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Impacts of Forest Degradation on Rural Livelihoods and Food Security, East Wollega Zone, Ethiopia

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ACRONYMS

AGERTIM	Assessment of Gully Evolution Rates Through Interviews & Measurements
ARDO	Agriculture and Rural Development Office
CSA	Central Statistics Authority
CSA	Central Statistic Authority
DAs	Development Agents
ECEA	Ethiopian Customs and Export Authority
EFAP	Ethiopian Forestry Action Program
EMA	Ethiopian Mapping Agency
EMA	Ethiopian Mapping Authority
EMSA	Ethiopian Meteorological Service Agency
EPA	Environmental Protection Authority
EPA	Environmental Protection Authority
ETB	Ethiopian Birr
EWARDO	East Wollega Agriculture and Rural Development Office
EWMEO	East Wollega Zone Mineral and Energy Office
FGD	Focus Group Discussion
FGD	Focus Group Discussion
GIS	Geographic Information System
HHs	Households
HHs	Households
ITTO	International Timber Trade Organization
m.a.s.l	meter above sea level
NEPA	National Environmental Policy Act
NMSA	National Meteorological Service Agency
OBFED	Oromia Bureau of Finance and Economic Development
OCSI	Oromia Credit giving Service Institution
OCSI	Oromia Credit and Saving Institution
ODA	Overseas Development Agencies
OFEDB	Oromia Finance and Economic Development Bureau
OFWE	Oromia Forest and Wildlife Enterprise
PFM	Participatory Forest Management
PRA	Participatory Rural Appraisal
REDD	Reduced Emission from Deforestation and forest Degradation
Sq.km	Square kilometer
SWC	Soil and Water Conservation
TGE	Transitional Government of Ethiopia
TGE	Transitional Government of Ethiopia
UNDP	United Nation Development Program
UNEPA	United Nation Population Fund
UNESCO	United Nation Economics and Socio Cultural Organization
WBISPP	Wood and Biomass Inventory Strategic Project Plan
WISPP	Wood Inventory Strategic Project Planning

GLOSSARY

Ancootee,	*edible root crop well known in the study area*
Arfaasaa	*the Spring Season*
Ba'aa dugdaa	*a bundle of wood usually carried by women on their backs*
Ba'aa duroo	*a bundle of wood usually carried by men on their heads*
Ba'aa gatiittii	*a bundle of wood usually carried by men on their shoulders*
Baattuu qoranii	*a person who usually relies on sale of firewood*
Bada dare	*midland agro-ecological zone*
Bada dare	*midland ecology*
Badda	*highland ecology*
Baddaa	*highland agro-ecological zone*
Birr	*Ethiopian currency*
Boolla- kasalaa	*a hole where charcoal is made*
Bosona	*forest area with diverse tree species*
Bulchaa gandaa	*a leader/administrator of gandaa*
Ciraaroo	*domestic wood fuel (twig) used for making caabeta*
Cir-gubii	*clearing and burning of forests*
Daadoo	*customary labour group or arrangement*
Daadoo	*labor festivity usually arranged among five to ten people*
Daboo	*festive work party*
Daboo	*labour festivity (one of the social support arrangements)*
Danda'aa	*self-sufficient*
Darabaa	*the seasonal movement of farmers with their cattle*
Darabaa	*seasonal movement of farmers with their cattle*
Deegaa	*the destitute*
Deegaa	*the destitute*
Dureessaa/sooreessa	*the rich*
Fe'umsa	*a bundle of wood set for transport on donkey/horse*
Gabaa Jimataa	*Friday market usually referring to a place name*
Gabaa Kamisaa	*Thursday market usually referring to a place name*
Gamojjii	*lowland agro-ecological zone*
Gandaa/ Gandalee	*the lowest administrative structure*
Garee misoomaa	*a group of farmers comprising 15 to 30 HH heads*
Gooxii	*administrative structure below a gandaa*
Gubaa(Cirii-gubii)	*the process of farmland preparation using fire*
Gubaalessa	*a farm plot cleared and burned i.e. ready for farming*
Hora	*a pond that tests salty used for fattening cattle*
Iddirii	*funeral association*
Ittoo	*a soup prepared for making breads soft and delicious*
Iyyeessa /Harka qalleess/	*the poor*
Arfasaa	*Spring Season*
Gannaa	*Summer Season*
Jigii,	*Similar to daboo*
Kanchiii	*medium sized wood used for poles*
Maagara	*smaller sized poles*
Mana-dhoqqee	*a house built up of mud and woods*

Of danda'aa,	*self-sufficient*
Okaa	*fodder (grasses) collected from forests or woodlands*
Qoraan	*firewood*
Rooba gannaa	*Summer/Kiremt/ rainfall*
Shanee	*a group of 3 to 9 farmers/discussants/*
Waaqeffataa	*a person who adheres in Waaqaa (God)*
Waldaa Qusannoo fi Liqii	*credit and saving enterprise*
Xarbii	*a wooden construction pole*

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ABSTRACT

This thesis examines impacts of forest degradation on rural livelihoods and insurance of food security at the community level of East Wollega, Ethiopia. Furthermore, the research is also aimed at assessing of the uses and abuses of forest resources, causes of forest degradation and its impacts, indigenous forest and other natural resource management approaches used for sustaining ecological services and forest based livelihoods of the local communities. The theory of the tragedy of commons, the livelihood perspectives and empirical forest degradation wave model were used for assessment of forest degradation and its impacts. Both quantitative and qualitative methods and different data collection tools (questionnaire survey, key informant interview, FGD, PRA, case studies, transects and observations) were used. Satellite image analysis, descriptive statistics, cross tabulation, chai square, AGETHIM, content analysis and different PRA analytical tools were for analysis of data. Then, forest degradation is found to be negatively impacting the livelihoods of the local communities and other environmental resources of the study area. Shortage of forest timber and non-timber product; reduction of fuel wood, constructional materials, forest species of diverse ecological, reduced forest species of socio-economic values, change in farming system, e.g. intensification of cash crops, reduced agricultural productivity (crop and livestock and bee keeping) were some of the on-site- impacts of forest degradation identified so far. Accordingly, the following recommendations are also made. In order to minimize and mitigate the continuing forest degradation, intensification of farming and creating diverse livelihoods options have to be the critical objective of forest management attempts. Forest friendly farming systems have to be appreciated through introduction and creating of new forest based livelihood activities. To overcome fuel wood shortage, substitute energy sources have to be accessed by stakeholders. Watershed development program and integrated forest resource management has to be implemented according to indigenous knowledge of the communities. Overall, participatory forest and Eco theological management approach that sustains the livelihoods of the local communities have to be appreciated.

Key words: Forest Degradation, forest Based Livelihoods, Food Security, forest and other natural resources

CHAPTER ONE: INTRODUCTION

1.1. Background

Forests are one of the most important natural resources with diverse economic, socio-cultural and ecological uses. The livelihoods of hundreds of millions of people worldwide have been engaged on forest products either directly or indirectly. Forests have a vital safety net role in time of needs (Anonymous, 2008). According to World Bank (2001), more than 1.6 billion people were dependent on forest resources globally. About 350 million people were living within and adjacent to dense forests and 60 million indigenous people were exclusively dependent on forest resources. Mostly, indigenous forest dwellers were the primary users of forest resources to a higher degree for domestic uses and income generation. As some studies show, about one-third of the world's land area (about 40 million km^2) was covered by forests of diverse uses and services that have the most accessible productive resources available for people with minimum income alternatives living in the rural parts of the world(Nadkarni, 2005; Anubha Kaushik, 2006).

However, over exploitation of forest products and conversion of forests into farms and other land use types were identified as major causes of forest degradation which in turn affects the forest based livelihoods of the people adversely (Botkin Keller, 2000). According to Steilin(1982);Weber and Stony(1989), about 3.8 million hectares of tropical forests were lost between the year 1981 to 1985. Due to unsustainable forest based livelihood activities, about 2.3 million hectares of the tropical forests was documented as an annual loss in the mid-1980s. This implies that almost everywhere in the world, the natural forests have been degraded worryingly.

In Ethiopia too, about 40% of the former forest resource was reportedly lost since 1940 due to human induced factors and unsustainable livelihoods of the communities (Harriso, 1987; Friis, 1992). On the other hand, the studies by EFAP (1994) and McKee (2007) show that an annual forest loss of the country was between 150,000 and 200,000, and 146,000 hectares respectively.

Recently, it is reported that about 14% (2.1 million hectares) of forest cover in the country was lost since the close of 1990s (Fekadu Gurmessa, 2010).

A growing influence of forest based livelihoods, illegal harvesting of forest products, expansion of farms, overgrazing and other activities were identified as major causes of forest degradation (Fekadu Gurmessa, 2010, Ministry of Environment and Forest, 2014). Due to similar reason, the remaining natural high forest species and woodlands *(e.g. Aningeria adolfi-friederci, Arundirania alpina, Albiza schimperiana, Prunus africana, Podocarpus flactus)* of the southern and south-western parts of the country were found to be highly vulnerable (Kumlachew Yeshitila and Tamirat Bekele, 2003)

Basically, forest degradation and its impacts on livelihoods of the rural communities seem seldom surveyed, which holds true to the Ethiopian experience in general and the study area in particular. Hence, this study is intended to detect the magnitude of forest degradation and its impacts on the livelihoods of the local communities and recommends sustainable forest management strategies that fulfill the existing gaps.

1.2. Statement of the Problem

Alarming population growth has attributed to increasing demand for forest products and impacted forest based livelihoods of the local communities adversely. Encroachment of settlements, expansion of farmlands and unsustainable forest based livelihood activities were perceived to be the main causes of forest degradation. Abuse of forest timber and non-timber products has also impacted the environmental resource bases, forest based livelihoods and existing indigenous forests and other natural resource management arrangements of the local communities badly.

The resettlement of tens of thousands of people on extensive woodland found adjoining the study area was an agent of forest degradation exerted varying degrees of loses on forests and other natural resources. Equally, the influence of the former Anger Dhidhessa state farm (currently, owned by the private investors and Enterprises) on existing forest species and other natural resources continued actively. Forest degradation and growing demand of forest products, forest use competitions

and conflicts of interests among different forest use stakeholders and forest smugglers seems the common episode of the study area.

Due to forest degradation, the old age seasonal opportunistic movement of farmers with their cattle (*darabaa*) searching for fodder (*okaa*) and salty ponds (*hora*), pristine wood lands and browsing trees and shrubs for their cattle as well as cultivable plots for production of annual food and cash crops became impractical. Indigenous forest based livelihood activities and main socio-cultural attachments of the local communities with forest resources seem discarded.

It also confirmed that deteriorating livelihoods of the local communities and food insecurity at household level were impacts of a growing population and increasing demands for forest products and other natural resources (Pankrust, A., 1986; Kashun Birhanu, 2000; Tesfaye Tafesse, 2007; Zelalem Teferea, 2007 and Zelalem Temesgen, 2008). A growing demand for forest products, settlement encroachment and land use competition among stakeholders were apparently perceived as main causes of forest degradation. Due to several factors, the remaining forests and other natural resources of the study area were subjected to demographic stress. The magnitude of forest degradation and its impacts on timber and non-timber forest products and other natural resources became the grave concern. Furthermore, the socio-cultural dynamics were found to be triggering forest degradation and made the rural livelihoods of the local communities more precarious than before.

Generally, the uses and abuses of forests and the impacts of forest degradation prevalent in the study area include; the encroachments of farm and settlement, forest clearing and burning, fuel wood and charcoal production, poor logging and extraction of timber for house construction, fencing posts etc. remain threatening the rural livelihoods of the local communities. By virtue of its location, the forest resources of the study area have been contributing to sustainable flow of streams and tributaries of the Blue Nile. But, the ongoing forest degradation seems constraining the reliability of streams and perennial rivers originating from the *Komto-Watcha- Tsigie* forest areas and *Wolene* and *Gara-achani* ranges.

Under valuation of indigenous forest trees in comparison with other exotic tree species and the increasing demand for exotic species, mainly eucalyptus trees also seems hastening the degree of degradation of indigenous forest species. Again, unsustainable forest resource utilization and inequitable share among different stakeholders, lack of forest tenure and inconsistencies in mandate of forest management institutions seem among the causes of forest degradation and household food insecurity.

Poor governance and unsustainable forest management practices were ambitious agenda which seek active participation and involvement of forest communities and civil societies in policy implementation, institutional arrangements and setting management priorities, i.e., effective, fair and proportionate enforcement and sanctions for illegal activities. Also, management plan between local and higher levels of government's sectors linkage, checks and balances to prevent domination by any one level or branch of government and devising mechanisms for conflict resolution seem poorly implemented.

Scarcity of fire wood and other timber products, loss of bio diversity, soil erosion and land degradation, fluctuation of hydrological regime and the decline in agricultural productivity and food insecurity have been the major concerns. The impacts of forest degradation on natural resource bases, agricultural productivities, the socio- cultural affairs, forest based household income and food security status of the local communities were hardly documented.

Therefore, the study was aimed to address and fill the existing theoretical and practical gaps in light of the livelihood perspectives and provide sustainable forest resource management methods that suit the natural and cultural setup of the area.

1.3. Objectives of the Study

This study has both general and specific objectives clearly stated.

1.3.1. General Objective

The general objective was to assess the status of forest resources and impact of forest degradation on rural livelihoods in ensuring food security of the local communities.

1.3.2. Specific Objectives

The specific objectives were to:

i. Assess the status of forest resources and changes in the land use/cover system
ii. Identify the uses and abuses of forest resources and impact of forest degradation on other natural resources.
iii. Identify the proximate and underlying causes of forest degradation.
iv. Identify the effects of rural off- farm and forest based livelihood activities on existing forest resources of the study area.
v. Realize the link between forest degradation and diversified livelihoods and household food security inference.
vi. Assess indigenous and modern forest and other main natural resource management systems.

1.4. Research Questions

It is known that the way a researcher asks a question determines categorization of questions on a measurement scale, affects data collection, analysis, presentation and conclusion to be drawn. Accordingly, the research questions of this study were outlined conforming to the specific objectives.

i. What are the status of forest resource and the change in land use/cover system?

ii. What are the proximate and underlying causes of forest degradation?

iii. What are the uses, abuses of forests and forest degradation and its impact observed?

iv. What effects does an increasing off-farm and forest based livelihoods have on forests and integrated natural resources of the study area?

v. How does the existing forest degradation linked with the rural livelihoods in ensuring food security of the local communities?

vi. What indigenous and modern forest and other natural resource management practices exist in the study area? (What are the sustainable forest resource utilization and management culture to be maintained in the face of deteriorating livelihoods and growing food insecurity, shortage of landholding, increasing forest based and increasing demand for fuel wood, forest fodder, timber and other non-timber products etc.?)

1.5. Significance and Scope of the Study

The problem of forest degradation seems multi-dimensional affecting environmental well-being and the livelihoods of the communities and hindering the goal for tackling food insecurity. Thus, the study of the socio-economic conditions as factors of forest degradation and its impacts on livelihoods of the local communities, socio-cultural and other natural resources, forest management approaches and adaptive strategies were concerned issues. Assessment of underlying causes of forest degradation and its impacts on the rural livelihoods and strategies used by the local communities to overcome existing shocks were issues considered in detail. So, there is a hope that agricultural experts, foresters, environmentalists, development agents, non-governmental organizations (i.e., forest management stakeholders) and policy makers. The study contributes additional insights and perspectives for addressing forest management issues, causes of forest degradation and forest based rural livelihoods in ensuring food security at households and community levels.

The findings of this study could bridge the former gaps by conducting temporal and spatial detection and proper assessment of forest degradation and its impacts on rural livelihoods and food security. More importantly, the indigenous eco- theological forest and other natural resources conservation measures appear sound and useful recommendation easily implemented by the local communities and all forest use stakeholders.

On the other hand, this study is delimited to the local level assessment of land use/cover change, forest degradation and its impacts on forest based livelihoods and other off-farm rural activities. The direct and underlying anthropogenic causes of forest degradation were also considered haphazardly. Thus, it considers some selected *gandalee* and households found very close to the natural forests and plantation forests i.e. households found within the radius of about 10 km from the forest frontiers supposed to be the direct forest users.

1.6 Limitations of the Study

Among several forms of odds that encounters, shortage of proficient data and inconsistence in documentation of data from different governmental and non-governmental offices were the common constraints. Conducting comprehensive botanical assessments appears difficult. So, I decided to conduct partial assessment of some local forest species and indigenous trees and their uses only.

Again, due to diverse and complex nature of variables which affect forest degradation and livelihood and food security, I couldn't go beyond implementation of simple statistical techniques like descriptive statistics, qui square etc., for analyzing the data collected through questionnaire survey and reporting of the finding of the study using frequency percentage, tables and graphs. Land use/cover detection and analysis using satellite imageries of different periods was expensive and difficult to get the latest satellite imagery of the study area.

Never the less, I would like to acknowledge the uncertainties that are associated with satellite images used for forest over change detection and analysis. Certain appraisal

of forest trees and plant species of medicinal and other values and identification of vegetation structures were accomplished through field observation, PRA, key informants interview and consulting documents.

1.7. Organization of the Study

This dissertation is generally organized into different chapters having considerable topics and sub topics. Accordingly, chapter one is the introductory part. Chapter two is about theoretical frameworks and review of related literature. Chapter three is description of the study area in broad. Chapter Four is materials and methods of the study. The finding of the study begins with chapter five i.e., the demographic profiles and effects of increasing population growth. Chapter six is about state of forest land use/cover change and the rural livelihoods. Chapter seven is about the socio-economics and livelihoods of the community. Analysis of forest uses and abuses is incorporated in chapter eight. Then, chapter nine which is about some traditional and current forest management and integrated natural resources of the study area. Chapter ten is conclusion and recommendation part of the study.

1.6. Definition of Terms

The definition of terms and the conceptual framework adopted for analysis of " Impacts of forest degradation on the rural livelihoods in ensuring food security in East Wollega" is felt to be appropriate to be defined operationally as follows.

Forest and other natural resources: In this study**,** forests and other natural resources are popularly understood as a continuous stand of tree comprising of major forest biomes i.e., water, soils, wildlife and other natural resources directly affected by existing forest resources.

Forest Degradation: As already stated in the review literature, forest degradation is a more complex and ambiguous concept with varying forest management objectives. Anyway, in this study forest degradation is defined as reducing forest areas and depletion of forest species and other forest associated natural resources as revealed through analysis of satellite imageries and ground observation. Moreover, definition

of forest degradation is established based on interpretation of existing perceptions and historical narrations and comparisons of availability of forest timber and non-timber products of the past and the present days were basis for defining forest degradation as depletion of forests and integrated natural resources due to human induced activities of the local communities.

Rural Livelihood: For Scoones (1998) and Ellis (2000), refers to the sustainable livelihood approach focusing on livelihood assets like natural capital, social capital, human capital, physical capital and financial capital useful for livelihoods of the local communities. livelihood is defined as capabilities, assets and activities required for means of living (Warner, 2000). The concept of livelihood integrates ecological, economic and social well-being of the people. In terms of definition, livelihood is grounded in multidimensional meanings and could be considered in different perspectives. Therefore, the fundamental livelihood concept of this study largely considers the natural capital (natural resource bases of the study area), their uses and abuses and the impacts of forest degradation on forest based rural livelihoods of the local communities.

Food security: Food security is defined as economic and physical access to food by all people at all times (FAO, 1983). i.e., people's ability to consume food from their own production as well as by purchasing food, availability and continuity of supply are necessary factors to achieve food security. Similarly, a food security condition of the study area was considered based on food availability and access conditions. Hence, households were considered food secure according to the availability of food supply and off farm income generation for purchasing food for domestic consumption.

CHAPTER TWO: THEORETICAL FRAMEWORK AND REVIEW OF RELATED LITERATURE

2.1. The Common Pool Resources Theory

Different theories and models can be used to understand the process of forest and other natural resource degradation and management approaches and livelihood strategies of the communities. For this study, however, the theory of common pool resources, tragedy of the commons, the livelihood theories and the concepts of population-development nexus environment were reviewed in detailed to get the insights of forest degradation and its impacts on rural livelihood and food security frameworks.

Communal natural resources like forest resources, water resources (streams and rivers, wetlands, traditional irrigation schemes etc.), wildlife, grazing lands (pasture lands) could be considered using the common pool resources and common property management approaches and theoretical lenses (Ostrom, 1990). The theory of "Tragedy of the Commons", proposed by Hardin (1969), deals with the common property use and unsustainable utilization of such resources by the community i.e., common pool resources owned neither by the governments nor privately by the local people. After his thought of over exploitation of such common resources by some people, the' beneficiary groups', at the expense of other community members, Hardin recommended such solutions as state control and individual ownership and governance of the common property resources as the best management measure.

But, this assumption was ignored until the mid-1980s when common resource property regime rather replaced by the state controls and individual ownership in many countries of the world (Halake, 2010). On the other hand, many scholars like Dietz et al. (2003) come up with different ideas against the tragedy of the commons in support of the strength and management potentials of the communities i.e., indigenous management and self-governing institutions and their contribution to the welfare of the communities by solving the problem of common resource uses.

Thus, the community governance and participatory natural resource management seem the sound approach and useful recommendation to overcome forest degradation and promote sustainable natural resource management and forest based livelihoods of the communities at large.

2.2. The Livelihood Theory: Food Insecurity and Vulnerable Livelihoods

The Livelihood theory is a comprehensive framework which pools together different assets and vulnerability contexts i.e. strategies which can either facilitate or deter the process of household livelihoods. A livelihood is deemed sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities, assets and activities both now and in the future without undermining the natural resource base of an area. It is an approach based on evolutionary thinking about poverty reduction, the way the poor and vulnerable people live, the importance of structural and institutional issues; people suggest development activities i.e., people centered responsive and participatory, multi-level, conducted in partnerships with both the public and private sectors, dynamic and sustainable. It helps to organize the factors that constrain or enhance livelihood opportunities and shows how they relate to one another.

2.2.1 The Livelihood Assets

According to Scoones (1998) and Ellis (2000), pursuing different livelihood strategies, depend on the basic materials and social, tangible and intangible assets like natural, physical, human, financial, and social capitals. The natural capital includes land, forest, water and other integrated environmental resources useful for survival of the societies. Natural resources play a vital role in sustaining livelihoods of the community. Crop production and livestock rearing at domestic level depend on availability of arable land and natural resources such as vegetation cover, soil and water resources.

Land and other natural resource assets have contributed significantly to the livelihoods of poor population either directly or indirectly (Degefa Tolesa, 2005).

Likewise, physical capitals like transport, electricity, human health and animal veterinary clinics, schools, telecommunication etc. also contribute much in supporting livelihoods of the people (Scoones, 1998). It is known that people use different physical capital; infrastructures and household level property ownership to pursue their livelihoods.

Yet, out dated farm implements and other physical capital were reportedly found among the factors constraining the efficiency of labour productivity of households engaged on crop production, livestock rearing and off-farm activities. The existing physical capitals appear incapable of supporting agricultural and off-farm activities in ensuring the livelihoods of the communities. Consequently, the local communities' pressure on existing forest and other natural resources became highly intensified.

Again, shortage of labour was identified as factor affecting the livelihoods of the communities. It was the serious problem that attributes to unprecedented migration of working age groups (Adults) from their birth places in search of jobs overseas. As the key informant interview shows, strategically, the remaining poor households with scarce labour and infrastructures opportunistically join the game and became the champion in competitive forest resource uses. The other one is financial capital, i.e., the resources available for people in the form of savings, credit from micro financial institutions, regular remittances or pensions that provide people with different livelihood options (Degefa Tolesa, 2005).

As the current study shows most of the surveyed households had access to get credit from Oromia Credit and Saving Enterprise, which provides financial services and supports to the rural communities and government development interventions at *gandaa* level. But, little was done to arrange the credit services for the poor households directly engaged on sale of fire wood and charcoals for motivating them so as to take part in forest and integrated watershed resource management campaigns. Again, the financial capital was the big challenge for majority of the local communities of the study area. Variation in wealth status occurs due to uneven distribution of the financial assets.

It seems shortage of financial capital that forced the poor with limited livelihood options to engage on off-farm activities (e.g. Forest-based livelihood activities) cleverly. On the other hand, social capital is a resource upon which the people's livelihoods established i.e., social networks, social claims, social relations, attachments and associations. It is found that main social capitals and arrangements like *daboo daadoo shanee, jigii,* etc. have been ensuring the livelihoods of communities of the study area in diverse ways.

Currently, however, several social capitals and the indigenous labour support arrangements become powerless to support the ongoing natural resources conservation programs and sustainable forest based livelihood activities.

2.2.2 Trends and Shocks

The livelihoods of rural communities are influenced by vulnerabilities of varying degrees, exogenous to household and local circumstances (Ellis, 2000). Shocks are external sources of vulnerability which affect the livelihoods of the communities adversely. The biophysical resources, demographic variables and their trend, technical changes in production systems and economy of the people in a given area over time are some notable shocks affecting livelihoods of the people (Carney, 1998; Pretty, 1998; Scoones, 1998).

Likewise, soil erosion and declining soil fertility, termite invasion, drying up of streams and rivers, overgrazing, livestock diseases and reduced crop productivity were identified as a potential shocks affecting the livelihoods of the communities in the study area at large ,i.e., considerable attrition to the livelihood assets. In support of this, cases studies have also confirmed that many households were food insecure and uncertain to escape the poverty trap due to rapid population growth and smaller size of per capita landholdings and increased rate of forest degradation and other natural resources. Never the less, substantial agronomic and structural conservation measures were implemented during the watershed development and natural resource conservation campaigns to overcome the prevailing livelihoods shocks due to forest degradation.

2.2.3 The Mediating Processes

Researchers have made distinctions between institutions, organizations and social relations that act as mediators for either enhancing or constraining rural livelihoods. North (1990) has defined institutions as rules of game in a society or, more formally, are the humanly devised constraints that shape human interaction. And he defines organizations as groups of individuals bound by some common purpose to achieve common objectives. For Ellis (2000), social relations are like positioning of individuals and households within the society in gender, caste, class, age, ethnicity, and religion.

Similarly, it is found that, social relations and resource entitlements have impacted communities' access to resource uses and food security status of households of the study area. For example, households having small land size or no land, livestock, grass thatched roof etc. have been marginalized and disrespected. They often labeled as 'hiyyeessa *qoraan baattu*', literally means a destitute who frequently engage on hauling and selling firewood. Although, forest-based livelihood activities remain their primary option in ensuring household food security, it is unlikely that they usually participate in forest management and conservation works voluntarily. Hence, marginalizing forest based livelihoods seems deterring active participation of this people in managing existing forest and other natural resource of their locality.

2.2.4 Livelihood Strategies

For Ellis (2000), livelihood strategies are activities that generate the means of household survival. In turn, activities that households engage on for their survival depend on the asset status mediated by social factors, exogenous trends and shocks. Livelihood strategies are dynamic over time. Owing to continuous changes, people normally develop their own coping mechanisms and adapting strategies. Likewise, the communities in the study area have been engaged on crop production, livestock rearing and varieties of off-farm livelihood activities. Moreover, sedentary farming with crop major and livestock minor, different off-farm activities like forest based

livelihood activities; labor sale and migration etc. also remain the prominent livelihood strategies increasingly adopted by local communities.

Many authors (Scoones, 1998; Pretty, 1998; Carney, 1998; Ellis, 2000) considered different activities like agricultural intensification, extensive farming and crop diversification, migration etc., as livelihood strategies and resilience against the prevailing shocks. The case of some rich households, who have expanded their farms through sharecropping arrangements and land purchased from other community members, most likely follow different livelihood strategies. Intensification through increased labour input is the common practice rather than using more technological inputs. According to Degefa Tolesa (2005), people in all systems attempt to diversify their livelihoods forced by 'necessity' rather than 'choices'.

This implies that people face hardship for survival if they have no option but depend on a single livelihood activity of their own products or transfers. So, existing ambition and strategies to generate more income have motivated farmers in the study area to adopt cultivation and intensification of cash crops by transformation of old age mixed farming into cash crop based 'agro forestry' farming practice.

2.2.5 Livelihood Outcomes

The livelihood outcome is the end product of interaction of different elements in a system. The livelihood outcomes need to be seen in the light of both desirable and undesirable achievements (Scoones, 1998; Pretty, 1998; Carney, 1998; Ellis, 2000; and Degefa Tolesa, 2005). For example, to attain food security on a sustainable basis seems possible for relatively rich people. But, for the rest members of the communities, there may be undesirable outcomes, in the sense that they survive under vulnerable livelihood situations.

Vulnerable livelihoods could be taken as one of the factors discouraging the sustainability of environmental resources and management strategies to be implemented by the local communities.

Most of the rural households have been engaged on direct extraction of timber and non-timber forest resources. Thus, it is unlikely that forest-based livelihoods can solve all the economic and social problems of the people since it reduces forest availability due to the increasing demands of fuel wood and other forest timber and non- timber products. In order to solve forest degradation and food insecurity problems at the local level, community-based organization that stewards and enriches forest resources have to be firmly established.

The communities around the forest areas have to participate in watershed management, forest and other natural resource conservation activities. Again, investments in human, physical, financial and social capital seem necessary livelihood strategies to be adapted for restoring the natural resource capital. Furthermore, the implementation of PFM in different parts of the country seems promising in ensuring sustainable forest ecosystems and forest based livelihood activities of the local communities.

2.3. REVIEW OF RELATED LITERATURE

2.3.1. Introduction

Forests provide benefits in the form of wood, food, income, watershed protection, environmental services and enabling people to secure a stable and adequate food supply. Deforestation and forest degradation, however, are reducing the capacity of forests to contribute to food security, and major benefits, such as fuel wood and fodder and other timber and non- timber forest products (Girma Tadesse, 2001).

Land and associated natural resource degradation i.e., loss of vegetation cover, soils and nutrient depletion, have been the major ecological as well as economic problems with severe impacts on the livelihoods of the communities. Different studies indicate that the fertile topsoil is lost at a rate of about one billion cubic meters per year, resulting in massive environmental degradation and a serious threat to sustainable agriculture and rural livelihoods (Hurni, 1990; Esser et al., 2002; and Haileslassie, 2005). Governments, citizens and scientists are increasingly concerned about the role of forests and impacts of forest degradation on environmental changes.

Evidences are mounting from multiple studies that humans at an aggregate level are exploiting forests resources unsustainably, thus creating unprecedented forest degradation which impacted the livelihoods of the local communities adversely. Hence, this chapter draws attention to forest degradation, drivers of forest degradation, the rural livelihoods and food security status at the local level using the theoretical construct forms knowledge basis which guides the researcher to investigate and fill the existing research gaps.

2.3.2. Forests and their Distribution

According to White (1983) and Eyre (1968) the potential distribution map of Africa shows, varying forest biome like arid vegetation, savanna, tropical montane rain forest and the Mediterranean vegetation. Similarly, the patterns in forest distribution in East African proper are more complex and highly fragmented montane type (Adams M. William et al, 2003).

The indigenous forests composed of tree species such as *Apodytes dimidiate, Hagenia abyssinica, Ekebergia capensis, Pouteria adolfi- friedericii, Croton macrostachyus, Schefflera abyssinica* etc. are largely grown on Ethiopian high plateau areas, the central parts with lower slopes and the south western parts of the country. Many forests of abundant species give way to conifers forests of *Juniperous* and *Podocarpus falcatus* with increasing altitude. On high plateau of between 2500 and 3200 meter above sea level, woodlands with mixture of coniferous *(Juniperous)* and acacia species found gradually changed to savanna at even higher altitudes. This condition seems highly conducive for agriculture but annoying forest clearance extensively (Lewis and Berry, 1988; Langley, 1981).

The detailed classification is the physiognomic approach which considers the links between vegetation and climate. The maps of assumed distribution of climatic-vegetation types are made based on the distribution of the climatic zones. The wide ranges of the ecosystems present in the world are grouped into small numbers of major ecosystem types called biomes in different continents (Eyre, 1968). On the other hand, White (1983) has classified Africa's vegetation into twenty zones.

The first ten were centers of endemism and the rest as transitional, mosaic or unrehearsed areas. Furthermore, the definition of major Africa's vegetation is given based on UNESCO's vegetation map as transitional formations of indigenous extent, edaphic, different physiognomy and natural vegetation as follows:

Forest is defined as a continuous stand of tree of at least 10 meters tall with interlocking crown. **Woodland** is an open stand, at least 10 meter tall with canopy cover of at least 40 percent and its field layer usually dominated by grasses. **Bush land** is an open stand of bushes usually 3-7 meter tall with a canopy cover of at least 40 percent, while **wooded grassland** is land covered with grasses, and other herbs, with woody plants covering 10-40 percent of the ground. **Scrub forest** is an intermediate between bush land and thicket, while **Transitional wood land** is an intermediate between forest and wood land. **Scrub woodland** is stunted woodland less than 8 meter tall or vegetation intermediate between woodland and bush land (white, 1983).

It is known that objectives of forest uses could govern the local definition of forests resources at large. Likewise, a forest/forestland has been perceived as "open and closed trees, woodlands, shrubs and vegetation comprising of endogenous species and exotic plantations thriving over communal lands".

Owing to expensive human modification and transformation of natural vegetation, the actual distribution of forest in Africa today is very different from the potential distribution of vegetation demonstrated by the vegetation map of the continent (Eyre, 1968). Human induced land use/cover change has impeded the regeneration of both open and closed forests and formed the bases of Africa's modern cultural landscape. For example, in the south western Ethiopian highlands, the former broad-leafed ever green forest has been rehabilitated into low land forest type and then wood land savannas, riverine forests and highly degraded forest patches on tops of the hill slopes, along ridges, escarpments, gorges and river valleys.

According to my own observation, growing demands for forest products, forest-based livelihood activities and farmland expansion seem the main factors the local forests

and other natural resource degradation. Small scale agricultural investors and farm enterprises working nearby the forest compartments have been reported by the local communities as agents of forest and other resource degradation. Currently, forest degradation and its impacts on livelihoods of the local communities became the major concern of the primary forest users and stakeholders.

Huge areas of natural forests in the world have been cleared for different uses such as firewood, charcoal making, construction woods, extensive farming, and livestock grazing. Deforestation and forest degradation become the ongoing processes of climate change and bio- diversities and continue adversely affecting the rural livelihoods. Forest degradation has altered many of the world's tropical forest landscapes to such a degree that only 42% remaining, of which 18% existed in large contiguous tracts and became highly threatened (Baryant et al, 1997).

Again, about 830 million hectare of the tropical forest and its biome were fragmented and about 350 million hectare was severely threatened by fire, land clearance and destructive timber harvesting practices (Bryant et al., 1997; ITTO, 2002). Furthermore, Meridian (2009) also presented that forest degradation accounts for about 18% of global greenhouse gas emission, larger than the emission from the total global transportation sectors.

Scientists and different scholars also worried that without reduction of emissions from deforestation and forest degradation, the widely endorsed goal of climate stabilization of a maximum 2^0c temperature increase will not be reached. The impacts of climate change seemed worse due to deforestation and forest degradation which have been common phenomena in many countries of the world. With depletion of forest, most parts of the world's countries and places have been exposed to such natural hazards as increased runoff and erosion. Erosion from farmland has increased especially where repeated hoeing and plowing have caused soil compaction and so caused reduced infiltration of rainfall, leading to diminishing river flows and drying of streams and minor water spots within watersheds. The conceptual analysis of forest degradation shows interwoven watershed resources problems.

Forest degradation has caused increased erosion and loss of top soil, poorer harvests, siltation in stream valleys and wetlands, worsening food insecurity, declining water supplies, increasing risk in rural livelihoods (Wood and Alen Dixen, 2006).

2.3.3. Why Deforestation and Forest Degradation?

For Grainger (1986), deforestation is temporary or permanent clearance of forests for agricultural and other purposes. The usual motive of deforestation is to replace forest by another land use type like shifting cultivation, permanent agriculture and non-agricultural activities. In traditional shifting cultivation, extensive forest areas have been cleared and cultivated for two to three years, then abandoned to allow forest and soil fertility to regenerate. Farmers return after a decade or two decades to repeat same process. But, the amount of vegetation cover on that patch reduces as rotation period become shortened.

On the other hand, the introduction of permanent agriculture, whether it involves cultivation of annual or perennial crops or keeping livestock on permanent pastures, requires the replacement of forests on permanent basis. So, the vegetation cover is not merely modified or converted but transformed into a new state that remains as long as human interruptions exists (Poorer, 1976).

Forests have been the leading energy sources in many African countries and it accounts for over 90 % of all energy supplies in countries like Ethiopia, Tanzania and Mali (Foley, 1987). According to FAO (1992), rounded wood production in Africa was about 88 % of the total 485 million cubic meters timber production i.e., increment of rounded wood production by more than 30% when compared with the amount documented in late 1980s and late 1990s. This trend has caused extensive deforestation and shortage of fuel wood and has led to recurring forest degradation in many countries (FAO, 1981; Floor and Gorse, 1987; FAO, 1992).

Deforestation and forest degradation occur by subsequent burning and recurrent fires, livestock overgrazing, combined with intensive animal browsing of trees and shrubs

that would otherwise produce a substantial wood cover and resulting in a vast area of climax savanna wood lands (Pears, 1985).

A similar effect can result from encroachment of settlement, in which land less people move into the area, usually by road, clearing forest in vast strips on either side that involves permanent replacement of forest cover by an agro ecosystem with a woody component inferior to forest in height and biomass density. Agro-eco system which is often grouped under agro forestry has its own contribution for well-being of rural livelihoods (Nair, 1989). But, extractive forest uses, like selective logging causes forest degradation. Sometimes because of the extensive human impact on forests, net distinctions between forested areas and settled areas, though superficially attractive, are unrealistic. Huge areas of the richest forests in the world have been cleared for fuel wood, timber products, agriculture, livestock and other livelihood activities responsible for rapid disappearance of forest resources (Lanly, 1981).

Countries with the most tropical forests tend to be developing and overpopulated nations in the southern hemisphere and they have been clearing forests and associated vegetation cover for survival. Never the less, some efforts have been deployed to stop deforestation directly through boycotts of multinational corporations responsible for exploitative logging, the most effective conservation policies in these countries have been efforts to relieve poverty and expand access to education and health care.

African forest which covers about 635 million hectares (16%) of the world's total is attracting increasing attention. This is because of its potential as a sink for carbon dioxide and ongoing agricultural expansion, commercial harvesting of timber products and urbanization are driving high rates of deforestation and forest degradation on the continent and making forests of the continent an obvious target for any study and research works. Likewise, forest resource in the south western Ethiopian highlands has been intensively exploited and became severely degraded, since the end of the 19^{th} century and this becomes a grave concern.

Many studies show that the loss of forests was about 27% of the existing forest cover in 1970s. About 60% of the natural high forest was degraded due to human activities

(Resuing, 1998). On the other hand, a predicted loss of about 1.33 million hectares of woody plants and natural high forests of many districts was documented from 1990 to 2005 (WBISPP, 2004).

Similarly, settlement encroachment and farm expansions by clearing and burning of extensive forests were some of the causes of forest degradation currently observed in the study area. For example, increasing losses of outlying forest blocks due to farm expansion by private investors remain a grave concern. Moreover, illegal settlement within forests and woodlands, clearing and burning of the forests has caused forest degradation and environmental problem at large. It is observed that deforestation and forest degradation has destroyed habitats and greatly accelerated soil erosion, reducing crop and livestock productivities. Consequently, food insecurity at household level seemed the worst incident, which in turn continued triggering the ongoing forest degradation in the area.

2.3.4. Population Pressure and Forest Degradation

Unprecedented population growth of the developing countries stays one of the threatening factors for contemporary agricultural development and environmental well-being, which is against the *Boserupian* perspective. In the first instance of the theoretical preposition of population, the Neo-Malthusians have pessimistic views and considers that population growth has the potential to out strip agricultural production. Similarly, the existing trends in population growth will have adverse impacts on the local forests and integrated natural resources.

Three major factors were found responsible for environmental degradation in Ethiopia i.e., the physical factors, the human and structural factors. The first one involves the influences exerted by the natural topography and the terrains of the country; the next one is the influences of human activities on the environmental resources and lastly, potential population growth and the corresponding rural poverty (Muluneh Woldetsadik, 2001)

Population growth has caused environmental degradation through increased demand for more arable land and other basic necessities from our immediate environment. Farm expansion and settlement encroachments towards forest areas might have caused environmental degradation followed by prevailing rural poverty and food insecurity i.e., part of the structural natural resource degradation. Case studies of the former south western Ethiopian provinces Illuababora, Jimma and Wollega shows that the provinces had total population of about 6.5 million i.e., the most sparsely populated part in the country (Alemneh Dejene,1990; Solomon Abate,1994).

The region had over 1500mm of rain fall occurring all year round and huge forests growth of higher protective roles from soil erosion and land degradation. Currently, however, a growing population pressure has caused unprecedented destruction of forest resources, eco-systems and the natural resource stocks (Arnon, 1987; UNEPA, 1991). Forest degradation becomes the paradigm that requires urgent forest management strategies. Forest degradation has considerable impacts on livelihoods and food security insurances at both household and community levels. Thus, achieving food security seems difficult due to the impact of rapid population growth, environmental degradation and drought (DeWaal, 1988).

Similarly, the progressive clearing of the savanna vegetation in sub humid and semi-arid parts of the continent for fuel wood and agricultural intensification was vast with adverse impacts on food security status of the people (Myers, 1991). For example, Callaghan et al. (1985) reported that the annual clearance of acacia woodland in central Sudan was 3.6%, i.e., almost equal to the amount of forest loss in Ethiopia as of the early 20^{th} century.

2.3.5. The Role of Forests in Ensuring Food Security

Forest products have significant values in the form of food, timber and non-timber products and the income generated from forest based activities that ensure food security status of the local communities throughout the developing world (FAO, 1989; Hoskins, 1990; FAO, 1990; Townson, 1995; Arnold and Townson, 1998; Reddy and Chakravarty, 1999).

It is true that the poorest households apparently have the highest degree of reliance on forest products for their livelihoods, as they have the least access to cultivable land and so supplement their production by gathering of forest products on common-property and open-access forest lands (Jodha, 1990; Reddy and Chakravarty, 1999).

Forests have also important roles in ensuring food security and "buffer" foods, helping to meet dietary needs during periodic food shortages (FAO, 1990; Arnold and Townson, 1998). Even if forest products constitute smaller amount of overall food consumption and income generation, their absence during critical times causes the risk of food shortages. The loss of "consumption insurance" for food-insecure households can have further negative effects on agricultural and natural resource management strategies, high-risk and low-return investment patterns (Holden and Binswanger, 1998).

Forests can support key sectors in much economies of the country, like crop and livestock agriculture, energy, tourism and water resources. For example in Africa, over 70 % of the population depends on forest resources for energy and other livelihood support needs. Forests have a crucial role in maintaining the local environmental quality, as well as providing international public goods and services. Yet, agricultural production and access to food across the continent seem severely compromised due to forest degradation. According to Godwin Kowero (2009), people with only basic farming technology, low incomes, and few livelihood options necessarily depend on natural forest resources for their survival. So, any comprehensive strategy able to address forest degradation must also improve the livelihoods of forest-dependent poor people as well.

Nevertheless, some national forest programs and projects are implementing relevant international agreements, such as the convention on biological diversity, reducing emissions from deforestation and forest degradation to reduce unwanted deforestation and degradation attempts. Addressing the forest livelihood of the community seems the priority concern in order to undertake any forest management program.

2.3.6. Insights of Forest Degradation and Food Security

According to Malbutt (1986), forest degradation is the same as deforestation that severely reduces the vegetation covers of an area i.e. the first step in the long term process of soil erosion. Forest degradation is a more complex and ambiguous concept. Its definition depends on the objectives for which the forest is managed. For example, if the objective is the complete protection of the forest ecosystem and all its components and functions, then economic harvesting of forest products could be considered degrading, even if it is managed "sustainably". Basically, if the management objective is to obtain a sustainable yield of wood products from the forest, then harvesting would not be considered degrading.

On the other hand, the loss of desired level of maintenance over time of biological diversity, biotic integrity and ecological processes could be considered the impacts of forest degradation. Desired levels of ecosystem maintenance can vary significantly depending on the forest management objectives, e.g. provision of rural livelihoods, environmental services. There is disagreement over objectives for which the forest should be managed, that are frequently sources of conflict between governments, forestry professionals, and environmental groups, local communities, logging companies, indigenous groups and others. Since forests are a renewable resource, some forms of degradation are reversible, although rehabilitation may take a considerable time. Forest degradation is sometimes irreversible, resulting in an irretrievable loss of some forest ecosystem functions.

In contrast to deforestation, which is defined as permanent conversion to other uses, forest degradation implies the existence of some forest cover but a reduced capacity of the ecosystem to function. Forest degradation which involves depletion of ground cover, exposure of barren lands and soils to rainfall causes different types of soil erosion.

It is reported that the loss of nutrient-rich topsoil is one of the causes of decrease in crop productivity which implies reduce in rural livelihoods and food security status of the people (Bruijnzeel, 1990; Chomitz and Kumari, 1996; Tengberg et al., 1998).

Moreover, forest degradation is believed to have severe impacts on food security at household level i.e., revealed by typical shortage of fuel wood, which is the major source of domestic energy and income, mainly for poor households.

Two in five people worldwide, or approximately 3,000 million people, rely on fuel wood or charcoal for heating or cooking, albeit, approximately 100 million people were in a "fuel wood famine" (FAO, 1995; Townson, 1995). Decreased fuel wood supply can affect household income and food preparation which reduces nutritional values and increases risk of food-borne diseases (FAO, 1989). The time required for collecting scarcer firewood can also impede women's ability to participate in household and agricultural labor and thus jeopardizes the household's food security condition (FAO, 1987).

The Committee of the World Food Security defined food security as the economic and physical access to food by all people at all times i.e. people's ability to consume food based on their own production as well as their ability to purchase food, and the sufficiency, stability and continuity of supply are necessary to achieve food security (FAO, 1983). Forest degradation and food security status of the rural communities seem directly related. It is observed that forest degradation reduces the future capacity of soil productivity which leads to decline in agricultural productivities and impacted food security status of the local communities adversely.

The assumption is that forest management status can indicate food security conditions of the communities at the local level. Properly managed forest and other natural resources imply relatively better livelihoods of the communities and their food security status and vice versa.

2.3.7. Inter-Sectorial Policy Linkage and Management of Forest Resources

According to FAO (1994), governments should manage forests through programs and projects instead of dealing as a mere elements of a national sector. Forests are nonetheless analogous to other systems of national interest such as infrastructure, education, finance, transportation and energy. Hence polices chosen to express and

serve these interests influence the aggregate, quality, composition, distribution and use of a country's forests. According to landscape transformation model, three broad paradigms of forest transformation exist. They are dynamic model driven primarily by urban or industrial developments, water development and enforced public protection of forest boundaries. According to the urban system paradigm of forest cover change or transformation, land use and associated forest patterns change because of opportunities and the controls to which the urban system allows access.

The classic hinterland forest transformation shows that extensive forests of sparsely populated area disappeared as roads and authorities penetrate it for commerce, settlement and control. Trees grow rather along roads and near population centers where authorities are strong enough to protect them and where the urban economy creates a slack in land use by attracting farm labour to non- farm jobs and where urban land markets increase their value for non- agricultural ownership. Thus, configurations of policies specific to this system are generally contained within national strategies for industrial and commercial development and for strengthened central and market institutions. The hydrological system, on the other hand, gives emphasis to the distribution of water that shapes the distribution of trees.

The distribution of water could be changed and resulted to forest transformation as the result of human interventions (FAO, 1994). For example, an initially natural riparian forest that widens on alluvial fans, at the river beds and in estuaries that narrow in steep and stretches, could be segmented by artificial irrigation systems and construction of dams. By irrigation systems, people intensify production over time, population densities climb and holding size fall in irrigated areas and people shift to homestead forests and horticultural production. So, forests become pattern of household orchard.

In short, policy specific to this system generally are contained within national strategies for agricultural and water resource development and strengthened system of specialized administration in agricultural areas and around hydroelectric facilities. Juridical reserve system: this model forms exclusive boundaries from of land use and

forest patterns around them. The model shows complex of forces that seals off areas from intrusion in order to maintain sovereign control. But, due to social differentiation of opportunities among group of people, forest clearance elsewhere and poaching in the preserve never stopped (FAO, 1994).

The configurations of polices to the specific systems are contained within national strategies for public finance, internal and external boundaries control, policy regulation and international relations. The overall economic implications of the national policy models are reasonably well understood, but aggregate forest landscape formations have been ignored. The development strategies could be shifted from project based assistance to policy-oriented programs that enabled the policy analyst turned their attention to the impacts of inter-sectorial policy linkage on the forestry sector (M.R.de Montalenbert, 1992). This implies the inability of the traditional forestry strategies to slow the accelerating pace of deforestation and forest degradation outside of the forestry sector.

2.3.8. Environmental Policy of Ethiopia

The environmental policy of Ethiopia was approved in 1997 to direct the environment and related activities (EPA, 1997). The Policy document has different principles. One of the key principles of environmental conservation section 3.2 is quoted as follow:

> ” Natural resources conservation activities shall be integrated with activities in all other sectors at all level. In situations where it is necessary to balance between conflicting needs of short term economic development and long term environmental conservation, the degradation and pollution posed by development activities on ecosystem must be kept minimal”

According to this principle, threat, rarity, demand and environmental and economic factors are taken into consideration. The principle ensures the local communities participation in planning and management affairs and ensures them to secure the lion’s share from the income generation.

In addition, section 3.3 of this principle deals with forest resource that integrates forest development strategies, forest management and conservation with land and

water resources, energy resources, ecosystem and genetic resources and agricultural activities. It considers the balance of use/forest resource harvesting / with the natural regeneration capacity of the forest resources (EPA, 1997). But, existing that the balance of forest resource use seems disrupted due to population pressure and increasing demands for fuel wood and additional timber and non-timber forest products at all levels.

2.3.9. Major Goals of the National Population and Environmental Policies

The population policy document of the transitional government of Ethiopia stated that the major goal of the national population policy of Ethiopia is the harmonization of rate of population growth and the capacity of the country for the development and rational utilization of the natural resources (TGE, 1999a). Generally, the policy objectives of population and forest and other natural resource management were coined as follows:

I) Closing the gap between high population growth and low economic productivity through planned reduction of population growth and increasing economic return
II) Improving the carrying capacity of the environment by taking appropriate environmental protection and conservation measures;
III) Significantly improving the social and economic status of vulnerable groups like women, youth, children and the elderly.
IV) Raising the economic and social status of women by freeing them from the restrictions and burden of traditional life and enabling them to participate in development packages.

Furthermore, the policy focuses on four major areas of population activities of priority attention such as improvements in the quality and scope of reproductive health service delivery, population research, data collection and disseminations, expansion and strengthening of domestic capacity for training in population and expansion of information, education and communication and social mobilization (TGE, 1993a).

On the other hand, the environmental policy of Ethiopia issued in 1997, is the output of the conservation strategy of Ethiopia, a policy document initiated in 1989 and approved in 1997. The policy aims at improving the quality of life of the people through sustainable development of natural as well as cultural resources (Melaku Bekele, 2008). Yet, lack of awareness on existing policy issues seems obstacle for achieving the desired sets of objectives pertaining to implementation of natural resource management and conservation and family planning packages to keep on the optimum environmental resource use principle.

2.3.10.Sustainable Forest Management Strategies

A definition of sustainable forest management known as sustainable forestry to this present day understandings was developed by the ministerial conference on the protection of forests in Europe and it has been adopted by the FAO, since then as " The stewardship and use of forests and forest lands in a way and at a rate that could maintain their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems." It is the concept that can be described as the attainment of balance between societies' increasing demands for forest products and the preservation of forest health and diversity.

For forest managers, sustainable management of a particular forest tract means determining, in a tangible way, how to use it today to ensure similar benefits, health and productivity in the future. Forest managers must assess and integrate a wide array of conflicting factors, commercial and non-commercial values, environmental considerations, community needs, and even global impact to produce sound forest management plans. In most cases, forest managers develop their management plans in consultation with citizens, businesses, organizations and other interested parties in and around the forest tract.

The tools and visualization have been recently evolving for better management practices. This is because forests and societies are in constant unrest and the desired

outcome of sustainable forest management is not a fixed one. What constitutes a sustainably managed forest practice will change over time as values held by the public change (Anonymous, 2008). Hence, forest management requires continuous monitoring and participatory approach.

2.3.11.Forests and other Natural Resource Conservation

There are basic conservation methods and principles used to protect global natural resources. Although each resource has a unique set of conservation problems and solutions, all resources are interconnected in a complex and little-understood web. Scientists have learned that damaging one thread of the web may weaken the entire structure (FAO, 2005). It would be impractical to work toward the conservation of soil, for instance, without considering the needs and effects of adjoining water and forest resources.

So, forest conservation is necessary to end deforestation and forest degradation which are causing unprecedented environmental damages and destroying large areas of forest for agricultural and other purposes. Forest degradation destroys animal habitats and greatly accelerates erosion, adding to the sediment loads of rivers and making seasonal flooding much more severe.

According to (FAO, 2005), the world's total forest area was just less than 4 billion hectares. The amount of forest area coverage continued reducing at an estimated rate of about 7.3 million hectares per year, an area equivalent in size to Panama or Sierra Leone. It was occasional that the rate of decline becomes slowed in comparison with the period from 1990 to 2000, when the world had lost about 8.9 million hectares of forested area per year. Africa and South America continued to have the largest net loss of forests, while forest loss also continued in North and Central America and the Pacific Islands. Europe and Asia showed a net gain in forest areas due to forest planting, landscape restoration, and expansion of natural forests. China, in particular, reported a large-scale of forestation effort. Clear-cutting is a forestry harvesting technique in which all the trees in a given area are removed. The advantages of this

technique include the eventual production of trees of approximately the same age and height, which are easy to harvest using mechanized equipment.

The disadvantages, on the other hand, include the elimination of old growth forest and animal habitat, excessive erosion, and an unappealing landscape. In an effort to conserve forest resources, the timber industry is modifying clear-cutting techniques so as to include the complete use of all harvested trees and the replanting of clear-cut areas. In many parts of the world like the United States and Canada, forests are threatened by extensive logging, called clear-cutting, which destroys plant and animal habitat and leaves the landscape bare and unproductive if not properly reforested. Small pockets of ancient forests from 200 to 1,200 years old still exist but are threatened by logging interests.

