encourage UGF(DP7)	1.000	.401

Extraction Method: Principal Component Analysis

7.2.4 Examining communal land and resource use management practices - Lot 2

This communal land resource use management (CLRUM) lot 2 includes three key institutional sustainability design principles. These are:

- Congruence with local conditions where community by-laws are congruent with local situations/suitable to the local situation or not (DP2a).
- Appropriation and provision. This is about considering the proportional equivalence between benefits and responsibilities (DP2b).
- The status of conflict resolution mechanisms (DP6).

7.2.4.1 Congruence with local condition; appropriation and provision of rules, benefits and responsibilities in managing communal resource use (DP2a+b)

With regard to Ostrom (1990) and Cox *et al*. (2010), DP2 in general refers to the congruence between appropriation and provision of rules in relation to the local conditions. As Agrawal (2012) described, this principle stipulates two separate conditions. The first condition was that both appropriation and provision rules conform in some way to local conditions; and the second condition was that congruence exists between appropriation and the provision of rules interms of community benefit and their responsibility. Congruence between appropriation and provision of rules (DP2b) is frequently described in the literature as congruence between costs incurred by users in terms of labour, resources and money(responsibility) on the one hand and, on the other, the benefits they receive via their participation in collective action (Pomeroy *et al.,* 2011).

Based on Ostrom's (1990) and Cox *et al.'s* (2010) argument, under congruence with local conditions design sub principle (DP2a), major points considered were: to see to what extent the nature of appropriation and provision of rules was in congruence with local / social and environmental conditions in the study area. On the other hand, under this sub principle, appropriation and provision (DP2b) was also considered to see how the situation on the benefits obtained by users from a CLR that was determined by the provision of rules or not. Under key design principle two (DP2a+b), there were four major activities that communities exercised to sustain CLRU. These are:

- Capturing of benefits from CLR,
- Community contribution in the form of labour and payment for nominal fee,
- Community members and leader responsibility in controlling CLR use, and
- Reaction/response for the illegal secret exploitation of CLR.

Table 51: Statistical Findings on Communal Land Resource Use and Management Practices - Lot 2

Iterms N=302,	Descriptive Stat			Educational level		Economic level		Altitudinal lelvel	
	Mean	Median	Std. Deviation	F	Sig.	F	Sig.	F	Sig.
Appropriation and provision : Comm. members capture benefit from CLR (DP2b)	1.02	1	.75	.39	.52	.08	.76	1.36	.05
conditions(Existence of Community contribution in the form of labour or payment for nominal fee….(DP2b)	2.91	1	.72	.62	.43	.02	.88	1.07	.73
Community leader responsibility in controlling CL resource use(DP2a)	2.14	2	.73	4.62	.03	3.95	.04	78.6	.00
Provisioned by-laws are congruent with local situations Community reaction/response for secret exploitation of CLR(DP2a)	1.66	2	.60	4.14	.04	.938	.33	25.2	.00
Existence of functional use conflict resolution mechanism (DP6)	2.05	2	.734	1.86	.17	1.49	.22	86.5	.00
Existence of CLU boundary conflicts resolution mechanism (DP6)	1.93	2	.724	.281	.59	.791	.37	80.5	.00

From the HH survey, the nature of benefit capturing practices from CLR was rated as very weak (mean = 1.02 and median = 1). On the other hand, their contribution in terms of labour and money for CLR development intervention was moderately exercised (mean = 2.91 and median = 3). With regards to either benefit capturing and community contribution, there was no any statistical variation found between different covariant factors like level of education, economy and ACZ (P = 0.59 and 0.73) (Table 51).

As to 77% of community KI and 93% of experts KI described and argued that there were many community supporters of the by-law/government law that was set to protect and locally imposed bans on exportation of communal land resources like grass, firewood or other forest products outside the community. However, they agreed that existing legal by-laws and restrictions for resource use were in place, but not obligatory and workable.

In all ACZ settings in the study area, 92% of community KI explained that communities also worked 40 free labour days in a year on communal land development interventions for activities like planting tree seedlings, sowing

grass seeds, conserving and other CLM practices. Moreover, community KI from Wourch and Dega ACZs further explained that communities contribute money for guarding and protecting communal forest. Besides, 100% of the interviewed development agents and experts at all levels confirmed that community free labour contribution during mass mobilisation to develop and manage CLR was moderately exercised.

On the other hand, community leadership to handle the responsibility of controlling CLR use was found to be weak (mean = 2.14, median = 2). The perception of community HHs in this regard was statistically significant variation between and among different educational, economical and ACZ settings (P = 0.03, 0.048 and 0.000) respectively. In support of this, 69% of community KI described this with their own local language as "*Yegara wongara*". This means: managing communal property or any property shared in common is a difficult and problematic task to manege. Communal property management for community leaders was tough to run properly. In line with this, particularly KI from Kolla and Woyinadega ACZs reported that trees from CFL were felled here and there and grass was illegally taken away without permission. According to these KI, it was becoming evident that they were generally perceived that most leaders and community members were not responsible in controlling CLRU.

In addition, on whether provisioned by-laws were congruent with local situations or not, all community key informants were agreed that by laws set by the communities were congruent with government legislations and community cultural settings. But, according to them, as long as it is communal resources, most of community members were not enthusiastic and cooperative to apply the agreed upon by-laws and did not show interest to apply them as per the rule. According to GD, this was so simply because community members were not fully involved in setting by laws and decision making process.

From the community HH survey, the response on community members illegal secret exploitation of CLR (DP2a) was rated as weak (mean = 1.66 and median = 2). From the analysis of variance it was depicted that there was high significant variation only across different ACZ settings (P = 0.000). No

significant variation across covariants at different educational and economic levels was found.

The reason for variation in controlling CLR use across ACZs, as pointed out by GD in Kolla and Woyinadega ACZs was because of the the existence of very weak controlling system due to the traditional set of experience accumulated within the surrounding community. According to FG discussant, it was further explained that the reason for this was also because communities around there have grown up with no restrictions on using CLR. This made them to reject any by-laws that forced them to use CLR in a restrictive way. On the contrary, in Wourch and Dega ACZ sites, it was reported that there was a relatively good controlling mechanism. According to FG discussant, there was a very limited and shortage of CLR in these ACZs. Due to this, most community members in this ACZ respected CLR and the overall controlling mechanisms were with better function compared to the other ACZ settings.

Young (2012) explained that considering local conditions that are involved with the predominant culture, ideology, customs, and livelihood strategies of a community played a great role in controlling CLR use in a sustainable way. On the other hand, Gautam, Schmidtz and Willott (2013) highlighted the negative consequences of externally imposed rules that do not match with local customs, culture, local ideology and livelihood strategies. In this case, particularly on whether the government legislation and community by-laws were in congruence with the local culture and custom, it was found from KII that 97% of them agreed that both community by-laws and government legislation were congruent with the local situation, ideology and livelihood strategy.

However, in other areas outside the study site, Gautam and Shivakoti (2005) described that there was an experience that community by-laws imposed on communities. For example, there were instances where community by-laws forced the community to enforce a total ban on harvesting communal land resource products like collecting of dead wood and grass. This kind of by-law was not congruent with the local needs and situation. It rather contradicted their livelihood and customary systems of local villagers who had traditionally allowed them to collect leaf litter for animal bedding and fallen twigs for firewood.

In this study, FG discussant also emphasised that they need to have by laws to protect and develop CLR. However, they wanted also to be benefited out of the protected CLR. According to this GD, it was then after these community members have the interest to control illegal secrete exploitation of CLR

7.2.4.2 Conflict resolution mechanisms in managing communal land and resources (DP6)

> "*Systems with low-cost conflict resolution mechanisms are more likely to survive. Conflict over an exhaustible resource is inevitable in CLR management, necessitating the presence of established mechanisms for conflict resolution to maintain collective action"* Ostrom (1990).

Under this sustainability design principle on conflict-resolution mechanisms, the focused area was to see how the appropriators and their Kebele administrators and community elders have effectively access to resolve conflicts. This is between and among appropriators or between appropriators and officials. Under this, two conditions of conflicts in the area were identified. These are: communal land resource use conflict and boundary conflicts. Therefore, it was tried to check the institutional performance in resolving both types of conflicts.

According to community HH survey, the existence of functional use and boundary conflicts resolution mechanisms, in general, were found weak (mean = 2.05, 1.93 respectively and median = 2 in both cases. From the ANNOVA, it was found that there existed a significant statistical variation across different ACZ settings for both resource use and boundary conflict resolution mechanisms (P = 0.000). From community KI, it was noted that variation existed between Dega and Kolla ACZs. As reported by 67% of KII, the status of communal land boundaries and resource use conflict resolution in Dega ACZ was moderately functional while 78% of KII in Kolla ACZ reported that there were only very weak resolving mechanisms.

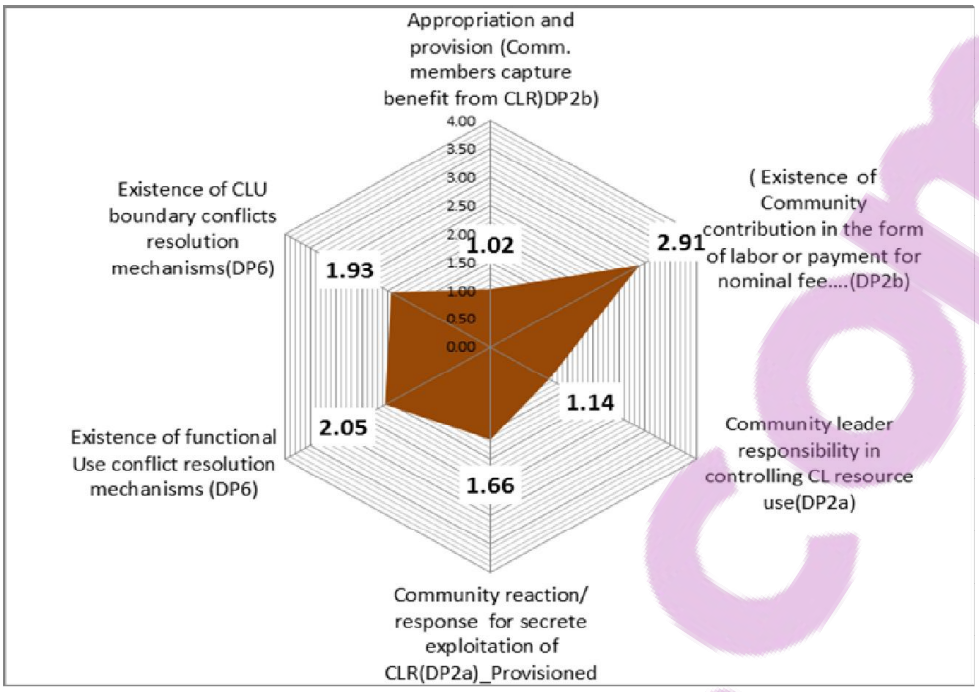

Figure 20*: Cobweb Presentation on the Status of Institutional Sustainability under Communal Land Resource Use and Management Practices – Lot 2*

With regard to the overall conflict resolution mechanisms, 71% of KI experts reported that conflict resolution mechanisms existed in most community by-laws and government law. According to them, it was stated that mediation and arbitration for disputes arise out of communal land, and adjacent boundary and resource use conflicts shall be resolved by the elders' committee or by their own respective cultural mechanisms. In line with this, FG discussant remarked that resolving conflicts through selected community elders' committee was practiced. They also pointed out that they prefer elder committees rather than using external authorities to resolve disputes (e.g. state police and responsible government authorities). Meanwhile, only 59% of community KI believed that conflicts on communal land resource use had in fact declined compared with what happened before ten years ago.

In conclusion, as depicted in Figure 20, conditions with regard to the existence of community contribution in the form of labour or payment of a nominal fee were found moderately functioning. Besides, the existence of positive congruence between government legislation and community by-laws was also

moderately functional. In this case, from GD, it was explained that none of them were against the local tradition or cultural norms as well. However, the actual performance on benefit capturing from CLR and community reaction/response for illegal secret exploitation of CLR was perceived and rated by the HH survey from very weak to weak. Therefore, attention should be given by the government and community leaders to make better benefit share out of CLR uses. It was also strongly emphasised by community FG discussants that community leaders in different positions should exert all the necessary effort to make the agreed by-laws participatory and there by functional.

