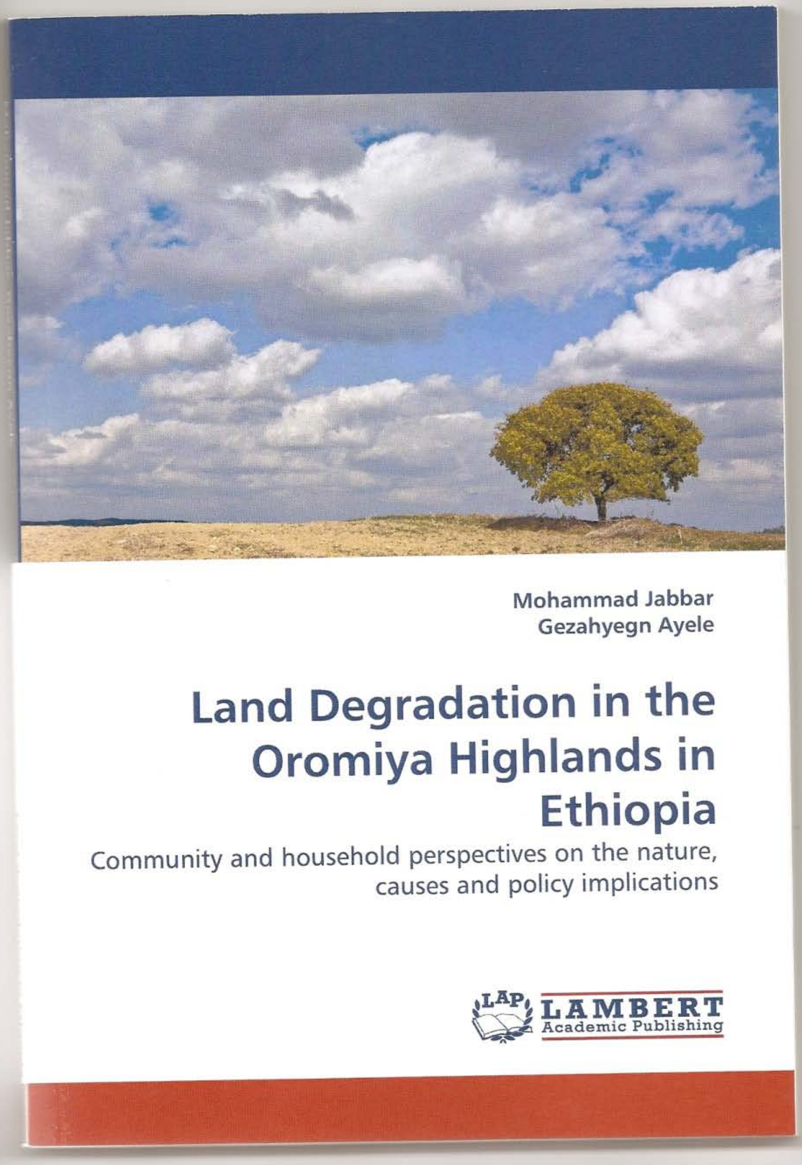
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The field surveys for this study were conducted during 2000-2001 under a research project titled "Sustainable land management in the highlands of Oromiya Region in Ethiopia" implemented jointly by the International Livestock Research Institute (ILRI), Nairobi, Kenya, the International Food Policy Research Institute (IFPRI), Washington D.C., USA, the Oromiya Agricultural Development Bureau (OADB), Addis Ababa, Ethiopia, and the Ethiopian Agricultural Research Organization (EARO), Addis Ababa, Ethiopia. Some preliminary analysis of the data was done but due to lack of resources and time, analysis and write up could not be completed during the life of the project or later. The project partners' exclusive propriety rights in the data had expired in 2004 in accordance with the terms of the collaboration agreement, so the data set was made available in the public domain in that year.

We were involved in the original project so became interested to use the open access data and bring the analysis to some degree of conclusion and make the results available to the wider audience because we felt that the collected data were highly valuable and still relevant for understanding the long term sustainable land management and environmental development problems and opportunities in the Ethiopian highlands.

Several agencies and people deserve appreciation and thanks for their valuable contributions during the design and implementation of the surveys. Principal funding for the surveys was provided to ILRI and IFPRI by the Swiss Development Cooperation, the Government of Norway, and ILRI and OADB also provided complementary resources. Aliye Hussen and Yadesa Dinsa of OADB, an agency of the Oromiya Regional Government, had released ten of their field staff from different regions who were deployed to conduct the surveys over several months; Yadesa also had helped with supervision of field work. Yigezu Atnafe and Abebe Misgina, Senior Research Technicians of ILRI, had very diligently supervised field work teams under difficult field conditions, and they also had supervised computerization and cleaning of the data. Paulos Dubale of EARO, Simeon Ehui and Mohamed A Ahmed of ILRI and John Pender of IFPRI had provided useful comments and suggestions at different stages of the surveys. However, we remain solely responsible for the content and views expressed in this book.

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Chapter 1
Background and Objectives of the Study

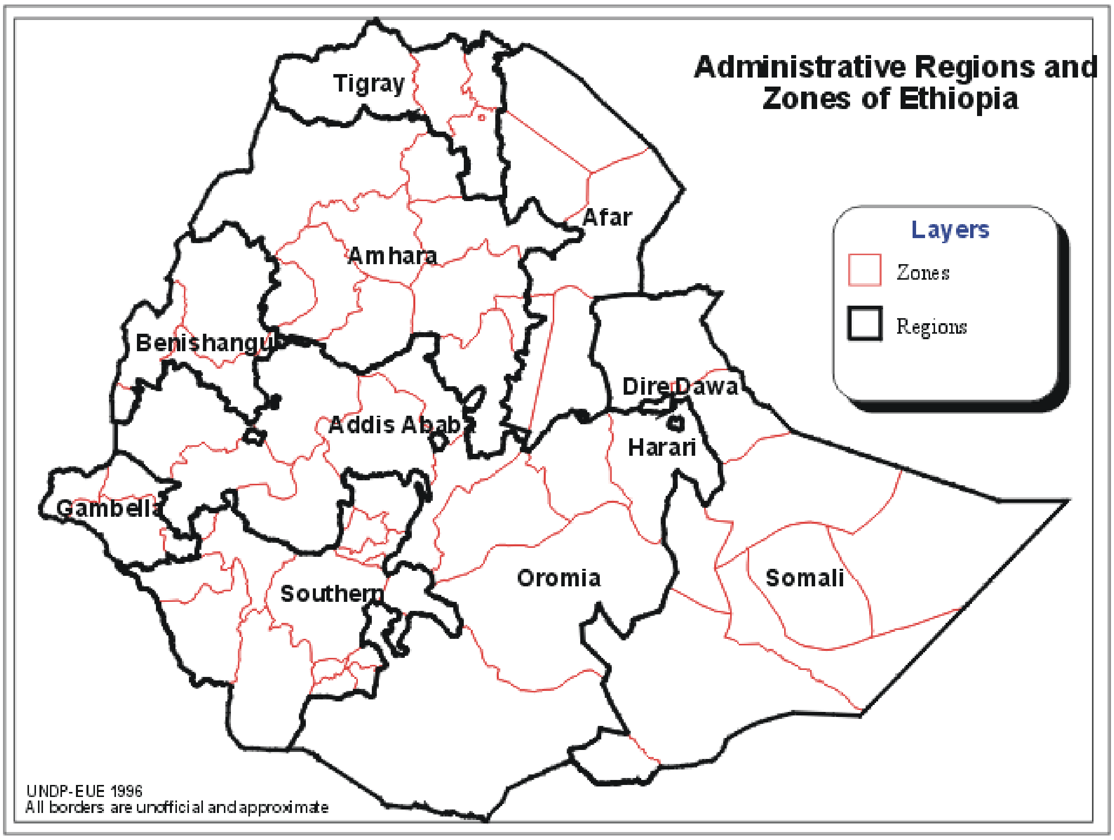
1.1 Background of the Study

Poverty, malnutrition, low agricultural productivity, severe land degradation, shortage of water and fuel wood are common problems in the highlands (>1500 metres above sea level) of Ethiopia where 90% of the country's 70 million people and over 70% of its livestock population live. Poverty is acute with over 45% of the population living on less than a dollar a day (MoFED, 2002). Population pressure has already pushed farmers onto fragile soils and steep slopes causing severe soil erosion, nutrient depletion and deforestation, which are responsible for declining agricultural productivity.