Until the 1990s, the U.S. Forest Service was directed by Congress to maximize the harvest of timber in order to provide jobs. In the late 1980s and early 1990s, however, environmentalists charged the government for violating of the National Environmental Policy Act (NEPA) and heavy logging was deemed non sustainable. As a result, the timber harvest was reduced and foresters were directed to follow a more sustainable policy called ecosystem management. This policy required foresters to focus on conserving natural habitats rather than maximizing tree harvest.

In Ethiopia, many forestry institutions now have started to practice various forms of sustainable forest management and a broad range of methods and tools have been used for readily monitoring and evaluating the status of the forest cover in the country. Nevertheless, key informant interview showed that improper logging of forest timber has been the prolonged problem caused by forest enterprises, forest based small scale and micro enterprises and agro- business investors engaged on cereal and cash crop farming. More than ever, such unsustainable forest uses continued threatening natural forest tree species and other natural resources of the study area.

2.3.12.Forest Conservation and Use Conflict

Conservation is the sustainable use and protection of natural resources including plants, animals, mineral deposits, soils, clean water, clean air, and fossil fuels such as coal, petroleum, and natural gas (Microsoft Encarta, 2009). Natural resources are grouped into two categories, renewable and nonrenewable.

A renewable resource is one that may be replaced over time by natural processes, such as fish populations or natural vegetation, or is inexhaustible, such as solar energy. The goal of renewable resource conservation is to ensure that such resources are not consumed faster than they are replaced. Nonrenewable resources are those in limited supply that cannot be replaced or can be replaced only over extremely long periods of time. Nonrenewable resources include fossil fuels and mineral deposits such as iron ore and gold.

Conservation activities for nonrenewable resources focus on maintaining an adequate supply of these resources well into the future. Natural resources are conserved for their biological, economic, and recreational values, as well as their natural beauty and importance to local cultures. For example, tropical rain forests are protected for their important role in both global ecology and livelihoods of the local culture. Conservation conflicts arise when natural-resource shortages develop in the face of steadily increasing demands from a growing human population (Microsoft Encarta, 2009).

Controversy frequently surrounds how a resource should be used, or allocated, and for whom the priority of resource use is given. For example, a river may supply water for agricultural irrigation, habitat for fish, and water-generated electricity.

Farmers, fishers, and industry leaders strive for unrestricted access to this river, but such freedom could destroy the resource, and conservation methods are necessary to protect the river for future use. Conflicts get worsen when a natural resource crosses political boundaries. For example, the headwaters, or source, of a major river may be located in a different country than the country through which the river flows. There is

no guarantee that the river source will be protected to accommodate resource needs downstream. In addition, the way in which one natural resource is managed has direct effect upon other natural resources. Cutting down forests near a river, for instance, increases erosion, the wearing a way of topsoil and can lead to flooding. Eroded soil and silt in the river cloud adversely affect many organisms such as fish and important aquatic plants that require clean, clear freshwater for survival.

Some resources are so unique or valuable that they are protected from activities that would destroy or degrade them. For example, national parks and wilderness areas are protected from logging or mining in the United States because such activities would reduce the economic, recreational, and aesthetic values of the resource. Forests and wetlands may be protected from development interventions because they enhance air and water quality and provide habitat for a wide variety of plants and animals (Microsoft Encarta, 2009).

2.3.13. Forest and Other Natural Resources Conservation in Ethiopia

The history of conservation in Ethiopia dated back to the early 1960, along with the green revolution movement which was aimed in ensuring the country with food security. Activity like hillside closure, wood lots, terracing, etc. were among the solutions suggested by the conservation oriented projects. The resource conservation, initiated in the early 1970's, has attempted to conserve and regenerate soil and water and gives little attention to forest resources.

According to John (1991**)**, relatively few conservation projects in Ethiopia have been evaluated or made public with available evidence confirming the conservation work was neither effective nor sustainable.

The natural resource conservation practices could be organized into three phases**:** the first conservation experience of the country that had been practiced between 1957 and 1974, during the *Derg* regime from 1975 to 1991, and the current conservation undertakings, since 1991 up to now (Shbiru and Kifle, 1998). During the first phase of conservation exercise, government's primary target was ensuring economic

development through utilization of the natural resources sustainably. But, in the second year of plan (1963-1967), awareness on the consequences of deforestation and soil erosion on human wellbeing were agenda of the time. Then, the need for policy and legislation emerged and it was drafted for the first time concerning ownership and utilization of forest resource.

As the concept of conservation grows, the third five year plan, in its document incorporated participatory, coordinated and decentralized administration approach were developed centering deforestation as major problem of the country (Shibiru and Kifle, 1998). However, the existing land tenure system and limited integration of peasants to the national economy affected the conservation activities of the time remained unsuccessful (John, 1991). The second phase from 1974-1991,was marked by incorporation of rural afforestation and reforestation programs into government policy due to several factors i.e. heavy reliance of increasing rural populations on natural forests and woodland for fuel wood and construction materials resulted in biomass shortages and required attention.

After 1974, the government policy was amended with respect to natural resource management and the national forestry program of Ethiopia was also established in the same year (Jagger and John**,** 2000). Then, the ten year perspective plan (1984-1994) and Ethiopian highland reclamation study and forestry conservation plans were drafted. Significant action plan of afforestation and reforestation were made practical. Accordingly, about 600,000km bund was constructed, 470,000km hillside terraces were built and 80,000 hectares of land was closed for regeneration (John, 1991). During the third phase, post 1991, the national conservation strategy is designed and approved in 1997 as strategic frame work for the management of the environment and having broad objective of improving the quality of life of all Ethiopians through sustainable utilization of the country forest.

Decentralized administration, participatory, cross sectors approach was also appreciated. In the strategy the country become owner of environmental policy that identifies issue like integration of gender, social and cultural issue and public

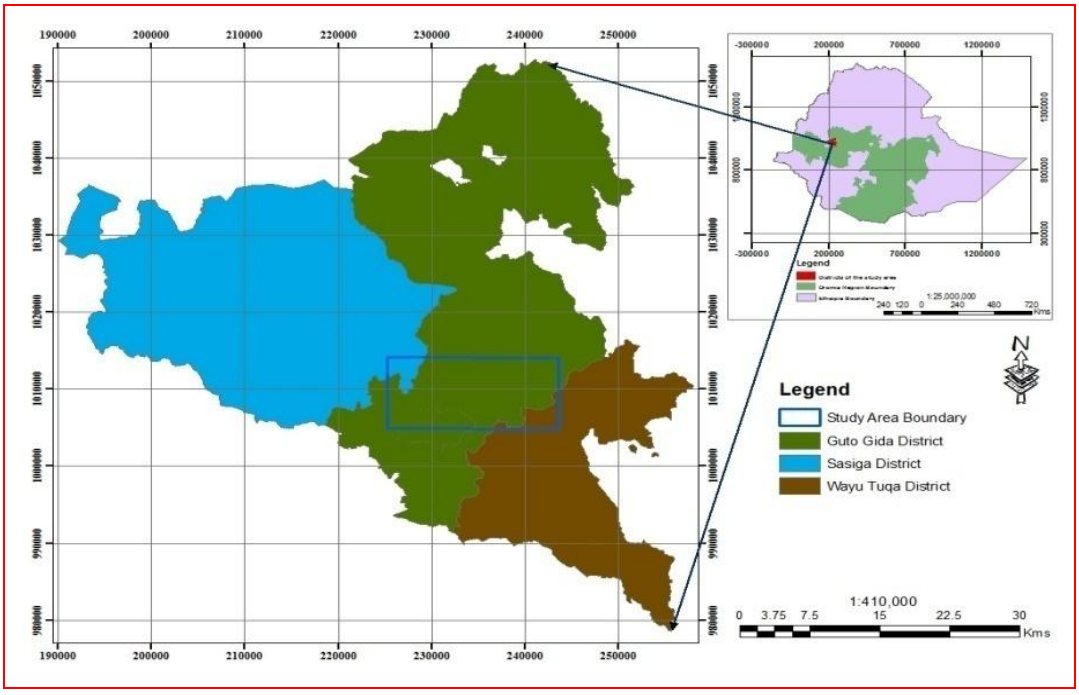
awareness and promoting understanding of the essential linkage between environment and development as important agent of promoting conservation of resources(EPA,1997).

CHAPTER THREE: KOMTO-WATCHA-TSIGIE FOREST AREA

3. The Study Area

The study area (Komto-Wacha-Tsige forest area) is found between $9^{o}5'$N to $9^{o}10'$ N and 36^{o} 30' E to 36^{o} 40'. It is bordered by three districts- Wayu-tuka, Guto-gida and Sasiga of East Wollega zone, Oromia regional State. It is about 20 to 30 kilometers away from Naqamte town, the capital of East Wollega Zone. It lies between 1850 and 2900 meters above sea level. The forest blocks in the study area covers about 9100 hectares, of which 6.84% was natural forests, about 40.81% plantation forests and the remaining 52.35% was classified as open fragmented farm lands (See Figure 3.1)

Figure 3. 1: Map of the Study Area



Source: Field Survey, 2012

3.1 Climate

Climate is the dominant factor affecting the type of soil, vegetation and wildlife distribution of an area. It affects the welfare and livelihood activities of man directly. The major components of climatic factors are temperature and rainfall. The varying landforms (relief features) of the region seemingly has resulted to varying temperature and rainfall conditions.

In turn, variation in temperature and rainfall characteristics is attributed to variations in physiographic features and human induced land use/cover dynamics. Theoretically, the western and south western regions of the country, including the study area, were considered as the wettest parts in the country with the maximum rainfall all year round. Practically, however, the average temperature varies between 20^{o}c and 30^{o}c, and 10^{o}c and 25^{o}c for the hottest and the coldest seasons respectively. The annual rainfall also varies between 2000mm and 2800mm for the highland areas and the variation of rainfall for some lowland areas was between 800mm to 1400mm (EMA, 1986).

According to EWARDO (2009), the zone had three agro-ecological divisions of which 11% is high land, 49% mid-land and 40% low lands. To put it differently, the entire zone has three traditional climatic zones i.e., *Baddaa, Badda-daree,* and *Gamojjii*. The Zone receives the annual amount of rainfall of between 1000 and 2400mm and the annual temperature of between 14^{0}c and 26^{0}c. On the other hand, the study area experiences about 2158mm annual rainfall and about 19^{0}c average annual temperature.

The recorded climatic data shows that the annual amount of rainfall of the study area was about 2200mm (NMSA, 2014). On the other hand, own computation showed about 2002.5mm average total rainfall representing the three consecutive decades signifying the study area. Although, the finding showed reduction in amount of annual rainfall of about 187.5mm, based on the broader criteria set by FAO (1984), still it was one of the major humid areas in the south western parts of the country.

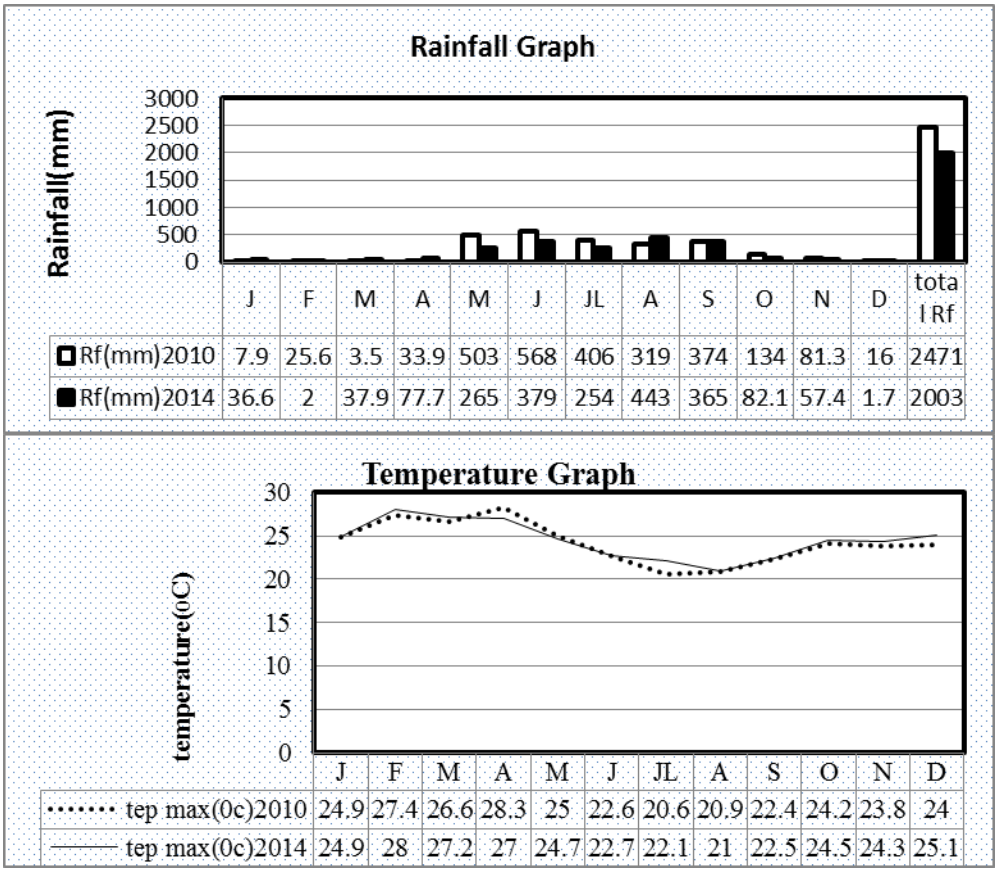
In the year 2010 & 2014, the area experienced the average minimum and maximum temperature of about12.5^{0}c and 25.5^{0}c respectively (See Table 3.1). In general, the climatic condition of the study area is believed to be among factors suitable for luxuriant forest and vegetation growth.

Table 3. 1: Temperature & Rainfall Data

Climatic data/months	J	F	M	A	M	J	JL	A	S	O	N	D	Avg./ Tot
tep max (^{0}c)2010	24.9	27.4	26.6	28.3	25	22.6	20.6	20.9	22.4	24.2	23.8	24	24.90C
Tepmax(0c)2014	24.9	28	27.2	27	24.7	22.7	22.1	21	22.5	24.5	24.3	25.1	24.50C
Rf(mm)2010	7.9	25.6	3.5	33.9	502.8	568.1	405.9	318.7	373.8	133.6	81.3	16	2471.1 mm
Rf(mm)2014	36.6	2	37.9	77.7	265.4	379.4	254.2	443.3	364.8	82.1	57.4	1.7	2002.5 mm

Source: NMSA, 2014

Figure 3. 2: Temperature and Rainfall Graphs



Source: NMSA, 2014

3.2 Vegetation and Wildlife

The South and South Western Ethiopian regions have been the rich sources of diverse forest and plant species and wildlife relatively. The forest resource of the region still has higher potential scenic features that could be used as tourist attraction sites.

3.2.1 Vegetation

The natural vegetation plays a critical protective role, retaining soils and minimizing splash erosion, preventing the raindrops against compaction of the soil, slowing runoff and reducing the concentration of overland flow, and maintaining high soil moisture through the shade provided by complete forest canopy. Once forested land is cleared and non-tree crops are substituted, the soil climate is completely modified (Douglas L., 2007)

According to (FAO, 1995), non-timber products (goods of biological origin other than wood), play an important biological and social role for human nutrition in many parts of the world. The non- traditional sources of food play vital roles in human well-being and food security. They markedly contribute to human nutrition, improve health through their contribution in prevention and treatment of disease, broaden food base and diversify diet, thereby decrease nutrient deficiencies, contributes to the house hold food security.

Many forest plants yield fruits which are edible. Although their number is very large, they are consumed locally and rarely marketed due to lower economic importance (FAO, 1997). But, attention has not been given to these resources and not much work has been done concerning minor forest products. As the population of the communities rise and more infrastructural development takes place in the area, demand for timber and non-timber forest products is likely to ascend and hence cause greater threats to vegetation cover of the area. As far as the study area is concerned, Watcha-Tsigie and Komto forest which is generally classified as *Afromontane* upland forest, mid upland semi-deciduous forest, few riverine forest types and plantation types has been contributed to the livelihoods of the local communities in diverse ways.

The forest is dominantly composed of tree species of *Afromontane* rainforests types such as *Apodytes dimidiate, Hagenia abyssinica, Ekebergia Capensis, Pouteria Adolfi-friederici, Croton macrostachyus, Schefflera abyssinica* and diverse trees of woodlands and plant species.

According to Fekadu Gurmessa (2010), about 180 plant species belonging to 151 genera and 66 families were recorded and identified from Komto Forest and its surroundings. Out of the total, about 42 species (23.33%) were trees, 43 species (23.88%) were shrubs, 62 species (34.44%) were herbs, 11 (6.11%) grasses and sedges, 14 species (7.77%) were lianas, 7 species (3.88%) were ferns and 1 (0.55%) species was a woody hemi parasite. Some forest species of the study area were found to be economically viable and used as income generation through marketing of forest products. Hence, they were identified as highly threatened species, for example *Adolfi-friederici* which is shown by figure 3.3

Figure 3. 3: Pouteria adolfi-friedericii, the Endangered Forest Species of the Study Area

Source: Field survey, 2012

3.2.2 Wildlife

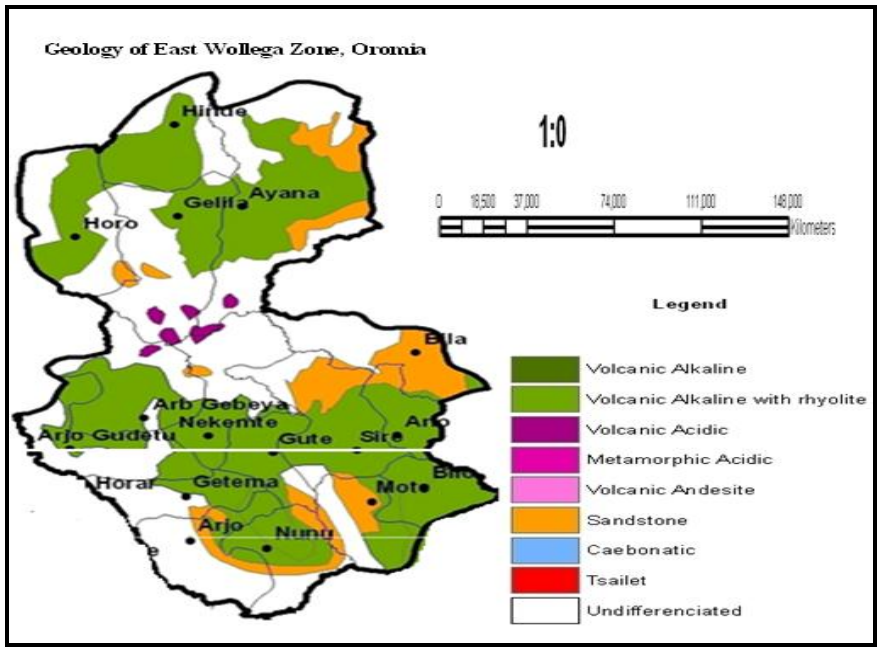
Own communication with the elders showed that the forests in the study area were intact habitat for various species of wildlife including birds, reptiles, and amphibians. Archival data and biographies of large mammal species exist in Wollega museum

confirms that larger mammals used to roam in the study area and its surroundings until the past four decades ago. Currently, however, only limited numbers of such mammals as spotted hyena, Abyssinian black and white monkey, common jackals, porcupines etc. remain. In general, existing condition shows that the ongoing deforestation and forest degradation due to illegal settlements and human encroachments were found to be danger for the survival of wildlife in the study area.

3.2.3 Geology, Drainage and Relief Features

As indicated by the geological map of East Wollega zone, the study area predominantly comprised of volcanic alkaline with rhyolite, volcanic alkaline and sand stone. There are also considerable areas whose geological settings are classified as undifferentiated (See Figure 3.4)

Figure 3. 4: Map of Geology of East Wollega Zone, Oromia



Source: OBFED, 2012

The forests in the study area have been source of several tributaries such as Beska Wacha, Adiya, Tato, Oda, Yaya- jabo, Alaltu, Uke, Kersa, Chikecha and many more head streams of the Dhidessa River. They are sources of waters used for traditional small-scale irrigation, source of fish catch, withdrawal of sands and clay for

construction and making of pottery i.e. were among the short lists of the livelihoods of the local communities. Furthermore, the hydrological regime and stream flow pattern of the area seems highly dependent upon the remaining forest cover of the study area.

3.3 General Background

East Wollega, has 18 districts and 288 rural *gandalee.* It is bounded to the southwest by IlluAbbabora, to the west by the Dhidessa river which demarcates it from West Wollega, to the northwest and north by the Benishangul-Gumuz regional state, to the northeast by Horro-Gudruu Wallega Zone, to the east by West Shewa zone, and to the southeast by the Gibe river which separates it from Jimma zone. The highest point in this zone is Gaara-achanii(about 3,276 m.a.s.l.). The area is known by its dense natural forest and other resources such as rivers, fertile soils and minerals. In addition, it is the major coffee growing zone of the country. For example, the CSA (2007) report shows that about 40,606 tons of coffee was produced in West and East Wollega combined in the year 2005 i.e., about 35.3% and 17.9% of the region's and the country's total coffee production respectively.

That amount of coffee output was possible thanks to the remaining forest cover of the area. Yet, forest degradation becomes a fear among most of the coffee producing communities of the zone including the study area. The existing forest cover of the zone has been reduced due to ever increasing rural population and their settlements. The total population of zone was about 1,374,547 of which 1,198,628 were rural and 175,919 urban dwellers (OFEDB, 2010). This population may be categorized as the rich (*dureessaa/sooreessa*), self-sufficient (*danda'aa*), poor (*harka qalleessa*) and the destitute (*deegaa*), following the wealth ranking approach of the leeqaa Oromo of East Wollega.

The then existing data shows that the Zone had the total of about 833567.6 hectare cultivable and about 667919.8 hectare of cultivated farms with food crops (cereals), cash crops (chat, coffee, sesame etc.), different perennial crops, fruits and vegetables.

Land reserved for grazing (pasture land) was about 146702.1 hectare. The zone had also forest and woodlands of different tree and plant species.

Existing estimate shows that natural and plantation forests coverage of the zone were 61204.94and 25496.51 hectares respectively.

The zone had also considerable woodlands of about 57980.2 hectare, that contributed to increasing of the total coverage of forests and woodlands to about 14, 4681.62 hectares. The settlement area comprised the total area of about 52931.2 hectares. Moreover, there were lands with miscellaneous values comprising about the remaining 10, 0080.49 hectares of the total land area of the zone. Similarly, the land use types and their proportion of the districts in the study area were identified according to the following (See Table 3.2)

Table 3. 2: Land Use/ Cover Classifications at District and Zone Levels

district	Area (ha)	Cultivated land(ha)	Cultivable land(ha)	Pasture land	Forests &other woody vegetation cover (ha)	Land under constructions and settlements	Land used for miscellaneous purpose
G/gida	109150	85660	90582	7790	4146.5	1380.5	5251
Sasiga	93813	51806	53668	11609	21958	5197	1381
W/tuka	28953	25194.4	25593	944	654	555.5	1206.5
total	231916	162660.4	169843	20343	26758.5	7133	7838.5
Zone tot	1,315,894.65	6,67920	833,568	146,702	144,682	52,931.2	10,0080

Source: EWARDO, 2009

3.3.1 Guto-gida

Guto-gida is one of the 18 districts of east Wollega zone. The District has 22 rural *gandalee* covering the total area of about 109150 hectares. It is contiguous with Wayyuu-tuqaa in the east, Sasiggaa and Diggaa in the west, Giddaa-ayyanaa and Gudayyaa-biilaa in the north & Leqaa-dullachaa to the south. It has three agro-ecological zones of different proportions.

The high land, midland and the lowland cover about 2.80 %, 56.0 % and 41.20 % of the total area coverage of the district respectively. Otherwise, the district is characterized by undulating landforms with prominent hills and mountains.

Dalo and Arruu are two of the mountains having an altitude of 2200meter and 2100 meters above sea level respectively. Loko (1700m), Sariiti (1950m) and Ongorcha (2000 m.a.s.l) are also known hill slopes and scenic features. It is found at altitude of between 1350 and 2450 meters above sea level. It experiences the mean annual temperature of slightly greater than 18^0c and mean annual rainfall ranging from 1600 to 2000mm. According to historical narrations, the district had dense forests and woodlands sometimes before four decades. Currently, however, about 3430.67 hectares of natural forest (30.2%) and forests plantation forests (69.8%) are left confined to Komto- watcha- tsigie forest blocks. Most of the time, people cut the existing forest to generate income by selling of charcoal, firewood and different lumbering materials. Consequently, the former high forests, woodlands, riverine forests and other vegetation covers of the district became highly threatened (See Table 3.3)

Table 3. 3: Vegetation Cover and their Classifications

Vegetation Type	Area in Hectare	Name of the Rural *Gandaalee*
High forest	980	Gaarii, Jireenya, Faayineeraa, D/Kaanee
Woodland	2394	Arjoo, Faayineraa, Nagasaa
Reverine	15.44	Loko,, Mexi, Lugo, Horo Alaltu,
Shrub	56.67	A/Magarsa, J/Tolera, Loko, Mexi, Lugo, H/Alaltu

Source: ARDO, 2009

3.3.2 Wayu-tuka

Wayu-tuka is one of the sample districts which have an area of about 28953 hectares. Gute which is the administrative town of the district is, about 12kms far away from Naqamte town. The district is bordered by Sibu-sire in north and in east, and Leqaa-dulacha in south and Guto-gida in the west.

The district experiences an average annual temperature of slightly more than 20^0c and the average annual rain fall of about 1600mm. It has three agro-climatic zones. The high land accounts for 38%, the mid land 49% and the low land about 13%. It is located between altitudinal range of 1300m.a.s.l and 3140m.a.s.l.

In the district there are also dominant mountain peaks and hill slopes like *Komto*, *Gara-achani* and *Tuka* which rises to elevations of about 3350, 3140 and 2350 m.a.s.l. respectively. Sometimes in the past, the district had dense forests and bush lands. Currently, however, the amount of forests and shrub lands were found to be about 11.7% and 3.92% hectares respectively. Deforestation and forest degradation were the severe problems not only affecting the environmental well-being but also impacting the livelihoods of the local community at large (OFEDB, 2009).

The proportion of arable, grazing and forest lands in Wayu tuka district was 55.16 %, 3.18% and 11.7% respectively (EWARDO, 2012) the remaining land area is either degraded, built-up or serves other purpose (See Table 3.4).

Table 3. 4: Land Use Classification of Wayu- tuka District

Land Use Type	Area (hectare)	%
Arable land	15,971.50	55.16
Pasture land (grazing land)	921.665	3.18
Degraded /barren area	484.195	1.67
Forests	3383.665	11.7
Shrub land	1135.695	3.92
Others	7056.075	24.37
Total	28,952.80	100

Source: ARDO, 2012

3.3.3 Sasigga

Sasiga is one of the 18 districts of East Wollega zone, found in the western part of the zone. It has 28 rural *gandalee,* including the sample *gandalee (*H/fayisa and T/tsigie) and 2 urban *gandalee* (towns) and more than 400 sub *gandalee*(*zoonii fi garee misoomaa*). Galo is the big market and administrative town of the district. It is found about 18 kilometers far away from Naqamte town. The district has a total area of about 938.13 square kilometers (4.48 %) of the zone's total area.

It is bordered by Guto-gida district in the east, Limmu district in the north, Benshangul Gumuz Regional State in the west, and Diga district in the south and southwest. According to EWARDO (2009), the district has two distinct agro-ecological divisions. Namely, the mid land *(Bada-daree)* and the low land *(Gammojjii)*, comprising the area coverage of about 60 percent and 40 percent respectively.

The district is generally characterized by undulating topographic features except the extensive riverine forest and wetlands found adjacent to Anger-Dhidhessa River banks. The district has altitudinal range of the between1500 to 1960 meters above sea level. There are two known volcanic hills namely Abalo and Wata having an altitude of 1987 and 1798 meters above sea level respectively. The district is drained by Qersa, Gumbi, Haro, Ddidiga, Koho, Bege, Adiya, Gerersa, Akeya and Adi are head streams and tributaries of Anger - Dhidhessa River.

The largest part of the district experiences mid land climate. It has the mean annual temperature of about 27^0c and 1000mm annual rainfall. The dominant soil type in the district is loam soil which is a suitable for agricultural activities (See Table 3.5).

Table 3. 5: Soil Types and their Coverage

Soil type	Coverage(hectares)	Suitability
Sandy soil	14,072	Less suitable
Loam soil	38,463	Suitable
Clay soil	11,257	Moderately suitable
Silt soil	30,021	Less suitable

Source: ARDO, 2012

Minerals reserves such as gold, clay, limestone, and mineral waters are plentifully. The district has wildlife such as lion, hyena, pig, monkey, ape, fox, tiger and etc. Currently, however, forest based livelihoods activities and growing population has caused severe damages to the habitats, wildlife reserves and the remaining forest resources and integrated natural resources. Most diversified plant and wildlife species become highly threatened and become extinct.

Based on the population & housing census report (CSA, 2008), the projected population of the district was 84298 as of 2008. Out of the total population, about 96.90 percent were the rural and 3.10 percent urban population. The district had the crude population density of about 80 persons per square kilometers (See Table 3.6)

Table 3. 6: Population Statistics of Sasiga District

Year	Rural			Urban			Total		
	M	F	T	M	F	T	M	F	T
2007	40657	38773	79430	1263	1320	2583	41920	40093	82013
2008	41770	39834	81603	1318	1377	2695	43087	41211	84298

Source: ARDO, 2012

According to the CSA (2008), the district has shown considerable population growth. Estimation made for population in the sample *gandalee* (H/fayisa& T/tisgie) also confirmed similar evidence in trend of population growth. Household survey result also shows the average family sizes for the rural and urban population were 7 and 5 children respectively.

3.4 Main Livelihood Activities

Most of the community of the study area engages on agricultural and forest based activities in ensuring food security at household level. Farming and livestock production were the dominant activities. Never the less, such off farm livelihood activities as petty trade and labour sale have been valuable income generating options for many poor households of the study area.

3.4.1 Farming

The farmers in the area practice mixed farming system. The main crops grown in the area include cereal crops such as maize, sorghum, *teff*, millet, wheat, barley, pulses and faba bean, field pea haricot bean, oil seeds like sesame, soya bean; and perennial crops such as coffee and other fruits also grow in almost all the districts but with varying intensities.

Table 3. 7: Crop Production and Livestock Rearing in Different Agro- Climatic Zones

Agro-Climatic zone	Type of crop	Type of livestock
Highland	Barley, wheat, beans, Peas, *eragrostis*(*teff*), onion and potato	Donkey, horse, mule, sheep, cattle, chicken etc.
Middle highland	Maize, sorghum, mille, barley, wheat, peas, beans, eragrosits(*teff*), cotton, Niger seed, potato	cattle, sheep, got, horse mule, donkey, chicken
Lowland	Sugarcane, maize, banana, coffee , sweet potato, *eragotis* (*teff*) cotton , peas, beans	Sheep, goat, cattle chicken

Source: EWARDO, 2012

3.4.2 Livestock

People have distributed livestock and other domestic animals around the world and then helped their numbers grow at a rate that has changed the landscape. The spread of these animals is one of the major ways people have changed environment through agriculture. A recent important issue in cattle production is the opening up of tropical forest areas and their conversion to rangeland. In a typical situation forest is cleared by burning and then crops are planted for years. After that time the soil has lost much fertility that crops can no longer be grown economically. The land already cleared can support as grazing area for some considerable years until it can no longer support even grazing and is abandoned.

In general, overgrazing slows the growth of vegetation, reduces the diversity of plant species, leads to dominance by plant species that cattle aren't fond of, hastens the loss of soil by erosion as plant cover is reduced and subjects the land to further damage from the cattle's trampling on it. The damaged land can no longer support the same density of cattle which leads to decreasing productivity of the cattle, having negative implication on food security status of the local farm households. In Ethiopian highlands, livestock are an integral part of the farming system and cattle are the most important. Similarly, the contribution of livestock in sustaining food security of farmers in the study seems the most important. More than half a million livestock

were reportedly owned by farmers of which cattle constitutes about 58% of the total livestock population (EWARDO, 2009).

3.5 Rural Supplies and Service Provisions

The local communities have been engaged on different farm and off-farm activities due partly to availability of different rural services and supplies provided by the government and non-governmental organizations. All the *gandalee* of the study area have access to primary school, health post, and veterinary services, dry and all weather roads, saving and accounting and market services. Shortage of electricity and interruptions power and potable water supply were the major problems. Moreover, limited alternative energy supply for domestic use seems one of the reasons hastening the rate deforestation and forest degradation locally.

3.5.1 Domestic Fuel Energy Source

All human cultures require the production and use of energy resources with capacity to produce work or power. The world energy supply depends on many different resources including traditional fuels such as firewood, charcoals and animal dung, which are significant energy sources in many developing countries. The community in the study area use firewood mainly from forest and woodlands. Firewood holds the first rank which accounts for more than 95% of the total fuel energy consumptions followed by crop residue which is in the second place and accounts for only 2% of the total. Other energy sources are only rarely used by some well to do households.

Table 3. 8: Dominant Fuel Energy Used in the Study Area

Energy Source	%	Rank
Fire Wood	>95	1st
Charcoal	1	3th
Crop residues	2	2nd
Kerosene	1	5th
Animal dung	1	4th

Source: EWMEO, 2012

3.5.2 Market Services

The major market places serving the local community include *Bakee Jama'aa* in Naqamte (Saturday and Tuesday are the major market days) *Tsigee* (the small rural village having prominent market day regularly on Thursdays *(Gabaa Kamisaa).* The third market place is *Jimatee*, near *Gute*, the administrative town of *Wayu tuqa* district. From Naqamte, it takes about 5 hours on foot to reach *Gabaa Jimataa* as well as *Gabaa Kamisaa*. The local merchants who want to do marketing at both market places can do it and return home on the same day. The marketing condition differs regarding to the products available for sale and the size of merchants and the customers frequently involved in the local trade. For example, *Gabaa Kamisaa* is the biggest market day and farmers and merchants engage on transaction of cash crops such as coffee and sesame and fatten bulls.

Most of the local farmers sell different root crops like *ancootee* and others, chicken, egg and butter, honey, firewood and charcoal, construction poles, and purchase kerosene, and other products during the market days. Farmers came to *Bakkee Jama'aa* to buy manufactured products and sell agricultural and timber and non-timber forest products. Bakkee Jama'aa was the known market place where the surrounding farmers and merchants from other areas supply cattle, butter, honey, and cereals and in return buy educational materials, soap, gasoline, salt and more other ingredients used for preparing sauce (*ittoo)* eaten with local bread, clothes and other manufactured products. The key informant interview showed that the credit and saving service cooperative had a long history and the primary option as a local level mutual support arrangement.

The sources of credit were the rich households and informal money lenders and the Oromia credit and saving association and household package programs. Many farmers reportedly said they had access to credit given in kind such as cereals and cash crops. currently, credit in money- kind based informal arrangements such as getting access to credit from the local merchants in exchange of payable products from considerable plots of eucalyptus and cash crops such as coffee and *chat* (the

local arrangement of credit delivery system) increasingly become important.(informal communications with some local people).

Farmers' cooperative was instituted with initial members of more than 500 farmers. It delivers the community with edible oil, sugar, soaps and other commodities from the market shed found in *Tsige* village. Following the onset of the spring season *(Arfaasaa)* minor rainy period, the farmers' cooperatives usually engage on distribution of fertilizers in collaboration with the district and zonal agricultural offices. But, during the field survey I found the shop of the cooperative closed and some respondents in the village also said that the shop hardly supplying them with different commodities as it did when it was first opened.

3.5.3 Micro and Small Scale Enterprises and Local Institutions

Besides agricultural activities, some of the villagers in *Tsige* village also engage on off-farm activities. These include daily labour in Ukkee private extensive farms, and petty trade (butchery, local brewery, carpentry and the like). Again, some villagers were organized at micro levels on different off farm activities such as quarrying, wood works as livelihood strategy. Other physical assets of *Tsige* village and its surrounding are shown by the village map (Figure 8.1).

The *gandaa* administration of *Tsige* town has management memberships (the *gandaa* administrator, vice administrator, and other additional members) responsible for different activities such as rural development, security, organizing the rural communities. Moreover, there were government and non-government institutions like women's association, youth's association, and school committee, farmer's association, a civic society/social organization/ for mutual aid and burial ceremonies, health pot, health station, community police station, veterinary post, schools, meteorological station, administration office, churches, development agent.

3.5.4 Credit and Saving Service Cooperative

The union of the cooperatives was established in 2008 with initial capital of 1,263,925.79 ETB.[1] The key informant interview showed that that the union of the cooperatives had mandate of giving credit and saving services to all members of the cooperative so that they boost agricultural productivity and ensure food security at household level.

On the other hand, farmers are obliged to save the net income they incur from after they pay back amount they borrowed from the union. The interest of credit that the union need from money lent out in principle is 15% for the rural farmers and 10% for urban credit takers. Accordingly, member of micro enterprises working on local quarries (extraction of rocks for different constructional purposes and also on farmers' multipurpose agricultural cooperatives) run their business with money they borrow from the cooperative. The cooperative provides the communities with household consumable products and agricultural inputs like selected seeds, fertilizers etc.

So far, there were no any micro and small scale enterprises pertaining to non-timber forest product uses and expansion. Credits and related services were missing for implementation of the sustainable forest and integrated resources managements and efficient uses of the existing forest products. Thus, rendering credit and saving services for implementation of environmental friendly rural livelihoods and to deliver on the green economy vision seems the proper interventions.

[1] *Interview with, Miss. Workitu Fida and Mr. Nmomisaa Midhegsaa, Saisiga, 2012*

CHAPTER FOUR: MATERIALS AND METHODS OF THE STUDY

4. Methodology and the Sampling Design

Both primary and secondary data sources were used for this study. Qualitative and quantitative research methods and different tools of data collection, data analysis, and interpretation were also implemented. Non random sampling, a three-stage sampling technique is employed to select the study area. Firstly, East Wollega zone was purposively selected among the total zones found in Oromia. Secondly, among the 18 districts of East Wollega, 3 districts adjoining the Komto- Watcha-Tsige forest blocks were selected. Then again, of the 3 districts, 6 *gandalee* and households were purposively selected based on their vicinity to the peripheries of the existing forest compartments. Generally, the total of 183 samples households from the lowest level of the *ganda** administrative level i.e., *gooxii*** were selected for the questionnaire survey (see table 4.1)

Table 4. 1: Distribution of Sample Districts, *Gandaalee* and HHs

District	Sample *Gandaalee*	Total Population			Total House-holds			Sample Households			remark
		M	F	T	M	F	T	M	F	T	
Sasiga	Tokuma-Tsigie	2022	1936	3958	477	66	543	27	3	30	The sample HHs were selected from the sub *gandalee* (*gooxii*)purposely
	Haro-Fayisa	1243	1304	2547	413	44	457	28	3	31	
Guto-gida	Kitessa	1873	1577	3450	263	87	350	32	0	32	
	Jirenya	2231	2263	4494	800	99	899	27	4	31	
	Gari	2632	1992	4624	715	122	837	25	5	30	
Wayu-tuka	Dalo-Komto	4108	3984	8092	1170	252	1422	25	4	29	
Total		4508	13056	27165	3838	670	4508	164	19	183	

Source: Field Survey, 2011/12

*The lower level, ** the lowest level of a district administrative structuring currently in use in Oromia Regional State

Pilot survey was conducted to check for validity and reliability of the methods of the study. Thus, interview of some households, transects and observations were conducted across the *gandalee* (Kitessa-Jirenya, Gari-D/komto and H/feyisa-T/sige).

The aim of the pilot survey was to identify the land use and land cover characteristics of the study area, by giving special attention to the existing forest cover and other natural resource uses, indigenous resource management and adaptation strategies enduring among the communities.

4.1 Method of the Study

A mixed method of diverse data collection and analysis tools was used. Specifically, document review, satellite imageries, field observations, focus group discussion and PRA were used for collecting data concerning forest use and abuses, indigenous management practices, forest based livelihood activities and additional off- farm activities used in ensuring food security for the local communities. Case studies were also conducted to substantiate the household food security problems which occur due to forest degradation. Furthermore, household questionnaire survey was conducted to investigate the socio- economic and demographic characteristics such as age, education, family size, landholding and ownership of different farm implements.

The PRA sessions and focus group discussions were conducted to acquire data on land use/cover dynamics and forest degradation and its impacts on the rural livelihoods and household food security, after classifying the *gandalee* into two *clusters* on the basis of dominant local farming system practiced by the local community as governed by accustomed traditional agro- ecological settings. The *cluster* comprising of *D/Komto, Gari*, and *Jirenya*, has highland agro ecology and it was categorized as 'mixed food crop-livestock farming cluster' while, the *cluster* from *Kitessa, H/ fayisaa*, and *T/ tsige* were classified as 'mixed cash crop- livestock farming cluster' of the midland agro-ecology.

The most accessible *gandalee* from each *clustered sites* were selected for conducting the PRA sessions, FGD, key informant interview, the AGERTIM method (assessment of gully evolution rates through interviews and measurements) and case studies.

Then, *Hadiya* and *Haro-fola* were selected from the two sample *gandalee (Gari and H/fayisa)* as clusters of 'mixed food crop-livestock farming' and 'mixed cash crop-livestock farming' respectively.

4.1.1 Group Discussions

To obtain a general overview of the historical background of forest resource management in the study area, group discussions and PRA sessions were conducted at two purposely selected *goxii* of the rural *gandalee* found surrounding the forest areas. The total number of participants involved in the group discussion and PRA sessions were 27 and 15 from different age groups respectively. In the first place, transect walks were made to appraise the condition of the forests.

The aim of the transect walks was to identify various resource systems used by the community, resources available and their ownership and identify perception of the local people about the forest resources, opportunities and problems of forest resources, availability of forest based- livelihood activities and their contribution to ensuring household food security, cross check information during resource mapping of the area. Above all, the aim of the exercise was to develop understanding on the locally existing indigenous technical knowledge, especially the cultivation practices, forest, water and soil conservation measures, livestock management, social labor organizations, off- farm and non- farm rural livelihoods.

Furthermore, semi structured questions were used to assess the historical and physical setting of the area, the past and present forest cover status, forest management practices preference ranking of forest uses, cause and impact of forest degradation exercises were made in order to find the local people's perception of cause and impact of the problem. In many studies, cause and impact analysis and problem tree analysis that aims at identifying the negative aspect of existing issues that prevail could be understood in a complete form. The cause-effect analysis was also used to identify the bottlenecks to which stakeholders attach priority and which they seek to overcome. Then, the discussion results were recorded to establish further discussion used for key informant interviews conducted subsequently.

4.1.2 Key Informant Interviews

The Key informants and their selection involve enquiring who experts are and seeking them out (Chambers, 1992). Alike, the key informants were selected from elders & adults regardless of sex, from those who were already involved in the focus group discussions. So, I imagine, they had a good knowledge of chronologies of events, local histories, and the resource potential of the area. The interview questions were framed basically to assess peoples' accounts of the past; how things have changed; ecological histories; changes in land use patterns; changes and trends in forest resource use patterns; and causes of changes and trends. Thus, nine key informants were selected from two clusters closer to the forests blocks.

4.1.3 Questionnaire Survey (Structured Interview)

A structured and semi structured questionnaire (scheduled interview) was prepared in Oromo language to collect data by questioning the sampled household heads and recording/documenting their responses corresponding to inquires provided by the questionnaire. The interview covered questions to elicit demographic and socioeconomic data such as respondents' age, sex, residence, family size, marital status, and forest based livelihood options, income from farm and off-farm sources, resilience and adaptive strategies and forest management practices employed and/or adapted at communities and household levels.

As usual, preliminary assessments were conducted ahead of the actual field survey which begun as of February 2012. Then, the final questionnaire survey was conducted by deploying 6 agricultural and rural development agents (DAs) team for data collection work

4.1.4 Participatory Rural Appraisal (PRA)

Participatory Rural Appraisal (PRA) is one of the participatory and qualitative research tools used to acquire the real data existing in the field as identified analyzed and interpreted by the team. It is defined as- "a growing family of approaches,

methods, attitudes and behaviors to enable and empower people to share, analyze and enhance their knowledge, and to plan, act, monitor, evaluate and reflect" (Chambers, 2004).

In this study too, the PRA is selectively used for investigating the existing forest degradation, the underlying causes of forest degradation and the impacts of forest degradation on rural livelihoods of the local communities.

4.2 Method of Data Analysis and Interpretation

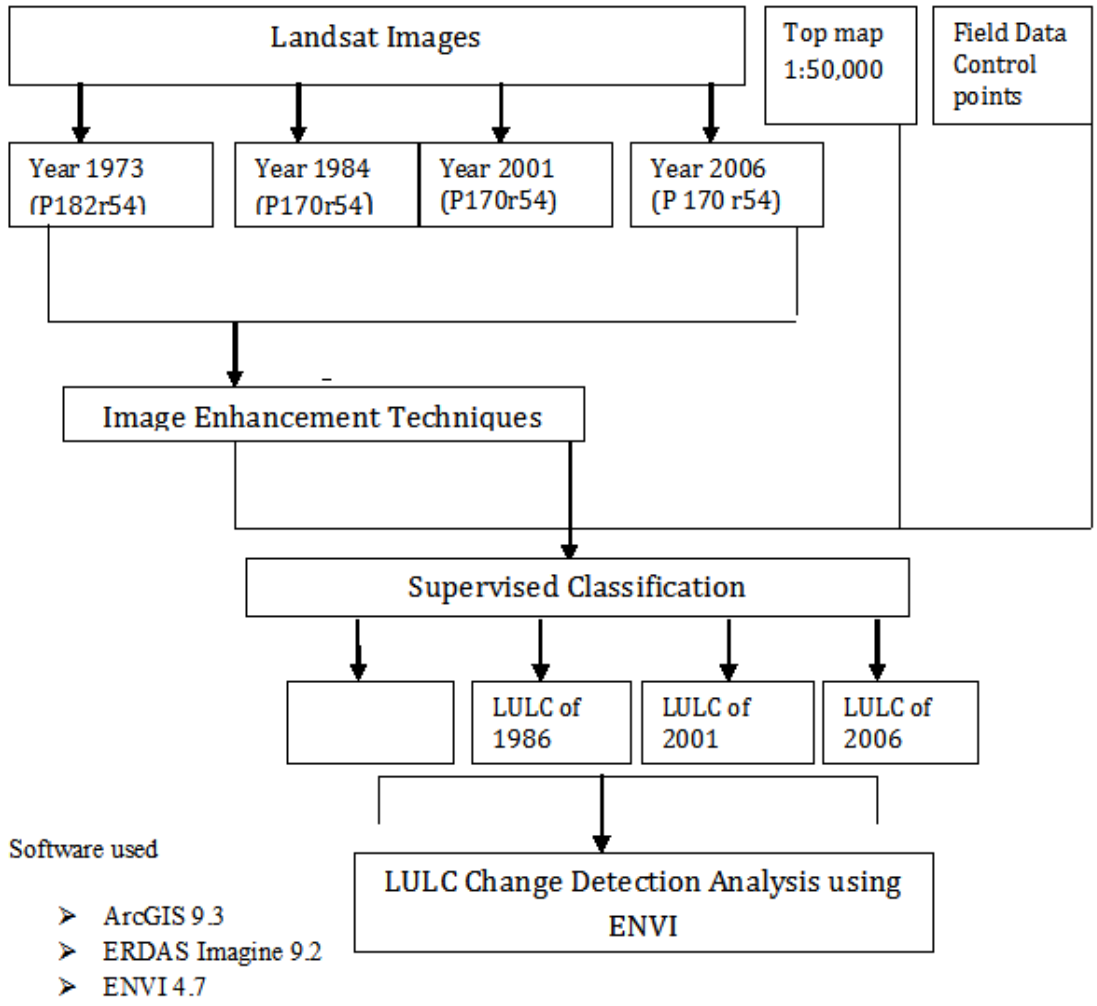
Main techniques like encoding, processing, analyzing and summarizing of data using different software such as Arc GIS 9.3, ERDAS IMAGIN 9.2, and ENVI 4.7 and Statistical Package for Social Sciences (SPSS) were implemented. Moreover, the PRA tools such as pair wise ranking, direct matrix and scoring using (N-1) N/2 by (Martin, 1995), wealth ranking, resource mapping and forest degradation model were also used as data analysis methods. Finally, the findings of the study were summarized and presented using quantitative and qualitative tools such as descriptive statistics, tables, bar and line graphs, charts, figures, maps and photographs.

4.2.1 Change Detection and Satellite Image Analysis and Interpretations

Satellite images were used for land use/ land cover change detection and analysis of the study area, within the time duration of the past three and half decades, that is about 33 years. The spatial change that occurred mainly to the forest area from 1973 to 2006 is detected and analyzed in detail. For this purpose, first multi temporal satellite images acquired for the year 1973 (MSS), 1986(TM), 2001 and 2006(TM) were used. The digital images were geo- referenced using the topographic maps and verifications for the ground truth was also incorporated through field survey and transect walks. Then, image classification of the three consecutive periods, both supervised and unsupervised image classification was conducted by ERDAS Imagine 9.2 remote sensing and GIS software.

As part of image analysis, accuracy assessment was carried out using 250 pixels to be selected for each land use / land cover map, using Kappa Coefficient (See Figure 4.1).

Figure 4. 1: Methodology of Change Detection and Analysis of Satellite Images



The focus of this study was mainly on land use/cover change detection over time span of 33-years (1973–2006) using Landsat imagery. In order to detect the change after intervention, satellite images (Landsat with 30m resolution taken on 1973, 1986, 2001 &2006) were used. Image Processing was carried out using ERDAS Imagine 9.2, Arc GIS 9.3 and ENVI 4.7 software. Thus, land use/land cover classes from the Landsat image were produced from visual interpretation. Description given for the land use land cover classification was adapted from the land use and land cover classification manual prepared by government department of agriculture (BoARD, 2001), after

intensive field survey was conducted for checking the ground truth. The field survey and transects were used besides the Landsat image of 2006 in order to evaluate the current land use and land cover types of the study area.

4.2.2 Trend Analysis and Historical Narrations

During the PRA session, participants were asked to show the trends of different variables in the village starting from the year that they are able to recall. Then the remarkable years were chosen by participants as the initial years to show the trends in rainfall and stream and river discharge, crop and livestock productivity, food supply, forest status and food security status at community level.

4.2.2 Multiple Forest Management and Stakeholder Analysis

In order to take different management approaches, it is necessary to identify different stakeholders and forest use groups who have been using and involved in different forest resource management arrangements. In general, this method is useful to understand who could potentially gain or lose by the ongoing forest degradation. According to ODA (1996), the stakeholders are defined as any person, group, community or body who has something to gain or lose from change in management of resources. In this case, "stakeholders" include local communities and those who are the direct forest users and those who are the indirect users, i.e., the interested parties. Stakeholder analysis was conducted in terms of direct and indirect forest use and assessment of the existing and potential forest use right and interest.

In addition, this method was used so as to observe the existing resource use conflicts and relationships between the different forest user-groups. Basically, formal and informal discussions were held on forest management issues in the past, at present and the future.

Participatory research tools such as social mapping, the *"three Rs matrix"* ("R"- right to use the forest, "R"- responsibilities to manage it and "R"- generating revenue from the forests), and the relationship mapping was used to explore the nature of forest based activities and the relations which existed between the forest use groups.

4.2.4 Questionnaire survey and Data Analysis

A total of 183 individuals were eventually interviewed across the six *gandalee* during the questionnaire survey. The data analysis was done using chi-square, cross tabulations and descriptive statistics to examine relationships between livelihood variables causing forest cover change (forest degradation) Again, some demographic and socio- economic variables like age, sex, educational level, marital status, family size, and household income (from agriculture and off farm calculated at present value), household income from forest based activities, land holding size, size of live stock owned, Income from forest timber sales were analyzed and described using simple statistical tools.

CHAPTER FIVE*:* DEMOGRAPHIC FEATURES AND POPULATION GROWTH

5.1 Sex and Age

According to UN (1973), change in sex composition can partly influence incidence of births and deaths as well as socio-economic factors. Data on such variables as sex and age characteristics were analyzed in order to understand household's working force, equity in resource use and the livelihood activities. Therefore, review of age and sex factors of a given population become important to witness how such variables correspond with forest based activities, forest degradation and food security issues of the study area.

According to table 5.1, the sample *gandalee* had different sex and age sizes. The total proportion of the sex statistics shows that male headed households were 164(about 90 %) of the total respondents and about 10 % the respondents were female headed households. The survey uncovers variations in age level of the respondents. Thus, about 164(90 %) of the respondents reportedly said their age was in the category of between 21-64 years (adult/working age group) followed by those above 64(8%) and the young populations of age less than 20 years (2%).

Table 5. 1: Age and Sex Structure of the Respondents

Site	Sex				Total	Age Category					
	Male		**Female**			**<20 yrs.**		**21 - 64 yrs.**		**>64 yrs.**	
	No	**%**	**No**	**%**	**No**	**No**	**%**	**No**	**%**	**No**	**%**
DK	25	86.2	4	13.8	29	0	0	27	93.1	2	6.9
GR	25	83.3	5	16.7	30	0	0	26	86.7	4	13.3
HF	28	90.3	3	9.7	31	0	0	31	100	0	0
JR	27	87.1	4	12.9	31	5	16.1	23	74.2	3	9.7
KI	32	100	0	0	32	0	0	31	96.9	1	3.1
TS	27	90	3	10	30	0	0	26	86.7	4	13.3
Total	164	89.6	19	10.4	183	5	2.4	164	89.6	14	7.7

Source: Field Survey, 2012

Note: *DK =Dale Komto; GR = Gari; HF=Haro Fayisa; JR= Jirenya; KI= Kitessa; TS= Tokuma Tsige*

5.1.1 Marital Status and Ethnicity

The marital status of the respondents shows the household family size and their share in environmental resource management. The study found that married households use more forest products for domestic purposes as well as for generating household income. Likewise, own observation showed that forest degradation appeared the challenging problem for married households than unmarried and other households. It should be noted that about 90% of the respondents were married and 3% unmarried. The remaining 7% of the total respondents were divorced, widowed or unknown. The fact that majority of the respondents were married households causes an increasing demand for forest resources for fuel energy and other domestic purposes.

