Journal of Sustainable Development in Africa (Volume 12, No.6, 2010)

ISSN: 1520-5509
Clarion University of Pennsylvania, Clarion, Pennsylvania

AN APPRAISAL OF THE CHALLENGES THAT AFFECT SUSTAINABILITY AND PRODUCTIVITY OF THE LAND USE IN THE BORENA WOREDA OF SOUTH WOLLO HIGHLANDS: ETHIOPIA

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ABSTRACT

In this context Ethiopian agriculture faces the challenge of providing food for a growing population. This article reviews the land use problems, caused by natural conditions and human action, and presents data showing that these problems will be exacerbated in the near future unless substantial measures are taken to preserve the land use for future use. The problem of land use stems largely from, natural conditions such as rugged terrain and short but torrential rainfall pattern of the study area. Inappropriate farming practices, overgrazing, deforestation and the use of crop residues and dung for fuel in rural households are among the main problems. Very high population pressure, has led to a decline in arable area. Combined with increasing land degradation and recurrent droughts, this has contributed to declining crop productivity. Increased human and livestock populations have led to agricultural encroachment on to marginal areas, significantly reducing the already dwindling vegetation cover and forest as well as woodland resources of the study area. Land use problem is also exacerbated by factors such as insecure land tenure, small land size, land fragmentation, weak agricultural research and extension services, lack of infrastructure, weak institutional issues, low level of technology use, and inadequate input supply and marketing systems. Policy failures and lack of capacity to implement government interventions also contribute to the problem of land use in the study area.

Keywords: land use, sustainability, productivity, Borena, Ethiopia

INTRODUCTION

Land and Land Resources refer to a delineable area of the earth's terrestrial surface, encompassing all attributes of the biosphere immediately above or below this surface, including those of the near-surface climate, the soil and terrain forms, the surface hydrology (including shallow lakes, rivers, marshes and swamps), the near-surface sedimentary layers and associated groundwater and geo-hydrological reserve, the plant and animal populations, the human settlement pattern and physical results of past and present human activity such as terracing, water storage or drainage structures, roads, buildings, etc. (FAO/UNEP, 1997). Land is an essential natural resource, both for the survival and prosperity of humanity, and for the maintenance of all terrestrial ecosystems (FAO, 1999a). Land Use is characterized by the arrangements, activities and inputs

by people to produce change or maintain a certain land cover type (Di Gregorio and Jansen, 1998). According to (FAO, 1995) land use defines the human activities which are directly related to land, making use of its resources, or having an impact on them. In this definition the emphasis is on the function or purpose for which the land is used and particular reference is made to the management of land to meet human needs. Land use refers to a serious of operations and associated inputs on land, carried out by humans, with the intention to obtain products and/or benefits through using land resources (McConnell & Moran, 2000).

Land use is the end product of activities on land resources by the human population inhabiting the area. It is the end product of the interaction between man and land. The kind and extent of land use are primarily determined by the basic physical and economic needs of individual inhabitants and conditioned by the social norms adopted by the community in which they live and in turn facilitated by prevailing economic and social institutions and physical infrastructures.

The diagnosis of land use problems should be taken where it is known that existing land use systems in an area are facing problems, which is likely in many land evaluation exercises, and where one of the objectives of the evaluation is to assist in solving these problems (FAO, 2007). In most developing countries, inefficient exploitation of the land reduces the amount of resource rent that can be collected, while lowering available future resource rents as land resources degrade over time in a suboptimal fashion (van Kooten and Bulte 2000). A cycle of land degradation occurs because, as forests are mined, people turn to grasses, crop residues and livestock dung for fuel, which deteriorates the land further (Pearce and Warford, 1993).

Rural land is both an economic and a political/social question in the present-day Ethiopia. Issues that warrant land use, management and conservation planning and strategy for poor countries like Ethiopia are many of which rugged topography, increase in population, intensification of agricultural land, use of marginal lands, land degradation, encroachment of forest areas are the main ones. Because the Ethiopian highlands support a large livestock population, the area experiences a severe deficit of animal feed. One estimate (Hurni, 1988) forecasts that all pasture land will be fully utilized by 2005. The demand for cropland has come into increasing competition with that for grazing land. The demand for cropland, fuel, timber, forage and browse, which is not compensated for by adequate inputs, e.g. replanting, and in the absence of effective management, is leading to an increasing depletion of the country's natural vegetation, particularly from pastures, woodlands and forests. In Ethiopia deforestation is a major problem and many peasants have switched from fuel wood to dung for cooking and heating purposes, thereby damaging the agricultural productivity of cropland. Moreover, the most striking feature of Wollo is its rugged topography; the province is dissected by high mountains and mountain chains, deep ravines, broad gorges and numerous rivers and streams.

Most of the research conducted on land degradation in Ethiopia in general and in the Amhara National Regional State in particular, with few exceptions, has focused on biophysical aspects of the land use problems particularly on soil erosion, without much emphasis on the economic, social, political or institutional factors that affect how farmers manage their land. Similarly, the policy response to land use problems in Ethiopia has focused on the technical aspects, promoting adoption of particular conservation technologies, particularly physical structures such as terraces and bunds. It may be that other areas of

policy intervention, such as land tenure policy, infrastructure and market policies have much greater impact than conservation programmes, or largely condition the potential success of those programmes. The insertion of the issue of land in the Ethiopian constitution in the early 1990s, however, may indicate that rural land has increasingly become a political affair. By inserting the land policy in the constitution, the current government has effectively eliminated the possibility of flexible application of policy. Even worse, it has eliminated all meaningful debates about efficient utilization of land (Samuel, 2006). However, there are growing criticisms of the existing land policy. The United Nations Economic Commission for Africa's (UNECA, 2002) economic report on Africa, for instance, stated that land tenure, along with the issue of governance, were "the most pressing areas requiring institutional reforms in Ethiopia."Moreover, it has been heavily criticized for not being participatory. The policy was the result of a centralized, top-down approach rather than being developed through consultations with all concerned parties (farmers, civil society, businesses).

The key objective of the proposed study is to identify major challenges that affecting sustainability and productivity of the land use in the Borena Woreda of South Wollo highlands, Ethiopia. This means to understand and to quantify the main factors leading to land degradation, and propose sustainable land use practices.

DESCRIPTION OF THE STUDY AREA

The study is carried out for Borena Woreda located in the north-central highlands of Ethiopia (Figure 1). The area is located within the administrative zone of South Wollo in the Amhara Regional State. It lies between 10^{0}34’N to 10^{0}53’N and 38^{0}28’ E to 38^{0}54’E. The Woreda covers a total area of 937km^{2} and is inhabited by about 158,920 people, Central Statistical Authority (CSA, 2008). It is characterized by diverse topographic conditions having four agro-climatic zones ranging from 1000 to 4000 meters above sea level (WDLUD, 1995). These are Kolla (Tropical) refers to lowlands between 500 and 1,500 meters, Woina Dega (Subtropical) refers to highlands between 1,500 and 2,300 meters, Dega (Temperate) refers to highlands between 2,300 and 3,200 meters and Wurch (Alpine) refers to highlands between 3,200 and 3,700meters. A mountainous and highly dissected terrain with steep slopes characterizes the upstream part whereas undulating topography and relatively gentile slopes characterized the downstream part.