7.2.4.3 Decision choice on ranking of challenging institutional practices under communal land resource use and management - Lot 2

Regarding principal component analysis, the extraction method was used to decide the most outstanding challenging institutional practices based on the factor load, rotational sum of square and eigenvalues.

Table 52: KMO and barttel's Test for Adequacy of sample Size

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.635
Bartlett's Test of Sphericity	Approx. Chi-Square	560.328
	Df	21
	Sig.	.000

Values of measuring Kaiser Sampling Adequacy (*MSA)* indicated that the correlations between X_i and the other variables were measured and found to be 0.635. According to the Kaiser classification sampling adequacy falls under the mediocre category and remains acceptable (Table 52).

Table 53: Total Variance Explained as Extraction Method for PCA on Practices under Design Principle 2a and 6

Total Variance Explained									N=302
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.221	34.338	34.338	2.221	34.338	34.338	2.405	34.338	34.338
2	.899	20.180	54.537	.899	20.180	54.537	1.413	20.180	54.537
3	.808	15.861	70.398	.808	15.861	70.398	1.110	15.861	70.398
4	.667	9.523	79.920						
5	.537	7.674	87.594						
6	.516	7.367	94.961						
etc									

In order to take a sufficient number of PCs, any component that displayed an eigenvalue of > 0.80 and the rotational sum of square loading (RSSL) >1 was taken and considered important to retain, accounting for a meaningful amount of variance. Scree plot was also used and eigenvalues were plotted against PC numbers (Figure 21). The principal components that were retained were those on the slope of the graph and appeared before the decrease of eigenvalue levels to the right of the plot (Manly, 2010). Based on this, three principal components (PCs) were retained for this analysis out of all the key design principles implemented under CLUM – lot 2.

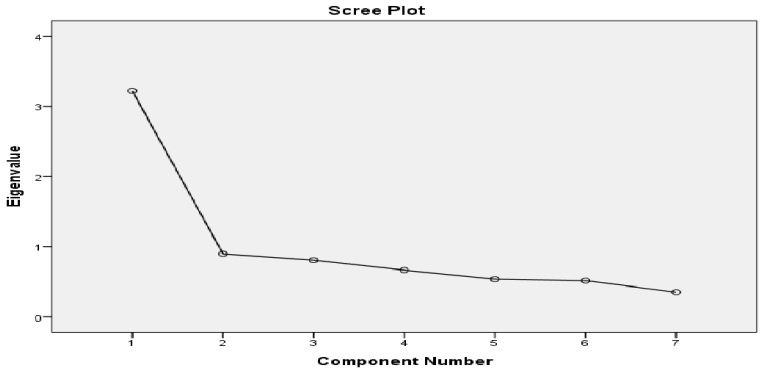

Figure 21*: Scree Plot for Key Design Principles under Communal Land Resource Use and Management - Lot 2*

The first four PCs with eigenvalue >0.8 and RSSL>1 were positive coefficients indicating a positive correlation among the variables. Principal component 1 (PC1) was found with 2.221 of the initial eigenvalues and shared 34.338% of the variance percentage. This was represented by community leader responsibility in controlling CL resource use (DP2b) which was found the most challenging problem under Lot-2 (Table 48). Community HHs perceived this practice as a first priority gap to be improved to keep institutional sustainability of CLRM. The variance explained under this component was equal to the sum of square loading (SSL) across rotation and was represented with the equation as:

(PC1) = 0.816 X 1 + 0.715 X 3 + 0.4917 X 6 = 2.405 (Table53).

The second principal component *(*PC2) also takes an initial eigenvalue and RSSL equal to 0.899 and 1.413 respectively that share 20.180% of the variations that made the cumulative variation to be 54.537%. This was represented by lack of community members' captured benefit from CLR - DP2b. From this, the HH survey showed that capturing benefit from CLR was the second most series gap that should be resolved by community leaders and concerned government bodies.

Table 54: Main PC Matrix Load Factor for key Sustainability Design Principles under Communal Land Resource use Management- Lot 2

Identified problems N=302	Component matrix;		
	1	2	3
Community leader responsibility in controlling CL resource use(DP2b)	.816		.167
Comm. members capture benefit from CLR - DP2b		.255	
Community reaction for secrete exploitation of CLR - DP2a		.031	
Existence of functional communal resource use conflict resolution mechanisms - DP6	.715		.182
Existence of CLU boundary conflicts resolution mechanisms - DP6)		.327	
Existence of Community payment for nominal fee etc - DP2a	.491		.201

Note: Extraction Method: Principal Component Analysis. a. 4 components extracted

The variance described under this component was equal to SSL representing with the equation as:

$PC_2 = 0.255X2 + 0.031X_3 + 0.359X_5 = 1.413$ (Table 53).

Principal component 3 (PC3) also shares 15.861% of the variations with an eigenvalue of >0.808 and RSSL = 1.110 with cumulative variation of 70.398%. This was represented by the existence of weak community reaction for illegal secret exploitation of CLR - DP2a. This was found as a third important challenge to be resolved inorder to fulfil the sustainability principle effective under CLUM Lot 2 practices. As indicated under Table 52, the variance for the information on illegal secret exploitation of CLR expressed under component 3 was equivalent to the SSL represented with the equation as:

$PC_3 = 0.167X1 + 0.182X_4 + 0.201X_6 = 1.110$ (Table 53).

Table 55: Load factor Communality Extrction on Decission Ranking under Designe Principle - Lot 2

Identified problems in order of priority; N=302	Initial	Extraction Load factor
Community leader responsibility in controlling CL resource use(DP2b)	1.000	.964
Comm. members capture benefit from CLR - DP2b	1.000	.822
Community reaction for secrete exploitation of CLR - DP2a	1.000	.698
Existence of functional communal resource use conflict resolution mechanisms - DP6	1.000	.667
Existence of CLU boundary conflicts resolution mechanisms - DP6)	1.000	.635
Existence of Community payment for nominal fee etc - DP2a	1.000	.611
Etc		

Note: Extraction Method: Principal Component Analysis

Therefore, in the above PC analysis, community leader responsibility in controlling CL resource use, community members capture benefit from CLR and community member reaction towards the illegal secret exploitation of CLR were found the most challenging practices. These were with the higher ranked problems among all institutional sustainability DP practices under CLRUM lot 2.

In line with this, Tilahun (2011) conducted a similar study in the Amhara region in four KAs. Two were with strong while the other two were with weak communal land management. Among communities with a strong communal land management system, he reported that communities complained that,

although their communal lands were closed and there were high restrictions and penalty payments, there was no practice where community members benefited out of closed communal land resources. According to this finding, he pointed out that, although there were strong by-laws and regulations, if community members did not get any benefit out of a closed CLRthen, the sustainability of CLRM will remain in question. Hence, from this study, it was pointed out that those community respondents from this Kebele had no concern to report to Kebele leaders when secret theft was observed.

In line with the above finding, it is revealed that even if there is a strong by-law and regulation, it is unlikely to be functional unless community members get advantage to support their livelihood out of closed CLR.

7.2.5 Communal land resource use controlling practices - Lot 3

Lot 3 includes three major key design principles for CLM. These are:

- Decision making arrangement and collective choice arrangements (DP3). This is focusing on communities affected by the operational rules that can participate and modifying the operational rules.
- Functional monitoring system with support of community by-laws (DP4a+b). Under this, those monitoring function and system that are accountable to controle the resource investigated.
- Graduated/step by step sanctions/penalty/punishment application on CLR was also the focus under DP 5.

7.2.5.1 Decision making arrangement and collective choice arrangements (DP3)

Ostrom (1990:90) stated that, "*most individuals affected by the operational rules in communal resources can modify the operational rules through participation in decision making process*."

According to Ostrom, this principle is in the spirit of the importance of local knowledge in applying by-laws to manage communal land and resource

management. With this notion, community participation right, the community leader decision making process (DMP) and women participation in DMP were examined. With regard to the performance of community participation right in public vote in DM, and community leaders' DMP through community participation, HH respondents perceived both activities were rated as weak (mean = 1.91, 1.82 respectively; and median = 2 for both cases) . Besides, there was no significant statistical difference found across educational and economic status. However, variation between and among different ACZs was significant (Table 56).

On the other hand 41% of community KI reported that both communities participation in voting and in the decision making process (DMP) was moderate while the remaining 59% rated it as weak. This practice was exceptionally very weak particularly in Kolla ACZ. This was because, institutionally, land administration and user practices were generally at the infant stage, particularly in this ACZ.

Similarly, according to the HH survey, the overall status of elected women's rights in DMP was found relatively better, though it was still weak (mean = 2.29, median = 2). However, variation was found statistically very significant only between and among different ACZ settings (F = 60.91; P = 0.00) (Table 56). From one way ANNOVA, this high variation depicted between respondents in Wourch and Dega ACZ where they rated relatively moderate while respondents in Kola and Woyina Dega rated it as very weak. In congruence with this, about 78% community KI who were from Wourch and Dega ACZs responded that women participation in both voting or DMP was reported as good. Even they emphasised that, nowadays, women are very much empowered compared with the past 10 years. Conversely, 87% of community KI from Kolla and Woyina dega ACZs perceived women participation in both voting and DMP was nil to very weak. Particularly, 100% of KI from Kolla reported that communities used to traditionally exercising men dominated decision-making processes. According to them even the elected women were not doing all the expected power exercises DMP properly in a way it was required.

Rehmato (2011) also depicted in his study conducted in the Amhara region that there were no experiences where decisions were passed by public vote. The author also added that real community participation in the decision making process was almost none in this part of the region. In line with this, concerning CLR use, management or administrative matters of community KI from all study sites, (ranging from 83% from Kola to 91% from Wourch ACZ) responded that community leaders eventually reach decisions. However, decision on communal land management related issues mostly was through mechanisms of roll call vote with KA executive committee members. They also added that public vote was also rarely exercised. However, it was also pointed out that, with regard to decision making and collective choice arrangement, no decision was made by the community leader/KA chairman alone in all the ACZs.

7.2.5.2 Key functional monitoring system with support of community by-laws (DP4a+b)

As Young (2002) claimed, monitoring makes those who do not comply with rules visible to the community, which facilitates the effectiveness of rule enforcement mechanisms and informs strategic and contingent behaviour of those who do comply with rules. Under DP4a the presence of monitors or not, and under DP4B looking over the monitoring system and condition that thelps for monitoringCLRM were assessed.

From the researcher's field observation, illegal collection of resources from protected communal forest resources, particularly from Kolla and Woyina dega ACZ study sites, were found comparatively high. However, from the HH survey, control on illegal collection of CLR for occasional sale or consumption in general was categorised as weakly exercised practices (mean = 2.25, median = 2). Besides, there was no significant variation found across covariant (educational and economic status) in implementing such practices. Besides, both community performance behind regular and periodic patrols to control CLR and a functional monitoring system with the support of by-laws were perceived also as weakly and very weakly implemented practices in the study area (mean = 2.23 and 1.23; median = 2 and 1) respectively. Similarly significant statistical variation

was not found between and among covariants particularly with an attempt to control theft over CLR (Table 56).

Community KI on the other hand were perceived in conformity with the HH survey findings with regard to illegal collection of CLR control for occasional sale or consumption from CLR. Nearly 79% of KI argued that controlling mechanisms were at a rudimentary stage and communities and community leaders described them as weak. Community's perceptions also underline the feasibility of monitoring in controlling such illegal exercises. According to GD, this was simply because communities believe, even though it was theft, most community members do not cut trees in excess of their needs. According to them, most community members believed that what community members illegally consumed was simply because it was necessary for their livelihood and they do not think of it as an illegal attempt.

Particularly, with regard to the actual exercise in executing a functional monitoring system with live and workable by-laws, about 93% of community KI agreed that the overall performance was very weak. As a remark, they also added that there was no change or improvement in this particular issue compared with the past ten years.