With respect to ethnicity, more than 95% of the surveyed households were Oromo while the remaining 5% of the respondents were *Amhara* and others language groups (See Table 5.2). Existing perception shows that knowledge of the ethnic background and socio-cultural characteristics of respondents and the entire communities seems necessary to grasp the dominating indigenous resource management arrangements and assume conventional natural resource management options. Sometimes, unawareness of the host communities' traditional resource management approaches appears causing conflicts and degradation of common resource pools. So, to solve such problems, attention should be given to conservation and management of local forest resources in line with indigenous knowledge of the Oromo Eco-theology.

Table 5. 2: Marital Status and Ethnic Profile of the Respondents

	Marital Status						**Ethnicity**					
	Married		Unmarried		Other		Amara		Oromo		Other	
	No	%	No	%	N	%	No	%	No	%	No	%
DK	25	86.2	2	6.9	2	6.9	1	3.4	26	89.7	2	6.9
GR	26	86.7	0	0	3	10	1	3.3	28	93.3	1	3.3
HF	29	93.5	0	0	2	6.5	0	0	31	100	0	0
JR	25	80.6	1	3.2	5	16.1	1	3.2	29	93.5	1	3.2
KI	32	100	0	0	0	0	0	0	31	96.9	1	3.1
TS	28	93.3	1	3.3	1	3.3	0	0	28	93.3	2	6.7
Total	165	90.2	5	2.7	13	7.1	3	1.6	173	94.5	7	3.8

Source: Field Survey, 2012

5.1.2 Religion and Educational Background

Different views and beliefs make differences in the use of natural resources and the human centered versus nature-centered debates of development and civilization. So, respondent's religious and educational background could influence how to use and manage environmental resources. Mainly, the educational background of a respondent were used as indicators of the level of awareness of the respondent's on the natural resources uses and abuses and the impacts of forest degradation on the rural livelihoods of the communities.

It was found that except those respondents of less than 5% who were Muslims and *Waaqeffataa*[2], the majority of respondents were affiliated to Christians (mainly, followers of The Protestant Christianity). Concerning educational background, about half of the respondents said they attended elementary and above educations. Those who could not read and write, and who can read and write were 28% and 24% respectively. This analysis of educational background of the communities seemingly shows that most the respondents had no full awareness on conventional conservation practices of forests and integrated natural resources.

Table 5. 3: Religions and Educational Background of the Respondents

Site	Religion						Educational Status					
	Christian		Muslim		Other		Can't Read and Write		Can Read and Write		Elementary school & above	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
DK	25	86.2	2	6.9	2	6.9	3	10.3	5	17.2	21	72.4
GR	26	86.7	0	0	4	13.3	11	36.7	11	36.7	8	26.7
HF	31	100	0	0	0	.0	9	29.0	10	32.3	12	38.7
JR	25	80.6	3	9.7	3	9.7	12	38.7	9	29.0	10	32.3
KI	32	100	0	0	0	0	3	9.4	4	12.5	25	78.1
TS	29	96.7	1	3.3	0	0	14	46.7	5	16.7	11	36.7
Total	168	91.8	6	3.3	9	4.9	52	28.4	44	24.0	87	47.6

Source: Field Survey 2012

[2] *Waaqeffataa* a person who adhere to indigenous religion of the Oromo

5.1.3 Family Size of the Surveyed Households

The rate of human population outstrips the growth of agricultural output or food production (Malthus, 1960). According to this proposal, household's size is basis for population growth i.e., households with larger family size need extra food and other necessities and then putting pressures on the local natural resource. Hence, a growing population happens to be the driving forces of forests and other natural resource degradation which in turn affects the livelihoods of the local communities adversely. According to CSA (2007), population number and densities shows an increasing trend at all levels, with considerable variations of less than 10/km^2 for Gambella region to about 350 people per square kilometer in Harari region.

Likewise, the respondents were asked about their family status, principally their family size. It should be noted that about 72% of the respondents from Kitessa reported more than 5 family members for their household and about 83% of the respondents from D/Komto reported 3 to 5 members for their households. In general, out of total household respondents about 46% and 45% reportedly told they had family members of 3 to 5, and above 5 members respectively, which seem to have contributed to a growing population of the study area positively. So, family planning is a moral duty to be exercised by the communities at large since it is believed to bring about the optimum population growth and environmental resource use norms.

Table 5. 4: Family Size of the Respondents

Site	Family size						Total
	< 3 persons		3 - 5 persons		> 5 persons		
	No.	%	No.	%	No.	%	No.
DK	2	6.9	24	82.8	3	10.3	29
GR	5	16.7	15	50.0	10	33.3	30
HF	2	6.5	17	54.8	12	38.7	31
JR	4	12.9	14	45.2	13	41.9	31
KI	2	6.3	7	21.9	23	71.9	32
TS	3	10.0	6	20.0	21	70.0	30
Total	18	9.8	83	45.4	82	44.8	183

Source: Field Survey, 2012

5.1.4 Population Growth and Family Planning

Currently, the population growth all over the world is threatening well beings of the people and leading to environmental resources degradation. Hence, family planning has to be implemented sustainably to control the unprecedented population growth in equilibrium with the natural resource supply.

As interview with the rural health post staffs shows, a growing population in the study area has demanded for family planning services. However, in depth interview with the key informant[3] showed that the number of women voluntarily involved in the programs of family planning and getting services was unsatisfactory. This is because of inconsistency in accepting the rules and implementation of measures of birth controls as prescribed by the physician of the mothers. Some of the women also reported that they often become reluctant and offended to use pills, fearing of its long term impacts on their health condition.

Moreover, the influence from their husbands and socio- cultural perceptions regarding having large family size has persisted since the times of forefathers. Hence, each household wishes to have the average family sizes of greater than seven. Similarly, the surveyed households reported that they wish to have larger family size. But, larger family size inevitably leads to a growing demand for forest and other natural resource products which results to shortage of these resources (forests and other natural resources).

In the absence of livelihood diversification, households with large family size continue to suffer from shortage of food. So, the existing forest and other natural resources compatibly became degraded with continued reliance of households with larger family sizes on forest resources as a primary livelihood option (income source)

In short, larger family size seems to be one the existing factors for the ongoing forest degradation and unsustainable forest based livelihoods of the local communities.

[3] *Adde Natsanat Gamachu, health post officer, Tokuma tsige, 2012*

5.2 Population Growth, Changes in Environmental Resources and Livelihoods of the Communities

According to USESA (2001), the growth of world population and production combined with unsustainable consumption patterns place increasingly severe stress on the life supporting capacities of our planet. Though the finding of this study, it was confirmed that population growth has caused fragmentation and shortages of farmland and prominent livelihoods and food security challenges affecting the local community. Own observation shows that the increasing population number, forest based livelihood activities get expanded at the expanse of huge forest loss and forest degradation. Again, due to continued forest degradation extensive farms and grazing lands undergo severe erosion and land fragmentation.

The communities have developed insights on the environmental changes taking place locally as being aroused due to population growth. The respondents were interviewed regarding the dominant environmental changes occurred since the past four decades. Accordingly, almost half of them replied that forest and integrated natural resource degradation in the study area was severe. In this case, other natural resources include the major and sensitive natural resources to human induced degradation such as waters resources (stream and river flows and wetlands and more other surface and underground water bodies and drainage systems), soils, wildlife and their habitat and many other forest creatures such as birds, reptiles and amphibians.

On the other hand, about 37% and 16% of the respondents reported that they perceived decreasing amounts of forest timber and non-timber product supplies and declining livelihoods of the local community respectively, attributed to a growing population pressures on the environmental resources since the past four decades(See Table 5.5).

Table 5. 5: Respondents' Perceptions on Impacts of Population Growth

Site	Change in livelihood activities		Decrease in forest products supply		Degradation of other natural resources	
	No.	%	No.	%	No.	%
DK	11	37.9	8	27.6	10	34.5
GR	7	23.3	11	36.7	12	40
HF	5	16.1	10	32.3	16	51.6
JR	1	3.2	14	45.2	16	51.6
KI	3	9.4	9	28.1	20	62.5
TS	2	6.7	15	50	13	43.3
Total	29	15.8	67	36.6	87	47.5

Source: Field Survey, 2012

5.2.1 Population and perceived level of Forest Degradation

The forest resources in Ethiopia, though rich in bio-diversity, timber and non-timber products, and their environmental services, they are found to be severely threatened by different agents of forest degradation. Largely, forest products throughout the country have been harvested recklessly and hastening forest degradation reach a critical stage. This is credited to the existing big problem in forest management and monitoring methods, as recognized from historical narrations and existing opinion of the local communities.

The question survey result also shows about 31% of the respondents reportedly said that forest degradation was very high and about 42% high. On the other hand, less than 20% and 10% of the respondents reportedly said it was moderate and low or no degradation respectively (Table 5.6). In brief, the finding shows that almost three-fourth of the respondents agreed that the rate of forest degradation in their locality was high and very high.

Table 5. 6: Respondents' Perception on Severity Level of Forest Degradation

Site	Perceived Severity level of forest degradation							
	Very high		high		moderate		low or no degradation	
	No.	%	No.	%	No.	%	No.	%
DK	16	55.2	7	24.1	6	20.7	0	0
GR	8	26.7	11	36.7	8	26.7	3	10.0
HF	14	45.2	14	45.2	1	3.2	2	6.5
JR	4	12.9	24	77.4	2	6.5	1	3.2
KI	3	9.4	9	28.1	11	34.4	9	28.1
TS	12	40.0	11	36.7	7	23.3	0	0
Total	57	31.1	76	41.5	35	19.1	15	8.2

Source: Field Survey, 2012

5.2.2 Resource Depletion and Food Insecurity

According to UNDP (2006), Ethiopia was one of the poorest countries in the world, ranking 170th out of 177 countries in the human development index. The country's economy was heavily dependent on the agricultural sector. Although different data sources show progresses in all the GDP as registered within the past ten years, still agriculture contributes three-fourth of the labor force employment, more than half of the gross domestic product.

It is known that about 90% of the crop production was from subsistence farmers whose farming was characterized by low-input and low-output production system with heavy dependence natural resources, mainly forests and integrated resources. The recurrent drought and backward agricultural production system combined with inappropriate agricultural policies resulted in widespread food insecurity in the country (Devereux, 2000). According to Little (2008) and Clay *et al*. (1999), food aid and concessional food imports were incidents perceived conventional to respond to domestic food insecurity but, the country's food insecurity condition was persistent and worrisome.

Similarly, MoFED (2006) confirmed that about 38% of the country's populations (15 million people) were food insecure. As far as the study area is concerned, three-fourth of the respondents reportedly said they were living in food shortage (food insecure) for sometimes, most of the time and throughout the year. On the other hand, about a quarter of the respondents reportedly said they were living in food excess (food security). Those respondents living in food excess seemingly were more resilient to the existing food insecurity conditions than those who were living in food shortage.

They could sustain the impacts of forest degradation through diversification of livelihood strategies and by enhancing the forest based livelihood activities. For example, the tabulation of *gandalee* shows that about 59 % and 17% of respondents from Dale Komto and Tokuma tsige were living in food excess respectively. On the other hand, the rest 39% and 83% of the respondents from the two respective *gandalee* were food insecure. This implies that there was no livelihood diversification and income generation practices, other than subsistence agricultural and forest based livelihood activities. Even though, forest based practices were the most common livelihood activities of the communities in the study area, there was difference amount of forest uses among the *gandalee*. For example, relatively the amount of forest products such as charcoals, firewood, and construction woods and poles inflow to Naqamte town from Tokuma tsige is lower than the amounts of forest products inflow from communities in Dale komto to the town (See Table 5.6)

Table 5. 7: Households' Opinion and their Food Security Status

Site	**"Have you ever encountered food insecurity?"**			
	No		Yes	
	No	%	No	%
DK	17	58.6	12	41.4
GR	10	33.3	20	66.7
HF	7	22.6	24	77.4
JR	5	16.1	26	83.9
KI	6	18.8	26	81.2
TS	5	16.7	25	83.3
Total	50	27.3%	133	72.7

Source: Field Survey, 2012

Again, in relation to the durations and persistency of food insecurity problem, the respondents articulated their perceptions as follows. Most of the respondents i.e., about 43% of the total respondents reported they faced food insecurity problems for less than three months only. Again, another 43% and 13% of the respondents reported they lived food insecure usually for 3 to 5 months, and greater than 5 months respectively (See Table 5.8)

Table 5. 8: Percentages of Respondents and Seasonal Food Insecurity

Site	Duration of food shortage					
	< 3 months		3 - 5 months		> 5 months	
	No	%	No	%	No	%
DK	15	51.7	7	24.1	7	24.0
GR	6	20.0	19	63.3	5	16.7
HF	7	22.6	19	61.3	5	16.1
JR	6	19.4	21	67.7	4	12.9
KI	25	78.1	6	18.8	1	3.1
TS	22	73.3	7	23.3	1	3.3
Total	81	44.3	79	43.2	23	12.5

Source: Field Survey, 2012

5.3 Comparative Analysis of Forest Based Livelihood Activities as Causal Factors for Forest Degradation

The pair wise comparison was used to establish the activities perceived by the local people as the known factors of the indigenous forest degradation. For Martin (1995), pair wise comparison includes the setting of activities into pairs in order to analyze the causes of forest degradation and vegetation destructions of a given place. For this study, however, the method used by Martin (1995) is partially adopted to deals with responsiveness of the local people concerning forest degradation and the fundamental causes of this problem.

Accordingly, the rural livelihood activities such as fuel wood collection for sale, charcoal making and logging forest trees for sale, harvesting construction poles,

overgrazing, and expansion of farmlands were identified through the focus group discussions. The formula used by Martin i.e., (N-1) N/2 is selected for this purpose.

Subsequently, 15 pairs of activities were established based on matrix algebra. Each respondent from a focus group discussion team (25) were asked to opt for the major causal factors of forest degradation among the alternative pairs of livelihood activities provided. Lastly, the options were added and the mean score is recorded on pair wise matrix, in this manner, the relative rank corresponding to each pair of livelihood activity(perceived causal factor for forest degradation) is prepared as follows.

Table 5. 9: Total Mean Scores and Ranking of the Six Livelihood Activities

activities	Fuel wood	charcoal making	Logging	Harvesting construction poles	Overgrazing	Agriculture farmland expansion
Total Score	150(25)	120(20)	72(12)	60(10)	54(9)	132(22)
Total mean score	30	24	14	12	11	26
Percentage	20	16	9.6	8	7.3	17.6
Rank	1	3	4	5	6	2

Source: Field Survey, 2012

Note: the numbers in the parenthesis for the total score represent the absolute number of the respondents.

According to table 5.9, it was found that fuel wood collection for sale, with the mean score of about 30(20%) was the most destructive livelihood activity. Overgrazing was the least destructive forest based activity with a mean score of 11(7.3%) of the total mean score. Agricultural farmland was ranked 2nd while charcoal making with 24(16%), logging 14 (9.6%) and harvesting construction pole 12(8%) were ranked 3rd, 4th, 5th and 6th respectively.

5.3.1 Fuel Wood Collection

The focus group discussants confirmed that firewood collection was the major destructive activity, because, the local people depend on the natural forest as source of fuel energy for household consumption and sale. In addition, the discussants bitterly objected for the destined robbery of the forest timber products as destructive

activity. As usual, debarking huge trees, set fire to forests and using the latest wood cutter machines were strategies of robbing the forest resources by the local wood smugglers. In general, in the name of fuel wood collection, complicated abuse of forest resources continued to be the serious problem of forest based livelihoods of the community as well as environmental sustainability.

5.3.2 Farmland Expansion

It is a common occurrence that households found adjacent to forest and woodlands continued to expand their farms gradually. Some farmers organized at micro level to acquire lands for cultivation of cash crops such as chat, sesame and eucalyptus trees. The ongoing encroachment of cultivation of crops towards the surrounding woodlands has resulted in further forest degradation. On the other hand, farmlands for investment were grappled from woodlands and the former forest areas, the process of which is found threatening the forests and integrated natural resources availability and forest based livelihoods of the local communities.

5.3.3 Charcoal Making

Majority of the participants of the focus group discussion pointed out that charcoal making has been practiced for generating household income. The respondents identified three *gandalee*(Gaarii, Kitessa and Jirenya) as the major ones known for producing charcoal for sale. The forest degradation wave model confirms that charcoal making have been practiced by almost all households and the reliable forest based market linkage between the local communities and the urban dwellers.

5.3.4 The Least Scored Activities

Forest based activities like logging trees and lumbering, harvesting poles for constructional purposes and overgrazing were identified as having lower destructive effects than the others in comparison. Charcoal making, fuel wood collection were identified as major factors of forest degradation. On the other hand, scarcity of the dominant forest species was among the indicators of the ongoing deforestation and forest degradation.

CHAPTER SIX: LAND USE/COVER CHANGE AND THE RURAL LIVELIHOOD DYNAMICS

6.1 Introduction

This chapter deals with analysis and descriptions of the land use/cover dynamics and the rural livelihoods of the community. The temporal and spatial change mainly of forests other land covers was analyzed based on community's perception. Other land use and land cover types, the existing farming system and the major off farm rural livelihood activities were also addressed accordingly. Furthermore, the major socio-economic and bio- physical factors causing land use/cover change (underlying causes) were analyzed based on the wider perspectives.

Analysis of land use/cover change was conducted through narration of the major incidences of the past 30 to 40 years. Remarkable incidents were selected as benchmarks so as to identify events which are perceived by the community as the consequences and impacts of forest degradation. Accordingly, three remarkable periods were selected and used as benchmarks. These are the period of Emperor Hile Sillasie I (before 1974), the *Derg* regime (1974-1991) and the FDRE government (1991- the present).

The PRA sessions and exercises including resource mapping, direct matrix scoring and ranking exercises, proportional pilling etc., the land use/cover change investigation supported by the transects and field observations were used to assess changes in the forest cover. Group discussions and key informant interviews regarding the effects of population pressure on the local forests and integrated natural resources were also conducted in order to understand the land use/cover dynamics of the study area. Moreover, secondary data such as different reports and documents were consulted to make the content analysis of the local forests and integrated natural resources, the existing use and abuses of the forests, the major causes of forest degradation and its impacts on the rural livelihoods of the local community.

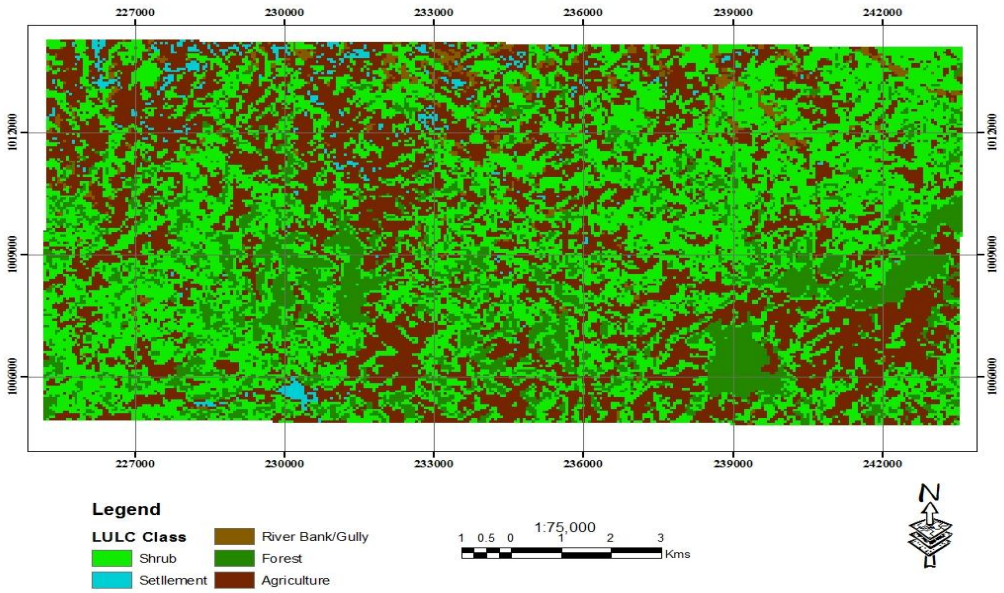
6.2 Land Use/Cover Change Detection and Analytical Outcomes

The land use/cover change detection and analysis was conducted based on multi spectral and temporal data acquired from satellite imageries of different durations (1973, 1986, 2001 and 2006). On the other hand, archival documents were also used in order to detect the contemporary land use/cover status of the study area.

6.2.1. Satellite Image of 1973

Analysis of the 1973 image of the study area shows that there were a very dense forest covering vast areas bordering volcanic ridge/hill/ and *Komto-Walene* ridges. Precisely, the image shows that the forest area was about 268800ha accounting for (15.76% of the total land use/cover type). On the other hand, agriculture, settlements, shrub and wood lands, river banks/gullies were comprised of about 620500ha (36.39%), 23200ha (1.36%), 755600ha (44.31%) and 36800ha (2.15%) respectively (See Figure 6.1)

Figure 6. 1: Land Use/Cover Pattern of the Study Area (1973)



As shown in fig 6.1, very large area was under shrub (44.3%), followed by agriculture and forest cover which were about (36.39%) and (15.76%) of the total land use/cover types respectively.

Table 6. 1: Land Use/ Cover Extent and Classes of 1973

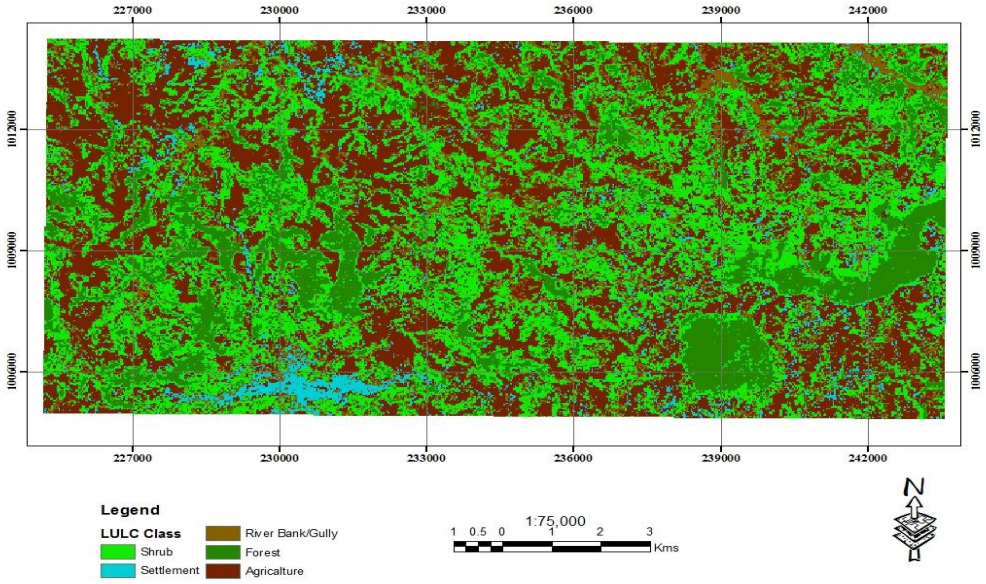
Area	Shrub	River bank/gully	Agriculture	Settlement	Forest	Class Total
hectare	755600	36800	620500	23200	268800	1704900
%	44.31	2.15	36.39	1.36	15.76	100

Source: Satellite Image of the study area (1973)

6.2.2. Satellite Image of 1986

In 1986, agricultural land was the dominant land use/cover class that covered of about 646800ha (37.90%) of the total area. The settlement area was about 77200ha (4.52%) perhaps; this was the smallest land use/cover portion. The other land use/cover types, the shrub, river bank/gullies and forest were 561600ha (32.91%), 179100ha (10.49%) and 242000ha (14.18%) respectively (See Figure 6.2)

Figure 6. 2: Pattern of Land Use/Cover (1986)



Generally, the largest area was an agriculture land (37. 90%), followed by shrub land (32.91%) and forest areas (14.18%). River bank/gully and settlement were 10.49% and 4.52% of the total land use/cover respectively (See Table 6.2)

Table 6. 2: 1986 Land Use/ Cover Extent and Classes

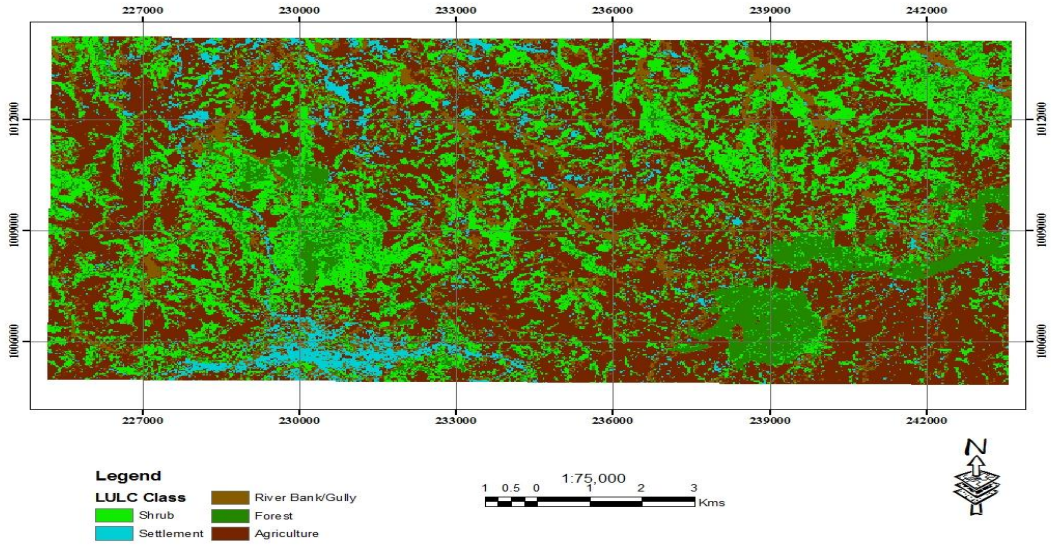
Area	Shrub	River bank/gully	Agriculture	Settlement	Forest	Class Total
hectare	561600	179100	646800	77200	242000	1704700
%	32.91	10.49	37.90	4.52	14.18	100

Source: Satellite Image of the Study Area (1986)

6.2.3. Land use/cover Pattern of 2001

The result of the 2001 image analysis shows that the agricultural (cultivated land) was the largest in area comprising about 839100ha (49.22%) of the total area, while the settlement area was the smallest coverage i.e., about 90300 ha (5.30%) of the total area depicted by the satellite image. The remaining land use/cover classes particularly the shrubs, river bank/gully and forest areas covered about 434100ha (25.46%), 192300ha (11.28%) and149100ha (8.75%) respectively (see Table 6.3)

Figure 6. 3: Figure 6.3: Pattern of Land Use/Cover (2001)



Generally, the largest area was under agricultural (cultivated land) (49.22%), followed by shrubs (25.45%), river banks and gullies (11.28%), forest (8.75%) and settlement (5.30%) of the total land use/cover types (See Table 6.3)

Table 6. 3: Land Use/ Cover Extent and Classes of 2001

Area	Shrub	River bank/gully	Agriculture	Settlement	Forest	Class Total
hectare	434100	192300	839100	90300	149100	1704900
%	25.45	11.28	49.22	5.30	8.75	100

Source: Satellite Image of the Study Area (2001)

6.2.4. Land use/cover Pattern of 2006

The 2006 satellite image shows that the area coverage of agricultural land being the largest one i.e., about 852700ha (50.01%) of the total area class On the other hand, the forest cover comprised the area of about 132800ha (7.83%), that is the smallest land use/cover class of the total. Shrub, River bank/gully and settlement comprised about 380200ha (22.30%), 182000ha (10.68%) and137800ha (8.10%) respectively.

Figure 6. 4: Pattern of Land Use/Cover of 2006

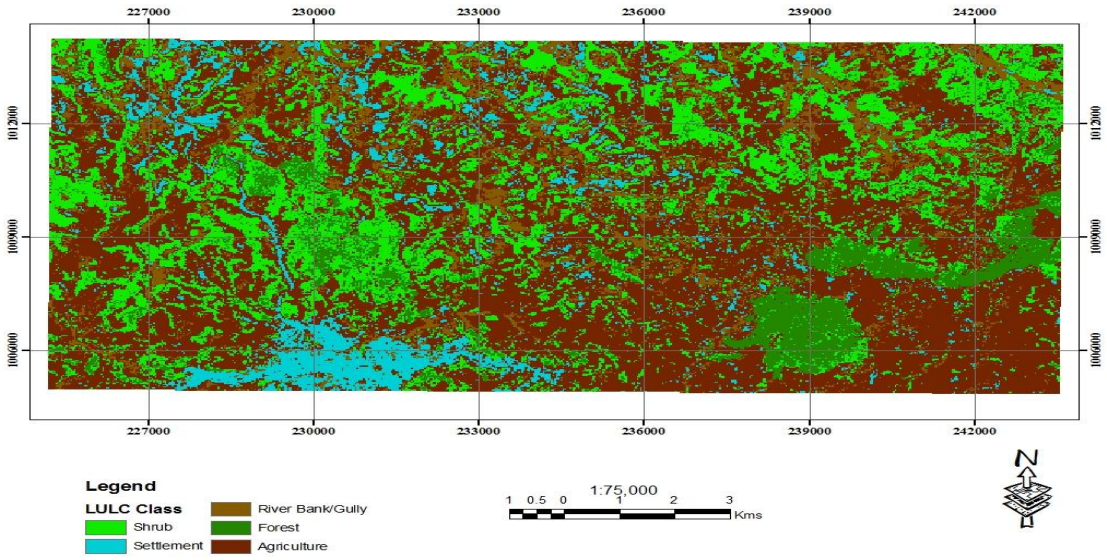


Table 6. 4: Land Use/ Cover Extent and Classes of 2006

Area	Shrub	River bank/gully	Agriculture	Settlement	Forest	Class Total
hectare	380200	182000	852700	137800	132800	1704900
%	22.42	10.68	50.01	8.10	7.80	100

Source: Computed from Satellite Image of the Study Area, 2006

6.3 Trend Analysis in Land Use /Cover Change of the Study Area

Temporal and spatial trends in land use/cover dynamics of the study area is considered in three phases 1973-1986, 1986-2001, and 2001-2006.

6.3.1 Land Use/Cover Change from 1973 to 1986

Detection of changes in the land use/cover types of the study area of the period between 1973 and 1986 shows about 23200ha (1.36%) land use was initially classified as settlement area. It was very small fraction of the total land use/cover. The area was sparsely populated and as a result very limited human induced forest degradation was observed. Hence, only smaller settlement areas including Naqamte town was shown by the satellite imagery of 1973. Since then, however, the settlement area increased and it covered about 75900ha (4.45%) as depicted by satellite image of 1986. In brief, a positive increment of about 3.1% was observed at the cost of other land use/cover types.

Similarly, a sharp increase in agricultural land area was documented as depicted by the satellite imagery of 1986. The initial extent of agricultural land coverage was about 620500 ha (36.39%) which gradually increased to about 635800ha (37.29%) in 1986. Generally, a difference of about 15300 ha.(0.90 %) was observed as expansion of the cultivated land cover type. In 1973 and 1986 the areas under forest cover and shrubs were about 268800(15.76%) and755600 (44.31%); 241300ha (14.15%) and 563700ha (33.06%) respectively. In sum, the forest and shrub land showed a change of about -1.61% and -11.25% in 1973 and 1986 respectively (See Table 6.5)

Table 6. 5: Summary of Land Use/Cover Change between 1973 And 1986

Land use/cover type	1973		1986		Change b/n1973&1986 (ha)	(%)
	Area(ha)	% total	Area(ha)	% total		
Shrub	755600	44.31	563700	33.06	-191900	-11.25
River bank/gully	36800	2.15	188200	11.03	151400	8.88
Agriculture	620500	36.39	635800	37.29	15300	0.90
Settlement	23200	1.36	75900	4.45	52700	3.09
Forest	268800	15.76	241300	14.15	-27500	-1.61
total	1704900	100	1704900	100	-	-

Source: Computed from Satellite Image, 1973 and 1986

6.3.2 Land Use/Cover Pattern of Between 1986 and 2001

Land use/cover classes acquired from the satellite images showed the extent of land use/cover changes as noted next. In 1986 Settlement areas was about75900ha (4.45%) of the total land use/cover extent. This is because of population growth and settlement encroachment towards areas of the natural forest resources that is a remarkable evidence of land use/cover dynamics.

Settlements, Naqamte town and its surrounding rural villages were steadily encroached into the peripheral forest areas and woodlands and other land use types of the area. Later on, the settlement area enlarged to about 90300 hectare (5.29%) in 2001. This shows that about 14400 hectare (0.85%) of the total area previously under some other land use/cover types was converted to settlement area. The other is agricultural land which is shown by the 2001 satellite image, covering an area of about 839100 hectare (49.22%) i.e. a difference of about203300 hectare (11.93%) from its (1986) coverage.

On the contrary, the area under forest cover reduced from about 241300 hectare (14.15%) in 1986 to 149100 hectare (8.75%) in 2001. This shows that about 92200 hectare (5.40%) that is a third of the total forest cover of the 1973 was lost until 2001.

The forest cover of the study area was degraded and changed into other land use/ cover types through human interferences such as agricultural land expansion and exploitation of forest products for different rural livelihood activities (See Table 6.6)

Table 6. 6: Summary of Land Use/Cover Change between 1986 And 2001

Land use/cover type	**1986**		**2001**		**Change b/n1986&2001 (ha)**	**Change b/n1986&2001(%)**
	Area (ha)	% of total	Area(ha)	% of total		
Shrub	563700	33.06	434100	25.46	-129600	-7.60
River bank/gully	188200	11.03	192300	11.28	4100	0.25
Agriculture	35800	37.29	839100	49.22	203300	11.93
Settlement	75900	4.45	90300	5.30	14400	0.85
Forest	241300	14.15	149100	8.75	-92200	-5.40
total	1704900	100	1704900	100	-	-

Source: Computed from Satellite Image, 1986 and 2001

6.3.3 Land use/cover Pattern of between 2001 and 2006

The spatial analysis of the images of 2001 and 2006 shows the settlement and agricultural (cultivated lands) increased by about 47500 hectare (2.20%) and 13600 hectare (0.79%) of the total land use/cover respectively. River banks/gullies were decreased by 1000 hectare (0.06%).

The decreasing areas of river banks/gullies seemingly was due to rehabilitation works and small scale traditional irrigation scheme for planting chat (*Catha delis*) by some farmers of the study area. On the other hand, shrubs and forests have shown a decrease in area of about 53900 hectare (3.16%) and 16300 hectare (0.95%) respectively.

Table 6. 7: Summary of Land Use/Cover Change between 2001 And 2006

Land use/cover type	2001		2006		Change b/n2001&2006(ha)	Change b/n2001&2006(%)
	Area(ha)	% of total	Area(ha)	% of total		
Shrub	434100	25.46	380200	22.30	-53900	-3.16
River bank/gully	192300	11.28	182000	10.67	-1000	-0.61
Agriculture	839100	49.22	852700	50.01	13600	0.79
Settlement	90300	5.30	137800	8.10	47500	2.20
Forest	149100	8.75	132800	7.80	-16300	-0.95
total	1704900	100	1704900	100	0	0

Source: Computed from Satellite Image, 2001and 2006

6.4 Human Induced Land Use/Cover Change

There is a complex combination of factors attributed to land use/ cover change which is identified by PRA sessions and exercises. Generally, population growth, increasing demand for forest products, decline in productivity of land, increased incidents of soil erosion and gully formations, termite invasion, climate change (rainfall and temperature variability), change in farming system (cultivation of cash crops), were some of the major factors and indicators of land use/cover change observed in the study area.

It is known that the communities depend largely on existing forest timber and non-timber products for fuel wood, constructional materials, human and livestock customary medicines and intangible services (socio-cultural and spiritual values). Nevertheless, the existing shortages of fodders and grazing areas, timber and non-timber products due to farm intensification and conversion of crop lands into eucalyptus lots were some of the factors threatening the local forest and integrated natural resources.

Even though, adaptation of the market-oriented cash crop (the production of chat, coffee and exotic eucalyptus trees species) remains a significant practice in ensuring household food security through generating household income, unplanned growing of

eucalyptus was adversely reported as threatening the indigenous forest species and related biodiversity.

The cash crop based farming system seemingly has negative effects on the old age mixed agricultural system (indigenous farming systems) and forest based livelihood activities as well as indigenous natural resource management arrangements of the local community. Moreover, settlement encroachment and intensification of eucalyptus and timber based livelihoods were identified as another principal aspects of land use/cover dynamics. Consequently, the biophysical services of the environment, the socio cultural contributions of the indigenous forest and integrated natural resources of the study area has been reduced. Inconsistently, the chat based agroforestry intensification continued in the study area seemingly has considerable ecological and economic contributions.

Overall, the existing trend in land use/cover change, particularly the ongoing forest degradation is blamed for reducing forest based livelihood activities, crop productivity and food security of the community at large.

6.5 Extents of Forest Cover Change and Indicators of Forest Degradation

What extent of the local forest covers were converted to some other land use/cover types?

The forest cover change (forest degradation) is a spatial and temporal change in forest status. The forest cover change in the study area is detected and analyzed using historical narrations, field observation and satellite image analysis of varying periods. The temporal forest degradation is observed between 1973 and 2006 i.e., divided into three phases. The extent of forest cover of about 268800 ha(15.76%) of the total land use/cover types of 1973 was selected for bench marking the initial forest cover for further analysis of the forest cover status, for example, when we see the forest cover of 2006 it get reduced to about 132800 ha(7.80%). Generally, the forest dynamics was unprecedented that about 136,000 ha (7.96%) forest was lost between 1973 and 2006 (See Table 6.8 and Figure 6.5). In addition, analysis and description of the

pattern of forest cover change is depicted using forest degradation wave model (See Figure 6.7)

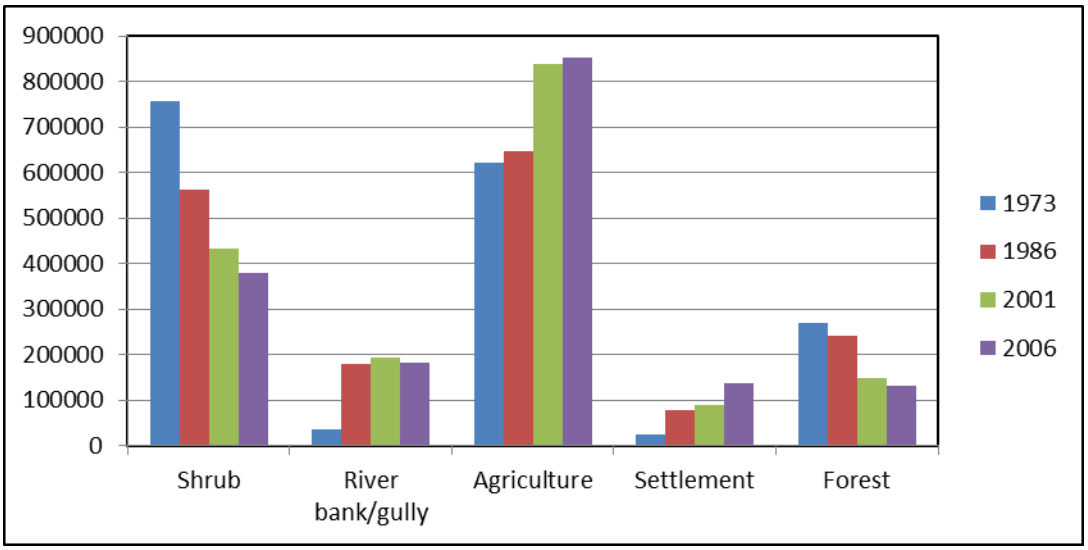
Figure 6. 5: Magnitude of Land Use/ Cover Change Of between 1973 And 2006

year	Shrub	River bank/gully	Agriculture	Settlement	Forest	Class Total
1973	755600	36800	620500	23200	268800	1704900
1986	561600	179100	646800	77200	242000	1704900
2001	434100	192300	839100	90300	149100	1704900
2006	380200	182000	852700	137800	132800	1704900

Source: Satellite Imagery, 1973, 1986, 2001 and 2006

On the basis of land use/cover extent indicated in table 6.8, the following graphic representation of the extent of different land use/cover types of between 1973 and 2006 is set as follow.

Figure 6. 6: Graph Representing the Land/Use Cover of between 1973 and 2006



Source: Satellite Imagery of 1973, 1986, 2001 and 2006

The impact of forest degradation is measured based on the amount of forest land forgone (lost) and negative implication of the newly formed/occurred/ land use/cover type on the rural livelihoods, mainly on forest based and related activities such as:

- Shortage of forest based rural livelihood activities
- Decline in soil fertility and hence decreased in crop productivity
- Reduce forest fodder and decrease in livestock productivity
- Reduce in bio-physical services provided by forest and other natural resources
- Ignorance of the socio-cultural values of forest and other natural resources

Hence, the implication of these has resulted in

- Reduced household income
- Reduced crop productivity
- Reduced livestock productivity
- Reduced supply of timber and non-timber forest products
- Challenge in good governance and sustainable forest management provisions

Overall, the observed effects of forest degradation are summarized as follows

- Household food insecurity and increasing duration of such incidents
- Socio-cultural vulnerabilities
- Environmental vulnerabilities(forest and other natural resource loss)

Most of the time, empirical data shows that the amount of land use/cover change as well as the opportunity cost forgone as the result of change. Likewise, the findings of this study confirm that the decreasing forest cover had effects on forest based income sources and forest based livelihoods of the local communities. The existing empirical data analyzed in (See Table 6.8 and Figure 6.6) confirms the severity of the ongoing forest degradation and forest based livelihoods of the local communities.

Accordingly, the forest area has been decreasing throughout the considerable time periods. Conversely, the amounts of annual average income from forest based activities get increased (from 550 ETB, 1500 ETB, 3000 ETB, and 4500 ETB and to 5000 ETB). Based on the attributes in the table, the chart also shows a smooth coinciding decreasing trend of the local forest coverage, instead of increasing price of forest product sale during the time of observation.

The lower price of forest products before 1973 was due to availability of abundant forest cover and forest product supply. As finding of this study shows, forest degradation has led to the rising prices of forest products due to shortage of forest

product supply. This incident has adversely affected the livelihoods and food security status of the local community, mainly the poor households.

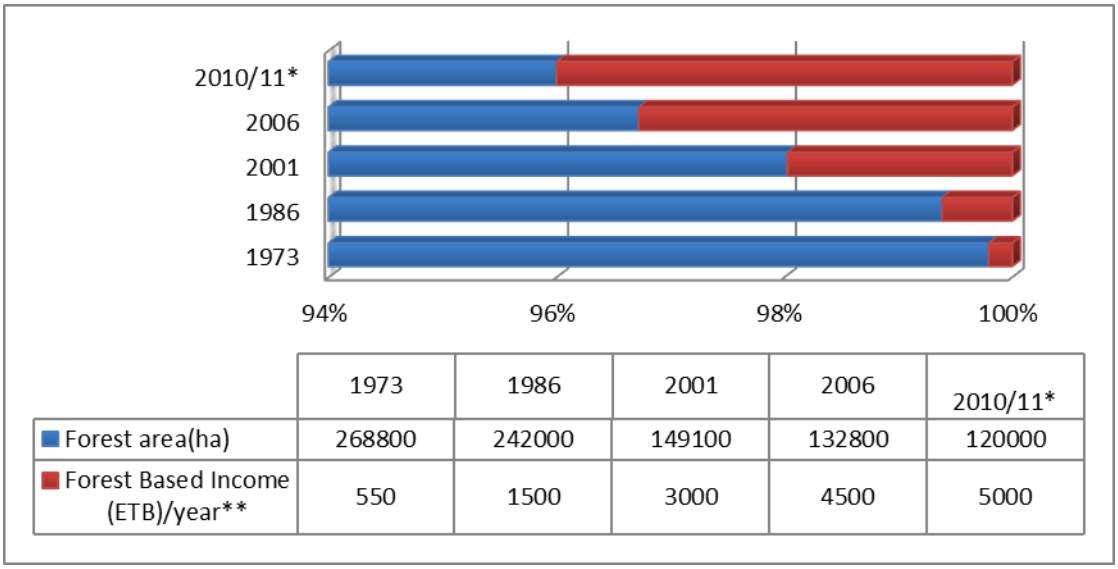
Table 6. 8: Extent of the Forest Cover and the Mean Annual Forest Based HH Income

Year	Forest area(ha)	Forest Based Income (ETB)/year**
1973	268800	550
1986	242000	1500
2001	149100	3000
2006	132800	4500
2010/11*	120000	5000

Source: Field Survey & EWARDO, 2012

*Note: **the forest based income data is obtained through informal discussion with some households still leading their livelihoods from forest product sale.* Secondary data (annual plan Report)*

Figure 6. 7: Graph of Forest Cover and the Mean Annual HH Income



Source: Field Survey & EWARDO, 2012

6.6 Trend of Forest Cover Change and Forest Degradation Wave

As reported by Mark Kinver, science and environment reporter (BBC News, 2013), the study by Ahrends and others researchers showed that the pattern and trend of the

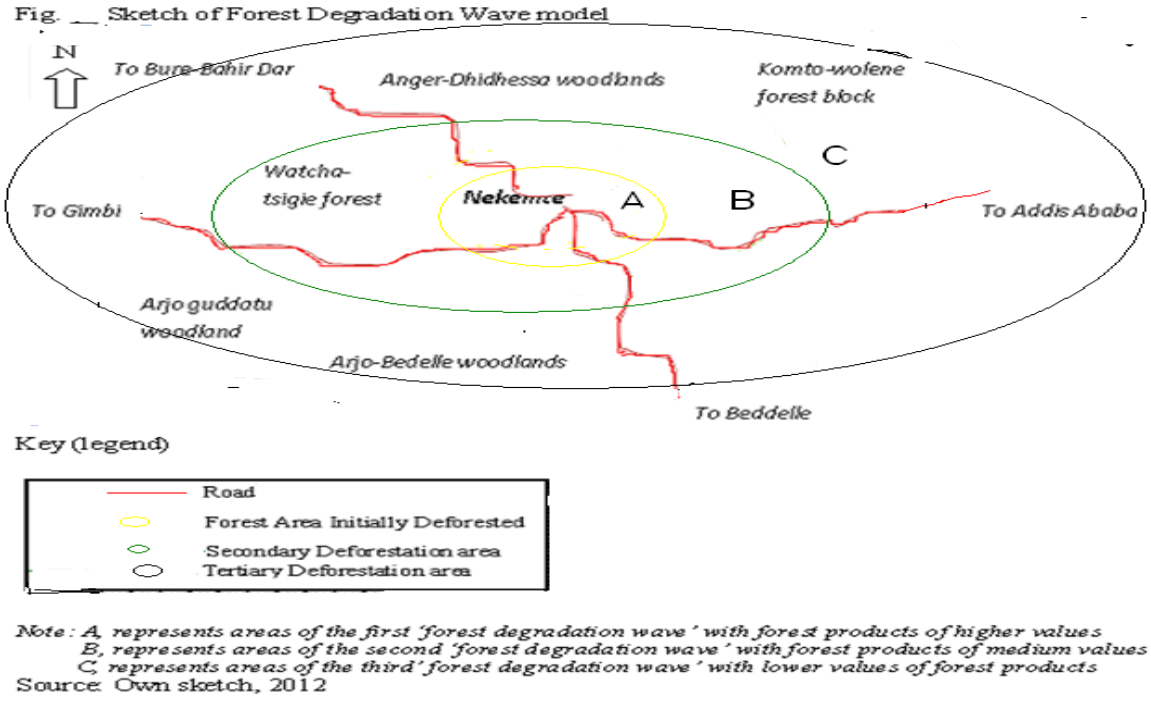
tropical forest degradation is based on 'Forest Degradation Wave' model, derived from an economic theory that provides a general representation to predict patterns of forest tree loss (trend of forest degradation). It translates to a prediction that waves of forest degradation will emanate from major demand centers and expand into nearby forested areas, targeting resources in sequence, starting with those of highest value.

Likewise, the finding of this study also shows the dynamics of land use/cover and the forest status based on the past historical account of the area as well as tiresome transects and field observation. Accordingly, the 'forest degradation wave' model is partially adapted for signifying the current pattern and trend in forest degradation analyzed and rebuilt as contextual model shown by concentric circles(See Figure 6.7)

This partially adopted forest degradation wave model used for identifying the major forest based activities and patterns causing forest degradation exclusively. Hence, in the first wave round(C), the most valuable forest stands are harvested for sale or export, which is followed by the second wave round (B) where secondary growth (forest stands) are thought to be harvested for local constructional uses. The third and final wave (A), involves the local people collecting wood to make charcoal for varieties of uses. This is found to be the most destructive of all the waves because fire wood collectors and charcoal burners would collect everything for short term economic benefits.

Briefly, the degradation of forest seems ongoing first within the immediate surroundings of the town, then as the urban settlement expanded and demand for forest timber products increased, the forest degradation has been expanded alarmingly. This increased demand for forest products and settlement encroachment has created concentric "wave of forest degradation". Consequently, forest based livelihood activities of the local communities with lower standards of living; forest dependent poor people and other the direct stakeholder become adversely affected.

Figure 6. 8: Forest Degradation Wave Model



Note : A, represents areas of the first 'forest degradation wave' with forest products of higher values
B, represents areas of the second 'forest degradation wave' with forest products of medium values
C, represents areas of the third' forest degradation wave' with lower values of forest products
Source: Own sketch, 2012

6.7 Land Use/cover Status and Change in Farming System

According to UNDP (1986), farming system implies the land use system which is elaborated in terms of cropping and livestock rearing patterns. Hence, any change in the farming system is reflected in land use/cover status. Farming system is a collection of distinct functional units of a farm including crops, livestock and operational activities as well as assemblages of farm resources such as land, labour and capital, means of technology used in the production of primary agricultural products (Muluneh, 2003).

Similarly, Change in the farming system seems a common practice and adaptive livelihood strategy of the communities of the study area. Increasing population number was among the major factors enforcing farmers to abandon an indigenous farming system.

Consequently, new adaptation strategies and livelihood options were employed by the local communities. It is known that there are major adaptation strategies employed in farming system and considered in relation to vulnerability and resilience of the community against the shocks. The growing resilience of the community using the new farming practices and all technical aspects together with social and economic issues contributed richly. For example, among the major adaptive strategies in the agricultural systems, Muluneh (2003) reported that the four non-exclusive categories; changes in the farm structure and cropping pattern, changes in the infrastructure and institutional settings, changes in agronomic practices and inputs intensification and changes in farming outputs have brought significant improvement in food security status for West *Gurageland* of Ethiopia.

Similarly, the farming problems such as shortage of land, agronomic and structural farmland conservation practices, termite assault and failure in cropping patterns were found to be the main shocks identified adversely affecting the livelihoods of the communities in the area. So, such adaptive strategies as changes in functional units, neglecting the old age farming systems and cash crop intensification were widely practiced activities of short term profits. Still, some of these strategies seem sufficient for improving the socio economic welfare and the food security status of the communities.

Shortage of land, land degradation and depletion of soil fertility have been the major causes of crop productivity decline, which in turn has aggravated the incidence of food insecurity at both house hold and community levels. According to *obbo Ayyaanaa*[4], forest- based livelihood activities and the cash crop based farming systems were strategic responses to shortage of landholding or small farmland holding size and urban-rural linkage that influenced shift in relative importance of crops to be cultivated. For example, growing of *chat* and eucalyptus tree was the most selected option for generating higher income as majority of the surveyed households agree. Own observation also shows that lands previously under cereal crops were

[4] *Key informants from Gari and Guto-Gida Agricultural Office, Nekemte, April 2012*

changed to eucalyptus lots and *chat* gardens, because of the comparative advantages of income generated by local people from chat and eucalyptus tree sale.

6.7.1 Introduction of '*Chat* and *Chat* Culture'

The population growth and uncontrolled resettlement that took place in the area have caused enormous pressure on the existing natural resources such as forests, woodlands and other resources. The former very fertile croplands become severely degraded and highly fragmented. Following the decline in old age farming systems (mixed agricultural practices), the majority of the local people started to engage on alternative livelihood activities. One of the adaptation strategies of the local community was the introduction of *chat* and its intensive cultivation. Own field observation showed that *Chat* and the prevailing *chat* culture and the increasing demand for chewing chat in and around Naqamte town, seemingly motivated the farmers to convert their former annual crop lands into perennial *chat* plots.

Although, majority of the respondents told that they normally started getting additional income from *chat* sale, the incidence of food insecurity showed no improvement. As reported by some farmers, failure in access to food through own cultivation occurs because of the conversion of crop farms into *chat,* eucalyptus lots and other perennial crops. The study found that the newly introduced livelihood strategies and growing alternative cash crops like chat, sesame, eucalyptus trees were widely adopted by the farmers. On one hand, there was recurrent challenge as to get access to food from own annual crops and livestock productions due to degradation of forest and other natural resources. Anyhow, the adaptation of chat based agroforestry/farming system/ seemed environmentally friendly and income oriented livelihood activity of the local communities.

6.7.2 The Paradox of Chat and its Livelihood and Environmental Advantages

Chat is a cash crop with psychoactive properties whose tender leaves and twigs are chewed for their stimulating effects. The first known reference to *chat* consumption in Ethiopia was in a 14th-century. It is since the turn of the 20th century that the use

of *chat* traditions has expanded within and beyond Harerghe, the area of traditional *chat* consumption (Gebissa, 2008).

Although, cultivation of chat is not appreciated due to its negative effects and side defect on human health, otherwise, chat plant seems environmentally friendly and used as income source supporting the livelihoods of the communities at large.

For example, in the early 1970s, fresh *chat* exports accounted for little more than 5% of Ethiopia's total export returns The foreign exchange earnings from *chat* export gradually reached $32 million in 1975 and $36 million in 1984, and it became the second largest Ethiopian export item after coffee (ECEA, 1991). From September 1999 to August 2000, about 15,684 tons of *chat* was exported and fetched 619 million birr ($72 million). This figure amounts to about 14% of Ethiopia's export earnings and perhaps constitutes the second largest foreign exchange earner for the country and it has become the backbone of our country's economy (Gebbisa, 2008).