It has been estimated that one-half of the arable land in the Ethiopian highlands is moderately to severely eroded (FAO, 1986; Constable, 1985). Soil erosion is widespread averaging a loss of 40t/ha and contributing to critical nutrient depletion. Most Ethiopian soils are already deficient in nutrients, especially nitrogen and phosphorous. Among 30 countries in Africa, Ethiopia has the highest rates of net nutrient losses per year of 30 kg N/ha and 5 kg P/ha (Stoorvogel and Smaling, 1993). Soil and water conservation practices are rare, and farmlands show accelerated soil erosion and soil nutrient depletion in addition to over-exploitation. For example, the removal of wheat grain and straw from the fields depleted N, P, and K from the soil amounting to 200 kg/ha while the removal of grain and the stalk of maize will deplete around 400 kg/ha of the three major nutrients. This does not include the nutrient losses through soil erosion, which could account for higher amounts. Use of animal dung and crop residues as household fuel rather than as manure and livestock feed further aggravates this nutrient loss. Nutrient deficient soil limits crop yields. Average grain yields are less than 2 tons per hectare though modern varieties cultivated on a small portion of land give higher yields. Nutrient deficient soil may also produce grain deficient in micronutrients and thus impair human nutrition and health (Hurni, 1993).

The Oromiya Region constitutes about 31.2% of the total land area of Ethiopia making it the largest of all the regions in the country (Figure 1.1). The region has predominantly an agrarian economy with about 70% of the region's GDP and 92% of its employment provided by agriculture**.** During the 1990s, the region accounted for about 51% of the total crop production in the country and it was the main source of the country's agricultural surplus and major source of food supply for the major urban centres as well as deficit areas in the low lands. The region also accounted for 63% of national exports and a major source of raw materials for the domestic industries (Debele et al., 1998a).

Figure 1.1 Administrative regions and zones of Ethiopia



However, severe land degradation has been emerging as a key constraint to sustain and further expand agriculture's role in the development of the region's economy as well as the economy of the country. Teferra et al (2002) reviewed available literature on land degradation and its consequences in the region. They reported that degradation can be triggered by various processes that lower potential productivity, leading to long-term, sometimes irreversible, deterioration of land. These processes are numerous but in the region major forms of degradation were soil erosion, and biological, chemical and physical degradation. Their findings are summarized as below:

Soil erosion is the most widespread form of land degradation in the region and most research on understanding the degradation process and finding solution to combat it has been concentrated on this topic. Average erosion rate for agricultural land has been estimated at about 40 t/ha but there is wide variation between different parts of the region and between production systems. Several factors contribute to erosion.

First, rugged topography with steep slopes and thin soil makes many areas in the region vulnerable to erosion. Elevation in the region ranges from less than 500 to over 4,300 meters above sea level (masl). About 48% of the region's total area are highlands lying above 1500 masl while areas between 1000 to 1500 masl. constitute 38%. The highlands are home to more than 80% of the total human population and 70% of the livestock population of the region and account for over 90% of the cropland. Almost 90% of the region's economic activities are concentrated in the highlands. Increased agricultural activities on these types of land have enhanced erosion rates. For example, in three Peasant Associations in west Hararghe population pressure forced farmers to cultivate land with over 50% slope even though there was a directive from the wereda not to cultivate land over 35% slope (Wakjira et al., 1996). Increase in population as a result of a resettlement programme in Illubabor has forced the community to clear up forests on steep slope for maize cultivation. As a result erosion and leaching due to heavy rainfall decreased soil fertility (Hagmann 1991). In the Ginchi watershed in west Shewa, analysis of aerial photographs shows that in 1950 only 34% of the watershed was under cultivation mainly in the lower and middle part of the undulating landscape, 60% was under pasture and woodland, covering the medium and higher slopes, and 6% was under roads, pathways and water bodies. In 1990, the situation has completely changed. Crops are now grown on over 60% of the land area extending up to 35% slope while pasture and woodland has reduced to half their previous sizes. Furthermore, the length of gullies has increased 14 times between 1950 and 1990 and they have become wider and deeper because of severe erosion (Mohamed Saleem, 1995). Similar situations exit throughout the region.

Second, a large part of the region receives high amount of rainfall concentrated in a limited period in the year, which also contributes to erosion as rainfall intensity is more important than rainfall amount in causing erosion. For example, at one experimental research site, 64% of 1082 mm rainfall was recorded in three months and at another site, 86% of 1654 mm was recorded in four months. At these sites 50-60% of soil loss occurred in those intensive rainy periods (Krauer, 1988; Hagmann, 1991). The effect of the rainfall pattern on erosion has been exacerbated by traditional cultivation practices in which land is tilled before the main rainy season and left bare and loose during the main rainy season (FAO, 1986).

Third, some of the major soil types in the region, e.g., vertisols, inceptisols, are susceptible to high erosion rates due to their inherent characteristics. While other soil types such as nitosols and luvisols may not be naturally very susceptible to erosion but use of inappropriate agricultural practices have made them erosion prone as well.

Fourth, loss of forest and other vegetation cover over time due to population pressure and expansion of crop land has contributed a great deal to enhance erosion rates over a large part of the region. Recent estimates suggest that the rate of deforestation is about 3.1% per annum due to expansion of cropland, shifting cultivation, commercial agriculture, fuel wood collection, commercial logging, urbanisation and poor management of natural forests. (Debele et al., 1998a). A study in Bura Adele, Berisa and Daneba Peasant Associations of Adaba Dodola district (Bale zone) shows that the annual rate of deforestation was 1.6%, 9.4% and 5.6% respectively during 1993-97 (Kubsa, 1998). Another study on Belete forest and Gera forest of Jimma zone show that the annual rate of deforestation was 9.5 % and 4.7% respectively during 1996/98 (MoA, 1998). In some areas, vegetation loss leads to termite infestation, which enhance erosion and contributes to further vegetation loss, creating a downward spiral that eventually makes the land unusable.

Fifth, excessive tillage for some crops, e.g. teff, the main grain crop in the region, tilling sloping land, reduction of fallow and crop rotation practices, overgrazing of pasture and cropland are some of the agricultural practices that also have enhanced erosion.

Biological degradation or the decline of humus content of soil through mineralisation has been increasing rapidly mainly due to increased continuous cultivation, removal of biomass from the soil and reduced nutrient cycling, particularly inadequate or no use of dung as manure to replenish fertility. Most of the dung is used as fuel in the face of reduced availability of woody biomass, which again is the result of increased deforestation. An equivalent of about 6118,000 G cal/year of animal dung is used for fuel in the region. This is equivalent to about 1.5 million tons of dung or 14,920 tons of fertilizer N or about 29,000 tons of urea. This amount is equivalent to the amount of urea distributed in the region in 1997. If applied at the rate of 50 kg/ha (equivalent to about 100 kg urea/ha), this amount could cover 286,900 ha of land. Use of dung for fuel means denying the soil of its effective conditioner and fertilizer. This practice is most pronounced in areas where forest cover have more or less disappeared and where acute fuel shortage is being felt like in East Shewa, North Shewa, West Shewa, Arsi and Bale (Debele et al., 1998b).