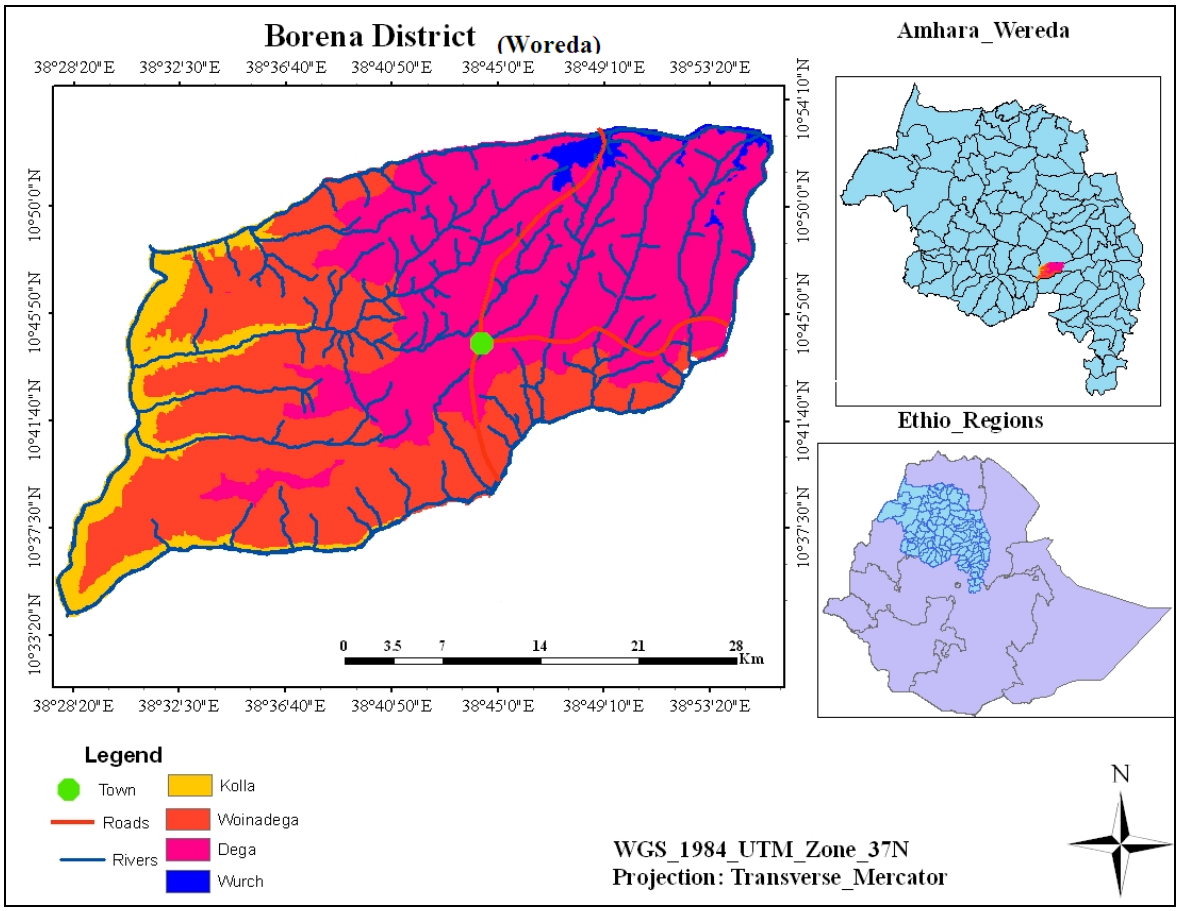

Figure 1: Location map of Borena woreda

The total annual rainfall varies from 889 to 1500 mm per year. The highest rainfall falls during summer, which starts in June and ends in September and short rainy season is in spring which encompass March, April and May. The mean annual temperature of the region varies from 14^0c to 19^0c. The absolute maximum temperature occurs from March to May and the absolute minimum temperature occurs in December, July and August. The upper North Western part of the Woreda is known for its minimum temperature which results in the prevalence of wurch type of climate while the South Western part of the Woreda, has the highest temperature, characterized by kolla climate.

MATERIALS AND METHODS

The materials used included consultation with key officials, field observation, discussions with farmers and key informants, analysis of existing secondary data which is collected from Central Statistics Agency, Meteorological Service Agency, Woody Biomass Inventory and Strategic Planning Project for Amhara National Regional State, and Review of Related Literature.

The methodology used for the above mentioned data collection consisted of both primary and secondary sources of information. Primary information was collected from study sites through conventional field survey, formal and informal meeting with local people and government staff. Secondary information was collected through review of available existing literature. Accordingly, the data were collected, analyzed, assembled and present in the results and discussion of this paper. Field observations are carried out concurrently to complement semi-structured interviews with farmers and key informants. The author also used Focus group discussion to obtain information of a qualitative nature from a predetermined and limited number of people sharing a common feature. Simple statistics such as percentages, standard deviations were applied to analyze numerical data and these were presented in the form of tables and figures.

RESULTS AND DISCUSSION

There are multiple interacting challenges, which have caused and are causing land use less productive and became degraded in Ethiopia in general and in the study area in particular. Major challenges to land use in the study area are presented in the next section and they are outlined by a simple framework addressing these problems in the study

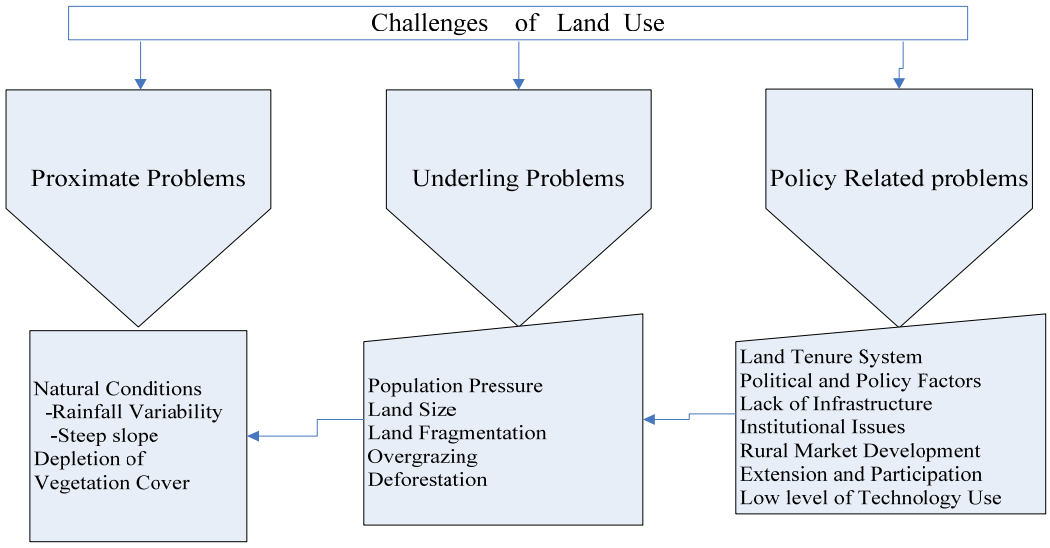

Figure 2: A simple framework addressing the major challenges of land use in the study area