Concerning regular and periodic patrols to exercise control, particularly FG discussant from Dega and Wourch ACZs reported that there was a regular patrol and no problem in this regard. According to these GDs, the reason for this was that they permanently recruited a guard among community members. Payment for the guard came from the money contributed by each individual community member. Although no sufficient study was found at this time, from the researcher's field experience, recruiting a guard among members was exercised in many places in the Upper Blue Nile Basin to protect and conserve CLR.

Besides, literature also depicted that similar activities were also practised in other countries. For example, in Agrawal's (2008) study, the strength of local forest institutions in Kumaon Himalaya, India, found that "the number of months a guard was hired has a very strong and statistically highly significant direct

effect on forest condition." Bardhan (2010) performed a statistical analysis of 48 CLR systems and found a positive correlation between cooperative behaviour and the presence of a guard position. However, Ghate and Nagendra (2005) found a negative correlation between the presence of a guard and forest conditions in their statistical analysis of 95 community-based forest management systems in India.

In this regard community KI responded to the advantages and disadvantages of hiring a guard. About 61% of them responded that guarding has more an advantage as long as the guard is a community member. The remaining 39% replied that guarding has a disadvantage simply because they have experienced that the hired guard was becoming corrupt after a while and started abusing communal resources. However, McCarthy *et al*. (2011) and Pender (2012) showed that it may be optimal for a community to establish restrictions without actually spending anything on monitoring, corresponding to the "social fencing" case where the community establishes restrictions but does not hire a guard. Rather, the community enforces the restrictions by mutual trust.

Table 56: Statistical Findings on Communal Land resource use Control Design Principle - Lot 3

N=302,	Descriptive Stat			Educational level		Economic level		ACZ	
Items - Lot 3 LU controle	Mean	median	Std. Deviation	F	Sig.	F	Sig	F	Sig.
Community participation right in public vote in DM(DP3)	1.91	2.00	.599	.123	.727	.205	.65	23.86	.00
Community leaders DMP through community partcipation(DP3)	1.82	2.00	.632	2.75	.098	.334	.56	36.01	.00
Elected women has right in DMP(DP3	2.29	2.00	.843	.317	.384	2.05	.15	60.91	.00
Illegal theft control for occasional sale or consumption from CLR(DP4b)	2.25	2.00	.835	.56	.455	1.359	.24	74.41	.00
Regular and periodic patrol to control CLR(DP4b)	2.23	2.00	.822	5.56	.019	.021	.88	101.17	.00
Functional monitoring system with support of bylaws(DP4a)	1.23	1.00	.732	4.96	.027	.121	.78	98.17	.00
Existence of applied penalty from money punishment to jail (DP5)	1.17	1.00	.728	1.07	.300	2.124	.14	52.26	.00
Traditional way sanction methods exist to be applied for violations of community laws/by-laws (DP5).	1.09	1.00	.840	.081	.776	1.168	.281	81.970	.00

On top of the above, in this study, particularly in Kola ACZ, about 89% of community KI indicated that monitoring was difficult due to the topography and size of the communal land and, as a result, encroachment by the adjacent land holders to communal grazing/forests land was highly exercised. This practice occasionally expands their individual territory and diminishes the size of the communal land areas.

7.2.5.3 Graduated/step by step sanctions application on communal land resources (DP5)

> *"We have already seen that people prefer to spend more time negotiating consensus than establishing and imposing sanctions".* Cleaver (2009:374).

According to the above author, sanctioning discourages individual members within the community from excessive violations of community by-laws.

Wood/grass theft from communal forest and grazing land does occur for individual consumption and occasional sale. Under this DP, more specifically whether appropriators who violate operational rules were likely to take graduated sanctions or not (depending on the seriousness and the context of the offence) by other appropriators or by officials accountable to the appropriators, or by both or by none were assessed.

This practice under DP5 was commonly exercised in all study sites. However, an action that was taken in the form of different sanction methods varies from place to place. Under this design principle, there were two major activities investigated. One was the existence of a penalty with money punishment or a jail sentence. The other was the existence of traditional sanction methods applied for violations of community by-laws/legislation.

In both cases from the HH survey the existence of a penalty and the traditional way of sanctioning were both found weakly performed (mean = 1.17 and 1.09; median = 1 and 2) for respective type of sanctions. Among other covariates, significant variation was also exhibited across different ACZ settings for both penalty exercise and the existence of the traditional sanction method (Table 56). Both Wourch and Dega ACZs perceived that imposing a penalty and community concern in reporting to their leaders were found good to very good(mean = 3.56 and 3.67 respectively; median in both cases = 4).

As to the finding from FG discussant, the reason for the high rate in Wourch ACZ was that communities associated forest protection more with religious beliefs, while in the Dega ACZ they associated the existence of forest with their life. GD from Dega ACZ also reported that, they understand the consequence if they lose community forest, then an effect like flooding and erosion will severely damage their livelihood. Therefore, communal forests, particularly on the Dega and Wourch ACZs, are considered as part of their livelihood. On top of this, in Wourch and Dega ACZs, 69% of community KI described that step-by-step sanctions exist, and were applied well for violations of community by-laws and legestlation including a combination of fines and labour. However, jail time punishment was practiced on rare occasions.

Conversely, about 84% of community KI from Kolla and Woina dega ACZs reported that there was a step-by-step sanction that existed in the by-law. But, it was not at all applied for such violations. In support of this, it was found from the HH survey that both activities were very weak (mean = 1.03 and 1.27) respectively while median = 1 for both cases.

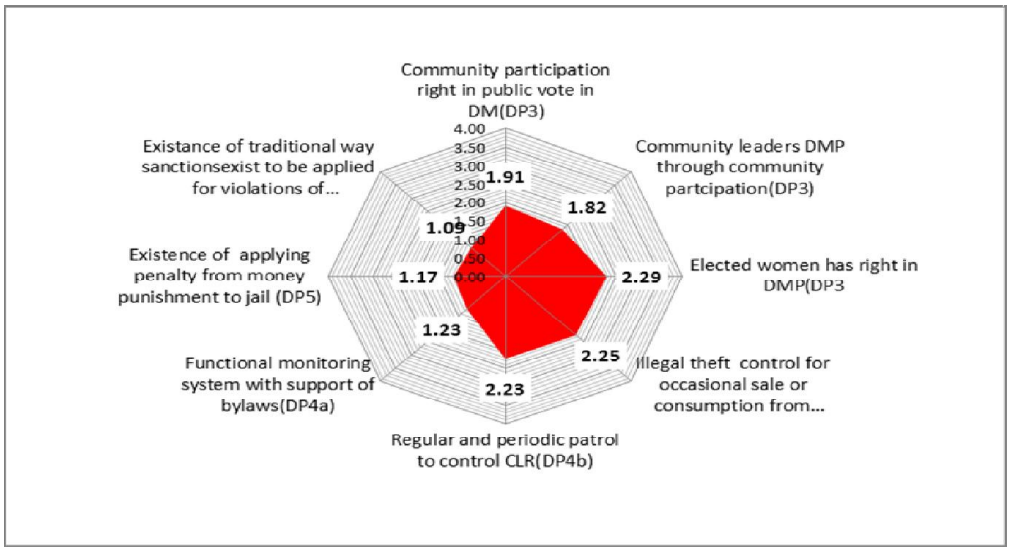

Figure 22*: Cobweb Presentation Depicting the Status of Communal Land Resource Use Controlling Practices - Lot 3*

In summing up, as is shown in Figure 22, HH respondents perceived that performing sustainability principles on monitoring of users and resources (DP4a+b) and collective-choice arrangements (DP3) were found weak. On the other hand, applying principle of graduated sanctions was found to be very weak. Particularly from community KI from Kolla and Woina Dega it was confirmed that both principles under CLRU control lot 3 were weakly applied.

However, Gautam and Shivakoti (2005) pointed out that the amount spent on graduated sanctions and monitoring is an increasing function of communal land resource profitability. However, the effects and the 'how' of these functionality issues are ambiguous in general, though we may expect that increases in sanctions and penalties leads to the high probability of sustaining communal land resources. Nevertheless, as DP 4a+b were found to be weak in their application, the conclusion was communal institutions in managing communal

land resources use control were generally weak and it was not in line with the sustainability of communal land resources use and controling system.

7.2.6 Decision choice on ranking the most challenging factors under CLRU control - Lot 3

For this principal component the analysis extraction method was used to decide on and prioritise the most outstanding challenging factors hampering the sustainability of institutional practices under Lot 3. The ranking of challenging problems was based on the factor load, the rotational sum of the square and eigenvalues.

Table 57: KMO and Bartlet's Test for Sample Adequacy

KMO and Bartlett's Test;		N=302
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.651
Bartlett's Test of Sphericity	Approx. Chi-Square	564.169
	Df	28
	Sig.	.000

Kaiser sampling adequacy (MSA) indicated that the correlations between X_i and the other variables were measured and found to be 0.651. According to the Kaiser classification, sampling adequacy falls under the mediocre category and remains acceptable (Table 57).

Table 58: Total Variance Extraction method from PCA for Communal Land Resource use Control- Lot 3

Component (N=302)	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.245	40.561	40.561	3.245	40.561	40.561	2.488	31.096	31.096
2	1.060	13.250	53.811	1.060	13.250	53.811	1.239	15.484	46.390
3	.874	10.921	64.731	.874	10.921	64.731	1.153	14.412	60.992
4	.767	9.394	74.316						
5	.647	8.083	82.399						
6	.549	6.863	89.262						
7	.461	5.761	95.022						
8	.398	4.978	100.00						

Extraction Method: Principal Component Analysis

To assess the number of PCs whether sufficient or not, any component that displayed an RSSL>1.52 or eigenvalue of >0.85 was accounting for a meaningful amount of variance and was retained in the ranking procedure. To determine this, scree plot was also used and eigenvalues were plotted against PC numbers (Figure 23). The PC that was retained on the slope of the graph appeared before a consistant decline of eigenvalues levels to the right of the plot (Manly, 2010). Using this criterion, three PCs were retained as the most important challenging factors for the sustainability of institutional practice under lot 3. Factors extracted represented different patterns of practices on the key design principles implemented under CLRU control practices - lot 3 (Table 58).

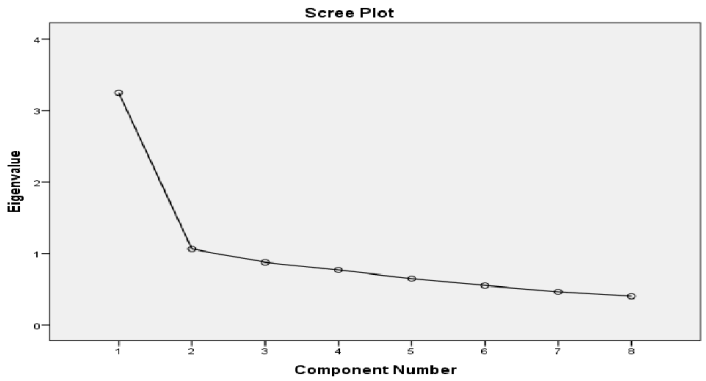

Figure 23*: Scree Plot for Communal Land Resource Use Control Design Principle (Lot 3)*

The entire first three PCs with RSSL>1.52 or eigenvalue >0.85 were positive coefficients indicating as a positive correlation among the variables (Table 55). The first principal component (PC_1) considered was the one with the largest eigenvalue and percentage of variation of the total variation. Although the first PC took the major portion, this quantity was taken to explain an inadequate percentage of the total. Hence, the second and the third PCs were also considered by adding the first to the second and the third PCs to encompass and maintain a larger percentage of the total variation (60.99%).