Chemical degradation or nutrient depletion has been increasing due to more intensive cultivation without adequate replacement of nutrients. It has been estimated that over 40 kg N is being lost annually from crop land, other say about 100 kg is being lost, and that the negative balance has been on the rise (Stoorvogel et al., 1993; Steinfeld et al., 1998). How much of this loss is due to erosion and how much due to chemical degradation is not known. Information about the loss of other principal nutrients is not available. Application of organic manure has been declining, application of inorganic fertiliser has been increasing but at a slow pace to make any significant impact to arrest the degradation process.

Physical degradation due to compaction, sealing, reduced aeration and permeability is also a problem. Such degradation occurs due to excessive tillage for land preparation, overstocking and overgrazing both pasture and cropland, and overuse of certain cattle routes and watering points (Abebe, 1992; Abate, 1994).

A complex set of natural, political, and socio- economic factors have been responsible for the degradation of land resources including soil (Tolcha, 1991; Teferra et al., 2002). Appropriate understanding of the causes and processes of these interrelated problems, and development of appropriate policies and technologies to solve them will require in depth research. Years of agricultural and community development research on crop, livestock, soil, water and vegetation produced many technology options capable of improving the lives of farming families, but their adoption has been slow. Some attempts to arrest the problems of land degradation in the region have been made in the past mainly through technical interventions such as constructing terraces and bunds on sloping lands, and indirectly through policy support such as supplying subsidized inputs to improve soil fertility and productivity. However, these attempts were disjointed, covered only a small part of the region and were not based on adequate understanding of the real causes of degradation. Without proper understanding of the causes and consequences of land degradation, it is difficult to devise appropriate technology and policy interventions.

An important reason for poor adoption of disseminated solutions is the lack of adequate synergy between formal researchers' perspectives and the perspectives of the households and communities about the problems and solutions. Demand driven research and technology generation usually take cognizance of end user perspectives. But physical and biological researchers may measure extent and process of land degradation taking standard degradation criteria as indicators and relate them to various land use practices and other factors to explain the process. Possible solutions emanating from such understanding are then recommended for extension dissemination to households and communities. How the target households and communities respond to those recommendations and whether any positive outcome is derived from the technology dissemination programmes depend on how the communities and households themselves perceive the problems and whether the recommended solutions fit their own understanding and expectation of possible solutions and whether the recommendations fit their resource conditions and policy and market environments. When there is a strong synergy between formal researchers' and household and community perspectives on the diagnosis of the problems and identification of possible solutions, the chances of positive impact of research and extension are greater.

1.2 Objectives of the Study

Given the overwhelming importance of the highlands in the Oromiya Region and the apparent severity of its land degradation problems, a study was conducted to characterize the nature of land use practices, nature and extent of land degradation in the highlands, assess the causes of land use change and land degradation, identify knowledge gaps and some options about the possible pathways of overcoming the problems and improve agricultural productivity. The available literature reviewed by Teferra et al (2002) indicated that there was a strong formal science bias in land degradation related research in the region. Therefore, this study was designed with the assumption that soliciting the perspectives of local communities and households about the dynamics of land use, management and the degradation process and possible solutions would be a very useful and practical contribution to the research, extension and policy making community as well as the generality of citizens in the region.

In chapter 2, the conceptual framework and methodology for sampling and data collection are described. In chapter 3, the nature and extent of changes in land use pattern and degradation status in the sample communities as perceived by the community and household respondents are described. Reasons for change in land use pattern and degradation status as perceived by the community and household respondents are described in chapter 4. Evolution of land tenure systems and their impact on land rights (access, use and transfer), land management and degradation are discussed in chapter 5. Summary of the findings and policy recommendations are presented in chapter 6.

Chapter 2
Conceptual Framework, Data Sources and Survey Methodology

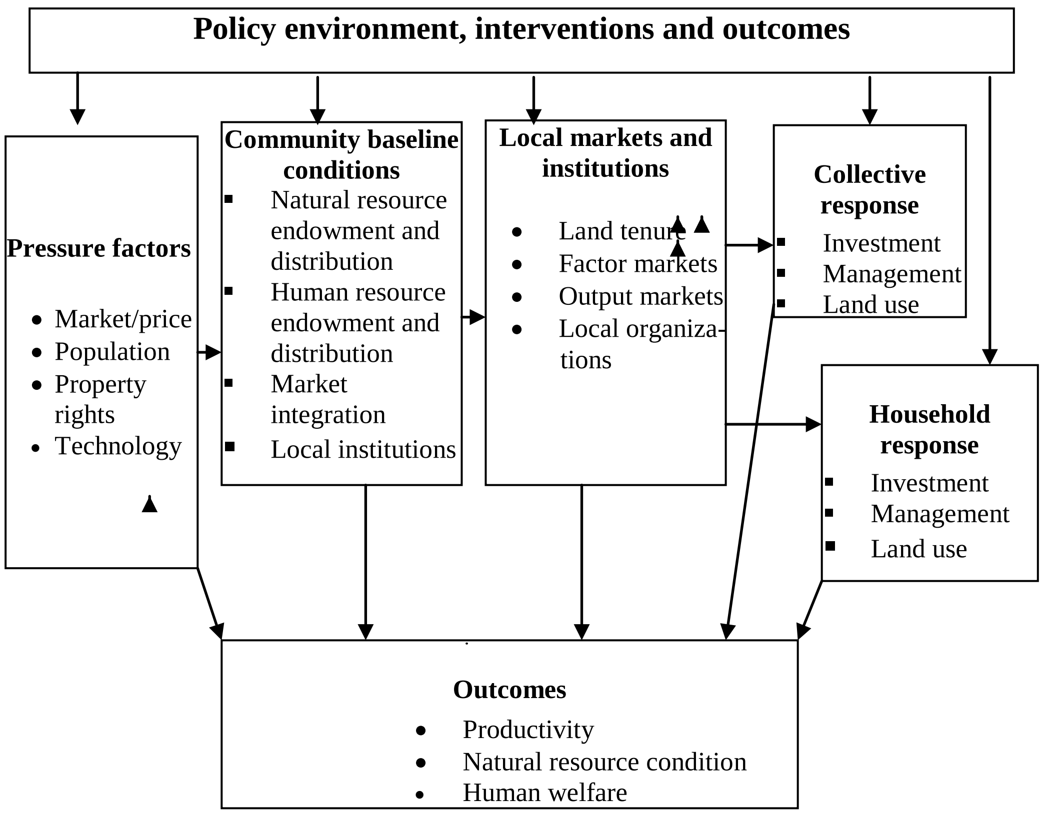
2.1 The Conceptual Framework

Changes in resource use pattern and their impact on human welfare can be analysed and explained in different ways. One set of framework derived principally from theories of agricultural intensification explain changing management systems in terms of changing microeconomic incentives facing farmers as a result of changing relative factor endowments such as land and labour (Boserup, 1965; Hayami and Ruttan, 1985; Binswanger and McIntire, 1987; Pingali *et al.*, 1987). Others have included additional variables to explain differences in resource management patterns inspired by theories of collective action (Olson, 1965; Ostrom 1990; Baland and Platteau, 1996), market and institutional development (North, 1990); rural organisation (Bardhan, 1987), and agricultural household models (Singh, *et al.*, 1986; de Janvry, *et al*., 1991).

The main features of these frameworks have been illustrated by Scherr et al. (1997) as shown in Figure 2.1 . They posited that "pressure" factors operating at a broader national or regional level (e.g. population growth, changes in national market prices, development of new technologies, changes in official property rights) induce, within individual communities, shifts in local market structure, prices and/or local institutions (e.g. land tenure arrangements, labour markets). The nature of these shifts will be conditioned by community characteristics that help to determine local comparative advantage. The shifts at the community level induce responses in natural resource management (NRM) at both the household and collective levels. At the household level, responses may take the form of changes in land use, product choice, investment, and/or land management (intensity, input mix, and conservation practices). At the community level, responses may take the form of collective investments in land, collective self-regulation of private resource use, changes in management of communal resources, or changes in formal or informal rules of access to natural resources. The net results of these changes in NRM are changes in natural resource conditions, productivity and human welfare. Both the responses themselves, and changes in the outcome variables, can have feedback effects on community baseline conditions and local markets and institutions, thus contributing to further change and innovation at the local level because the relationships expounded here in a simple manner are in reality neither linear nor unidirectional.