Natural Conditions

The study area is characterized by diverse topographic conditions having four agro-climatic zones ranging from 1000 to 4000 meters above sea level (Figure 1). This wide range of altitude is a major factor in determining the temperature and rainfall conditions of the area under discussion. As agricultural production is mainly rainfed, the pattern and distribution of rainfall determine the growing period. Thus, high rainfall intensity, steep slope and rugged topography of the study area are the main causes of land degradation. The impact of raindrops, with tremendous amount of energy, on bare unprotected soils accelerates the process of erosion by water. Loss of topsoil through runoff is increased by the absence of soil cover, steep slopes and intrinsic soil properties. These facts are well experienced in the study area and the problem is particularly serious at the onset of the rains when ploughed fields are without any vegetation cover. Cropping of cereals, particularly teff, which

is dominant in the area under discussion, aggravates the situation as farmland requires repeated ploughing before sowing and it remains bare at the onset of the rain.

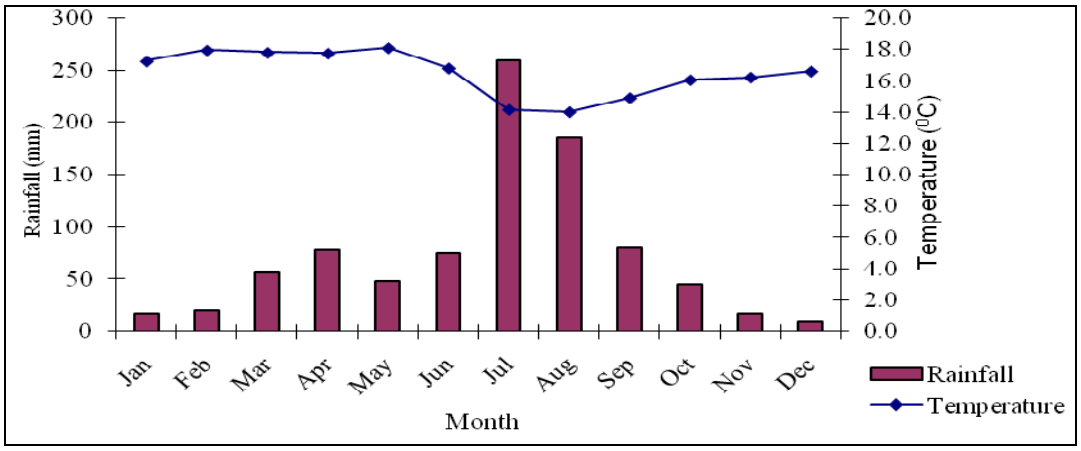

Figure 3: The characteristics of mean monthly rainfall and temperature of 6 stations in and nearby the study area, period 1993-2005

Figure 3 shows the characteristics of mean monthly rainfall and temperature of 6 stations in and nearby the study area. The dries month is December, and July is the wettest. The largest year-to-year variation of rainfall is in December and the lowest in July. As shown by the monthly rainfall and temperature distribution, months from October to May constitute the dry season and the wet season extends from June to September, with a heavy rainfall concentration in July and August. These mean monthly rainfall condition of the study area shows short growing season maximum of 4 months (120 days).

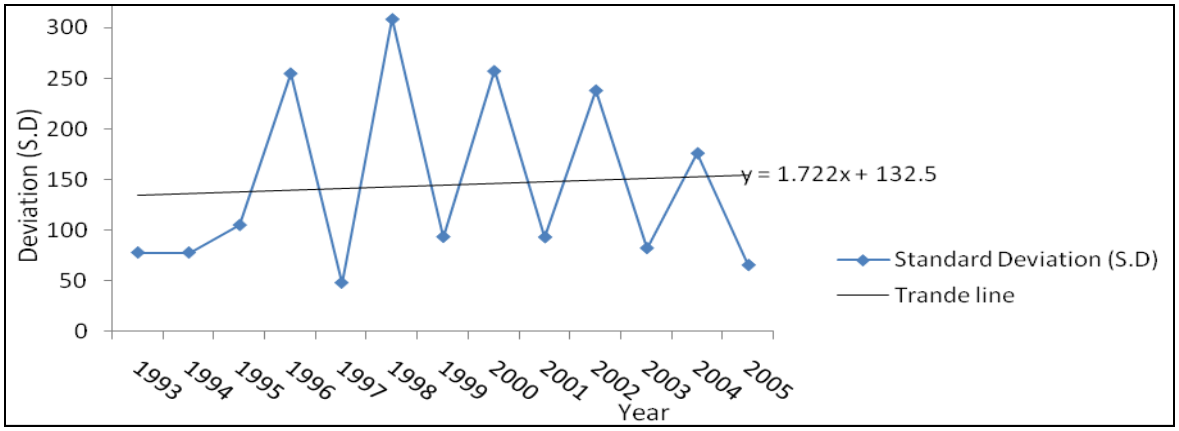

Figure 4: Area-average time series for 6 rainfall stations in and nearby the study area, period 1993-2005

The areal averages for the 6 stations situated in the study are displayed in figure 4. This diagram shows that the variability is greater. Although long-term temporal change of rainfall analysis is very important, it is limited to 13 years due to lack of long year records rainfall by the stations. The linear regression model show that the rainfall of the study area increase in 1998 but after that one year decreased then significantly increased in the next year alternatively up to 2005. The general trend of the

rainfall show decreasing. This variation may hinder farmers' agricultural practice as well as the use of crop verities in the growing period of the crop.

Population pressure

Although population growth in general increases pressure on the natural resources, the relationship is complex and varied, depending on specific circumstances. Generalizations about the negative effect of population growth on the environment are often misleading (UNFPA 2001). Current demographic trends pose a dual land problem: scarcity and competition in the urban and peri-urban areas, and abandonment and lack of maintenance of property in remote rural areas with low population supporting capacity and limited earnings from land use.

The combination of increasing population pressure and available land has the following effects on land and land use (FAO 2003):

- An initial expansion of cultivable land to meet increasing food demands
- A reduction of the fallow period in traditional agriculture that increases the risk of soil nutrient depletion and land degradation, so reducing the intrinsic value of the land, even though it may have no direct effect on land prices in the absence of a land market
- Increased competition for land, so causing land prices to rise and indirectly fostering the development of intensive production technologies.