Principal component 1 (PC1) was found with 3.245 of the initial eigenvalues and shared 40.56% of the variance percentage that included and was represented by weak/no monitoring system with the support of functional by-laws (DP4a) (Table 58). This means that there exists a very weak or absence of monitoring system with a weak support of functional by-laws. This was found as the highest ranked problem in the study area where communities wanted to be resolved to keep CLR in a more sustainable way. The variance explained under this component was equal to the sum of square loading (SSL) across rotation and was represented with the equation as:

(PC1) = 0.787X1 + 0.770X2 + 0.672X4 + 0.456X7 = 2.448(Table 58)

Table 59: PC Matrix Load Factor across Communal land Resource use Control Design Principle - Lot 3

Identified problems in order of priority	Component		
	1	2	3
Weak/no Monitoring system with support of functional bylaws(DP4a)	.787	.218	
Domination of community leaders DMP through KA executives or KA chairman(DP3)	.770		.067
Low Community participation right in public vote in DM(DP3)		.238	
Illegal CLR theft for occasional sale or consumption from CLR(DP4b)	.672		
Minimum/no penalty from money punishment to jail (DP5)			.064
Absence of regular and periodic patrol to control CLR(DP4b)		.793	
Minimum right for elected women in DMP(DP3	.486		
No existence of traditional way sanctions exist to be applied for violations of community laws/bylaws.(DP5)			.629

Note: Extraction Method: Principal Component Analysis.

The second principal component *(*PC2) also took an initial eigenvalue of 1.064 and a 13.250% share of the variations that made the cumulative variation to be

53.811%. This included and was represented by domination of community leaders DMP through KA executives or KA chairman (DP3). As a second ranking, it was pointed out that domination of community leaders was pointed out as a persistent higher problem. This means that, mostly, community recognised and perceived that KA executive committees' and leaders influence most DMP in controlling CLR. This DMP was not participatory. The variance described under this component was equal to SSL representing with the equation as:

$PC_2 = 0.322X1 + 0.536X_2 + 0.359X_4 + 0.695X_5 + 0.340X_7 = 1.239$ (Table58).

Principal component 3 (PC3) shared 10.921% of the variations with an eigenvalue of 0.87 and RSSL>1.152. With this, the total cumulative variation was found sharing about 60.99%. PC3 was represented by low community participation right in public decision (DP3). HH respondents felt and ranked DP3 as a third important problem which, should be due considered to enhance the sustainability CLRU control under lot 3. The information on workability of by-laws' variance expressed under component three was equivalent to the SSL represented with the equation as:

$PC_3 = 0.067X2 + 0.064X_5 + 0.629X_8 = 1.153$ (Table 58).

Table 60: Load factor Communality Extraction on Decision Choice Ranking under Communal land Resource Use Control - Lot 3

Identified problems in order of priority	Initial	Extracted loading factor
Weak/no Monitoring system with support of functional bylaws(DP4a)	1.000	.960
Low Community participation right in public vote in DM(DP3)	1.000	.902
Illegal use of CLR (theft) for occasional sale or consumption from CLR(DP4b)	1.000	.869
Minimum/no penalty from money punishment to jail (DP5)	1.000	.705
Absence of regular and periodic patrol to control CLR(DP4b)	1.000	.675
Domination of community leaders DMP through KA executives or KA chairman(DP3)	1.000	.665
Minimum right for elected women in DMP(DP3	1.000	.638
No existence of traditional sanctions exist and applied on violations of community laws/bylaws.(DP5)	1.000	.532

Note: Extraction Method: Principal Component Analysis

Therefore, in the above PC analysis, out of eight activities under sustainability DP 3, 4 and 5 under Lot 3, the following three factors were identified and ranked as the most unresolved ones in controlling communal land use resources. These are:

- Weak/no monitoring system with support of functional by-laws
- Domination of community leaders and
- Low community participation right in public vote in DM

In support of this, these three most outstanding and high ranked challenging problems were also identified during GD. They finally remarked that both government at various level and community leaders should due consider to solve those high ranked problems to minimize the challenge towards enhancing sustainable communal land use control.

In conclusion, when observing the overall PCA extraction outside the three components to the order of priority were: CLR theft for occasional sale or consumption from CLR (DP4b), minimum/no penalty from money punishment to jail (DP5), absence of regular and periodic patrols to control CLR use (DP4b), minimum right for elected women in DMP (DP3), and no existence of traditional ways of sanctions to be applied for controlling violations of community laws/by-laws (Table: 59).

7.3 Conclusion

The purpose of this chapter was to investigate the sustainability of institutional practices in managing communal grazing and forest land resources. As concluding remark, in the area of institutional practice on communal land administration, communal land boundary delineation and government support in strengthening user group formation were among activities that preformed better and positively contribute towards sustainable communal land administration. Besides, the existence of positive congruence between government legislation and community by-laws, community contribution in the form of labour or payment of a nominal fee in developing and protecting CLR was also found as a good institutional practice to sustain CL administration. On the other side, clear

boundary demarkation, user boundary definition, workability of by-laws and encroachment controlling were evaluated as challenging factors hampering institutional sustainability in the area of communal land administration.

In terms communal land resource use and management, the existence of functional communal resource use and boundary conflict resolution mechanisms were also the strong side that contribute towards institutional sustainability. However, community leader responsibility in managing CL resource use, enabling community members to capture benefit from CLR and community reaction for secret exploitation of CLR was the weakest side in sustaining institutional CLR use and management practices.

On the other hand, exercising the minimum right for elected women to be involved in DMP and periodic patrols for illegal use of CLR were found as an area that should be well considered as fundamental institutional practices under CL resource use and management control. Meanwhile, weak/no monitoring system with support of functional by-laws, domination of community leaders in DMP and low level community participation right in public vote was a gap that hinders institutional sustainability in the area of controlling communal land resource use management.

Generally, it was concluded that the status of sustainability on institutional practices in managing CLR was found friable with poor application system on the ground.

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CHAPTER EIGHT

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

The study was intended to contribute to add information on communal and management practices and policy applications in view of sustainability and climate resilience. The study was conducted in the Upper Blue Nile Basin of Ethiopia, in Bir–Temicha Watershed located in the Amhara Regional State, Ethiopia.

Under this study, major objectives were formulated into four areas. The first major objective was to examine climate change variability, trends, its impact, community adaptation practices and associated impediment factors. The second overall objective was to scrutinize the pressure, practices and extent of grazing and fuel biomass utilization load over the communal grazing and forest land use system. The third and fourth objectives were to examine the sustainability of community based institutional land use management practices and related policy settings and applications respectively. The study made use of a literature review on climate change/variability and adaptation practices, communal land management related institutional practices and policy formulation in Ethiopia. This review helped in understanding the situations on the status of communal land use and management in the study area.

In order to meet the above objectives, both qualitative and quantitative research methods were deployed depending on the nature of the objective to be examined. Based on the findings, discussions and conclusions were presented in the four chapters. This final chapter is aimed at summarising the major findings and providing general conclusions and recommendations.

8.2 Summary of results

8.2.1 Climate variability, trend, impact and adaptation practices

The study has presented a comprehensive analysis of seasonal and annual rainfall variability and trends. The maximum mean rainfall was achieved in the Dega while the lowest was received in the Kolla ACZ. On the other hand, the Kolla ACZ was the area found with high rainfall variability and inconsistency compared to other ACZs. With regard to the annual precipitation trend in different ACZ settings, Kola, Woyina dega and Wourch areas were found with a significant declining annual precipitation trend while only in Dega areas was precipitation found with an increasing annual trend.

The most outstanding manifestations of climate change and variability impact in the study areas were water scarcity, migration, feed scarcity, livestock diseases/death, and invasion of unwanted shrub in communal lands.Of all climate change adaptations, government teams in all areas played a good role in accessing and communicating information on the implementation of adaptation practices. Besides accessing information through religious and social institutions, efforts were made to create access to major roads into major market areas < 10 km, use of improved stove, area closure management, biophysical adaptation measures on communal lands, role of "*Edir"* and watershed associations as local social institutions and selling of assets were found to be moderately exercised as alternative adaptation mechanisms. Use of credit, radio, cut and carry/controled grazing and solar energy alternatives were found generally weak but moderately implemented only by literate community members. The four outstanding barriers pointed out as having serious implications for climate change adaptation to enhance a more climate change resilient CL resources and management system were shortage of credit facility/financial constraints, community low level awareness, weak institutional capacity and lack of information in getting informed about climate change behaviour.

8.2.2 Assessing the pressure over communal land

a. Feed availability and carrying capacity

The total livestock and available land as a natural feed/forage source in the study area was found to be 30712 livestock, and 12811 TLU were grazed on 2878.6 ha. From these forage sources, it was possible to produce 4408.3 tons of DM per year. In addition, from crop residues and aftermaths, it was also possible to produce 4050.7 and 2497.7 tons of DM per annum respectively. Therefore, the total DM required was found to be 29210.7 tons/year. On the other hand, the available feed from communal grazing land resources and crops was found to be 10, 956.6 tons/year. This showed that the available feed source can be sufficient and satisfy only by 37% of the annual DM demand. The average CC was found to be 3619LU while the actual TLU was 12811. The gap or the overload presure on these grazing lands was 9191LU. This means that on 2878 ha of communal grazing land, there were an extra 9191LU or a minimum of additional 3LU/ha rate grazed and pressurising the land for further feed deficiency and exposing CGL it to more degradation.

This study also found that the average stocking density was 4.45LU/ha while its CC remains 1.26Lu/ha. Among all four KAs, the higher grazing pressure was found in Dega and Woyina dega ACZs. It was 8.7 LU/ha and 6.22LU/ha respectively while the actual CC remained as low as 1.38LU/ha and 1.13 LU/ha respectively. These implied that their grazing capacity was only 15.9% and 18.2% respectively. The study site in Kolla ACZ had the lowest grazing pressure, with relatively better carrying and feeding capacity even though it was still beyond the CC. The level of pressure in this area was 1.93LU/ha while it's CC was 1.19. This means that grazing land in Kolla ACZ was supposed to feed only 61% of the available LU.

b. Fuel biomass demand and consumption

The motive behind fuel biomass energy demand in the study area was largely due to high dependency for their subsistence. Of all the existing fuel biomass sources, in all parts of the study area 81% of domestic bio fuel was derived mainly from fuel wood and dung. The remaining 19% was fulfilled from crop

residue. In summing up, for all fuel wood and other wood utilisation, the rate of extraction ranges from 390.04 tons in Wourch ACZ to 1821 tons of wood being extracted from communal forests every year. On top of this, dung was collected mostly from communal grazing lands. The consumption rate ranged from 32.19 tons per year in Kolla ACZ site to 832.63 tons per year in Wourch ACZ. Moreover, out of 1891 hectares of communal forest area 4343.05 tons of wood were utilised for different purposes. This means, 2.29 tons/ha of wood were consumed every year.

The biggest fuel biomass gap was found in Wourch ACZ area (-2702.41 kg/HH/year). This means about 44.43% of the demand was satisfied. The smallest gap was recorded in Kolla area (-511.91 kg/HH/year) satisfying up to 86.71% of their demand. In particular, when observing fuel wood energy demand versus consumption, the maximum gap ranges from -1834.67 kg/HH/year in Wourch ACZ to -234.39 kg/HH/year in Kolla area where demand satisfaction was met by 25.08% and 78.29 % respectively.

8.2.3 Policy/legislative setting and application

The establishment of the Communal Land Administration Committee and elder arbiters were found to be strong points for LAU legislative and policy application. Besides, communities were also satisfied with the certificate issuance for communal land holding rights even though it was first level. However, the placement of this first level certificate book in the hands of selected CLAC individuals was not welcome. It was also suggested that it was better to place it in the Kebele Administration Office/concerned government office at the Kebele level. On the other hand, community members were not refraining themselves on activities that lead communal lands to further erosion and deforestation. CLAC and Kebele leaders were also not transferring CL to landless youths following the legal procedures. In most cases, both expert and community groups agreed that communal holdings were governed more by customary law rather than formal judiciary system.

With regard to communal resource use control, the absence of land use planning exercises which determine the application of this provision to manage

communal land was lagging behind from what was expected. On top of the above, no or insignificant exercises worked out on land use planning and planning control activities, no systematic and regular community satisfaction survey study and thereby no legislative revision conducted, low level of attention to land administration activities by Woreda and Kebele level administrators, weak control over the grassroots level leaders and uncontrolled expansion of human and livestock population growth were becoming gaps and a challenge for better LAU system and effective policy application.