Concerning the introduction of chat to the study area, so far there is no written document except some oral appraisals. The existing oral narratives suggest that esteemed local Muslim *Imams* and *she'ikis,* used to grow *chat* near their homestead in and around the fortress of Musilm elders (*masaraa sheyikootaa*). The Muslim faction (*Tijjaniyaa*), follower of *Sheek* Alfakii Ahmad Umer, might be the pioneers in introducing *chat* to the area as stimulant plant used mainly during the month of *Ramadan* to stay longer praying in groups *(duwa'a).*

On the other hand, informal communications with elders showed that the *fuqiraa* and *gariibaa* who were presumably considered among the community as chat addicted groups and those who positively accepted the medicinal and spiritual significances of chat, were assumed to be the first users and growers of *chat* on a piece of garden plots. Anyhow, *chat* has been one of the perennials with higher demand and cash crop for generating both government revenue and house hold income in ensuring food security. In general, most of the surveyed households told they get encouraged to renovate their lands under cereal crops into chat farms as means of livelihood diversification against food insecurity shocks (See Figure 6.8)

Figure 6. 9: Chat and Coffee Production by Inspired Farmer of the Study Area

Photograph: © 2012
Mosisa Ararso.

6.7.3 The Chat Leading Agro-forestry Farming Practice

The ongoing land use/cover change has adversely affected the farming system of the communities in study area. Incidences of soil erosion and gully formations, soil moisture stress, land fragmentations, prevalence of pests and livestock diseases have been the prevalent problems affecting the local community's well-being. The prevailing food insecurity among the surveyed households also appears the serious challenge for the local communities who rely on agriculture to meet their subsistence needs. Adaptation to land use/cover change certainly become the major concern for many farming households. The case study presents the efforts of the local people in ensuring food security through implementation of diverse adaptive strategies.

Own observation confirmed that the *chat* leading agro forestry seems widely perceived as environmentally friendly livelihood alternative adopted by many farmers of the study area to overcome the impacts of forest degradation. Although, it is not a well-established seasonal migration, this farming system has also attracted daily laborers from the neighboring districts working on chat lots and contributed to livelihoods of the local communities.

Box 1: A Case Study of Inspired and Successful Farmer

Obbo Hambisa Guddataa, was a farmer who lives in village of H/fayisa of Sasiga district. He was 55 and has 9 children from his two wives. Having limited farmland size, he was one among the poor farmers who had been living in the area for decades. Due to shortage of farmlands, he decided to work as daily laborer on the then mechanized state farm of maize in Anger Diddessa established during the *Derg* regime.

When the state farm closed up all over the country, *Obbo* Hambisa returned home and began to cultivate his own limited farms using traditional irrigation methods. Soon, he applied to the then farmers' association office, for use right of the existing marginal lands (wetlands, thickets and wood lands) and started new market oriented and environmentally friendly farming system (agro-forestry) in which he become well known locally. During the field survey, I found his home garden and adjacent plots covered with different perennials, such as fruits (avocado, mango, orange, papaya, lemons etc.) grown mixed with tuber crops.

His on-farm trees were used as shade for coffee shrubs and site where to put (hung) traditional beehives. Moreover, he had more than two hectare of land under perennial chat growth mixed with seasonal vegetables. He has been engaged on *chat* production and could able to make it readily available for sale at least twice annually i.e., during the dry season and before the onset of the big summer rain (*rooba gannaa*). The annual income he typically earns from *cha*t sale was about 75, 000 ETB, the amount which has secured his family's food consumption. Moreover, he has become the owner of a car which he rent out as public transport, marketable product storage sheds and houses for shops and similar business activities in Naqamte town.

Generally, this case study enables us to discover how much forest friendly livelihood activities (forest based-livelihood diversification) inherently implemented by the farmers become resilient agricultural practice (farming system) in ensuring household food security and sustainability of forest resource uses (See Figure 6.9)

Figure 6. 10: Chat Plot at Backyard of a Farmer in the Study Area

Photograph: © 2012
Mesisa Ararso.

6.8 Forest Uses and Incidences of Forest Degradation

It is known that forest resource provides the rural communities with diverse uses. Among the uses of forests, the biomass energy has become worth mentioning as it is the major energy source in Ethiopia. Traditional biomass sources (wood crop residues and cattle dung) supply 94 percent of the total energy requirement of the country. Yet, the use of the biomass is unplanned and uncontrolled as its demand exceeds its supply that contributes to the degradation of natural resources.

Woody vegetation contributes greatly to the local economy as well. The fuel wood industry is worth approximately the USD 420 million a year. On the other hand, the non-wood products, prominent among which is 'wild' coffee, are traded locally and internationally. More than 480 species of wild trees, shrubs and herbs have been recorded as important forest-food sources and medicinal plants vital for local food and health security for humans as well as for livestock traditional veterinary services (Edwards, 2010).

Even though evidences available so far suggests the local people and individual's management of forests and wood lands could be appraised of being effective, on the contrary, several studies reportedly show forest resources, woodland and bush lands

in the country are found to be degraded and abused at a very alarming rate that calls immediate and effective management interventions. According to Edwards (2010), around 140 thousand hectares of forest is lost each year or an average of 1.0 to 1.5 percent per year since 1990. Nevertheless, the recently enacted environmental laws seemingly give more attentions to the economic significances of the resources. For example, Mellese (2008) has criticized the Wildlife Development and Conservation Authority Establishment Proclamation No 575/2008(preamble) by highlighting its exceptional consideration for economic advantage rather than the socio-cultural and environmental services. That means wildlife is conserved for the sake of economic benefits.

Again, the participatory forest management approach in use by Oromia Forest and Wildlife Enterprise was accredited as sustainable forest governance working for development, protection and sustainable utilization of forests in the region. However, studies by Ombudsman (2013) and other civic societies show that OFWE has been applying forest management objective of economic connotations as priority area. This forest management attempt seems a proximate cause for occurrence forest resource use conflicts among the local communities, direct and indirect forest users and institutional stakeholders thereby undermined the ecological services of the forest resources of the study area.

On the other hand, the optimum growth of forest and other natural resources of the area is found highly affected due to human induced factors like expansion of farmland, over harvesting of forest products i.e., indicators of ongoing severe forest degradation adversely impacting the livelihoods of the communities and ecological services of the study area .

6.8.1 Forest Fire its Effect

Forest fires have caused untold damages to both natural and plantation forests and woodland vegetation, particularly during dry seasons. In Ethiopia, forest fire occurs frequently in lowlands where temperature remains higher throughout the year. Until the present time, the rural community living in marginal areas around woodlands and

the remaining forest patches set fire to forestlands for 'shifting cultivation' practices. Moreover, due to the widespread charcoal making, wild honey collection, illegal wood cutters sometimes set fires inside and around forest areas which is seemingly identified as the major causes of forest fire and forest degradation.

Consequently, more than 500 hectares of woodlands and *Arundnaria* forests found within watershed of the Angar-Dhiddessa valley destroyed due to forest fire incidents. Usually, fire is used for clearing fallowed lands and crop residue and straw left on farm plots before the onset of the big summer rains. The traditional agricultural calendar recognizes preparation for farm plots using fire, the process of land preparation for farming using fire *(gubaa*) and the forest and wood land attacked by the forest fires a cleared and burned farm plot *(gubaalessa*).

Before sometimes 30 to 40 years back the local farmers used to practice traditional shifting cultivation (*cir-gubii*), the agricultural system similar to *chitemene* (meaning to cut) commonly practiced by Bemba people of Luapula province of Zambia. Personal communication with community elders in 2012 showed that farmers in the study area used to clear forests, woodlands and undergrowth then they burn the dry materials. This process is perceived among the local community as customary soil management practice and increase in crop yields for quite shorter times of between 3 to 5 years.

Moreover, there is an old age perception among the local people, regarding the indigenous practice of burning of woodlands and thicket on seasonal basis. This is a special occasion perceived by the local community as customary practice undertaken so as to get high-quality growth of pasture, access to extra plots and control weed growth. Forest fire is the main incident affecting the bio diversity of the area. Many animal and plant species of diverse values have been depleted and many cultural and spiritual ceremonies related to indigenous forest were also neglected.

Generally, forest fire is identified as the seasonal incident which affects the growth of varieties of plants and vegetation there by causing the stream flow variability and soil water stress. The most severe problem occurred due to forest fires is the loss of

habitat and migration of wildlife, illegal settlements and the expansion of farm for cultivation of such crops as sesame and Niger seed for generating income used for supporting many households' attain the optimum food security level (Figure 6.10)

Figure 6. 11: Slash and Burn (Cir-gubii), Means of Encroachment towards Forest Areas

Source: Field Survey, 2012

Fire wood collection, charcoal making and logging indigenous forest trees were identified as the major forest based (off farm) income generating livelihood activities of the local communities. On the other hand, same livelihood activities were found to be the major driving forces of forest degradation and loss of bio diversity.

6.8.2 Fuel wood and other Sources of Fuel Energy

According to (EEA, 1989), Ethiopia's energy resources are principally obtained from biomass, hydro, wind, solar energy, geothermal and fossil fuel. Energy from bio-mass comes mostly from wood, cattle dung and agricultural residues, comprising more than 94% of the total energy demand of the country. Biomass energy is predominantly used for domestic and commercial cooking. The proportion of cattle dung and agricultural crop residues in the total biomass supply has increased over the past several decades due to diminishing access to wood for fuel by the rural households.

In fact, the principal energy resources of the country are given in brief data summary (table 6.10) Woody biomass is the most principal energy resource used in the country followed by crop residues and hydropower, accounting for about 111%, 16% and 2.4% respectively. On the other hand, winds, solar energy, geothermal, natural gas,

coal and oil shale contribute insignificant amounts to the existing higher energy demand.

But, the huge potential energy sources in the country, some times in the future could be able to reduce the high proportion of use in woody biomass, crop residue and cattle dung. Therefore, through alternative energy uses, one can also think of the reforestation and rehabilitation of the former forest and integrated resources. The wise use of crop residue and dung applications as input for farming activities leads to further increment of crop productivity, which plays a significant role in ensuring food security at both household and community levels.

Table 6. 9: National Potential and Annual Energy Exploitation in the year 2008

Source	Unit	Potential	Annual Exploitation	Exploited amount (%)
Woody biomass	Million tones/year	45	50	111
Crop residue and Cattle dung	Million tones/year	51	8	16
Hydropower	GWH(Giga Watt hour)	159,300	3,600	2.4
Wind	GWH	100,000	0.10-0.20	0.0
Solar	GWH/m^2 day(Kilo Watt hour)	5.5-6.5	10GWh	0.0
Geothermal	(Gwhe) Giga watt hour electricity	3000(22,000)	0.0	0.0
Natural gas	TCF(trillion cubic feet)	4.0	0.0	0.0
Coal	Million tones	199.0	0.0	0.0
Oil Shale	Million tones	168.2	0.0	0.0

Source: Sue Edwards (2010) (ed.) Ethiopian Environmental Review, No.1, 2010 Forum for Environment Addis Ababa, Ethiopia.

Note: Woody biomass stock and the yield data is from (MoARD, 2002& 2005) wind resource estimate is for the wind speed of 7.5m/s and at 50MW/KM2, and exploited energy is estimated for about 100 deep well wind pumps; solar energy use is based on 6MW installed capacity; geothermal resource is based on 700MWe and 5000MW total capacity at 50% plant factor

It is observed that fuel wood was a significant source of domestic energy in the study area. Unsustainable fuel woods and other forest product uses, however, have led to severe forest degradation. The use of firewood and charcoal in both rural and urban households and commercial and social/community service delivery institutes (hotels, local brewery houses and the local coffee posts, university, hospitals, hostage administration posts, etc.) get increased frighteningly.

The exclusive utilization of fire wood for generating heat and preparing food is identified as a big problem threatening the overall forest status and the communities' welfare. Discussions with elders showed that before four decades, forest and woody biomass were plentiful. Indeed, this plentiful existence of firewood in the past has been narrated through customary sayings as: "*qoraan ibidaan daaraa tau'u, ollaan wal hindhowatu*", which is literally translated as "firewood which is not more than a waste of ash, is used for free and shared among the neighbors merely".

Since the past four decades, however, firewood supplies get reduced and became one of the scarcer resources. Therefore, it is worthless to expect the past generosity in persistence, while people are worrying and explaining their worries by sayings like *"muka saree ittiin offirra ittisnu dhabaa jirra"* that is literally mean "It a challenge to get even a stick to protect oneself from wild beast attack and for elders support" Therefore, reversing the dreadful trend in forest degradation needs massive tasks and participatory forest management and watershed development initiatives working at the local level.

6.8.3 Customary Utilizations of Fuel Woods

One of the indicators commonly used for assessing environmental degradation is the availability of fuel wood in a community (Alemneh, 1990). As to my understanding, shortage of forest timber for domestic fuel energy is one of the indicators of forest degradation. It is known that shortage of fire wood requires much more labor and time for collecting from marginal areas far away from homesteads of the local communities. So far, in the study area, no socio- cultural ethics backings measurement of weight of woods consumed and its documentation. Therefore, it was difficult to get the daily and annual amounts of fuel wood consumed by the respondents.

In order to solve this problem, some selected households were consulted to give estimations of weight of bundles of wood packed for carriage by male *(ba'aa gatiittii and duroo)* and by male (*ba'aa- dugdaa),* and by donkeys and other beasts of burden *(fe'umsa)*. In addition, emphasis was also given to the size and weight of bundle of

wood depending on the species of trees collected for fuel wood, whether it is dry or wet, sex and age of a person carrying the bundles of woods, an attempt is made to standardize the weight of a bundle of fuel wood in terms of kilograms. This is done by taking some samples from each means of transportation used for hauling a bundle of fuel wood and then weighing it. Accordingly, the average weight of a bundle of fuel wood per adult woman, man and donkey was estimated to be 8kg, 10kg and 15kg respectively. This is how the weighing of a bundle of fuel wood and average household consumption of a bundle of fuel wood was roughly fixed.

6.8.4 The Per Capita Wood Consumption

It is renowned that there is shortage of reliable data on forest based livelihood activities and their impacts on forest resource status throughout the country. Adequate information and data regarding the location, area, stock, annual incremental yield and deforestation rate as well as per capita wood consumption are missing. Only, data generated through observations and transects as well as interview and discussion with different stakeholders show that the existing forest and integrated resources get reduced in species composition as well as area coverage since the past three to four decades.

For example, the extent of natural forest cover at the country level was more than 15 million hectares in 1950s, but in 1990's the amount was reduced to 2.5 or 3.0 million hectares. One of the causes of the forest cover change was the ever increasing demands of forest products that arise from different forest use stakeholders. Moreover, the per capita wood consumption shows that the country's total demand for wood and wood products in 1992 was 47.5 million m^3. From the total amount, about 45 million m^3 (94.7 %) was for fuel wood consumption. The actual consumption during the same period was estimated to be within the range of between 13.8 and 47.5 million $m^{3.}$ According to EPA (2003), set a statistical report that the demand for forest products continues to increase to about 95 million m^3 by the year 2014

In order to avert the problem of forest degradation and associated eco-systems and undo the consequent social and economic disruptions, countrywide tree planting

activities and demarcation of forest reserve areas have been implemented. In connection to this, the demarcation and inventorying of 58 natural forest priority areas totalling 4.78 million hectare can be mentioned. However, attempts of the government and the public could not bring sustainable forest growth and watershed development as well as progress in forest based rural livelihoods of the communities.

There were different factors discouraging the growth of forest and integrated natural resources in the study area. The increasing population pressure and consequent settlement and farm expansions, the mounting demand for fuel wood, construction and industrial wood, forest fires, low public awareness, pervasive poverty and failure to demarcate and protect the boundaries of forests were the major factors affecting the existing forests and other natural resources.

6.8.4.1 Fuel Wood and Domestic Consumption Rate

Based on informant interview result, own observation, and the overall findings of the current study the timber forest products, mainly, fire wood was large. Hence, daily domestic consumption of firewood by each household of the study area was estimated to be about 10 to 15 kilograms. This can be further calculated to get annual fuel wood consumption per household per year (12.5kgx30x365= 136875kg). With this assumption, about 25048125kg of fuel wood is locally consumed by the sample households annually.

It seems that the amount of fuel wood consumption may be escalated attributed to shortages in supply of alternative fuel energies like dung, crop residues, charcoals and electric power. In order to overcome the existing shortage of firewood, most households often collect fire wood from OFWE's forest concession areas, i.e., Komto-Watcha, Cirri and Tsigie forest blocks. Hence, this increasing trend of demand and amounts of fuel wood use by the local communities seems aggravating factor for the loss of forests in the study area, unless the proper management is implemented sooner (Figure 6.3)

Figure 6. 12: Interview with Respondents on Amount Fuel Wood Consumption

Photograph: © 2012
Mesisa Ararso.

6.8.4.2 Charcoal Making

For making charcoal, members of the community collect wooded raw materials usually from the community and state forests illegally. Currently, however, forest tree species of higher values essential for charcoal production already degraded and become scarce which was a bad fate for poor charcoal sellers of the community members. Own observation and communication with the key informants confirms the reduction in availability of the forest timber and non-timber products and indigenous tree species such as *Dabaqqaa* (*Terminalia laxiflora), Ambabessa* (*Albizia gummifera) Lafto* (*Acacia lahai) etc*. has fastened the depletion of forest other natural resources (soil fertility, availability of water resources etc.)

Never the less, most of the community members continued engaging on charcoal making as one of their livelihoods options. It is confirmed that almost all the surveyed households have site where they prepare charcoal (*boolla kasalaa*) at the back yard of their home. It seems that charcoal making in such traditional way could be one of the reasons for the abuse of the forest resources in the area (Figure 6.12)

Figure 6. 13: Traditional Charcoal Making Sites

Source: Field Survey, 2012

6.8.4.3 Carrying Local Forest Product for Sale

The survey of forest products out from the surrounding forest areas was conducted at temporary entry near Kumsa Moroda Palace (Naqamte town) for four consecutive days. The aim of this survey was to make educated guess regarding the magnitude of fuel wood and other forest timber product inflow rate, labor and means of transportation used, market trend and estimate of the revenue obtained from sale of known forest timber products of the area.

In addition, analysis of forest product marketing is believed to create awareness on economic values of the local forest resources and forest degradation cost. An effort was made to regulate the mean weight of each wood product load/haulage/observation at a time and estimation of the local market price of each product (See Table 6.11 & 6.12)

Table 6. 10: Average Load per Day per Carrier Type

Forest products(timber)	Wood Products (Load/ haulage/day)									
	Man/woman				Ave.	Donkey/ horse				Ave.
	1	2	3	4		1	2	3	4	
fire wood	75	32	26	90	55.7	14	8	6	18	11.5
Charcoal	60	28	26	80	48.5	10	8	6	12	9
*Xarbii(*Lumber)	12	4	4	20	10	5	1	2	8	4
Kanchii (medium pole)	12	4	4	14	8.5	-	-	-	-	-
maagara (smaller poles)	24	14	20	28	21.5	5	1	-	4	3.33
Ciraaroo(twig)	38	26	12	40	29	6	4	3	8	5.25

Source: Field Survey, 2012

Note: Means of haulage and the time of observation were purposively arranged based on the local community's' perceptions.(means of haulage was limited to only humans and locally available beast of burden thinking that they could only give such services beyond 10km radius. -*Kanchii (*medium-sized pole) used for house construction -*Ciraaroo(*twig*)*used as fuel wood. 1-4: No of days of observation and data collection 3rd and 4th days of observation were market days)

As shown in table 6.11, about 56 and 12 bundles of firewood of varying weights were hauled to the town by means of man/woman and donkey/horse respectively. The average number of packs of charcoal and bundles of *Kanchii* (medium sized poles) hauled to the town by means of man/woman and donkey/horse were 49 and 9; 10 and 4 respectively. The amounts of *kanchii and maagara* hauled to the town relatively were smaller in amount attributed to their bulky nature.

Different forest products were identified and estimated value was established according to the key informant's perception for each product. Accordingly, the daily and annual packs of charcoal estimated at prices of about 3180 and 1144800 ETB were some of forest based income generated from the study area. Selling charcoal and poles were the most important forest based livelihood income followed by firewood with daily and annual amount of 2030 and 730800 ETB respectively. Concerning the revenue generated from the sale of timber products, the purchasing power of the local people was considered and then the average market price of each product was estimated based on information gathered from the local people.

Table 6. 11: Average Load Per Day by the Inhabitants and Income Generated

No.	Load type	Min	Max	Mean	Income generated from sale of wood products (load type)	
					Daily(ETB)	Annual(ETB)
1	Fuel wood	26	90	58	2030	730800
2	Charcoal	26	80	53	3180	1144800
3	*Xarbii(construction pole)*	4	20	12	2400	864000
4	*Kanchii*	4	14	9	405	145800
5	smaller poles *(maagara)*	14	28	21	1050	378000
6	*Ciraaroo(twig)*	12	40	26	650	234000
Total		**14.33**	**45.33**	**29.83**	**9715**	**3497400**

Source: Field Survey, 2012

Note: the price of each timber product is put as follows:

- *A sack of charcoal weighing 30 kg had a local market price of 60 ETB ; A bundle of about 1 m^3 of fuel wood= 35 ETB*

- A bundle containing 8 thinner poles (maagara) of about 10 cm diameter and5m height = 50 ETB ; A bundle of twigs=25 ETB

- A Kanchii(diameter 20 to 25 cm and greater than 10 meter high)=45ETB ; A Xarbii(2.5m height and 30 cm width= 200 ETB

- (1 USD was equivalent to about 18.04 ETB); A bundle of fuel wood was equivalent to about 12.5 kg.

CHPTER SEVEN: THE ECONOMIC ACTIVITIES AND LIVELIHOODS OF THE COMMUNITIES

7.1 Economic Activities

The communities in the study area have been engaged on different economic activities including the forest based activities as one of the main sources of income for their livelihoods. The local forests and other natural resources have been supporting the livelihoods of the communities in diverse ways in ensuring household food security.

7.2 The Major Livelihoods of the Communities

The main livelihoods of the communities include crop production, livestock rearing forest based and other off-farm livelihood activities. In fact, agriculture was the dominant livelihood activity in ensuring food security at community and household levels at the time of this study. The finding of this study showed that about 55.7% of the respondents were engaged on subsistence agriculture followed by handcraft activities which accounted for about 25.1% of the total livelihood activities of the surveyed households. Petty trades and other off farm activities comprised of about 9.8% and 7.7% respectively. On the other hand, labour sale comprised only 1.6% of the total livelihoods of the communities. This is because of the temporary and unreliable nature of the jobs done by daily labourers and its lower accessibility.

Furthermore, the livelihood contrast of the gandalee showed that 66.7%, 62.5% and 60% of the surveyed households in Gari, Kitessa and Tokkumma-tsigie were predominantly engaged on agriculture respectively. On the other hand, about 45% and 27% the surveyed households in Haro-fayisa and Tokkuma-tsigie reportedly engaged on handcrafts (mainly wood works). About 13% and 6% from Tokkuma tigie and Kitessa said they engaged on petty trade activities respectively (See Table 7.1)

In general, own observation showed that almost all sample gandalee were found actively involved in hand crafts, especially, in wood works and petty trades i.e.,

selling of charcoal, firewood, construction woods, chat and some livestock and agricultural products.

Table 7. 1: Respondents According to their Main Livelihood Activities

Site	Livelihood Activities									
	Agriculture		Daily labour		Handicraft		Petty trade		Other	
	No	%	No	%	No	%	No	%	No	%
DK	17	58.6	3	10.3	4	13.8	3	10.3	2	6.9
GR	20	66.7	0	0	4	13.3	3	10.0	3	10.0
HF	11	35.5	0	0	14	45.2	4	12.9	2	6.5
JR	16	51.6	0	0	8	25.8	2	6.5	5	16.1
KI	20	62.5	0	0	8	25.0	2	6.3	2	6.3
TS	18	60.0	0	0	8	26.7	4	13.3	0	0
Total	102	55.7	3	1.6	46	25.1	18	9.8	14	7.7

Source: Field Survey, 2012

Own communication with key informants also showed that the communities in the study area engage on small scale crop production and livestock rearing for domestic purposes as well as for sale. The cultivation of cereals like *teff*, maize and sorghum has been the common crops that require extensive farms. But, shortage of land was the major factor hindering extensive cultivation and diversifications of crops.

Then the local communities were forced to engage in alternative forest based livelihood activities like chat and eucalyptus tree growing for sale. In addition, Forest- based hand crafts and other off-farm activities were also found to be the main income sources for majority of the surveyed households (See Table 7.1) Yet, the increasing engagement on forest based hand crafts by majority of households, especially in the two *gandalee*, could be considered as one of the factors aggravating degradation of forest resource in the study area.

7.3 Forest Based Livelihoods and other off- Farm Activities

Diverse forest-based and off- farm livelihood activities have been in use for ensuring food security at household and community levels. As far as the study area is concerned, the existing forest uses could be divided into two.

The first forest use groups were those directly engaged in unprocessed forest product sale while the second user groups engaged in forest based small scale micro

enterprises. Specifically, more than half of the respondents were reportedly engaged on forest- based activities for ensuring their own food security status while about 16% of the respondents said they were daily laborers. Again, the remaining 14% and 12% respondents said they were engaged in petty trade and other off- farm activities respectively (See Table 7.2). As per the finding of this study, forest based livelihood and other off farm activities play significant role in ensuring food security and well-being of the local communities. It is also identified that forests and other natural resources in the study area have been contributing the local communities with diversities of products and services

Table 7. 2: Households and Different Off-farm Livelihood Activities

Site	Off farm Livelihood Activities							
	Forest based		**petty trade**		**Daily labor**		**Other off- farm activities**	
	No	%	No	%	No	%	No	%
DK	11	37.9	8	27.6	5	17.2	5	17.2
GR	18	60.0	1	3.3	5	16.7	6	20.0
HF	15	48.4	4	12.9	8	25.8	4	12.9
JR	25	80.6	2	6.5	3	9.7	1	3.2
KI	20	62.5	6	18.8	3	9.4	3	9.4
TS	17	56.7	5	16.7	5	16.7	3	10.0
Total	**106**	**57.9**	**26**	**14.2**	**29**	**15.8**	**22**	**12.0**

Source: Field Survey, 2012

On the other hand, it was observed that the forest resources were highly depleted, which in turn has impacted forest related natural resources of the study area (see the satellite image of 1973, 1986, 2001 and 2006 and the detected changes (See Table 6.8 and Figure 6.5)

7.4 Narration of Komto-Wacha-Tsigie Forest

According to Yonas Yemishaw (2002), the National Forest Priority Areas (NFPAs), invariably, are under extreme pressure from settlement, land-use conversion for farming and grazing, excessive extraction, and neglect in terms of forest management and protection. As narrated by the local elders and key informants, Komto-wacha-Tsigie forest was different from plantation forests owned by the state elsewhere. The

forest comprised indigenous trees and plant species and diverse wildlife inhabiting in the forest.

As one of my key informants told me, sometimes before four decades the forest compartments were owned privately by the then landlords. The local communities had limited rights of using forest products for they had no access right in the past. Then, with forest tenure change, increasing population growth, settlement encroachments and urban expansion, increasing demand for forest products and forest based livelihood activities, the indigenous forests and other natural resources declined gradually. Most of the forest lands were used for shifting cultivation (ciraa) i.e. for production of cereal crops such as maize and sorghum. Moreover, the forests were also used for beekeeping and as a source for collecting forest edible fruits for the local people as well as animal fodder. Beyond the non-timber values of the indigenous forests, the local people have been enjoying timber products for making various agricultural tools, household furniture and construction purposes. The forest use intensification has caused depletion of the potential supplies and services of the local forest.

Figure 7. 1: Interview with Key Informant from Guto-gida

Source: Field Survey, 2012

7.5 Landholding and Farming System

The farming system in Ethiopia can be classified into three major types. They are small holding, pastoral nomadic and modern large scale commercial farming (FCACC, 2003). Farmland holding systems and sizes of private farmland has never been constant throughout different regimes that governed the country. For example,

in 1976/77, 1983/84, 1997/98 and 2002, the average private landholding reported were about 1.5, 1.3, 1.1 and 1.02 hectares respectively at country level. But, currently, the holding size is reduced to between 0.5 to 2.5 hectares. Again, the average landholding size of about 0.38 hectare was reported by 11% of the households living in the highland areas of the country (Muluneh Weldetsadik, 1994; Beyene Dolicho, 1998).

The finding pertaining to the landholding condition showed that about in the study area showed about 67 % of the surveyed households had certified farmland of their own. Then, about 21% and13% were households who sharecroppers and others, and those who had on farmland at all, respectively (See Table 7.5). Concerning the landholding size, almost half of the respondents (47%) of the total households reportedly said they had farmland sizes of between 0.06 and 0.5 hectares i.e., small holding size. Again, about 28% and 15% of the respondents said they had farmlands of between 0.6 - 1.0 hectares (medium holding size) and 0-0.05 hectares (no land, or small holding size). Only less than ten percent of the respondents told they had over 1.0 hectares of farmland of their own. On the other hand, about 20 % and 13% of the respondents said they had no land of their own and sharecroppers respectively (See Table 7.4).

Table 7. 3: Landholding and Farming System

Site	Response on Landholding (usufruct right) and Farming System					
	Yes		No		Share cropping & others	
	No	%	No	%	No	%
DK	19	65.5	3	10.3	7	24.1
GR	24	80.0	3	10.0	3	10.0
HF	17	54.8	6	19.4	8	25.8
JR	21	67.7	3	9.7	7	22.6
KI	24	75.0	3	9.4	5	15.6
TS	17	56.7	5	16.7	8	26.7
Total	**122**	**66.7**	**23**	**12.6**	**38**	**20.8**

Source: Field Survey, 2012

Informal discussion with elders in 2012 also showed that three fourth of the communities in the study area had farmland size of between 1 and 2 hectares. Slightly more than 10% of the households had farmland size of greater than 2 hectares. The

elders told that the remaining 5% of the community members had no farmland so, they temporarily engaged on farming through share cropping (*qixxee*) and similar customary arrangements. Hence, shortage of land and small holding size and farm fragmentation seems the underlying causes for forest degradation and unsustainable livelihoods of the local community.

Table 7. 4: Proportion of the Respondents by Landholding Size

Site	Landholding size							
	0 - 0.05 ha (no land or almost no land)		0.06 - 0.5 ha (small)		0.6 - 1.0 ha (medium)		> 1.0 ha (large)	
	No	%	No	%	No	%	No	%
DK	4	13.8	15	51.7	6	20.7	4	13.8
GR	6	20.0	9	30.0	10	33.3	5	16.7
HF	5	16.1	13	41.9	10	32.3	3	9.7
JR	3	9.7	16	51.6	9	29.0	3	9.7
KI	4	12.5	18	56.3	8	25.0	2	6.3
TS	6	20.0	15	50.0	9	30.0	0	0
Total	**28**	**15.3**	**86**	**47.0**	**52**	**28.4**	**17**	**9.3**

Source: Field Survey, 2012

It is known that there could be different perceptions on the farm landholding size which depends on different factors that are usually taken into consideration, agricultural production systems and productivity evaluations. Although, the farmers' perception of landholding status is sensitive issue and hardly reliable, the information collected based on perceptions of the surveyed households supplemented the existing literature regards to the landholding conditions of the study area.

Accordingly, participants were asked to give their responses on status of their farmlands. Then, bout 55 % of the respondents reported the size of their farmland has "decreased". About 36% and 9% of the respondents told their farmland size showed "no change" and "increased" respectively. Reasonably, it seems that the livelihoods and food security conditions of the communities get reduce corresponding to ever decreasing farm size i.e., shortage of farmlands.

The existing perception shows, that the extent of landholding of each farm household has been steadily reduced due to increasing population pressure. Consequently, the community forests and the surrounding woodlands remain the primary alternative

land use available for subsistence farms and intensifications of cash crops such as *chat* and eucalyptus tree.

Table 7. 5: Respondents' Perception on Landholding Size

Site	Perception on landholding size						Total
	Decreased		No change		increased		
	No	%	No	%	No	%	No
DK	21	72.4	4	13.8	4	13.8	29
GR	11	36.7	17	56.7	2	6.7	30
HF	21	67.7	7	22.6	3	9.7	31
JR	18	58.1	10	32.3	3	9.7	31
KI	16	50.0	12	37.5	4	12.5	32
TS	14	46.7	15	50.0	1	3.3	30
Total	**101**	**55.2**	**65**	**35.5**	**17**	**9.3**	**183**

Source: Field Survey, 2012

7.6 Land size and Perceived Scale of Forest Degradation

In the past, land was plenty and the local farmers used to cultivate and grow different crops on more than five hectares. But, with increasing number of population, the size of land owned by each household get reduced and fragmented which in turn has been one of the driving forces of land use/cover change.

As the correlation between landholding and perceived scale of forest degradation specified in table 7.7 shows, about 92% the respondents who had landholding size of less than 0.05 hectare reportedly said forest degradation ranges from medium to very high. About 92% and 90% of the respondents who had landholding sizes of between 0.06 and 0.5hactares; and 0.6 and1.0 hectares respectively, told that forest degradation ranges from medium to very high. Again, 94% of the respondents who had land size of greater than 1.0 hectares reportedly said forest degradation in the study area ranges from medium to very high scale. Generally, about 92% of the total respondents told that the scale of forest degradation ranges from medium to very high.

Table 7. 6: Landholding Size and Perceived Scale of Forest Degradation

Response	Holding size (<0.05ha)	Holding size (0.06-0.5 ha)	Holding size (0.6-1.0 ha)	Holding size of > 1.0 ha	Total
Very high	8	35	13	1	57
high	14	31	25	6	76
medium	4	13	9	9	35
Low/no	2	7	5	1	15
Total	**28**	**86**	**52**	**17**	**183**

Source: Field Survey, 2012

Furthermore, the chi-square test yields a test statistic of $\chi 2 = 20.092$ with degrees of freedom $df = 9$ and a p-value ($p = 0.017$). This finding showed that household's perception of the scale of forest degradation is significantly depends upon the size of landholding owned by the respondents. Households with no or smaller landholding size reportedly said the scale of forest degradation was high or very high. This implies that there is a difference in awareness on level of forest degradation between households who owned larger landholding size and those with smaller holdings sizes. The finding shows that those households with smaller landholding size or no farmlands had better awareness on the forest status, since they had direct access to forest resource use as a primary livelihood option. Mostly, households who had shortage of farmland seemingly had detailed perceptions on the ongoing forest degradation and its impacts on forest based livelihood activities and household food security.

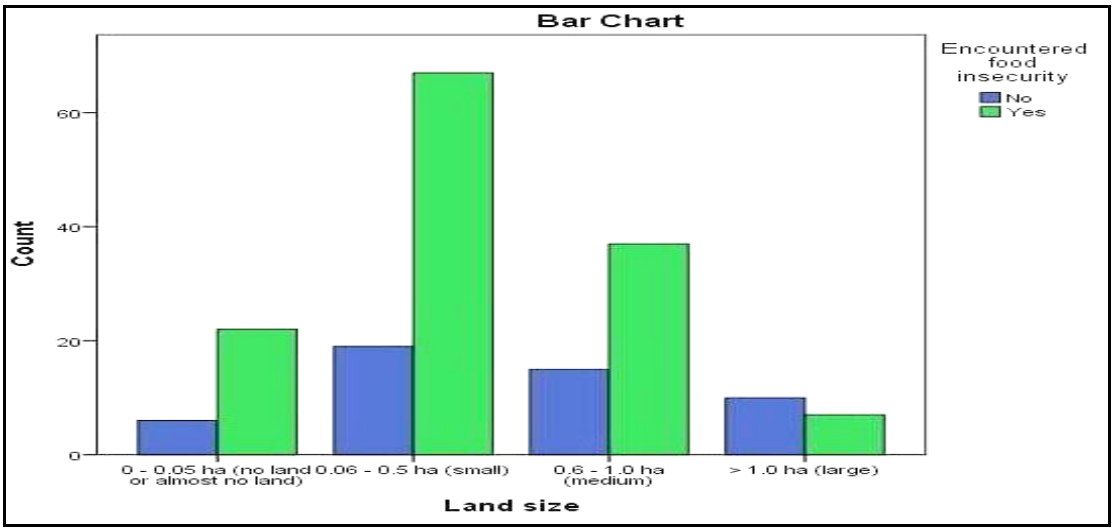
7.7 Landholding and Food Security Status of the Surveyed Households

The relationship between tenure of farmland, mainly of the size of cultivated land plays a vital role in amount of crop yield to be obtained as identified through field survey. The correlation of landholding sizes and household food security status was made based on opinion question pertaining to household exposure to food security problems.

Accordingly, households who had landholding size of less than 1 hectare reportedly said they were food insecure for most of the months in a year. On the other hand, respondents who had landholding size of greater than 1 hectare reportedly said they faced no food insecurity exposures year round (See Figure 7.1).

Overall, it can be concluded that landholding size owned by the local communities seems directly related with food security status of households and the rate of dependency on forest resource as a resilient option against food insecurity conditions. In this case, households with smaller landholding size were found to be extremely dependent on existing forest resources than households with larger landholding size.

Figure 7. 2: Graph showing correlation of Landholding Size and Food Security



7.8 Availability of Forest Fodder and Food Security

It is known that availability of grazing areas and improved livestock feeding methods has significant contributions for the improvement of livestock productivity. As informal discussions with the local elders showed, the livestock productivity and food security status of the surveyed households are highly correlated. Likewise, the relationship between sources of livestock feeds and food security is identified using chi square test statistics.

In order to identify whether livestock feeding method is dependent on household's food security status, computation was carried out and the test yields a test statistic of χ

2 = 13.711 with degrees of freedom df = 3 and a p-value (p = 0.003). Therefore, it may be possible to suggest that the grazing land use (availability of livestock fodder and feeding methods) depend on the household's food security status. Hence, we can conclude that food secure households have at least diverse livestock feeding methods as well as they had their own plots reserved for grazing purpose, while households of food insecurity face shortage of grazing lands. Many households were poor and do not rear livestock that can support their livelihoods and food insecurity status.

Based on opinion of the respondents, the existing households were classified into as food secured and food insecure. As table 7.7 shows, the surveyed households used different livestock feeding methods. For example, out the food secured households, 29.8% were reportedly said they frequently used open access forests as primary livestock feeding method. About 86.4% of food secure households told that they frequently used cut and carry feeding method. Likewise, the largest percentage of food insecure households (70.2%) reportedly said they frequently used open access forests as primary livestock feeding method, while smaller proportions of food insecure households told that they frequently used cut and carry method.

In general, almost half of the surveyed households reportedly said they frequently used open access forests as primary livestock feeding method, while equal proportions (12%) of the surveyed households told that they frequently used cut and carry, and other livestock feeding methods. It may be possible to suggest that food secure households tend to use cut and carry and other feeding methods. This observation shows that most of food insecure households tend to use open grazing communal plots and open access forests as primary option and vice versa.

Table 7. 7: Perception of Respondents on Livestock Feeding Methods and Food Security Status

Food security status	Cut and carry method	Open grazing communal plots	Open access forests	Other feeding method
Food secure HH	19(86.4%)	7(15.6%)	28(29.8%)	12(54.5%)
Food insecure HH	3(13.6%)	38(84.4%)	66(70.2%)	10(45.5%)
Total	**22(12.0%)**	**45(24.6%)**	**94(51.4%)**	**22(12.0%)**

Source: Field Survey, 2012

7.9 Crop Production and Factors Affecting Crop Productivity

Crop production includes the annual and perennial crops of different varieties cultivated for subsistence and marketing. In this study, more consideration is given to the subsistence annual crops. There are many factors affecting crop productivity of a given area over extended periods. The factors could be classified into two groups of physical and human induced ones. The respondents in FGD stated the major physical factors affecting crop productivity is change in climatic conditions.

Own observation of the study area confirms human induced land use and land cover change was also a significant factor that has reduced crop productivity. Furthermore, the causes for crop productivity decline were identified based on communities' perceptions and indigenous knowledge. In detail, the respondents were asked about the status of crop productivity and hence about 61% of the respondents reported crop productivity has been decreased.

Table 7. 8: Respondents and their Perceptions on Crop Productivity Status

Site	Perception on crop yield						Total
	Declined		Almost constant		Increased		
	No	%	No	%	No	%	No
DK	23	79.3	4	13.8	2	6.9	29
GR	16	53.3	10	33.3	4	13.3	30
HF	21	67.7	7	22.6	3	9.7	31
JR	18	58.1	7	22.6	6	19.4	31
KI	18	56.3	9	28.1	5	15.6	32
TS	15	50.0	14	46.7	1	3.3	30
Total	111	60.7	51	27.9	21	11.5	183

Source: Field Survey, 2012

Physical and human activities have contributed to reduced crop productivity of a given area either directly or indirectly. In addition, rugged and undulated topography coupled with high rainfall, and different agents of erosion and poor conservation and management practices of forest and other resources have reduced soil fertility and agricultural productivity. There are several factors affecting the agricultural productivity. Forest degradation, however, was the major causes of crop productivity decline as perceived by 45.42% of the surveyed households. The remaining 22 %, 21% and12% of the respondents attributed to shortage of agricultural inputs, soil fertility decline and change in climatic condition, respectively (See Table7.9)

Table 7. 9: Factors Affecting Crop Productivity as Perceived by the Respondents

Site	Causes of Crop Yield Decline								Total
	Change in climate conditions		shortage of agricultural inputs		forest degradation		Soil fertility decline		
	No	%	No	%	No	%	No	%	No
DK	4	13.8	9	31.0	4	13.8	12	41.4	29
GR	3	10.0	7	23.3	17	56.7	3	10.0	30
HF	3	9.7	10	32.3	18	58.1	0	0	31
JR	2	6.5	5	16.1	19	61.3	5	16.1	31
KI	7	21.9	5	15.6	9	28.1	11	34.4	32
TS	2	6.7	5	16.7	16	53.3	7	23.3	30
Total	21	11.5	41	22.4	83	45.4	38	20.8	183

Source: Field Survey, 2012

Own communication with elders showed that the farmers' had varying preference of land use to possess for crop production based on soil fertility conditions. Similarly, this study also found that more than half of the surveyed households (59.6%) opted for forest and woodlands as the primary land use type they preferred to hold. About 22% of the respondents reportedly said they preferred to hold wetlands and strips of land along river banks to other land use types. On the other hand, 18.6% of the respondents told they preferred to hold other land use types of miscellaneous values. Forests in the study area have been used more by the landless poor people. It is honest to recognize the forests in the study area as the last destine of forest degradation wave. Hence, the increasing demand for forest land use seems to have accelerated the rate of forest degradation.

Table 7. 10: Respondents According to Land uses Preference

Site	Land Use Preference						Total
	Forest and woodlands		Wetlands and flood plains		Other types of land uses		
	No	%	No	%	No	%	No
DK	17	58.6	8	27.6	4	13.8	29
GR	15	50.0	9	30.0	6	20.0	30
HF	17	54.8	6	19.4	8	25.8	31
JR	20	64.5	4	12.9	7	22.6	31
KI	23	71.9	7	21.9	2	6.2	32
TS	17	56.7	6	20.0	7	23.3	30
Total	109	59.6	40	21.9	34	18.6	183

Source: Field Survey, 2012

7.9.1 Crop Production and Landholding Conditions

Crop production is characterized by small scale holding subsistence agriculture of just a hectare of farmland and limited use of fertilizers, pesticides, improved seeds and implements. Moreover, heavily dependence of agricultural activities on rain is another essential feature of smallholding peasant farm in the study area. Most of the farmlands were infertile due to forest degradation and termite invasion.

Similarly, the annual plan implementation report by EWARDO (2011/12) shows an estimate of crop yields for the main cereals at 12.5 quintals per hectare i.e., lower than the yields the farmers used to harvest from the same plot, sometime before four decades when forests and vegetation cover were plenty and farms were fertile.

On the other hand, field observation shows that various crops were cultivated in different agro-ecological parts of the study area to solve the declining crops due to declining soil fertility. Currently, almost half of the respondents said they normally cultivated cash crops like chat, coffee and sesame. A quarter of the respondents opted for cereal crops like wheat, teff, maize etc. The remaining 18% and 6% of the respondents told that they often cultivated fruits and vegetables; and tubers and root crops respectively (See table 7.11)

Still, there is cross variation among the gandalee in types of major crops produced due to variation in agro-ecological situation and individual preference of types of crops based on the market condition. For example, the existing documents shows that more than half of the total crops cultivated in Jirenya Haro fayisa, and Gaarii were cash crops such as chat and coffee, and other supplementary crops like sugarcane production for income generation.

Table 7. 11: Respondents and Types of Crop They Prefer for Production

Site	commonly produced crop types								Total
	Cash crops		Cereal crops		Fruits and vegetables		Tubers & root crops		
	No	%	No	%	No	%	No	%	No
DK	14	48.3	10	34.5	3	10.3	2	6.9	29
GR	12	40.0	10	33.3	7	23.3	1	3.3	30
HF	16	51.6	4	12.9	5	16.1	6	19.4	31
JR	19	61.3	5	16.1	5	16.1	2	6.5	31
KI	12	37.5	15	46.9	5	15.6	0	0.0	32
TS	16	53.3	6	20.0	8	26.7	0	0.0	30
Total	89	48.6	50	27.3	33	18.0	11	6.0	183

Source: Field Survey, 2012

7.9.2 The Major Subsistence Crops

Table 7.12 shows the trend in area of land allocated each year for cultivation of different crops has remained increasing at the expense of woodlands and other marginal areas. For example, sesame cultivation was the primary area of income for majority of the surveyed households. Existing data shows an increasing demand for woodlands and marginal areas for sesame production each year. The area of land allocated for sesame production in the year 2006 was about 4311 hectare which has increased to about 6703 hectare by the year 2010, i.e. about 2.8% increment of sesame plot within five successive years.

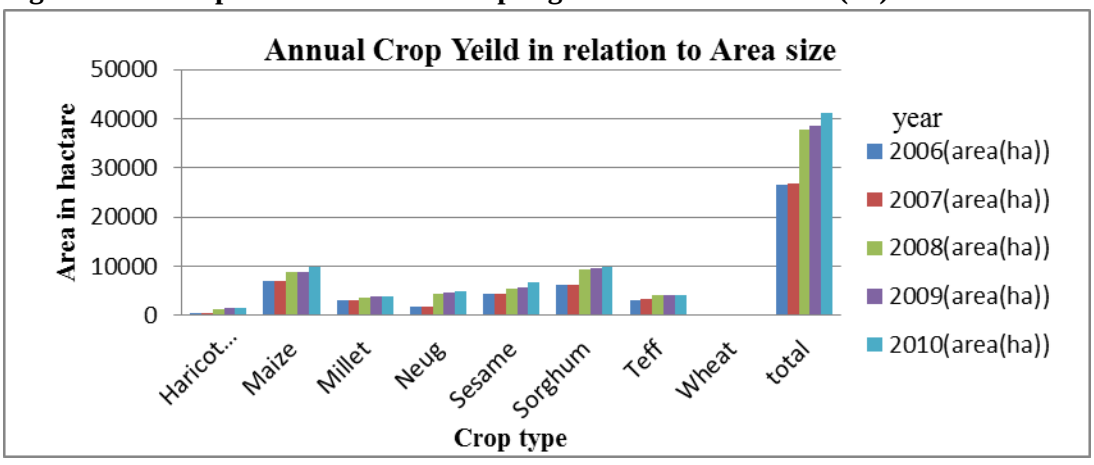
Table 7. 12: Major Crops from Farmers' Holdings and Crop Yields

Crop Type	year									
	2006		2007		2008		2009		2010	
	Area (ha)	Yield (Qut.)	Area (ha)	Yield (Qut.)	Area (ha)	Yield (Qut.)	Area (ha)	Yield (Qut.)	Area (ha)	Yield (Qut.)
Maize	7006	229237	7132	178200	8867	361744	8950	372745	9997	373893
Sorghum	6166	181897	6270	125400	9499	338277	9689	348288	9880	348875
Teff	3153	18629	3257	16285	4076	23678	4174	23775	4135	23589
Millet	3225	24983	3183	28647	3731	24885	3833	24595	3859	27518
Sesame	4311	26513	4450	13350	5498	25366	5605	27369	6703	29352
Neug	1765	11473	1881	5643	4508	18032	4617	18134	4814	18134
Haricot	514	4112	504	4032	1408	11308	1488	11319	1493	11386
Wheat	326	4268	280	6160	290	5260	356	5365	369	5421
Total	**26466**	**501112**	**26957**	**377717**	**37877**	**808550**	**38712**	**831590**	**41250**	**838168**

Source: ARDO (Guto-gida), 2012

More briefly, Figure 7.3 illustrates the increasing annual crop yield corresponding to the increasing holding size of the farmlands put under cultivation form 2006 to 2010. So, farm expansion for cultivation of selected cash crops seems one of the causes for the increasing incidents of forest and other resources degradation in the study area.

Figure 7. 3: Comparison of Annual Crops against Area Cultivated (ha)



Source: ARDO (Guto-gida), 2012

7.10 Dynamics of Customary Farm System and Adaptation Strategies

According to UNDP (1986), the land use system is elaborated by components of agricultural activities of cropping and livestock patterns are the result of farming system. A farming system could be reflected in the landscape of a given area, i.e., the land use/cover pattern of a given area is the consequence of the farming system and other human induced factors. Most of the time change in the farming system arises from population pressure and shortage of land and some other drivers like market demand and individual preference to cultivate certain crops deserve mention.

Thus, change in the farming system could be taken as one of the different adaptation strategies used by the local people in sustaining their livelihoods. For example, (Muluneh, 2003) identified the main ways of farming system adaptation to the population pressure in West Gurageland in four non- exclusive categories; change in farm structure and cropping pattern, change in infrastructural and institutional setting, change in agronomic practices and input intensification, and change in outputs. Likewise, as per the study by Yared Amare (2000), farmers in food deficient regions of Ethiopia use a broad ranges of livelihood activities such as decisions on cropping patterns, sale of cash crops and livestock, involvement on daily labour activities or off-farm income generation activities and social support arrangements.

Observations conducted in different parts of the study area also showed the existence of diversified livelihood options apart from the customary farming system. Explicitly, the respondents were asked a question why change in the farming system was observed frequently in the study area. Their answers to the question were different. Out of the total respondents, about 64% said that the main reason for change in farming system was shortage of agricultural inputs and about 33% reportedly said, preference for cash crops was the major reason for change in farm system. The remaining 35% and 21% of the respondents reportedly described the main reasons of change was declining soil fertility status and the problem of termite invasion respectively (See Table 7.13).

Table 7. 13: Perception of Respondents Regarding Change in Farming System

Site	Reason for change in customary farming practices								Total
	Preference for cash crops		Shortage of agricultural inputs		Soil fertility decline		Problem of termite invasion		
	No.	%	No.	%	No.	%	No.	%	No.
DK	16	55.2	3	10.3	7	24.1	3	10.3	29
GR	9	30	4	13.3	9	30	8	26.7	30
HF	9	29	1	3.2	16	51.6	5	16.1	31
JR	11	35.5	2	6.5	9	29	9	29.0	31
KI	11	34.4	0	0	12	37.5	9	28.1	32
TS	15	50	0	0	11	36.7	4	13.3	30
Total	71	38.8	10	5.5	64	35	38	20.8	183

Source: Field survey, 2012

7.11 Livestock Production and Grazing Condition

In the study area, properly classified land use based on the above requirements and limitations was not practically implemented. So, this is constraining livestock and grazing land use conditions.

More than half of the respondents reportedly said they use fodder from forest and about a quarter of the respondents reported that they use open communal grazing areas. Again, 12% of the respondents reported they used other livestock feeding options. On the other hand, 12% of the respondents had no livestock, so they do not use the existing livestock grazing methods.

In general, it is observed that forest resources provide fodder and watering site for the livestock which has direct contribution in ensuring food security of the survey households as well as the local communities.

Table 7. 14: Distribution of Households According to their Preference for Grazing Methods

Site	Livestock grazing methods								Total
	Have no livestock to bother		Open communal grazing areas		fodder from forest		other alternatives		
	no.	%	no.	%	no.	%	no.	%	no.
DK	4	13.8	0	0.0	21	72.4	4	13.8	29
GR	6	20.0	4	13.3	15	50.0	5	16.7	30
HF	6	19.4	13	41.9	11	35.5	1	3.2	31
JR	3	9.7	13	41.9	12	38.7	3	9.7	31
KI	2	6.2	15	46.9	9	28.1	6	18.8	32
TS	1	3.3	0	0.0	26	86.7	3	10.0	30
Total	22	12.0	45	24.6	94	51.4	22	12.0	183

Source: Field Survey, 2012

The number of livestock in Ethiopia is estimated at 75 million, which enable the country ranked first in Africa (CSA, 2003). Moreover, the existing estimates show that the livestock production contributes some 30% of the agricultural sector and about 14% of the total GDP. From the total livestock, the cattle population of the country was about 41,527,142(CSA, 2002), which was next to poultry. Larger numbers of cattle was documented and become one of the causes of overgrazing and forest degradation in the study area.

According to table 7.15, out of the total household heads, about 64% of the respondents had the total number of livestock that ranges between 1 and 10 and about one-fourth of the respondents responded that they owned a number of livestock greater than ten. Again the remaining 12% of the respondents reported that they had no livestock.

Table 7. 15: Distribution of Households According to Number of Livestock Owned

Site	No. livestock owned						Total
	No livestock		1 - 10 livestock		> 10 livestock		
	no.	%	no.	%	no.	%	no.
DK	4	13	15	51.7	10	34.5	29
GR	6	20	19	63.3	5	16.7	30
HF	6	19	22	71.0	3	9.7	31
JR	2	6	18	58.1	11	35.5	31
KI	2	6	21	65.6	9	28.1	32
TS	1	3	22	73.3	7	23.3	30
Total	**21**	**11.5**	**117**	**63.9**	**45**	**24.6**	**183**

Source: Field Survey, 2012

The livestock sector contributes significantly towards ensuring food security, especially for richer households possessing different livestock products for income generation. As narrated by the local elders, livestock resources have been used to support household's food security all year rounds. But currently, number and livestock productivity (cattle productivity in view of amount of milk and milk product supply) has decreased ever than before.

Regarding income generation from livestock (cattle and sheep and goats) sale, more than one- third of the respondents reportedly said they could have generated more and between 1000 and 5000 ETB annually from livestock sale. Again, almost a quarter of the total respondents said they obtained annual income of less than 500 ETB from livestock sale. Not more than, 13% of the respondents reportedly obtained more than 5000 ETB annually.

Income generated from livestock resources has direct relations with existing forest and integrated resource, while considering these resources as sources of fodder supply contributing to livestock productivity.