Public policies may influence this temporal process at various levels: through the pressure factors (e.g., agricultural research programmes, sector price policies, employment policies); by directly influencing community conditions (e.g., restrictions on natural resource use, infrastructure investment); by intervening in local markets or institutions (e.g., regulating property rights, local credit programmes); by influencing household or community responses (e.g., through technology dissemination programmes); or by directly intervening in outcome variables (e.g., nutrition programmes or safety net programmes involving food distribution and employment).

Figure 2.1 Conceptual framework for analysis of land degradation



Source: Scherr et al., 1997.

For the Oromiya Region, currently available information were not adequate to analyze and understand the dynamics of the process of agricultural intensification including changes in land and livestock management and livelihoods and provide policymakers with guidance as to which of the intervention points would be most effective in promoting positive outcomes with respect to land management and agricultural development. Most public action aimed at improving management of fragile land focused on influencing household, and to some extent, community responses. But sometimes and in some situations it might be more effective to influence local markets and institutions or to invest in community infrastructure, since these might largely determine household and community response factors. For example, soil management could represent the underlying problem area, with soil erosion and nutrient depletion being two of most critical manifestations of unsustainable management as indicated earlier, and deforestation, livestock management, land tenure, government policies and market performance could be key factors affecting these problems. Establishing these linkages would be helpful for identifying sustainable land management strategies and new technologies to deal with the low agricultural productivity problems in the region. However, there was very little empirical evidence that elucidated the relationship between these different levels of policy actions, and their actual effects on the key outcome variables through community and household responses. Finding such empirical evidence was one of the main objectives of this project.

The proximate causes of land degradation and low productivity are relatively well known from bio-physical research findings. The most important causes include agricultural production on steep terrain and erodable soils, low and uncertain rainfall, low vegetative cover of the soil, burning of dung and crop residues, declining fallow periods, limited application of inorganic or organic sources of plant nutrients, and limited adoption of soil and water conservation measures. Underlying these immediate causes may be many factors, including population pressure; poverty; the high cost or limited access to farmers of fertilizer, fuel and animal feed; lack of farmer knowledge about integrated soil, water and nutrient management measures; lack of access to credit; and other factors. Government policies and programmes — including macroeconomic and sectoral policies, public investments in infrastructure such as roads and dams, input supply policies, agricultural research and extension policies, land tenure policies, credit programs and others— can have a strong impact on farmers' soil and water management decisions by influencing these factors. The impacts of these underlying factors under the diverse conditions of the highlands are not yet well understood.

The conceptual framework clearly shows that land degradation is a complex process involving many factors at different levels interacting through different pathways. However, in order to undertake a feasible empirical analysis, the framework was simplified by hypothesizing that agro-ecological potential, population pressure and market access were the principal drivers of change in agricultural intensification, land use pattern, land degradation and livelihood options (see more on this later in the discussion on site selection)**.** Since community and household responses to baseline resource conditions and policy and market environments are central to this conceptual framework, it was assumed that soliciting the perspectives of local communities and households about the dynamics of land and livestock management and land tenure rights for livelihoods would be a very useful and practical approach to analyze the past changes and identify directions and options for the future. To that end, an initial set of hypotheses were formulated reflecting the existing knowledge summarized in an extensive review of literature (Teferra et al., 2002) and experiences from the region and elsewhere. The hypotheses are :

1. Population pressure increases the demand for:
   - Land, leading to farming on steep and fragile soils and conversion of grazing land in to crop land
   - Biomass as a source of fuel and wood, leading to deforestation
   - Dung and residues for burning as sources of fuel rather than as manure and mulch
   - Livestock products leading to higher stocking rates and overgrazing.
   - Thus population pressure leads to soil degradation through various pathways. But population pressure may also induce sustainable land management and intensification if congenial technologies, markets and institutions are promoted.

2. Poorly developed and missing markets and high cost of transport due to low road density discourage investments in soil and water erosion.
3. Land tenure, policy and infrastructure and market access largely condition the incentives for investment in productivity improving and conservation technologies.

These hypotheses were not tested exactly in these forms but they were used as general guides for collection of data and their analyses. The empirical work involved breaking down these major hypotheses into more specific hypotheses to test a few critical relationships between population pressure, market access and natural resource conditions on land and livestock management practices and property rights in land and their consequences on land degradation.

2.2 Selection of Study Site and Samples

2.2.1 Highland as the focus of the study

The Oromiya Region has variable topography and elevation ranging from 500 masl to over 4,300 masl. The highlands (>1500 masl.) constitute about 48% of the region's total area while areas between 1000 to 1500 masl. constitute 38% and areas below 1000 masl cover 14% (OBPED, 1997a). The highlands are home to more than 80% of the total human population and 70% of the livestock population of the region and account for over 90% of the cropland. Almost 90% of the region's economic activities are concentrated in the highlands (Dinka, 1996).

The region is divided into 12 administrative zones and 180 weredas or districts. Based on the country's meteorological and agro-ecological maps and information on minimum and maximum altitude and areas with different altitude, 144 out of the 180 weredas or administrative districts in the region contain major parts of their areas belonging to highlands while the other 36 weredas have major parts of their areas belonging to low lands. In terms of climate, highlands in the region are cool and the lowlands are warm. The most prevalent agro-climatic condition in the highlands, although there are considerable variations from locality to locality, is tepid to cool in temperature and moist to sub-humid in moisture. The lowlands have semi-arid to arid climate (Debele et al., 1998a). There are two rainy seasons- short rains during January-February and long rains during June-September with considerable local variation in terms of actual calendar months/weeks and the amount of rainfall and its intensity, all of which affect run off rate, soil moisture, crop production pattern and soil degradation (OBPED, 1997b).

Out of the total land area of 353,690 km^2, vegetation cover accounts for 67.5%, while cultivated land accounts for 29.5%. Grassland, water bodies, urban and built up areas and waste lands constitute the rest (Table 2.1). Land use pattern vary significantly across the 12 administrative zones in the region due to differences in topography, soil type, climatic conditions, population density, among other reasons.

Table 2.1 Land use pattern by zone in the Oromiya Region, 1993

Zone	Total Land, km^2	% land by use type					
		Cultivated land	Grass land	Forest	Wood land	Bush/ Shrub	Others
Arsi	23060	60.5	0.63	7.60	17.32	12.94	1.19
Bale	66430	6.5	4.83	14.10	39.20	34.97	0.37
Borena	95290	3.3	2.86	3.40	35.51	54.51	0.38
East.Hararghe	24610	30.8	2.36	0	22.57	43.63	0.60
West Hararghe	17230	21.7	0.75	0.93	24.06	52.52	0
Illubabor	15870	45.6	0	38.90	9.43	6.14	0
Jimma	18490	47.7	0	25.08	20.99	6.27	0
East Shewa	13860	60.6	4.40	0	11.48	13.11	10.4
North Shewa	11290	73.6	0	0.82	4.98	19.96	0.62
West Shewa	21600	74.5	0	2.00	7.95	15.49	0.07
West Wellega	23980	40.6	0	2.66	25.43	29.37	0.19
East Wellega	21980	49.4	0	0.48	5.46	42.66	1.97
Total	**353690**	**29.5**	**2.02**	**7.20**	**25.03**	**35.28**	**0.99**

Source: OBPED, 1997b.