8.2.4 Communal land management institutional practices

Out of the overall performance under design principle 1, boundary delineation and government support in strengthening user group to develop CL were found moderately practiced. Nevertheless, activities like user boundary definition, nested enterprise/overlapping functions, workability of by-laws and encroachment controlling were found very weak.

With regard to the existence of community contribution in the form of labour or payment of a nominal fee, it was found moderately functioning. Besides, there exist also a positive congruence between government legislation and community by-laws. However, benefit capturing from CLR and community reaction/response for secret exploitation of CLR was perceived and rated from very weak to weak.

In performing the principles on monitoring of users as well as resources, it was generally found as a weak institutional application system. Some of the weaker parts under this were: In efective organization system interms of collective-choice arrangements, weak monitoring and functional by-laws, domination of community leaders in DMP and low level community participation right in public vote DMP.

8.3 General conclusion

This study generally aimed to investigate communal land and use management practices and associated policies towards enhancing climate resilience and sustainability. To this end, the conclusions from this study were winded up as the following:

A spatiotemporal rainfall variability and trend across the study area were found. In 31 year based metrological data, both dry and wet events were observed. However, the periodicity for extreme dry or wet events was not predictable in all ACZ and it's difficult to draw a conclusion on whether the cyclic-random nature of the rainfall follows a distinct trend or not. These variability impacts manifested themselves in the form of water shortage, feed scarcity and migration. To withstand the impacts, adaptation practices were moderately exercised. However, low level community awareness and institutional capacity and support were found the most outstanding barriers in the study area. This created high a level of limitation and uncertainty among communities in doing better community adaptation responses. Although there are practices excersised for climate change adaptation, those barriers and impacts mentioned above will affect the sustainability of communal land use and resource management in one hand and on the other threatened the capacity communal lands to enhance climate reseliance.

In terms of determining the pressure on feed availability and carrying capacity, there was a relatively high livestock population where feed availability was limited. The CC of communal grazing land and stocking density was found beyond the threshold of communal grazing lands. From this it was possible to draw a conclusion that there was weak communal grazing land use management practices and, thereby, poor livestock and feed resources productivity existed at least in the study area. With regards to fuel biomass consumption and demand, it was also deduced that the total fuel biomass demand in all study sites significantly exceeded the actual consumption in all ACZs. Besides, of all fuel biomass types, the high fuel wood per capita consumption and demand clearly indicated the high pressure on communal forest that leads to further communal land degradation and forest resources

depletion. Therefore, this implies that communal land management practices were poorly managed and clearly illustrated the extent of intense pressure overcommunal land resources. This in turn hampers the quality of vegetation and seriesly affect the productivity of communal forest and grazing land and reducing the resilience capacity of communal lands.

Communal land use and administration and use policy/legislative setting and application at ground level, the following were deduced: Although the regional and federal land administration and use proclamation/regulation and directives with regard to the preparation of land use planning, refraining communities from activities that aggravate land degradation, the introduction of cut and carry and controlled grazing benefit systems on communal resources were not set with strong obligatory statement. Besides, when it comes to the application of these provisions, very little attempt has been made. Hence, undue state power exercise on the above legestlative elements could be considered as one of the legestlative/policy application weaknesses that lead to further communal land tenure insecurity.

On the other hand, legislative instruments on communal land administration committee establishment and the formation of an elder arbiter committee to resolve communal land-related disputes, the availability of state structure down to the lowest KA level was an essential opportunity that contributes towards the institutional sustainability of communal lands management and control

However, applying the overall adjudication process per the legislative setting, updating of communal land adjudication status, CLAC involvement in the decision making process in reallocating a portion of communal land to landless youths or investors and effectiveness of community by-law on taking measures on sanctions were found as another prominent legislative elements that were not properly applied on the ground. Therefore, it is concluded that the communal land legislative setting was established while its application on the ground still remained as a gap. These unattempted legislative application challenges could hamper the sustainability and tenure security of communal land.

The sustainability of institutional practices in managing communal land resources the following was deduced and concluded. Government support in strengthening user group formation and existence of positive congruence between government legislation with community by-laws in one hand and on the other community contribution in the form of labour or payment of nominal fee in developing and protecting CL was found as a strong side of both government and community institutions. Besides, existence of functional conflict resolution mechanisms, the right for elected women in DMP and periodic patrol or control over illegal use of CLR in Dega and Wourch ACZs were found to be fundamental institutional practices with a fairly good attempt towards sustainable communal land administration in the area of land administration, land use management and control area.

Nevertheless, clear CL boundary settings, user boundary definitions, workability of by-laws in controlling illegal resource use and encroachment, community leader responsibility in managing CL resource use, capturing of benefits from CLR, community reaction to secret exploitation of CLR, weak/no monitoring system with support of functional by-laws, low level of community participation and the rights in public vote was found as a gap for the sustainability of institutional practices to manage communal land.

As a final remark, it was concluded that spatiotemporal climate variability existed in the study area. But community adaptation practice to enhance communal land resilience was found as an area that needs better effort for development. On top of this, the anthropogenic pressure and impact on communal grazing and forest land was found in a series threat. On top of this, if the existing trends in terms of CLM system, institutional practice and policy/legislative application at the ground continue as it was, then, sustainability of CLMP and the nature of CLR resilience on the face of climate change remain weak and consequently sever land degradation and depletion of CLR will be likely.

8.4 Recommendations

Climate variability, trend, impact and adaptation practices on communal lands

1. In order to cope with the impact of rainfall variability, establish appropriate drought tolerant as well as flood or severe erosion resistant tree seedlings and grass species in communal lands that suit the nature of ACZ settings is recommended and should be given due emphasis.
2. To halt major adaptation barriers found under this study, policy formulation and implementation of evidence-based communication processes that will enhance community awareness on climate change and community adaptation response measures over communal lands have to be in place.
3. Making informed adaptation strategies in developing a more climate change resilient communal land resource and management system is highly recommended. Besides, a strategy for the implementation of effective adaptation measures should include not only technological adaptation aspects, but also the renovation of the social and cultural aspects to bring about full-fledged adaptation practices.
4. Integrated research on adaptive capacity measures with regard to resilience enhancement on communal land is highly recommended. In addition, Detailed and repeated research is also required to investigate and analyse the nature of variability and trends to enhance a sustainable and climate resilient communal land management system.

Presure over communal land

a. Minimizing the pressure over communal grazing land

1. Improvement of feed in terms of quantity and quality with available technological options and use of other alternativel feed resources should be an area of action.

2. Control grazing, rotational grazing/grass land improvement/forage development, fodder conservation method and the like should be duly considered and exercised widely.
3. Implementing proper communal land use planning and determining the number of stock per unit of communal grazing area should be duly considered. In addition, efforts have to be in place to provide information and awareness to enable communities to establish their own private grazing areas.
4. Conduct further research on livestock breeding and better feed production and management techniques. This helps to improve the quality of feed and livestock while reducing the quantity of livestock per unit area so as to reduce the pressure on communal land.

b. Reducing the pressure over communal forest land use

1. To minimise the pressure, it would be appropriate to think towards using a more efficient energy alternative and energy conservation system. Besides, a systematic extension system has to be in place to enable communities to establish their own private woodlots.
2. Enrichment plantation and area closure management with proper access and use rights are of paramount important to reduce the burden on communal land resources.
3. Proper use, accessing and controlling mechanisms with certifying communal forest land use rights in recognising tenure security have to be devised.
4. Moreover, beyond development interventions to address sustainable communal land resources, further research is still required to investigate the social dimension that helps in minimising the pressure on communal land.

Sustainability of institutional practice

1. Better efforts have to be in place to make a positive match in defining clear resource use and boundary settings with functional and agreed upon by-laws.

2. Setting a clear directive to avoid duplication of overlapping institutional nesting/functions in order to have sustained institutional practices and performance in sustainably managing CLR is recommended.
3. Proper strategy should be developed to maximise community members' benefit sharing and to engage them in different income generation programmes out of CLR uses. This is a fundamental step forward in order to reduce the pressure, increase the sense of ownership, improving livelihood as well as sustainability.
4. Empirical findings on factors like different size and heterogeneity of user groups within communal land resource users on the one hand and, on the other, the type of by-laws within which these users operate are important factors. These require further study to improve the functionality of by-laws and strengthen institutional performances in managing CLR.
5. Case studies have to be conducted to verify and understand how institutional settings interact with different social and biophysical variables to produce better outcomes towards enhancing institutional sustainability on CLRU management. Above and beyond, further research endeavours are still of paramount important in considering other social, cultural and legislative dimensions for identifying more effective and workable institutional practices to boost sustainable CLM.

Communal land administration and use related policy/ legislative settings and applications

1. It is recommended that the ultimate LAU planning system has to be in place to enhance tenure security and sustainability of communal land and resources.
2. Organising spatial data and information systems for the communal land adjudication process, and updating the communal land adjudication status are of paramount important to be worked out side by side.
3. It is recommended that community users and adjacent land holders shall participate during the communal land adjudication, land use and management planning process to enhance the sense of ownership and thereby guarantee the sustainability.

4. Woreda leaders should encourage and facilitate the involvement of Kebele and CLAC in the decision making process and minimise state power exercised during any communal land expropriation.
5. A standardised and regular LAU monitoring and follow up system has to be in place to facilitate CLU resource and development control.
6. Evaluating and reviewing the implementation of communal land use and administration related legislation through grassroots feedback from users and experts is highly recommended.
7. Further, in-depth research on a different spatiotemporal scale is recommended to further identify and scrutinise the policy application constraints dimension in order to enhance sustainable climate resilient communal land administration and use management practices in the country.
8. Community agreed upon by-laws and relevant legislation application on land administration and land use (LALU) and forest utilisation proclamations and regulations have to be properly and effectively exercised and implemented with the appropriate directives in order to utilise communal forest resources with a proper and efficient use system.

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10. APPENDIXES

10.1. Ethical clearance

UNISA university of south africa

2014 03 20

Ref. Nr.: 2014/CAES/058

To:
Student: TH Tedela **Student nr: 50873598**
Supervisor: Prof Mekuria Argaw
Department of Environmental Sciences
College of Agriculture and Environmental Sciences

Dear Prof Argaw and Mr Tedela

Request for Ethical approval for the following research project:

Analytical study on the appraisal of communal land use management practices and policy towards sustainability and climate change resilience

The application for ethical clearance in respect of the above mentioned research has been reviewed by the Research Ethics Review Committee of the College of Agriculture and Environmental Sciences, Unisa. Ethics clearance for the above mentioned project (Ref. Nr.: 2014/CAES/058) **is given for the duration of the research project.**

The committee wishes to recommend that the researcher consider the length of the questionnaires and ensure that participants are given the option to take a body break between sections to ensure that the participants do not tire.

Please be advised that should any part of the research methodology change in any way it is the responsibility of the researcher to inform the CAES Ethics committee of such changes. In this instance a memo should be submitted to the Ethics Committee in which the changes are identified and fully explained.

The Ethics Committee wishes you all the best with this research undertaking.

Kind regards,

Prof E Kempen,
CAES Ethics Review Committee Chair

Please note the comments on the length of the questionnaire

Prof MJ Linington
Executive Dean: College of Agriculture and Environmental Sciences

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10.2. Letter of confirmation for Edition

8 Nahoon Valley Place

Nahoon Valley

East London

5241

28 June 2016

TO WHOM IT MAY CONCERN

I hereby confirm that I have edited the following doctoral thesis using the Windows "Tracking" system to reflect my comments and suggested corrections for the student to action:

Analytical study of the appraisal of communal land use management practices and policies towards climate change resilience and sustainability in the Upper Blue Nile Basin, Ethiopia by TENAW HAILU TEDELA, submitted in accordance with the requirements for the degree of DOCTOR OF PHILOSPHY in the subject ENVIRONMENTAL MANAGEMENT at the Department of Environmental Management, College of Agriculture and Environmental Science, UNISA.