Table 7. 16: Distribution of Households According to their Income from Livestock Sale

Site	Average income from livestock sales							
	< 500 ETB		500 - 1000 ETB		1000 - 5000 ETB		> 5000 ETB	
	No	%	No	%	No	%	No	%
DK	11	37.9	6	20.7	5	17.2	7	24.1
GR	12	40.0	6	20.0	5	16.7	7	23.3
HF	14	45.2	13	41.9	3	9.7	1	3.2
JR	4	12.9	17	54.8	7	22.6	3	9.7
KI	3	9.4	20	62.5	6	18.8	3	9.4
TS	1	3.3	18	60.0	8	26.7	3	10.0
Total	**45**	**24.6**	**80**	**43.7**	**34**	**18.6**	**24**	**13.1**

Source: Field Survey, 2012

CHAPTER EIGHT: ANALYSIS OF FOREST USES AND Misuses

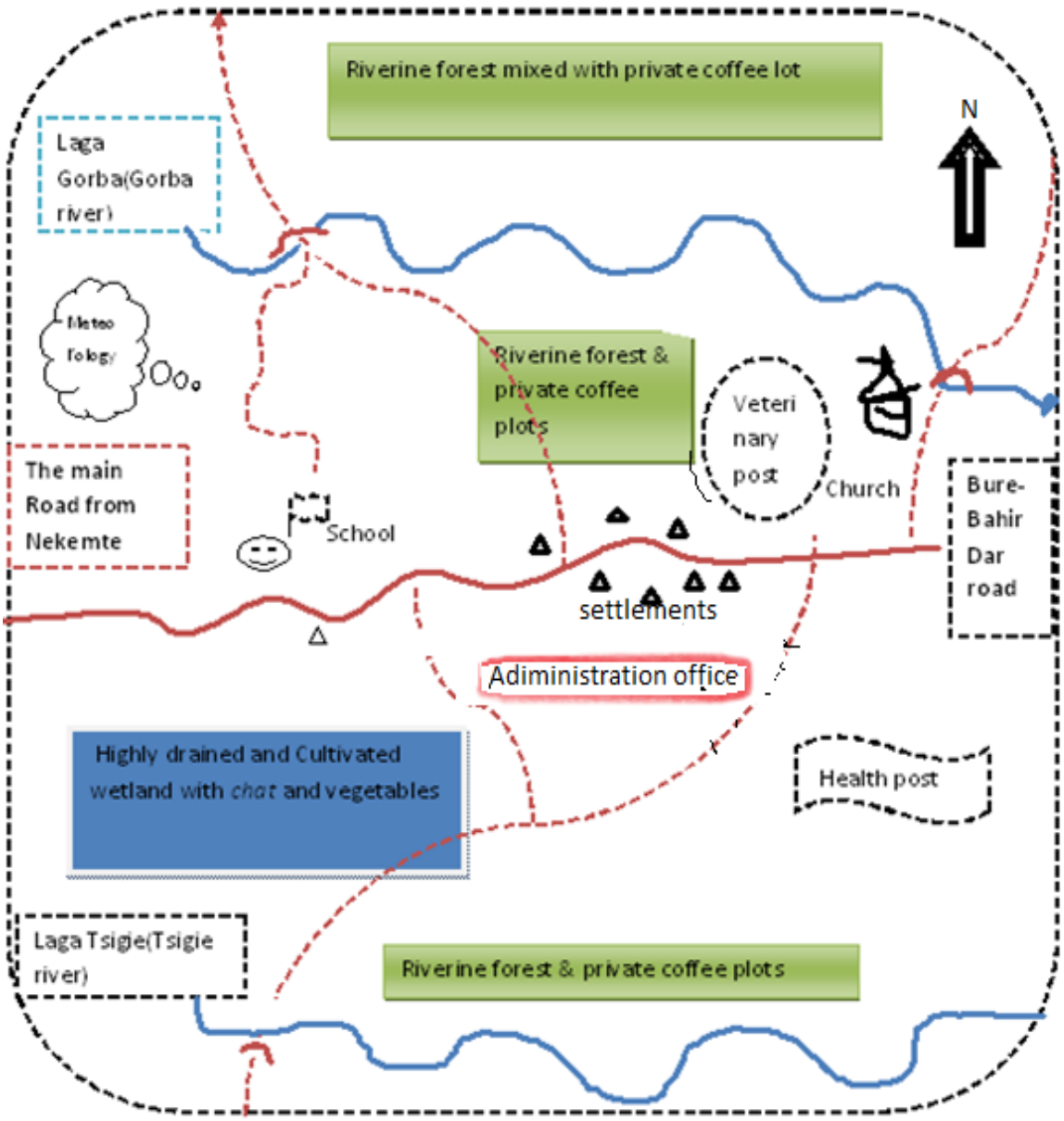
8.1 PRA Sessions and Exercises for Analysis of Forest Uses and Misuses

Participatory rural appraisal was materialized as participatory tool of learning in the late 1980s. It is people oriented and field based participatory approach which is a continuum of rapid rural appraisal. As a development tool, it goes beyond committing the people in appraising and evaluating their problems, it extends into analysis, planning and action. (Narayanasmy, 2009)

For this study, the first round PRA sessions was conducted in March, 2012 at Tsige village of Sasiga district in which 15 team members (9 male & 5 Female) deployed to involve in the sessions. The practical exercise began with preparation of the resource map. Generalized steps were used for drawing the maps. Firstly, the detailed discussions on the available resources of the area so as to generate the background information for the making of the resource map. Secondly, form the team, one person was selected for drawing a map on a flip chart. Then, the final resource map was prepared and readily available for guiding the overall investigation of the causes and impacts of forest and other natural resource degradation.

A resource map of a sample village from the study area was mainly drawn to present information on farmlands, land and soil types, cropping patterns, land and water management, productivity, watershed, degraded lands and forests etc. (See Figure 8.1)

Figure 8. 1: Resource Map of the Tokumma-tsige, 2012



Source: Field Survey, 2012

In order to prepare the resource map of the study area, field survey was conducted to select the two *gandaalee* and their *gooxii (sub ganda administration)* purposively. Then the team did the drawing of the map consciously (See Figure 8.2)

Figure 8. 2: PRA Team Preparing the Resource Map of Tokuma-tsige

Source: Field Survey, 2012

8.2 Community Wealth Ranking Exercise

Classification of households into different wealth groups was established by the team after discussion on the issue for setting conventional ranking criteria. Accordingly, PRA sessions were conducted in Gari and Haro-fayisa). In Gari, the participants agreed and classified the entire communities into four wealth categories; rich, medium, poor and very poor. On the other hand, the entire households in Haro-fayisa were classified into three wealth categories; the rich, medium and the poor (See Table 8.1)

The wealth ranking exercise conducted in the two sample *gandalee* showed differences in wealth and standard of living among the studied households. For example, the finding shows that in Haro-fayisa the rich households comprised about 10 % of the total households. The remaining households were medium, poor and very poor that comprise of about, 30%, 45% and 15% of the total households respectively. On the other hand, the wealth ranking status of *ganada* Garii confirms that about 18% of the households were rich. The remaining 50% and 32% were medium and poor households respectively.

Table 8. 1: Wealth Ranking of the Surveyed Households and the Ranking Criteria

Gandalee	Wealth Categories	Criteria for categorization	Proportion	
			No. house holds	%
Gari **(Total house hold 837)**	Rich	-more than pair of oxen and more than 5 cows - more than ten sheep and goats - equines - house roof with corrugated iron sheets(80 sheets and above) - more than half hectares of eucalyptus wood lots - sale no fire wood and charcoal - Food secure all year round	87	10.4
	Medium	-Single ox and less than 5 cows -less than 5 sheep and goats -house roof with iron sheet(less than 60 sheets) -one equine or no any - About 0.25 ha. eucalyptus wood lot - food secure for about six months in a year -sale fire wood and charcoal some times	250	29.9
	poor	-single or no oxen and cows -one or two sheep and goats -no equines -no eucalyptus lot -house thatched with grasses/small iron roofed house (20 to 30 sheets) - sale fire wood and charcoal regularly -food secure only for 3 months	375	44.8
	Very poor	-No oxen and cow any livestock - house with grass thatched roof - regularly sale fire wood and charcoal - 0-0.125 ha. land(often sharecropper)	125	14.9
Haro-fayisa **Total household (457)**	Rich	more than pair of oxen and more than 10 cows - more than ten sheep and goats - equines - house roof with corrugated iron sheets(80 sheets and above) - more than half hectares of chat and coffee - Food secure all year round	85	18.6
	medium	Single ox and less than 10 cows -less than 5 sheep and goats -house roof with iron sheet -one equine or no any - About 0.25 ha. chat or coffee lot - food secure for about nine months in a year -sale fire wood and charcoal rarely	227	49.7
	poor	-single ox and 1 or 2 cows -less than5 sheep and goats -no equines - at least chat at back yard garden -house thatched with grasses - sale fire wood and charcoal some times -food secure for 3-5 months	145	31.7

Source: Field Survey, 2012

In general, this study found that more than three- fourth of the households in both *gandalee* were of medium, poor and very poor when count up together. This implies that the proportion of households engaged on forest based activities (fire wood sale, charcoal making and other forest products) remains higher and become one of the threatening factors for the remaining forest resources of the area.

8.3 Transects

Transects are observatory walks or treks across the countryside and fields to study natural resources, topography, indigenous technology, soils and vegetation, farming practices, problems and the opportunities that are cross-tailed with resource mapping and modeling. It is a systematic walk taken along with a few key informants through a particular area with a purpose (Narayanasamy, 2009). A walk through a rural communities also brings into focus household and economic activities, such as livestock grazing management, crop cultivation, rural forest- based and hand crafts and it also throws up a number of aspects of rural livelihoods that would probably otherwise go unnoticed.

Resource transects include different types and there were also different procedures tracked for conducting the transect survey. The major types of transect include; straight transects, zigzag transects, looping transect (single and multiple loop), *Nullah* transects, and sweeping transects, village and cultural transects (Narayanasamy, 2009)

Accordingly, the transect route, number of transects, the type of transect and the time of transect were identified further on and then awareness on the purpose of the transect exercises was given for the PRA team. Then, the type of transect, i.e., *Nullah* was selected due to manageable size of the participants required for conducting transect. Concerning the PRA team members, three key informants from each *gandaa* Gari and Haro-fayisa(a key informant from Agricultural development Agent (DA), manager of the *gandaa* (*dura bu'aa gandaa*), one person from the elders) were selected for the exercise.

During transect walks; check lists were used to collect data and information concerning the rural forest based livelihoods and the forest resource status and resource management and livelihood options used by the communities. Moreover, a variety of 'chance encounters', woodcutters, firewood collectors, charcoal makers, shepherds, landless laborers, farmers were consulted concerning the problems of forest degradation and its impacts on the livelihoods of the communities.

Then, the participants used checklist(See Table 8.2) to drew the transect map based upon opportunity identification matrices, that was used as reference to identify the major natural resources, the land use types, natural resource problems (forest and other resource degradation), resilient strategies implemented by the communities to avert the limitations.

Table 8. 2: Checklist Used for the Transects

No.	Variables	Points along the transect(References)	
		Ganda Gari	Ganda Haro-fayisa
1	Slope	Chalalaqi stream(A)	Kumsa Moroda Abode
2	Ownership	Gari rural administration office(B)	Laku river bridge
3	Forest tree species	Gamachu(C)	Haro fola hamlet
4	Wildlife	Laku swamp(D)	Haro fola Elementery school
5	Livestock	Hadya river(E)	Somiriga sub *ganda*
6	Stream and river	Traditional Qaalluu institution (*Masara Qaalluu*)(F)	Plantation forest compartment
7	Crops standing		*Chat* plots
8	Soil conditions	Highly degraded and gully formations	Rural administration office
9	Forest based activities	Only recently planted seedling	Haro-fola, Jirenya and Kitessa
10	Indigenous forest status	Shortage of indigenous forest tree species	In all the sample *gandalee*
11	Conservation strategies	Recently constructed terracing and some watershed structural works(check dams)	In all *gandalee* of the study area.

Source: Field Survey, 2012

8.3.1 Transects and Field Survey (Direct Observation and Recall Method)

Transects and observations were used to explain the spatial dimension of people's reality and they are effective ways to collect data related to rural life and development. The focus of transect is cross sectional view of the different ago-ecological zones and provides comparative assessment of the complex interaction of man and his environment, natural resource and their management activities(Mascarenhas,1992;Kumar,2003; Narayanasamy,2009).

Table 8. 3: Transects: Analysis of level of Severity of Forest Degradation and Related Issues

Checklist data/information/	Level of severity	Checklist data/information/	Level of severity
Cutting forest trees and deforestation	3	Illegal settlements	1
Agricultural expansion	1	Land fragmentation &shortage of farmland	3
Overgrazing	2	Shortage of off- farm activities and unemployment	3
Natural forest fire	1	Declining soil fertility and termite invasion	3
Urban sprawl	2	Declining crop productivity	3
Fire wood collection	3	Household food insecurity	3
Charcoal making	3	Increasing demand for wood and wood products	3
Non timber forest product collections	1	Increasing forest based or wood product based micro-enterprises	3
Infrastructural developments	1	Lack of integrations among stakeholders managing forests	2
Unsustainable rural agricultural farm investment programs	1	Impact of failure in indigenous natural resource management practices	2

Source: Field Survey, 2012

Note: Just after each transect, the team was asked to evaluate the human activities (causes) and impacts of forest degradation using level of severity (cause/impact of forest degradation: 0= none; 1= slight; 2= higher; 3= severe) and the transect evaluation of the two *gandalee* was summarized in one table.

Similarly, the finding of the transect conducted in the study area also focused on cross section observation and assessment of complex interactions forest based activities, forest degradation and its impacts and forest and other natural resource management activities. For this purpose, a checklist of inquiries was used to collect data encountered during the field survey (See Table 8.3)

Different causes and impacts of forest degradation were identified and evaluated using the rating scale through transects and field observations. The state of forest and other resources and associated problems of the study area were identified and evaluated with rating scale ranging from "none (0)" to "severe (3)". Unfortunately, there was no variable/factor/of zero scale. This means the variables identified were factors directly or indirectly causing forest degradation, otherwise impacts of forest degradation were found threatening the livelihoods of the communities.

The causes of forest degradation as identified during transect were; cutting forest trees and degradation, firewood collection, charcoal making, increased number of forest based micro enterprises (timber based livelihood activities and wood works). Moreover, factors such as declining soil fertility and termite invasions, declining crop productivity, land fragmentation & shortage of farm land and house hold food insecurity were also identified as both indicators as well as impacts of forest degradation.

The PRA exercise was conducted by participants from development agents (6) of the sample *gandalee*, district agricultural offices (3) and forest user groups (10). Thus, direct and indirect stakeholders were identified as agents of forest degradation, after the uses and the abuse of the forest resources prioritization was done. The findings showed problems of forest concession owned by Oromia forest and wildlife enterprise and management strategies of disappointing forest products sales and income share of the local community from the direct sale of forest products.

8.4.1 Transects Survey of the Local Forest Status and Land use/cover Change

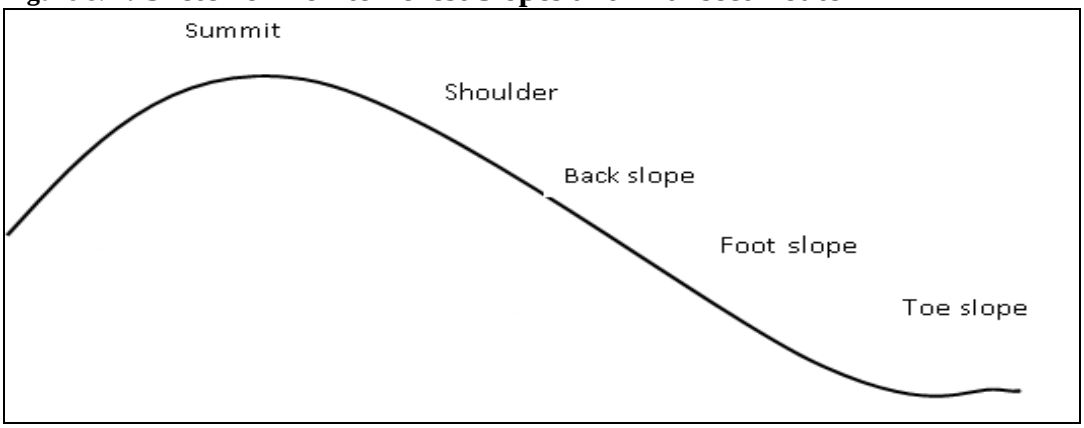
Land use/cover study was carried along identified transect route in January, 2008 by the then research team of Oromia Forest and wildlife enterprise in order to collect baseline information. Correspondingly, in 2012, land use/cover survey was conducted along the same transect route (See figure 8.3). Concurrently, some individual farmers were interviewed concerning their management of private fields and community forests and integrated natural resources. To develop better understanding on the apparent contradiction, the existing land use/cover was comparatively analyzed using historical narrations. Accordingly, greater variation in land use/cover condition was documented due to increasing population pressure on the existing forest and other resources of the study area.

Figure 8. 3: Photographic View of Komto Forest in 2008 and 2012

Source: photo 1 ©OFWE, 2008 & Photo© Mosisa Ararso, 2012

Note: 1.Cultivated 2.Fallow 3.Grazing 4 forests 5. Woodlands and tickets 6.on farm trees 7.Swamp 8.Bush and shrubs 9. Non-cultivatable; the red track lines depicted on the photographs represent rough sketches of transect paths

Figure 8. 4: Sketch of Komto Forest Slopes and Transect Route



Source: Field Survey, 2012

The transect walks of 2008 and 2012 were conducted in the same month and following same path. The result of transect shows a marked difference in the land-use types observed in 2008 and 2012. It seems that the most prominent land use/cover changes were due to conversion of swamps, wetlands and forests into other land cover types i.e., plantation of *chat*, fruits and vegetables. For example, in 2008 wetlands constituted more than 5 % of the total land use types, but by the year 2012 there was no such land cover type identified along the transect path. None of the former wetlands and the surrounding forest areas sustained, but changed to *chat* and coffee plots vastly.

Again, the result of transect shows that the eucalyptus woodlot increased by more than double in area cover. Such land use change has resulted in significant increase in wood fuel availability and income generation for most of the surveyed households on one hand and negative consequences on soil fertility and availability of streams and river flows on the other hand, a change was also occurred to the relative diversity of some indigenous forest trees like *Arundinaria abysinica* which predominated the hill side (35% Summit and Shoulder) But currently, plantation forest trees species such as *Cypressus Lustanica, Acacia species, Eucalyptus Saligna, Eucalyptus Camaldulensis*, *Grevillea Robusta* etc. already replaced the former indigenous forest species. Hence, about 75% plantation forest cover apparently existed at foot and back slopes of *Komto* volcanic ridge as confirmed by the later transect.

In 2008, about 30% forest of indigenous trees covered hill top and the shoulder of the *Komoto-walene* ridge, gradually has reduced to about 20% in 2012. The lands left for fallow were insignificant as observed during the initial and final years of transects (about 15% of land was left to fallow in 2008 while, less than 15% was resting in 2012). Decreasing crop productivity due to reduced fallow period has led to land transformations from annual crop farming system to perennial plantations and agro forestry practices. In general, the comparable snapshots of the same area of land-use/ land cover patterns of two periods show considerable spatial and temporal changes.

Table 8. 4: Land Use/Cover Types of the Hillside of Dalo Komto, (January, 2008*& 2012)

Land use/cover type	**Classifications of hill slope in Degrees and Proportions of the LULC Types.**									
	Toe slope (mean=4.20)		Foot slope (mean=8.1)		Back slope (mean=12.30)		Shoulder (mean=10.7)		Summit (mean=6.1)	
	2008	**2012**	**2008**	**2012**	**2008**	**2012**	**2008**	**2012**	**2008**	**2012**
Cultivated	#	#	x	#	x	#	x	x	x	x
Fallow	x	x	x	x	#	#	#	#	#	#
Grazing	x	x	#	x	#	x	x	x	x	x
Woodlots and other perennials	x	x	#	x	#	x	#	#	#	#
Natural and plantation forests	x	x	x	x	#	x	#	#	#	#
Other(wetlands, spring sources)	#	x	#	#	x	x	x	x	x	x

Source: partially adopted & Field Survey, 2012

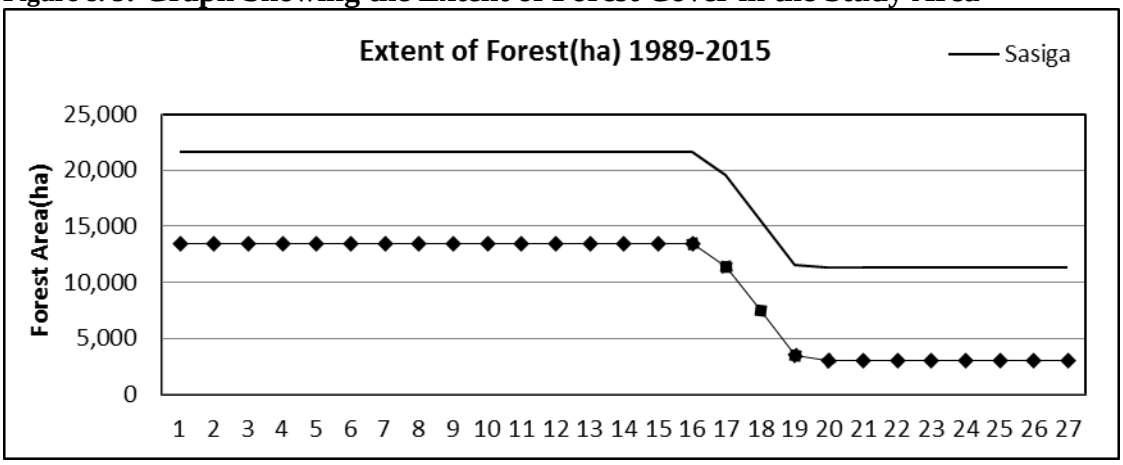
*Note: "#" the variable considered is there; "x" the variable considered was not in place or is already ceased; *data included in the table for the year 2008 is partially adopted from the techniques of transect and reconnaissance survey of the study area by the OFWE, Naqamte field office.*

The estimated length of time farm plots usually left to rest was set based on the key informants' perceived knowledge. The slope was measured using a clinometer and then the location of the plots along the hillside was recorded.

8.4 Status and Trend of Forest Degradation

According to EFAP (1994) Ethiopia had about 40% high forests, some decades ago (c.1930s) of which some 35% of Ethiopia's lands (c.120 million hectares) were high forests of broadleaved types. However, at present only 2 to 3 percent of the country are covered with indigenous broad leafed forests of high mountain type. The recent statistics have shown a continual trend in deforestation and forest degradation in Oromia region, East Wollega zone and the study area districts in specific attributed to increased population growth, agricultural expansions and increased forest based livelihood activities as well as forest product consumption (See Figure 8.4)

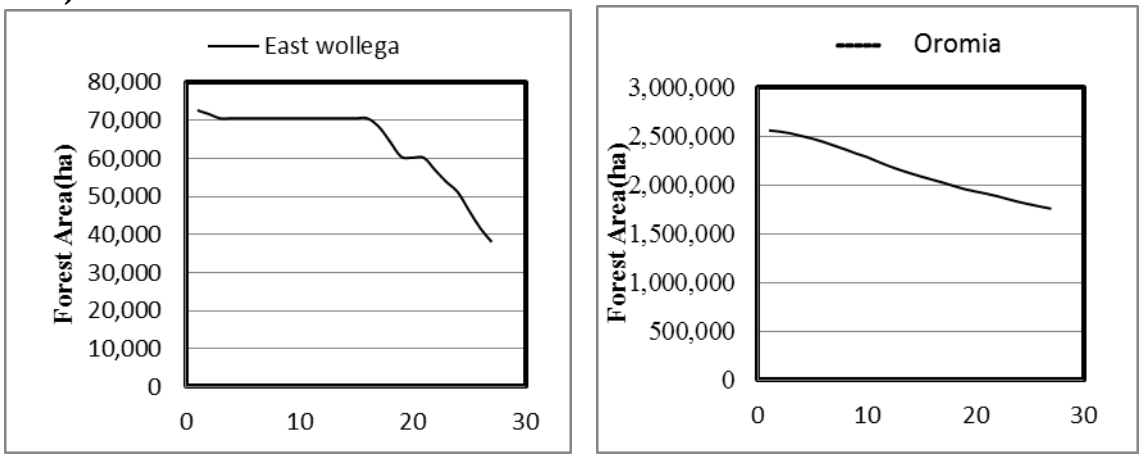
Figure 8. 5: Graph Showing the Extent of Forest Cover in the Study Area



Source: OBFED, 2012

As projection of the extents and trends of deforestation indicates, between 1989 and 2005 the rate of deforestation of the two districts of the study area kept on going constantly. The extents of forest cover of Sasiga and Gutowayu districts were estimated at 22,500 and 14,000 hectares respectively. On the other hand, from 2005 to 2009 the trend of deforestation showed a sharp decline corresponding to a decrease in forest areas i.e., from about 22,500 to 11,000 hectares and 14,000 to 2,500 hectares in the two districts, Sasiga and Guto-Wayu, respectively. Then, according to the projection from 2006 to 2015, the trend in deforestation seems highly reduced due to proper conservation methods and restrictions on abuse of forest resources.

Figure 8. 6: Extents of Forest Cover in East Wollega and Oromia Region (1989 2015)



Source: OBFED, 2012

8.5 The major Uses and Misuse of Forest Resources

Own discussion with key informant showed forest in the study area had diverse uses. The local forests have been used as open access resources where the local communities get some useful forest products for ensuring food security at the household level. Moreover, finding of the use diversity analysis showed that the communities in the study area were dependent on forests so as to get not only forest products of economic values but, for socio-cultural and ecological services as well. Most of the community members agreed that they had *De facto* use rights (as existing, not necessarily by legal establishment) on some forest products like firewood, fodder, water and local medicines. Nevertheless, the forests in the area have become highly degraded due to ineffective forest management system, though some contemporary management institutions were busy in promoting sustainable use of the forest resources through implementation of participatory forest management schemes.

8.5.1. Functions, Products and Other Attributes of the Local Forest

Forest resources have various uses which could be summarized as functional values, timber and non-timber products and other attributes. As functional values; forest resources support bio diversity, maintain water and soils, moderates the local climate.

In addition, they have the socio- cultural and spiritual values. Forests are also providing the local community with varieties of products (timber and non-timber products). Other attributes of forest or their potential uses include eco-tourism, center for scientific researches, for boundary demarcations and gathering places of elders to discuss on social affairs, for example, to resolve conflicts and hostility among members of the communities.

Generally, the uses of the local forest were analyzed based on the commonly perceived scales coded as "1" for absent; "2" for exceptional;"3" for present and"4" for common and important value of the forest (See Table 8.5).

Table 8. 5: Functions, Products and other Attributes of the Local Forest Resources

Topic	plantation forests	natural forests	natural woodlands
Forest functions			
Supporting bio-diversity	1	2	3
-water resources	1	2	3
-soil resources	1	3	3
-moderating local climate	3	3	3
-socio-cultural function	3	2	2
Spiritual purpose	1	3	1
Products			
Constructional Purposes& industrial raw material	4	3	4
Fuel energy	4	3	4
Medicinal values	3	3	3
Edible products	1	3	3
Other attributes			
Eco-tourism	1	1	1
For boundary demarcation or relative location	3	4	3
Research centers	3	1	1

Source: Field Survey, 2012

8.5.2. Ecological Services and Economic Values

Forests provide ecological services such as mitigation of the local climates, adjustment of water cycle and stream flow characteristics, conservation of soils and land resources, carbon sequestration and sustenance of the world's bio diversity.

The socio- economic contributions of forest resources are also diverse and numerous. In addition, forests are useful as sources of livestock fodders and shade and veterinary medicines. Furthermore, the social values of forest resources have been tied with indigenous beliefs and ethical identity of the people (a brief discussion of this aspect is given in chapter nine).

According to the information obtained from EFAP (1994), forestry provides about 2.5% of the total GDP in Ethiopia. Similarly, information obtained from the focus group discussions and field survey and observations showed that forests in the study area were supplying different ecological services like moderating of the local climate (attracting timely rainfall, mitigating extreme temperatures, stream flows, used as wind break, shed for livestock and the people on move etc.) Moreover, own communication with some key informants showed that socio- economic and cultural values of few forest compartments of the study area still remain diverse and many.

The FGD team also identified economic and livelihood values of timber and non-timber forest resources such as used for fuel wood, charcoal, natural gum, herbal medicines, farm implements, and construction pools, lumber, minor forest plants and epiphytes used for hand crafts, bee forage and for hanging traditional beehives on trees in forests. In addition, they told that considerable community members depend on indigenous forest trees for their shade. Most of the local communities view such trees as sacred and also used as gathering sites where to discuss different social issues. For example, *Sombo Araaraa* in Guto Gida was an indigenous tree (*Ekebergia ruepelliana*) used as a shade for gatherings of people and give local service as assembly hall (*gaaddisa walga'ii*) gathered to attend traditional ceremony of conflict resolution methods used by the local elders and it also used as a mystical place i.e., where a bull is slaughtered and scarification ceremony conducted.

8.5.3. The Economic Uses

According to Mulugeta (2008) and Damel et al., (2010) the uses of forests and other woody biomass were plenty and used for employment generation, import substitutions and expansion of the GDP. Forests form predominantly source of energy

for domestic households and industrial uses. They supply non-timber products such as wild coffee, honey and bee wax, incense and gums, spices, civet musk. Forests and other integrated natural resources occupy key positions in the country's economy. For example, forest coffee production contributes more than 10% of the GDP and it generates more than 60% of the country's foreign currency earning. In the same way, forests in the study area were reportedly contributed to the livelihood of the communities in diverse ways.

Detailed field surveys were conducted to assess the economic significances of the forests in the study area and evaluate the forest based income obtained by the local communities. Moreover, assessment of most of the household utensils and farm implements was conducted and the functions of indigenous forest products were found to be immense some times before the last four decades. Currently, however, forest products for utensils and constructional purposes seem to be scarcer and less durable than before. Over all, it is observed that exploitation of the local forest for generation of revenue seems the major cause of the unprecedented forest degradation ongoing in the areas.

8.5.4. Use Diversity Analysis of the Major Forest Species

In order to conduct use diversity analysis of forest tree species, the direct matrix ranking and scoring, requires the respondents to compare, score and rank individual forest tree or shrubs species using the common criteria commonly perceived among the local community (Martine, 1995; FTP, 1995). Following this, the direct ranking and scoring techniques were partially adopted in a way as to well coincide with conventional PRA data collection, analysis and interpretation of data.

Accordingly, the PRA team members were given orientation to give the highest score (4) for the species perceived as the most important and the lowest score (1) for the tree species perceived as having the lowest values. For this exercise, about ten use categories were identified from forest tree and other woody plants found in the two sample *gandaalee* (H/ Fayisa& D/ Komto) and the intact wood land found in Dhidhessa watershed (See Table 8.6)

Table 8. 6: Forest Species and Use Diversity Identified by PRA

Common forest trees	Use Diversity									
	Constructional material & farm implements	Fuel wood	Animal fodder	Bee forage	Human food	Spiritual value	Human medicine	Veterinary medicine	Tooth brush	Other uses
Waddeesa (Cordiaafricana)	4	1	1	4	0	1	1	1	1	3
Baddeessaa (Syzigumguineense)	4	4	1	4	2	1	1	1	2	3
Laftoo (Acacia spp)	3	4	2	2	0	2	2	2	1	3
Hoomii (Pygeumafricanum)	4	2	2	2	1	3	2	2	1	3
Harbu (FicusSpp)	3	2	2	2	2	2	2	2	2	3
Kararoo(Aningeriaadolfifredrici)	4	1	1	2	1	1	1	1	1	3
Afarfatu (Dracaena steudner)	4	2	2	2	1	2	2	1	1	3
Sombo (Eckebergirueppeliana)	4	4	2	4	2	2	1	1	1	3
Qomonyoo (Bruce antidysentrica)	4	4	3	3	2	1	1	1	1	3
Bakaniisa (Croton macrostachys)	4	4	1	4	1	1	4	4	1	3

Source: Field Survey, 2012

Note: - 4= high Priority value 3= Secondary value 2= sometimes used 1= rarely used 0= never

According to table 8.6 analysis of the use diversity of the forests and indigenous woody plant species were identified and assigned different priority values. For example, concerning the use diversity of *Cordia africana (Waddeessaa)*, high priority value(4) is set to only two selected uses i.e., its priority use perceived as "constructional material and farm implement" and "bee forage" and site for apiary. It is rarely used (1) as fuel wood, animal fodder, spiritual purpose, human medicine, veterinary medicine, tooth brush. On the other hand, the use diversity score of (3) and (0) was assigned for its utility as "other uses" and "human food" respectively.

Commonly, tree species of high priority values for constructional uses, bee forage, and firewood, animal and human medication were identified.

Similarly, secondary vegetative plants and shrubs of miscellaneous uses were identified and set in priority, using same PRA technique.

Moreover, it is confirmed that forest degradation and depletion of the old age forest tree species have negatively affected the livelihoods of the local communities and their food security status. Hence, in order to arrest forest degradation and harvest the full potential benefits i.e., sustainable use of forests, other natural resources and forest biome of potential uses/functions/ have to be documented and held in reserve (conserve) based on indigenous forest management approach as well as conventional forest governance approach.

8.6 The Common Indigenous Forest Resources and their Uses

Forests in the study area have been used for varieties of socio economic and environmental purposes. These include bee forage and honey collection, medication, source of livestock fodder, hunting and fishing. Generally, it was found the forests in the area have supplied the communities with basic functions like ecological services, forest timber and non-timber products, and others like eco-tourism, boundary demarcations, and spiritual services (to be explained in the forgoing chapter nine)

8.6.1. Bee keeping and Bee forage

Ethiopia ranks first in bee colony in Africa. Most of the colonies of bee have settled in the south-western Ethiopia, mainly in Oromia where forests and flowering trees and plant species used for bee forage could be found throughout the year. Bee keeping has been the dominant source of household income until the recent past. Moreover, bee keeping is perceived as one of the cultural asset and indicator of wealth status among the local community. Only some selected forest tree and plant species were used for carrying traditional bee-hives hanged on them.

The findings showed that the rich households used to own an average of 100 to 150 beehives while, the poor owned minimum of 50 traditional bee- hives. But, today the shortage of forest honey bearing tree species (bee forage) that have economic and socio-cultural values has reduced the availability (honey supply) of the area. However, these days a person hardly owns ten to twenty beehives due to scarcity of forest species used as bee forage as well as trees where to place/hang/ the beehives on.

About 25 bee- hives per house hold head and about 5 bee- hives per house hold head were reported being placed on some selected trees/shrubs used traditionally as bee forage in the study area. It is observed that different indigenous tree species serve as the main sources of nectar and pollen for bees and with fewer contributions from other remaining plant species (shrubs herbs and climbers) widely grown across the study area. Deferent forest tree and plant species have been useful in traditional apiculture. Furthermore, the PRA finding showed that different forest tree species (bee forage) were prioritized and expressed in percentage. Accordingly, the plant species used for bee forage were classified as shrubs, trees, climbers and herbs. Shrubs like *sokkorru*, *reejjii* were identified as contributing for about 15% of the bee forages. From the forest trees *eebicha* and *hambabbeessa* were perceived to make up more than half (55%) of bee forage supplies. On the other hand, epiphytic plants like *baala-baggii*, *kalaalaa* and herbs like kusa'ee, *keelloo* and *siddisa(Trifolium semiplosum)* were considered as sources of bee forage of about 5% and 25% respectively (See Table 8.7)

Table 8. 7:Forest Species Used for Honey Bee Forage

forest diversity (species composition)	The major species known	Percentage (as considered out of 100%)
Shrubs	*Sokkorruu, reejjii etc.*	15%
Tree	*Eebicha, hambabbeessa etc.*	55 %
Creepers	*Baala baggii ,kalaalaa etc.*	5%
Herbs	*Kusa'ee, keelloo,siddisa etc.*	25%

Source: Field Survey, 2012

Over all, it is observed that the production of honey and beeswax was based on traditional practices. Many people keep beehives in adjacent forests and their backyards and they use fire to harvest honey and protect themselves from being sting by the bees. Bee keeping (apiculture) industry is not highly developed, so it requires well protected forest bee forage and promoting of the non-timber forest resource uses among the local communities.

8.6.2. Forest Species of Medicinal Values

It is known that much of the forest vegetation like shrubs and trees have been used by the local people since the time of their fore families for both animal and human medicinal and purposes. Different parts of plants have been used based on the prescription of elderly people, mainly traditional medicinal herb collectors who had good understanding and experiences. In the PRA sessions, the team members discussed on the uses locally available medicinal plants like trees, shrubs, herbs, climbers and tubers.

Accordingly, human aliments and numbers of plant species and their parts used such as roots, barks, leafs, steams, fruits, flowers, fluids extract, and whole plant to treat the problems were identified and organized accordingly. For example, the local communities often use leafs of *Ecualyptus saligna(bargamoo aadii)* by boiling and inhaling its steam as a treatment against common cold. On the other hand, powdered berries of *podocurpus falcatus(ejersa) Arunndanariya (heexxoo)* were used by the elders as cure for gonorrhea and tapeworm diseases respectively. Currently, however, the use of some forest species for medicinal purpose seems appreciated by some adult and old elderly members of the local communities (See Table 8.8)

Table 8. 8: Lists Medicinal Forest Species and their Treatment and use Prescriptions

Disease type	Forest plant species (non-timber natural forest species)	Parts used	Method of preparation and how to use
Common cold	*Ecualyptus saglina (bargamoo adii)*	Leafs	immerse the leafs into boiled water and inhaling the steam
Gonorrhea	*p.falcatus (ejersa)*	Seeds	Extracting oil from the seeds
Tapeworm	*H.abyssinica(heexoo)*	seeds	Grinding into powders &diluting into syrup
Evil Eye	*(qabaricho)*	root	Steam(fumigating)
Ear disease	*Acacia (laaftoo)*	Fluid extracts	dropping into the ear
Infections(skin rash)	*Acacia sieberiana (doddota/laaftoo)*	leafs	Squeezing the leafs and rubbing on the infected part slightly
Liver disease	*(raamsoo)*	leafs	hitting the patient by the leafs
Skin rush and sore	*Croton macrostachyus (bakkaniisa)*	leafs	squeezing

Source: Field Survey, 2012

According to Farnsworth et al. (1985), more than 80% of the developing countries continue to rely on traditional medicines, predominantly indigenous flora, for primary health care. In countries like Brazil, medicinal plants supply the major health care for a majority of the people. This is because of cultural preference and the higher cost of pharmaceutical products. For large numbers of rural and urban poor people, medicinal plants offer the only available treatments for both minor and serious ailments (Elisabetsky and Wannamacher, 1993)

In the same way, medicinal forest plants and shrubs have been providing treatments for both minor and serious ailments for a significant portion of the rural population, particularly poor people in the study area. According to documents reserved in Wollega museum, there were major medicinal plants used by the local people before three to four decades. As evidence, the list of ten top leading medicinal plants sold in Naqamte and neighboring towns on market days (See table 8.9)

Table 8. 9: Ten Leading Medicinal Plants Sold in Naqamte town, Ethiopia in19980s

S.N	Scientific name	Local name	Plant part used	Principal uses
1	*Embelia schimperi*	*heexxoo/haanquu*	Seed powder	Anti-tapeworm
2		*qabarichoo*	root	heal snake bite
3	*Stereospermum kunthianum*	*botoroo*	bark	heal tooth ache &decay
4		*ulumaayii*	slight twig	heal tooth ache &decay
5	*Strychnos spinosa*	goosuu	berries	Good mouth smell
6	*Premna schimperi*	*Urgeessaa*	stem	fug mating milk pots
7	*Foneix reclinata*	*meexii*	berry	Edible wild fruit stomach ache
8	*Croton macrostachyus*	*bakkaniisa*	leaf	Headache and skin disease
9	*Warburgia ugandensis*	*Befti*	root	tonsillitis
10	*Acacia sieberiana*	*Laftoo-adii*	shoots of the branch lets	Skin rash due to *afuuffaa bofaa**

Source: Field Survey, 2012

**afuuffaa bofaa* -a breath of a snake which causes a skin antipathies

Degradation of Watcha-Komto-Tsigie forests simply not only the loss of potential medicinal plants and non-timber products for the area but also erosion of an alternative human health and veterinary care option for many people in rural and urban areas found surrounding the forest blocks. It is known that, habitat is a critical factor in determining species wealth.

Apart from this, the plant parts used and the manner in which medicinal products get harvested also affect population structure and availability. Primary forest tree products, including barks, roots, and shoots, are widely used, but little is known about the sustainability of harvesting strategies currently employed. Particularly vulnerable are those species occurring at low densities, those whose roots are harvested, and those whose bark or oil is extracted unsustainably (Cunningham, 2000). Different studies show that determining sustainable harvesting strategies requires basic ecological information. But, according to (Peters, 1994), the ecology of even the most widely used species is poorly understood. The same thing is also happening in the

study area with regards the unwise use of forest tree for medicinal as well as other timber and non-timber uses.

One of the big problems of misuse and declining such forest species is the existing ignorance of indigenous and ethical principles of natural resource management of different forest use stakeholders and the community at large. It is known that majority of local people, only partially have awareness of forest trees and plant species that have been used by their forefathers. Own observation showed that consideration proportion of the respondents could hardly identify the remaining valuable forest species of medicinal as well as socio- cultural values.

8.7 Forest Use Right: Past and Present

During Emperor H/Silassie Regime,(before 40 years) most of the time domestic use of forest woods and non-timber products were allowed for use by the local lords (*Abba-qoroo*) for the rural communities needing it for housing, fencing, firewood , and for making minor household furniture. Personal communications with elderly people showed that except in a very special case, for beehive, shed for coffee which could be used on the bases of rental agreements for use and except in a very special cases; a closely guarded royal forests or forest with a mythical significance, the actual prevention of communities' use of forests and forest products was not in place. The Communities in the study area used to collect none- timber forest products for free.

During the *Derg* regime, after the 1975 land reform proclamation which ensured the motto- 'land to the tiller', the rural lands and other natural resources such as forests, woodlands, extensive grazing area and wetlands were nationalized and controlled by the state and the rural peasant association. It was during the *Derg* regime that most of the rehabilitation of forests and other integrated watershed (environmental resource) protection and conservation programs in progress. Forest rehabilitations and conservation of the soils and water resources was one of the fundamental rural development programs under implementation. Own communication with key informant from OFWE in 2012 showed that afforestation program of the Derg regime had contributed to growth of forest trees within watershed and degraded areas.

Currently, these plantation forests become the main source of revenue for forestry enterprises.

On the other hand, the open access condition of the local forests of the *Derg* regime has caused severe forest degradation. Never the less, different management approaches by different stakeholders have been on trials since then. For example, participatory forest management approach with special attention to economic exploitation of the remaining forest resources is partially introduced to the study area by the OFWE. It may be too early to comment on the management strategy of the enterprise, since it seems it is at its initial stage (first phase of the project). Anyhow, the enterprise has legally established the local participatory forest management organization (*Waldaa Kunuunsa Bosonaa (WKUB))*

But, still the problem of illegal use of the forest resources by the local people and some urban people coming from the surrounding towns is threatening the forest resources and related bio- diversities. Some people from the surrounding towns and villages (Naqamte, Gute, and T/tsige) have been in competition with government enterprises and local communities for forest use right. Usually, after timber harvest, fire wood collectors and charcoal makers and the local carpenters overrun the forest blocks pretending to use the forest trees left over. Hence, such illegal forest use competition and other deception of the people can be noted as the driving forces forest degradation frequently occurring in the study area (See Figure 8.7)

Figure 8. 7: Illegal Collection and Hauling of Firewood from Komto Forest

Source: Field Survey, 2012

8.8 Rural Livelihoods Impacts on Existing Forests

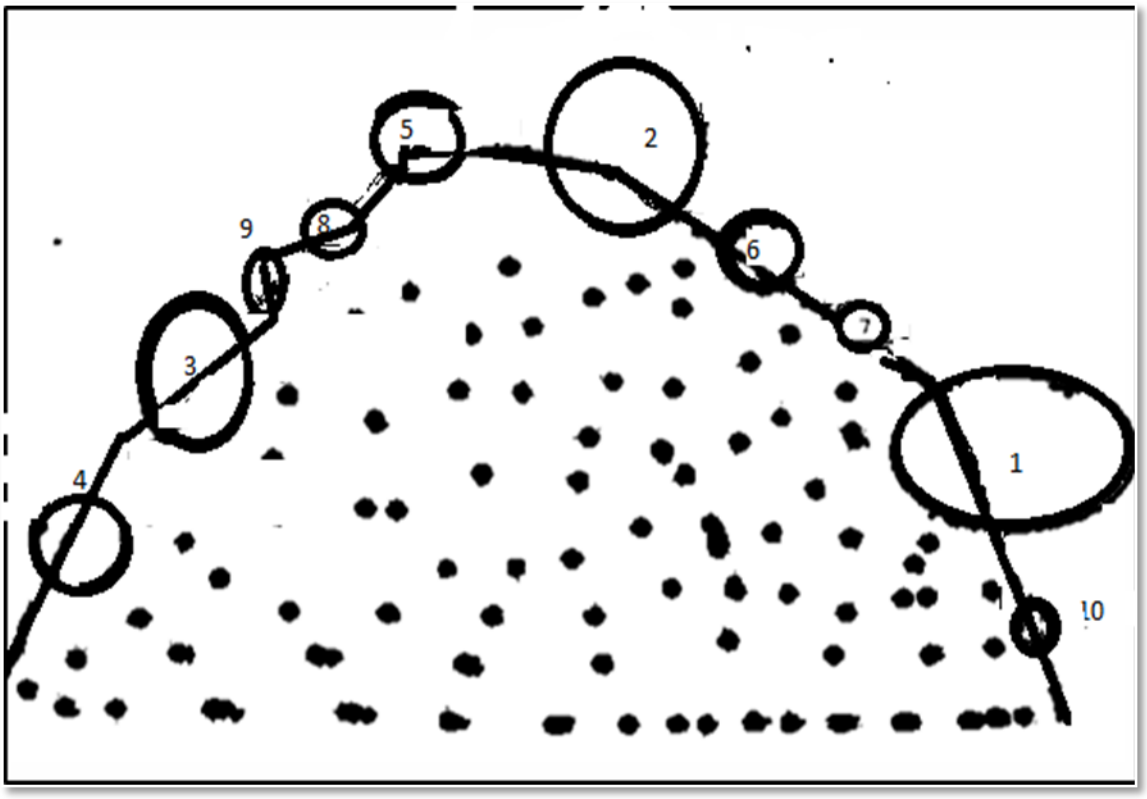
The biotic pressure on forests can be depicted through Venn diagrams, even though it is not possible to exactly quantify the pressure. It was found that people who were living either on periphery of or within the forest used it for collection of minor forest products, grazing of cattle, collection of firewood and cutting timber for construction and other uses. In short, the identification of exploitative forest based activities was done using the following partially adopted technical PRA steps (Narayanasamy, 2009):

- Meeting of the key informants was conducted and the purpose of the exercise was informed
- News print was cut into different size circles. The largest circle represented most important and the smallest circle for the least important. In between these two extremes were circles representing fairly different area sizes.
- Then participants were asked to draw a big semi-circle on the ground presumably representing the forest area.
- Participants were asked to list the purpose of which they make use of the local forests
- They discussed on the purpose of wise utilization of the forest. Then, they were allowed to select bigger circle for representing the dominant use of forest resources and vice versa.
- I motivated them to place the circle in the relevant area. I also informed them, if they make use of the forest for collection of minor produce quite often and the extent of collection is less than the overlapping area would be less.
- Accordingly, the participants were able to select the circle for each purpose.
- Then, the team has done the exercise displaying a clear picture of pressure of population on the forest.

Then, the effects of population pressure and rural livelihood activities on forest resources were identified as the top ten livelihood activities having potential impacts on forest and other natural resources in order of decreasing importance: 1)farmland expansion, 2) cutting down forest trees for construction, 3)charcoal making,

4)firewood collection, 5)pole wood harvesting, 6) traditional pit sawing or lumbering, 7) harvesting forest honey using fire, 8) keeping livestock inside and around forest fringes, 9) settlement encroachment and unban expansion, 10)quarrying for road construction, Finally, the Venn diagram of varying circle sizes as per the procedure or steps followed during the PRA exercise (See Figure 8.8)

Figure 8. 8: Venn Diagram: Human Impact on the Forests of the Study Area



Source: Field Survey, 2012

The finding of PRA exercises shows that the purpose wise pressure of population in the study area which is depicted in figure 8.8. Accordingly, it is identified that farm land expansion was the most critical causes of forest degradation followed by cutting forests for construction purpose, charcoal making, for firewood collection etc.

On the other hand, quarrying for road construction ranked the least, which is represented by the smallest circle (number 10). Generally, it is observed that in between the two extremes are different human induced livelihood activities having varying degrees of impacts on the forest status of the area.

8.9 Impacts of Forest Degradation

In order to assess the existing impacts of forest degradation, interviews were made with key informants mainly from East Wollega zone and district agricultural offices, land administration and environmental protection offices, Oromia wildlife and forest enterprise, and agriculture and rural development agents. As the findings of the key informant interview and PRA exercises show listing and prioritizing of the impacts of forest degradation was made using direct ranking method as partially adopted from the major matrix in almost all contexts under PRA (Narayanasamy, 2009).

The direct ranking of the impacts of forest degradation was made based on key informant interview from some government offices and institutions. Accordingly, climate change at local level with total score of 37 was ranked the first followed by crop productivity decline and scarcity of forest products, those with the total score of 36 and 35 were ranked second and third respectively. Again, agreeing to opinions of the key informants, the direct ranking of impacts of forest degradation showed that livestock productivity decline as the last of the priority set by direct ranking method (See Table 8.10). Reasonably, the impact of forest degradation on livestock productivity seemingly is influenced by availability of alternative animal fodder and improved grazing system in use by some farmers. For example, feeding livestock using cut and carry method, tethering and modern ways of keeping livestock have contributed to increasing livestock productivity i.e., reducing pressure on forest resources.

Still, existing perception of magnitude of impact of forest degradation on livestock production vary comparable with wealth status and a number of livestock owned by each household. Commonly, only a few farm households locally known as the rich (*Soreessa*) and the medium farm households (*Giddu galeessa*) had considerable numbers of livestock, mainly the cattle. Then again, the poor households (*Iyyeessa*) reportedly have no awareness or they give no much attention to the impacts of forest degradation on livestock productivity while specifically considered. In any case, the livestock productivity continues declining, because of forest degradation and

shortages of forest fodder and many more related problems like poor management and veterinary services.

Table 8. 10: Direct Ranking of Impacts of Forest Degradation

Impact	SAO	GGAO	WTAO	DA(Gari)	DA(H/fayisa)	ZAO	ZWFE	ZLAEP	Total Score	Rank
Scarcity of forest products	4	5	4	5	4	3	5	5	35	3
Wildlife loss	5	5	4	5	4	3	4	4	34	4
Livestock productivity decline	3	5	3	5	4	4	4	3	31	10
Increasing demand for forest products and forest use conflicts	3	4	3	5	5	5	4	4	33	5
Soil erosion and land degradation	4	5	5	5	4	3	3	4	33	5
Crop productivity decline	4	5	5	5	5	4	4	4	36	2
Drying of streams and rivers	5	5	4	4	4	3	4	3	32	8
Shortage of food(food insecurity)	5	5	4	4	5	3	4	3	33	5
Declining income from forest product sale	4	3	4	4	5	4	5	3	32	8
Local climate change	5	4	5	4	4	5	5	5	37	1

Source: field Survey, 2012

Note: SAO= Sasiga district Agricultural Office, GGAO= Guto gida district Agricultural Office
WTAO= Wayu tuka district Agricultural Office, DA (Gari) = Development Agent from *ganda* Gari
DA (H/fayisa) = Development Agent from *ganda* Haro fayisa
ZAO= East Wollega Zone Agricultural Office
ZOWFE= East Wollega Zone Office of the Oromia Wild life and Forest Enterprise
ZLAEP= East Wollega Zone Office of Land Administration and Environmental Protection

8.9.1. Climate Change; Rainfall and Stream Flow Variability

Ethiopia is reach in water resources that have local and international significance. There are some studies attempted to assess the likely impacts of climate change on the potential uses of these water resources, flow characteristics, volume of water flow etc. For example, Kife (1999) reported that Awash River is highly sensitive to climate change. Likewise, Deksiyos (2000) reported that the Abay basin is predicted to decrease by up to 33.6% volume of water flow (discharge) due to climate change.

Then, Husien(2006), Tenalem Ayalew and Deginachew Legesse (2007) reported that climate change could affect the hydrology of Lake Tana, affecting the magnitude and seasonality of surface flows (runoff) and shrinking of some rift valley lakes in Ethiopia respectively. Even though, many studies have been conducted on the issues of climate change, there is still a gap in uncovering of the major causes of climate change as a result of deforestation and forest degradation. So, improved forest cover seems strategic importance. The finding of FGD showed that forest degradation in the study area has caused change in local climate. For example, the untimely arrival of rainfall season and its withdrawal, erratic flow of the local rivers and streams. Own informal discussions and observations also showed that there were shortage of livestock fodder and grazing attributed to climate change which is worsened by forest degradation.

However, forest resources conservation measures mitigating the climate change for sustaining the reliability of water resources were rarely adopted in different parts of south western Ethiopia, including the study area. Therefore, indigenous management of forest and other natural resource mentioned by the local elders seems the best optional forest conservation and climate mitigation measure to be implemented by the local communities.

8.9.2. Rainfall and Stream Flow Variability

The relationship between land use/cover and hydrology is complex, and established wisdom about their nature can also change over time. However, some patterns are reasonably robust. For example, Bruijnzeel(1990) reported that intact natural

vegetation cover guarantees optimum stream flow under given geo-climatic conditions.

It also affords maximum soil protection and therefore provides optimum regulation of seasonal flows while moderating erosion and stream sediment loads. In addition, *montane* cloud forests and related cloud affected ecosystems such as *páramos* provide maximum amounts of stream flow due to a combination of high rainfall, extra inputs from cloud water capture by the vegetation, and low water use due to frequent occurrence of fog. Occasionally, intact natural vegetation cover by itself is no guarantee that floods or landslides will not occur, especially in large scale watersheds and under extreme weather events. Yet, their frequency will be less with intact vegetation than is usually observed after conversion. According to existing observations, there is direct like between forest degradation and availability of waters and river flows. Even though, plantation forests, mainly of eucalyptus and other exotic species were perceived by the local people as having impacts on optimum stream flow and availability of water resources.

