Pressure of Local Communities on Gugu Mountain Forest Region. South Eastern Oromia, Ethiopia.

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This is to certify that the thesis prepared by Demissie Tsega, entitled: Pressure of Local Communities on *Gugu* Mountain Forest Region. South Eastern Oromia, Ethiopia and submitted in partial fulfillment of the requirements for degree of Degree of Master of Arts (Environment and Development) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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ABSTRACT

Pressure of Local Communities on *Gugu* Mountain Forest Region. South Eastern Oromia, Ethiopia.

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Deforestation is the chronic problem in Ethiopia, particularly in the study area. This study was done on Gugu Mountain forest area which is located in the Arbagugu District Forest and Wildlife Enterprise (ADFWE) of Oromia national regional state, Ethiopia. The ultimate goal of the study was to assess drivers of deforestation. To collect information relevant to the study 112 household heads, experts and elders were used as sources of data. Systematic random sampling method was employed to select household heads from selected kebeles. Questionnaires, key informant interview, FGDs and document analysis were the major tools employed to collect data. Data were analyzed using binary logistic regression, descriptive statistics (percentages, frequency, mean and standard deviation), and content analysis.

Accordingly, the finding of this study indicated that the longer residence time near/in forest region, absence of expert visit, smaller grazing land, lack of knowledge of forest border and low education status of household were significantly contributing for clearing more than or equals to a hectare of forest catchment to include in their farm plots. Sampled households reliance on forests to acquire fire wood (83%); construction materials (94.6%); occurrence of forest fire and policy related issues had also a significant role for destruction of Gugu mountain forest. Imposing responsibility on government bodies to control ongoing deforestation and preserve existing forest, and weak linkage between local communities and ADFWE on forest issue which was caused mainly due to absence of sufficient experts at district level, logistic problem, remoteness of an area and absence of decentralized administrative unit within district forest concession areas were also contribute their own share for deforestation. Finally, recommendations were given in the context of the study area.

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ACRONYMS

ADFWE.....Arbagugu District Forest and Wildlife Enterprise

A.F.W.E.....Arsi Forest and Wildlife Enterprise

a.m.s.l.....above mean sea level

AZFEDO.....Arsi Zone Finance and Economic Development Office.

CBD.....Convention on Biological Diversity

CBNRM.....Community Based Natural Resource Management

CCP.....Command and Control Policy

CIFOR.....Center for International Forest Organization and Research

CITES.....Convention on International Trade in Endangered Species of wild fauna and flora

CO_2 .....Carbon Dioxide

EPA.....Environmental Protection Authority

ETG.....Ethiopia Transitional Government

EUE.....Emergency Unit for Ethiopia

FAO.....Food and Agricultural Organization

FCCC.....UN Framework Convention on Climate Change

FDRE.....Federal Democratic Republic of Ethiopia

FGDs.....focus group discussion

Fig.....figure

FRA.....Global Forest Resources Assessment

GDP.....Gross Domestic Product

GIS.....Geographic Information System

ha.....hectares

HHH.....household head

IBC .....Institute of Biodiversity Center

IFF.....Intergovernmental Forum on Forests

IPF.....Intergovernmental Panel on Forests

ILRI.....International Livestock Research Institute

ITTO.....International Tropical Timber Organization

km.....kilo meter

m.....meter

mm.....milli meter

MoEDC.....Ministry of Economy and Developmental Cooperative

MNRD.....Ministry of Natural Resources and Rural Development

NTFP.....Non-Timber Forest Product

NGOs.....Non Governmental Organizations

°C .....degree celcious

OLS.....Ordinary Least Square

ONRS.....Oromia National Regional State

OFWE.....Oromia Forest and Wildlife Enterprise

proc.no. .....proclamation number

reg.no. .....regulation number

RRI.....Rights and Resource Institutes

SFM.....Sustainable Forest Organization

SPSS.....Statistical Package for Social Science

TLU.....tropical livestock unit

UNCCD.....UN Convention to Combat Desertification

UNCED.....UN Conference on Environment and Development

UNEP.....United Nation Environmental Panel

UNESCO.....United Nation Educational, Scientific and Cultural Organization

UNFF.....UN Forum on Forests

UNRISD.....UN Research Institute for Social Development

WB.....World Bank

WRI.....World Resource Institute

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Today, many environmental problems, of which loss of forest, are apparent to the Tropics (Barrow 2006). He suggested that the global environmental problems are a trans-boundary issues that its causes and consequences could be shared by all countries. A widespread belief asserts that population growth is a significant driver of the problems (Mather and Needle 2000).

Since environment is both nature and society which related to each other and coexist (Neefjef 2000), we need to protect our globe natural resources from rapid depletion. Ahmad and Muller (1982) indicated that environmental management based on an integrated planning approach should be placed in order to achieve an acceptable balance between the quality of the human environment and the quality of natural environment. According to them, in order to facilitate the environmental management task, it is necessary to identify the key factors (i.e., social, technical, political, legal, ecological and economic) and their relations and interdependencies.

Ethiopia is endowed with diversified biological resources that have local and global importance. However, most of these biological resources are depleted at alarming rate due to social, economic and environmental threats. Most of the highlands in South-West Ethiopia that were covered by high forests are cleared at rapid rate in recent years (Rojahn 2006). Apparently, Badege Bishaw (2001) stated deforestation and land

degradation as the most important issues threatening the survival of Ethiopia and her people. The few remaining forests patches of intact habitats are diminishing at an alarming rate and the biological diversity is being lost as the result of the direct effect of resource exploitation and as a result of habitat loss. In short, our ecological footprint is growing by seconds and our ecological resilience is dwindling in the same rate (UNESCO 2008).

Forests affect atmospheric and edaphic moisture and hydrological conditions of the site by the stature (height), structure (roughness), leaf physiognomy of the canopy, the structure of the root system, and the physiological features of the absorption and utilization of output of water by the trees (Bruenig 1996; FAO and CIFOR 2005; FAO 2008). Deforestation exposes soils to sunlight, which increases soil temperature and the rate of soil carbon oxidation (Gorte and Sheikh 2010). This process increases the rate of CO_2 released to the atmosphere.

Forests can be usefully conceived as complex, self organizing systems with multiple natural processes that respond to internal and external drivers that act up on it (Thompson, *et al* 2009). As a result, any unsustainable forest operations and other pressures on forest resources can lead to forest degradation and permanent losses in forest biodiversity (CBD 2009). Therefore, to understand the existing realities at local scale conducting research on forest related issues is inevitably important.

1.2. Statement of the Problem

Exploitation of the natural environment has always been a part of human culture. Increases in human population have likewise increased demands on the natural resource (Gascon, *et al* 2004). Historically, resource scarcity was thought to be largely applicable to non-renewable resources but increasingly unsustainable use of renewable resource is primarily becoming threat to the planet and its people (Ginkel 2002). The decline in forested area due to cutting is occurring worldwide in prehistory and throughout the history of civilization, whenever people have lived near or in forested areas, forests have been cut. Today, deforestation continues in areas where forests remain, many of these forests are in tropics, in mountain regions, or in high latitudes, places that were difficult to exploit before (Botkin and Keller 1987).

Even though forest statistics in Ethiopia are unreliable and has little clarity which creates confusion for those involved in the sector (MELCA mahiber 2008), there are some studies and reports that show the rate of deforestation. Accordingly, the rate of deforestation at national level was estimated at 150,000 ha per year (MNRD and EP 1993); and 62,000 ha per year (WB 2001). Furthermore, Berry (2003) indicated that forest of Ethiopia that was covered 16% of whole country (20% of highland areas) in 1950s diminished to 2.2% of whole country (5.6% of highland areas) in 2000.

At regional level, i.e. Oromia Regional National State, before half a century the highland forests were estimated nearly at about 15,000,000 ha (which was approximately about 40% of the land at that time). But, currently the remaining high forest of the region is estimated to be less than 10% (Nigussu Feyissa 2007; Abayney Derero, *et al* 2011). This

may be because of the higher vulnerability of highland forest areas, due to highlands of Oromia are home to more than 80% of human population, 70 of livestock population and over 90% of cropland of the region (Bezeayehu Tefera 2002).

Reports from different district of Arsi zone indicated that as there is high rate of deforestation (AZFEDO 2011/12). Additionally, studies that were conducted on land use and land cover change in the adjacent areas of ADFWE forest concession depicted that the shrinking of forest cover from time to time (Netsanet Deneke 2007; Meseret Midkessa 2009).

In the study area, diminished size of forest coverage, increased number of farmers that cleared forest and included to their farmland, and reduced number and volume of rivers and streams flowing from forest region were observed problems. Additionally, unsuccessful attempt made by agricultural offices of respective districts to prevent forest destruction through protective approach before 2008 and the growing challenge to ADFWE (*Arbagugu* District Forest and Wildlife Enterprise) to introduce participatory forest management to an area since June 2008 were also problems related to *Gugu* mountain forest region. Therefore, this study investigated the gaps that triggered deforestation through identification of level of significance of different factors contribute for deforestation of an area, the extent of perception of local communities on forest conservation and the presence of linkage between districts and communities on the forest related issues.

1.3. Objectives of the Study

1.3.1. General Objectives

The general objective of this study was to assess drivers of deforestation of *Gugu* mountain forest region.

1.3.2. Specific Objectives

This study intended to attain the following specific objectives:

- To identify socio-economic factors contributing to deforestation in *Gugu* mount forest catchment.
- To assess perception of farmers living near and/or in *Gugu* mountain forest region toward forest conservation.
- To assess level of communication and interconnection between the ADFWE and communities dwelling near and/or in *Gugu* Mountain forest region for preservation of forests in the area.

1.4. Research Question

Qualitative and quantitative information that were reliable for this study were collected based on the following basic questions for the attainment the aforementioned three specific objectives of the study.

1. What factors are significantly contributing to deforestation of *Gugu* mountain forest area?
2. How do farmers living near and/or in *Gugu* mountain forest region perceive forest conservation?

3. Was there communication and interconnection between ADFWE and communities near and/or in the *Gugu* mountain forest region to control deforestation?

1.5. Significance of the Study

The outcome of the study will generate information for policy makers, governmental and non-governmental organizations to design and develop effective sustainable forest management strategies and policy by critical identification of factors for deforestation at local. Moreover, the information generated through this study will enable to minimize the gaps observed for implementation of forest preservation by identifying the areas of problem both in the district and communities.

In other way, the finding of the study is important for *woredas*[1] and district that entitled to preserve the study area forest to get aware of the societal perception on forest conservation. Additionally, the study will help as a spring board for other researchers to conduct study on an area.

1.6. Delimitation of the Study

The study was delimited to the assessment of drivers of deforestation. Spatially, it covered only areas confined with *Gugu* mountain forest region. Specifically, the study covered areas (*kebeles*[2]) that were adjacent to the forest area of Mount *Gugu* and possessed forest land from the mountain area. Farmers living near and/or in forest region, based on ADFWE demarcation data were included for data collection procedures. All

[1] Woreda is administrative unit less than Zone and equivalent to district.

[2] Kebele is the smallest administrative unit of FDRE government.

investigations worked in line with factors influencing deforestation, perception of communities on forest conservation and community's linkage with ADFWE.

1.7. Limitation of the Study

Even though the use of satellite imageries and GIS (geographic information system) analysis to clearly examine the land use and land cover change of an area is highly recommended, it was difficult to easily access and apply for this study area. The finance and time allocated to this paper could not allow the detail investigation of the factors by increasing the size of samples and thoroughly field observation in the area. Absence of studies undertaken on the area in this regard and inaccessibility of well documented data create some difficulty to estimate the sample size to be included in the study. The highly dispersed and encroachment of settler in the forest area created a challenge to obtain information easily. The watershed management training program held at a time of data collection affect the level of perception of farmers about environmental problems and management issues.

CHAPTER TWO

REVIEW OF LITERATURE

2.1. Definition and Concepts

2.1.1. Forest

Definitions of a forest vary across countries and organizations because of the diversity and abundance of the world's forests, differences in culture and forest use, and the stage of a society's development (Kobayashi 2009). Forest is, initially, defined as a minimum area of land of 0.05 hectares with tree crown cover (or equivalent stocking) of more than 10 to 30% trees with the potential to reach a minimum height of two to five meters in situ (FCCC 2001). Later, by Global Forest Resource Assessment (FRA), it is modified as land spanning more than 0.5 hectares with trees higher than five meters and a canopy cover of more than 10% or trees able to reach these threshold in situ (FAO 2005).

According to Lund (2001), Ethiopia used the national criteria to define forest land includes definition type which considers coverage, crown cover of 60% and tree height of nearly 7 m.

2.1.2. Forest Degradation and Deforestation

On the other hand, forest degradation and deforestation might be used interchangeably, but they are different concepts. Forest degradation is change within the forests which negatively affect the structure or function of the stand and site, thereby lower the capacity to supply products and/or services (FAO 2001; FAO 2002). Similarly, forest degradation, also, refers to the reduction of the capacity of forest to produce goods and services (ITTO

2002). As FAO (2009a) stated options for rationalization of forest degradation includes decomposition into elements, theoretical elimination, clustering, elements of sustainable forest management (SFM), composite measures and valuation of forest goods and services.

Deforestation, however, implies the long term or permanent loss of forest cover and implies transformation into another land use (FAO 2005). It includes areas of forest converted to agriculture, pasture, water reservoir and urban areas. It excludes areas where trees have been removed as a result of harvesting or logging and where the forest is expected to regenerate naturally or with the aid of silvicultural measures. But, areas where impact of disturbance, over utilization or changing environmental conditions affects the forest to an extent that it cannot sustain a tree cover above the 10% threshold.

2.2. Drivers (Causes) of Deforestation

Deforestation and forest degradation are the result of a very complex confluence of actors' interests and circumstances that range from global demands for timber or agricultural products to the need of local communities for land to use in subsistence agriculture (Badiozamani 2007). Therefore, causes of deforestation could be reviewed as follow based on some scholars findings.

Agriculture: Agricultural expansion (expansion of cropped land and pasture) is, by far, the cause of tropical deforestation (Geist and Lambin 2001, 2002; DeFries, *et al* 2010). Kaimowitz and Angelson (1998; 1999) argue that substantial evidence supports the assertion that higher agricultural prices stimulate forest clearing. They make agriculture more profitable and help finance putting additional land into production. An argument

which may modify this conclusion is that over the long-run higher agricultural prices may facilitate a country's transition to a more industrialized economy, which relies less on agriculture. That implies deforestation would increase in the short term but later fall. Furthermore, the evidence on how increased agricultural input prices may affect forest clearing is mixed, particularly as regards fertilizers. Analytical models point to two conflicting effects: the first involves the substitution of fertilizer by land in response to the change in relative prices; the second a reduction in the amount of land devoted to crops because farming becomes less profitable (Kaimowitz and Angelson 1998; 1999).