Brian Carlson (B.A., M.Ed.)
Professional Editor

Email: bcarlson521@gmail.com

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10.3 House hold survey questionnaire

UNISA university of south africa

House Hold Survey Questionnaire

IMPORTANT INFORMATION:

This questionnaire has been formulated as a precondition to fulfill my PhD Dissertation/Thesis in Environmental Management with a research title: "Analytical Study to Enhance Communal Land Management Practices and Policies towards sustainability and Climate Change Resilience in the Upper Blue Nile Basin, Ethiopia". Therefore, the main purpose of conducting this questionnaire is solely for academic purpose so as to assess your knowledge and practices on the concept of Communal land management practices and policies in relation to sustainability and climate change resilience.

Please read them carefully and respond truthfully and to your best of knowledge, so that your answer accurately describe your actual acquaintance and practice which, leads the study to have a reliable and realistic research finding.

	Items	Name
1	**Area and personal description:**	
	Administrative location name	
	Region	
	Woreda	
	KA	
	Sub Kebele –Village	
2	Geographical location	
	Altitude	
	Latitude	
3	How many are Respondents' family number	
	Husband/Wife(if >1)	
	Mother for Husband/Wife	
	Father/ Husband/Wife	
	Brother/s	
	Sister/s	
	Son	
	Daughter	
	Other(specify)	
4	Which category you are	
	Sex, M=1, F=2	
	Age level : 18-30 =5, 31-40=4, 41-50=3, 51-60=2, >60=1	
	Educational level: Illiterate=1, Read and write=2,Grade1-4=3, Grade 4-8=4, Grade >8=5	
	Economic level: Code:1=Poor;2=Medium;3=Rich	
	Marital status: Married=4, Unmarried=3, Divorce=2, widow=1	
	STATE OF COMMUNAL LAND USE	
113	What do you think are the main/important reasons for a change in land use	
	Code: Strongly disagree =-4, Disagree =-2, Not certain =0 , Agree = 2, Strongly agree = 4	
	Reasons for a change in land use land cover/ land degradation	
A	**Grazing land**	
114	Shortage of forage/feed due to high livestock density	

115	shortage of cultivated land due to high population density	
116	Weaker regulation on grazing land use	
117	Community low level awareness on grazing resource use and management	
118	Others (specify)	
B	**Forest land**	
1110	Shortage of fuel wood due to high population density	
1111	shortage of cultivated land due to high population density	
1112	Weaker regulation on forest land management and use	
1113	Community low level awareness on forest resource use and management	
	Others (specify)	
1114	To what extent community members uses communal grazing and forest land resources for the purpose mentioned below?	
	Code: very common =4, Common = 3, Less common =2, very less common =1, Not used at all =0	
	Purpose	
1	**Grazing land resource use**	
	Free grazing (open)	
	Controlled grazing / Rotation)	
	Cut and carry	
	Stall feeding	
	Roof hatch	
	Others (specify)	
2	**Forest land Resource use**	
	Fuel wood collection	
	Bee hiving	
	Shelter for cattle	
	For construction	
	For making farm tool	
	Others (specify)	
1115	Do you have your wood lot and grazing land areas? Yes =1/No=0	
1116	If yes how is the status of land title situation on you?	
	Private Wood Lot	
	Number of parcels	
	Av. Size (ha)	
	Status of land title(Land title status NC= Not Certified=0, 1st Level Certified(without map)=1, 2nd level certified (with map)=2)	
	Private Grazing Land	
	Number of parcels	
	Av. Size (ha)	
	Status of land title(Land title status NC= Not Certified=0, 1st Level Certified(without map)=1, 2nd level certified (with map)=2)	
1117	Describe the amount of community energy demand in the study unit area?	
	Type of resource used	
	Fuel wood consumption/ HH/week	
	(3) Number of man bundle consumed /HH/week	
	(4) Weight of Single bundle (KG	
	(5) Volume of Single bundle (M3)	
	(6)Number of man bundle required /HH/week (Demand)	
	Cow dung consumption/ HH/week	
	(3) Number of women/man carry consumed /HH/week	
	(4) Weight of Single carry (KG)	
	(5) Volume of Single carry (M3)	
	(6)Number of man bundle required /HH/week (Demand)	
	Crop residue consumption/ HH/week	
	(3) Number of man bundle consumed /HH/week	

	(4) Weight of Single bundle (KG	
	(5) Volume of Single bundle (M3)	
	(6)Number of man bundle required /HH/week (Demand)	
	others consumption/ HH/week	
	(3) Number of man bundle consumed /HH/week	
	(4) Weight of Single bundle (KG	
	(5) Volume of Single bundle (M3)	
	(6)Number of man bundle required /HH/week (Demand)	
	Code: Very Strong influence =4, Strong influence =3, Moderate Influence =2,Insignificant influence =1, No Influence = 0	
P/D	**Major pressure/driving factors/Causes for Comm. Land degradation**	
1211P	High population density and high demand of resource like wood, grass for different purpose	
1212P	High livestock density and high demand of grazing land and feed compared to the resource	
1213P	Encroachment	
1214P	Flood/erosion	
1215P	Forest fire	
1216P	Poor road side drainage/disposal	
1217D	Weak/no communal land related policies application	
1218D	Weak /no Communal land tenure security practices	
1219C	Inappropriate communal land management practices	
1220C	Low level of community awareness on communal land resource usage: E.g. (un planned/ over-exploitation and removal of communal land resource)	
1221C	Uncontrolled/in proper forest/grazing land resource use	
	Other(specify)	
123	Describe the State, Impact and Response	
	Code : Good state /+impact = 4, Slightly good state /+impact = 2, Not observed = 0, Slightly bad state /-impact = -2, Bad state /-impact = -4	
S	**State of condition after the observed pressure?**	
1230	Soil quality (depth, fertility etc.)	
1231	Quality of vegetation/Vegetation cover	
1232	The abundance and richness plant species(number and composition) in a given area / biological diversity	
1233	Palatable species for livestock in communal land	
1234	Availability of Water resources	
1235	Rill and gully situation	
1236	Sedimentation	
1237	Invasive species on communal grazing and forest land	
1238	Other(specify)	
I	**Impacts as the result of the above state of communal land degradation**	
1240	Livestock productivity and yield	
1241	Availability of wood for different purpose	
1242	Availability of feed	
1243	Productivity of fodder	
1244	Other Goods and services derived from the communal land (Like graze, recreation, cultural use… and also like collecting grass, wood, and other materials)	
1245	Downstream moisture	
1246	Quality of the communal lands(General)	
1247	Poor animal health/death	
1247	Conflicts	
1247	Unusual rainfall and temperature change manifestation	
1247	Other(specify)	
R	**Responses of the community/government to reverse the impact observed? Code: Very Strong response =4, Strong response =3, Moderate response =2,**	

	Insignificant response =1, No response = 0	
1254	Better Land use/management practices are being exercised	
1255	Support for communal land management (conservation and rehabilitation) increased	
1255	Better investments in land and water resources is in placed	
1256	Land policies and policy instruments strengthened/enhanced	
1238	Those policies set and applications are getting better	
1239	Monitoring and early warning systems for climate stress established	
1259	Set/revise and implement national action plans for climate resilient and sustainable communal land management	
1260	Other(specify)	
(II)	**CLIMATE CHANGE/VARIABILITY, VULNERABILITY AND COMMUNITY ADAPTATION**	
221	How community climate calendar is reliable/confirm the climate variability pattern? Code: Strongly agree= 4, Agree =2, Not certain = 0, Disagree= -2, Strongly disagree=-4	
	I am not reliable with the climate pattern	
	Climate pattern disturb communal land management resource and practices	
	Climate pattern disturb my lively hood	
	Mostly my prediction and climate events didn't match	
	Stressing events on communal land:	
231	**Were there any stressing events observed in the last 30 years? Yes=1, /No=0**	
232	**If yes,** What impacts are observed on communal land resource use and management and the surrounding community as a result of peak/stressed rain fall and temperature condition across 30 years' time and how was the level of intensity?	
1	Drought/ Failed on grass and legume feed? Code: More sever=3, Sever=2, Less sever=1, Not a sever at all=0	
	If your answer is 3,2 and1, then What was the impacts	
	Which year/s happened	
	Which month/s happened	
	Frequency in 10Years	
2	Flooding? Code: More sever=3, Sever=2, less sever=1, Was not a sever at all=0	
	If your answer is 3,2 and1, then What was the impacts	
	Which year/s happened	
	Which month/s happened	
	Frequency in 10Years	
3	Intense storm? Code: More sever=3, Sever=2, less sever=1, Was not a sever at all=0	
	If your answer is 3,2 and1, then What was the impacts	
	Which year/s happened	
	Which month/s happened	
	Frequency in 10Years	
4	Other? (specify) Code: More sever=3, Sever=2, less sever=1, Was not a sever at all=0	
	If your answer is 3,2 and1, then What was the impacts	
	Which year/s happened	
	Which month/s happened	
	Frequency in 10Years	
233	Did you observe/face a HH crises due to the above climate stress observed during the last 30 years? Yes=1, /No=0	

234	If yes, what was the main house hold crises/livelihood problems /difficulties faced by community? **Code: More sever=3, Sever=2, less sever=1, Was no problem=0**	
	Events	
1	Food/ feed insecurity	
2	Poverty	
3	Fuel wood scarcity	
4	Shortage of grazing land for feed resource /Feed resource scarcity	
5	Shade scarcity for livestock	
6	Water scarcity	
7	Other(specify)	
	Adaptive capacity	
	235. What adaptive capacity you were/are practiced/ to cope with climate change/variability? Code: Very Strong=5, strong=4, Moderate =3, weak =2, Very week=1 , Not performed/existed=0	
	Adaptive mechanisms Communal grazing/Forest land	
231.1	**Economic welfare**	
	Use of credit institution	
	Use Selling my/ family labor	
	Selling assets (livestock honey etc.)	
	Doing non farming business	
	Others(specify)	
231.2	**Social/cultural institution**	
	Disaster prevention and prevention committee (DPPC) established	
	Using “Edir”/other social institution to assist community during any climate stress	
	Area enclosure managed by community bylaws	
	Others(specify)	
231.3	**I got information communication /Access to information through:**	
	Church /religious institutions are used	
	Radio/other media groups formed	
	Social/cultural institutions	
	Government development teams at village level	
	Others(specify)	
231.4	**Transport alternatives**	
	Availability of rural road network density increased	
	Access to major road is nearby (<10KM) connected	
	Access road to Market places is connected nearby (<10KM)	
	Others(specify)	
231.5	**Ecological /environmental management**	
	Cut and carry /controlled grazing exercised	
	Establish private processed grazing and/ wood lot areas	
	Establish of conserved feed system (like silages, fodder bank…)	
	Planting drought resilient multipurpose grass, shrub and/or tree species on communal lands	
	Physical and biological measures(enrichment plantation with multipurpose tree, forage and grass establishment etc.) implemented to manage communal lands	
	Others (specify	
231.6	Energy alternative	
	Availability and using of improved stoves increased	
	Availability and using of solar energy for cooking/light increased	
	Availability and using of bio gas for cooking/light increased	
	Others(specify)	
III	**COMMUNAL LAND USE MANAGEMENT INSTITUTIONAL PRACTICES**	
311	Do you think that there are any land management practices made in communal land? No=0, Yes=1	
312	If yes, and if the following listed TECHNOLOGIES are practiced in study area, indicate the level they mate the required purpose in managing communal land	

Key:	S/ES= Soil/ ecological Conservation Services:	a) High protective cover, b) high organic matter and nutrient cycling and c) low vulnerability to erosion (windbreaks, shelterbelts etc.);
	WR=Water regulation :	a) High infiltration, b) low runoff and erosion) and c) high water supply (surface, ground);
	CRS= Climate Regulation Service :	a) High carbon sequestration; b) low greenhouse gas emissions
	LHS= Lively hood service:	a) High Income generation, b) high grasses for feed, c) high wood for fuel, construction and farm /house tool making.
312.1	Classify the level of Communal land management Practices weather it attains the intended purpose or not as:	**Very high satisfaction if >70% = 4 ; Moderate satisfaction if 40-70% = 3; Moderate satisfaction if 15-40% = 2 ; Very minimum/didn't mate if <15% = 1 Not done at all = 0 NB: (Fill numbers only from 0 to 4)**