The total population of the study area was 125,126 in 1994 (CSA, 1994) and it increases up to 158,920 in 2007 (CSA, 2008) with the rate of 1.84% ($r=1/nL_n (p_t/p_o)$ which implies it will double within 38 years ($DT=Ln2/r$). Thus, population growth was certainly the most driving force or problem of the land use. This is because the demand for land for cultivation and settlement and forests for fuel and construction purposes was greater. When no more land is available for expansion, both phenomena lead to migration towards newly opened agricultural areas or to cities. In general, the combination of population growth, limited expansion of arable land, and more and more land being used for both agricultural and non-agricultural purposes, increases the pressure on, and competition for, the available land in the study area.

Land tenure System

Land tenure is a way of regulating rights, access and control of land for the mutual benefit of the land user and the government (FAO, 1999). Land tenure conditions may be insecure, by limiting factors such as where the relevant laws are weak, ambiguous or inconsistent, where there is limited access to land administration services in rural areas or where records are of poor quality as well as where laws may be enforced selectively.

Recent international trends towards improvement include the strengthening of individual private ownership or use rights in land and the partial liberalization of land markets, legal recognition of customary rights or claims to land by indigenous people and local communities, improving registration of the rights to land of individuals or communities, facilitation of access to land for the poor and those excluded from holding rights, such as women in some countries.

Land tenure refers to rights and obligations which are held in land and other natural resources. In this respect land tenure has a direct impact on land use, and thus also on the value of the land, since it may restrict some income generating activities.

According to the discussion with the focus groups (elders) until the l974 revolution, Ethiopia in general and the study area in particular had a complex land tenure system. In the Northern provinces--particularly Gojam, Begemdir and Simen (called Gonder after 1974), Tigray, parts of Wello in which this study was conducted, and northern Shewa the major form of ownership was a type of communal system known as *rist*. According to this system, all descendants (both male and female) of an individual founder were entitled to a share, and individuals had the right to use (a usufruct right) a plot of family land. Rist was hereditary, inalienable, and inviolable. No user of any piece of land could sell his or her share outside the family or mortgage or bequeath his or her share as a gift, as the land belonged not to the individual but to the descent group. Most peasants in the northern highlands held at least some rist land, but there were some members belonging to minority ethnic groups who were tenant farmers.

The other major form of tenure was *gult*_ an ownership right acquired from the monarch or from provincial rulers who were empowered to make land grants. Gult owners collected tribute from the peasantry and, until l966 (when gult rights were abolished in principle), exacted labor service as payment in kind from the peasants. Until the government instituted salaries in the twentieth century, gult rights were the typical form of compensation for an official.

Other forms of tenure included samon, mengist, and maderia land. Samon was land that the government had granted to the Ethiopian Orthodox Church in perpetuity. Traditionally, the church had claimed about one-third of Ethiopia's land; however, actual ownership probably never reached this figure. Estimates of church holdings range from l0 to 20 percent of the country's cultivated land. Peasants who worked on church land paid tribute to the church (or monastery) rather than to the emperor. The church lost all its land after the 1974 revolution. The state owned large tracts of agricultural land known as mengist and maderia. Mengist was land registered as government property, and maderia was land granted mainly to government officials, war veterans, and other patriots in lieu of a pension or salary. Although it granted maderia land for life, the state possessed a reversionary right over all land grants. Government land comprised about 12 percent of the country's agricultural land. Prior to 1975, land in Ethiopia was concentrated in the hands of absentee landlords, tenure was highly insecure, arbitrary evictions were common, and many lands were underutilized. All these tenure systems restrict the majority of the peasants from access to land. High inequality of land ownership reduced productivity and investment and led to political grievances and eventually overthrow of the imperial regime.

By l974 it was clear that the archaic land tenure system was one of the major factors responsible for the backward condition of Ethiopia's agriculture and the onset of the revolution. On March 4, l975, the Derg regime announced its land reform program. The government nationalized rural land without compensation, abolished tenancy, forbade the hiring of wage labor on private farms, ordered all commercial farms to remain under state control, and granted each peasant family so-called "possessing rights" to a plot of land not to exceed ten hectares. The land reform destroyed the feudal order; changed landowning patterns.

According to the Ethiopian Highland Reclamation Studies (EHRS, 1986) land is usually allocated to individual peasant associations (PAs) members in proportion to their family size in the study area in particular and in the highlands of Ethiopia in general. Although efforts are made to make the allocations long-term, in practice boundaries have been frequently revised

to accommodate new members joining the PA from inside (i.e those reaching the age of 18) or migrants from outside who have successfully requested such rights. In the second place, where a producer cooperative (PC) is formed within a PA, the PA is obliged to arrange for the PC members to be reallocated land that is contiguous, which inevitably means displacing PA members not joining the PC and adjusting the boundaries of others to accommodate them. The interview with elders explain that there was uncertainty about the possible communalization of land through producer cooperatives and the frequent and continuing land redistributions discourage peasant efforts to invest in the permanent conservation and improvement of their holdings. Above all, there was strong land use and social conflicts between PA members who are not PC members and the PC members.

Moreover, problems associated with declining agricultural productivity and poor farming techniques still were prevalent. Government attempts to implement land reform also created problems related to land fragmentation, insecurity of tenure, and shortages of farm inputs and tools. Peasant associations often were periodically compelled to redistribute land to accommodate young families or new households moving into their area. The process meant not only smaller farms but also the fragmentation of holdings, which were often scattered into small plots to give families land of comparable quality. Consequently, individual holdings were frequently far smaller than the permitted maximum allotment of ten hectares. The second problem related to security of tenure, which was threatened by increasing pressure to redistribute land and to collectivize farms. Many peasants were reluctant to improve their land because they were afraid that they would not receive adequate compensation for upgrades. The third problem developed as a result of the military government's failure to provide farmers with basic items like seeds, oxen, and fertilizer.

Following the fall of the Derg regime, the current federal government drafted a constitution, which was enacted in 1995. In it land per se remains public property, and sales and exchanges remain prohibited or restricted and land is usually allocated to individual peasant associations (Pas) members without considering the family size in the study area (Figure 5). It only considers age of people who reach at the age of 24. But use of the land was liberalized, by allowing renting in and out of both land and labor, and inheritance rights were strengthened. The constitution also assigned legislative power over land to the federal level of government and reserved implementation to the States. Most of the farmers also express that there is a problem of tenure insecurity and hesitation to apply sustainable land management practices.

A key challenge then in the land debate in Ethiopia in general and in the study area in particular is to find mechanisms for land transfer who allows some consolidation of land while offsetting the dangers of a rapid growth in landlessness through dispossession or unproductive accumulation of land. After 1996 Amhara Land redistribution that was based on more on political criteria than family size in the region in general and the study area in particular and this might have weakened the claim-making power of children at that time and even young people who were not reach at the age of 24 at that time (Yigremew,2006).As figure 5 shows 36.96 and 34.9 percents of the youth groups have not access to land because of their age is under 24 years whereas 63.04 and 65.1 percents of the population have access to the land since their age is above 24 based on the result of the 1994 and 2008 Central Statistical Authority (CSA) National Population and Housing Census Abstract of Ethiopia respectively.