Illegal Settlement and Land Tenure System: FAO (2009a) indicated that illegal settlement, insecurity in forest and lack of tenure are among causes of deforestation. Kitessa Hundera (2007) indicated that among causes for forest degradation is emanated from settlers moved from other parts of the country. Institutional factors such as policies that favor concentration of ownership, land tenure policies, illegal activities and corruption results in forest decline of a given areas (Hermosilla 2000; Koyunen and Yilmaz 2009). According to Araujo, *et al* (2008) insecure property rights in land drive deforestation, even though it should not be interpreted as a simple positive correlation between deforestation and property rights insecurity. It is, therefore, argued that the way land reform is implemented has a detrimental impact on deforestation: untenured deforesters claim property rights that are gained after expropriation procedures.

Security of tenure is recognized as a fundamental requirement to ensure that resources are managed sustainably. Duration, assurance, robustness and exclusivity have been identified as the main legal elements for secure tenure arrangements (FAO 2009b). This implies that tenure holders should returns on their investments without interferences.

Surprisingly, strengthening forest tenure security can result in improved management and conservation of forests and conversely, that weak tenure can result in the poor management and conservation outcomes (RRI 2009).

Economic Growth and Globalization: As development pressures increase, intervention tends to become more intense, and can include selective logging, replanting, active thinning and other forms of management (Dudley and Phillips 2006). At the extreme, this may involve the conversion of forests into exotic monoculture plantations, which are more akin to agricultural crop systems than natural forest ecosystems. Globalization is the most important driving force behind forest degradation and deforestation trends by providing comparative advantages of different regions and countries in determining the location of the production site (Seppala 2007).

Forest Fire: Fire occurs in all forest ecosystems and is neither good nor bad. The effects of fire help some members of the ecosystem and harm others (Raven 2006). Unwanted fires change the species composition, vegetation structure and composition (FAO 2007). As a result soil properties are degraded and soil productivity decreases.

Mining: It is one of the major causes of deforestation and forest degradation, as commercially valuable minerals are often found in the ground beneath forest (Kobayashi 2009). Additionally, forest degradation due to mining projects has another effect: it causes a decline in natural environment's productivity, and it renders the local community more vulnerable to fatal floods, landslides, adverse climatic shocks and other natural disasters.

Logging and Charcoal Production: The evidence regarding timber prices is less definitive but suggests a similar conclusion, although the effect of higher timber prices remains particularly controversial. Higher prices may promote deforestation by making logging more profitable (Kaimowitz and Angelson 1998; 1999). Particularly in situations where producers do not have secure rights over forest resources, higher timber values only increase the net benefits of land clearing (presuming landholders sell the timber from cleared forest) and would definitely encourage deforestation.

Grazing and for Domestic Consumption: Forest degradation is related to the unregulated extraction of firewood and fodder, which has led to an alarming decline in the quality and resistance of trees in the region (Baland, *et al* 2009). Wood fuel includes wood collected or removed directly from for energy purpose.

Off-farm employment: Micro-level, analytical, simulation and empirical models strongly suggest that higher rural wages reduce deforestation by making it less profitable to engage in agricultural and forestry activities associated with deforestation (Kaimowitz and Angelson 1998; 1999). They also suggest that, at the individual household level, greater off-farm employment opportunities produce a similar effect by competing with such activities for labor.

Resettlement: The vegetation and forests in the resettlement area were cleared indiscriminately, at the way in which could not have any possibility to replenished (Getachew Woldemeskel 1989).

2.3. Implication of Deforestation

Occurrence of floods: The relationships of forests and floods existing knowledge is frequently based more on perceived wisdom or myths than on science (FAO and CIFOR 2005). The conventional wisdom is, therefore, that forests act as giant sponges soaking up water during heavy rainfall and releasing freshwater slowly when it is most needed during the dry months of the year. According to Raven (2006) a forested watershed allows water to seep slowly into soil and drain slowly into its collecting basin or waterway. But, when there is forest cover loss, land degradation, soil erosion and landslips are occurred (FAO and CIFOR 2005; Bruijnzeel 1990, 2004). In fact, scientific evidences clearly indicate that forests cannot stop catastrophic large scale floods commonly caused by severe meteorological events.

Drying of Wetlands: Cloud forests (forests that occur at elevation of 2000 to 3000 meters) capture water from water stripping of horizontally moving fog, i.e. in addition to vertical precipitation (Hamilton 2008). But the extra water obtained by cloud forest varies according to rainfall patterns, topographic position, frequency or persistence of cloud and extent to which clouds are wind driven. In the absence of forests in the certain area, since forests are acting giant sponges (FAO and CIFOR 2005; Raven 2006; Legesse Negash 2010), underground water diminished. So that, streams that are flowing from the areas will, gradually, be disappeared. Deforestation and losses of vegetation within a wetland catchment area is the starting cause for an accumulation of silt within the wetland ecosystem (Mckee 2009) which contribute for lesser amount of water.

Low Quality Water: Forests' most significant contribution to water for all living things is in maintaining high water quality. They achieve this through minimizing soil erosion on site thus reducing sediments in water bodies (wetlands, ponds and lakes, streams and rivers) and through trapping or filtering other water pollutants (Hamilton 2008). At the areas where forests are cleared the amount of water flow to down streams increases due to absence of capturing of water comes as precipitation. Sudden flooding may occurs both in deforested areas and downstream.

Fuel Wood Accessibility: According to Amanuel Mehari (2005) the life quality of the people is severely affected by access to fuel wood. When fuel wood is short, people eat less and eat more uncooked foods; they reduce eating foods of higher nutritional and biological values. Especially, eating raw meat containing eggs or reproductive structure of intestinal parasites or pathogens can severely deteriorate the health of the people. Consequently, the efficiency and performance of the human labor declines and so is also the agricultural production.

Species Destruction: An unwise use of the forest biological resources could certainly bring about a disturbance of the ecological equilibrium which maintains the normal functioning of ecosystems and their structural component (Puff and Sileshi Nemomissa 2001). In addition, according to Brooks, *et al* (1999), the reduction of forest area should result in reduction of its number of species and do so in the characteristics way according to the familiar species area relationship. Loss and fragmentation of natural habitats due to anthropogenic disturbances such as logging, agriculture, altered fire regimes and decline in earth's biodiversity (MacArther and Wilson 1967; Harris 1984; Reid 1994).

Affect Micro Climates: Forests mitigate temperature extremes, by trapping electromagnetic radiation that comes from the sun (Legesse Negash 2010), and provide wind breaks that help dampen dust storms and moderate extreme cold (Raven 2006). Therefore, locally forest management is likely to influence carbon sequestration by trees, the interaction of forest to climate change and the forest services provided to local populations (Bernier and Schoene 2009). As a result any of the three possible approaches for adapting climate change, i.e. no intervention, reactive adaptation and planned adaptation, need to be considered.

2.4. Forests as a Common Resources

Forest cover is a form of capital that is productive in several land use which can be intermittently harvested (Deacon 1994). Poorly enforced ownership exposes standing forests and other kind of capital to a form of confiscation or default risk and thereby, discriminates against capital intensive land uses.

According to Berkes, *et al* (2006) Common-property (or common-pool) resources share two key characteristics. First, these are resources for which exclusion (or control of access) of potential users is problematic. The physical nature of the resource is such that controlling the access of potential users is costly and, in some cases, virtually impossible. Migratory or fugitive resources such as fish and wildlife pose obvious difficulties. Similarly, ground water, range and forest lands, and global commons such as the high seas, the atmosphere, and the geosynchronous orbit, pose problems of exclusion.

The second key characteristic of common-property resources is subtracting ability; each user is capable of subtracting from the welfare of others. This characteristic creates a

potential divergence between individual and collective economic rationality in joint use. As one user continues to pump water from an aquifer, others experience increased pumping costs; as the number of fishing boats increases, the catch per unit of effort for each declines. On the basis of these two characteristics, we define common-property resources as a class of resources for which exclusion is difficult and joint use involves subtract ability.

Common-property resources are held in one of four basic property-rights regimes (Berkes, *et al* 2006). Open access is the absence of well-defined property rights. Access is free and open to all, as with ocean fisheries of the past century. This is the regime implied in Hardin's model. Private property refers to the situation in which an individual or corporation has the right to exclude others from using the resource and to regulate its use (FAO 2004b). Under communal property, the resource is held by an identifiable community of users who can exclude others and regulate use. Some shellfish beds, range lands, forests, irrigation and ground water have been managed as communal property. State property or state governance means that rights to the resource are vested exclusively in government, which controls access and level of exploitation. Examples include crown lands and resources such as fish and wildlife held in public trust.

It has become a truism that resources held in common are vulnerable to overexploitation. Forty four years ago, Hardin popularized this dilemma calling it the "tragedy of the commons" by the use of a metaphorical village common in which each herdsman "is locked into a system that compels him to increase his herd without limit". Hardin argued that such problems have no technical solutions, and emphasized the need for government controls to limit "freedom in the commons [which] brings ruin to all". Hardin and others

have subsequently pointed to privatization of common resources as another solution consistent with the analysis of many resource economists. It is usual to assume that resource degradation is inevitable unless common property is converted into private property or government regulations are instituted.

Berkes, *et al* (2006) criticize the common pool resource management forwarded by Hardins (1968) by indicating the following points. First, the Hardin model confuses common-property resources with open access, the absence of property rights. By equating common-property resources with open access, and then assuming that open access leads to overexploitation, the model falls into the trap of equating the commons with overexploitation. Second, the model assumes that the individual interest is unconstrained by existing institutional arrangements. In many communities, common-property resource users are compelled by social pressure to conform to carefully prescribed and enforced rules of conduct. Third, the model assumes that resource users cannot cooperate toward their common interests. This is not necessarily so; under certain circumstances, voluntary collective action is feasible, and sustainable outcomes are not unusual. Fourth, the model overlooks the role of institutions that provide for exclusion and regulation of use. Finally, the set of solutions offered by the model is too limited. Privatization or the impositions of government control are not the only viable policy options.

In general, Berkes, *et al* (2006) propose that successful approaches to the commons dilemma are found in complementary and compatible relationships between the resource, the technology for its exploitation, the property-rights regime, and the larger set of

institutional arrangements. They also propose that combinations of property-rights regimes may in many cases work better than any single regime.

2.5. Forest Management

2.5.1. Issues of Resources Management

Natural resources play a special role in the life of the poor more than 1.3 billion people depending on fisheries, forests and agriculture for employment (FAO 2004a). Between 1970 and 1999 the natural wealth of the Earth's forests, fresh water ecosystems, ocean's and coasts declined by thirty three percent (for example, Borrini-Feyerabend, *et al* 1997; Barton, *et al* 1997; Anyaegbunam, *et al* 1998; Degron 2001; Borrini-Feyerabend, *et al* 2001). When population increases, the need for land and other resources also increases. Woodwell, *et al* (1983) realized that in tropical areas the rate of agricultural expansion since 1950 has been proportional to the rate of growth of human population. Thus, more forests are converted into agricultural land; natural resources are over exploited (Ha Houng 1999).

Ha Houng (1999) identified the causes for environmental deterioration under the heading of political, socio-economic, ecological, technical and managerial aspects. Political aspects of environmental resource deterioration indicated includes inappropriate and ineffective implementation of governmental regulations, levels of economic development in different areas lead to different levels of environmental consciousness of the people, political and economic influence policy-making process, social unrest and others. The socio-economic aspect includes expansion of institutional corporations, religion and superstition, unequal distribution of income and others. Climate change, lack of

coordination between government and involved agencies, for instance, are ecological, technical and managerial aspects.

According to Ha Houng (1999) to address environmental problems government should constructively issue environmental policies that bring environmental protection. Pricing policy or fee of using environment, management of resources by governmental regulation, green tax and clean technologies, community involvement, regional cooperation and support from developed countries are the points that are forwarded by Ha Houng to overcome environmental deterioration.

2.5.2. Resource Management and Development Linkages

According to Sanginga, *et al* (2010) the linkage between environmental change and the well being of populations who depend on natural resources can be summarized as five schools of thought:

The Downward Spiral Approach (Orthodox View): stated that poverty is a major cause and effect of global environmental problem. Poor people are forced to overuse environmental resources to survive from day to day and the degradation of natural resources further impoverishes them.

The Environmental Entitlements Approach: considered how societies are developed diverse institutional arrangements for managing natural resources and avoiding collapse. It emphasizes on the multifaceted nature of human-ecosystem iteration.

The Sustainable Development Approach: considers pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but also for the future generations.

The Sustainable Livelihoods Approach: achieved through access to a range of livelihood resources (natural, economic, human and social capital) which are combined in the pursuit of different livelihood strategies. It place people at the center of a web of inter-related influences that affect how these people create a livelihood for themselves and their households.

The Resilience Approach: posits that the challenge of NRM can be confronted with a renewed optimism towards the empowerment of local communities to manage their natural resources more sustainably and to adapt to change and live within uncertainty.

2.5.3. Forest Policies and Legislation

2.5.3.1. Forest Policies and Legislation in International Context

Forest policy is the set of orientation and principles of actions adopted by public authorities in harmony with national socio-economic and environmental policies in a given country to guide future decisions in relation to management, use and conservation of forest and tree resources for the benefit of the society (FAO 2010).

First attempt to establish an international legal regime for the protection of forests were made in 1992 at the United Nations Conference on Environment and Development (UNCED) conference in Rio with the emphasis on the tropical rain forests. The United Nations Conference on Environment and Development (UNCED), Earth Summit in Rio,

1992 recognized the significance of planted forests in sustainable forest management as reflected in the Forest Principles and Chapter 11 of Agenda 21.

Following this, two intergovernmental forum for forest policy were established under United Nation Commission on Sustainable Development the Intergovernmental Panel on Forests (IPF) from 1995-1997 and the Intergovernmental Forum on Forests (IFF) from 1997-2000. From 1995, the Intergovernmental Panel on Forests and Intergovernmental Forum on Forests subsequently supported by the United Nations Forum on Forests formulated a comprehensive set of proposals for action to achieve sustainable forest management, several of which related to enhancing the social, cultural, environmental and economic benefits of planted forests.

When UNFF (United Nations Forum on Forests) was established in 2000, it constituted a new international arrangement on forests and gave international forest policy a new momentum. UNFF is a forum in which all member states of the UN are represented, deciding traditionally by consensus. Initially, UNFF met yearly (UNFF1- UNFF7), now, the cycle will be biennial with UNFF 8 took place in 2009.