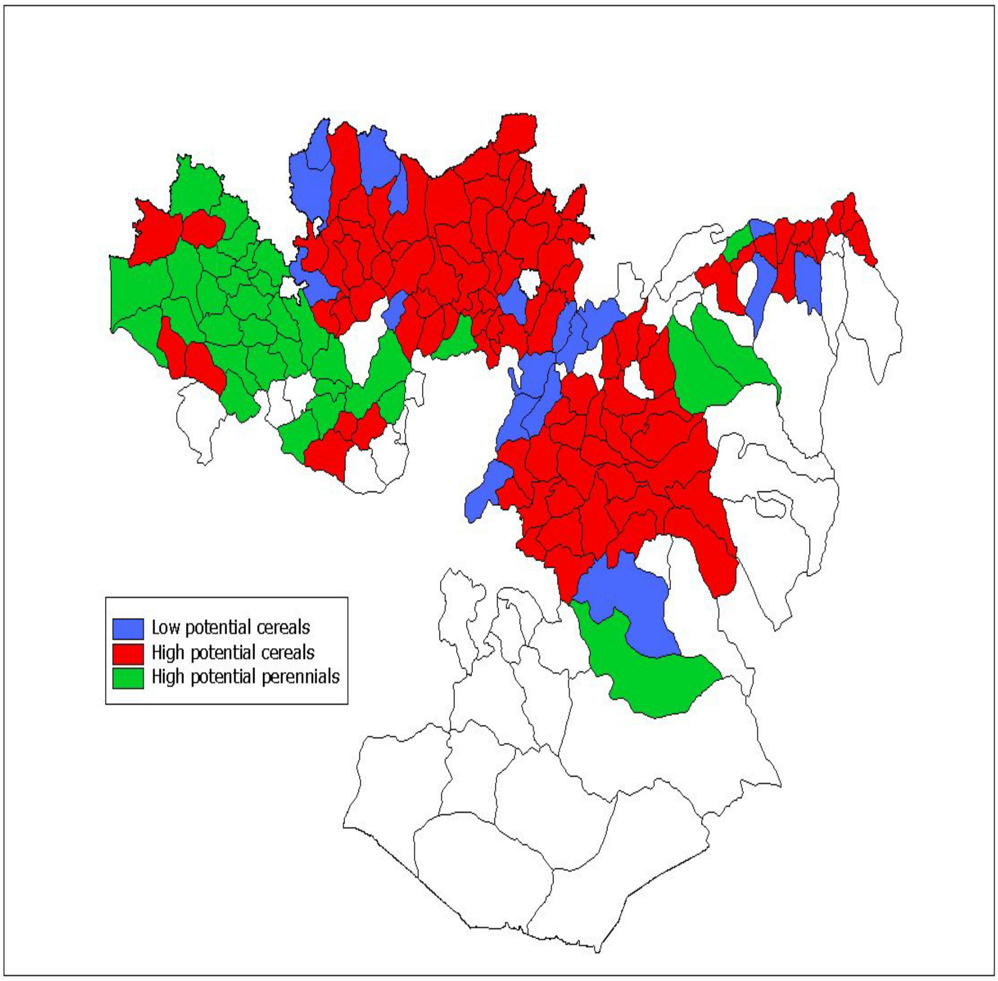
The region is generally divided into three main agro-ecological zones : high potential cereal (HPC) zone, low potential cereal (LPC) zone and perennial zone (Figure 2.2). This classification has been done by the Ministry of Agriculture based on a number of criteria including soil, climate, and types of crops grown (Table 2.2). Out of 144 highland weredas in the region, 91 are located in the HPC zone, 18 in LPC zone and 35 in the perennial zone. Forty four weredas, including most of the weredas located in low potential areas, have been identified as food insecure and there is widespread malnutrition and chronic food insecurity in many rural areas of the region.

Within each zone there are various subsystems of production but there are two broad categories: the mixed crop-livestock farming system and the pastoralist system. The mixed crop-livestock farming system dominate the highlands while most of the lowland weredas have dominance of grassland, bush/shrub and are inhabited by pastoralists and agro-pastoralists as crop production is constrained by lack of adequate rainfall and water. The mixed crop-livestock systems in the highlands can be further divided into four sub-production systems which have implications for how the land resource is used and the resulting effect on degradation. These are :

- The enset-coffee-cereal-livestock production system**:** This production system occurs along Wolliso to Jimma part of the region.
- The forest coffee–enset-cereal-livestock production system: This production system is practised in parts of Jimma zone and the highlands of Borena.
- The mixed cereal-livestock production system: This is the most widely prevalent production system in almost all zones in the region.
- The barley-wheat-livestock Production System: Arsi, Bale, East Wellega and North Shewa zones lie within this production system. Compared to system c, this system generally lies at a slightly higher altitudes

The region has the largest livestock resource base in Ethiopia. Cattle, sheep, goats, donkeys and camels are major types of animals reared and there are about 18.8 million tropical livestock units (TLU) in the region. The mixed crop-livestock farming system of the highlands carries 70% of the total livestock resource base while the remaining 30% is owned by pastoralists in the arid and semi-arid lowlands.

Figure 2.2 Agro-ecolocal charcteristics of the highland weredas of the Oromiya Region, Ethiopia



Note: The figure is not according to exact scale

Table 2.2 Basic/common bio-physical features used as criteria for agro-ecological zonation in Ethiopia

Criteria	Agro-ecological zone		
	Low Potential Cereal	High Potential Cereal	Perennial
Rain fall	Low to medium	Medium to High	High
Moisture retention capacity[a]	Low	Good	Good
Soil type	Nitosols, Cambisols, Arenosols	Vertisols, Nitosols	Nitosols
Soil fertility	Low to Medium	Medium to high	Medium to high
Soil Depth	Shallow to medium	Medium to deep	Medium to deep
Soil erosion	Medium to High	Low to Medium	Low
Major crops	Maize, Sorghum, Teff	Teff, Wheat, Barley, Maize Sorghum	Coffee, Chat Maize, Teff, Barley
Livestock[b]	Cattle and Goats	Cattle, Sheep	Cattle, Sheep, Goats
Vegetation/ Forest cover[c]	Low to Medium	Low	High
General problems or constraints	Low productivity, high risk and limited options	Waterlogging and drainage	Soil acidity

a. Moisture retention capacity is a function of all the other soil characteristics
b. In low cereal areas, some animals are raised by pastoralists or the area has some link with lowland pastoralists
c. In high potential cereal areas, deforestation made current vegetation cover low

Source: Ministry of Agriculture, Government of Ethiopia, unpublished data

Pastoralists of the lowlands almost totally depend on livestock. Livestock is a multipurpose resource providing draught power and manure for crop production, food (meat, milk, butter, cheese), other by-products, and it is a principal form of saving or living bank and export earning. Pastoralists of the region provide most of the animals exported from the country in general. Livestock also provide manure for fuel and serve as insurance during crop failure. In medium to high altitudes (>500 masl), about 90% of crop production is carried out by using draught power (Debele et al., 1998a; CSA, 1999).

Over time, cultivated area has increased while other types of land use like forest, grazing land and bush land have decreased due to population pressure and uncontrolled extraction in both high and low land areas.

Given the complex array of factors influencing land, livestock and water management and the diversity of situations in the region, especially the major differences between high and low lands, uniform set of technologies and policies would not be suitable to effectively address the problems of the entire region. It was envisaged that different set of policy, institutional and technology strategies would be required to facilitate more productive, sustainable, and poverty-reducing land management under the diverse circumstances of the highlands and the low lands of Oromiya. Higher rural population density and its rapid growth in the absence of any significant net migration of labour to the urban and industrial sector has been creating much pressure on the land resources in the highlands, which apparently has been causing widespread degradation especially where fragility is an additional problem. Therefore, this study was focused only on the highlands of the region. Available resources did not permit inclusion of lowlands where also poverty is endemic but the nature and extent of land management problems are of a somewhat different nature.