The findings of focus group discussions showed that many farmers were complaining about the shortage of water resources and stream flow variability due to growing expansion of eucalyptus on subsistence farms and forest concessions owned by OFWE. Likewise, it is observed that the hydrological data analysis of head streams and small rivers like little Anger and its major head streams show incompatible stream flow pattern i.e., fluctuations in amounts of discharge (See Table 8.11; Figure 8.9)

Table 8. 11: Annual Discharge of the Little Anger River at Gutin, East Wollega

Year	Annual discharge (Million m3)	Year	Annual discharge (Million m3)
1982	323.821	1995	562.212
1983	381.684	1996	936.577
1986	461.733	1997	794.776
1987	466.334	1998	1112.217
1988	722.446	1999	934.160
1989	642.608	2000	756.195
1990	488.571	2001	706.787
1991	476.170	2002	548.322
1992	749.894	2003	633.185
1993	1015.031	2004	691.597

Source: Ministry of Water, Irrigation and Power, 2012

Note: Basin Area=3742km^2 and Location 9^0 30'N, 36^0 35'E

Figure 8. 9: Graph of Annual Discharge of the Little Anger River near Gutin town

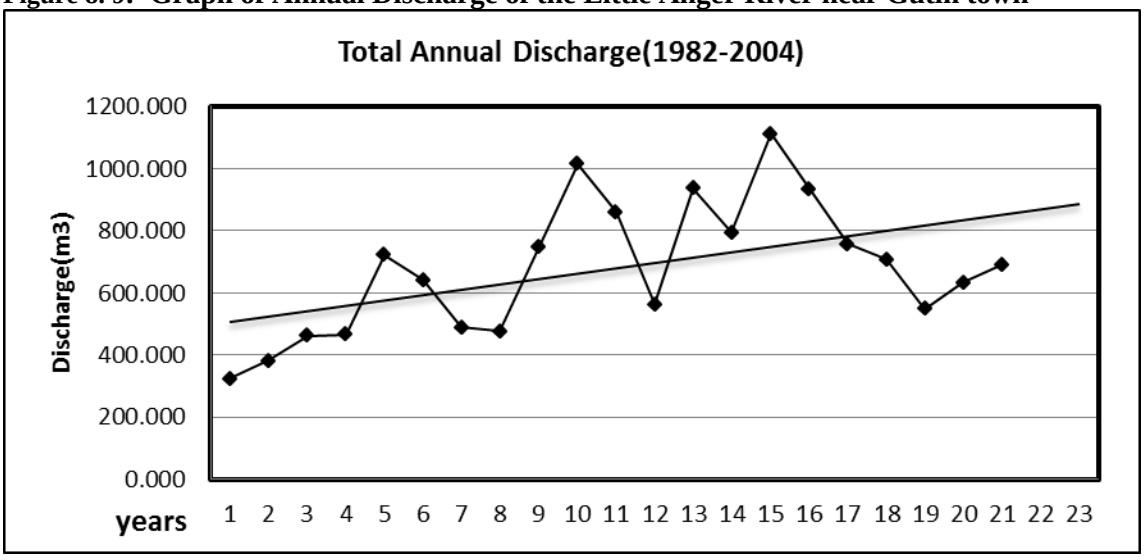
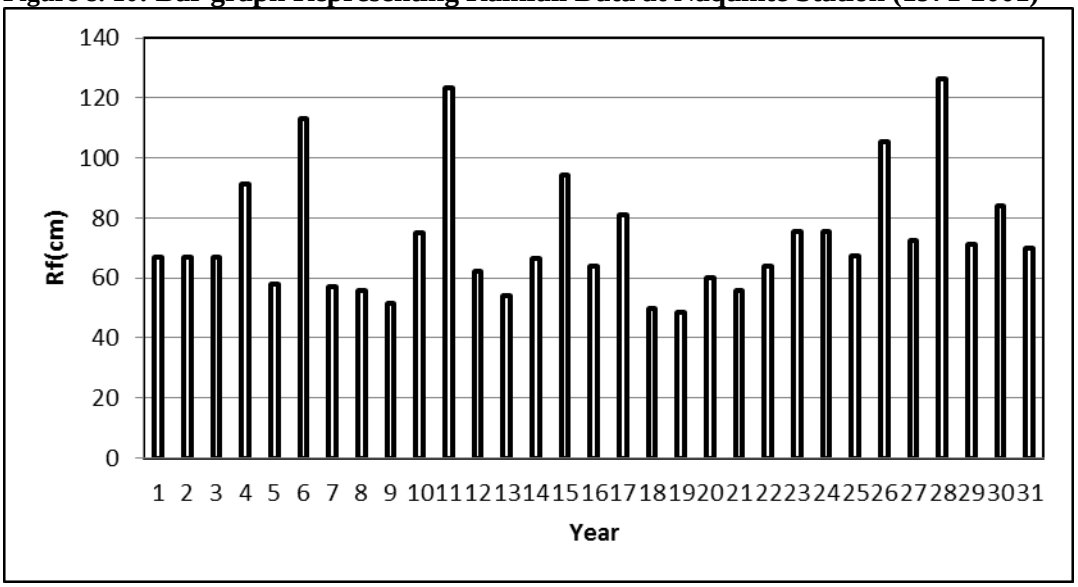


Table 8. 12: Rainfall Data of Naqamte Station East Wollega, Ethiopia (1917-2001)

year	Annual Total Rainfall (cm)	year	Annual Total Rainfall (cm)	year	Annual Total Rainfall (cm)
1971	67	1982	62.1	1993	75.3
1972	67	1983	54.2	1994	75.3
1973	67	1984	66.6	1995	67.3
1974	91.4	1985	94.5	1996	105.4
1975	58	1986	63.9	1997	72.3
1976	113	1987	81	1998	126.5
1977	57	1988	50	1999	71.2
1978	56	1989	48.4	2000	84.2
1979	51.5	1990	60	2001	70
1980	75	1991	55.9		
1981	123.5	1992	63.9		

Source: NMSA, 2012

Figure 8. 10: Bar graph Representing Rainfall Data at Naqamte Station (1971-2001)



Source: NMSA, 2012

Generally, the finding of this study summarized in such a way that fluctuation in annual rainfall graph (See figure 8.10) occurred alike variability in discharge of little Anger river that rises from forests in the study area (See figure 8.9). Again, the forest change detection and analysis made showed unprecedented decrease in forest areas within time series not more than four decades (See figure 6.5 Table 6.8) In summary, the finding showed that the extended process of forest degradation has resulted to

decreasing trend in stream flow (variability in discharge of little Anger river) and annual rainfall distribution at the level.

Finally, I would like to forward that there is unsolved gap that needs detailed experimental research meant for verification of how the ongoing forest degradation relates with such variables like variability in rainfall distribution patterns, variability in river discharge, incidents of soil erosion and occurrences of gullies and etc.

8.9.3. Soil Erosion

The environmental threats to Ethiopian agriculture are an extensively debated issue (Alemneh Dejene, 1990). One of the threats commonly known to Ethiopian agriculture is the problem of soil erosion that has adverse impacts on agricultural productivities (decline in crop yield and livestock productivities). One of the vital causes of soil erosion as reported in many studies is the problem of forest degradation and abuse of other natural resources by humans and their attempts to ensuring their livelihood and food security. Never the less, soil erosion is difficult to measure even when the means and the resources are available. But, it is still possible to estimate the level of erosion whether it is "very sever", "severe", or "minor" using farmers experience and perceptions in relative terms.

Even though the incidence of soil erosion is common in different land use types with varying levels, the most commonly perceived soil erosion by the respondents was the level of erosion on their farm plots. Besides this, other indicators of soil erosion and land degradation, such as soil depth and level of stoniness were more easily observed on crop lands than other land use types. Again, farmers were also interviewed regards to the level of soil erosion on their farms and they told their perceptions. Accordingly, about 63% of the respondents told that they encountered very severe soil erosion.

More than a quarter of the total respondents reported they had severe problems of soil erosion due to degradation of forest and decline in vegetation cover. On the other hand, those who reported they experienced minor problems and no problem of soil erosion account for only 5% and 2% respectively.

The respondents who reported that they had minor as well as no problems most likely had larger farmlands and practice some kinds of agronomic conservation measures like crop rotation and fallowing.

In support of this, informal communication with the local elders showed that the decreasing crop yield and the prevalence of food insecurity both at house hold and community levels were the impact of soil erosion due to forest degradation. In response to the existing problem of soil erosion, some house hold respondents reportedly said they adopted minor conservation works on their farms by giving more attention to planting of trees and structural measures for rehabilitating such land degradation due to increasing soil erosion and evolution of gullies and their impacts. Moreover, many farmers started to use indigenous knowledge for managing the on farm trees as well as the indigenous forest species resilient to the prevailing shocks (biophysical and the socioeconomic problems arising from land use/cover dynamics)

Table 8. 13: House hold's Perception of Level of Soil Erosion on their Major Farm Plots

Level of Erosion	Number of Respondents	Percentage of Respondents
Very severe	115	63
Severe	55	30
Minor	10	5
No Problem	3	2
Total	183	100

Source: Field Survey, 2012

Forest Degradation Threatens the Livelihoods of the Poor People

As household survey indicates the poor people had large family size. More than one-third of the households were food insecure because had no financial capacity. They couldn't produce sufficient food at home, so they had few or no crops and livestock. They merely earn their livelihoods from off- farm livelihood activities. Own observation confirms that almost all age groups of the communities and household members have been relying on the same kind of livelihood activities (forest-based livelihood activities), the major types of which include exploitation of forest products

through collection of fire woods and constructional poles, ply woods and charcoal making, in order to generate income that contributes to the household food security.

It is observed that almost all, young and adults, school children and others were found while walking on streets to market places, carrying bundle of fire woods and sacks of charcoals on their backs and heads. Moreover, the partial survey by the researcher also reveals that most of the participants look improvised; they walk on the scratching asphalted roads on bare foot long a distance of not less than ten to fifteen kilometers specially the market days of Naqamte (See Figure 8.11). So, it is possible to say that the forest based livelihood activities make up the largest share contributing to the rural house hold food security of many households in the study area. Furthermore, the case study also highlights how the contemporary conditions of the rural livelihoods activities act as underlying causes of the forest degradation and as well as how the existing problem of forest degradation adversely impacting the social-economic condition of the rural communities.

Figure 8. 11: Involvements of Community Members in Charcoal Selling

Source: Field Survey, 2012

8.9.4. Livestock Assets

The most important type of asset owned by the rural farm households is their livestock. According to Eyasu (2006), livestock ownership creates the full personal realization of the pastoralists. Likewise, the livestock possession has been used as the main condition for ranking the local communities as “rich”, “medium” and “poor” household. The PRA result showed that before three to four decades, almost all farmers had considerable livestock used for different purposes. Some members of the communities i.e., the “rich” households used to possess about 100 cattle, 30 sheep

and goats, 5 equines and 50 poultry. On the other hand, the "poor "household presumably had more than 20 cattle, 10 sheep and goats, 2 equines and 20 poultry.

But, the current condition of the farm households deteriorated so much so that almost more than half of the surveyed households became food insecure for more than five months in a year due to reduced size of livestock and their productivity. The contribution of livestock in the farming system also reduced attributed to decreased number of livestock owned by the local people. For example, own communication with farmers showed that the use of manure (*ciicata*) for crop cultivation became a minor option due to same reason. But, currently forest degradation has put traditional mixed farming system (livestock based farming system) under enormous pressure.

As far as my observation is concerned, increased population number of the study area was the underlying cause of forest degradation. Then, shortage of grazing pastures and forest fodders decrease in animal productivity and food security problem became prevalent at household level.

8.9.4.1. Shortage of Fodder, Livestock Diseases and Productivity

It is known that forests contribute fodders and also other diverse services to the well-being of livestock and wildlife. Different studies showed that the productivity of livestock depends on availability of pasture and water sources. For example, Solomon Mengiste et al, (2010) reported that livestock productivity is highly constrained due to feed shortage. Likewise, the finding of the PRA sessions and FGD show that the ongoing forest degradation in the study area as one of the main factors attributed to livestock productivity decline. In addition, the shortage of livestock feeds has attributed to reduced productivity of the livestock and livestock disease and animal loss (See Figure 8.11)

8.9.4.2. Livestock Disease

The office document account showed that the common livestock diseases in the area were *trypanosomiasis*, *antrax*, black leg and *pasteurelosis*. Own observation and discussion with the local elders showed that the livestock in the study area were

suffered not only from the common diseases listed above but, insufficient supplies of fodder and water from free grazing lands and forest compartments which seemingly has caused the livestock plague (See Figure 8.12). Hence, we can say that shortage of livestock fodders, the prevailing malnutrition and animal diseases remain the main cause for reduced animal productivity and incidence of food insecurity among most of the surveyed household of the study area.

The writer tied to illustrate conditions of animal using selective photographs. Accordingly,(photograph number 1) illustrates a cow infected from *trypanosomiasis* and veterinary expert giving treatment barely after the cattle is getting lost immunity of survival. Again, livestock problem was illustrated by the shabby kraal (Photograph number 2), where the livestock is kept during nighttime. Usually, farmers construct such temporary livestock milieu (*mooraa beyiledaa*) thinking that livestock wastes (*ciicata*) could be able to keep their garden fertile. Such arrangement has been used by the local people since the first time mixed agricultural started in the area. In addition, shortage of animal fodders and water in the area were found to be among the severe problems that affected animal productivity adversely. These are illustrated by (photograph number 3) found to the right corner of the first raw and (photographs number 6) found in the corner of the raw in arrangement.

On the other hand, (photograph number 4) in the second row at the left corner shows that forest resources are supplying the cattle with natural fodder and give security at the times of prolonged dry seasons, thereby securing the livestock from diseases.

Figure 8. 12: Livestock Conditions and Veterinary Service

Photograph: © 2012
Mesisa Avarso.

The surveyed households had different animals of varying sizes reared for their livelihood options. Only some livestock like cattle, sheep and goats and equines were considerably surveyed at household level.

Accordingly, about 22% of the respondents reported that they owned more than five heads of cattle. The remaining 35% and 43% of the surveyed households reportedly said they owned less than five and no cattle respectively. Again, about 31%, 51% and18% of the surveyed households told they owned five and above, less than five, and no sheep and goats respectively. Finally, the study found that 4%, 30% and 66% of the surveyed households had five and above, less than five and no equines respectively (See Table 8.14).

In brief, the sizes of livestock owned by the surveyed household seemingly resulted to higher demand for forest fodder and strive to exploit the existing forests for instantaneous needs, which in turns lead to more destruction of the forest.

Therefore, the farmers have to implement the management strategies which promote the regeneration of the local forest fodders as well as increase the livestock productivity that ensure food security at the household level.

Table 8. 14: Household Distribution by Number and Types of Livestock Owned

Amount owned	Livestock type					
	Cattle		Sheep& Goats		Equines	
	No.	(%)	No.	(%)	No.	(%)
5 and above	40	22	56	31	8	4
Less than 5	64	35	94	51	55	30
Have no	79	43	33	18	120	66
Total	**183**	**100**	**183**	**100**	**183**	**100**

Source: Field Survey, 2012

Land degradation has been the major environmental problem occurring in different parts of Ethiopia that is indicated by the declining agricultural productivity. The underlying causes of land degradation are human induced land use/cover change i.e., clearance of vegetation cover, deforestation and forest degradation practices (Woldeamlak Bewuket, 2003) and Aklilu Amsalu, 2006))

Forest degradation and deforestation are driven by social factors such as growth in population that results in scarcity of land and other integrated natural resources. So, the demand for such basic needs enforces people to over exploit mainly of the forests and other natural resources. Therefore, forest degradation could be evaluated and described based upon the losses occurred to other forest integrated natural resources like soils, water, and other forest integrated bio diversities.

For example, the average annual soil loss rate nationwide was estimated at 12 tones over one hectare, giving a total annual soil loss of 1,493 million tones, the event that is partially attributed to human induced land use/cover change, mainly the occurrence of forest degradation. The soil erosion hazard is much higher for land under annual crop as compared to that under grazing, perennials crops, forests and shrubbery.

Even though, land under annual crop is covering only 13 percent of the country's area, it contributes to about 45 percent of the estimated total of soil loss from the country (MoARD and WB, 2007)

8.10 Forest- based Small Scale and Micro Enterprises

Forest based small scale enterprises were the major livelihoods of the community (pit sawing and carpentry for making household wooden furniture, harvesting and selling of building poles and collecting firewood and charcoal making, few handcrafts like making of basketry and traditional beehives and agricultural implements) next to crop production and livestock rearing practiced in the three *gandalee* (Gari, Jirenya and Kitessa) found in Guto Gida district.

Own observation and discussion with the communities in the study area showed that different forest based small scale enterprises were established as job opportunity for youths and sources of income for many poor households of the study area. On the other hand, the increasing number of forest-based small scale enterprises seemingly becomes one of the major causes of forest degradation. The situation has resulted in acute shortage of forest wood and non-wood products to the point where the traditional livelihoods are threatened.

Consequently, the prices of forest based raw materials, particularly construction woods, firewood; plywood and sawn timber for house building and wooded furniture (rural wooden chairs, tables and beds) have shown significant increase at the local market levels. Ultimately, the unprecedented increase of the small scale forest based activities would never escape the economic failure owing to shortage of valuable raw material supply i.e., the indigenous forest tree species. The finding of this study showed several causal factors of forest degradation.

Among the causes of forest degradation, urban sprawl and increasing illegal settlements inside and around the forest areas were found posing forest management problems persistently. Generally, as key informant interview confirms, lack of specific forest use right and holistic forest and other natural resource management

systems were the major factors causing forest use conflicts among different forest use stakeholders and parts.

8.10.1. Forest Based Livelihood Activities and Case Studies

According to FAO (1987) the term ” forest based” refers to all materials from the forest, and so includes not only wood but also the other materials derived from a forest habitat such as rattans, reeds and bamboos. Furthermore, environment friendly rural livelihood activities such as forest coffee production, forest honey, tapping trees for resin and other more materials of economic and socio-cultural significances could be referred as forest based livelihood activities.

Historical narrations and case studies confirmed that the area had rich forest resources with substantial old age indigenous forest species diversity forming diverse livelihoods for the local community. In contrast to the situation in the past, forest based livelihood conditions of the present days differ from the past three to four decades as many informants allegedly responded.

Box 2: Inspired and Successful Farmer- Bantii Aaga

Banti Aaga was 35 years old. He is married and has 4 children. Currently, he is living in Tsige village and works on forest based livelihood activities, mainly as a carpenter. He engaged on wood works as a major livelihood activity for about ten years. He began the work when timber products were plentiful. But with establishment of forest based microenterprise, the demand for timber products increased from time to time because many people engaged on woodwork and availability of electricity service for 24 hours that facilitates machine driven wood works throughout the year which increased efficiency of production of wood products.

The wood work machines seemingly have facilitated the frequency of furniture produced and the rate of production directly which in turn affected the volume of timber cut from the existing forest areas. He told that his income from sale of wood work products has increased 3 times as compared to the situation before when he used to produce wooden furniture using traditional hand tools. Accordingly, the estimated

income he used to earn from the sale of wooden furniture was about 900 ETB. The work was conducted by family labour, in which the members were assigned to specific part for the final work assembled as finished product. The major wooden items made by *obbo* Banti and his family include boxes, beds, wooden cabinets, doors & windows, chairs, etc. (See Figure 8.13).

Figure 8. 13: Carpenter Using a Power Driven Lathe

Photograph: © 2012
Mosisa Ararso.

For the question I raised regards the management status of forest resources in the area, the respondent said that there was no stakeholder responsible for managing the forest and integrated resources and everybody considers these resources as common pool resources. He also renowned the risk of degradation of indigenous forest tree species and integrated natural resources were apparent in the area requiring the involvement of communities and more other forest use stakeholders for sustainable management of the resources.

Thus, the sustainability of forest based livelihoods in the study area and surrounding urban areas should be maintained and forest based micro enterprises and sources of forest raw material supplies have to be monitored periodically. Again, different non-timber forest based activities should be encouraged as income diversification option

for ensuring household food security as well as alternative mean of forest management approach.

8.10.2. Hulling Wood Products; Charcoal Making and Firewood Sale

It has been a common phenomenon to see that all rural farm households' members visiting Naqamte town on duty or for any other purpose on market days, hauling wood products like fire wood, charcoal, pole and lumbers on their backs, heads and donkeys for sale.

This shows that, many poor people in the study area have few livelihood options but, 'the open access' forest based livelihood activities. The regular reliance of mostly, of the poor households so as to get their daily meal, which is from hand to mouth as well as a short term profit, apparently become the major cause of forest degradation.

In spite of the threatening paces of forest degradation, the local people optimistically continued forest based livelihood activities of subsistence quality. Such livelihood condition is usually expressed by a local proverb: *"boruu, guyyaa biraadha… Kan borii, boritu beeka"*_ which is literally mean "tomorrow is another day, hence, let it proceed accordingly." Such local proverb has inherently been perceived by the local communities and motivating them use the existing forest resources adversely. Most of the poor and destitute households reportedly said that they suffered untenable livelihood conditions and food insecurity. That is, the poor households had ability to grow few crops and own few or no livestock that enable them become resilient against the shock that arises from resource depletion.

Overall, such livelihood shocks play the leading role in enforcing the local destitute and poor households directly engage on forest product for domestic use and income generation. In contrast the reduced availability of forests and other natural resources, found to be one of the critical condition challenging the sustainability of livelihoods and food security status of the community. For example, the following forest based livelihood activities provided by the photographs further illustrates how different

forest use groups or stakeholders get involved in forest degradation endeavors, either knowingly or unknowingly (See Figure 8.14).

Figure 8. 14: Local People Participating in Charcoal Making and Firewood Sale

Photograph: © 2012
Mosisa Ararso.

As photograph (no.1) shows partially dried single stand of indigenous tree (*bakaniisa*) was prepared for making charcoal, after the trunk of the tree was cut and arranged in meter cubes. This is done to get an estimated amount of charcoal from meter cube of wood input. As local estimate shows, a person can obtain 3 to 4 smaller sacks (1 pack of charcoal has average weight of between 10-15 kg.) The charcoal containers or packs are called *madaabaraa xiqqaa*. Then, it is possible to estimate the amount of charcoal to be produced from 1 cubic meter of wood.

Photograph (no.2) shows few college students who live in Naqamte in rental kiosk, carrying bundles of sticks (firewood) they collected from the community and state forest compartments(Watcha-Tsige and Komto forest areas) to use for cooking. Photograph (no.3) shows a woman living closer to Komto forest, collecting firewood for domestic use as well as for sale using advantage of the open access to the forest use.

The last photograph (no.4) shows the same community members leaving around the community and the state forest compartments carrying packs of charcoal to Naqamte town for sale. According to the socio-economic survey conducted by Oromia Forest and Wildlife Enterprise (OFWE, 2009), the number of households and the total families residing inside and around *Wathcha-Tsige and Komto* forest blocks (plantation forest and natural forest compartments) incidentally increased due to

unprecedented urban-rural migration and settlement encroachments and expansion of the zonal town of Naqamte. The crude density of forest area was estimated to be about 3 persons per hectare (computed by dividing the total population of the sample *gandalee* by forest area in hectare.

According to existing information, more than 95% of the local community belongs to the *Leeqaa Oromo* of the *Maccaa* and *Tuulama*a descent. There are also some ethnic groups from northern Ethiopia, i.e., Amahra and Tgiray people who come to the area mainly during Emperor Hile Silassie and the *Derg* regime through legal population resettlement programs otherwise, through illegal ways.

Later on, a large number of farm households from Western and Eastern Hararge Zones of Oromia regional state were made to resettle in the area through the resettlement program of the regional state implemented in the recent past.

It is tragedy that the area is still welcoming both legal and illegal settlers at the expense of forest and woodlands ruin for agricultural land expansion and establishment of settlement and local villages. The area is known by mixed agricultural activity (farming system), in which crop production and animal husbandry (livestock production) become the major livelihoods of the local communities.

In addition, most of the farm households relay on forest based livelihoods of both timber and non-timber hand crafts, bee keeping and other forest timber and non-timber activities. However, firewood collection, charcoal making, cutting of forest trees for making farm implements, preparing poles for making houses and other constructional activities were identified as the dominant income generating activities so far documented. As observed during field survey, many the households had earth pits (*boolla cilee*) near their home gardens where they make charcoal. A person can also prepare traditional charcoal making place illegally in the wilderness. The traditional charcoal making underground hollows is prepared secretly when ever need arises hoping tree logs and wooded shrubs could be obtained from the surrounding state and community forests, thickets and woodlands.

The photographs used in this case study (figure 8.14) show the processes of forest based livelihood activities on regular basis. As photograph (no.1) shows traditional charcoal making inside earth pits. Photograph (no.2) shows forest site where logs and twigs are collected freely. Photograph (no.3) shows grass thatched house, which is one of the indicators of being a poor household with few livelihood options besides charcoal and fire wood selling.

Box 3: *Adde* Sabbi Guttataa

Figure 8. 15: Striving Woman Household Head

Photograph: © Mosisa Ararso, 2012

Adde Sabbi Guutata lives in Gaarii, one of the sample *gandalee* was ranked as the poor, based on the local wealth ranking standard set by the PRA participants. She was 45 years old and had 3 children. All of her children were students who she supports with necessary learning materials and school fee. She had a small plot of less than 0.5 hectare to cultivate maize, *teff* and barley for home consumption. *Adde* Sabbi has one ox and two cows from which she earns income.

Never the less, by engaging on forest based livelihood activities, *adde* Sabbi makes considerable amount of additional income from forest product sale like fire wood, charcoal, and few non-timber forest products. For *adde* Sabbi, the products she collects from Komto forest enabled her to overcome the livelihood constraints. But, since the past five years, her income from forest product sale got decreased and adversely impacted the food security status of her family.

8.10.3. Production of Lumber and construction/Building /poles

Many of the local people and others from urban area come to the forest area to engage on woodwork like curving and preparing pole for different construction and household utensils. These people use traditional big saw handled by two men for cutting standing tree and trimming logs. The forest thefts use automatic saw of lower sound for felling trees usually at night time. They also use forest fire for preparing fast foods, cutting wild honey, as protection against attacks of wild life and to look for new trails inside the forests (thicket lands) for selective exploitation of tree species like *Cordia african*, *Angeneria adlof federici* etc. (See Figure 8.16).

The traditional camp fire in the forest may stay burning for several days and expand into forest fire. It is observed that the incidents of the forest fire normally occur during dry season due to encroachment of the local people into the forests for charcoal making, wild honey collection and deliberate burning of forests and woodlands for agricultural land expansion. The contradiction is that after forest fire, no stakeholders need to assess the extent and degree of damage as quickly as possible to decide whether burned forest-timber or non-timber can be salvaged or not. Therefore, attempts to assess the damage of forest fire from the ground have to be supported by any participatory assessment and monitoring of forest resources conditions to be arranged in advance.

Figure 8. 16: Cutting and Preparing Construction Poles

Source: field Survey, March, 2012

Photograph: © 2012
Mosisa Ararso.

8.10.4. Traditional Beehive Making

Forest based handcraft has been one of the most accessible livelihood activity for the majority of the poorer households and it has generated income which contributed to their food security. On the other hand, shortage of non-timber forest products and indigenous knowledge for extraction of the valuable products from the forests negatively impacted many of the households engaged on forest based activities. For example, it is reported by one of my key informant that some times in the past the local people used to bind house rafters by stripping bark of different indigenous plant species of the forest ecology. Most of the local people by and large used to collect wild epiphytic plant species which is locally known as *Tiliacora troupinii (hidda liqixii)* for binding the house beam free of charge.

Today, it seems that such practice became discarded and the local people are forced to use a material substitute of similar utility, but with different accessibility of use (here cost is associated). This is supposed to be occurred due to the sharp dependence of increasing population on limited natural raw material supply by the forest resources found in the study area. In addition, lack of wood manufacturing industry and institutions and organizations designated to promote such handcrafts can be taken as constraints which hamper the competence of non-timber forest service to the needs

of rural livelihood intensification. Even though, it seems many members of the community have stopped to engage on traditional handcrafts like basketry and making of beehives, occasionally there are some people continued to earn income from handcraft products as a family business (See Figure 8.17).

Figure 8. 17: Making of Traditional Beehives for Sale

Photograph: © 2012 Masisa Ararso.

8.10.5. Income Diversification and the Eucalyptus Dilemma

Income diversification is the process by which different households are enforced to opt for new livelihood activities in order to widen their income sources. Agricultural diversification is concerned with producing a wide variety of crops and livestock and their products, the transformation of one farming system from subsistence to commercial activities and many more off farm activities.

The livelihood diversification also includes a complete transformation of agriculture based- livelihood activities to non-farm activities and providing labor for sale. As focus group interview result shows, forest based livelihood activities were considered as the major source of income for the local communities. The need for income diversification by the communities in the study area seems a survival response to shocks and stresses that arise from environmental resource degradation.

As reported by the farmers, eucalyptus was the primary choice due to its merits of rapid growth and wood production, coppicing ability, its demand for diverse uses that could generates consistent income. Similarly, the economic offering of eucalyptus is

widely stressed by Zenebe and et al. (2007) in which the continued domination of plantation forest uses for fuel and construction in the years to come. On the other hand, it is widely perceived by the local communities as having negative impacts mainly on other plants (under growth), soil fertility and sustainable stream flow and availability of water resources in the area.

The existing perception among the community about eucalyptus trees seems comparable with perception of others found elsewhere in the country. In addition, the local people though that of eucalyptus plantation has hindered the survival strategies among forest biome and integrated bio-diversities and water- soil conditions of the area. Hence, the farmers often utter, *"Baargamoon lafa gogisa, biqiloota biroo nidhora"*. This means that eucalyptus species are perceived among the farmers as a curse because it lowers underground water level and cause degradation of undergrowth herbaceous plants and forest integrated bio-diversities. Yet, there are quite a number of research results indicating eucalyptus species as competent users of water. For example Davidson (1989) reported that eucalyptus species in the study area could produce 46.6m^3/ha/year depending only on the then annual rainfall of about 2,158mm. Conversely, under the same condition, he reported bio-mass production from acacia, coniferous species and broad leafed species were 16m^3, 16.4m^3 and 12.4m^3respectively. This indicates that eucalyptus produces the highest amount of bio mass which is economically profitable.

Moreover, Davidson (1989) also reported that eucalyptus uses only 785 liters of water for producing one kilogram of biomass, while cotton, coffee, banana consume about 3200 liters of water each, and sunflower, field pea, cow pea, soybeans consume about 2400,2000,1667 and 1400 liters of waters respectively. This empirical finding again shows how much eucalyptus tree is efficient user of water itself. Incidentally, all the existing literatures as well as the findings of current study suggests that eucalyptus has short term economic benefits in addition to its role for domestic fuel energy. Otherwise, it can be taken as non-friendly stands for the entire indigenous under growths and other bio diversities that keep the soil fertile and moist.

8.11 Analysis of Forests and Other Natural Resource Degradation

The study area originally was covered with dense *montane* forest, woodland and plantation forest of extensive areas with huge quantities of forest species and other natural resources[5]. Now days, the land transformation (land use/cover change) is perceived as the major event caused by human induced activities that arises from an increasing human as well as livestock population pressure. As far as my observation is concerned, population dynamics and the unsustainable forest resource and other natural resource uses presumably were the major factors threatening forest resources of the study area.

Overall, own observations and result of PRA also confirmed that diverse indigenous plants and tree species compositions of the natural forests have been severely depleted to such a great extent that only smaller forest and woodland areas remained as category of undisturbed high forest patches surrounding a volcanic hill of Komto and along river valleys of *Hadiya, Ukke, Laku, Calalaqii, Lugo, Laga-harre, Gorba,* and across Komto-Wolene mountain ridge.

Yet, there are also considerable amounts of state plantation forest compartments of highly disturbed and fragmented forest stands merely survived adjoining Naqamte town. The ever increasing population pressure, land use and land cover dynamics, and unsustainable rural development interventions as well as an increasing forest based livelihood activities (forest based micro enterprises) were intervening factors of forest degradation and shortage of forest products. Moreover, the natural and indigenous forest patches found on the top of Komto-Walane ridge and strips of forests found along Hadiya and Laku rivers became highly disturbed and adversely affected the forest based livelihoods of the communities.

Indigenous forest trees are found along the course and of the main rivers and streams (as riverine forests) have faced severe forest degradation and species loss.

[5] In depth interview with *Obbo* Dhugasa in H/ Fayisa, Feb.2012

Competition among the local people for farmland along river banks and wetlands were also frequently reported by forest managers and stakeholders as dilemmas in rural development interventions. The remaining woodland resources, different tree and plant species, shrubs, tickets and interwoven epiphytic herbs along escarpments of the higher altitudes form forest based livelihood potential for considerable numbers of farm households. More than half of plantation forests found in scattered compartments and woodlots of varying sizes throughout the agro-climatic zones (low land, midland and the highland) have significant roles of generating diversified income for almost all studied households in one or more diverse ways.

Out of the total exotic plantation forests, considerable eucalyptus woodlots were owned by rural farm households and absentees living in urban areas of Naqamte and the surrounding district towns. Furthermore, widely scattered on-farm trees and few old age forest growth of indigenous tree species and exotic species are found on privately owned farmlands were reported to give diversified contributions for many people living in the study area.

Generally, personal communication with elders and own observation confirmed that forests in the study area have been perceived by the local people and peri- urban communities as the huge source of timber and non-timber products. Most of the local people apparently replied that they had market access to buy woods for constructional as well as fuel energy from private wood/timber/product vendors and micro enterprises accredited to work in prearranged grouping.

Forest product sellers in the town (indirect forest users) get access to these raw materials through illegal wood cutters /wood thefts/ from Watch-Tsigie-Komto forest compartments. This illegal forest raw material (product) marketing is also reported to be one of the major causes of forest degradation apparently threatening the sustainable forest growth and its provisions.

8.11.1. Causes of Forests Degradation and other Natural Resources

Major causes of forest degradation and other natural resources, the dynamics of land use/cover and its impact on livelihoods of the community was assessed using the PRA trend analysis technique. To confirm the trend in land use/cover change, the time series (temporal divisions) of three consecutive gaps (at present, the past 20 to 30 years, and the distant past 30 to 40 years back) were fixed deliberately.

Then, using the PRA sessions, awareness creation on some basic PRA tools, techniques and procedures i.e., the technical manipulation of the PRA exercises was made brief. For data collection and analysis of the trend in forest degradation, locally available materials such as coffee beans were used. About 10 coffee beans were made ready to represent the rank of prevailing problems. Accordingly, the problem with the highest incidence was represented by 10 coffee beans and the problem with the lowest prevalence is represented by a coffee bean. A further probe was conducted regarding the causative factors of forest cover change, impacts of forest degradation and the forest based livelihood activities of the communities.

Then, it was identified that the local forest resource has been degraded in the past three to four decades, which is also confirmed by field observations of the status of the forest coverage and major forest species composition i.e., indigenous forest species degradation. Overall, the prevalence loss of wild life, non-timber forest products, soil fertility, crop productivity, livestock productivity, and depletion of grazing land as well as farm lands were found to be the major consequences of forest degradation. An increased population has led to accelerated rate forests and woodland clearance which was used for various forest products and expansion of farm land. Consequently, the existing land for agriculture has reduced as forest is degraded and soil erosion becomes severe.

Some prominent gullies are observed expanding onto farmlands, like the one shown in photograph below, which is purposely selected and measured at a point/area/ having about 5.75m width and 3.55m depth (See Figure 8.16). Hence, this study uncovers that increasing population is the principal cause for declining forest

products accessibility and forest based rural livelihood activities necessary in ensuring food security at the house hold and community levels.

8.11.2. Change in Forest Cover and Impacts of Forest Degradation

It is clear that different supplementary methods and techniques are used for investigating the land use/cover conditions. To assess the causes of forest degradation and overall impacts of forest degradation, different quantitative and qualitative methods were used. Definitely, the forest cover change (magnitude of forest degradation) and the impacts of forest degradation were assessed through the PRA techniques of data analysis like pilling, scoring and direct ranking (See table 8.18).

Table 8. 15: Temporal Analysis of Forest Cover Change and its Impacts

S/n	Causes of forest & other natural resource degradation & the impacts perceived	currently	20 to 30 years ago	30 to 40 years ago
1	Forest degradation	**********(10)	******* (7)	**** (4)
2	Forest stream flow variability	******** (8)	******* (7)	**** (4)
3	Wildlife and their habitat	********** (10)	********(8)	***** (5)
4	Shortage non- timber forest products	********** (10)	******* (7)	***** (5)
5	Soil fertility(soil erosion)	**********(10)	****** (6)	**** (4)
6	Crop productivity	**********(10)	******* (7)	**** (4)
7	Livestock productivity	**********(10)	***** (5)	*** (3)
8	Land availability for cultivation	**********(10)	******* (7)	***** (5)
9	Shortage of Grazing land	**********(10)	******* (7)	*** (3)
10	livestock population	***** (5)	****** (6)	****** (6)
11	Human population	**********(10)	*********(9)	******* (7)
12	Food security problem	**********(10)	**** (4)	*** (3)
13	Off farm livelihood options	**** (4)	****** (6)	****** (6)
14	Forest based livelihood status	********** (10)	****** (6)	***** (5)
15	Lack of Indigenous forest and other resource management approaches	******* (7)	***** (5)	**** (4)

Source: Field survey, 2012(Partially adapted from Gubbels and Koss (2000)

Note: *Coffee beans have been used to study the trend*

- Ten coffee beans indicate the highest prevalence (**********)

- One coffee bean, indicating the lowest prevalence (*)

As indicated in (table 8.18), there are considerable impacts ascribed to forest degradation and the declining status of integrated natural resources. As the finding of the PRA result shows, the perceived level of forest degradation before 30 to 40 years

was qualitatively evaluated and scored (4/10) i.e., below the average score, which confirms the lower magnitude of forest degradation of that time. Again, the lower magnitude of forest degradation perhaps indicates the lower population pressure and the local people's strong devotion to ethics of indigenous forest and integrated environmental resource management practices.

On the other hand, the magnitude of forest degradation "currently" the recent past "20 to 30 years ago "is scored (7/10) and (10/10) respectively. The highest extreme score goes with the highest magnitude of forest degradation and incidence of impact of forest degradation of the current days. Similarly, the descriptions of the remaining points (2 to 15) could be given as per data analyzed in table 8.15

In general, the increasing population pressure is identified as the underlying cause of forest degradation manifested through diverse human practices i.e., the increasing dependence of the local people on forest based activities for ensuring their household food security status. Due to imbalance of population growth and existing forest supply, the households' as well as communities' incomes from forest based livelihood activities become reduced considerably.

8.12 Forest degradation; Soil Erosion and Gully Formations

Clearing of forests for different purposes and economic benefits such as fuel woods, constructional woods and poles, commercial charcoal production, agricultural land expansions and settlement encroachments towards indigenous forests and woodlands has impacted the forest based livelihoods of the communities. Amounts of timber and non-timber raw material obtained from the forest and other natural resources such as water resources, soil resources, different fauna and flora (bio diversities) supporting the livelihoods of the local people become inadequate. Land degradation due to deforestation and forest degradation appears a common phenomenon in the study area.

There were some indicators that confirmed the existence of forest degradation such as tree and plant roots exposure to the surface, river bank side erosion the formation of

gullies and badlands as the result of severe erosion rills on cultivated plots (See Figure 8.19).

As my key informants[6], who has been leaving in Jirenya, Guto-gida district near to the elongated gully (See figure 8.19) said, the gully was not in a place four decades ago, but dry weather road that connects Naqamte town with Anger Guttin resettlement sites and the Anger Dhidheessa Mechanized State Farm of the Derg regime. However, the recent observation of the area shows, the gully was larger and covered the former road side farmlands and forest fringes due to growing deforestation and forest degradation since the past four decades.

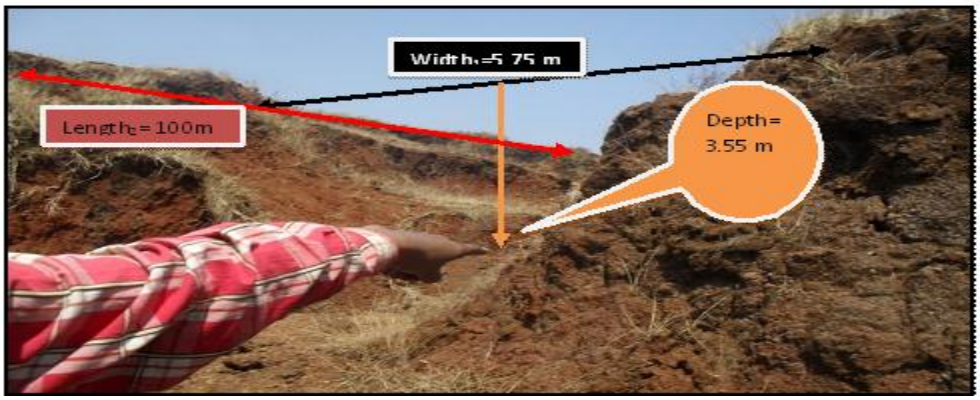
In my observation through transects I confirmed that most of the former common grazing lands in Jirenya (one of the *gandalee* of the study area) were highly degraded and vast areas of farm plots owned by majority of the surveyed households changed into gullies, rills, stoniness and degraded lands. Gullies indicate the presence of physical degradation as the result of depletion of vegetation cover. Attempts have been made to measure the volume of soil loss and the area covered by the gullies using partially adopted formula implemented by Stocking and Murnaghan (2001) as follows:

Volume of soil lost= Cross Section Area (m^2) X Depth (m)
Cross section Area=1/2(Av. width W1X Av. LengthL2X Depth (m)) = Soil loss (t/ha)
Soil loss= m^3/m^2x conversion to t/ha. Thus, the soil loss from the specific sample site (within $100m^2$) was found to be ½(5.75m x 100m x 3.55m) = $1020.625m^3$, i.e., the same as ($1020.625m^3/100m^2$= 10.20625t/ha). So, this trial produced about 10.21t/ha of top soil loss within the past three decades attributed to degradation of forest vegetation induced by diverse human activities.

[6] ObboYadasa Bultum, Jirenya (2012)

The amount of soil loss estimate was by far lower that the erosion rates estimated at 130 tons/ha/year for crop lands and 35 tons/ha/year average for all lands in the highlands reported by Ethiopian Highland Reclamation Study(FAO, 1986).

Figure 8. 18: One of the Gullies Identified in the Study Area



Photograph: © 2012, Mosisa Ararso

Moreover, the AGERTIM method (Assessment of Gully Evolution Rates through Interviews and Measurements) was used following Mitiku et al. (2006) for this study. This technique included measurements of short-term gully occurrences and historical narrations of incidents as well as Participatory Rural Appraisal (PRA) and key informant interview. Overall, The AGERTIM method was used as partially adopted for analysis of quantity of the soil loss and farmers' perceptions of the properties and agents involved in the occurrence of the gullies. I believe that this simple trial is useful for creating in depth understanding of impact of forest degradation that triangulates the findings of impacts of forest degradation obtained through historical narrations and it is also useful as a tool for supporting the qualitative research methods as well.

8.12.1. Local Perceptions on the Causes of Forest Degradation

Forest degradation could be seen occurring differently based up on the nature of factors or agents of forest degradation and the objectives behind the causal factors. Hence, the following two major causes of forest degradation are identified in the study area.

The immediate causes of forest degradations occurs when people exert pressure on immediate environmental resources directly or indirectly so as to obtain the short term economic benefits and other benefits unsustainably. The underlying causes include complex integrations of livelihood activities and people-environmental resource nexus going on process. Nevertheless, at micro level communities' perceptions of the causes and impacts of forest degradation could be a proper forest management approach.

The PRA result shows that the causes of forest degradation were identified and ranked accordingly. Hence, out of the seven causal problems listed, charcoal making and firewood collection is ranked the first followed by three livelihood activities; expansion of agricultural lands, illegal settlement encroachments, increasing demand for forest product (mainly timber products) are ranked the second important ones in causing forest degradation. The Participants selected population factor as the third important in causing forest degradation. The fourth and fifth important factors are overgrazing and natural fire (See table 15).

Table 8. 16: Pair wise Ranking of the Causes of Forest Degradation as Perceived by the PRA Participants

Impacts	1	2	3	4	5	6	7	Count	rank
1	x	2	3	4	1	1	1	3	3
2	1	x	3	2	2	2	2	4	2
3	3	3	x	3	3	3	3	6	1
4	1	4	3	x	4	4	4	4	2
5	1	5	3	5	x	5	5	4	2
6	1	2	3	4	5	x	6	1	4
7	1	2	3	4	5	6	x	0	5

Source: Field survey, 2012

Note: 1= Population increase, 2= expansion of agricultural lands, 3= charcoal making and firewood collections, 4= illegal settlement & encroachments towards forestlands, 5= increasing demand for timber products, 6= over grazing 7= natural forest fire.

8.12.2. Indicators and Impacts of Forest Degradation

It is known that forest degradation has diverse impacts on biophysical (environmental resources) as well as socio- economic and cultural conditions of the forest dependent communities in particular. Similarly, the major impacts of forest degradation are identified based on the then prevailing insight of participants of the PRA and FGD held during the field survey. The following are the major indicators as well as impacts of forest degradation assumed for the pair wise ranking exercise; reduced crop& livestock productivities, reduced stream and river discharges, shortage of biomass for fuel energy & woods for constructions, reduced non-timber products, destruction of wildlife habitat, dilapidated forest based income sources mainly for the poor households and the overall prevailing issue of the household food insecurity. So, the finding of this exercise shows that dilapidated forest based income sources for the poor households (6), reduced crop& livestock productivities (1) and household food insecurity(4) and/or reduced non-timber products(7) were ranked 1st, 2nd and 3rd indicator of the impact of forest degradation respectively (See Table 8.16)

Table 8. 17: Pair wise Ranking of the Indicators and Impacts of Forest Degradation as perceived by the PRA Participants

Indicators/Impacts/	1	2	3	4	5	6	7	Count	rank
1	x	1	3	1	1	1	7	4	2
2	1	x	2	4	5	6	2	2	4
3	1	3	x	4	5	3	7	2	4
4	4	4	4	x	5	6	7	3	3
5	5	2	5	4	x	6	7	2	4
6	1	1	1	4	1	x	1	5	1
7	7	7	3	4	7	6	x	3	3

Source: Field survey, 2012

Note: 1= reduced crop& livestock productivities; 2= reduced stream and river discharge; 3= shortage of biomass for fuel energy & woods for constructions; 4= reduced non-timber products; 5= destruction of wildlife habitat; 6= dilapidated forest based income of the poor households; 7= household food insecurity

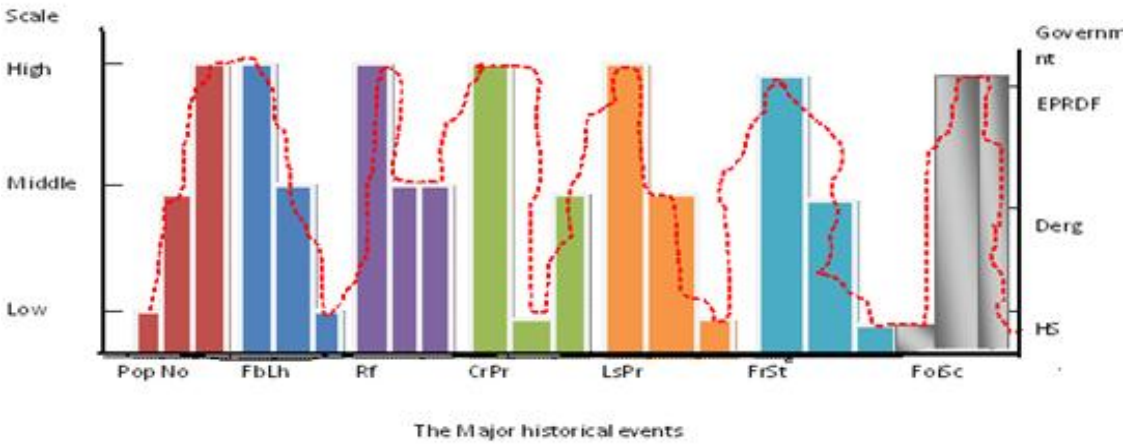
8.12.3. Trend Analysis of Causes and Impacts of Forest Degradation

PRA exercise was conducted to show causes and impacts of forest degradation over times. The exercise was conducted according to the following steps. In the first place,

charts were prepare to show the trend lines i.e., on the x-axis the time period then the y-axis is represented by 'high', 'middle', and 'low' for describing ; population status, human activities, rainfall pattern, crop productivity, animal population, forest degradation, and food security status as perceived by the participants of the varying governmental periods in Ethiopia .

Hence, analysis and interpretation of causes and impacts of forest degradation was done empirically. As indicated by the figure 8.19, the scale of change in forest based livelihood*(FbLh)* seemingly in descending level or scale; that is (High, *EPRDF*),(Medium, *Derg*) and (Low, during *HS*). In this case, the high level of existing forest based livelihood options during the present days (the *EFDRE* government indicates an increasing short term forest based income at the community and households levels. On the other hand, it shows the higher pressure and continued forest use competition being threatening the remaining forests of the study area.

Figure 8. 19: Histogram and Trend Line Illustrating Impacts of Forest Degradation and Rate of Changes of the Variables



Note: pop No- Population Number, Fb Lh – Forest based Livelihood Options, Rf- Rainfall, LsPr-Livestock Productivity, FrSt- Forest Status, FoSc- Food insecurity

Then, using the trend analysis bar and line graphs, explanations were given on each variable regards to the underlying problems, suggested solutions and how well these solutions worked.

The trend analysis established the current situation of the forests against the past. Then it is arranged in a way that forest degradation has been the severe problem which needs further investigation in all dimensions of the historical perspectives. Thus two land mark years with an interval of ten years was fixed for this purpose (See Table 8.18)

Each incident and its impact were technically analyzed following the PRA exercise implemented by (Narayanasamy, 2009). Accordingly, the problem with highest frequency is represented by the maximum proportion of coffee beans and vice versa, for the lowest prevalence of the problem under consideration. Overall, the rating scale that ranges between 1 and 10 counts of coffee beans is fixed representing the lowest and the highest scale respectively. Then, the absolute score is merely converted and described in percentage.

Table 8. 18: Trend Analysis of Forest Degradation and Associated Impacts as Perceived by the Local Communities.

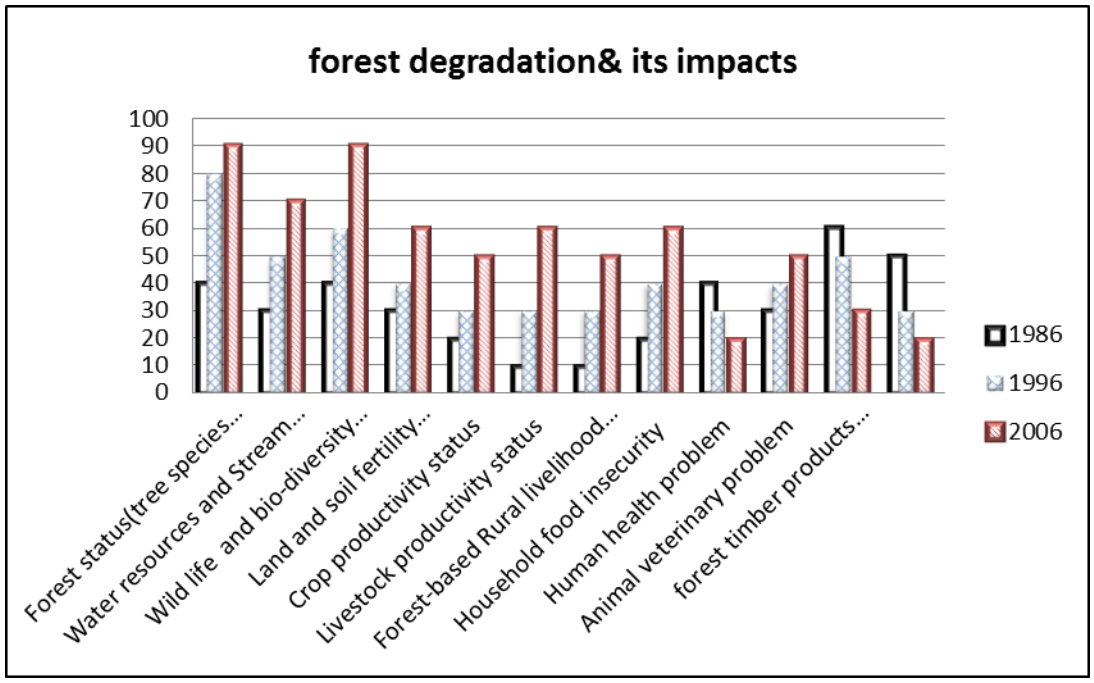
Issue	**year**					
	1986		1996		2006	
	number	%	number	%	number	%
Forest status(tree species diversity status)	4	40	8	80	9	90
Water resources and Stream shortage	3	30	5	50	7	70
Wild life and bio-diversity problem	4	40	6	60	9	90
Land and soil fertility problem	3	30	4	40	6	60
Crop productivity problem	2	20	3	30	5	50
Livestock productivity problem	1	10	3	30	6	60
Forest-based Rural livelihood activities	1	10	3	30	5	50
Household food insecurity	2	20	4	40	6	60
Human health problem	4	40	3	30	2	20
Animal veterinary problem	3	30	4	40	5	50
forest timber products availability	6	60	5	50	3	30
non-timber products availability	5	50	3	30	2	20

Source: Field survey, 2012

Note: Rating scale (1-10: 1= the lowest& 10= the highest score).

The rating scale is converted into percentage to show the trend of change of each theme. The illustration of the temporal comparison of the impacts of forest degradation is also presented in detail (See Figure 8.20).