	Technologies/Practices	
1	**GLM (grass land improvement practices)?** No=0, Yes=1	
a	soil/ecological Conservation S.	
b	water regulation S.	
c	climate regulation S.	
d	Lively hood S.	
2	**Controlled grazing/stall feeding technique**? No=0, Yes=1	
a	soil/ecological Conservation S.	
b	water regulation S.	
c	climate regulation S.	
d	Lively hood S.	
3	**Cut and carry feeding system**? No=0, Yes=1	
a	soil/ecological Conservation S.	
b	water regulation S.	
c	climate regulation S.	
d	Lively hood S.	
4	**Area closure/Biodiversity?**? No=0, Yes=1	
a	soil/ecological Conservation S.	
b	water regulation S.	
c	climate regulation S.	
d	Lively hood S.	
5	**Planting on micro basin/other physical structures?** No=0, Yes=1	
a	soil/ecological Conservation S.	
b	water regulation S.	
c	climate regulation S.	
d	Lively hood S.	
6	**Planting on area enclosures/Enrichment plantation**? No=0, Yes=1	
a	soil/ecological Conservation S.	
b	water regulation S.	
c	climate regulation S.	
d	Lively hood S.	
7	**Biological rehabilitation of gully control measures/Gully land management?** No=0, Yes=1	
a	soil/ecological Conservation S.	
b	water regulation S.	
c	climate regulation S.	
d	Lively hood S.	
8	**PSWC (Check dam, Water Ways, Cut off Drains, Water retention structures etc.)?** ? No=0, Yes=1	
a	soil/ecological Conservation S.	
b	water regulation S.	
c	climate regulation S.	
d	Lively hood S.	
9	**If there are other practices (specify)?**	

a	soil/ecological Conservation S.	
b	water regulation S.	
c	climate regulation S.	
d	Lively hood S.	
313	How is the level of participation? **Code: Very regularly/always =4, Mostly=3, Rarely=2, very rarely=1, Not at all=0**	
1	Community participated during problem identification, prioritization and planning	
2	Community participated during implementing technologies in the CL	
3	Community participated with free labor	
4	Community participated in maintaining structures	
5	Community participated in guarding from human and cattle intrude	
314	What do you think are the constraints/**influence** that impedes the sustainability of communal land management practices/ conservation measures?	
315	In your opinion, what do you think are the solution for the above mentioned problems?	
Code for 321.1- 321.4, 3251.1-3251.8: Very well Applied (>75%) and CL gets very much better than 10 years before = 4; Moderately applied (50% - 74%) and CL gets better than 10 years before = 3; Applied minimal (25%-49%) /and CL got little better than 10 years before = 2 ; Applied but insignificant (<25%) and positive change on CL R use is insignificant from 10 years before = 1; Do not applied/not existed =0		
(I)	**Indicating Sustainability on communal land resource managements**	
321.1.	**GandCC(Government and community**	
1.	Communities (individual and /or group) undertake self-motivated and do regular maintenance of activities on physical measures under taken in the area?	
2.	Some community members replicate some of successful CLM practices in to their own grazing/wood lot areas?	
3.	Existence of community based environmental organization(CBO) (watershed association, user groups)that play good role in protecting and developing CL	
4.	Woreda and Kebele leaders give substantial support in mobilizing required experts for managing CL?	
5.	Human health and veterinary institution, Development agents/agricultural offices EPLAU agents/offices in terms of their existence and appropriate in their service provision?	
321.2.	**EV/E(ECONOMIC VIABILITY/EFFICIENCY)**	
1.	Getting additional incomes like from: Selling of seedlings, honey production, fattening, dairy, sale of grass, logs, forest and NTF products and etc.?	
2.	Market situation for products/resources that are coming from communal forest/grazing lands?	
3.	Loan provision to promote communal land resources in time of need?	
4.	Equity of income distribution in using communal land resources?	
321.3.	**REEP**	
	R (RESELIENCE/STABILITY/RISK SECURTY)	
1.	Community controlling mechanism in the case of flooding, erosion, fire damage and etc. on CL?	
2.	Resilience/ stress with standing nature of communal land site to dispose flood/excess run off, with stand drought, fire etc.?	
3.	Recovery and regeneration of closed areas and gully lands (grass and woody biomass)	
4.	Security of communal resources like grass, wood, beehive and etc. from theft?	
	EE. (ENVIRONMENTAL PROTECTION/CONSERVATION)	
1.	Visible reduction of soil erosion such as rills and gullies	
2.	The recharging status of springs/ ground water enrichment/base flows in the downstream areas as a result of CLM interventions?	
321.4.	SA **(SOCIAL AND HUMAN ASSET)**	
1.	Community accepted that CLM practices are useful to them	
2.	Communities and community leaders actively participate in the planning and implementation CLM practices?	
3.	Commitment and voluntariness of community members for free labor contribution in working and protecting communal land development interventions?	
4.	Sense of community in respecting bylaws/law to protect and develop communal land resources?	
5.	Role of women in the planning and implementation process in the study area n managing communal lands?	

(II)	How community based natural resource management principles are considered in managing communal lands?	
	Indicators of Sustainable Communal natural resource management principle	
3251.1	**CLRB**	
1.	Communal land resource areas are clearly defined their boundaries?	
2.	No encroachment/ Expansion of communities' private plots to the un demarcated communal land resources areas controlled?	
3.	Community leaders involvement community participation and agreement on delineation boundaries	
4.	Communities' agreement, obligatory and its workability with the existing legal and bylaws restrictions for boundaries?	
3251.2	**BCB /in U R/C that suit to the local situation**	
1.	**Use/benefit:** Community member have the right to use communal resources?	
2.	Community members' practice capturing benefits out of communal resources in a regular manner?	
3.	Existence of Community payment for a nominal fee for each use of communal land resources?	
1.	**Responsibility: C**ommunity leaders' seriousness responsibility in controlling communal resources?	
2.	Community members' reaction on the secret exportation of communal resources?	
3251.3.	**DMA**	
1.	Community participation right through Public vote (by voice or raised hands in decision-making process in managing communal lands?	
2.	Community **leader** decisions making process through: kA executive community leaders /KA chairman on communal land management related issues?	
3.	Elected women has a right in the decision making process?	
3251.4.	**MandFCLRM :**	
1.	There is a functional monitoring system with the supports of bylaw/government law to encroachment and locally imposed ban on exploitation of communal land resources (like grass and fuel and other wood and NTFP)?	
2.	No illegal theft of wood/grass from communal land for any **occasional sale or individual consumption?**	
3.	Communities/leaders representatives' has agreed to conduct **regular and periodic patrols and surveillance to monitor and control communal land resources?**	
3251.5.	**PA on IECLR**	
1.	Existence and application of penalty from m**oney punishment to Jail time** for violations of community by laws on encroaching, illegal cutting and grazing**?**	
2.	Community resident reporting to their respective leaders when observed illegal exercise in order to punish illegal thefts of wood/grass occurred from communal land?	
3251.6.	**CRM**	
1.	Functional conflict resolution mechanisms existence to resolve community resource use conflict?	
2.	Conflicts over communal land resource use are declined?	
3251.7.	GRR to PCLR andOCUG	
1.	Government laws support community in providing use right and protecting communal land?	
2.	Government programs/laws encourage organizing /establishing of user groups with law/ bylaws to work and use on communal resources?	
3251.8.	**OFSGI**	
1.	Absence of over lapping/gap in decision making process between and among different user groups and watershed associations leaders in managing communal lands?	
2.	Absence of overlapping/gap function between KA leaders and different social organization and watershed associations leaders in managing communal lands?	

10.4. Key informant interview check list

IMPORTANT INFORMATION:

PLEASE READ THIS SECTION CAREFULLY BEFORE YOU PROCEED IN RESPONDING THE QUESTIONS.

This questionnaire has been formulated as a precondition to fulfill my PhD Dissertation/Thesis in Environmental Management with a research title: "Analytical Study to Enhance Communal Land Management Practices and Policies towards sustainability and Climate Change Resilience in the Upper Blue Nile Basin, Ethiopia".
Therefore, the main purpose of conducting this questionnaire is solely for academic purpose so as to assess your knowledge and practices on the concept of Communal land management practices and policies in relation to sustainability and climate change resilience.

Please read them carefully and respond truthfully and to your best of knowledge, so that your answer accurately describe your actual acquaintance and practice which, leads the study to have a reliable and realistic research finding.

This questionnaire is designed mainly for <u>Key Informant Interview (KII)</u>

<u>Personal and area info:</u>

Administrative location Name		Geographical location and name of respondent		Sex	
Region		KI Name (If volunteer)			
Woreda					
KA					
Sub Keble		Altitude			
Village		Latitude			

1. In your opinion, how do you see/ evaluate the condition of natural resource (forms and extent of severity in land degradation) when compared to 5, 10 and 15 years ago? (On CFL, CGL and FL?

2. What do you think about the reasons /causes that for the NR condition happened /of such changes in land degradation/ with time (On FGF?)

3. How is status and situation in certifying the land (both for private and communal lands)? How is the condition of tenure security and investment on land after certification?

4. How do you describe the type and magnitude of impact because of condition/ land degradation condition/ on different social group (Rich, medium, poor)? In different LU? (CFL, CGL and FL?

5. How do you describe the magnitude of its impact of condition/ land degradation condition/ on Gender perspective (men and women affect?

6. What are the government/community responses to minimize the impact On A. CF, B. GL and C. Farmlands?

   A. On communal grazing lands

   B. On communal forest lands

   C. Farm lands

231. In managing communal lands, from your experience and knowledge, what are community adaptation capacities practiced/observed to manage communal lands and adapt climate change/variability stresses?

In terms of doing: like for CGLM:

area enclosures and management, use of rotational grazing, arranging private grazing plot, develop Water harvesting structures and strategies, use of stall fed animals, designing and implementing relevant byelaws, Prepare hay and silage for feed (under line it) or if there are others please (Specify)?

For CFM: area enclosures and management, arranging private wood lot, using of alternative energy system, designing and implementing relevant byelaws or other (Specify)Income generation activities from CL? , Social/cultural institutions establishment?, Access to information?, Better transport alternatives? Ecological / environmental management?, Use of different energy alternative?

421. If there are some social institution, mention their name of existed social institutions (Like: Watershed users association, Cooperatives, Micro and small enterprises, or any other) Micro finance institutions in the area and how is the status of functionality to manage and control communal forest and grazing land applications?

422. What do you think are the Potential gaps / constraints in social institutions in managing communal lands in a more sustainable and climate resilient manner?

423. What is your possible suggestion to improve the gaps/constraints in the application both government and social institutions in managing communal lands towards climate resilient communal land management?

424. Do you belong to a local association to manage and use the communal forest /grazing land? How long have you been a member? And what activities you are doing in relation with communal land resource use and management?

425. Who do you think are the deciding **Government/ formal institution** to access, use and control over both communal grazing and forest lands?

426. Who do you think are the deciding **Social / informal institution** to access, use and control over both communal grazing and forest lands?

10.5 Group discussion check list

IMPORTANT INFORMATION:

PLEASE READ THIS SECTION CAREFULLY BEFORE YOU PROCEED IN RESPONDING THE QUESTIONS.

This questionnaire has been formulated as a precondition to fulfill my PhD Dissertation/Thesis in Environmental Management with a research title: "Analytical Study to Enhance Communal Land Management Practices and Policies towards sustainability and Climate Change Resilience in the Upper Blue Nile Basin, Ethiopia".
Therefore, the main purpose of conducting this questionnaire is solely for academic purpose so as to assess your knowledge and practices on the concept of Communal land management practices and policies in relation to sustainability and climate change resilience.
Please read them carefully and respond truthfully and to your best of knowledge, so that your answer accurately describe your actual acquaintance and practice which, leads the study to have a reliable and realistic research finding.

This questionnaire is designed mainly for <u>Group discussion (GD)</u>

FG members and description of their location:

Administrative location Name	Geographical
Region	
Woreda	
KA	
Sub Keble	
Village	
Altitude	
Latitude	

Respondent FG Name (If volunteer)	Sex	
	M	F

111. Can you tell your observation on <u>communal grazing and forest land use land cover change history</u> in the last 10 and 30 years?