Several broad international agreements covering the protection of species, such as the CBD, CITES and RAMSAR Convention, also indirectly protect forests. United Nations legally binding instruments, including the Convention to Combat Desertification (UNCCD), Framework Convention on Climate Change, and the Convention on Biological Diversity strongly support afforestation and reforestation in rehabilitation of degraded forests and fragile ecosystems.

In addition to the above, there are developments relating to trade that also have direct and indirect impacts on forests. Global and regional agreements on economic cooperation and trade are emerging that are redrawing the relationship between countries. Regional and sub-regional organizations in Africa are active in the field of forests, facilitating regional collaboration.

2.5.3.2. Forest Policies and Legislations in Ethiopian Context

The Proclamation of 1975 nationalized rural lands state became a lawful manager of land and resources. During this time, the farmers have no possibility of lawful access to the asset, the embarked on a whole scale deforestation of hillside plantations or natural resources (Yeraswork Admassie 2001). Moreover, the resettlement and villagisation programs destroyed the forests in the endeavor to build homes and to acquire farm land to grow crops for settlers (Teferi Regasa 1999).

The evolution of a sound forest policy goes back to proclamation number 192/1980. Proclamation no. 192/ 1980 covers management of forest and wildlife resources and still valid as it relates to both forest and wild life management. Even part of it has been repealed in proclamation number 94/1994 forest utilization and conservation, and in proc. no. 456/2006 of rural land administration and land use. In September 2007, Forestry Development, Conservation and Utilization proclamation (proc. No. 542/2007) which repealed proc. No. 94/1994 recognizes state and private forests. Above all, the issues of sustainable natural resource management inculcated in the constitution (proclamation number 1/1995) of the country.

Environmental Protection Authority (EPA) and Institute of Biodiversity Center (IBC) are the major environmental institutions relatively stable in their organizational structure that may directly and/or indirectly acts on behalf of forest. EPA, established under proc. No. 9/1995, involved with developing environmental policy and legislation, setting standards for environmental media, monitoring pollution, establishing environmental impact assessment law, negotiating and signing access and benefit sharing agreements on genetic resources and undertaking capacity development in relevant agencies (proclamation no. 295/2002, proclamation no.299/2002 and proclamation no. 300/2002).

On the basis of mandate provided from the federal there are also proclamations and regulations enacted to safeguard the abuse to be on natural resources because inappropriate use. For example, Oromia National Regional State (ONRS) proc. No. 138/2008, 130/2007 and reg. No. 84/2007 which states reestablishment of investment administration, rural land administration and use, and establishment of Oromia regional state forest enterprises supervising agency respectively are among prominent one.

Furthermore, there are multilateral environmental agreements related to forests (directly or indirectly) that Ethiopia is party: Convention on Biological Diversity (CBD), Cartagena protocol on Biosafety to Convention on Biological Diversity, Convention to Combat Desertification (CCD), UN Framework Convention on Climate Change (UNFCCC) and Kyoto protocol.

- CBD entry into force on December 29, 1993; Ethiopia adopted on May 31, 1994 (proclamation 98/1994).
- Cartagena protocol entry into force in September 2003; Ethiopia signed on 24 May 2000, ratified on September 12, 2003 (proclamation 362/2003).

- CCD entry into force on December 26, 1996; Ethiopia ratified in 1997 (proclamation 80/1997).
- UNFCCC entry into force in March 1994; Ethiopia adopted on May 31, 1994.
- Kyoto protocol entry into force on February 16, 200; Ethiopia adopted on February 21, 2005.

2.5.4. Forest Management Approaches

Forest management is the process of planning and implementing practices for the stewardship and use of the forest and other wooded land aimed at achieving specific environmental, economic, social and /or cultural objectives (FAO 2001). It includes management at all scales such as normative, strategic, tactical and operational.

Traditional natural resource management is highly emphasized on commodities and natural resource extraction (Meffe, *et al* 2002); as exploitation natural resources were perceived as superabundant. Therefore, top down command and control policy (CCP) approaches in natural resource management failed to resolve the problem in natural resources in many different national contexts (Allison, *et al* 2006).

Thus, major threats to our natural resource management today stem principally from a lack of understanding of natural community dynamics, an ignorance of sustainable yields and the continuous loss of non renewable resources (Anderson 1995). While intensive forest plantation and conservation efforts are on the rise, primary forests continue to become degraded or converted to agriculture at alarming rates (FAO 2006).

The failure of conventional approaches led to an attempt to involve the people living in and around the forests in the conservation of the forests in the 1990s (Girma Amante

2006). New alternatives are being explored to bypass state monopolization of sustainable forest utilization and conservation activities. These include furthering the democratic process, policy liberalization, newly-assumed responsibility on the part of local communities, and decentralization (FAO 2002a).The poor conservation outcomes that followed decades of intrusive resource management strategies and planned development have forced policy makers and scholars to reconsider the role of community in resource use and conservation (Agrawal and Gibson 1999).

Contextually, sustainable forest management, as a dynamic and evolving concept, aims to maintain and enhance the economic, social and environmental values of all types of forests for the benefits of present and future generation (Kunzmann 2008). Moreover, ecosystem approaches for the further protection of the forests from the current alarming rate of deforestation. Ecosystem approach is, therefore, a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. This ecosystem approach helps to reach a balance of three objectives such as conservation, sustainable use and fair and equitable sharing of benefits arising out of the utilization of genetic resources (CBD 2000). Ecosystem approach based on the application of appropriate scientific methodologies focused on levels of biological organization, which encompasses the essential structure processes functions and interactions among organizations and their environment.

Accordingly, ecosystem approach requires adaptive management to deal with the complex and dynamic nature of ecosystems and the absence of complete, knowledge or understanding of their functioning (CBD 2000). According to WRI (2000), ecosystem approach has integrated approach which reorients the boundaries that traditionally have

defined our management of ecosystem, respects ecosystem at micro level, integrates social and economic information with environmental information about ecosystem and maintains the productive potential of ecosystem.

The arguments towards founding community-based forest management up on secure ownership of the resource are straight forward. Lasting local custodianship may logically be expected to be more easily noted where ownership of the resource is legally clear and secure. So that, security of tenure logically provides the most profound incentive of all towards sustainable forest conservation allowing the community to adapt a long term horizon management decision and therefore more cautious management. Local peoples, as a result, will feel responsible for their natural resources only when they can exert control over such resources, when they can impose duties and obligations on themselves and when they have the right knowledge and means to exercise such control and are sufficiently interested in the process (Breemer 1995).

Singh (1992) indicated that easy availability of grants and subsidies, prejudices and discrimination against women, illiteracy and lack of awareness, factionalism and heterogeneity of population, disparity in wealth and social status, interferences by politicians and misunderstanding about the motivation and objectives of population organization may affect the role of people's participation in forest management. Generally, rural communities must be allowed and encouraged to become responsible management of nature and natural resources on their own territories (Briemer 1995).

2.6. Empirical Evidences on Factors of Deforestation

Frey (2002) attempts to identify factors that result in deforestation by dividing land use into five different categories. The method of regression used to model the effect of deforestation in the study area (Ouro Preto de Oeste, Rondonia in western border of Brazil) was Ordinary Least Square (OLS). For Frey (2002) the independent variables that have effect on deforestation include family characteristics, farm characteristics and agricultural inputs.

Family characteristics like families that remain on lot for longer period of time might deforest less and household that has several loans or bank account may possess the financial means to deforest the land at larger scale. Farm characteristics variables such as road distance from city center and road condition may/not lead to deforestation. The more technological input that a farmer owns the easier it may be to deforest.

Mahapatra and Kant (2003) used multinomial logistic model to check independent variables such as forest size, population growth, economic growth, dept service growth, agricultural growth, road development and level of democracy as a factor for deforestation at the country-specific policy prescription. Mitinje, *et al* (2007) adopt linear regression model which used area of land cleared as dependent variables, and household size, level of farm income, education level, extenxsion contacts and fuel wood requirement as independent variables.

Giliba, *et al* (2011) used logistic regression method to analyze binary dependant variables. Accordingly, the dependant variables were livelihood activities, farm land size,

period of residence, awareness on general forest reserve management and boundaries, household size, education level and distance.

In general, for analysis factors of deforestation both at local level and cross national level different scholars employed various types of models. Multinomial logistic model (Mahapatra and Kant 2003); linear regression (Frey 2002; Zikri 2009; Mitinje, *et al* 2007), Binomial Logistic regression (Okojie 2003; Mahapatra and Kant 2003; Giliba, *et al* 2011); Spatial regression Models (Vaclay, *et al* 199; 2002); Environmental Kuznet Curve /EKC (Bhattarai and Hamming 2001; Ehrhardt-Martinez, *et al* 2002) and Bio-economic model (Namaalwa, *et al* 2006) were among models used in deforestation.

Angelsen and Kaimowitz (1998; 1999) put the empirical observation based on his personal analysis as following:

Table 2.1. Variable of deforestation

No.	Variable	Effect on deforestation	Comments
1	Higher agricultural price	Increase or reduce	Depends on assumption
2	Population growth	Increase	May increase at the decreasing rate due to induced innovation
3	Lower transport cost	Reduce	Support analytical model
4	Higher agricultural productivity	Reduce	
5	Higher wages	Reduce	Support models with labour market
6	More off-farm employment	Reduce	
7	Higher fertilizer price	Increase or no effect	May increase shifting cultivation
8	Higher no-fertilizer input price	Reduce	Other inputs complement land
9	More credit available	Increase or no effect	
10	Higher quality soil	Increase	

Source: Angelsen and Kaimowitz (1998; 1999) on pp.19 and 82 respectively.

2.7. Conceptual Frame Work

According to Geist and Lambin (2001), causes of deforestation can be grouped under two main headings which were proximate factors (e.g. agricuitural expansion, infrastructure expansion, wood extraction etc) and underlying factors (e.g. economic factors, policy and institutional factors, cultural factors, demographic factors etc). Accordingly, proximate

factors have direct impact on forests to convert to non-forest lands, whereas, underlying factors indirectly contribute for occurrence of deforestation.

More specifically, all factors indicated on the figure 2.1 have two way relationships with deforestation. According to Mahapatra and Kant (2003), all factors of deforestation indicated in the figure have dual relationship with deforestation.

Demographic factor (which mainly proponed population growth) depict both Boserupian and Malthusian effect on deforestation. The existence of high population in the absence of technological innovation that eases the pressure of peoples on environment will create burdens on forests and, therefore, deforestation occurs which will manifest the Malthusian effect. But, if the growing population supplemented by more innovation that reduces the pressure on forests Boserupian effect can be observed.

Agricultural expansion that simply intended in controlling more land for farm and grassland encourage deforestation. But, agricultural growth with intensification may enable farmers to acquire productivity, thus, the possibility to control more land is lesser hence deforestation could not took place.

The economic activities supplemented by off-farm activity have lower impact on forests. But, if societies are engaged in any activities that directly rely on forest deforestation will happen. Socio-economic factors, on the other hand, contribute for occurrence of deforestation when the societies are not using resources sustainably. Policy and institutional factors cause deforestation when they mal-administered. If there is less fear of punishment and leaders are not abiding by law deforestation will be common. The

pressure from community on the proper implementation of policies and proper function of institutions will minimize the occurrence of depletion of forests.

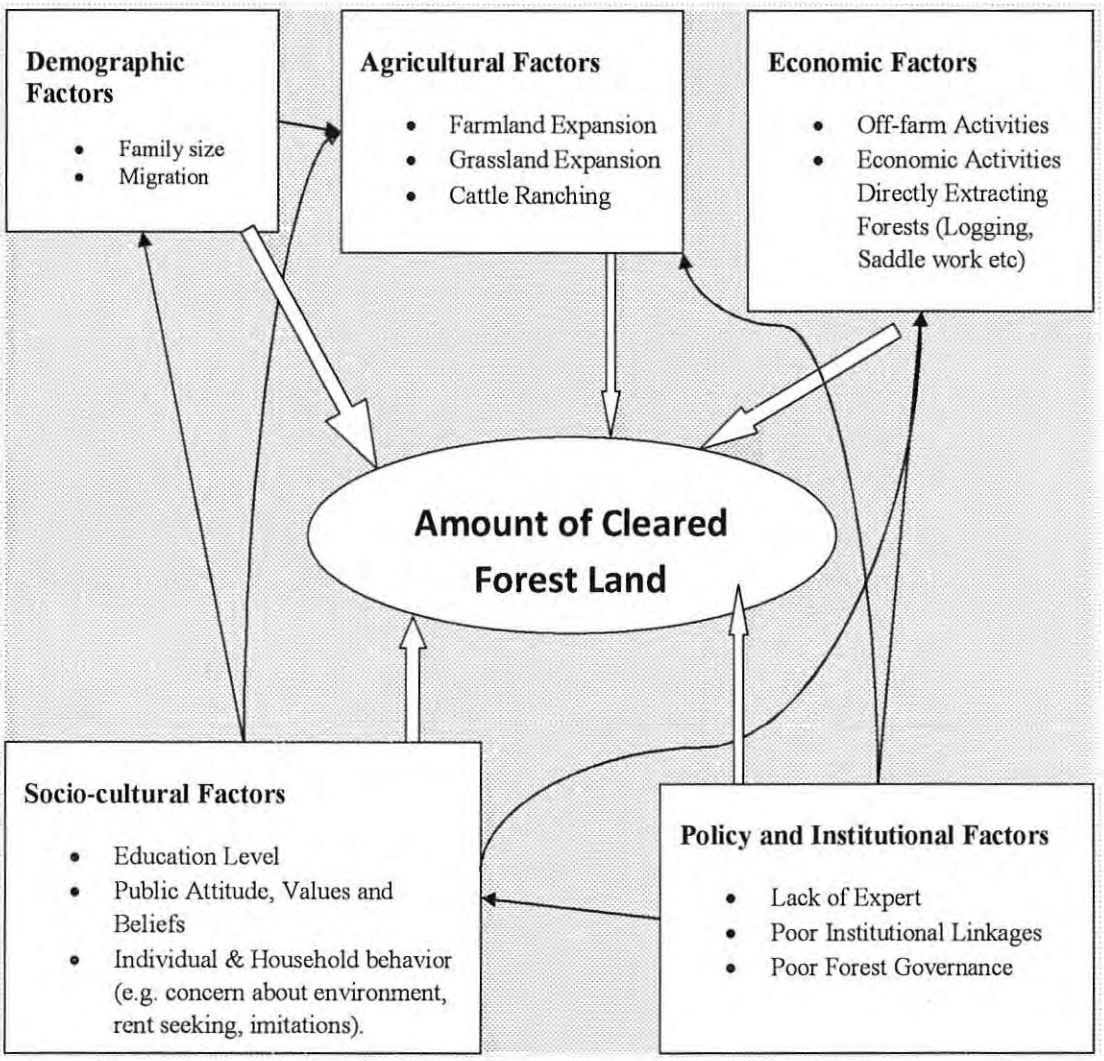


Fig. 2.1 Conceptual Frame Work

Source: Modified from Geist and Lambin 2001; Mahapatra and Kant (2003).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Description of Study Area

3.1.1. Location and Physical Characteristics

The study area is found in Oromia National Regional State (ONRS) in the present East Arsi zone. Administrative hierarchy of the forest area lies in Oromia Forest and Wild Life Enterprise (OFWE) at regional level, Arsi Forest and Wild Life Enterprise (AFWE) at zonal level and *Arbagugu* District Forest and Wildlife Enterprise (ADFWE) at district level.