Figure 8.20: Graph of Forest Degradation and Its Impacts

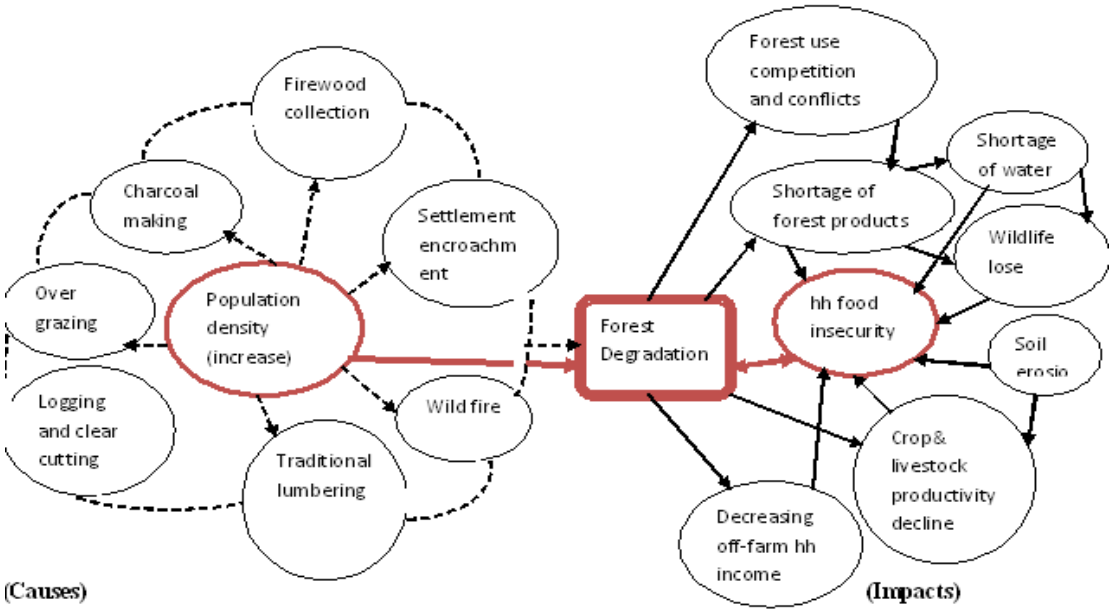


8.13 Forest Degradation and Food Insecurity: A Cause and Impact Diagram

Cause and impact analysis is a form of flow diagram. It helps to understand an issue in a complete form. It can be used to understand people's perception of causes and impacts of a problem as well as flow of events (Narayanasamy, 2009).

On technical drawing of the diagram, I assisted the participants to write causes of a problem on separate cards and place the cards on the left hand side of the 'problem' and to show the linkage between the causal factors if any. The participants were also asked to write the impacts on separate cards and put on other side of the 'problem' and they did it well. Lastly, the conceptual framework of the diagram was depicted for consultation (See Figure 8.21).

Figure 8. 21: Cause and Impact Diagram



Source: Own Formulation, 2012

It is to be noticed that Population growth (increasing population pressure) appears the root cause for unsustainable human induced livelihood activities which are integrated and forming vicious cycle, leading towards forest degradation. Population density where the broken arrows radiate out from, directed towards forest degradation as shown by continuous red arrow. On the other hand, the impact side has household food insecurity at the center of all the outer smaller centers of forest degradation effects which simultaneously interconnected with each other. The conceptualized diagram depicts the circle containing forest degradation just directed towards household's food insecurity and the vice versa. The conceptualized cause and effect diagram becomes realized in that at the center of all causes and indicators of forest degradation is increased population size which requires optimum resource uses.

As the result of the ever increasing livelihood competitions have led to the unprecedented degradation of forests and integrated natural resources. Hence, household food insecurity and the dwindling livelihoods of the communities became both cause and impact of forest degradation as specific to the study area.

8.14 Narration of the Forest Condition and Impacts of Forest Degradation

Focus Group Discussion on forest covers change, causes of forest degradation, and impacts of forest degradation on rural livelihoods and in ensuring house hold food security were held in two selected clusters or sample *gandalee* (Haro-fayissa and Gari). The issues rose for discussions were historical narrations of the forest cover status of the past and the present, the driving forces of forest degradation and impacts of forest degradation

Information collected through an in depth interview and discussion with the local elders during the PRA sessions revealed that the area was largely covered by natural forests some decades ago. The forest was habitat of wildlife including amphibians, birds, arboreal, and mammals of different types. From the forest rise many head streams and small rivers such as *Laku, Hadya, Laga hare* and many others. There were also wetlands full of water and reeds (‘*Caffee*’- Cyprus Spp.) The local people used to thatch their houses using reeds (*caffee)* grown at bottoms of forested hill slopes and along streams and river courses.

Currently, the former forest areas have been changed into agricultural lands for cultivation of subsistence crops. Long standing communal grazing lands were privatized and became private landholdings causing acute shortage of grazing land so as to continue with traditional cattle rearing methods commonly known among the *Leeqa* of East Wollega. The former cereal crop farming system and land use and land cover structure of the study area was found to be transformed into woodlots (eucalyptus trees plantation) and *chat* plots.

Regarding the change detection and analysis of the study area, the existing land use/ cover is given in table 8.19. Out of the total land use/cover types, arable land comprised of about 43% followed by cultivated land and grazing land which comprised of about 34% and 8% of the total land use/cover respectively.

On the other hand, land use/cover of miscellaneous values comprised about 5% of the total land use/cover type. Forest land had about 4.5% of the total percentage distributions of the land use/cover types followed by bush and shrubs, and cultivable land of about 3% and 2.7%, respectively.

Table 8. 19: Land Use/ Cover Classification of East Wollega Zone

land use/cover type	Area(ha)	Area Coverage (%)
Arable land	833567.6	42.87
Cultivated land	667917.8	34.32
Grazing land	146,702.10	7.54
Forest land	86700.51	4.46
Bush and Shrubs	57980.2	2.99
Cultivable land	52931.2	2.72
Miscellaneous	100080.9	5.1
Total Area	1945880.31	100

Source: ARDO, 2012

Furthermore, own observation of the study area showed that agricultural land expansions and settlement expansions sprawl of new villages, development and expansion of district administrative towns, secondary service and market towns and the development of roads and other infrastructures, have been impacting the local forest resources severely. A continuous deforestation of woodlands and forest degradation also remained the big challenge activated by population pressure, deteriorating livelihood assets and the prevalence of food insecurity at household level.

8.15 Causes of Households' Food Insecurity

In this Section, Matrix scoring which enables to attempt institutional analysis based on multiple indicators was used. Procedure for analysis of the problem under consideration include selecting the sample *gandalee*, listing of the major problems along the first column of the matrix, assigning score against each of the problems and sum up, score and ranking.

Accordingly, out of the total problems listed, decline income from forest based activities are selected the primary cause of house hold food insecurity followed by shortage of agricultural inputs and decline in crop and livestock productivity considered respectively out of the total problems listed. On the other hand, cultural barriers (8^{th}), crop damage by climate variability (9^{th}) and crop damage due to wild animals ranked the last (10^{th}) respectively. Thus, we can say that the exercise shows the best fit between existing scholarly ideas regards food security problem, and the impact of environmental resources degradation, i.e. the forest resources at large.

Furthermore, the exercise could be evidence for the declining conflicts among wild animals and the local people that stayed as serious problem rose by farmers until sometimes the past three decade. This argument again supports the general supposition of forest degradation and its considerable impacts on wild animal and their habitat.

Table 8. 20: Matrix Scoring and Ranking of Causes of Household Food Insecurity.

	Sample gandaalee							
Causes of household food insecurity	D/kom too (15)	Gaarii (15)	G/gidd aa (15)	H/Fay isaa (15)	Jireny aa (15)	T/Tsig ee (15)	Total	rank
Reduced soil fertility	12	13	14	12	13	11	75	4
Decline in crop livestock productivity	11	14	14	13	14	13	76	3
Decline income from forest based activities	14	14	14	13	13	11	79	1
Landholding insecurity	8	9	7	10	8	9	59	7
Shortage of farmland	10	12	13	12	12	11	70	5
Shortage of agricultural inputs	12	13	13	12	14	14	78	2
Poor agricultural land management & farming practices	7	13	14	11	12	12	69	6
Crop damage due to climatic factors	6	5	6	7	8	9	41	9
Crop damage due to Wild animals	9	7	6	5	6	7	40	10
Cultural factors(religious and holiday ceremonial & marriage events	7	8	7	8	6	6	42	8

Source: Field Survey, 2012

Note :(I) each perceived cause of food insecurity is scored against 15

CHAPTER NINE: TRADITIONAL AND CONTEMPORARY FOREST AND OTHER NATURAL RESOURCES MANAGEMENT PRACTICES

9.1. Introduction

Leeqaa tribes are among Maccaa and Tuulamaa Oromo who live in the western parts of Oromia region, around Naqamte and Dambi Dolloo areas. In this chapter, forest management and some natural resources of the past and the existing modern management approaches that have been implemented by different institution and stakeholders were remarkably surveyed.

9.2. The Oromo Eco Theology: Traditional Forest and other Natural Resource Management Practices

The Oromo Eco-theology teaches a positive relationship between *Waaqaa,* humanity and nonhuman creations. So, it is thought to have the capacity to address the environment and developmental problems. It is still widely accepted conviction that the Oromo Eco theology is mainly concerned with the nature of *Waaqaa*, spirits, beliefs and the relationship between *Waaqaa* and humans, and between humans and the natural environment (Workineh, 2005). In the subsequent paragraphs, attempts were made to show the importance of indigenous socio-cultural institutions in conserving the environmental resources.

For Leeqaa communities, the world consists of three elements: *Uumaa, Ayyaanaa* and *Safuu* i.e., the moral codes according to which events take place. These elements are based in 'words', 'things', and the enter relations among them that hold the created universe altogether. For example, *Ayyaanaa* is an ideal thought through which *Waaqaa* expresses himself and his creations. *Uumaa* is perceived as creator and *umamaa* refers to *God's* entire physical world (*Waaqaa*'s creation) respectively. *Safuu* is basically an ethical principle by which human actions are judged as right or wrong (Gemetchu, 1993).

The Oromo eco-theological worldview is complex; however, there are some basic ethical principles protect natural resources. For example, axing the sacred trees is

violating the will of *Waaqaa*. It is wrong to cut down such trees. In particular, Sycamore (*Odaa*) is symbolized as an auditorium *(Galma*) used for meeting and respected. As my key informant told me, it is traditionally accepted that 'sacred trees whisper', even for if forest smugglers try to chop down their branches. It is believed that cutting sacred trees is resulted in annoying the *Waaqaa's* spirit and that may cause death to doer of the action.

On the other hand, it narrated that the leeqaa and other communities in the study area used to perform prayer ceremonies besides permanently flowing rivers, by the side of big mountains, hills, and trees. According to the teachings of the Oromo religion, such natural resources and objects are viewed as sacred and are well protected. There are ethical rules which discourage cutting down the sacred trees and reckless deforestation and forest degradation. The depletion of a species to the point of extinction is strictly forbidden and ethically wrong (*safuu)*. Currently, however, only some forests and integrated natural resources around *Qalluu* residences (*Masaraa Warra Qaalluu*), like springs, saline ponds *(hora)*, sacred forest species and wildlife are left intact (own observation).

9.2.1. The *Gada* Rituals: *Buttaa, Irreecha* and Indigenous Natural Resources Management Practices

9.2.2.1. Buttaa

Results of key informant interview showed that the forests and other natural resources of the study area had been under control of the Leeqaa communities. The *Gada* and traditional institutions had been managing and conserving the existing natural resources, until the last *Buttaa*- one of the rituals proficiently practiced by the then *Maccaa* Oromo, almost a century ago (*Jarra tokkon dura*). *Buttaa* is one of the Gada ceremonies in which the respected intermediaries (the *Qaalluu* and the *Qaallittii* get together for prayers for "almighty God-"*Waaqaa"* and the mother Earth-"*dachee"*. According to my key informant, before the *Buttaa* festivity, the *Qaalluu,* have to stay nine days and nine nights in the wilderness of Montane forests (mountain jangle forest areas) and pray forgiveness of all indulgences for the communities and himself.

The practice of *Buttaa* ceremony which is called *tulluu bahuu/irreesa tulluu (i.e.*, climbing up a hill slope for paying) starts in the first day. Then, *malkaa bu'uu/irreessa malkaa* (going down to a river valley) ceremony will take place. On the ceremony, crowds of people are expected to accompany the *Qaalluu* carrying green branches of spiritual forest trees, herbs and grasses; singing and dancing cultural songs.

Markedly, the wetlands and streams from the upper slopes exist in plenty wherever mountain forests are supposedly accelerating the infiltration rates for recharging associated wetlands and the down streams. In short, traditional institutions, religious and cultural practices seem have contributed to the sustenance of forest and integrated natural resources as well as the adoption of indigenous knowledge as important input for the holistic resource management arrangement. Therefore, the lessons drew from narrations of traditional resource governance seems very essential for addressing the existing problems of forest and integrated natural resources degradation and the ongoing severe loss.

9.2.2.2. Irrecha

Irrecha is a special ritual which had been practiced by the Leeqaa, along the Hadiya River and the saline ponds of Komto (*Hora Komto*), which is currently dried up due to increasing loss of indigenous forest species. According to my key the local community used to celebrate *Irrecha* twice a year. The first celebration is scheduled to be held at the onset of spring season *(Afraasaa*) i.e., very important for retrievals of forest fodder and grasses for livestock grazing and loosen the soil for farming until the onset of the summer rains (Rooba-*gannaa*).

Secondly, towards the end of rainy season and in autumn during when relatives and people living at distance places could join for religious and cultural practices. The availability of such natural resources like forest and integrated herbs and green plants seems necessities for *Irrecha.* It requires such resources as grasses, flowers, wetland growth. Hence, *Irrecha* can also serves as one of the green revolution strategies working toward mitigation of currently threatening problems of the global climatic

change through conservation and controlling of the forest and integrated natural resources.

9.2.2. The Qaalluu Institution

The concept “Qaalluu” refers to both an institution and the mediator i.e., between Uumaa and Uumamaa, as perceived by the local community. The Qaalluu leaders have been acting as custodians for all the institutions of the Oromo. Such institutions were abandoned, in spite of their rational governance on the socio-economic as well as environmental resources of the community. As far as researcher’s observation is concerned, the declining decision making power of the Qaalluu institution and violation of Safuu were perceived to be the major causes of forest degradation and depletion of integrated natural resources. Nevertheless, the practices of the Qaalluu institution are intact and most respected among the Borana and Gujii Oromo in different ways unlike the Qaalluu institution that exists elsewhere in Oromia regional State. This institution has been involved in environmental resource (forest and integrated natural resources) management as direct resource use stakeholder.

The *Qaalluu* is a leader of the kinship system in the community. He is the most respected and senior person who is responsible for the rituals and organizational election of *Gadaa* leaders. He is also concerned with blessings and has explicit 'religious' responsibilities while the *Gadaa* Councils are elected at the *Gadaa* centers. Otherwise, information from the key informants confirms that the *Qaalluu* had power in arbitrating between major conflicting clans and conflicts in the use right of natural resources such as water, grazing areas and forest fodders and non-timber products among the local people.

It is found that the Leeqaa were used to pay due attention to the moral status of both humans and nonhuman creatures since they strictly adhere to the *safuu*- an ethical principle that put human beings should live in harmony with all other creatures in the natural environment. But, as time passes, violation of *safuu* becomes the *norm* that has affected the positive relation between individuals, humans and the natural environment.

Based on this governing concept, it is believed that violation of such ethical code and principles has resulted in mismanagement of forests and integrated natural resources, which in turn become one of the major causes of such problems of livelihoods and food security of the local people.

The community in the study area used to exercise diverse indigenous natural resources management systems that have great contributions for their livelihoods as well as environmental sustainability. Some of these institutions were directly linked with the socio- cultural and livelihoods of the communities. For example, the *Qaalluu* institution has been directly involved in different socio- economic and spiritual affairs. The concern for environmental resources (forests and integrated natural resources) such as water resources, soils, and wildlife etc. and their management is apparently remains the main concern of such native institutions.

Notably, there is a strong relationship between the socio-cultural and economic affairs under *Qaalluu* institution. Hard work and community's labour support institutions are important for successful achievement of different livelihood activities. Responsibility and love for work is a prominent ethical principle of the *Qaalluu* institution. A quotation that goes with this is "*yaa soogiddaa! ofii jettu mi'aayi, kanaachi dhagaa se'anii sigatuu"* - which is literally translated as *''You salt! Be tasty on your account, either people throw you away assuming you a stone"*. Hence, the local people have old age perceptions on the almighty of the spirit of *Waaqaa* and his blessings always accompany hard working people and their livelihoods affairs.

In the discussion I made with local farmers regarding livelihood and resource management ethics of the *Qaalluu* institution and the devotees, they told me that *beekaa (Qaalluu)* have been hardworking and environmental friendly leaders. As evidence, there were many indicators how the ethical watershed development and resource management works are taking place near and around residence of *Qalluu* /*Masaraa Qaalluu/,* which has been perceived by the local people as the sound deeds and strong indigenous resource management system of the institution.

Nevertheless, today, the interview I made with the descendent and nominee of the *Qaalluu* institutional leader disclosed that no one wants to remind the past positive socio- cultural and environmental contributions of the institution.

Moreover, I observed that the majority of the local people who follow Christianity perceive the spiritual practices of the *Qaalluu* as evil deeds and sin against God's commandments. Although, marginalized by most of the local people, they still have positive natural resource management out looks and remain against abusive environmental resources use approaches that accelerate resource depletion.

Largely, it is observed that the *Qaalluu* institution and devotees had appreciations for the ethics of self-reliance and hard work. Hence, the ingenuity of the *Ayyaantuu*- the spiritual chief and the forest and environmental friendly customary leader, has to be adopted by other community leaders and forest resource managers and stakeholders as well. Therefore, traditional beliefs and practices as related to forest and other resources like land resource, streams/rivers/, wetlands and big trees (*dechee*, *malkaa*, *caffee muka haadhoo*, respectively) their overall, spiritual values seemingly have important place in management and governance of forest resources, which ensures sustainable forest based livelihoods of the local communities.

Again, I believe that the *Qalluu* could be perceived as a model for the present generation; their moral obligation towards sustainable use of the natural resources without compromising the share of future generations i.e., *safuu* - an ethical principle to be applied by human beings so as to live in harmony with all creatures and environmental resources.

9.2.3. Customary Natural Recourses Management Ethics and Indigenous Management Arrangements

9.2.3.1. Customary Natural Recourse Management Ethics

This section briefly reviews the common natural resources and their management ethics and rules and regulations that enforce the local community in strictly adhering to the *safuu*.

The traditions of communal ownership of forests and other natural resources have been deep rooted among the *Leeqaa* Oromo of East Wollega. Forest common properties (FCPs) paradigms have been used as management and forest governance system in many countries of the world. However, in the last decades, the rapid and profound socio-economic, cultural and institutional changes have been shaking the rural world, with the newly-emerging demands and global policy arenas. The socio-economic changes have been challenging the role of well-rooted traditional institutional arrangements used for forests and integrated natural resource conservations.

The local communities in the study area had their own culture and a belief regards to natural resource use and ethical management practices. As *Obbo* Tomaas Baqqalaa[7] told me, still some people adhere to ethical natural resource management and widely practice it locally. This ethos and belief is known among the Oromo people as *Safuu*. For example, cutting sapling and shade trees, killing feeble wildlife, draining and drying streams and rivers, etc. all are perceived to be *safuu*.

They traditionally used to give due attention to natural /environmental /resources such as land, rivers and the wetlands, wildlife and especially forest resources due to its multipurpose. They acknowledge especially forest resource due to its multipurpose. Forests provide nesting habitats for bee colonies, construction materials, fuel wood, and medicine, food and livestock fodders during dry seasons and afford shade and hence play significant role in modifying the local climatic conditions.

According to Mr. Charinet Waqwayyaa, East Wollega Zone Culture and Tourism office process owner, Oromo people had rules and regulations to positively reinforce the *safuu* on socio-cultural and environmental issues that have been classified into five major classes (Seera *Safuu Shanan Oromoo*). Accordingly, Being adulterous *(Sagaagaluu)*, charges a person be penalized by castrating (*cinaan isaa ni*

[7] The key informant from *Kitessa*, near Kumsa Moroda Gallery, Naqamte, 2012

tumama(man)) and being pinched/pierced/by hot iron around genital organ (*fagaara ishee keessa diiminaan gubamti* (woman), Being a liar *(Sobuu)(*a person who considered as liar faces ostracism from the communities); Non truism (*ganuu ykn wal ganuu*) (a person would be penalized to death by covering with grasses or crop straw and letting him/her fire to ash (*daaraa botoroo hanga ta'utti gubama/tti*)).

Killing /mardering/ a person (*nama ajjeesuu*)(a person who committed crime of killing a person would similarly be penalized by death or forced to make reparation *(gumaa))*; Stealing (*hatuu*). Stealing is a crime, so a person found stealing any property and resources belong to others would be penalized by iron by hot knife on the two sides of forehead of a person;

Equally, unnecessary cutting of indigenous trees leads to last long annoyance and bad fortune. Moreover, in the indigenous forest management practices that have been known since the time of Oromo early settlers (*Maccaa* Oromo), there was a practice that had been connected to the early social rules of the *Gada* system- that governs the society in such principle having wide-ranging acceptance among the Oromo.

According to the customary rule, "All natural resources belong to human uses and permitted by the supreme creator of the Heaven and the Earth- "*Waqa guracha garaa adii isa Samii fi Lafa uume*" for human uses have to be shared among the communities fairly". The customary rule also commands that land and its endowments were supposed to be owned by exclusive group of people. Forests were very important resources that have been governed by *Gada* rules prohibiting their overuse and destructions. Cutting saplings and trees of spiritual and cultural significances remained outlawed. There is also a general accepted rule that 'growing up trees never be cut down'-(' *muka ol adeemaa muruun- safuu dha*').

Furthermore, different customary rules (*laguu*) having significant contributions for forest management practices were also identified. For example, *a person who is complaining of tapeworm disease has to be isolated; since he is believed to be unclean*. Hence, he is not allowed to climb up on '*qararoo/soqee/* tree' for hanging up beehives- this is because of the respect people have for such tree species. So, a person has to use *Hygnia absynica (heexoo)* as medicine to cure from tapeworm disease so as

to climb the tree carefully. It is found that the communities were used to adhere to ethical natural resource use and management paradigm of the *Gadaa* system of diverse socio- cultural and spiritual celebrations usually arranged at some selected sites (sacred indigenous forest trees in and around blessed *lafa caffee fi jiidhinsaa* - wetlands. Currently, however, such cultural values and ethics of resource management approaches seemingly neglected and replaced by unethical and irresponsible selfishness in the favor of short term economic benefits that has caused damage like, forest and other natural resource degradation. Most of the households in the study area have been engaged on clearing and burning of the local forest resources for farmland expansion, cutting constructional poles and logs and lumber for pit sawing for making of wooden furniture, fuel wood and charcoal making.

Therefore, it seems rational that such harmless ethos and traditional institutions should not be ignored from being integrated to the current natural resource management approaches to reduce the continuing forest degradation and its consequential impacts on forest based livelihoods of the local people.

9.2.3.2. Indigenous Forest Management Arrangements

The indigenous forest management practice was anchored on the socio-political rule of the *Gada System*, which was gradually neglected after the conquest of the former Oromo territories by the Abyssinian rulers, mainly after Emperor Minilk II, after 1850s (Tasama Ta'a, 2006). The discussion made with local elders in 2012, clarified that land and integrated natural resources were considered as common property- '*qabiyyee ummataa*' before the emergence of the private land tenure and management system by the local chiefs *'Abba-lafaa'*.

The rural lands and its resources had been managed by the community elders implicitly by the governance titles of *Abba funyoo*, *Abba Lagaa* (the indigenous management title of the land including wetland and rivers and associated streams respectively). Exclusive group –use right, a system in which forest and other related natural resources were supposedly owned by a clan(*hortee*) adhering to traditional rules and regulations governing the rational utilization of the environmental resources

such as forests, wetlands, springs and rivers, and common grazing lands etc. The other indigenous resource management arrangement was based on mutual benefits, i.e., equity (fair play) in resource use. According to *Obbo* Charinnat Waqwayya[8], Leeqaa had sound experience of resource sharing and negotiating over resource access and forest use conflicts. Historically, Gumuz and Oromo people were used to share forest and other resources for hunting, gathering, bee keeping, shifting cultivation other livelihood activities (Zelalem Temesgen, 2008). Currently, such cultural hunting and common resource use cculture become archaic and remains rather a story. This is because of alarming population increasing which results to forest degradation and loss of huge wild animals, scarce in natural resource availability, and the change in land use/cover and livelihoods of the local communities.

As result of discussion with communities show, forest resources degradation in the area is believed to have started a century ago. The reason was the weakening of traditional resource management approaches and the establishment of Naqamte as seat of the local government and administrative town. The beginning urbanization has attracted much more population number and attributed to urban sprawl towards marginal natural forest areas. Hence, negotiating new common property system is required so as to stop or minimize the unprecedented forest degradation and integrated major natural resources provoked from resource use completion among the local people and diverse neighborhoods.

9.2.4. Indigenous knowledge and its Use for Natural Resource Management

Indigenous knowledge is generally defined as: "naturally acquired and also learnt knowledge and adaptations that human being employs to reverse harsh environmental conditions in acquiring, first of all, basic needs. It is the value of living in harmony of

[8] Director, Tourism and Cultural Development Office of East Wollega Zone, Naqamte, 2012

human beings with the environment around them and it focuses on human needs and strategies people employ in order to acquire their needs" (Martine,1995; Koech,1996;Wood,1995;Chambers,1983;Pandey,1996).

Similarly, Warren (1991) has defined indigenous knowledge as the local knowledge that is unique to a given culture or society, important knowledge that facilitates development in participatory and sustainable ways. On the other hand, Koech (1996) has defined indigenous knowledge as the interaction of people to diverse environmental settings, environmental factors and niches through which value of conservation, protecting and sustaining natural resources is adopted by the community i.e., the experience that changes through peoples' creativity and innovations and by cultural diffusion learnt.

According to FAO (1995), indigenous knowledge and customary institutions supports the local communities to identify impacts of forest degradation and other resources, without conducting further investigations or logical lessons. For example, the Somali people in the Northern part of Kenya used to identify soil type based on its color (Netting, 1968), some farmers in Nigeria also use color to identify the soil fertility level (Chamber, 1969) and the local communities in Kenya have knowledge of plant species by identifying and naming them accordingly (Conclin, 1979).

In Ethiopia also, there are elders and knowledgeable person who frequently observe such phenomenon as indigenous forest species; leaf shedding, flowering periods and use of such events in agricultural calendar for understanding climatic conditions; temporal dynamics, variability of the onsets and cession of seasonal rainfall and its reliability has been impacting the rural livelihoods of the communities (researcher's informal discussion with elders in the study area, 2012). Accordingly, agricultural calendars could be planned based on the indigenous knowledge of the patterns and timing of flowering and maturity of the dominant forest plant species. Besides, it has been commonly observed in the study area that farmers could guess the length of a rainy season based on mere observation of *darabii* (earth warm) and its length.

Existing perception shows;" if *darabii* looks relatively longer, there would be longer rainy season and vice versa"

Currently, however, with declining vegetation cover and the soil moisture stress, *darabii* hardly exists. So, the ongoing forest degradation has brought about the loss of *darabii* and other bio diversities, which in turn have partially distressed the indigenous settings in agricultural calendar and rainfall patterns. Moreover, findings from satellite image analysis and the interview schedule of the study indicated that, the local knowledge has been contributed to the development of forest based rural livelihood activities such as bee keeping, forest coffee production and many more non- timber forest livelihood activities (agro-forestry practices). Again, the local knowledge has been used as ground truth in the analysis of land use/cover dynamics, the adverse impact of forest degradation on major economic activities and physical entity affecting the livelihoods of the local community and in confirming the reliability of the remote sensing techniques implemented.

The existing common perception among the local community confirms that the major causes of forest degradation arise from failure in utilization of indigenous knowledge in natural resource management practices as it used to be. Thus, forests and integrated natural resources have to be well addressed based on the indigenous knowledge in complement to the existing rural development strategies.

9.2.5. Forests as a Common Resource Use

Natural resources such as forests, grazing areas, wetlands, streams and rivers have been considered the ultimate providers of the rural livelihoods and common property resources. The depth of perception of common property as *kan kenya* (ours) features predominantly in the area, expressing the philosophy of collective resource ownership. It can be said that the common property shows the integrity and social life and cultural bondage of the community. Currently, however, the common property systems of the past have been undermined gradually since the establishment of the Ethiopian empire around the last quarter of 19^{th} century.

There are still some natural resources left to be seized by the communities as collective/common property resources. These resources include; water from streams and rivers, grazing areas and inaccessible forest and woodlands. Unlike the Boranaa Oromo who use land as collective property governed by the '*Gada* System', the use and management of the common property has been the responsibility of the local elders and *ganda* committee since the past four or five decades. In the course of my work, I reviewed the local forests and indigenous tree species which have been acknowledged by Leeqaa due to their critical functions within the mixed farming systems. Like all other environmental resources, forests in the study area provide diverse functions and services to the community such as ecological service, economic contributions, and they provide socio-cultural contributions (spiritual, recreational and scientific research spots) which are central to the socio-cultural integrity of Oromo people.

More recently, forest resources become increasingly important for the communities living inside and around the forest blocks. The rural and the peri-urban communities obtain different benefits from forest resources mainly as a source of income and as a safety net during the time of food insecurity complained by majority of household heads. During transect, the forest compartment near the informant's[9] home, the benefits the local communities get from the forest compartment and arts of making traditional wooden agricultural implements from the local forest timber were appreciated (See Figure 9.1).

Moreover, as I observed his family members they were busy engaged in forest based livelihood activities such as locally adapted root crop and spices (cardamom, ginger, and other). The homestead was full of perennial fruits and vegetables and garden beehives for honey productions seemingly had significant contributions in ensuring the livelihoods of the studied households.

[9] One of *the key informants who was the Qaalluu leader/beekaa/ living very lose to Komto forest , 2012*

Figure 9. 1: Occasion of Interview with one of the Key Informants

Source: Field Survey, 2012

In the distant past, the local people used to manage forests and other natural resources flexibly within the general natural resource management frame work of *Leeqaa* of East Wollega Zone (Temesgen, 2010). According to the existing view of the people regards to forests and integrated natural resources had been uniform and the same i.e., there was a common perception that forests are 'soul for them and their livestock'.

In the course of time, the cattle rearing practices, an old age farming system and natural resource management icons of the communities have been abandoned. Consequently, food insecurity and livelihood problems continue challenging the livelihoods of the communities due to the rapid forest degradation and woodland clearances induced by the de facto open access to the forest use conditions and loosen forest and other natural resource management. So, well-built management of forests and integrated resources is a critical issue for supporting livestock based livelihood activities.

9.2.6. The Leeqaa and their Perceptions of Forest Resources

9.2.6.1. The Values of Forest Resources

The Leeqaa manage the forests and protect trees for various reasons. The focus group discussion result shows that forests are sources of genetic diversity, food, materials

for construction, medicine, honey, sapwood for a honey collector's barrel-hive, charcoal, firewood, incense, ritual objects and forage for livestock. In addition, traditional Oromo institutions had detailed knowledge on the values of forest and different vegetative covers in that they protect soil erosion, influence climate and provide shade for humans and animals. In addition, local people have developed the knowledge of indigenous medicinal plants. Hence, they used to plant new tree and crop species and monitor their growth and development besides wild herb collections for the same purpose of controlling diseases. Then, it should be recognized that the study and understanding of the traditional medicinal plants help present days pharmacologists to discover new chemical compounds of medicinal values.

9.2.6.2. The Socio-cultural Values of Forest Resources

The forest and associated indigenous trees are respected and used as emblem of the *leeqaa*. Forests in the sacred areas bear very significant tree species of cultural and socio-economic significances. Especial attentions are given to forest and other natural resources, hence, forests are perceived as 'kennaa *Waaqa*' which means God's endowment. According to the information obtained from key informants, forests and indigenous tree species have aesthetic values and scenic beauties and protect humans and animals from intense heat of the sun and storms.

There were also appreciation and esteem for some sacred trees of *spiritual* values. Some tree species (*Qoolloo* or *Abdaarii or Muka araaraa)* are still believed to have a special association with *Waaqaa* and held to be sacred and are believed to be inhabited by some powerful spirit to be worshipped. In the same way, communities in the study area used to exercise the ceremonial scarification(*dhibaayyuu),* promised gifts for sacred trees in the form of milk and milk products, local liquors and bread and an ox (*galchaa/gadhiisii/)* for wilderness, believing such practice brings sympathy and blessings from the local *Abidarii or Qoolloo).*

It is observed that particular old age remnants of the local *Mukka-Abidarii* or *Qoolloo* in and around Komto forest are conserved for similar spiritual purpose. Discussion made with elders and the *Qaalluu,* also reveals that *Mukka-Abidarii* or *Qoolloo* had

been worshipped and well respected forest tree species. Hence, it seems unethical to climb up on the top of Komto forested hill without permission from the local *Qalluu/Ayyantuu/* elders. Trees of spiritual uses stay untouched unless special need arises (for instance religious and naming ceremonies and the transfer of one age grade to another grade level). Sometimes, when somebody unknowingly cuts the sacred/worshipped trees, the local *Qaalluu/Ayyaantuu/* has to anoint the damaged parts with butter so that the trees could produce fresh shoots.

The forests have contributed to an indigenous culture to continue without distortions for more than hundreds and even thousands of years. There are tree species of high cultural values often noticed by elders through proverbial praises and songs. For example, there is an expression of feelings of love and praise of one's mother and father equating them to *Qararoo/Soqee* "king of trees", that is perceived and uttered through cultural songs as:

"*qararoo moti mukaa dha'ata malee hinyaabani.*

walga'ii namaa keessa, hati ofii giiftii dha;,abban ofii goftaa dha;

isaan malee hinwaamanii"-

This is translated as *"from among trees Qararoo is the king. It cannot be climbed without the help of a rope; among a crowd, one's mother is the queen and the father the king. No one is called without them".*

Hence, traditionally, natural forests and their component tree and plant species had great recognitions in the communities, the lesson which has to be disseminated among the current generation as the axiom of forest resource conservation approach. Again, forests and integrated natural resources such as lands and waters are paradigm around which spatial, historical and genealogical information is organized. For example, land is praised and appreciated by Oromo people as *'Mother Earth'* which is also stated as a melody:

"Dachee yaadha margaa, irri kee midhaani, jallii kee bishhanii

Qonnee sirra nyaanne; horree sirra yaafine..."

This is literally means *'' wow mother earth owner of plentiful and rich vegetation. On your surface flourishes what we eat; down below filled with water what we drink. Thanks mom, we cultivate and growth to eat and enjoy up on you…"* With ongoing forest degradation, however, all the praises and appreciation become a mere shout and cry. A name given to rivers and local streams manifests the plenty endowments of natural resources (abundant supply of resources) and rich cultural and environmental knowledge of the community. But, deforestation and forest degradation presents an entirely different perspective of the rivers and streams and other natural resources of the area.

The establishment of plantation forest and beginning of commercial logging destroyed ancestral gathering places, hunting grounds and highly prized indigenous tree species of multiple purposes such as *Qararoo(Soqee), Birbirsa ,Qilxuu, Hoomii, Wadeessa* , *Muka-arbaa, Odaa* etc. by disregarding the socio-cultural importance of these trees. The existing perception supports economists who argue that culture is irrelevant to development. But, as the study by Harrison (1992) shows lessons can be learnt from the East Asia's success i.e., attributed to an ethos containing elements of Confucianism, Taoism, and ancestor worship.

9.3. Current Forest Management Practices in the Study Area

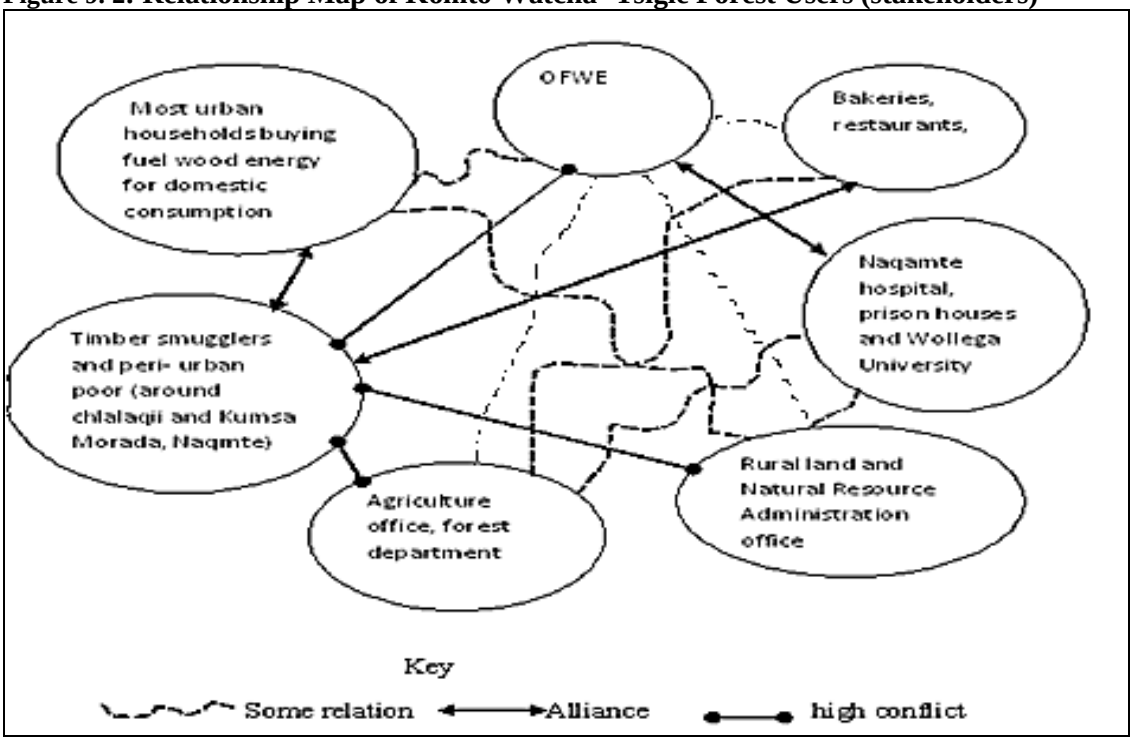
Current natural resource management practice ongoing in the study area includes mostly the scientific conservation with some indigenous conservation and management of the forests and integrated natural resources, actually practiced by different stakeholder having varying resource use interests.

9.3.1. A Relationship Mapping and Analysis of Forest Use Stakeholder

A relationship map was used to explore the kind of forest based relationships that exist between various direct and indirect forest use and management stakeholders. Different community groups and others who use the forest resources were identified and then placed in different circles and their relationship was marked. The map is used to show whether the relationship between groups is one of conflicting, an alliance; indicating collaboration support or assistance or neutral.

Actual identification of different forest users through relationship maps may help as a starting point for identifying forest use problem and means for conflict resolution. In this study too, the forest users (stakeholders) were identified as having some relationships, alliance or high conflicts. For example, the Oromia Forest and Wildlife Enterprise has some relationship with most urban households, bakeries and restaurants buying fuel woods, Agriculture office, rural and natural resource administration office; high conflict with timber smugglers and direct alliance with interested institutions.

Figure 9. 2: Relationship Map of Komto Watcha- Tsigie Forest Users (stakeholders)



Source: Field Survey, 2012

Stakeholders are users of a given resource that could be classified based on objectives of use and management systems. Hence, for this study negotiating new common ownership of the existing forests, analysis of a stakeholder was first identified in terms of direct and indirect forest use. The analysis involved PRA exercises and discussion on the current and future forest resource management that concerns different parties on such points as "Who is benefited from the forest? (See Table 9.1)

Table 9. 1: Summary of Forests Users (Stakeholders)

Direct users	Indirect users	Indirect stakeholders
✓ Rural HHs	✓ Urban HHs using fuel wood for domestic consumption	✓ Agriculture, Land & Natural Resource Administration Office
✓ Urban/peri-urban poor fuel wood Collectors and sellers	✓ Wollega University	✓ Natural Resource Management Groups at local level(*garee misooma gandaa)*
✓ OWFE(Wollega Branch Office)	✓ Prison and Hospital	✓ NGOs
✓ Timber Harvesters	✓ Private contractors working on construction and buildings	✓ Religious Institutions
✓ Forest Based-Micro Enterprises	✓ constructional wood sellers	
✓ Others	✓ Hotels, Restaurants, Bakeries etc.	

Source: Field survey, 2012

In the course of stakeholders' analysis based on selected inquires like "who benefit from the forest?", an attempt have been made to conduct detailed observations and field survey to summarize the stakeholders who make use of the forest and integrated resources either directly or indirectly. Both direct and indirect users of the forest resource are diverse in socio- economic backgrounds. Direct forest users were identified during the PRA sessions conducted at Dale-Komto and Haro-fayisa. Accordingly, the direct forest user groups were community adjacent to the forest in Gari and Kitessa and dwellers of urban peripheries of Naqamte town.

The local people in these *gandalee* have been direct users of the forest resources and engaged in forest based livelihood activities as timber sellers, construction pole sellers, charcoal makers and firewood sellers.

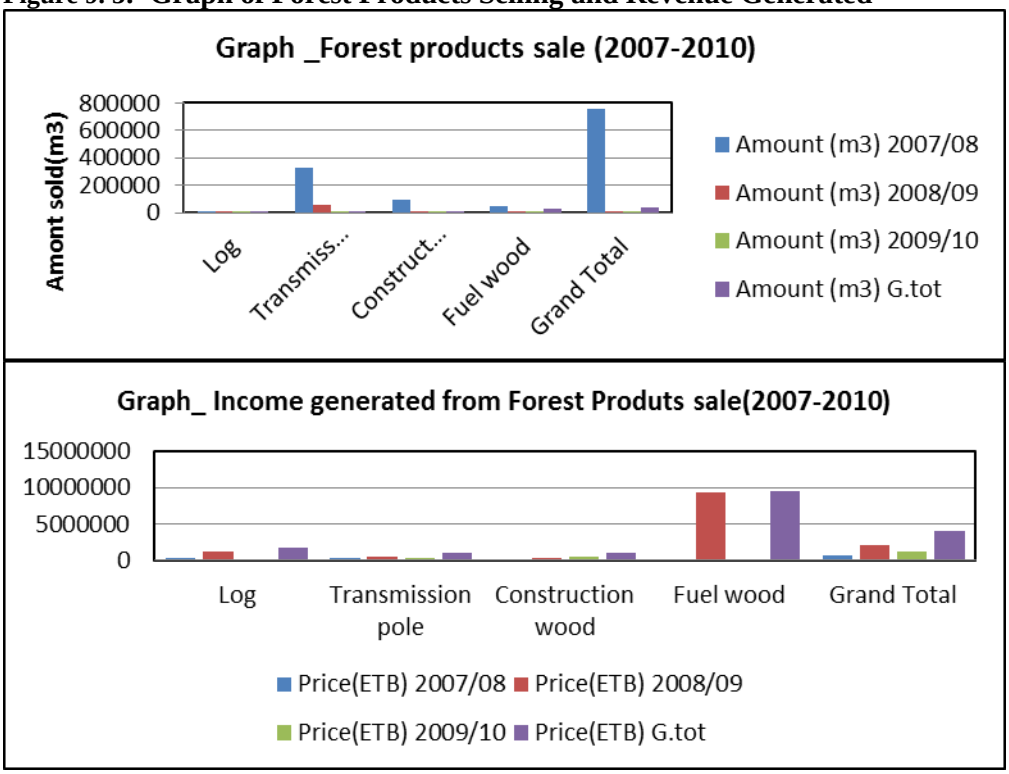
Moreover, few members of the communities including peri- urban dwellers use forest fodder for their livestock throughout the year. In general, the direct users get benefits the local forests in the form of fuel wood, other domestic uses and income by selling timber and non-timber forest products. The revenue generated from the sale of forest products is getting increased from time to time. This may imply that the livelihoods are increasingly dependent on the sale of forest timber products. Among the known forest user stakeholders, the Oromia Forest and Wildlife Enterprise (OFWE) has autonomous use- right and the dominant decision maker. The existing document analysis confirmed that the enterprise has exploited the former state and community forest products for different purposes and it has generated more than four millions of Ethiopian Birr within three consecutive years(2007/08, 2008/09, and 2009/10) (See Table 9.2)

Table 9. 2: Forest Product Quantities and Income Generated from the Products Sales

Product type	2007/08		2008/9		2009/10		Grand total (m3)	Grand total (ETB)
	Qty. (m3)	Price (ETB)	Qty. (m3)	Price (ETB)	Qty. (m3)	Price (ETB)		
Log	429	283394	1807	1283341	253	179417	248	179417
Transmission pole	792	331200	59670	434304	242	314046	1631	314046
Construction wood	908	97861	3432	307912	5511	554861	9850	554861
Fuel wood	1499	45374	3057	9356993	6321	173114	24368	173114
Grand Total	17119	757835	8893	2119127	12326	1221437	38338	1221437

Source: OFWE Wollega Branch Office, 2012

Figure 9. 3: Graph of Forest Products Selling and Revenue Generated



Source: OFWE Wollega Branch Office, 2012

In order to continue negotiating with new approach and conduct forest resource use stakeholders' analysis, the following points were considered: livelihood conditions of some community members, controlling forest access and use (rights over the forest), and to what extent do the local people have traditional usage of existing forest resources?. To address these and more other forest management approaches, participatory research tools were employed[10]. Currently, forest resource tenure right is not at hands of the community, except little use right of forest product (firewood, fodders, bee forages, and medicinal plants). Forest resource management becomes the difficult issue that has contributed to the formation of open access common resource pool.

[10] The methodology adapted from Boku Tache & Ben Irwin, 2003

The forest resource management approach planed by OFWE seems new approach that is based on generation of revenue from the sale of existing natural and plantation forest timber. It seems that the enterprise is working to replace indigenous forest species with that of fast growing exotic forest species, the management approach which denies the integration of forest bio-diversities as well as the socio- cultural services of indigenous forests and the non-timber forest based livelihoods they contribute to the communities. As a result, there is a gap in forest use right and management systems under implementations by different forest use stakeholders.

9.4. Multiple Forest Management and Stakeholder Analysis

In order to take different management approaches, it is necessary to understand and identify the different stakeholders and resource use groups (forest use groups) who could be involved in sustainable forest resource management. In general, such analysis is useful to understand who could potentially gain or lose by forest degradation.

According to ODA (1996), stakeholders are defined as any person, group, community or body who has something to gain or lose from change in management of the resources. In this case, "stakeholders" include local communities and those who are the direct forest users and those who are the indirect users, i.e., the interested parties. A stake holder analysis is used in terms of direct and indirect forest use and assessment of the existing and potential forest use right and interest. In addition, this method is used so as to observe the existing resource use conflicts and relationships between the different forest user-groups.

Basically, the formal and informal meeting and discussions were held concerning forest management issues of the past, present and the future. Participatory research tools such as social mapping, the 'three Rs matrix' (Right to use the forest, Responsibilities to manage it and Revenue generated from the forests), and the relationship mapping was used to explore the nature of forest based activities and the relations which exist between the forest use groups.

9.5. Stakeholder Analysis and Resource Mapping

Different participatory research tools were used to conduct the stakeholder analysis based on existing literature reviews and empirical evidences. A social map is used to show boundaries of *gandaalee*(*gooxii fi garee*), settlements, and land use patterns. The map provided a quick reference to the location of forest resources and woodlands, the major water resources (streams, rivers and wetlands). Once basic data was mapped, participants were asked to list and place *gandalee* and the groups (*shanee*) that lived in the area, i.e., the creation of the initial stakeholder. The stakeholders were divided into direct and indirect stakeholders based on how they get benefits from the forest resources (timber and non-timber products). The forest use stakeholders were different in socio-economic background; wealth status, residence (rural/urban), interest of use and others (table 9.3).

Table 9. 3: Stakeholder Analysis

Direct Users	Indirect Users
Communities in *gandaalee* near the forest areas	Forest product traders and shop-owners
Peri-urban poor in forest adjacent town(Naqamte, Gute)	Builders rely on indigenous tree species and termite resistant constructional materials
(Waldaa Kunuunsa Bosonaa(WKUB) *	Restaurant and bakeries, Institutions and public service organizations, local coffee boilers buy fuel wood and charcoal
Pole wood processing industry	Urban households buy cooking fuel wood and charcoals
Timber harvester/smugglers	wood based micro enterprises buy pole, lumber and other timber products for making varieties of household and office furniture
PA and woreda committee for local level land and natural resource management	Federal/Regional/District Rural land and Natural Resource Administration
Forest Department in Agriculture, EPA and other government bodies	The local traditional institution- the *Qaalluu* leaders, Catholic church, Mekane Yesus Central synod missionaries and NGOs

Source: Partially Adopted from Boku Tache & Ben Irwin, 2003

**Participatory forest Management Organization on the process of establishment by OFWE during the time of the field survey, 2012*

9.6. The "3Rs" Matrix

It is observed that the most common forest user groups (direct stakeholders) were forest adjacent communities living in the four *gandaalee* (Dalee Komtoo, Jireenyaa,

Gaarii, and Qixxeessaa) Peri-urban poor in forest adjacent town (Naqamte, Gute) were found to be the direct stakeholders since most of the poor living mainly in Naqamte town depends on fuel woods and charcoals for domestic uses as well as for sale i.e., forest products they collect from komoto-watcha-tsigie forest compartments and the surrounding woodlands areas, customarily. It is reportedly identified that different government and non- government organizations, civic organizations and public institutions has been involved as direct as well as indirect forest users, providers and controlling groups(the 3Rs Matrix analysis). In general, through stakeholder analysis, a stakeholder's right to use the forest, responsibilities to manage it and the revenue obtained from this local community forests were identified. However, the priority right to use the forest resources by the stakeholders without incurring any cost was seemingly identified as one of the causal factors for degradation the local forests and integrated natural resources. In order to bring the sustainable use of these resources, all the stakeholders basically ought to use the integrative forest management approach which considers the responsibility of forest conservation as a decisive factor for sustainable use of the natural resources for the betterment of the livelihoods of the local communities.

9.7. Forests and Other Natural Resources Utilization: Rules and Regulations

The forest resource use regulations in the study area are enforced by forest guards sanctioned by the *"Waaldaa Kunuunsa Bosonaa (WKUB)"* i.e., the name of locally institutionalized Forest Conservation Association. There are rules and regulations governing the utilization of the tree resources. Some of the rules include cutting live trees from the natural forest is strictly forbidden, members of the organization are allowed to use/collect/ fire wood for domestic purpose, cutting of forest stands is allowed after special permission is obtained from forest management board of WKU for such purposes as construction of houses and fences, the non- timber forest and integrated resources use is permitted as far as the activities exerts no pressure on the sustainability of the forest resource(bee keeping, collection of medicinal herbs, edible

fruits, animal fodders, using water resources and streams for watering livestock, fishing, and domestic use etc.)

According to information gathered from the respondents, some people were organized at the micro enterprise levels and engaged on activities such as quarrying and extracting sands from the forest areas supposed as livelihood strategy. My field survey and observation indeed, has confirmed that the local people could generate more additional income from such off farm activities for maintaining their household food security status. However, such activities have been the reasons for forest degradation and acute shortage of water during the dry seasons, land degradation due to human induced soil erosion, loss of the vast vegetation and the indigenous forest species of the area.

9.8. Forests and Integrated Natural Resource Management Approach

People in the study area use forests in variety of ways which add to the livelihoods of the community. Forests products have been used domestically and for household income generation (for market). As the finding of this study shows, more than half of the community in the study area secured their incomes from the sale of forest timber products such as fire wood, construction poles and woods used for different constructional purposes.

On the other hand, there were also considerable households who depend on the non-forest products in various forms such as forest coffee, honey, and spices. The local community used to relay on indigenous knowledge regarding forest product uses and management approaches. Currently, however, the contribution of indigenous forest management in climate moderation, rainfall generation, protection of water sheds and soil fertility seems unsuccessful. Also, it seems that strong local institutions or/and stakeholders assuming the leading role in forest management and control were missing.

Thus, the establishment of new and rearranging of the past indigenous forest management approaches such as the *Abba Lagaa* system of wetland and its surrounding forests management and *Abba Funyoo (*the customary institution accountable for management of community grazing areas and sources of animal fodders) as resource management strategy seems proper measures for resolving the existing environmental resource degradation problems.

In addition, the former institutions/ systems of resource use conflict resolutions by the elders (*jarsummaa*- the conflict resolution process conducted by the elders.), allocation of open access rights to non-timber product use and individualization of access rights to forest land for coffee, chat, fruits and more other agro-forestry practices have to be prearranged and empowering communities so that they could manage their forests and integrated natural resources potentials for the betterment of the livelihoods of the communities.

9.8.1. Soil Conservation Measures

Fallowing is one of the agronomic conservation measure and soil management strategy used for maintaining soil fertility i.e., a process that decrease the threat of soil erosion through both its effects on soil fertility and its provision of ground cover, which reduces water runoff (Woomer,1994). During the past long decades, fallowing was only one of the choices which farmers had to improve soil fertility. But currently, the use of artificial fertilizers, even though, it is still restrained by most of the farm households due to high cost and limited availability, remained the widely accepted among the farmers as alternative means of soil fertility improve. Many farmers still use animal manure, household compost or mulching to improve soil fertility.

Other technologies such as green manure, improved fallow and agro forestry are not in attendance in the study area. Due to highly degraded and fragmented landholdings, farmers are widely implementing farm management decisions based on their private farm plot characteristics. I found that forest degradation due to population growth and the increasing need for forest product consumption did influence management decisions. Hence, Fallowing and using crop residues or weeds as mulch become

rarely practiced on farm fields at all distances from the homestead (woodland areas reserved for traditional shifting cultivation agricultural practices (*qabiyyee qonnaa lafa gammoojjii*)

9.8.2. Agronomic and Vegetative SWC Measures

An improved crop management includes the uses of improved seeds, appropriate varieties, and diverse varieties optimum timing of planting, appropriate spacing of plants, fertilization and integrated pest and disease management, etc.

Improved ground cover, improves the soil physical settings (soil texture and structure), which is also contributed to improvement in the soil nutrient compositions. Most of the farmers in the study area use agronomic soil and water conservation (SWC) measures as traditionally evolved from their fore fathers. Burning of crop residue on farms and implementing such practices as crop rotation, intercropping or mixed farming, cover crops, agroforestry have been used by the local farmers. However, such indigenous management practices lack firm integration and well established holistic approach i.e., SWC approach at the watershed level, the critical issue in rural development interventions.