2.2.2 Selection of Weredas and Peasant Associations

In the conceptual framework, it was stated that community and household perspectives about changes in land and livestock management for livelihoods and land degradation would be the primary basis for analysing the past changes and identifying future opportunities. Therefore communities and households were the final sample units for data collection. It was hypothesized that differences in agricultural potential, population density, market access were the main drivers of agricultural intensification, land management practices and land degradation calling for diverse and flexible responses to the diverse problems.

Longitudinal data on the drivers of change and outcome indicators at plot, farm, household and local community or even higher geographic levels would be ideal for conducting the proposed analysis. In the absence of such data for the Ethiopian context, it was decided to collect cross-sectional data at two points in time on these dimensions from sample areas representing different agro-ecological and socio-economic conditions so that relationship between drivers of change and their outcome indicators like land use, land degradation and livelihood pattern could be statistically established and lessons for possible temporal relationship inferred.

It was planned that data would be collected at community, household and plot levels on a recall basis, so it was necessary to chose dates that were sufficiently apart to document perceptible and measurable changes yet easy to remember for the respondents. As such 1991 was chosen as the base year and 1999 as the end year. 1991 was the year when a new transitional revolutionary government replaced the former Marxist government so respondents were expected to remember their own and local situation when such a major change in the country took place. 1999 was the year just before the survey so it was expected to be remembered well. The sampling and data collection procedures followed for these are discussed below.

Because of the existence of considerable diversities within the Oromiya Region in terms of agricultural potential or agro-ecology (henceforth these two terms are used interchangeably), population density and market access, a stratified sampling approach was adopted to select communities and households.

However, because of resource limitations, all the 144 highland weredas could not be studied, so samples had to be drawn. For this purpose, each highland wereda was characterized in terms of three criteria - agro-ecology or production potential, population density and road density as a proxy for market access. Then they were stratified into 'development domains' using a combination of all three criteria, and then samples were drawn from various domains as illustrated below. [1]

First, each wereda was characterized according to its agro-ecology. Each wereda would belong to either HPC zone or LPC zone and perennial zone depending on its physio-graphic characteristics such as soil, climate, and types of crops grown as previously depicted in Figure 2.1. For the purposes of this study, only coffee growing areas in the perennial zone were considered for sampling. Other perennial crop areas e.g. enset (a food crop) and chat (a narcotic cash crop) dominated areas were excluded.

Second, population density (rural population per hectare of arable or cultivable land) was calculated for each wereda based on latest information on population and land use available from the Central Statistical Authority. Then the weredas were divided into three groups – bottom one third as low density, middle one third as medium density and top one third as high density. However, in order to allow sharp distinction between areas with different population densities, 106 weredas representing low and high population densities were considered for sampling, 38 medium population density weredas were left out from further consideration.

Third, there was no universally acceptable specific indicator or data on market access for the given context, so for the purposes of this study all weather road density per square kilo metre was considered as a proxy for market access as it captured the difficulty or otherwise of accessing agricultural input and output markets and also other information and services like health, extension, credit. In 1998-99, the Oromiya Region had about 85 meters of all weather road per skm, so this was used as the cutting point to characterise a wereda as high and low road density wereda.

[1] Land management and degradation were also studied about the same time under different research projects in the highlands of Amhara and Tigray regions of Ethiopia and in Uganda, and the concept of development domain was also used to characterize different geographic situations. However, the criteria used for stratification of development domains were different. For example, in the Tigray region, access to irrigation and market access were used for stratification of weredas; in the Amhara region, population, market access, rainfall and access to irrigation were all used for stratification. Pender et al. (2006a, 2006b) reported the findings of these studies. The nature of degradation, their causes and opportunities for addressing them varied across regions, and development domains. They were not directly comparable to the findings of this study due to the different criteria used for domain classification though in some cases the nature of the findings have some similarity.

Once the characterization of each wereda based on the three criteria was done, the weredas were stratified into 12 'development domains' using a combination of agro-ecology, population density and market access e.g. a wereda could belong to high potential cereal zone with high population density and high market access domain and another could belong to high potential cereal zone with low population density and high market access domain, and so on (Figure 2.3).

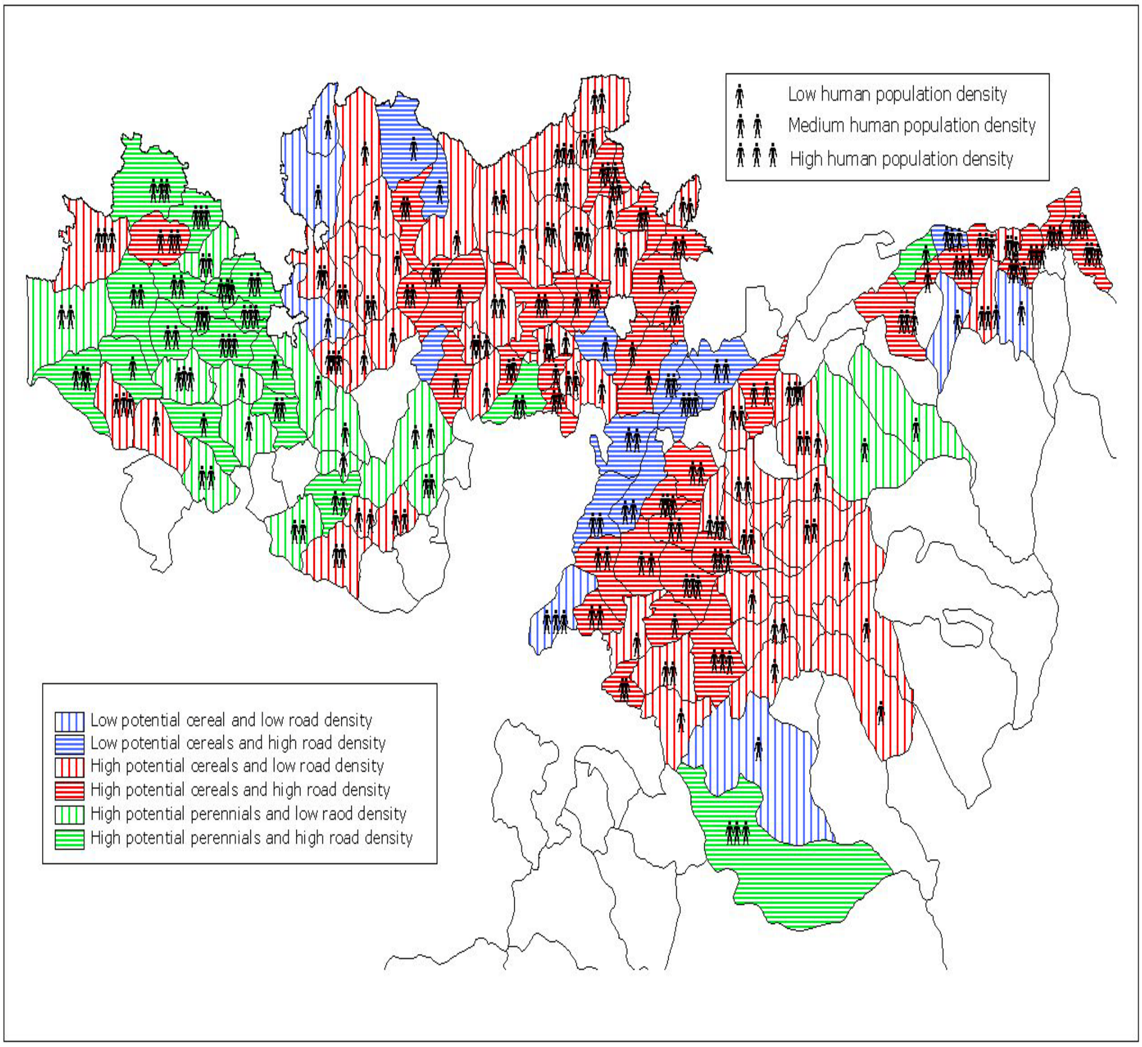
Then in stage 1, from among the weredas representing each of the 12 domains, three weredas were selected at random, which gave 36 or about one third of the 106 eligible weredas. The distribution of the selected weredas between the 12 domains is shown in Table 2.3. This was considered as adequate representation for the region.