OFWE established as independent organ government in accordance with proclamation number 87/1997 article 49 (1) and regulation number 16/2001. The seat for OFWE is Addis Ababa. The enterprise, in general, structured as nine branch office and 39 districts.

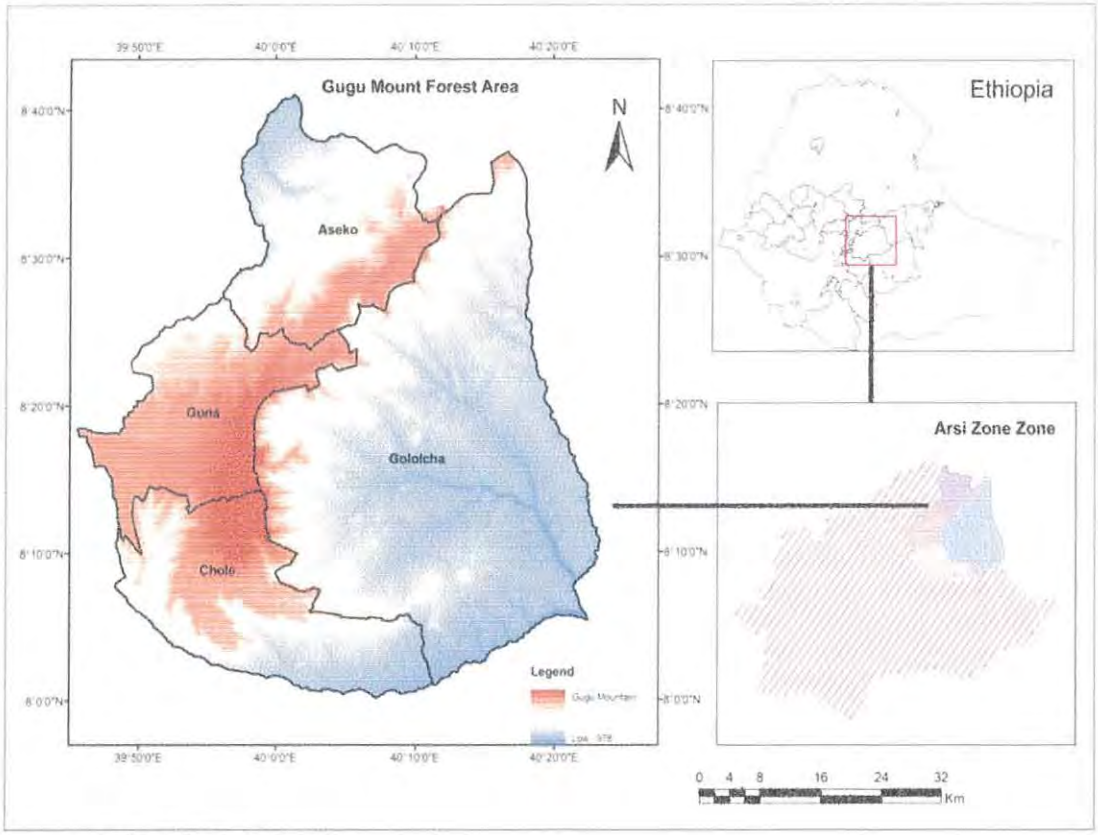
AFWE, one of the branch offices of OFWE among the nine, is the business making public enterprise formed through regulation number 86/1999. The enterprise owns and administers 234,652 hectares of forest resources. Five districts (namely *Harana Kokosa, Adaba Dodola, Arbagugu, Chilalo and Galama Shashemenie*) are found under administration of the enterprise. The head quarter of AFWE is located in *Arsi Negele* town at 225 km South of the Addis Ababa.

Arbagugu District Forest and Wildlife Enterprise (ADFWE), which is the study area, opened its office at the end of 1999 E.C. Initially, it was started by including forests in three *woredas* (*Guna, Merti* and *Aseko*) and later adds the two *woredas (Chole and*

Gololcha). The center for the district is located at *Abomsa* town which is found approximately at 190 km from Addis Ababa.

The relative location of *Gugu* mountain forest area is found at the around 279 km South East of capital, Addis Ababa (see figure 3.1). Astronomically, it is located at 8^0 N and 40^0 E. Gugu Mount Forest, intersects the four *woredas* namely: *Chole, Guna Aseko* and *Gololcha*. Rivers like *Gololcha, Refrefa, Jeldi, Hindhesa, Koro, Moye, Moye Amuma, Tebe* and others are flowing from the mountain to the surrounding *kebeles*. Due to its elevation and discharge from it, the mount serves as water tower to the *woredas* that borders it. So that, the continuous deforestation on the mount range continuously diminishes the number and the amount of streams flow to the adjacent areas. It extends from 2500 m to 3574 m a.m.s.l.

The adjacent two *woredas* (*Chole & Guna)*, which shares the largest portion of the forest area and have more proximity to estimate weather condition of the mount *Gugu* areas, have the temperature that ranges from 10 ^{0}C to 15 ^{0}C and annual rainfall that ranges from 800 mm to 1200 mm (AZFEDO 2011/12). Wild life such as Minilik Bush Buck (*Tragelaphus Meniliki*), Hyena, Kerkero, and Leopard (*Panthera Pardus*) are the major one. With regard to bird species it needs further investigation. The dominant vegetation type of the forest region includes *Asta* (*Erica arborea*), bamboo (*Arundinaria alpine*), *Koso* (*hygenia absinica*), are among from the dominant vegetation, and different grass types are found on the mountain area.



Source: EthioGIS 2012

Figure: 3.1. Map of the study area.

3.1.2. Population Composition

The majority of population in the area is composed of Oromo and Amhara ethnic group (Mohammed Hassen 2006). Majority of the population dwell in rural area. In *Guna* district the crude density of 162 persons per km^2 in the year 2000 E.C and 166 people per km^2 in the year 2002 E.C was observed. The crude density of population in *Chole* district, on the other hand, 159 persons per km^2 in the year 1999 E.C to 173 persons per km^2 in the year 2002 E.C. From this one can simply analyze that there is a growing trend in the population density in both district. The overall population data of the two *Woredas* shows that majority of the population are rural dwellers (see Appendix II 'A' and 'B'). The

increase in population number without change in means of production may further worsen the level of pressure on natural resource specially that of forest. Islam and Orthodox Christianity are predominant religions in the *woredas'*.

3.1.3. Economic Activities

Bi-modal pattern of the rainfall gives a wide opportunity for both districts to produce different types of the crops and use the same land twice a year that is, *Meher*[3] and *Belg*[4]. However, *Meher* is the largest season in terms of both cultivated land and crop production. The major annual crops grown in the district are cereals, pulses and oilseeds. Majority of the society in the area depends on agriculture, and the pastoralist is also found there. Therefore, mixed agriculture is, i.e. farming of land and herding of animals, the common activity. It is sedentary economic activity which depends on rain water.

3.2. Target Population

The subject of the study was farmers that own farm and/or grass land in *Gugu* Mountain Forest area. This was, in fact, based on forest demarcation done by ADFWE to delineate its concession. Accordingly, the office identified that more than 1000 farmer household heads of the have farm and/or grass land in the forest area of Gugu mount. Surprisingly, there are household heads that have homes in the forest area.

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[3] Meher time includes the crop harvested in the month of June to August (rainy season of most part of the country) and collected from November to January (sunny season of most part of the country).

[4]Belg time includes harvesting time that stretches from February to March and collected on the basis of type products. Because some could be collected in early June while Others spend up to September.

3.3. Research Design

Due to the time provided for data collection, cross-sectional research design was used. This design enabled the researcher to obtain all necessary data with the given time and cover the study area (Kumar, 1999).

3.3.1. Sampling Design and Sample Size

Gugu mountain forest covers the *Dega* and *Wurch* agro-ecologic zone that four adjacent *woredas* shared. According to Hurni (1998), the agro-ecologic zone of Ethiopia was classified as *berha* (<500m), *kola* (500-1500m), *weyna dega* (1500-2300m), *dega* (2300-3200m) and *wurch* (>3200m). ADFWE began demarcation of *Gugu* mountain forest region in 2009 in *Guna* and *Aseko* while forest area from the side of *Chole* and *Gololcha* undertaken in 2010. By considering difference in year *Guna woreda* from 2009 and *Chole woreda* from 2010 were taken purposively due to their accessibility. From the *kebeles* (i.e., *SamoBitana, Dima Badosa, Dima Wacalie* and *Walargi Bobe kebeles* in *Guna,* and *Yai Gugu, Koro Gugu, Ashutie Kofelchisa* and *Gado Yabeta* in *Chole)* in these two *woredas,* those bordering forest regions, by employing simple random sampling (i.e. specifically lottery method) four *kebeles* were selected from the total eight *kebeles* as sites for the study. Accordingly, *Koro Gugu* and *Ashutie Kofelchisa* from *Chole woreda,* and *Walargi Bobe* and *Samo Bitana* from *Guna woreda* have got the chance to be included in the study sample.

The total household heads, in these four *kebeles*, which own farm and/or grass land in the forest concession or fully dwell in the forest region, were about 671 household heads. To make it more manageable in terms of economy and time, the researcher included only

112 (~17% of the total population of sampled area) household heads for the source of information of the study. To select these 112 household heads from sampled household heads systematic[5] random sampling was employed by using the list prepared by ADFWE as a sample frame.

Table 3.1. Sample size taken from each *Kebele*

No.	*Woreda*	*Kebele*	**Total numbers of household heads own land from *Gugu* mountain forest area own land**			**Number of sampled household heads who own land**		
			<1ha.	>=1ha.	Total	<1ha.	>=1 ha	Total
1	*Chole*	*Koro gugu*	41	59	100	6	11	17
		Ashutie Kofelchisa	36	61	97	5	11	16
2	*Guna*	*Wellargi Bobe*	154	100	254	25	17	42
		Samo Bitena	117	103	220	19	18	37
		Total	**348**	**323**	**671**	**55**	**57**	**112**

[5] $\frac{n}{N} x K$ Where **n**=sample size (112); **N** is total population (671) and **K** total household in each *kebeles* (Ashutie Kofelchisa, Koro Gugu, Samo Bitana and Walargi Bobe) used to calculate the proportion of number of samples to be included from each *kebele*. Initially, the household to be included in sample was identified using simple random sampling (i.e. lottery method), and then, by following the same interval on the sample frame of each *kebele* respective sample size was identified.

3.4. Data Sources and Tools of Data Collection

3.4.1. Sources of Data

To acquire all necessary information for this study, information were primarily obtained from farmers that own farm and/or grass land in the *Gugu* mountain forest area, and also, elders that have knowledge of an area, ADFWE manager and Natural Resources Management Experts in an area were asked.

3.4.2. Tools of Data Collection

Both primary and secondary data sources were collected through interview, Focus Group Discussions (FGDs), questionnaire, field observation and analysis of documents relevant to the study.

Focus Group Discussion (FGDs): In order to obtain information more specific to an area FGDs were conducted to explore the existing realities in the study area. Six to twelve members of participants in FGD are recommended to conduct more manageable and successful discussion (Krveger 1988). Therefore, FGD that included members of eight in *Koro Gugu*, and six in *Walargi* and *Ashutie Kofelchisa* was held. As a result of sparse settlement and inconvenience of an area the planned FGD in *Samo Bitana* could not be conducted. FGDs in all *kebele* took from one hour to one and half hour. Initially, problem of confidence was manifested on participant farmers. But, after greater effort of researcher to ascertain their confidence participants began to explain their ideas and existing realities based on raised issues. Even though dominancy and passiveness were reflected in all FGDs the researcher attempted all the best to equally engage all participants as much as possible.

Key Informant Interview: structured interview questions were given to ADFWE Manager (Appendix I-E) and other similar questions that were asked to elders and NRM experts (Appendix I-D) were also prepared. Accordingly, five (four elders and one NRM experts) interviewees were interviewed as key informants. The elders that were interviewed were selected based on the time that they were stayed in the area and their experiences on the overall *Gugu* Mountain forest area human activities.

Questionnaire: based on information from reviewed materials and facts in the area questionnaire that include both closed indeed and opened ended were prepared (see Appendix I-A). All questions were prepared in English and translated to Afan Oromo language. Finally, the questionnaires were distributed to 112 respondents through the guidance of one enumerator in each *kebele,* and overall supervision of the researcher.

Document Analysis: The researcher critically examined materials that were reserved in AFWE, AZFEDO, ADFWE documents, the *woredas'* as well as *kebeles'* archives for insight evidence on the prevailing problems. Furthermore, books, journals, articles, periodicals, internet websites, conference and proceedings were reviewed for obtaining different ideas on the studied problems.

Field observation: For substantiating some responses with evidences, the researcher employed field observation on the basis of structured checklist (Appendix I-C). Thus, variables in check list were thoroughly filled by observing the physical environment of the study area and in some aspects by cross checking with documents.

3.5. Data Analysis Method

Both qualitative and quantitative data were used for this study. The methods of analysis used in this study were as follow:

The ***first objective*** was analyzed by using binary logistic model for variables compatible to the model and descriptive statistics with content analysis for those variables that were not included in the model. Accordingly, six quantitative and four qualitative variables were selected for the model computation.