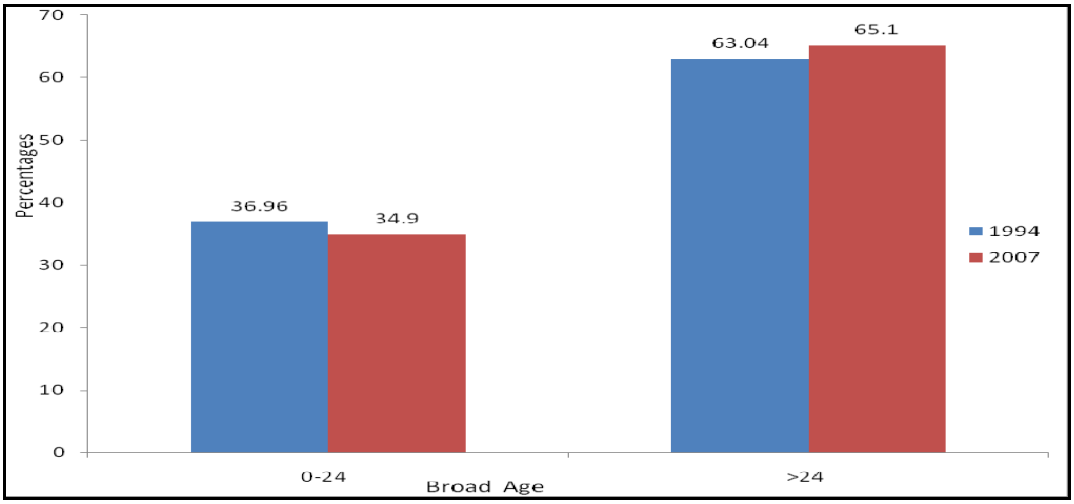

Figure 5: Percentage distribution of Population who have not and have access to land by age in the study area

Source : Culculated from CSA,1994 and CSA,2007.

Land size

Farm holding or size is referred to all land or livestock holdings, which are mainly used for both crop and livestock production (CSA, 2001). The question of farm size is related to the degree to which the size of landholdings can adequately support the livelihood of the farmer and a sustainable intensification of agricultural production. A number of researchers have raised the issue of the gradual conversion of Ethiopian agriculture from small-scale agriculture to micro-agriculture that cannot reduce the poverty of the farmers (Dessalegn, 1997, and 2005, Diao and Nin Pratt, 2005).

The census data (Table 1) shows that the total population in agricultural households that depend on agricultural holdings and classified by area size of holdings in the study area.

Table 1: Population in Agricultural Households and Households by Size of Holdings, For Private Holding in the study area

	All Number							
size of holding	30074	Under	0.10-	0.51 -	1.01 –	2.01 –	5.01 -	Over
(In hectares)		0.10	0.50	1.00	2.00	5.00	10	10
% of Area by Holding	100	0.2	11.6	31.5	45.5	10.3	0.9	-
Size (Hectare)								
Number of holders	37194	1530	11294	12721	10344	1259	*	-
% of holders	100	4.1	30.4	34.2	27.8	3.4	-	-

Source: CSA, 2001

About 45.5 percent of the agricultural households are operating on the land area size that ranges from 1.01 to 2.00 hectares. An insignificant number of households (0.9%) are reported to operate on average land holdings with sizes 5.01 to 10.00 hectares. A study by Nega, Adenew, and Gebre Sellasie (2003) shows that landholding is one of the factors that constrains farm income and the level of household food security.

As can be observed in Table 1 and figure 6 the average land size per household in the study area is estimated to be 0.80 hectare. This shows that shortage of land is the most land use problem in the study area. As landholding declines, per capita food production and farm income also decline, indicating that extremely small-sized farms cannot be made productive even with improved technology and certainly not enough to address rural poverty issues by the extension programmes that primarily focus on technology diffusion. Such farmers have little or no surplus for investment and for input purchase. Because of high vulnerability to food and income insecurity, farmers with relatively small farm holdings turn frequently to trading crop residue and animal manure as a source of fuel, rather than applying them for soil fertility improvement. The increasing decline of farm size also leads to a reduction of fallowing practice or shortening of fallow cycles, and rotation, with a consequence of declining soil quality and fertility in the study area. The average farm size is considered too be small to allow sustainable intensification of smallholder agriculture.

Therefore, the diminishing farm size has not only affected the profitability and level of technology use, but also the sustainability of rural livelihoods. As this fact supported by studies of Ethiopian Economic Association (EEA, 2004) the average land holding size in the Ethiopian highlands in general and in the study area in particular would thus be insufficient to feed a family of five, even if production could be successfully increased three times using improved technologies.

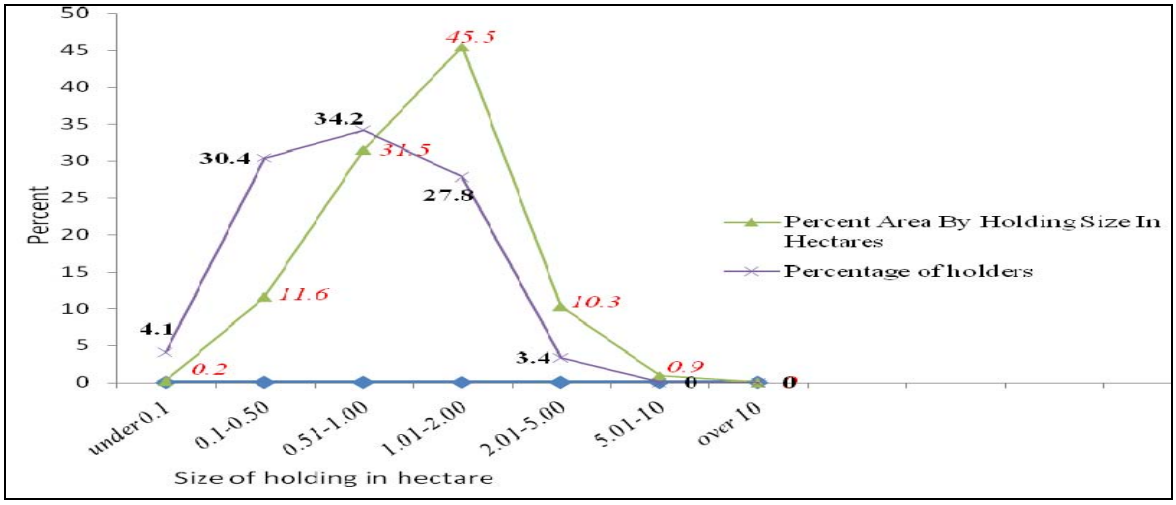

Figure 6 :Percentage distribution of agricultural helders and area by household size in hectars in the study area, For Private Holding

Source: CSA (2001)

Farm fragmentation

Farm fragmentation has increasingly emerged as one of the key problems of subsistence farming of Ethiopia (CSA, 2001). Providing information on land fragmentation is important to show how farmers waste their valuable working time, energy and other resources when the number of parcels is many and very far apart from one another. Accordingly, the census result (Table 2 and Figure 7) indicates that 168988 parcels were estimated under the total land holdings in the study area. Of this total parcels, the highest and smallest number of parcels or fragmentation of land are reported in area size of holding 1.01 to 2.00 hectares (36.5%) and 5.01 to 10 hectares (0.3%), respectively. In the study area, the average number of parcels per holder (168988 parcels per 37194 holders) was estimated at nearly 5 parcels and the average area per parcel (30074 ha area per168988 parcels) was 0.18 hectare.