In stage 2, from each of the selected weredas, depending on its size in terms of area and population, 2-3 Peasant Associations (PAs) were selected at random for community level data collection.[2] Thus a total of 85 PAs were selected from the 36 weredas. Although selected PAs from a wereda were expected to represent the general characteristics of that wereda and its development domain, at the time of data collection it was observed that in a few cases, the randomly selected PA did not fully represent the characteristics of the development domain which it was supposed to represent. For example, in a wereda representing perennial zone with high population density and high market access, there could be one or two PAs having low population density or low market access. In such cases, an appropriate replacement was taken in consultation with local key informants such as local government staff, ministry of agriculture staff and local leaders.

Agro-ecological, population density and market access characteristics of the 36 selected weredas are summarized in Table 2.4. It is clear that high potential cereal zone had

[2] After the revolutionary *Derg* regime came to power in 1975, rural institutions were reorganized. Peasant Associations were created as the lowest level local government institution. Each PA comprised of 500-800 households resident in one or more villages.

Figure 2.3 Highland weredas of the Oromiya Region of Ethiopia classified by agro-ecology, population and road density



Note: The figure is not exactly according to scale higher population and road densities compared to the other two zones. Looked differently, high road density areas had higher population density. Later we will show that population and road densities changed differently in different domains between 1991 and 1999 with different outcomes.

Table 2.3 Distribution of sample weredas according to development domains

Population density	Market access	Agro-ecology			Total
		HPC	LPC	P	
High	High	5	2	3	10
High	Low	4	3	2	9
Low	High	3	2	2	7
Low	Low	5	2	3	10
Total		17	9	10	36

Table 2.4 Population and road density in the weredas selected for community survey by domains, 1998-99

Domain	Population density per skm	Rural population Per ha	Road metre/skm
Agro-ecology			
High Potential Cereal	113	2.8	90
Low Potential Cereal	64	1.3	70
Perennial	84	1.8	100
Population density			
High	119	2.9	110
Low	69	1.5	80
Road density			
High	119	2.6	120
Low	73	1.9	60
All weredas	96	2.2	90

Source: Central Statistical Authority, unpublished data

2.2.3 Selection of households and plots

For household and plot survey, rather than covering all the 36 weredas and 85 PAs selected for community level survey, a sub-sample of weredas was considered adequate. As such a two stage selection procedure was followed. In stage 1, out of the 3 weredas selected to represent each development domain, one wereda was selected at random for each domain. In stage 2, out of the 2-3 PAs already selected from that wereda for community survey, one PA was selected to represent that domain. Thus 12 PAs were selected from 12 weredas to represent 12 domains. In stage 3, 10 households were selected from each PA from the list of households available from the PA office. This gave a total of 120 households. Next, plot level data were collected from all 494 farm and non-farm plots of the 120 selected households. Though relatively small in number in relation to the overall size of Oromiya highlands, the stratified multistage random selection procedure ensured representation of the diversity of the 12 domains.[3]

2.3 Collection of Data

Required community level information included changes in livelihood strategies and welfare and resource use pattern and their conditions in the overall village or community between the two years and on factors that might have influenced these changes e.g. population growth, access to roads, credit and extension programmes, collective decisions on resource management. Required household level information included changes in endowment of land, labour, livestock, education, and other assets; access to credit and extension; income sources and livelihood strategies; and sources of information of improved technologies between the two years. Required plot level information included changes between the two years in cropping pattern, land management practices, soil water conservation investment, land tenure status, input use, yield by crops, soil conditions.

[3] Where land ownership is highly skewed , small sample size may not be adequately representative of size distribution, rather stratified sample of a fairly large size may be required. In Ethiopia, especially in the Oromiya Region, land was nationalized in 1975 and total available land within a PA was distributed among its resident peasants on a per capita basis. It resulted in an egalitarian ownership pattern though some variation between PAs and weredas existed due to differences in population density. That is why, the small household sample was sufficiently representative of the conditions in the region.

The survey was conducted in collaboration with the Oromiya Agricultural Development Bureau (OADB), which was responsible for providing extension services as well as other agricultural services to farmers on behalf of the Oromiya Regional government. Separate questionnaires were prepared for community, household and plot level surveys and a number of OADB staff selected from its various zonal offices were trained and engaged for data collection under the supervision of senior researchers. Questions were both open and close ended with some precoding where appropriate and others had to be post coded. Training for survey enumerators included conceptual issues being addressed in the questionnaire, the reason why certain questions were being asked in certain form so that the enumerators had some logical background to the survey rather than just asking questions mechanically without understanding their meaning and implication. They were also trained in the use of appropriate code books, guide books and procedural guidelines describing how to identify respondents and deal with them, and these materials were provided along with the questionnaires.

For the PA or community level data, some quantitative information like total land area, total population, livestock population etc were collected from the PA office. For most of the other questions, group interviews were conducted with about ten respondents from each PA selected to represent different gender, age, occupation. There could be differences in opinion on the possible answer(s) to a question, in which case they were allowed to discuss among themselves and arrive at a consensus or at least have significant majority opinion to resolve the issue or record both majority and minority opinions. For the household and plot level survey, efforts were made to engage all adult members of the family – male and female-in the interview as questions included wide ranging issues all of which a single member – male or female- would not be able to answer satisfactorily. Each plot of land of a farm household was given a unique name and identification so that the respondents could relate answers to a physical location of that particular plot and avoid mixing answers for different plots. The plot level interviews were conducted at the plot. Actual land area of the plot was measured by land measuring tape, and soil samples were collected using standard soil sample collection technique under the guidance of a soil scientist. These were analysed to establish actual soil properties and fertility status and these were matched with qualitative answers given by the farmers themselves as well as with cropping history of the plot.

The surveys were conducted during April – June 2001,which was the slack season for farmers, so getting their time for interviews and discussions created minimal conflict with their farming activities. All the data were coded based on the coding plan using ACCESS software and then cleaned before analysis using SPSS and STATA.

The community, household and plot level data have been used to measure changes in different aspects of land and livestock management and livelihoods and their driving forces or related reasons as perceived by the communities and households. Information from a particular survey, say community survey, was used to interpret changes in some aspects while in some other cases where appropriate information from more than one survey, say both community and household survey, were used.

Chapter 3

Changes in Land Use Pattern and Degradation Status

3.1 Changes in Land Use Pattern

In 1975, under a land reform programme all rural land was nationalized and redistributed among peasants based on family size through the Peasant Associations (PA). Most of the crop land within the PA was redistributed, but some crop land and other types of land such as forest, common grazing land, water bodies and graveyards etc were kept as common land under PA control for common use or future redistribution if required. The PAs maintained yearly record of land use by type of use. Records from the sample PA offices showed that in 1991 crop production occupied over 50% of the land area in the PAs, and grazing land and forest each occupied around 20%, and homestead and settlement occupied about 5% of the PA land (Table 3.1). By 1999, area under crop land increased to 66% of the total or by 23%, grazing land decreased by 37% and forest land by 31%. Within these broad categories, nature and extent of change for specific type of land use such as rain fed vs irrigated crop land, common grazing land vs private pasture etc were highly variable. Thus in general expansion of crop land has occurred at the expense of grazing land and forest. It will be shown later that population pressure was the principal reason for this change in the land use patter.