According to Gujarat (2004) the probability to happen is given by:

$$\text{Pi= E (Y=1/Xi)} = \frac{1}{1+e^{-(\beta 0+\beta iX\ 1)}} = \frac{1}{1+e^{-Zi}} = \frac{e^{z}}{1+e^{z}}$$ while the probability not happen is given by: 1-Pi= $\frac{1}{1+e^{Zi}}$ Then, the formula for finding the probability to happen then computed as: $\frac{Pi}{1-Pi} = \frac{1+e^{zi}}{1+e^{-zi}} = e^{zi}$

$$Li = \ln\frac{Pi}{1-Pi} = Zi = \beta o + \beta iX1$$

Where ***L*** is log of the odds ratios; ***ln*** is natural logarisms; ***P*** probability to happen; ***1-Pi*** probability not to happen.

In line with the above equation of Gujarat (2004), Mahapatra and Kant (2005) derived the following formula to compute rate of deforestation using binary logistic model:

$\ln\frac{Pi}{1-Pi} = \beta o + \beta 1X1 + \beta 2X2 + \cdots + \beta 10X10 + ui$ Where: β is coefficient of independent variables showing marginal effect (positive/negative); $X_1 \ldots X_{10}$ are list of independent variables in the model; *ui* error term. Therefore, for this study

$\ln\frac{P\ (high)}{P\ (low)} = \beta 0 + \beta 1 * EDUC + \beta 2 * FAMSIZE + \beta 3 * GRASSL + \beta 4 * FARML + \beta 5 * LIVSIZE + \beta 6 * OFFARM + \beta 7 * RESIDENT + \beta 8 * EXPVISE + \beta 9 * FORBRDR + \beta 10 * DISTANCE + ui$

For the remaining objectives descriptive statistics (mean, percentage, frequency and standard deviation) was used. Based on the facts with perception and existing realities content analysis was provided.

Generally, to ease the overall data processing Statistical Package for Social Science (SPSS version 15.00) was used. Data were coded and entered to this software package after processing it the outputs of each command were used for analysis.

3.6. Variable Specifications

For employing Binary Logistic Model variables were organized on the basis of priori expectation for independent variables and dichotomous option for dependent variable.

The amount of farm and/or grassland cleared and now demarcated (AMLFOR) 1=high (if it is equals to or greater than one hectares), and 0=Low (if it is less than one hectares). In SPSS, the model is always constructed to predict the group with higher numeric code. Therefore, for this study the SPSS predicts the membership in high category since it is coded as 1 which is the higher value.

Assumptions for priori expectations of independent variables were stated as follow:

EDUC (education status of house hold head): the higher education status, the more awareness about environment. The lesser the education status the higher impact on environment due to higher resistance to new technologies and new ideas on preservation of forests. The more land will be cleared and included to former land. Moreover, it shows negative relationship with deforestation.

FAMSIZE (family size): the higher number of family in the household the more need to agricultural land to grow crops and rare animals. The more need to farmland the more forest to be cleared and vice versa. The positive regression on deforestation is expected from this variable.

GRASSL (grass land size): the more grass land house hold possesses the lesser release of livestock to forest. Absence or the lesser amount of grass land for household the more use of forest land as open space for their livestock food and use of forest as grassland. There is negative coefficient of regression of grassland size on deforestation.

FARML (farm land size): the more farm land the household head have the less futurity forestland cleared. The less farm land household owns the more the need to forest land conversion. The negatively regression between farm land size and deforestation is expected.

LIVSIZE (livestock size): the stock and flow of cattle encourage forest clearance. When number of cattle exceeds carrying capacity of the village grazing commons, people have to clear the forest for pasture. Or, a reduction in stock of livestock encourage clearance since could not afford their daily needs because of low income. In line with this, the study made by Kaimowitz (1996) in the case of Nicaragua and Costa Rica shows that decline in cattle population has led to a major increase in abandoned lands with brush, wooded areas and secondary forests. But, technological changes that improve the productivity of cattle raising will reduce pressure on forests (Serrao and Toledo 1992;1993; Mattos and Uhl 1994; Arima and Uhl 1997). Livestock sizes, in short, have both negative and positive regression on deforestation.

OFFARM (off farm activity): if household head have other employment other than plough land and rearing livestock, there will be a possibility to supplement the income for house consumption. So that, the lesser reliance on expansion of lands for farm. But, type of off farm activity matters. Off-farm activity has negative regression up on deforestation.

RESIDENT (time of residence in the area): the more time they stay the more forest land they cleared. The less time they stay in the area the less encroachment in the forest. Residence time shows positive sign while regressed with deforestation status.

EXPERV (expert visit): the higher frequency the expert visits the farmers, the more exposure to new means of production which can enable them to increase their productivity. Therefore, there will be lesser pressure on the forest and vice versa. Expert visit negatively affect deforestation level.

FORBDR (knowledge of forest border): the more knowhow of forest border the less encroachment to it and vice versa. Knowledge of forest border negatively affects the extent of deforestation.

DISTANCE (distance of the home): the more time that the home takes from the forest border the lesser land the household heads pass to the forest region. Therefore, there will be less impact on the forest area. Distance of home from the forest region will have negative regression on the forest region.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1. Characteristics Of Respondents

4.1.1. Education Status

From the total 112 sampled respondents, 65.2% of them have no formal education while only 34.8% of them engaged in formal education. This shows around 2/3rd of respondents in the study area did not go to school for education. Absence of formal education may owe its own contribution to lower pressure on forest. In line with this, many scholars proponed that formal education lower pressure on forest (Moran 1989; Tongpan, *et al* 1990; Godoy, *et al* 1996) by ease out migration and the adoption of the modern farm technologies that raise the productivity of land and labor (Lockheed, *et al* 1994).

Furthermore, UNESCO (2006) specifically indicated that four to six years education is the minimum threshold for increasing agricultural productivity through allowing farmers adaptation of new agricultural methods, cope up with risk and respond to market signals.

4.1.2. Family Size

The mean of family size from obtained survey shows 7.04, which is more than average size of household of rural dwellers at national level (Ethiopia, i.e. 4.9) and at regional level (Oromia, i.e. 5) (CSA 2007). The existence of large family requires more lands and other basic materials for consumption. Apparently, there will be a possibility to encroach more forest area to add lands and to collect other forest products.

In consistent with this, positive associations between farm size and family size have been documented in a variety of cultures and settings including Rwanda, Egypt, the Philippines, Iran, Peru and Ecuador (Hiday 1978; Good, et al. 1980; Schutjer, *et al* 1983; Easterlin and McCrimmins 1985; Clay and Johnson 1992; Coomes, *et al* 2001; Carr and Pan 2003). Specifically, Bilborrow (1992) indicated that the number of children bear positive link to the clearance of forest because of the increase demand for food and for other commodities.

4.1.3. Size of land holdings

In the study area the mean size of grazing land that a household owns is ~.55ha, while 1.51ha is the mean of farm land owned by sampled respondents. From the total respondents 25.9% (29) of them have no grass land outside of forest region while 3.6% of the respondents, from 112 sampled respondents, have no farm land out of forest region. This shows that farmers convert forests for gazing than farm land in the study area.

Similarly, Malthus (1914) described that when land becomes scarce people will keep on searching for new land, and so the share of agricultural land held by small holders exerts an influence on the annual rate of deforestation (Rock 1996). Globally, the main forest conversion process in the tropics was the transformation of closed, opened or fragmented forest to agriculture at alarming rate every year (Archard, *et al* 2002). There are studies that also suggested the damage to species is higher for land converted to pasture than for land converted for farming (Portela and Rademacher 2001).

4.1.4. Livestock size

In the study area, the mean of livestock size owned is nearly 10 TLU. To feed their livestock farmers in the area use forest lands as grazing. Moreover, information from FGD and interview shows that there are large amount of cattle that are coming to forest area during summer time from different *woredas*. This further worsens the situation in forest area by increasing the size of livestock to the level that exceeds grazing capacity[6] of the forest.

The grazing type that respondents in the area (as shown in Table 4.1) used were free grazing (71.4), tie grazing (21.4), both free and tie grazing 7.1%, but zero grazing is not use. In free grazing system, large grassland is required. To fulfill this, in the study area, more lands near the forest area were used as grass land for feeding their livestock's. But, Timmins (2002) indicated that the presence of cattle has an impact on vegetation species composition, structure and regeneration in the forests, that the effects of a particular grazing regime may take many decades to dissipate, and that the impacts of cattle change with intensity of use.

[6] Grazing capacity is a maximum possible stocking of herbivores that rangeland can support on sustainable basis (FAO 1988). According to FAO (1988) the estimates of grazing capacity are commonly based on the assumption that livestock require a daily dry matter intake equivalent to 2.5% to 3% of their body weight which is calculated by considering grazing efficiency, forage loss and proper use.

Table 4.1: Grazing type used by respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
FREE GRAZING	80	71.4	71.4	71.4
TIE GRAZING	24	21.4	21.4	92.9
ZERO GRAZING	0	0	0	92.9
BOTH FREE AND TIE GRAZING	8	7.1	7.1	100.0
Total	112	100.0	100.0	

Source: Field survey 2012

4.1.5. Off-farm activities

From the total sampled respondents only 31.3% of respondents engaged in off farm activities where the majority of them were not. But, from those who engaged in off farm activities (i.e. 35 household heads), more than 50% of them have the work directly depends on the extraction of forest products (see Table 4.2). Even though occupations supplemented by non-agricultural activities have little or no impact on land use change (Aliens and Barnes 1988), the aforementioned result shows that agricultural which directly related to forests. Therefore, off farm activity in the study area has no contribution in minimizing the deforestation process.

Table 4.2: Type of off-farm activity

	Frequency	Percent
SADDLE WORK	7	20.0
WOOD WORK	12	34.3
PITTY TRADE	10	28.6
OTHERS	6	17.1
Total	35	100.0

Source: Field survey 2012

4.1.6. Residence time

The minimum year that the household head stayed in the present area was 2 years where the maximum was 80 years. The mean year the household reside in the present area was found to be 32.01 years.

4.1.7. Distance of Homes From Forest Area

The mean time that homes of household took from the forest area was 10.29 minutes. The minimum distance of household home was zero minute, which refers to the household is dwell in forest region, and maximum distance of household home took 60 minutes (1 hour).

4.2. Empirical Analysis of Factors Contributing to Deforestation

Binary logistic model was employed to analyze factors of deforestation. The dependent variable for the analysis was the amount of forest land cleared by farmers and converted to farm and/or grassland. To make it more compatible for regression, data of land cleared which was collected in *timad*[7] converted to hectares and categorized as dichotomous variables which owes high and low options. Thus, those sampled respondents that own lands which was greater than or equals to one hectares (57 sampled respondents) were coded as high (one) and those whose land was less than one hectare (55 sampled respondents) were coded as low (zero).

Therefore, total land cleared by each respondent since he/she settled there was taken as dependent variable that could be affected by independent variables such as covariates (family size, grassland size, farmland size, livestock size, residence time, distance home from forest border) (see Table 4.3) and categorical (education status, off-farm activities, expert visit, knowledge of forest border) (see Table 4.4).

The goodness fit of the model in the findings of the study was found to be well. A chi-square (χ^2) [8]value of 87.833 with degree of freedom (***df***) of 10 was significant at the probability level of p=0.000. Similarly, the -2 log-likelihood (**-2LL**)[9] value of 67.397 indicated the model is well fitted the data. That is, both depicted that the independent

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[7] *Timad* is the amount of land that could be ploughed per a day by pairs of oxen (which is equivalent to ¼ hectare)

[8] Chi-square test is obtained by calculating the difference between initial -2log likelihood (likelihood function of intercepts) and -2log likelihood final (likelihood function of parameters).

[9] -2log-likelihood is chi-square test based on the difference in X^2 statistics between full model and reduced model.

variables affected the dependent variables. The *Wald statistics*[10] indicated that there is interaction between the dependent variables and independent variables. In line with this, Giliba *et al* (2011) indicated that the non-zero value Wald statistics refers for the presence of the relationship between dependent and independent variables.

Table 4.3 Covariate variables used in the model

	N	Minimum	Maximum	Mean	Std. Deviation
FAMSIZE	112	1	18	7.04	3.378
GRASSL	112	.00[11]	5.00	.5480	.70854
FARML	112	.00[12]	8.00	1.6500	1.50880
LIVSIZE	112	2.03	30.12	9.8256	4.81718
RESIDENT	112	2	80	32.01	20.427
DISTANCE	112	0[13]	60	10.29	9.394

Source: Field survey 2012

[10] Wald statistics=$\frac{\beta}{S.E}$

[11] These are respondents who have no grass land but forest region as grazing area for their livestock.

[12] These respondents represent those whose farmlands are fully demarcated in the forest region.

[13] Zero minute refers for those household heads whose home is found in demarcated area.

Table 4.4. Categorical variables used in model

Variables	N	Response	Code	Frequency	Percentage
EDUC	112	INFORMAL	0	73	65.2
		FORMAL	1	39	34.8
OFFARM	112	NO	0	77	68.7
		YES	1	35	31.3
EXPVISE	112	NEVER	0	55	49.1
		SOMETIMES	1	57	50.9
FORBRDR	112	NO	0	46	41.1
		YES	1	66	58.9

Source: Field Survey 2012

The model result indicated that the signs of all variables found to be consistent with priori expectations.

Table 4.5. Factors contributing to deforestation

		β	S.E.	Wald	df	Sig.	Exp(β)
Step 1(a)	EDUC(1)	-1.657	.833	3.955	1	.047*	.191
	FAMSIZE	.137	.104	1.727	1	.189ns	.872
	GRASSL	-1.653	.566	8.523	1	.004**	.192
	FARML	-.384	.305	1.583	1	.208ns	.681
	LIVSIZE (TLU)[14]	.078	.085	.849	1	.357ns	1.081
	OFFARM(1)	-.313	.675	.214	1	.643ns	.731
	RESIDENT	.098	.026	14.354	1	.000**	1.103
	EXPERV(1)	-5.513	1.068	26.625	1	.000**	.004
	FORBRDR(1)	-2.288	.870	6.922	1	.009**	.101
	DISTANCE (min)[15]	-.016	.043	.141	1	.707ns	.984
	Constant	3.783	1.535	6.077	1	.014	43.937

N=112; -2LL=67.397; X^2=87.833 (p=0.000); Over all percentage=90.2%; β =regression coefficient which stands for odds ratio; S.E. =standard error; df=degree of freedom; Exp (β) =odds ratio; sig=significance.

**significant at 5%; ** significant at 1%; ns= not significant*

Source: Model output.