Table 2: Farm fragmentation in the Study area

Number of parcels (percent)	Number of holders (percent)	size of holding(in hectares)
1.2	4.1	Under 0.10
20.2	30.4	0.10-0.50
35.9	34.2	0.51 - 1.00
36.5	27.8	1.01 – 2.00
5.9	3.4	2.01 – 5.00
0.3	-	5.01 - 10
-	-	Over 10

Source: CSA, 2001

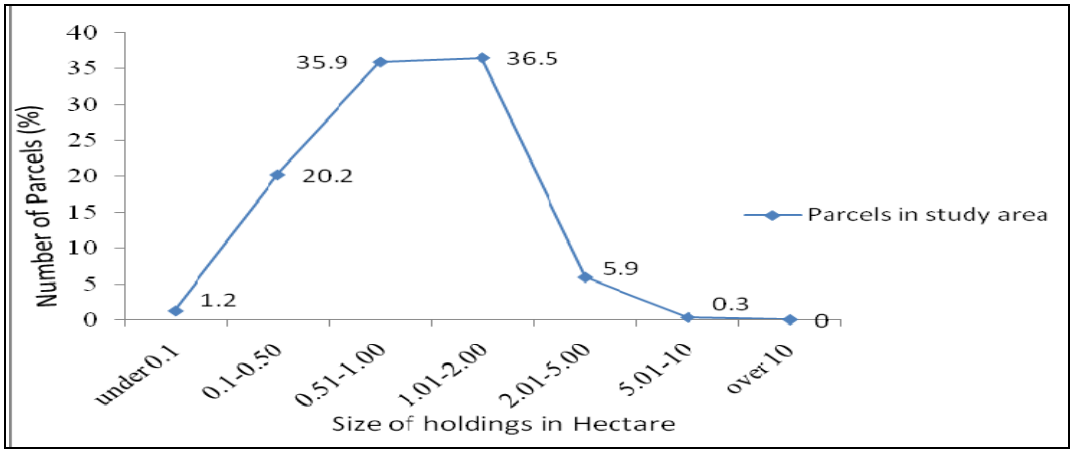

Figure 7: Average Number of Parcels by Size of Holdings In the study Area, For Private Holdings

Source: CSA (2001)

Political and policy factors

Although land use choices are generally made locally, often they are strongly influenced by commitments and policies made at government or international levels. Changes in political, institutional and economic conditions may cause rapid changes in the rate or direction of land use changes (FAO, 2007). Considering political factors raises questions about the relationships between individual decision-makers, decision-making groups and nested hierarchical (and perhaps spatial) structures, and

about rates of change. Institutions and rules may evolve at a different rate from that of human learning and evolution of decision-making. Thus there is a challenge of studying both fast and slow processes and of determining whether individual decision-makers perceive rules and institutions as fixed or as evolutionary. It may be necessary to conduct a focused rapid rural appraisal at community level with stakeholder groups or key informants to elucidate what exactly might happen when land-use changes take place (FAO, 1999).

The Marxist government taking power in 1975 transferred ownership of all rural land to the state, established peasant associations at the village level, and embarked on massive collectivization.

Together with lack of public investment, this led to rapid declines in productivity which, with a rapidly growing population, caused widespread soil degradation and erosion (Kebede, 2002). Following the overthrow of the Marxist regime in the early 1990s, intentions to move more decisively towards a system of private land ownership did not fully materialize. In fact, the 1995 constitution highlights that ownership of land is with the state and upholds the right of every Ethiopian who wants to engage in agriculture to receive inheritable use rights to a piece of land for free, a principle that can be enforced through administrative reallocation of land but that will likely conflict with the goal of ensuring land users' tenure security. Subsequently, a 1997 federal proclamation (law) devolved responsibility for land policy to the Amhara regions, leading to considerable diversity in key provisions as illustrated below.

Firstly, the fact that administrative redistribution of land is not an empty threat is illustrated by the fact that such action, partly in pursuit of political ends (Ege, 1997), was carried out in Amhara National Regional State (in which this study is conducted) as recently as 1997. In fact, a number of surveys highlight that a large number of farmers expect redistribution in the near future and that this reduces investment (Deininger and Jin, 2006) and a desire to prevent this has led Amhara region to more strictly circumscribe conditions for redistribution. Secondly, although land transfers via rental have been allowed officially, award and continued enjoyment of land use rights are dependent on physical residence in the village, something that may prevent migration from rural areas (Dessalegn, 2003). Moreover, all regions except Amhara region where this study is conducted have legal provisions limiting the amount of land to be rented out normally to 50% of holding size and setting a maximum duration for rental contracts. Thirdly, mortgaging and sale of land are prohibited everywhere. Finally, a 2005 federal proclamation aims to re-establish central guidance without clarifying how conflicts with existing regional laws are to be resolved. Together with a number of grey areas in the proclamations that are not resolved by regulations. This leads to confusion and provides scope for bureaucratic discretion. Certification of land rights cannot eliminate systemic uncertainty of this type but is likely to reduce its impact on investment or land transfers, something that needs to be borne in mind when interpreting our empirical findings.

Overgrazing

With increasing population pressure there is increasing competition for land between cropping and grazing. As grazing land is converted to cropland, crop residues assume increasing importance as livestock feed and this requires additional labor for harvesting, storing and feeding (WBISPP, 2002). In the study area Livestock are often confined to the Farmers' Association

area, although movement into the next Farmers' Association may occur in times of acute feed shortages. Thus the long-term numbers of livestock will oscillate around the ecological carrying capacity of the Farmers Association. Although most communal grazing areas in the study area are open without restriction, in a few areas, valley bottoms in particular are increasingly an issue to grazing management. In many cases hay production is extremely important but its importance is not considered in the study area due to less grazing land and awareness of farmers. Dry season access to these lands is increasingly strictly controlled but it is a recent phenomenon in the study area. Generally in the study area, the contribution of pasture to feed supply is relatively low (26%) and that of crop residues (64%) and aftermath grazing (9%) relatively high (Figure 8).