112. If there exist a change, which communal land undergo a significant change and What do you think are the main/important reasons for a change in land use/land cover?

113. According to your opinion, what are the level of communal land resource utilization Do you think it is over utilized (leads for further series degradation), Normal utilization (does not leads to further degradation) or Not utilized at all(that leads for further good rehabilitation) What is your argument and why?

31. Do you have access to information/ knowledge on sustainable land and communal resource management and marketing products? Yes……, No……,

If yes, what type of access (radio, Newsletter, through community and religious leaders, through DAs or other) and how is the level of adequacy?

236. Do you have strategies for **<u>communal grazing land</u>** management in coping/ adopting climate stress? like area enclosures management, use of rotational grazing, arranging private grazing plot, develop Water harvesting structures and strategies, use of stall fed animals, designing and implementing relevant byelaws, Prepare hay and silage for feed (under line it) or if there are others please (Specify)?

237. Do you have strategies for **communal forest land** management in coping/ adopting climate stress? This like area enclosures management, , arranging private wood lot, using of alternative energy system, designing and implementing relevant byelaws or other (Specify)If yes what mechanism?

313. What do you think are the constraints/**influence** that impedes the sustainability of communal land management practices/ conservation measures?

314. In your opinion, what do you think are the solution for the above mentioned problems?

419. What do you think are the major institutional/legislation problems over communal grazing and communal forest lands?

4110. In your opinion, what do you think are the solution to sustain communal grazing and forest land resources?

421. If there are some social institution, mention their name of existed social institutions (Like :Watershed users association , Cooperatives, Micro and small enterprises, or any other) Micro finance institutions in the area and how is the status of functionality to manage and control communal forest and grazing land applications?

422. What do you think are the Potential gaps / constraints in both government and social institutions in managing communal lands in a more sustainable and climate resilient manner? And what is your possible suggestion to improve the gaps/constraints in the application both government and social institutions in managing communal lands towards climate resilient communal land management?

10.6 Check list for summary of questions from CLAU Regulation/directive

DATA TO BE COLLECTED AT KA,WOREDA/REGION LEVEL					
No.	Articles in Local language	Check points	Responses		
			REGION	WOREDA	KA
24.1.10	□□□□ □□□/□□□/ □□□ □□□□□□ □□□□ □□□ □□□□ □□□□□ □□□ □□□ □□□□□□□ □□□□□ □□□□□/□□□□□ □□□□□□□□□ □□□□□ □□□□□ □□/□□/□□/□□□□□ □□□□□ □□□□□ □□□□ □□□□□□ □□□□□ □□□□□□□ □□□□ □□□□□ □□/□□ □□□□□□ □□□□ □□□□□ □□□□ □□□□□□ □□□□□□ □□□□ □□□□□ □□ □□□□□ □□□□ □□□□□□□ □□□ □□□ □□□ □□□ □□□□□□ □□□ □□□□□ □□□□□ □□□□□ □□□□ □□□ □□□□□□ □□□□□□□	Take a copy of 2or 3 instances of registration book and CL certificate, take a picture of these!!!	ACTION	ACTION	
24.2.3	□□□□ □□□ □□□ □□□□ □□□□ □□□ □□□□□ □□□ □□□□□□□□ □□ □□□□□□□ □□ □□ □□□□ □□ □□□□□ □□□□□ □□ □□□□□□□□	Take a number of this kind of case data!!			
26.1.1	□□□ □□□□□ □□□□□ □□□□ □□□□□ □□□□□□ □□□□□□□ □□□□□ □□□□□□□□ □□□□□□ □□□□ □□□□□ □□□□ □□□□□ □□□ □□□□□ □□□□□□ □□□□□□ □□□□ □□□□□□ □□□ □□□□ □□□ □□□□□ □□□□ □□□□□ □□□ □□□□□□	Number of cases where participatory CLUP exercised per woreda and in a region?			
26.1.5	yxµÆbþ ÞgùN tGÆ‰êE l¥DrGÂ □□□ □□□□ §Y b¸µÿD □□□□□ □□□□□□□ □‰ §Y ImœtF fÝd¾ ÆLçnù □□□□□ bwL mÊtÜ ImgLgL Ã§cWN mBT XSk mGfF y¸dRS QÈT mwsN YÒ§L#	Number of cases like this per KA /woreda and region			
27.1.5 ,	□□□□□□ □□□□□ □□□□ □□□□□□□- A. □□□□□□□ □□□□□ □□□ □□□ □□□ □□□□□□□ □□□□□ □□□□ □□□□□ □□□□ □□□□□□ □□□ □□□ □□□□ □□□□□ □□□ □□ □□□□□ □□□□ □□□□□ □□□□□ □□□□□□□.	Number and types of cases and types of punishment			
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27.2.2	□□□ □□□□ □□□ □□□ □□□□□ □□□ □□□□ □□□□ □□□□□□ □□ □□□□□ □□□□□□□ □□□□ □□□ □□□□□ □□□□□ □□□□□□□□□□ □□□ □□□□ □□□□□ □□□ □□□□ □□□ 133/98□ □□□□ 29 □□ □□□ □□□□ □□□□ 48.2 □□ □□□□□□ □□□□ □□□□□ □□□□□ □□□□□ □□□□□::□□□□□□ □□□□ □□□□/□□□□ □□□ □□□ □□□□□□□ □□□□□ □□□□□□ □□□□□ □□□□□□□ □□□□□ □□□ □□□□□□ □□□□□ □□□□□□□ □□□□□ □□/□/□/□□/□□/ □/□□ □□□□□ □□□□□□::	How many of KA, Woreda and region where CL demarcation exercised			
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31.1	□□□□□ □□□ □□□ □□□□□□ □□□□□□ □□□□□□ □□□□ □□□□□□ GÁ¬ãC Yñ„b¬L"- □. □□□ □□□ □□□□ □□□□ □□□ □□□□□ □□ □□□□□□ □□□□ □□ □□ □□□□□ □□□ □□□□□□□	Number of cases where forest utilization plan and CLU plan worked out			
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32.2	□□□□ □□□□ □□□□□□□ □□□□ □□□□□□ □□□ □□□□ □□□□□ 18 □□□□ □□□□ 1 □□□ 4 □□□□□□□ □□□□ □□□□ □□□□□□□□□ □□□ □□□ □□□□ 18.1 □□□□ □□□□□ □□□□□ □□□□□ □□□□□ □□□□ □□□ □□□□□□□ □□□□□ □□□ □□□□□□□ □□□□ □□□□□ □□□□□□□ □□□□□ □□□ □□□□□ □□□□□ □□□□ □□□□ □□□ □□□□ □□□□□	Number and types of cases per KA /woreda and region			
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34.4	□□□ □□□□ □□□□ □□□□ □□□□ □□□□□□ □□□□ □□□ □□□□ □□□□□ □□ □□ □□□□□□ □□□ □□ □□□□□ □□□□□□□	Number of cases/region/woreda/KA?			
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22.1	ywL mÊèC xStÄdR□□□□ □□□ □□ □□□□□ □□□□□ □□□□ □□□ □□□□□□ yqbl¤ xStÄdR `§ônT YçÂL#	How is the fonctionnai conflicts with article 35-(7) and 36.(1-9) ?			
24.1.3	□□□ □□□ □□□ □□□□□ □□□□ □□□ □□□□ □□□□	How is the status of real			

DATA TO BE COLLECTED AT KA,WOREDA/REGION LEVEL					
No.	Articles in Local language	Check points	Responses		
			REGION	WOREDA	KA
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25.1	□□□ □□□□□ □□□□□ □□□ □□□ □□ □□□ □□□□ □□□ □□□□□ □□ □□□ □□□ □□□□□□□ □□□□ 2/3□□ □□□□□ □□ □□□□ □□□□ □□□□□□ □□□□ □□□□ □□□ □□□□ □□□□□□ □□□□□□□ □□□□□□ □□□□ □□ □□ □□□□□ □□□□□□ □□□□□ □□□□□	How is the application of this article in the case of UG formation when sharing land from CL??			
26.1.8	□□□ □□□ □□□□□ □□□□□□ □□□□□ □□□□□□ □□□□□□ □□ □□□ □□□□ □□□ □□ □□□□□□ □□□□□ □□□ □□□□ □□□□□□□ □□□□□□ □□□□ □□□□□ □□□□ □□□□□□□	How is the coordination to implement from A-D above and number of cases where this kind of activities are implemented per KA /woreda and region			
27.1.3	□□□□□□ □□□□□□□□ □□□□□□□ □□□□□ □□□ □□□□□ □□ □□□□□□□ □□□□□ □□□□□□□□ □□□□□ □□ □□□□□□ □□□□ □□□□□□□ □□□□ □□□□□ □□□□□□ □□ □□□□□ □□□ □□□□□□□ □□ □□□□□□	How is the application?			
27.1.5 ,	□□□□□□ □□□□□ □□□□ □□□□□□□- B. □□□ □□□□□□□ □□□□ □□□□□ □□□□□□ □□□□□□ □□□□ □□□□ □□□□□□ □□□□□ □□□ □□□□ □□□□ □□□□□ □□□ □□□□□ □□□□□□ □□□ □□□□□□ □□□□ □□□□□□ □□□□□□□	Is there a MandE system in place? Is it described in the bylaw? Take a photocopy of an example bylaw			
30.1	□. □□□ □□□ □□□□ □□□□□□ □□□□□□□ □□ □□□□ □□□ □□□ □□ □□□ □□□ □□□□□□ □□□□ □□ □□ □□□□□ □□□□□□	An example of such sustainable use type after compensation			
29.5	□□□□ □□□ □□□ □□□□ □□□□ □□□ □□□□ □□□□□ □□□□□□ □□□□ □□□□□□ □□□ □□□ □□□□□□□□ □□□□□□ □□□□□ □□□ □□□□ □□□□□□□□□□ □□□ □□□□ □□□ □□□□ 29.4 □□ □□□□□□ □□□□ □□□□□ □□□□ □□□ □2/3□ □□□□ □□□□□□ □□□□□ □□□ □□□□ □□□□□□ □□□□□□ □□□□ □□□□□ □□□□□□□ □□□□□□□□□ □□□□ □□□□ □□□□□□ □□□□ □□□ □□□□□ □□□ □□□ □□□ □□□□□□□□ □□□□□ □□□ □□□□□□□	How is the compatibility of CL boundary and CWS boundary in the us and development intervention LU management			
31.1	□□□□□ □□□ □□□ □□□□□□ □□□□□□ □□□□□□ □□□□ □□□□□□ GÁ¬ãC Yñ„b¬L"- □. □□□ □□□ □□□□ □□□□ □□□ □□□□□ □□ □□□□□ □□□□ □□ □□ □□□□□ □□□ □□□□□□□	How is the participation and permission of community considered as a necessary condition			
34.4	□□□ □□□□ □□□□ □□□□ □□□□ □□□□□□ □□□□ □□□ □□□□ □□□□□ □□ □□ □□□□□□ □□□ □□ □□□□□ □□□□□□□	for 34.2-4, How is the cases on such resource/financial utilization procedure implemented: project plan developed?			
34.6	□□□ □□□ □□□□ □□□ □□□ □□□□□□ □□□ □□□□□□□□ □□□□□ □□□ □□□ □□□□□□ □□□ □□□ □□□□ □□□ □□□□□ □□□□□ □□□□ □□□□□□ □□□□□ □□□□ □□□□□□□□	If LU change, then, was there a case LUP or studies related conducted,			
35.4	□□□ □□□ □□□□□□□ □□□□□ □□□□ □□□□ □□□ □5-7 □□□□□ □□□□ □□□□□ □□□ □□□□□ □□□□ □□□□□□□ □□□□□□ □□□ □□□□ □□□□ 2 □□□ □□□□□□ □□□□□□ □□□□□□□	Are women selected as committee member (is this practiced in the ground?			
35.7	□□□□□ □□□□ □□□□□ □□□□□□□ □□□□□□□ □□□□□□ □□□□ □□□□ □□□□□ □□□□□ □□□□ □□□□□□□ □□□□□ □□□□ □□□□□□□ □□□□□ □□□□ □□□□□	How about the accountability functionality with others			