The model output indicated that education status, residence time, expert visit, grass land size and knowledge of forest border were significantly contributing to deforestation of *Gugu* Mountain forest region. Accordingly, these variables are interpreted as follow:

[14] TLU refers for tropical livestock unit. One tropical livestock unit is equivalent with 250kg. Accordingly, ox/cow=0.25TLU; heifer/young bull=0.75; goats/sheep=0.15TLU; donkey=0.65TLU; mule/horse=1.1TLU; and chicken=0.013TLU. (Ramakrisha and Demeke 2002; Storck, *et al* 1991)

[15] Min. stands for minute. It refers the time that distance from the home takes from their home if someone travels on foot in a single trip.

Education status (**EDUC**) has negative coefficient (β) of -1.657 with odd ratio Exp (β) of 0.191 which was statistically significant at probability level of 5% (p=0.047). This implies that the exposure of household head to formal education minimizes the likelihood of deforestation by reducing the chance of having more land in forest region by the factor of 0.191

The amount of grass land **(GRASSL)** that a household own has negative regression coefficient (β) of -1.653 with odd ratio Exp (β) 0.192 which was statistically significant at probability level less than 1% (p=0.004). This implies a unit increase in size of grass land created a chance of owning lesser land (less than one hectare) by a factor of 80.8%. From the model description one can understand that the possibility of farmers who own less grass have more chance to clear forests for further expansion of their lands.

Expert visit **(EXPVISE)** has negative regression coefficient (β) of -5.513 with odd ratio Exp (β) of 0.004 which was statistically significant at probability level less than 1% (p=0.000). Specifically, the presence of visit of households by experts reduces the likelihood of households to own lands that exceeds one hectare in the forest area by the factor of 99.6%. The presence or absence of extension contacts depends on the government policies and institutional factors.

At the study area, there are no forest experts at *kebele* level. Surprisingly, there is also lack of experts at *Arbagugu* District level. The interview response of ADFWE manager clearly indicated the shortage of skilled man power in the area of forestry at the district level. Due to remoteness of some sites under district majority of the experts release their job and go to other areas.

Residence time **(RESIDENT)** has positive regression coefficient (β) of 0.098 with odd ratio Exp (β) of 1.103 which was statistically significant at probability level less than 1% (p=0.000). The result portrayed that an increase in the number of years of residence of the households near and/or in the forest region increases the likelihood to own lands greater than or equals to one hectare by the factor of 103%. This implies that the more time the farmers live near and/in the forest area the more land will be cleared. Even though this finding contradicts the idea that longer stay near forest area increase experience on deforestation and perceived need of reforestation (Mitinje, *et al* 2007), it is in consistent with the increased number of years of residence increases the likelihood of forest reserve disturbance due to growing of family size (Giliba, *et al* 2011)

Knowledge of forest border **(FORBDR)** has negative regression coefficient (β) of–2.288 and odd ratio Exp β of .101 which was significant at probability level less than 1% (p=0.009). When households know the border of the forest it decreases the chances of having grass and/or farmland greater than or equals to by the factor of 89.9%. This result depicted that the more the farmers know about forest boundaries the less likely to break in to forest areas to expand their farm land. On the other hand, this implies if farmers have the knowledge of forest boundary they fear to encroach. Similar to this finding, authors like Giliba, *et al* (2011) showed the presence of negative regression between forest border knowledge and level of encroachment.

But, family size **(FAMSIZE)**, farmland size **(FARML)**, livestock size **(LIVSIZE)**, off-farm activities **(OFFARM)** and distance of home from forest border **(DISTANCE)** were not significant at the probability level of 5%. In some extent, these variables were found to be among factors contributing to deforestation of the area.

4.3. Other Factors Contributing to Deforestation of *Gugu* Mountain Forest Region.

4.3.1. Forest as Source of Fire Wood and Construction Materials

As indicated in Table 4.6 below 83% of respondents collected fire wood from forest while only 17% of them from other sources (from their own homestead trees and manure). Data on the national census report depicted that majority of rural dwellers obtained their energy source from firewood and charcoal (CSA 2007). According to EPA (2004) the fuel wood demand of the country is far exceeding sustainable supply. Therefore, the dependence of communities on the forest in the study area has contributed its own share for degradation of forest.

Table 4.6 also portrayed that from the total respondents 94.6% of them build their homes and fences by extracting raw materials from forests while only 5.4% of them acquire from homestead trees. According to national census data from the total rural housing units 98% of them were mostly made up of woods (CSA 2007) regardless of its source. Since the major source of raw materials for construction in the study area is forest; its impact on forest is inevitably high. Similar to this, Teferi Regasa (1999) indicated that forests were destroyed to build homes during resettlement activities.

Table 4.6. Forests as source of fire wood and construction materials

No.	Variables	Responses	Respondents	
			No.	%
1	Use forest as a source for firewood	Yes	93	83
		No	19	17
		Total	**112**	**100**

2	Use forest as source for building homes and fences	Yes	106	94.6
		No	6	5.4
		Total	**112**	**100**

Source: Field Survey 2012.

4.3.2. Occurrence of Forest Fire

According to information from the interview and FGD, the occurrence of fire[16] over the last five years was very common for the sake of expanding farm land, for obtaining fire wood and even for expelling wild animals (e.g. Hyena, fox etc). This reality can also be understood by simply observing forest areas that were burnt. In line with this, all respondents that have been there before last five year noticed this situation as well. Thus, out of 112 (as shown in Table 4.7) respondents 84 (75%) of them observed forests were disturbed by fire while only 28 (25%) of household were not came across the forest fire since they have been in the area. Evident to this, Dechasa Lemessa (2001) found out that the highlands and high forests in almost all parts of Ethiopia were victims of forest fire incident. Therefore, in the study area, forest fire was played a significant role in changing land use system from forest to agricultural land in the last five years.

Table 4.7: Occurrence of forest fire in the area at the time respondent there

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	28	25.0	25.0	25.0
	YES	84	75.0	75.0	100.0
	Total	112	100.0	100.0	

Source: Field survey 2012

[16] After the first draft of this paper was submitted to advisor the forest fire was burnt more than 50% of total area. (i.e. in March 2012).

Information from Interview and FGD cannot come up with the exact causes of forest fire. But, most commonly forest fires may be caused by natural causes and manmade causes (e.g. the need to expand for forest land, for preparing to fire wood and protection of wild life harm). Furthermore, forest fire can also be caused by economic activity like bee keeping. According to Giliba, *et al* (2011) improper use of fires while collecting honey causes forest fires which will discard forests.

4.4. Perception of Farmers About Forest Management

4.4.1. Perception of Farmers Toward Deforestation

As indicated in Table 4.8 beneath, all respondents feel that deforestation is a problem to *Gugu* mountain forest area. Simultaneously, 82.1 % of the respondents perceive that the extent of deforestation in the area is high, 13.4% as medium and only 4.5% of respondents replied as low. With regard to trends of deforestation in the area in the last ten years 97.3% of them observed as it was increasing while only 2.7% of them reported as it was decreasing. Generally, this finding shows that almost all sampled respondents agreed as deforestation is the problem to the area with high severity and increasing trend of deforestation.

Table 4.8. Perception of respondents on deforestation

No.	Variables	Responses	Respondents	
			No.	%
1	Does deforestation is a problem to your area?	Yes	112	100
		No	0	0
		Total	112	100

2	How do you perceive the severity of deforestation in your area?	High	92	82.1
		Medium	15	13.4
		Low	5	4.5
		Total	112	100
3	How do you perceive trends of deforestation in the last ten years?	Increasing	109	97.3
		Decreasing	3	2.7
		No change	0	0
		Total	112	100

Source: Field Survey 2012

On the other hand, respondents were asked to rank causes of deforestation in their area based on their personal experience. Accordingly, sampled respondents reported that agricultural expansion, over grazing, forest fire, poor government policies and timber production ranked from first to last respectively based on the level they contribute for deforestation of an area (for detail see Table 4.9).

Based on the information from questionnaire, interview and FGD, poor government policies can be identified due to the demarcation of once legalized lands with unclear justification. For example, certified lands, school compound, cooperative land which was given during EPRDF[17] and Derg[18] regime are best indicators. In line with this, Sudderlin and Resosudarmo (1996) described that government policies and practices faced inadequacies in terms of three phenomena: if the low incentive to prevent encroachment,

[17] Ethiopian People's Revolutionary Democratic Front (EPRDF) is ruling party of Ethiopia since 1991.

[18] Military government of Ethiopia from 1974 to 1991.

if policies encourage rent seeking and if there is insufficient support for provincial level protection of forests.

Table 4.9. Pair wise ranking causes of deforestation

No.	Causes of Deforestation	Frequency	Rank
1	Timber production	22	5
2	Forest fire	258	3
3	Over grazing	280	2
4	Poor government policies	202	4
5	Agricultural land expansion	358	1

Source: Field Survey 2012

Perception of respondents on the whether or not deforestation can be controlled was asked. Accordingly, Table 4.10 indicated that 83.04% and 9% of respondents agree and strongly agree on the possibility of deforestation control while only 16.96% of them are disagreed. The mean result of this finding tends to 2.25 that is nearer to agree, therefore sampled respondents were agreed that deforestation can be controlled.

Table 4.10. Perception of respondents on deforestation control

No.	Question	Response	Respondent	
			No.	%
1	Deforestation can be controlled by human intervention.	1. Strongly agree	10	9
		2. Agree	93	83.04
		3. Disagree	19	16.96
		4. Strongly disagree	0	0
		Total	112	100

Source: Field Survey 2012

4.4.2. Local Community Practices and Forest Management

From the total respondents of 112, all of them replied as they were not made discussion on environmental problems in their local community association such as *idir*[19]. Elderly and FGD substantiate this reality. They stated that *idir* and other local community associations are established on the basis of certain aims. Yet, nobody was tried to use these local community associations for such burning issue.

Respondents were also asked whether they have cultural practices that prohibit deforestation in their area. All respondents reported that the existence of cultural practices found there and peoples now a day no more abide by it as earlier. According to the respondents, traditional sacred area (called *Sheihkamserie*[20]) and individual worship sites (called *adbar*[21]) are the most commonly practiced and peoples were not cutting trees surrounding them due to fear of curse.

As indicated in Table 4.11, respondents were asked whether they use stoves that save firewood. Accordingly, 92% of them were not used stoves while only 8% of them were using. Majority of them (54.4% from those who have no stove) reason out the access of firewood as cause not to use stoves, where as 33% and 12.6% of the replied lack of awareness and problem of access of stoves as a cause not to use. This shows that more supply of firewood led farmers not to use stoves. Similarly, Longman and Jenk (1974)

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[19] *Idir* is local association established on the purpose of helping each other at the time of hardship.

[20] It was begun to serve as sacred area for traditional religion since 1913 E.C. It was founded by Seid Abal Kasim. Peoples in adjacent areas, and even from farther, gathered together and celebrate by bringing some gifts at least three times per annum (*Jia heto, molida and zara haji).* (Source: scripts on temple and interview with Adam K/Hussein A/kasim).

[21] Peoples may have *adbars* based on their neighborhood or individually.

indicated that peoples perceived forests nearby them as primary potential sources of firewood and charcoal.

Table 4.11. Use of stoves that save firewood

No.	Variables	Response	Respondents	
			No.	%
1	Do you use stoves that save firewood (e.g., mirt, lakech and gomze)?	Yes	9	8
		No	103	92
		Total	**112**	**100**
2	The causes for not to use	Lack of awareness	34	33
		Problem of access	13	12.6
		Enough access of firewood	56	54.4
		Total	**103**	**100**

Source: Field Survey 2012

Barbier (1997) proponed that the process of conversion of new areas of forest land involves migration from existing agricultural areas to forest frontier and land abandonment for further conversion and exploitation of frontier forest areas. According to CSA (2007), a person is considered as a migrant if he/she was born in another rural or town which is different from the current *kebele*. Based on this, respondents were asked whether they were living other area, cause for releasing their original area and why they prefer their present location.

The following Table 4.12 indicated that 40.2% of respondents were previously lived in other area while 59.8% of them where initially lived there. Despite of the outstanding numbers who originally live in the area, the number of those coming from other area was not small. From those who were displaced, 42.2%, 37.8% and 20% of them were

displaced as a result of land fragmentation, landlessness and land degradation respectively. In line with this, Farrag (1997) stated that landlessness, small farm size, marginal ecological conditions and depleted soil fertility are among major factors affecting emigration in Sub-Saharan Africa.

Table 4.12. Migration

No.	Variables	Response	Respondents	
			No.	%
1	Have ever lived in other area before you come to your present residence?	Yes	67	59.8
		No	45	40.2
		Total	**112**	**100**
2	What cause you to come to release your former area?	Land degradation	9	20
		Land fragmentation	19	42.2
		Landlessness	17	37.8
		Total	**45**	**100**

Source: Field Survey 2012

As indicated in the following chart (fig. 4.1), from the total of 45 respondents 89% of them were preferred this area due to its open access where as 11% of them acquire through government grant. This finding purely indicated that farmers in the study area perceive forest frontiers as open areas. In consistent to this, Longman and Jenik (1997) indicated that peoples near forest areas considered forest area as a permanent sources of farmland for cultivation and to obtain all other necessary things from it.

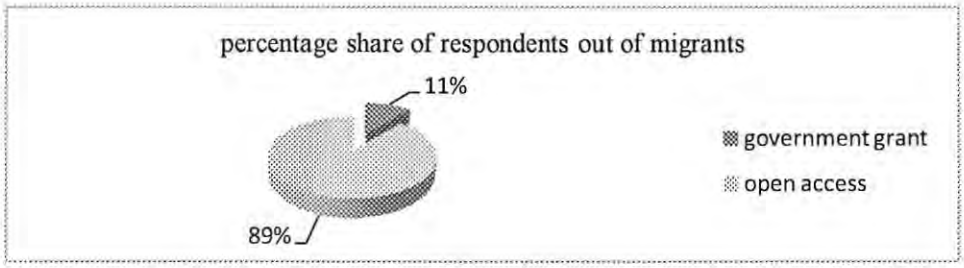

Fig. 4.1. Reason to prefer the current location

Source: Field Survey 2012

All respondents replied as there was afforestation and/or reforestation activity in their current *kebele*. But, from the total respondents (as indicated in Table 4.13) 77.7% of them participated in planting of trees while only 22.3% of them were not participated due to personal reasons.

Table 4.13. Afforestation and/or reforestation activities

No.	Variables	Response	Respondents	
			No.	%
1	Was there any reforestation and/or afforestation activities done in your area in the last ten years?	Yes	112	100
		No	0	0
		Total	**112**	**100**
2	Have you participated in the afforestation and/or reforestation activities?	Yes	87	77.7
		No	25	22.3
		Total	**112**	**100**

Source: Field Survey 2012

In the context of preserving planted trees 82% of them levied responsibility to only government bodies while only 15% of them with only local communities and others both local communities and government bodies (see figure 4.2). This finding shows even

though respondents were participating in planting trees they are not daring about the preservation and continuous follow up. World Bank (1992; 1999) indicated that many environmental problems could not be solved without active participation of local peoples. Unless the local people's perception that put duty on government bodies to conserve forest in their area changed, it is difficult to reforest, afforest and protect existing forest from deforestation.