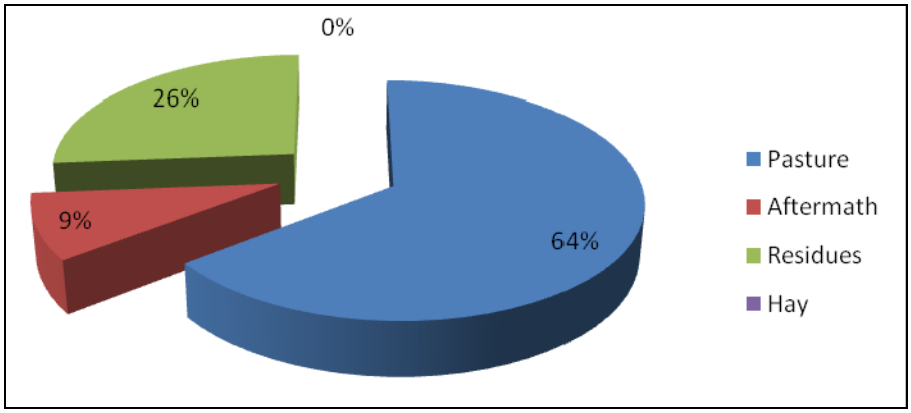

Figure 8: Annual Contribution of the Main Livestock Feed Sources in the study Area Source: Adapted from WBISPP Socio-economic survey (2002)

Carrying Capacity is estimated on the basis of maintenance requirements of dry matter using 2 percent of live-weight. The livestock density is 161TLUs/km^2 which is characterized by high livestock density and indicates diverse agro-ecological conditions (Table 3). The Stocking Rates exceed the estimated carrying capacity by 228%. Therefore, Stocking Rate is above the Estimated Carrying Capacity based on the source of feed in the study area .As indicated by Table 3 any severe negative feed balance at the study area revealed in this analysis indicates that Livestock population is greater than the carrying capacity of the land and the feed resources are under considerable pressure due to land degradation and low biomass production.

Table 3: The Livestock Carrying Capacity and stocking rate in the study area

Carrying capacity TLU's	Stocking rate TLU's	Stocking rate /CC%	Pasture Supply (tons)	Net Residues Supply (tons)	Aftermath Supply (tons)	Total DM Supply (tons)	DM require (tons)	Surplus-Deficit (tons)
71,492	162,904	228	88,815	25,738	15,921	130,474	297,300	-166,827

Source: Adapted from WBISPP Socio-economic survey (2002)

Depletion of Vegetation Cover and Deforestation

Vegetation cover protects the soil against the action of falling raindrops, increase the degree of infiltration of water into the soil, maintains the roughness of the soil surface, reduces the speed of the surface run-off, binds the soil mechanically, diminishes micro-climate fluctuations in the uppermost layers of soil, and improves the physical, chemical and biological properties of the soil (Zachar, 1982, Pilesjo, 1992). However, the study area has been experiencing vegetation degradation processes under the stress induced by both climate change and increased human activities.

The clearing of forests has been a long historical process in Ethiopia in general and in the study area in particular and it continues at a conservatively estimated rate of 62,000 ha per year (Leonard, 2003). According to the land cover change analysis made in the study area (Alelign, 2009 and Abate, 2010) the rate of forest degradation is very high from 1972 to 2003, the total area of forest coverage was 13599 ha (13%) and 9795 ha (10%) in 1972 and 1985 respectively. But in 2003 it was decreased to 6087 ha (6%), from 1972 to 1985 the forest coverage is almost decreased by half (Table 4). This shows forest is disappearing at a fastest rate due to complex factors.

Table 4: Area and percentage coverage of forests from 1972 to 2003 in the study area

Year	Area in (ha)	Percent of total area	Rate of change (%)◆
1972	13599	13	
1985	9795	10	-0.91
2003	6087	6	-0.95

◆ Rate of change in percent is calculated as change in between the two study years per total change of these years divided by the time interval times 100.

Source: Alelign (2009) and Abate (2010)

Forest cover change is triggered by various factors that undermine the forest cover potential and its productivity which leads to irreversible deterioration. Besides, forest cover change is the direct reflection of the dynamics of socio-economic development. Likewise, several factors stimulated by the activity of man are responsible for massive conversion of forest cover land into other land cover and land use units in Borena Woreda.

All the factors of deforestation such as the prevalence of various types of agricultural activities, fire wood and charcoal production, cutting trees to fulfill the demand of constructional materials, settlement expansion and income generation are directly or indirectly related to population growth.

There is an increasing trend of cultivated land from 1972 to 2003. For instance, between 1972 and 1985 about 3,804 ha forest cover land is drastically changed into agricultural lands. In addition to this, according to the views of respondents, the expansion of various types of agricultural activities is the major sources of forest cover change in the study area (Alelign, 2009; Abate, 2010).Therefore, the presence of peasants with their various types of agricultural activities (both crop

production and livestock rearing) inside and along the margin of the study area is considered to be the major factor for forest cover change in the study area.

In the rural areas fire wood collected from the nearby forest areas cow dung and crop residues are the most important sources of energy. In the study area there is a wider range of sources of wood fuel which accounts 62.5 percent of the total annual energy supply of which small branches, leaves and twigs (fallen wood) (BLT) account 33.65%, round/split wood accounts 28.47 % and charcoal accounts 0.38%. On the other hand dung cakes and crop residues accounts 25.98% and 11.1% of the total annual energy supply respectively. Most households obtain their crop residues and dung from their own farm. Some 10 percent of households obtain dung cakes from the communal lands. However, very small amount of modern energy sources (0.45%) are used in the study area (Figure 9). Hence, the increasing demand of forest products, in the form of fire wood and charcoal within and outside the district has been causes of deforestation in Borena Woreda.

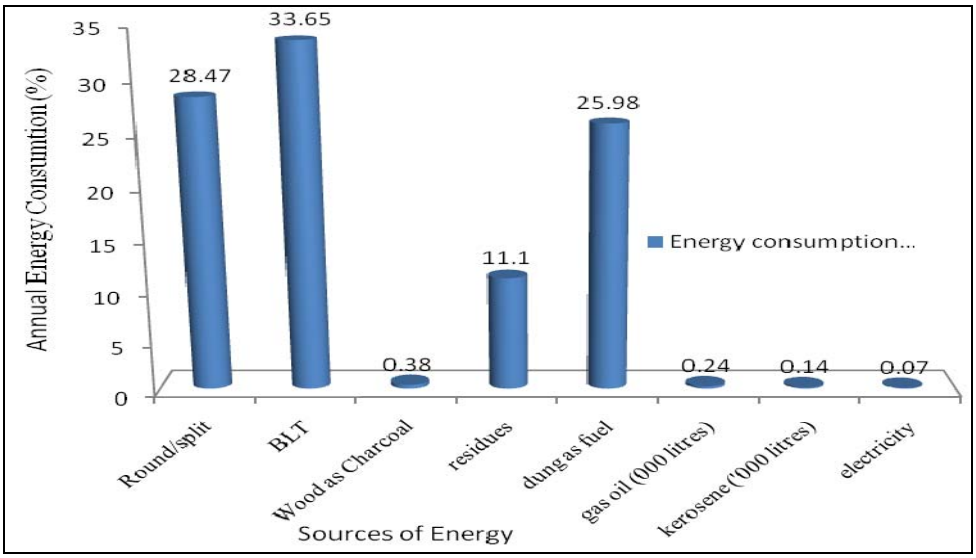

Figure 9: Relative contributions to total Household energy consumption by traditional and modern energy sources in the study area (%)

***Source**: Adapted from WBISPP Socio-economic survey (2002)*

Field observation data also indicated that the demand of forest products for the construction of house and fence as well as for making doors and windows has been aggravated the destruction of forest in the study area. According to the view of agricultural officers and forestry experts most of the population of the Woreda are food insecure. Therefore selling of wood and wood products are means of income for the poorest people and these landless youths and women illegally cut down trees from the forest area and supply large quantity of forest products for urban and rural dwellers through the nearby small markets.