The extreme pattern of soil erosion could be expressed spatially and temporarily. In this case, irregularity of erosion events within a year that occur during the big rain fall seasons and same events that occur during the dry season is not even. On the other hand, spatial location of erosion events could be recognized based on the amount of forest cover status of the area. As different literature show, the amount and intensity of rain fall and vegetation cover and forest resources have moderating effects on sequence of erosion events. It is confirmed that erosion decreases by about 10% when vegetation exceeds a ground cover of 40 %(stocking, 1998).

To avert such human induced causes of land degradation and forest based rural livelihoods, some kinds of conservation measures have been implemented by the local people. For example, the past five years were noticed by mass campaign of the

communities for different biological and structural measures of watershed conservation and development programs (See figure 9.4).

Figure 9. 4: Watershed Development Campaign and Structural Conservation Measures

Photograph: © 2012
Marisa Ararso.

9.8.3. Watershed Development and Natural Resource Conservation Campaign

Watershed resource conservation and development campaign in Ethiopia has been practiced in different times on both biological and structural conservation methods. The structural conservation mainly in the northern parts of the country has been implemented with such incentive as food for work for farmers participating in the works of the physical structures such as terracing (level bund/ bank terraces), check dam, drainage ditches and water ways etc.

In general, all structural conservation measures have potentials and benefits as well as limitations and weakness. Terraces for example, have such potentials and benefits as conversion of marginal land (hillsides) into cultivable lands, for reducing land scarcity, good conservation of soil and applied fertilizers, conserves soil and water, increase soil fertility and crop yields. Conversely, terraces have also limitations and weakness in which water logging on clay soil may occur, structures may cause loss of parts of arable land, and terraces need continued maintenance to overcome instability. Hill side terracing is practiced in mountainous areas with slopes greater than 30% for protection of reforestation areas. This structural conservation type is also used for integrated soil and moisture conservation.

On the other hand, if structurally conserved areas are not well monitored and susceptible under uncontrolled grazing, the limitation and weakness may overweigh the advantages deserved by such structural conservation measures. It is observed that structural conservation measures were not acknowledged as a primary conservation measure so far. As an alternative, majority of the local people reported they use biological conservation measures which integrate an old age indigenous practices as the best conservation options.

Again, by watershed conservation and development strategy under implementation more than 8 million hectares of land has been conserved as well as potentially identified for the future conservation programs throughout the country. Similarly, the implementation of conservation and watershed development program in one of the sample *gandalee*(Haro- fayisa in Sasiga district) for two consecutive years of 2011/12 and 2012/13 is reportedly organized(See table 9.4)

Table 9. 4: Structural Watershed and Soil Conservation Measures

Structural SWC Measure	**Year and Conservation Work Implemented**	
	2004(2012)	**2005(2013)**
Soil band	143km	51km
Micro basin	90(in number)	-
Cutoff drain	4.5km	0.25km
Waterway	5km	0.25km
Check dam	$155m^3$	$10m^3$

Source: Field Survey, 2012

As the result of the structural conservation measures implemented during the two consecutive years, some watershed based natural resource rehabilitation has been observed. Own observation confirms that different biological and structural conservation measures were implemented on both private farms and community lots.

Currently, however, the constructed structures were found to be severely damaged due to natural conditions (rainfall and runoff) and livestock trample on the structures

due to lack of coordination and monitoring of the conservation program by the communities.

As result of discussions made with Agricultural officers' show, the structural and biological conservation works involved the top down uniform work plan of the decisive measures. Thus, all the regional states, the zones, the districts, the rural *gandalee* and their sub units were forced to accomplish the duties of the watershed conservation and development program broadly without detailed studies on the socio-cultural as well as environmental constraining factors (for example variations in agro-ecological settings, landforms, soil types and their characteristics etc.)

Again, information obtained from selected farmer also confirms that *shanee* members had their workload (quota) to share. It seems, the farmers are forced to do the conservation works fearing the penalty put aside. Obviously, most of the farmers engage on labour sale as their livelihoods. This condition, hinder them not to finish the work according to the schedule set for the program. So, it seems productive to treat the livelihood problems of the community as critical problem that quest for the conservation program at large.

According to (Hurni and Meyers, 2002; Fitsum and Holden, 2003) conservation issues are neither merely a technical matter nor can they be resolved through legislation. It is a measure that needs to address also the socio- economic aspects of the land use and the link of incentives to the sound land use practices. Therefore, it is appropriate to seek solutions for forest resource depletion and the integrated watershed degradation solely at the household and community levels so that the solutions identified could communicate with the regional as well as the global policies.

9.9. Holistic Forest Management and Conservation Practices

Holistic forest management approach has often been used as a goal towards which forest use stakeholders should strive. The management of publicly owned forest systems for the almost exclusive purpose of timber harvest also has increased the cry

for a more ''holistic'' philosophy. The dominance of wood production as a goal has seriously decreased the value of forests for wildlife, stream quality, recreation, and conservation of biodiversity.

In holistic management, the wider range of environmental and social goals is considered as well as conventional economics (Carl F.Jordan, 1995). Forests and woodlands serve multiple economic, ecological and social purposes. In Ethiopia, forests and other naturally vegetated areas have been supplying fresh and fertile productive land to maintain agricultural productivity for millennia. Ethiopia's forest and woodlands are renowned for a number of commercial and non- wood forest products such as forest wild coffee, honey and bee wax, gum and incense, spice and civet musk.

The forest coffee, semi-forest coffee and forest garden coffee and other products supplied by forests and woodlands of the country occupy a key position in the country's economy (Fayera, 2006; Mulugeta, 2008; Demel et al, 2010). In addition to these timber and non-timber uses of forests, they also notably provide raw materials for preparing local compost and manure. Thus, through holistic and integrated forest conservation and management approaches, not only forests but also essential resources such as water i.e., streams, rivers, lakes and ponds, wetlands etc.; soils, wildlife and overall bio-diversities could be easily managed. In short, the forest conservation and management as well as integrated soil and water conservation practices by the studied household is given in table 9.5

Table 9. 5: Soil Resource Conservation Measures Frequently Used by the Respondents

Site	SWC measures frequently used					Total
	Manure & Application of compost	Application of chemical fertilizers	Shifting plots & crop rotation	Fallowing	Nothing	

	No	%	No	%	No	%	No	%	No	%	No
DK	5	17.2	7	24.1	7	24.1	10	34.5	0	0	29
GR	7	23.3	7	23.3	4	13.3	1	3.3	11	36.7	30
HF	9	29	12	38.7	3	9.7	1	3.2	6	19.4	31
JR	11	35.5	10	32.3	4	12.9	2	6.5	4	12.9	31
KI	4	12.5	15	46.9	3	9.4	2	6.3	8	25	32
TS	1	3.3	11	36.7	5	16.7	2	6.7	11	36.7	30
Total	37	20.22	62	33.88	26	14.21	18	9.84	40	21.86	183

Source: Field Survey, 2012

It is observed that different soil and water conservation measures were adopted by the local community against the widespread livelihood vulnerability. Thus, from the total surveyed households, about 34% were reportedly said they used chemical fertilizers followed by 22% of the respondents those seemingly used nothing as conservation and management practices due to shortage of money, landownership problems and some other socio-cultural factors. On the other hand, more than a quarter of the total respondents said they used manure and compost. This indicates the existing resilience and opting strategies of soil conservation measures currently in use by the local community.

Nonetheless, such customary soil conservation measures as shifting cultivation and fallowing of lands were seemingly abandoned due to continued land fragmentation and shortage of farms which have triggered agricultural livelihood problems observed in the study area since the past four decades. Preparing compost as organic fertilizer is one of the farm inputs applied for increasing crop yields. Vegetative organic materials, household ravage materials and residue can help as raw material inputs for preparing compost. The structural conservation measures and techniques have been widely in use since the *Derg* regime. In addition, fallowing had been used as indigenous farming system before the past three to four decades.

But, population pressure and shortage of farmlands hinders fallowing of lands and related farming systems.

It is found that different raw materials were used for preparing compost by the surveyed households. Accordingly, about 45% of the respondents reported that they often use forest tree and shrubs for preparing the local compost. Again, almost a quarter of the total respondents reported they use domestic waste residue and, about 17% of the respondents reportedly said they use cut and carry materials from own woodlots. Still, less than 10% of the respondents reportedly said they use to use straw and crop residue (See table 9.6). Usually, using none timber forest resources and integrated products for preparing local compost has been practiced by majority of the surveyed households. But, the existing forest degradation seemingly is threatening the optimum supply of such raw material. Therefore, regeneration of indigenous forests has to be considered as one of the forest management and watershed development precedence.

Table 9. 6: Raw Material Used for Preparing Compost Reported by the Respondents

Site	The most accessible source of inputs for compost making								Total
	Domestic waste resources		Forest trees & shrubs		Own/private woodlots		Straw and crop residues		
	No	%	No	%	No	%	No	%	No
DK	10	34.5	8	27.6	6	20.7	5	17.2	29
GR	6	20.0	15	50.0	4	13.3	5	16.7	30
HF	7	22.6	13	41.9	5	16.1	6	19.4	31
JR	3	9.7	18	58.1	3	9.7	7	22.6	31
KI	8	25.0	16	50.0	8	25.0	0	0	32
TS	12	40.0	13	43.3	5	16.7	0	0	30
Total	**46**	**25.1**	**83**	**45.4**	**31**	**16.9**	**23**	**12.6**	**183**

Source: Field Survey, 2012

The length of fallow cycle has impact on fertility of the farmland. The longer the farmland left for fallow the higher will be fertility level of the land and the vice versa. It is known that the study area was characterized by its sparse population settlements of lower density until the past four to five decades. Common forest areas and woodlands were abundant for different private and community uses and services (livestock grazing, bee forage, as traditional hunting grounds etc.).

Own observation also confirms that relatively infertile farm plots were customarily left for fallow at least for five to ten years.

However, with increase in population number over shorter duration of time, land become one of the scarce resource and the number of poor rural households with less than an hectare of farmland and those landless destitute has been prominent within the past two to three decades. Under this circumstance, the customary farming system becomes inconsiderate since the past three or four decades. This is also confirmed by household survey which reveals that almost half of the total respondents replied they had no experience of leaving land for fallow and about 30% of the respondents reported they practice fallowing by leaving their land for rest only for a year. Only some households from Dale-komto (2%) said that they allow their farmland for rest for more than four years (See table 9.7)

Table 9. 7: Reported Length of Fallow Cycle Practiced by the Households

Site	Length/years of fallow cycle								Total
	No fallowing practice		one year fallow cycle		2 - 4 years fallow cycle		over 4-years fallow cycle		
	No	%	No	%	No	%	No	%	No
DK	4	13.8	4	13.8	17	58.6	4	13.8	29
GR	7	23.3	17	56.7	6	20.0	0	0.0	30
HF	16	51.6	11	35.5	4	12.9	0	0.0	31
JR	21	67.7	7	22.6	3	9.7	0	0.0	31
KI	21	65.6	6	18.8	5	15.6	0	0.0	32
TS	18	60.0	9	30.0	3	10.0	0	0.0	30
Total	**87**	**47.5**	**54**	**29.5**	**38**	**20.8**	**4**	**2.2**	**183**

Source: Field Survey, 2012

In general, it is identified that shortage of land was one of the causes for neglect of the traditional land management. Instead, expansions of land into forest areas become the daily trend of life of the local people that has resulted to unprecedented forest degradation occurring in the study area.

CHAPTER TEN: CONCLUSION AND RECOMMENDATION

10.1. CONCLUSION

It is a matter of concern that almost everywhere in the world forest degradation occurs due to unsustainable rural livelihoods and forest based activities of the local communities. It is found that forest degradation has triggered negative impacts on livelihoods, sociocultural settings and the biophysical services provided by the local forests. Reduced forest areas; decreasing forest major tree species and gradual transformation of the former forest cover into forest fragments and degraded environments were indicatives of existing impacts of forest degradation. Overall, it was found that forest degradation has been affecting consistently the natural resources, socio- cultural and forest based livelihoods of the local communities.

As reported by Rademaekers et al. (2010), a growing population implies a growing demand for agricultural and forest products which has caused shortage of farmland and severe degradation of forest and other natural resources. Similarly, the report by Ministry of Environment and Forest (2014) showed that agricultural expansion by smallholder and commercial farmers and unsustainable wood consumption were the major drivers of forest degradation arose from population growth. It was reported that in Ethiopia, the extent of forest coverage was about 27.5 million hectare in 1992. But, the amount of forest cover has continued to decreases and only isolated patches of natural high forests remain in relatively less populated south western parts the country, including the study area.

Still, unsustainable utilization of forests and other natural resources through farm expansions, overgrazing and exploitation of timber and non-timber products became the main factors of forest degradation and other natural resource. Forest degradation continued activating the prevalence of food insecurity and unreliable livelihoods of the local communities. Due to the ongoing forest degradation, the former environmental friendly livelihood practices, open access to some common pool resources, mainly to the surrounding woodland ceased. The indigenous resource use

arrangements, for example, the seasonal movement of farmers (Trans- humans) with their cattle (*darabaa*) in search of livestock grazing fodder*(okaa)* and salty water (*pond*) and pristine wood land for cultivation of subsistence cereal crops and some oil seeds in lowlands (seems interrupted.

It was found that currently, most of the local communities in the study area have engaged directly or indirectly on the forests and other natural resources. The increasing forest based livelihood activities concurrently indicated the effects of human induced forest degradation being occurring in the form of "wave model" i.e. the forest degradation wave model.

Anyhow, Forest degradation is shortly surveyed and this holds true to the experience of Ethiopia in general and the study area in particular. This study is therefore, intended to assess the magnitude of forest degradation and its impact on the livelihoods of the local communities. Assessment of the uses and abuses of the local forest resources, the past and present forest management strategies were also treated as the main components of the study. The study was conducted taking sample *gandalee* (Dale komto, Gari, Harofayisa, Jirenya, Kitessa, and Tokkuma tsige) from the three districts of East Wollega.

As per objectives of the study, the main findings were summarized and presented briefly. Regards to land use/cover dynamics it was found that forest cover in the study area have been reduced within the past four decades due to a growing population which implies a demand for forest products and an increasing forest based livelihood activities. From its initial amount of 15.76 % the forested area get reduced by half, i.e. about 7.96% over the period between 1973 and 2006. In support of this finding, the surveyed households reported that the scale of forest degradation has increased alarmingly. About 42% of the respondents said that the scale of forest degradation was as high as about 31%.

The proximate causes of forest degradation were identified using different methods. For instance, the pair wise comparison of forest based rural livelihoods shows that fuel wood collection for sale has a mean score of about 30(20%). This is the most

destructive livelihood activity on forests found in the study area. Farmland expansion with a mean score of 26(17.6%) ranked 2nd while charcoal making 24(16%), logging 14 (9.6%) and harvesting construction pole 12(8%) were ranked 3rd, 4th, 5th and 6th respectively. Overgrazing was the least destructive forest based activity with a mean score of about 11(7.3%) of the total mean score.

Partially modified forest degradation wave model is used for identifying the major forest based activities and patterns causing forest degradation. Hence, in the first wave round(C), the most valuable forest stands were harvested for sale, which is followed by the second wave round (B) where secondary growth (forest stands) are thought to be harvested for local constructional uses. The third and final wave (A), involves the local people collecting wood to make charcoal (See fig. 6.7). This is found to be the most critical of all the waves because fire wood collectors and charcoal burners collect everything for short term economic benefits.

Shortage of farmland, small farmland holding size and farmland fragmentation were the underlying causes for forest degradation and unsustainable livelihoods of the local communities. Almost half of the respondents (47%) of the total households reported that they had farmland sizes of between 0.06 and 0.5 hectares (small holding size). Slightly more than 20% of the households were temporarily engaged on farming through share cropping (*qixxee*) and similar customary arrangements. Yet, more than 10% of surveyed households had no land. This implies that majority of the surveyed households were dependent on forest resources as a primary livelihood option. Consequently, forest degradation and other natural resources depletion were found the most serious problem that caused the incidents of food insecurity among the local communities.

On the other hand, the relationship between landholding size and the perceived rate of forest degradation at the 0.05 level of significance, a test statistic of $\chi 2 = 20.092$ with degrees of freedom $df = 9$ and a p-value of $p = 0.017$, i.e. shows a significant relationship of the variables considered. Households with no/or smaller landholding size showed very high scale of forest degradation. On the other hand, households with

relatively larger landholding sizes reported that their scale of forest degradation was lower. Generally, Landholding size of each farm household was steadily reduced due to increasing population pressure. Thus, forest degradation became the severe problem identified that negatively affects the livelihoods of the local communities.

Shortage of farmlands was observed as the vital cause of land use/cover change that severely impacted the rural livelihoods and food security status of the local communities. As opting strategy, the public forests and woodlands have become the only available alternative land use for tillage and cash crop intensifications (chat and eucalyptus) for the livelihoods of the communities.

The benefits forests provided in the form of timber and non-timber products for household income generation have an important and often critical role in enabling people to secure a stable and adequate food supply. Similarly, forests in the study area had diverse use values. They have been easily accessible resources to the local communities and significant in ensuring food security of majority of the surveyed households.

Analysis of the use diversity of forests and indigenous woody plant species showed *Waddeessaa*(*Cordia africana*) had higher use diversity score of (4) for its use as "constructional material and farm implement" and "bee forage and site for apiary". On the other hand, it was rarely used as fuel, animal fodder, spiritual purpose, human medicine, veterinary medicine, and tooth brush. Hence, it is scored with a lower uses diversity of (1).

On the other hand, *Cordia Africana* was found to have the use diversity score of (3) and (0) for it was perceived as having "other uses" and "human food" respectively. Most of the tree species identified had high priority values with regards constructional uses, bee forage, and firewood, animal and human medicinal use. In addition to forest tree species already identified, there are also secondary vegetative plants and shrubs of miscellaneous uses, and may possibly be prioritized using different PRA tools.

Different indigenous tree species served as sources of nectar and pollen for bees and with fewer contributions from other remaining plant species (shrubs, herbs and climbers) widely grown across the study area. Tree species such as *somboo*, *baddeessaa*, *waddeessa*, *harbuu* and *qilinxuu/qilxuu/*, *hambabbeessa, eebicha* and many other indigenous forest trees also have been used as a site for placement of traditional beehives.

Forests were used as the major human aliments and veterinary medicine. Different tree species and their roots, barks, leafs, steams, fruits, flowers, fluids extract, whole plant were assessed and identified for use.

On the other hand, some of activities that caused forest degradation such as cutting forest trees, firewood collection, charcoal making, forest based micro enterprises (timber based livelihood activities) were identified through the transect based observations. It is also confirmed that forest degradation and reducing forest areas and depletion of an old age forest tree species have negatively affected the livelihoods of the local communities and food security status of many of the surveyed households.

Moreover, declining soil fertility and crop productivity, termite out cropping land fragmentation & shortage of farm land and house hold food insecurity were identified as both indicators and impacts of forest degradation. Hence, in order to control forest degradation and harvest the full potential benefits i.e., sustainable use of forest resources and other natural resources and forest biome of potential uses have to be documented and held in reserve based on integrated indigenous forest management and conventional forest governance approaches

Furthermore, evidence show that, the rate of forest degradation has increased alarmingly due to increasing demand for forest products and change in the livelihoods of the local communities currently. The case studies and observation results also confirm that the use of woodwork machineries at household level and increasing number of small scale and forest based micro enterprises has caused alarming forest degradation. It is documented that more than half of the households in the study area

were engaged on forest based and diversified agricultural livelihood activities of subsistence character. Small scale subsistence agriculture like crop production and livestock rearing were used for domestic purposes as well as for sale.

Mono-cropping was the common cultivation system which includes the intensive cultivation of cereals such as *teff*, maize and sorghum. Many farm households had perceptions that existing shortage of land was one of the factors that hindered them not to engage in farm diversifications and other agricultural activities. Consequently, the local communities were forced to depend on forest based livelihood activities, mainly on chat and eucalyptus intensifications. In addition, Forest-based livelihoods and other off-farm activities were also found very important, supporting majority of the surveyed households in contributing to food security.

More than half of the studied households frequently engaged on forest- based activities for ensuring house hold food security while about 16% of the respondents said they were daily laborers. Again, the remaining respondents, 14% and 12% said they were petty traders and other off- farm employees respectively. An existing differences in the level of forest based livelihoods and other off-farm activities likely indicate the level of wealth and food security status of the surveyed households. Hence, those who highly engaged on forest resources correspondingly were found to be poor households and vice versa.

Generally, forest based livelihood activities were identified as having a significant role in contributing to household food security and well-being of the local communities. Most the surveyed households said they highly depend on the forest and other natural resources and they have been using products and services from the local forest resources. Yet, limited physical capitals could not enable to support agricultural and off-farm activities for ensuring the livelihoods of the community. So, the local people continued to depend on forest and integrated resources for their livelihoods as usual. But, such unsustainable use and over dependence on the local forest were found to be the major factors inducing forest degradation and decline in agricultural productivity and household food availability.

Thus, it is advisable to address, the proximate and underlying causes of forest degradation in order to harvest the potential benefits of forest resources and other natural resources. Then, the forest biome of potential uses/functions/ has to be documented and held in reserve through implementation of both indigenous and conventional forest management approaches.

10.2. RECOMMENDATIONS

The findings of this dissertation are used to develop the awareness of the communities and encourage them to implement forest conservation measures for rehabilitating the degraded forests and other natural resources of diversified values. Watershed-based forest conservation should be widely adopted by the local communities and the sustainable use of timber, medicines, productive soil, honey, rich biodiversity from the local forests must to be appreciated. To lessen the ongoing forest degradation the government and stakeholders must work for the improvement of the rural livelihoods of the local communities.

Major drivers were identified as triggering factors for the ongoing forest degradation and its impacts on the livelihoods of the local communities. The loss of indigenous forest species and destruction of habitats resulted in severe soil erosion and gullies, shortage of livestock fodder, dry up of head streams and rivers, scarcity of timber and non-timber products were incidents of forest degradation. To address these problems, the regional government, the local communities and forest use stakeholders should monitor the incidents of deforestation and forest degradation.

Specifically, at local level, the government has to give much more emphasis to conservation and watershed development programs and forest change detection, analysis and monitoring mechanisms. The local communities and forest use stakeholders have to device means of monitoring the local forests and implementation of indigenous forest and other natural resource management arrangements. In order to minimize the pressure on the public forests and rate of exploitation of forest products of the study area, individual households have to be encouraged to grow their own on-farm trees at least for their daily fuel wood consumption.

Results of the study indicate that the original forests has been severely degraded due to population pressure and growing demand for forest uses This problem seems heightened due to lack of sustainable forest management system., Thus, forest management system has to be implemented with full packages of forest information systems like GIS and remote sensing tools for efficient monitoring of the local forest cover and associated bio diversities changes. Specially, GIS, RS and socioeconomic data and factors impacting on forest conditions have to be integrated so as to map and analyze complicated relationship between forests based livelihood activities and biophysical forest variables.

As the findings of the study show fire wood and charcoal were main source of fuel energy and income of the local communities. To the contrary, the local forests seem reducing at alarming rate. In order to address forest degradation and a growing demand for fuel wood and conserve the forest resources of the study area, the following energy sector package alternatives (strategic options) have to be areas of intervention:

- The communities should access to alternative to wood fuel, electricity and electric stoves for cooking, improved kilns for charcoal production and cook stove. The government has to enforce the implementation of rural electrification and reliable electricity supply for the study area (Naqamte and smaller towns found closer to the forest areas)

- Agriculture sector package should be implemented as strategic option for conservation and sustainable use of remaining natural forest according to climate resilient green economic policy under implementation.
- There should be government interventions for promoting agriculture intensification through improved land management and efficient use of modern farm inputs, start growing cash crop based agroforestry (intensification of coffee and chat around homestead),focus on value chains for food crops and livestock productivity enhancement (start practicing dairy and meat production through improved fodder production and use, veterinary

services and improved breeds so as to minimize the increasing pressure of livestock on forest and other natural resources of the study area)

- Promoting natural regeneration of forest resources, conservation and watershed development endeavors in alignment with indigenous knowledge and local institutional arrangements. Community involvement in forest and other natural resource management and conservation has to encourage as part of forestry sector package.

Above all, the following recommendations appear useful to solve the recurrent severe forest degradation and advisable forest management strategies:

- Forestry development through macro-economic analysis- supply and demand assessment (identify what forest products used for what purpose and how much) and Promoting forest product based business development- Site-Species-Market approach (triangulation for most suitable sites, species including improved genetic material and management)
- Improve investment on forestry sector and support establishment, maintenance and management of nursery sites and planted trees of diverse values and promoting forest landscape restoration by growing forest functionality i.e., the goods, services and ecological processes that forests can provide at broader landscape level seems holistic approach used to resolve the impacts of forest degradation on the rural livelihoods and insurance of food security.
- To promote the sustainable use of the forest and its products, forest based livelihood studies and exploration of indigenous knowledge on the diverse uses and conservation of forests and integrated natural resources should be carried out. Undoubtedly, there is a need to conserve the existing forest resources using conservation ethics (putting limitation on freedom of action). Forest and natural conservation ethics, which is locally recognized as Safuu has to be implemented based on environmental conservation concept and the modern ecological knowledge (Eco theological conservation and forest management approach from the philosophical tradition of eco centrism).

- Again, to minimize forest degradation and improve the forest based livelihoods of the community, all forest management interventions should incorporate the local people as primary stakeholders and invite them for common discussions so that their local circumstances are taken into account and their wishes given priority.
- Overall, this research recommends the *leeqaa* Oromo Eco theology as useful indigenous forest resources and other natural resource management approach in line with the existing conventional forest and other natural resources management approaches to keep bring with sustainable rural livelihoods among the local communities. Forest management approach has to take into account active participation of the communities in decision making processes. The local communities have to be encouraged so as to maintain their socio-cultural affairs and taboos related to forests and some selected tree species of spiritual values. Forest management should be mixed type (modern and indigenous) and participatory in planning and decision making.

REFERENCES

Adams, M., William et al (eds.) (2003), Regional Environment: The Physical Geography of Africa, Oxford University

Adrian Wood & Alan Dixon (2006) Wetland Use as an Adaptive Response to Climate Change in Eastern and Southern Africa: Sustainable Wetland Management and the Functional Landscape Approach, University of Huddersfield, UK

Anonymous (2008) Sustainable Forest Management Practices in Ethiopia

Arnold, M. & Townson,I(1998) *Assessing the Potential of Forest Product Activities to Contribute to Rural Incomes in Africa*: ODI Natural Resource Perspectives No. 37, Overseas Development Institute, London, UK

Ascher, W.(1995) *Communities and Sustainable Forestry in Developing Countries*. Institute for Contemporary Studies, San Francisco, California, USA

BBC (2013) BBC.Co.UK Navigation, Science & Environment News Broadcasted on 3rd August 2010 Last Updated at 09:17 GMT

Breitenbach, F.V. (1993) The Indigenous Trees of Ethiopia, Addis Ababa, Ethiopia.

Bruijnzeel, L.A. (1990) *Hydrology of Moist Tropical Forests and Effects of Conversion: a state of the Knowledge Review*. Amsterdam, the Netherlands, Netherlands Committee for the International Hydrological Program of UNESCO

Brush, S. & Meng, E (1998) The Value of Wheat Genetic Resources to farmers in Turkey. *In* R.E. Everson, D. Gollin & V. Santaniello, eds. *Agricultural Values of Plant Genetic Resources*, PP. 97-116 Wallingford, UK

Carney D. (1998) implementing the Sustainable Rural Livelihoods Approach, Carney, and D. (ed.) *Sustainable Rural Livelihoods: What Contribution Can We Make? PP*. 3-27, Department for International Development, London

Chambers Robert (2004), Notes for Participants in PRA/PLA Familiarization Workshop in 2004, at www.ids.ac.uk/ids/paricip/research/pra/pranotes04.pdf

Chomitz, K. & Kumari, K. (1996) *The Domestic Benefits of Tropical Forests*. Policy Research Working Paper 1601, Washington DC, USA

CSA (2007) Population and Housing Census of Ethiopia: Results for Oromia Region, Vol. 1 **,** Ethiopia

CSA (2007) inspection records from the Ethiopian Coffee and Tea Authority of 2005, Ethiopia

DAO (2012) Agricultural Office Annual Action Summary Report Guide document, G/ Gida District, East Wollega Zone, Ethiopia

Das Gupta, P (1996) Inquiry into Well-being and Destitution. UK, Clarendon Press.

Demel Teketay, Mulugeta Limenih, Tesfaye Bekele, Yonas Yemshaw, Sisay Feleke, Wubalem Tadesse, Yitebitu Mogoes, Tesfaye Hunde and Demeke Nigussie (2010) Forest Resources and Challenges of Sustainable Forest Management and Conservation in Ethiopia

Dietz,T. Ostrom, E and Stren,P.C.(2003) The struggle to Govern the Commons. Science, 302, PP. 1907- 1912

Edwards, Sue (2010) Ethiopian Environmental Review No.1, Forum for Environment, Addis Ababa

Ellis, F (2000) Rural Livelihood and Diversity in Developing Countries, Oxford University Press

EMSA (2012) Rainfall and Temperature Data for Nekemte , Ethiopia

EPA (1997) Environmental Policy, Environmental Protection Authority, Addis Ababa, Ethiopia

Esser, K., Vgen, T.G., Yibabe Tilahun, Mitiku Haile (2002) Soil Conservation in Tigray, Ethiopia, Report No. 5. PP. 21, Agricultural University of Uppsala

EWARDO (2009) Strategic Management Plan of East Wollega Agriculture and Rural Development Office, Naqamte

Ezekiel Gebissa(2008) Scourge of Life or an Economic Lifeline? Public Discourses on Khat (*Catha edulis*) in Ethiopia, Department of Liberal Studies, Kettering University, Flint, Michigan, USA

FAO (1983) *Report of the Eighth Session of the Committee on World Food Security*, Rome, 13-20 April 1983, CL 83/10, Rome

FAO (1986) Highland Reclamation Study Ethiopia Final Report Vol. I & II, Rome

FAO (1987) *Restoring the Balance: Women and Forest Resources*; R. Clarke. Rome

FAO (1989) *Forestry and Food Security* FAO Forestry Paper No. 90, Rome

FAO (1990) *Major Significance of Minor Forest Products: The Local Use and Value of Forest in the West African Humid Forest Zone*, by J. Falconer. Community Forestry Note No. 6. Rome

FAO (1994) State Food and Agriculture, Food and Agriculture Organization of the UN, Series No. 27, Rome

FAO (1995) *Forests, Fuels and the Future*; Forestry Topics Report No. 5. Rome.

FAO (1996a) *Forestry and Food Security* by H. Gillman & N. Hart, Rome

FAO (1996b) State of the World's Plant Genetic Resources for Food and Agriculture, Rome

FAO (1997) The State of the World's Forests; 1997 Report. Rome

FAO (1999) *Special: Biodiversity for Food and Agriculture* SD Dimensions. www.fao.org/waicent/faoinfo/sustdev/Epdirect

FAO (2000) Measuring the Effect of Climate Change on Developing Country Agriculture, by R. Mendelsohn, FAO's Economic and Social Development Paper, Rome

Fekadu Gurmessa(2010) Floristic Composition and Structural Analysis of Komto Afromontane Rainforest, East Wollega Zone of Oromia Region, West Ethiopia, MSc thesis Addis Ababa University June 2010, Addis Ababa

Garrett Hardin (1968) The Tragedy of the Commons: Science, Vol.162. PP 1243-48

Girma Tadesse (2001) Land Degradation: A Challenge to Ethiopia. Journal of Environmental Management, No. 27 (6), 815–824

Godwin Kowero(2009) Getting REDD Right for Africa Nairobi, Kenya

Haileslassie A., Priess J., Veldkamp E., Demel Teketay , Lensschen J.P (2005) Assessment of Soil Nutrient Depletion and its Spatial Variability on Smallholders' Mixed Farming Systems in Ethiopia Using Partial Versus Full Nutrient Balances. Agriculture, Ecosystems & Environment 108 (1), 1–16

Halake Dida(2010) Impact of Community Interventions on the Customary Institutions of Forest Resource Management Among the Borena Oromo of South Ethiopia. Department of Social Anthropology, AAU

Heath, J. & Binswanger, H.P (1998) Policy-induced Effects of Natural Resource Degradation: The Case of Colombia. *In* E. Lutz, ed. *Agriculture and the Environment: Perspectives on Sustainable Rural Development*, p. 22-34. Washington, DC, USA

Hecht, S. & Cockburn, A (1998) *Fate of the Forest: Developers, Destroyers, and Defenders of the Amazon* (third edition) London, UK

Hodgson, G. & Dixon, J.A (1988) *Logging, Fisheries and Tourism in Palawan: Environmental and Economic Analysis*, EAPI Occasional Paper No.7, USA

Holden, S.T. & Binswanger, H.P (1998) Small-farmer Decision-making, Market Imperfections and Natural Resource Management in Developing Countries. *In* E. Lutz, ed. *Agriculture and the Environment: Perspectives on Sustainable Rural Development*, PP. 50-70, Washington, DC, USA

Hoskins, M (1990) The Contribution of Forestry to Food Security, Uppsala 160: 3-13

Hurni, H (1990) Degradation and Conservation of Soil Resources in Ethiopian Highlands, in Hurni, H., Messerli, B.(Eds.), African Mountains and Highlands. African Mountains Association, pp.51–63(Also Mountain Research and Development 8 (2–3), 123–130)

Jodha, N.S (1990) Rural Common Property Resources: Contributions and Crises, Economic and Political Weekly Vol. 25

John Campbell (1991) Land or Peasants: The Dilemma Confronting Ethiopia Resource Conservation, African Affairs, Volume 90, No.358, Oxford University Press

Jules Pretty (2006) Social Capital and Collective Management of Resources: in Kennedy Donald (2006) (ed.) Science Magazine

Kaimowitz, D, Byron and Sunderlin, W(1998) Public Policies to Reduce Inappropriate Deforestation; in E. Lutz, ed. Agriculture and the Environment: Perspectives on Sustainable Rural Development, p.303-322, Washington, DC, USA

Kashun Brihanu (2000) Resettlement, a Strategy for Vulnerable Group. Proceedings of Inaugural Workshop of Forum for Social Studies (Zenawork Taddese(ed.)) PP.123-151, Addis Ababa

Kumlachew Yeshitila and Tamrat Bekele (2003) The Woody Species Composition and Structure of Masha Anderacha Forest, Southwestern Ethiopia. *Ethiopia. J. Biol. Sci.*, 2(1**)**: 31– 48, Addis Ababa

Lipper, L. & Wilson, C (1999) Evaluation Report for the Northern New Mexico Rural Agricultural Improvement and Public Affairs Project (Unpublished). Berkeley, California, USA

M.R de Montalenbert (1992) Intersectoral Policy Linkage Affecting the Forestry Sector. In Gergerson, H., Oram, P. and J. Spears (eds.) Priorities for Forestry and Agro-Forestry Research, Washington DC

Maputo, J.A (1986) Desertification Indicators and Climate Change; 9:113-22

McKee (2007) "Ethiopia's Country Environmental Profile" Report Prepared for the European Commission, Addis Ababa

Melaku Bekele (2008) Ethiopian Environmental Policies, Strategies and Programs, pp.337-369; in Taye Assefa (ed.) Digest of Ethiopian's National Policies: Strategies and Programs, Forum for Social Studies, Addis Ababa

Ministry of Environment and Forest (2014) on Overview of REDD+ Process in Ethiopia. A Proceedings Paper, January 2014, Addis Ababa

Muluneh Woldetsadik (2001) Link between Population and Environment in Ethiopia: More People and More Trees in West Gurageland. UNEPA, Population and Development Vol., 1 Number 7, PP. 34-36

Nadkarni, M (2005) Global Forest Resources Assessment 2005, FAO Forestry Paper No. 147

Nair, P.K.R (1989) Classification of Agro-forestry System, in P.K.R Nair (ed.) Tropical Forest Resources Assessment, Tropical Africa, Tropical Asia, Tropical America (Rome)

Narayanasamy (2009) Participatory Rural Appraisal: Principles, Methods and application, Los Angeles

ODA (1996) Stakeholder Analysis, HMG, London.UK; in Boku Tache & Ben Irwin (2003) Traditional Institutions, Multiple Stakeholders and Modern Perspectives in

Commons Property, Accompanying Changes Within Borena Pastoral Systems, Securing the Commons No.4, London

Ostrom, E (1990) Governing the Commons: The Evolution of Institutions for Collective Action, New York, and Cambridge University Press.

Pankhurst Alula (1986) Report on a Study of Settlement Schemes in Wollega, Unpublished Manuscript, and Addis Ababa

Reddy, S.R.C & Chakravarty, S. P (1999) Forest Dependence and Income Distribution in a Subsistence Economy: Evidence from India. *World Development*, 27(7), PP. 1141-1149

Rademaekers K., Elchler L.,Berg J., Obersreiner, M. , Havlik, P (2010) Study on the Evolution of Some Deforestation Drivers and their Potential Impacts on the Costs of an Avoiding Deforestation Scheme, Rotterdam, Netherlands

Scoones, I (1998) Sustainable Rural Livelihoods: A Framework for Analyses. *IDS Working Paper No 72*, Brighton

Shibiru Tedla(1996) Population, Bio-mass Fuel and Environment in Ethiopia. In: Population and Development in Ethiopia. Proceedings of the Panel Discussion Held in Gihon Hotel, Feb, 1996, Addis Ababa, National Office of Population

Stocking, M and Murnaghan, N (2001) Hand Book for Field Assessment of Land Degradation. London, Earth Scan Publication Ltd.

Tengberg, A., Stocking, M. & Dechen, S.C.F (1998) Soil Erosion and Crop Productivity Research in South America

Tesfaye Tafasse (2007) Migration, Environment and Conflict Nexus in Ethiopia: A Case Study of Amhara Migrant Settlers in East Wollega Zone. Organization for Social Research in Eastern and Southern Africa (OSSREA)

Thomas Dietz, Eli nor Ostrom and Paul, C. Stern (2006) 'The Struggle to Govern the Commons', In: Kennedy Donald (ed.) (2006), Science Magazine's State of the Planets. Island Press, Washington DC

Townson, I (1995) *Forest Products and Household Incomes: A review and Annotated Bibliography*. Tropical Forestry Papers No. 31. Oxford, UK. , CIFOR and Oxford Forestry Institute

Turner, R (1999) Environmental and Ecological Economics Perspective, *in* J.C.J.M. Van Den Bergh, ed. *Handbook of Environmental and Resource Economics*, p. 1001-1036. Northampton, Massachusetts, USA, Edward Elgar

USESA (2001) Population, Environment and Development: the Concise Report, UN Population Division, Department of Economics and Social Affairs, New York.

Vosti, S. & Reardon, T (1997) The Poverty and Environment Links in Rural Areas of Developing Countries. *In* S. Vosti & T. Reardon (eds.) *Sustainability, Growth and Poverty Alleviation*, p. 47-65, Baltimore, Maryland, USA and London, UK, Johns Hopkins University Press. Wikipedia, the free Encyclopedia Sustainable Forest Management July, 2008

Warner, M (2000) Conflict Management in Community-based Natural Resource Projects: Experience from Fiji and Papua New Guinea. London: Overseas Development Institution (ODI), PP.42

Wilson, C (1999) Sustained Yield Recast: the Politics of Sustainability in New Mexico, Berkeley, California, USA, and University of California (Unpublished)

World Resources Institute (1994) *World Resources from 1994-1995*, Oxford University Press.

WRI (1999) *World Resources 1998-99 A guide to the Global Environment*, Oxford University Press.

Yonas Yemishaw (2002) Legal Forest Aspects: In (Demel Teketay and Tesfaye Bekele (eds.)) *State of Forests and Forestry Research in Ethiopia,* PP. 7-12, *the Working Paper* No. 1, Germany.

Zelalem Tefera(2007)State Sponsored and Self-initiated Resettlements and their Impacts on Ecology of Resettlement Areas: The Case of Angar Gutin, East Wollega, (Unpublished), Addis Ababa University

Zelalem Temesgen (2008) Resettlement and Its Impact on Vegetation A Case of Angar Gutin, Unpublished Thesis, Addis Ababa University

Zilberman, D and Sunding, D(1999) Climate Change Policy and the Agricultural Sector. Berkeley, USA, University of California

Appendix 1: Research tools (Questionnaires, Interview Schedules and Observation Survey Check List)

Addis Ababa University

Faculty of Social Science and Humanities

The Outline of research tools for PhD Dissertation entitled" Impacts of Forest Degradation on Rural livelihoods in Ensuring Food Security: East Wollega, Ethiopia"

The purpose of this interview questions is to assess the status of forest and impacts of forest degradation on rural livelihoods of communities around Komto- Watcha Tsigie forest areas of East Wollega Zone Ethiopia. Your Response will be used only for research Purpose, so you are kindly requested to provide genuine responses.

Thank you in advance

Part I: Interview schedule to be completed by household heads

Enumerator's Name: _____

Date of Interview: _____

Region _____ Zone_____ District (Aaanaa)_____

Sub District (gandaa) _____ goxii _____

1) Respondent's name _____

2) Age _____

3) Sex_____

4) Marital status: Married_____, Unmarried _____, Divorced_____, Widowed____

5) Religion: Christian____, Muslim _____, other (specify) _____

6) Ethnicity: Oromo_____,Amhara_____, Tgiray_____, Guragie_____
Others(specify)_____

7) Information about, family size, age, educational status and main occupation of the household members

s/n	name	Sex M=1 F=2	Age	Main occupation of the respondent	Grade completed	Remark
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Note: - Educational status: 1= uneducated; 2= can read and write; 3= can only read; 4= primary education; 5= junior secondary; 6= high school; 7= college and above

- Household members: 1= Father; 2= Mother; 3= Son; 4= Daughter; 5= Relatives and others
- Age: A1= < 15, A2= 15to64,A3=>65

8) Have you lived in this area since birth? 1. Yes, 2.No

9) If your answer for question no.8 is 'option 2', please specify the year when you came to the area and where you are from and the reason why you migrate into the area?_____
_____

10) Major Annual Crop Production and farmland holding Size

I) Data on Land Use and Crop Production in 2002(E.C)

s/n	Land use		Total annual crop production(quintals)	Consumed (quintals)	Sold (quintals)	Income from sale (ETB)
	crop type	ha				
1						
2						
3						
4						
5						
6						

ii) Data on Land Use and Crop Production in 2003(E.C)

s/n	Land use		Total annual crop production(quintals)	Consumed (quintals)	Sold (quintals)	Income from sale (ETB)
	Crop type	ha				
1						
2						
3						
4						
5						
6						

iii) Data on Land Use and Production in 2004(E.C)

s/n	Land use		Total annual crop production(quintals)	Consumed (quintals)	Sold (quintals)	Income from sale (ETB)
	Crop type	ha				
1						
2						
3						
4						
5						
6						

11) How do you perceive the extent of farmland you cultivate annually?

1] Increased 2] Decreased 3] Unchanged

12) If your response for question no.11 is 'option 1' or 'option 2', please justify clearly your reasons

_____
_____
_____

13) How do you perceive the amount of annual crops you produce continually?

1] Increased 2] Decreased 3] unchanged

14) If you have observed successive increases or decreases in amount of your produce, please justify clearly your reasons

_____
_____

15) What do you often use whenever the productivity of your farmland decreases?
1] manure 2] chemical fertilizers 3] Shift to new plot 4] Fallowing 5] other agronomic and technical conservation measures (specify the prominent measures you often use)

_____

16) If your response to question no.15 is 'option 3', which land use type do you often prefer to use?

1] forestland 2] wooded and grazing land 3] Wetlands 4] Others(specify)

_____
_____
_____

17) If you often use fallowing as agronomic land conservation measure, how long you leave it for rest?

1] one year and below 2] two years 3] three years 4] four years and above 5] never

18) What agronomic measure do you frequently apply in order to improve the fertility of your crop land use?

1] Animal manure and composite 2] Commercial fertilizers 3] Crop residues

4] Other agronomic measures (specify)_____

19) If you often use composite as agronomic measure for keeping soil fertility, where do you often collect the inputs from?

1] Forest trees and shrubs 2] Domestic household wastes 3] Crop residues 4] others (specify)

_____
_____

20) Data on Livestock

s/n	Type of livestock	total	Number of livestock sold (ETB)	Income from sale(ETB)
1				
2				
3				
4				
5				
6				
7				

21) Are there your family members frequently engaged on off- farm activities?

1] Yes 2] No

22) If your response for question no.22 is 'option 1', please fill the following the following table with appropriate information.

n/s	Off- farm activities	Distance from residence	workdays per year	Income per year
1				
2				
3				
4				
5				
6				
7				

23) What contribution do the off-farm activities have in ensuring food security level of your household?

_____
_____
_____

24) Do you remember the moment in a year when your household faces food security problems?

1] Yes 2] No

25) If your answer for question no.25 is 'option 1', please specify the months in a year when the problem gets the worst? _____

26) If you agree you are food insecure, please put the reasons why you stay food insecure, in order of worth (1st, 2nd, and 3rd)

A] Reduce in soil fertility and land productivity_____
B] Poor land management and farming practices____
C] Shortage of farmland (small farm size) _____
D] Landholding insecurity _____
E] Decline in livestock productivity_____
F] Decline incomes secured from forest-based activities____
G] Shortage of agricultural inputs_____
H] Unreliable rainfall patterns _____
I] crop damage due to climatic conditions_____
J] Decline in natural resources (forests and integrated resources) ____
K] Others (specify) _____

27) What major crops do you often grow? Please list them in order of significance

_____

28) What are the familiar problems you have encountered regards to crop production since the past three decades?

_____

29) Do you think there is increasing natural resource use competition and the trend in population growth in your locality?

1] Yes 2] No

30) If your response for question no.30 is 'option 1', can you suggest the impacts population growth and resource use completions on?

i) The existing forest resources of the locality

_____
_____

ii) Rural livelihoods and food security

_____
_____

31) What are the environmental changes you have observed since the past 30 years? (Please list them in order of importance)

_____
_____
_____

32) Do you have livestock? 1] Yes 2] No

33) If your answer for question no.33 is 'option 1', where does it graze regularly on?

34) Do you use firewood as source of domestic fuel energy? 1] Yes 2] No

35) If your response for question no.35 is 'option 1', where do you get it from often? (Please, list the sources in order of importance)

_____

_____

36) Have you ever experienced shortages of fuel wood supply within the past 30 years?

1] Yes 2] No

37) If your answer for question no.37 is 'option 1', what do you think are the causes of the problem? (Please, list them in order of importance)

_____

38) According to your perceptions, which level of forest degradation in your locality is genuine? 1] Very high 2] High 3] Low/Minimum 4] Not perceived at all 5] I'm not certain

39) When do you think was the time of higher incidents of forest degradation in your locality? 1] Since the time of our forefathers 2] Since 30-40 years 3] Since 20-30 years 4] Since 10-20 years very recently since 10 years

40) Have you attended training/awareness creation sessions/for a day or more on the following issues?

s/n	Topics of training/awareness raising issue	Yes	No
1	forest management and conservation methods		
2	Soil and water conservation		
3	Integrated catchment management		
4	Agro-forestry development		
5	Non-timber forest uses and management		
6	Off-farm rural livelihoods and food security		
7	forest based micro enterprises		
8	Others (specify)		

41) Do you have your own farm land? 1] Yes 2] No

42) If your answer for question no.42 is 'option 1', please give the specification in the following table.

Landholding of the household in 2011/12 cropping year	Area size in		Remark
	Sanga/Timad/	hectare	
Backyard garden plot			
Cultivated land outside of garden for annual crops			
Individual grazing land			
Fallow land			
Coffee and other perennial crops			
Plantation wood lot			
Fallow land			
Others(in total)			

43) Again, if your answer for question no.41 is 'option 2' please, specify the methods you are use currently to get farmland on temporarily bases?

_____

44) What are the social assets (e.g. Labour supports and others) often practiced by the local communities? (Specify their contributions in detail)

_____
_____
_____

45) Work Habit Scale/Livelihood activities Scale/

Direction: In the following List you will find rural livelihoods involving forest based activities. Then, Give your opinion by putting "X" under '4' if you always rely on the activity, '3' if you sometimes rely on the activity,'2' if you rarely rely on the activity and '1' if you never rely on the activity

S/N	Work habit/Livelihood/Activities	Scale(1-4)			
		1	2	3	4
1	Collecting firewood for sale				
2	Making charcoals for sale				
3	Clearing forests for farm expansions				
4	Engage in pit sawing				
5	Engage in non-timber forest resource collection for sale				
6	Cutting forest trees of constructional values for sale				
7	Engage in hunting				
8	Engage in fishing				
9	Engage in forest honey production				
10	Making handcrafts				

Part II: Questions for Focus Group Discussion

The following are open-ended questions regarding the history of the area, past and present natural resource especially forest management practices, types of forest resource uses, historical and present distribution and forest status/forest cover, forest degradation and its impacts are presented for discussed in *Afan* Oromo:

1) What sequence of events you remember regards to forest based livelihoods of the communities in the area?

2) How do you perceive the past and the present forest extents found in the study area? How do you relate prevalent forest degradation with household food security status of the communities?

3) What are the customary and conventional forests and integrated natural resource management practices have been practiced by the communities since the past four decades?

4) What are the major forest species and their use categories commonly known among the communities? (Put in rank from1st to 3rd)

5) How do you perceive forest degradation and its impacts on the local livelihoods of the local communities? What simple things could be done to overcome forest degradation and improve the situation?

_____
_____

6) What are the major forest resources (timber and non- timber products) commonly used by the local communities? (Please, list the major forest products in order of importance)

_____
_____

7) What are the contributions of customary institutions and the indigenous natural resource management practices for the well-being of forest resources? Discuss and appreciate customary socio-cultural forest use rights and forest management practices in relation to the conventional forestry utilization and management practices

_____
_____

Part III: PRA Program Sessions

1) Participants of the PRA sessions will prepare the current resource maps of their *gandalee/goxii* of the past 30 to 40 years and the current forest maps of their *gandalee* and compare and contrast the forest cover status (SESSION-ONE)

2) In this session, the participants will list forest species in use and put them in order of significance (from 1st to 3rd).

_____

_____

s/n	Use Category	forest species	rank
1	Food plant		
2	Ethno-medicinal plants		
2.1	Human medicine		
2.2	Veterinary medicine		
3	Farm implements		
4	Building materials		
5	Fuel wood		
6	Animal fodder		
7	Honey bee forage		
8	others		

3) The participants will discuss the causes and Impacts of degradation of non-timber forest products on rural livelihoods in ensuring food security and prepare cause-impact diagram or problem tree (SESSION FOUR)

4) Participants will prepare traditional/customary cropping calendar, wealth ranking guide lines, prepare temperature and rainfall proportional pilling charts representing the past 30 to 40 years and the current (SESSION SIX)

5) Participants will make short list the major causes of household food insecurity; analyze and score them based on easily perceived scales (SESSION SEVEN)

_____

_____

_____

Part IV: Check list for Data Collection through Transects and Observation. Indicate your response by putting 'x' mark

s/n	Behavior to be observed	yes	no	remark
1	The forest areas /blocks are fully or partially demarcated			
2	The forests are accessible to rural villages and district towns having power supplies for timber product processing.			
3	Many tributary rivers and streams rise from the forests			

4	In the forest live huge wildlife and numerous bird species			
5	The largest part of forest land is degraded and surface soils are exposed to the surface			
6	Dominant tree species are found as single stand inside farms , grazing and open fields nearer to the major forest fringes			
7	There is/are nursery sites near the forest areas			
8	There is /are illegal charcoal making site/s			
9	Livestock are grazing inside the forest areas			
10	There are people collecting firewood using simple tools			
11	There are wood based micro enterprises and private wood workshops found nearer to the forest blocks			
12	Collections of constructional and other meter cube of woods are found abundantly.			

Part V: Interview Questions for Gov't officials, NGOs advisors, Institutions and socio-cultural Organizational heads and key informants selected from the local communities.

1) What are the dominant livelihoods activities are often practiced by the local communities in ensuring their household food security?

2) Is there a traditional /indigenous/ farming practices frequently used in the area?

3) What are the existing perceptions of the local communities regards to the indigenous farming practices, agricultural productivity and the households' food security status?

4) What are the contributions of modern farming practices regards to crop productivity and household food security nourishment?

5) How does population growth impacts the forest resources found at the local level?

6) How does forest degradation is linked to the prevailing food insecurity at the household level?

7) Why conservation of the local forests remains a challenge? How could it be sustainably protected /managed? Why is the PFM?

8) How do the forest resources of the study area enhance food security conditions at the local level?

9) What are the drivers of forest degradation usually common to the study area?

10) What are the largely perceived impacts of forest degradation on the livelihoods of the local communities?

11) What mechanisms/strategies/ have been in use so as to minimize the impacts of forest degradation?

12) How do forests and integrated natural resource degradation impacts the ecology of the area?

13) What is the opinion of the local communities on rural agricultural development interventions versus forest degradation?

14) What are the means to reduce impacts of agricultural land expansion (investment on extensive farms) on the local forests?

15) Are there forest use and management strategies normally adopted by the local communities yet?

Appendix 2: Direct Matrix Ranking and Scoring Data Collection Checklist

No.	Coded pair of activities	Activities
1	2,1	Charcoal, Fuel wood
2	3,1	Logging, Fuel wood
3	3,2	Logging, Charcoal
4	4,1	Construction pole, Fuel wood
5	4,2	Construction pole , Charcoal
6	4,3	Construction pole, Logging
7	5,1	Overgrazing, Fuel wood
8	5,2	Overgrazing, Charcoal
9	5,3	Overgrazing, Logging
10	5,4	Overgrazing, Construction pole
11	6,1	Farm expansion, Fuel wood
12	6,2	Farm expansion, Charcoal
13	6,3	Farm expansion, Logging
14	6,4	Farm expansion, Construction pole
15	6,5	Farm expansion, Overgrazing

Source: Own Survey, 2012

Note: the procedure for conducting the direct matrix ranking and scoring

According to (Martin, 1995) numbers of activities could be established as

(N-1)N/2, which involves the following steps:

1. Calculating the total score, for example, *6* multiplied by *15(25)= x*
2. Total mean score for each activity i.e., *x/5=y*
3. Percentage for each activity i.e., *y/x* multiplied by *100=z*
4. Rank each activity from 1 up to 6
5. For example, fuel wood collection for sale is computed as follows

6. (The activities) multiplied by 25(# of participants), total score=150

7. Total mean score (150/5) = 30

8. Calculating for (30/150x100) = 20%

9. Then, indicating the ranks e.g., fuel wood collection is ranked 1st etc.