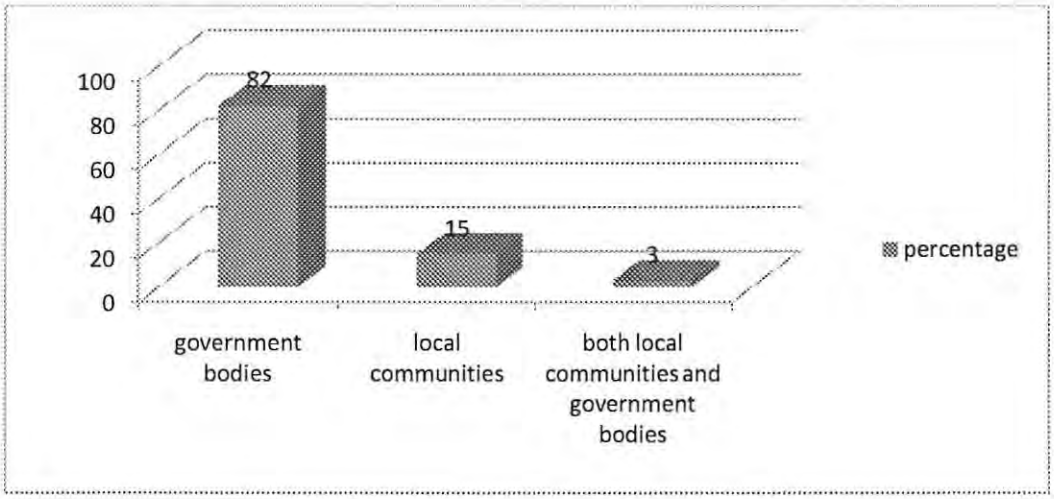

Fig. 4.2. Respondents' perception on responsibility to preserve new plants

Source: Field Survey 2012

Table 4.14 indicated that 90.2% of respondents agreed that homestead trees have their own contribution to minimize the level of pressure on forests while 9.8% of them disagree. This shows that the positive perception of sampled respondents on homestead trees.

Table 4.14. Perception toward homestead trees

No.	Variables	Response	Respondents	
			No.	%
1	Homestead trees have their own contribution to minimize level of pressure on forests.	Agree	101	90.2
		Disagree	11	9.8
		Total	**112**	**100**

Source: Field Survey 2012

Contrary to the aforementioned table, from the total respondents, 85.7% of respondent do not have any trees on their farm plot, the remaining 14.3% of them own trees that cover 0.06 to 0.5 hectares on their farm plot (mean area of tree planted is 0.04 hectares) (see Figure 4.3). As they replied the trees dominant tree they grow is eucalyptus where only few other species of trees were grown.

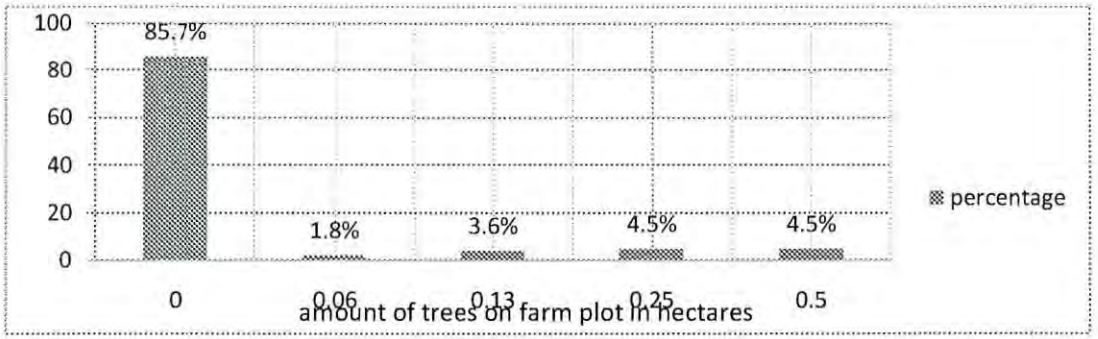

Fig.4.3. Respondents' homestead trees size

Source: Field Survey 2012

Based on Table 4.15, 90.2% of respondents replied that forest conservation benefits for them, while 9.8% of them were not accepted its importance. This shows that almost study area dwellers understand the importance of forest conservation for them. For those respondents that thought forest conservation is important (101 respondents), the

alternative that they preferred if intervened on the area was asked. Accordingly, 86.1% preferred staying on the area by engaging themselves on non-forest affecting activities, 12.9% resettlement where as only 1% of them preferred to go to urban areas (see Table 4.15). This shows that almost the respondents preferred to stay on the area. This may be because the majority of dwellers on the area are families. If some intervention that may displace them is implemented there will be dispersion.

Table 4.15. Perception on the benefits of forest conservation.

No.	Variables	Response	Respondents	
			No.	%
1	Does forest conservation benefit you?	Yes	101	90.2
		No	11	9.8
		Total	**100**	**100**
2	Which option do you preferred if implemented in Gugu mount forest region?	Resettlement	13	12.9
		Non-forest affecting activities	87	86.1
		Moving to urban areas	1	1
		Total	**101**	**100**

Source: Field Survey 2012

4.5. Linkage Between Local Communities and ADFWE

Before establishment of ADFWE, the forests in *Arbagugu* were administered under Agricultural Bureau by *Arbagugu* forest project and *Arbagugu* forest center respectively. At a time, *Etero* sawmill was directly administered by the then Oromia forest agency. The approach used was protective approach (controlled approach) in which guards were assigned to protect illegal activities in the forest.

But, at the beginning of 2008 ADFWE was established for introducing sustainable management of forest (participatory forest management) to the area. For Sustainable Forest Management (SFM) the introduction of ADFWE is inevitably crucial. However, for successful implementation of the planned objectives the role of communities who are the victims and part of an area is important. Therefore, for understanding the link of the two parties in the forest preservation process the following points were observed.

According to Table 4.16, 51.8% of respondents did not know about ADFWE while 48.2% of them knew ADFWE. This showed that majority of respondents were not know ADFWE. Thus, this manifested that the presence of communication gap between the bodies. Failure to know responsible body working on forest in their area may lead communities not to be collaborative on the activities that it operates.

Table 4.16. Respondents Knowledge of ADFWE

No.	Variable	Response	Respondents	
			No.	%
1	Do you know forest agency working in your area?	Yes	54	48.2
		No	58	51.8
		Total	**112**	**100**

Source: Field Survey 2012

As shown in the following chart (Figure 4.4), 72.3% of respondents were not know the presence of the demarcation of forest until it was started, while only27.7% of them have know knowhow on demarcation process. This shows as there was no or uneven public consultation. According to the district manager, there were activities to inform guideline come from Oromia Agricultural and Environmental Protection Authority in the year 2000 E.C. But, during consultation process farmers were not properly engaged as expected.

Colding, *et al* (2001) suggested that sustainable resource management needs to be embedded in social context. They argued that there must be social mechanisms in a society by which information from the environment can be conceived, processed and interpreted in order to confer resilience in ecological systems and their linked social systems. Therefore, to inform the guideline prepared for implementation of demarcation all social contexts to involve all farmers have to be looked and work accordingly.

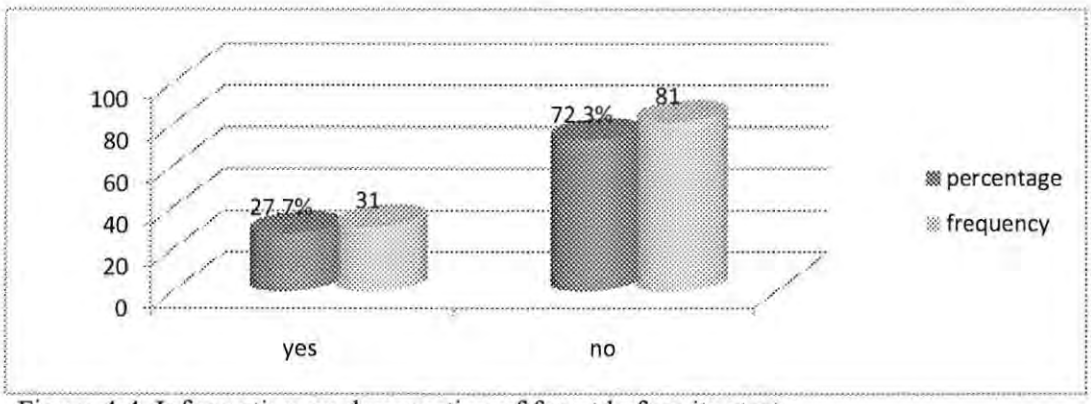

Figure 4.4. Information on demarcation of forest before its start

Source: Field Survey 2012

According to district manager the demarcation of forest area was done by committees that composed of ADFWE personnel, *woreda* administration office, agricultural bureau and land and environment administration, *kebele* administration, rural land measurer (certifiers) and elders. Elders were selected on the basis of their merits and public recognition while the inclusions of the remaining were mandatory.

The horizontal and vertical institutional linkage was mainly confined to court, and *woreda* administration to get help for controlling farmers that unlawfully pass the border. Above all, these linkage creates an opportunities for some rent seeking individuals to be benefited under umbrella of the ADFWE. On the other hand, absence of linkage to land administration and education offices creates difficulty in identifying formerly legalized lands for farmers personal and public use from forest lands. Moreover, different scholars indicated that the participation of different bodies to bring better changes in the resource management. In line with this, Figueroa, *et al* (2009) argued that the successful conservation and development demands the simultaneous participation of different

stakeholders such as professionals, governmental institutions, NGOs and local communities.

Moreover, communication gaps between community near *Gugu* Mountain and ADFWE was mainly aggravated by absence of decentralized institutional structure. The manager indicated that absence of sufficient experts at district level, logistic problem and remoteness of an area as a cause for decentralizing their administration system.

FGDs result showed as the ADFWE experts were coming to an area only during demarcation and if they hear that forests are destroyed. But, other time nobody came to an area to look for them and share ideas on deforestation problems in the area.

CHAPTER FIVE

CONCLUSSION AND RECOMMENDATION

5.1. Conclusion

Gugu mountain forest area is the most important site for all adjacent *woredas*, since it serves as water tower, and home of some species animals and plants. But, the level of challenge on the forest area increased from time to time and worsened the existing ecological balance. The threat to the forest of this region affects all the down streams both ecologically and socio-economically.

The finding of this study indicated that the longer residence time near/in forest region, absence of expert visit, smaller grazing land, lack of knowledge of forest border and low education status of household were significantly contributing for clearing more than or equals to a hectare of forest catchment to include in their farm plots. Factors such as family size, farm size, livestock size, off farm activities and distance of home from forest region found to be statistically insignificant at the probability level of 5% though their impacts were observed on area.

On the other hand, sampled households mainly depend on forests to acquire fire wood (83%) and construction materials (94.6%). Occurrence of forest fire and policy related issues had also a significant role for destruction of *Gugu* mountain forest.

Farmers near/in Gugu Mountain forest region perceived deforestation as a problem to their area and aware of its causes. But, they relied on government bodies to control ongoing deforestation and preserve existing forest. Additionally, the linkage between local communities and ADFWE on forest issue was not satisfactory. This was mainly due

to absence of sufficient experts at district level, logistic problem, remoteness of an area and absence of decentralized administrative unit within district forest concession areas.

5.2. Recommendations

Based on the above results the following recommendations are provided in relation to study area context:

- Introduction of farming practice that enable farmers of the area to increase their productivity. This can be through cultivating crops with high yield, livestock of selected species and modern bee farming system.
- Creation of opportunities which enable farmers to earn incomes those are not directly on forest exploitation.
- Introduction of fodders that can be grow in short time, and even to use some innovative ideas for feeding livestock rather than depending on forest areas.
- Convince local communities to use stoves which can minimize the consumption amount of wood and facilitate conditions to which all households can enriched.
- Looking for alternative source of energy which can be compatible to an area (e.g. Biogas).
- Encourage agro-forestry activities through discounting rate of sale of seedling, provide freely for those who cannot buy.
- Empower local communities to decide on their environmental problems with the help of expert advice and use local institutions as center of information delivery.
- Provision of training for all farmers, not only for that of models farmers.

- Changing attitude of farmers' toward district activity by clearly informing the objectives and the future benefit of forest to the society.
- Assigning adequate number of man power (forest experts) that will do in relation to forest conservation and demarcation process.
- Resettling those who have no land (fully encroached in the forest region) that can support his/her family members.
- Involve NGOs to help those farmers who have small land there until they become self sufficient.
- Further study before implementation of participatory forest management on the area was mandatory since there is disparity from the areas (Harenna and Chilimo) used to share experience in terms of its provisions to the communities.

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APPENDIX I

A. QUESTIONNAIRE PREPARED TO OBTAIN DATA FROM RESPONDENTS

1. Background of Respondents

1.1. Sex of household head 1=Male 0=Female

1.2. Age of household head _____ in years.

1.3. Marital status of household head 1=Married 2=Divorced 3=Widowed 4=Single

1.4. Educational status of household head

0=Illiterate 1=Read and write 2=Primary school 3=Secondary school 4=Preparatory 5=College or University

1.5. Religion of household head 1=Muslim 2=Christian 3=Others

1.6. Ethnic group of household heads 1=Oromo 2=Amhara 3=Others

1.7. Family size: Total_____ Male_____ Female_____

1.8. Information of household members.

No.	Code or name of household member	Sex	Age	Educational status	Kinship	Role in Household

2. Income and Economic Factors Related to Deforestation

2.1. Do you have land that you benefited from it? 1=Yes 0=No

2.2. If your answer for Q2.1 is 'Yes', fill the following table based on the amount of land you own this year excluding land in forest area which is already demarcated.