Lack of Infrastructure

Adequate roads are a prerequisite for rural development and poverty reduction. The road network in Ethiopia is one of the lowest densities in Africa (25 km/1,000 km^2) and as a result the rural parts of the country remain with traditional means of transportation such as draught animals (horses, Mules, donkeys and camels). Human labor, especially women, also often carries goods for over 10 km towards market centers (Abera, 2010).

Based on personal observation and structured interview the infrastructure such as road transportation is not well developed in study area. Hence, pack animals and portage are the major forms of transport. There was domestic route of airplane during the Derg regime but now closed due to unknown reason. Currently there is construction of one all-weather road which is started in 2006 by the Chinese company which covers from Kobolcha to Gundeweyn towns that pass through the study Woreda which is less than 100km in the Woreda. The development of roads is critical to the availability of agricultural inputs and reduces the prices paid for them as well as to increase the prices of production.

Institutional Issues

Institutional and organizational development may have a major impact on land use practices.

Interview results shows that while a number of institutions are charged with responsibility for dealing with land use they are inadequate and their responsibilities are not always well defined and donor programs are not always well integrated into local efforts. Based on the writer's experience and interview with focus groups in the study area there are traditional institutions such as traditional Money saving (*Iqub*) and traditional venereal and marriage rules (*Edir*) as well as religious institutions. Among the norms of these institutions, from land use practice point of view, there is large number of religious holidays during which manual labor is prohibited. This obviously affects the availability and cost of labor as well as the ability of farmers to make labor-intensive investments in land use practices or to adopt labor-intensive practices such as mulching or composting and other agricultural activities in the study area.

Rural Market Development

The nature and development of markets for factors of production (land, labor, draft animals and credit), inputs and out puts can play a major role in determining patterns of land use and land management (Lakew et al.,2000). When markets are well developed and competitive, farmers can be applying alternative land use and management options. However, the physical make up of the Ethiopian Highlands in general and the study area in particular is characterized by gorges and other topographic barriers which restricts the development of effective internal marketing systems in the area and this greatly restricting the economic movement of production from areas of surplus to areas of need.

Extension and Participation

Agricultural has a long history in Ethiopia in general and in the study area in particular. However, because of the weak infrastructure and the shortage of funding extension services are weak and serve only a small part of the study area. Allied with this problem is the poor historical record of local participation in finding approaches to dealing with the particular local problems of land use practices. Above all, top-down approaches were used in the past but bottom-top approach by understanding local issues on the basis of local knowledge is a key component of successful programs. To alleviate the

shortcomings of the previous systems and programs, the Amhara National Regional State, in which this study is conducted, launched the Participatory Agricultural Demonstration Extension and Training System (PADETES) in 1997. The aim of PADETES is to increase food crop and livestock production through an aggressive agricultural extension campaign program. Field studies have shown how farmers are innovating around the simple extension package provided, but the flexibility to do so is constrained by the program.

As a result, farmers who are obliged to acquire the whole package as part of the credit arrangement overseen by the government, they dispose of some of the fertilizer and seed on the local market. This has a positive impact overall as those officially not participating in the program (so called non-adopters in many studies) in using the improved technologies, but with lower risks (of credit default) and in lower quantities (suited to their own needs). Moreover, the use of different complementary inputs to the package recommended by agricultural experts is low.

Low Technology Agriculture

Agriculture in Ethiopia in general and in the study area in particular is characterized by low technology, low productivity and output, heavy reliance on nature and hence, subjected to natural calamities such as drought and famine. Despite its tremendous improvement, fertilizer use is however still very low and the promotion of improved seeds which are considered as the nucleus of any improvement is even more challenging for the extension system. For instance, only half of farmers participating in PADETES used improved seeds. In general, there is limitation on the technology itself to solve the complex and many faceted rural problems of low agricultural productivity, poverty and resource degradation. Acceptance of new technology depends on financial incentives to farmers, affordability and availability of modern farm inputs. Moreover, production (environmental) and market risks are affecting sustainable technology adoption in agriculture land use. Technology promotion among poverty stricken farmers who work under risky environment is a highly challenging activity. Technologies should be tested both for their technical performance and economical profitability. However, the supply of productive land and its efficient utilization has been increasingly constrained inadequate utilization of land-saving farm technologies. Therefore, the focus groups respond that most of their agricultural activities still use low technology and is inadequately equipped to deal with drought and famine. They used limited amount of Fertilizer because of cost or availability factors and traditional organic fertilizer is increasingly being used as fuel in the study area.

IMPLICATIONS OF THESE CHALLENGES FOR FUTURE LAND USE

- Change in population size and spatial distribution
- Accelerated Land degradation
- Reduction in Soil organic matter
- Decreasing of the water-holding capacity and nutrient availability of soil
- Increase of poverty and migration
- low agricultural productivity
- Declining of biodiversity
- Decline of water cycle and carbon storage capacity

CONCLUSION

In this paper the author has examined the available evidence regarding land use challenges in Borena Woreda of South Wollo Highlands in Ethiopia. It appears that the interrelated problems of land use stems largely from, natural conditions such as rugged terrain, short but torrential rainfall pattern, poor land-use practices and population pressure. Inappropriate farming practices, overgrazing, deforestation and the use of crop residues and dung for fuel in rural households are among the main problems of the study area. Deforestation due to population growth and the associated expansion of farming and increasing demand for resources are imposing threat on the biodiversity of the area. Insecure land tenure, small land size, land fragmentation, weak agricultural research and extension services, lack of infrastructure, weak institutional issues, low level of technology use, and inadequate input supply and produce marketing systems as well as Policy failures and lack of capacity to implement government interventions also contribute to the problem of land use in the study area.

Experience in this research reveals that human capital and financial limitations of institutions remain a major constraint on the use of improved techniques of land use practices. In general, findings of this study shows that the study area has been under continual land use challenges unless land use plan will be used in the foreseen future. Based on these findings the following measures should be taken as recommendations

- ✓ Creating awareness among the society concerning optimum use of natural resources
- ✓ Use of appropriate land use plan to optimize the land productivity.
- ✓ Strengthen family planning reduce consequences of population pressure on land use
- ✓ Landless youths and women should be organized in non-agricultural sectors minimize illegal tree cutting and harvesting activities
- ✓ Reforestation of trees in the degraded areas should be facilitated

ACKNOWLEDGEMENT

I thank the staff members of Central Statistics Agency, Meteorological Service Agency, Woody Biomass Inventory and Strategic Planning Project for Amhara National Regional State of Ethiopia in helping me to give the necessary data for this study. I also would like to thank Addis Ababa University School of Graduate Studies for the scanty financial support for the study.

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