No.	Land use type	Amount in *timad*
1	Grassland	
2	Farmland	

2.3. What your land ownership condition? 1=Own 2=Inheritance 3=Hiring

2.4. How many *timad* of land is demarcated as forest land?_____ in *timad*

2.5. Do you have livestock? 1=Yes 0=No

2.6. If your answer for Q2.5 is 'Yes', fill the following table. (Based on information in 2003 E.C.)

No.	Name of livestock	Amount in number	Sales amount	Unit cost
1	Oxen			
2	Cows			
3	Heifer/ young bull			
4	Goats			
5	Sheep			
6	Horse			
7	Donkey			
8	Mule			
9	Chickens			
10	Others			

2.7. Fill the following table in relation to the major crop that you produced in 2003 E.C.

No.	Type of crops	Amount in Kuntal	Sales amount	Unit cost
1	Barley			
2	Beans			
3	Paeans			
4	Linseed/wallet			
5	Wheat			
6	Others			

2.8. Vegetables and other homestead products of 2003 E.C.

No.	Name of vegetables	Amount in kuntals	Sales amount	Unit cost
1	Potatoes			
2	White onion			
3	Red onion			
4	Cabbage			
5	Others			

2.9. Livestock products in 2003 E.C.

No.	Name of products	Amount	Sales amount	Unit cost
1	Butter (in gram)			
2	Skin (Number)			
3	Eggs (number)			
4	Honey (gram)			
5	Others			

2.10. Other forest related activities in 2003 E.C.

No.	Name of product	Amount	Sales amount	Unit cost
1	Charcoal (in kuntals)			
2	Fire wood (in headload)			

3	Timber (in number)			
4	Rent of farmland			
5	Headload grasses			
6	Income from looking after cows			

2.11. What is the type of grazing do you frequently used?
1=Free grazing
2=Tie grazing
3=Zero grazing

2.12. Do you have any job other than farming that supplements your income?
1=Yes 2=No

2.13. If your answer for Q2.12 is 'Yes', circle the one that belongs you.
1=saddle work 2=wood work
3=Charcoal production 4=Mini trade
5=Weaving 6=Others_____

2.14. Do you engaged in bee keeping activities? 1=Yes 0=No

2.15. Do you have farmland from other *kebeles*? 1=Yes 0=No

2.16. If your question for Q2.15 is 'Yes', how many *timad* is it?_____

2.17. Do you have house and/or vacant space in nearby town? 1=Yes 0=No

3. <u>Social Factors Related to Deforestation</u>

3.1. Have you ever lived in other area before you coming to your current area? 1=Yes 0=No

3.2. If your answer for Q3.1 is 'Yes', what forced you to come here?
1=land degradation in the former area
2=land fragmentation in former area
3=landlessness

3.3. If your answer for Q3.1 is 'Yes', why do you prefer this area?
1=open access to forest land
2=government grant 3=Others_____

3.4. How long do you lived at your current residence? _____in years.

3.5. Do you know *Gugu* mount forest border? 1=Yes 0=No

3.6. How long your home takes from forest border? (use zero if it is in forest area) _____minutes.

3.7. How long the school takes from your home? _____in hours

3.8. Do you use contraceptive methods? 1=Yes 0=No

4. <u>Cultural Factors Related to Deforestation</u>

4.1. Do you use forest as the major source of fuel wood for your domestic use? 1=Yes 0=No

4.2. During constructing your house and fence, does forest is your major source of raw materials? 1=Yes 0=No

4.3. Is there any cultural practice that prohibits forest destruction in your area? 1=Yes 0=No

4.4. If your answer for Q4.3 is 'Yes', explain how it acts on behalf of forest preservation?

_____

_____

_____

_____.

4.5. Do you use stove that save fuel wood? 1=Yes 0=No

4.6. If your answer for Q4.5 is 'No', what causes you not to use stove that save fuel wood? 1=lack of awareness
2=access problem of stoves
3=enough access of fuel wood

4.7. Rank the farm method that you frequently employed to increase productivity of your land? 1=fertilizer 2=fallowing 3=animal dung

4.8. Have you made discussion on environmental problems (e.g. deforestation) in your local association such as *idir*? 1=Yes 0=No

4.9. Have you encounter wild life attack on your property? 1=Yes 0=No

4.10. If your answer for Q4.8 is 'Yes', how do you prevent them?
1=firing their homes 2=hunting
3=cutting trees 0= no reaction at all

4.11. Which one of the following method have you used to expand your present land? 1=burning bushes 2=complete clearing of bushes 3=partially clearing of bushes 4=using open spaces in forest area

5. Policy and Institutional Factors Related to Deforestation

5.1. Does forest (natural resource management) experts visit your farm and advice you? 1=Yes 0=No

5.2. Was there any discussion prepared by *Arbagugu* District Forest and Wildlife Enterprise and you engaged in? 1=Yes 0=No

5.3. If your answer for Q5.2 is 'No', why?
1=I had no information
2=I was not interested
3=it was not prepared for all farmers

5.4. Do you have information about forest demarcation before you its implementation? 1=Yes 0=No

5.5. If your answer for Q5.4 is 'Yes", what was source of your information?
1=discussion in the *kebele* 2=informal dialogues 3=discussion in *idir*

5.6. Have you pay tax for the land that you own in forest area before its confiscation?
1=Yes 0=No

5.7. Do you think that, those peoples who are member of committees in *kebele* administration are advantageous than other ordinary peoples to use forest product and forest land freely? 1=Yes 0=No

5.8. Are there full time guards that protect illegal logging of forests? 1=Yes 0=No

5.9. Was there any government body that asked you not expand to forest region before demarcation activity was started? 1=Yes 0=No

6. <u>Perception of Farmers on Forest Conservation</u>

6.1. Do you think deforestation is a problem for your area? 1=Yes 0=No

6.2. How do you perceive severity of deforestation in your area? 1=High 2=Medium 3=Low

6.3. How do you perceive trends of deforestation in last ten years? 1=Increasing 2=Decreasing 3=No change

6.4. Based on your personal observation, rank the following causes of Gugu mount deforestation. (write the rank number in relation to its comparison)

No	Cause	Causes					Score	Rank
		1	2	3	4	5		
1	Timber production							
2	Forest Fire							
3	Over grazing							
4	Poor government policies							
5	Agricultural land expansion							
6	Others							

6.5. What do you think of the consequence of forest degradation?

_____

_____

_____

_____.

6.6. The deforestation problem in your area can be controlled. 1=Strongly agree 2=Agree 3=Disagree 4=Strongly disagree

6.7. Was there any reforestation and/or afforestation program done in your *kebele*? 1=Yes 0=No

6.8. If your answer Q6.15 is 'Yes', have you participated? 1=Yes 0=No

6.9. In your opinion, who is responsible to preserve forest and newly planted trees? 1=Government bodies 2=Local communities 3=Both

6.10. Homestead trees have their own contribution to minimize level of pressure on forests? 1=Agree 2=Disagree

6.11. Do you have homestead trees? 1=Yes 0=No

6.12. If your answer Q6.19 is 'Yes', how much is it?_____in *timad*

6.13. Have a knowhow of forest border in your area before shading of borders has been started? 1=Yes 0=No

6.14. Does forest conservation benefit you? 1=Yes 0=No

6.15. If your answer for Q6.22 is 'Yes', which one of the following options do you prefer if you asked to release the farm land you own in the boundaries of forest? 1=Resettlement 2=Engagement in non-forest affecting activities 3=Moving to Urban area

B. POINTS DISCUSSION FOR FGDS

1. Introduction:
    a. Personal introduction of participants and facilitator.
    b. Objectives of the FGDs and activities to be done.
2. Do you think deforestation is the problem to *Gugu* mount Forest area? How do you suggest the trend of deforestation in your personal experience?
3. What do you think of the major causes of deforestation in the area?
4. How do you explain the link of *Gugu* mount forest area and adjacent *woredas/kebeles* communities?
5. How do you evaluate the *Arbagugu* District Forest and Wildlife Enterprise activity in demarcating forest area and counter response of communities? (in terms of consultation activity, peoples collaboration, fairness in selection of elders for demarcation committees).
6. As local organization, does *idir* or other organization contribute for preservation of natural resources by serving as center of discussion and unit for working together?
7. What do you think that the possible solutions for controlling deforestation of *Gugu* mount forest?

C. FIELD OBSERVATION RESULT

For those variables observed in the area ✔ mark is used while X for not.

No.	Checking Variables	Observed	Comment
1.	**Causes of Deforestation**		
1.1.	Farmland expansion	✔	
1.2.	Grassland expansion	✔	
1.3.	Fuel wood extraction	✔	
1.4.	Logging	✔	
1.5.	Forest fire	✔	
1.6.	Grazing	✔	
1.7.	Legal settlement	✔	Households that were dwelled beginning from imperial, *dergue* reign and even during EPRDF where included in the forest region.
1.8.	Illegal settlement	✔	There settlers that are illegally settled in forest area and now lies in forest region.
2.	**Observed realities in demarcated forest areas.**		
2.1.	Cultivated land	✔	Farms that have crop residue are observed.
2.2.	Grazed land	✔	Grasses that are protected are observed
2.3.	Fallowed land	✔	
2.4.	Demarcated steeped slope lands	✔	Mountainous areas are demarcated and tried to reforest even though nobody preserve for it.
2.5.	Demarcation of ericaceous lands	✔	
2.6.	Demarcation of land only acquired by expansion	X	Lands obtained by inheritance and own lands are also demarcated.
2.7.	Trees are introduced to area	✔	Eucalyptus trees are common in *Gugu* mount forest area and surrounding it
2.8.	Bamboo trees are highly degraded	✔	Highly extracted for construction purposes.
2.9.	Hygenia trees going to be extinct	✔	Now days, they became highly extracted for timber production to prepare doors, tables, windows, bed etc.
2.10.	Wetlands are dried	✔	Before the last five to ten years there were many wet areas in the mount *Gugu* forest area which is now highly diminished and risk rivers flow from them.
3.	**Reaction of communities whose**		

	land is demarcated		
3.1.	Still use lands	✔	Most farmers that own land in forest area are still using their lands in forest.
3.2.	There are households that expelled from forest area	X	There are no households that are voluntarily evacuated from forest area.
3.3.	There households that bring their case to court	✔	
3.4.	Sacred area in forest region	✔	*Sheihkamserie* traditional sacred area is found in the forest area (at the highest point of the mountain)
4.	**Variables that indicates policy and institutional failures.**		
4.1.	There was no any forest management to an area before the last five years.	✔	It is the only attempt that *Arbagugu* forest district made to demarcate and enclose forests for protection.
4.2.	Governmentally recognized lands are found in the forest area.	✔	Primary school in *Ashutie Kofelchisa*, land provided to youth in *Samo Bitena*, and cooperative land in *Koro Gugu* was found in forest area.
4.3.	Exact figure of forest area is available in the district office.	X	Until this data was obtained the exact area of forest was not measured.

D. KEY INFORMANT INTERVIEW QUESTIONS

General information

1. Name of interviewee:_____
2. Position in *kebele/woreda* (if any):_____
3. Years stayed here: _____in years.
4. Is there any activity related to forest preservation that you primarily lead in the area? 1=Yes 0=No

For elders only

5. From the time you have been here, how do you observe deforestation process of *Gugu* mount forest area?
6. Do you have any information on the administration system of *Gugu* mount forest area in the past three reigns?
7. When and how people began to use *Gugu* mount forest area as grazing land during summer time?
8. Based on your personal experience, was there crop production in the past three decades as observed now?
9. Do you know any forest management activity done in the area? And how was the cooperation of the society?
10. How do you comment the preservation activity run by *Arbagugu* District Forest and Wildlife Enterprise?

For experts only

11. Was there any activity done to register fauna and flora found in *Gugu* mount forest area?
12. Was there any discussion you made with farmers living in forest area?
13. How do you suggest the interest of communities own farm land in the forest to release forest area voluntarily?

E. INTERVIEW QUESTIONS FOR DISTRICT MANAGER

1. Personal information
   1.1. Full name:
   1.2. Position:
2. District information
   2.1. Name of district:
   2.2. Number of sites under district administration:
   2.3. Name of each sites:
3. Information of forests of an area before establishment of district.
   3.1. How was forest in the area administered before the establishment of Arsi Forest and Wildlife Enterprise and formation of *Arbagugu* district?
   3.2. How do you evaluate forest status and deforestation extent of an area before the establishment of *Arbagugu* District?
   3.3. Was there any forest management approach introduced to an area before?
   3.4. Based on your personal experience and data in your office, rank causes of deforestation according to the severity?
4. Establishment of *Arbagugu* forest district
   4.1. When did *Arbagugu* forest district begin to function? (Year of establishment in Ethiopian Calendar).
   4.2. Did forest demarcation begin immediately during the opening of district office? If no, when?
   4.3. Was there any public consultation before demarcation of forests started? If yes, how?
   4.4. Does the demarcation activity accomplished by committee? If yes, how they composed of?
   4.5. What are the criteria to select member of committee from farmers?
5. During demarcation
   5.1. Does communities were collaborative as expected?
   5.2. What were specific criteria to include areas in forest region?
6. Capacity of office
   6.1. Does the office have sufficient number of skilled man power?
   6.2. Do you think your office is logistically well organized? If No, why?
7. Institutional factors
   7.1. Does the district have structure that stretched to *kebele* level? If yes, mention how?
   7.2. Is there any horizontal or vertical linkage of district with other government bureau?
   7.3. What is the role of district in follow up of Controlled Hunting Activity of *Gugu* mount Forest area?
   7.4. How do you explain importance of *Gugu* mount forest management?
   7.5. As data collected through questionnaire from farmers that own land in *Gugu* Mount Forest area shows lands that were certified, collective land given in the reign of *derg* and EPRDF and other legal appropriate lands are included as forest land, how do you explain this realities?
   7.6. If you have any suggestion that supplement this study, you can write below.

Appendix II

The population composition of Guna woreda (projected based on 1999 E. C. census).

Year	Rural			Urban			Total		
E. C.	Male	Female	Total	Male	Female	Total	Male	Female	Total
1999	35595	35212	70807	2886	2672	5558	38481	37884	**76365**
2000	36533	36140	72672	3007	2,784	5791	39540	38924	**78463**
2001	37495	37091	74586	3133	2901	6034	40628	39992	**80621**
2002	38483	38068	76551	3265	3023	6287	41747	41091	**82838**

Source: Arsi zone finance and economic development office 2011/12

The population composition of Chole woreda (projected based on 1999 E. C. census).

Year	Rural			Urban			Rural + Urban		
E.C.	Male	Female	Total	Male	Female	Total	Male	Female	Total
1999	41597	40947	82544	3421	3326	6747	45018	44273	**89291**
2000	42693	42026	84718	3565	3466	7030	46257	45491	**91748**
2001	43817	43133	86950	3714	3611	7325	47531	46744	**94275**
2002	44971	44269	89240	3870	3762	7632	48841	48031	**96873**

Source: Arsi zone finance and economic development office 2011/12

Appendix III

Sampled letters of forest demarcation and signature of committees