The changes in the pattern of land use were not uniform across the various development domains. The changes were generally more prominent in the HPC domain and to some extent in the high population and high market access domains, though some specific land use changes have occurred somewhat differently in different domains than the general trend (Table 3.2). The sources of expansion of crop land might be different in different development domains. In some domains it could be principally from reduction of grazing land, in another it could be from reduction of forest and trees and in another it could be equally from both. In some cases, percentage changes appear high because the base levels are low. For example, perennial crop area and area under woodlot in the HPC zone increased by 156% and 126% respectively but the share of these uses were very low in 1991.

Table 3.1 Land use patterns in the sample Peasant Associations in 1991 and 1999

Land use	% of total area in the sample PAs		% change
	1991	1999	
Crop land	**53. 8**	**66.1**	**23**
Rain fed crop land	51.0	61.8	20
Irrigated crop land	0.5	0.6	17
Perennial crop land	2.3	3.7	51
Grazing land	**22.6**	**14.2**	**-37**
Common grazing/pasture	7.9	5.0	-37
Private grazing/pasture	10.3	4.5	-56
Wasteland	4.4	4.7	6
Forest and trees	**18.8**	**13.0**	**-31**
Forest	7.6	3.7	-52
Woodlot/woodlands	0.7	1.1	63
Bush/shrub	10.4	8.0	-24
Area enclosure	0.1	0.2	4
Homestead/settlement	4.2	6.3	50
Graveyard/fallow	0.7	0.7	3
Total	100	100	

Source: Community survey

The typology of land use discussed above does not mean the types are single purpose or have mutually exclusive uses. In reality, each type may have multiple uses. An important alternative use is for animal feeds. In the prevailing mixed farming systems, crop residues are principal sources of feeds for animals but in some situations, grains and other biomass remaining in the field after harvest may also be grazed or scavenged by animals. Common grazing land and natural pastures are other important sources. Feeds may also be derived- either harvested or grazed- from woodland, bush, forest, homestead land. In order to assess if the changes in land use pattern shown above was accompanied by changes in the feed sources for livestock in the sample communities, each community was asked to specify the primary and secondary sources of feeds for livestock.

Table 3.2 Changes in land use pattern in the sample Peasant Associations between 1991 and 1999 by agro-ecozone, population density and market access

Land use	% change by agro-ecozone			% change by population density		% change by market access	
	HPC	LPC	P	High	Low	High	Low
Crop land							
Rain fed crop land	22	24	8	19	22	19	22
Irrigated crop land	7	28	44	7	46	42	3
Perennial crop land	156	50	51	32	79	53	50
Grazing land							
Common grazing/pasture	-49	-29	-32	-42	-30	-48	-29
Private grazing/pasture	-63	-35	-58	-56	-57	-63	-48
Wasteland	11	15	-5	20	-4	5	7
Forest and trees							
Forest	-58	-60	-33	-66	-43	-45	-54
Woodlot/woodlands	126	12	45	54	86	68	53
Bush/shrub	-32	-44	-10	-44	-17	-15	-31
Homestead/settlement	53	46	44	52	47	53	46
Graveyard/fallow	480	-23	19	-9	37	-2	5

Source: Community survey

The sources varied between communities as every community did not have all feed sources equally but overall the pattern in terms of incidence of use of different feed sources changed only marginally between 1991 and 1999 (Table 3.3). Common grazing land and crop land (residues and aftermath grazing) were the top ranked sources of feed in both the years with homestead based feed supplies taking the third position. Incidence of purchased feed as the primary source was virtually non-existent in the sample PAs as market-oriented livestock production was absent but incidence of purchased feed as a secondary source was present among a few PAs. The incidence of common grazing as the primary source increased and incidence of crop land and homestead based feeds as primary sources decreased in 1999. Also these changes were not uniform across the development domains. Importance of common grazing increased more in the perennial zone and in low population density domain, crop residues became more important in high population density and high market access domains, aftermath grazing became more important in low population density and high market access domains, private pasture became more important in HPC and LPC zones, woodland/forest became more important in low market access domain, and purchased feed became more important in high market access domains.

However, even if the main feed sources did not change substantially, the volume of feed and quality of feed available might have decreased over time due to overgrazing by the existing livestock population on the reduced feed sources, which might have led to degradation of the grazing resources as shown later.

Table 3.3 Distribution of sample peasant associations according to primary and secondary sources of livestock feeds in 1991 and 1999

	% PAs in 1991		% PAs in 1999	
Feed sources	Primary source	Secondary source	Primary source	Secondary source
Common grazing land	46	16	53	12
Private pastures	4	10	4	11
Cropland (residues and aftermath grazing of fields)	32	43	29	46
Forest/woods/bushes	3	4	4	4
Homestead vegetation, household wastes	15	15	10	14
Purchased feed (concentrate)	-	12		13
All	100	100	100	100

Source: Community survey

3.2 Changes in Land Degradation Status

Soil erosion and fertility were considered as the main indicators of land quality. Erosion and fertility generally have an inverse relationship. Where erosion is high, fertility is likely to be low and vice versa. Erosion and fertility problems may originate at a spot –say a plot or farm- but at the end it becomes a spatial problem cutting across space. For example, water erosion is an upstream-downstream problem as soil particles eroded from higher slopes pass through lower slopes before sedimentation takes place somewhere. Therefore, during group interviews in each PA, respondents were asked about their perception on the nature of change in soil erosion and soil fertility in their PAs for each type of land but giving particular attention to crop land. They were given a choice of four options to indicate perceived change in erosion and score them as follows: major decrease (-2), slight decrease (-1), no change (0), slight increase (1), major increase (2); and four options in case of fertility: major decrease (-2), slight decrease (-1), no change (0), slight increase (1) and moderate/major increase (2).

Taking into account the overall degradation status in the PAs irrespective of land type, respondents in nearly 60% of the PAs perceived that there had been slight to major increase in soil erosion in their PAs and about 40% perceived that there had been major/slight decrease in fertility (Table 3.4). Perceptions about the nature and extent of changes in erosion and fertility varied significantly across agro-ecological zones and population density domains. Among the agro-ecological zones, highest proportion of the PAs in HPC zone reported major increase in erosion and also major decrease in fertility between the two years followed by LPC and perennial zones. Also higher proportion of PAs in high population density domain reported major increase in erosion but the same proportion in both high and low population density domains reported major/slight decrease in fertility. Overall, 53% of the PAs perceived that there had been slight to major increase in fertility in their PAs between the two years. About 61% of PAs in the perennial zone reported such increase compared to about 50% in the other two zones. About 50% of PAs in both high and low population density domains reported increase in fertility.

Table 3.4 Perceived changes in soil erosion and soil fertility in the sample Peasant Associations between 19991 and 1999 by agro-ecozone and population density

Degradation indicator and score	Agro-ecozone			Population density		All
	HPC	LPC	P	High	Low	
Change in erosion						
Major/slight decrease (-2, -1)	19	16	21	22	16	19
No change (0)	20	26	24	22	24	23
Slight increase (+1)	18	27	27	17	27	23
Major increase (+2)	43	31	28	39	33	35
All	100	100	100	100	100	100
Change in fertility						
Major/slight decrease (-2, -1)	46	40	31	40	40	40
No change (0)	5	8	8	5	8	7
Slight increase (+1)	23	21	37	34	20	26
Major increase (+2)	26	31	24	21	32	27
All	100	100	100	100	100	100

Source: Community survey

For each type of land, the scores assigned to the specific change categories were averaged to see the net overall change in erosion and fertility status in the sample PAs (Table 3.5). It appears that all types of crop land, pasture land and waste land, there has been slight/moderate increase in erosion and slight/moderate decrease in fertility. There was nearly 'major' decline in fertility in case of rain fed crop land. On the other hand, for different types of woodland, bush and forest, there has been slight decrease in erosion and slight increase in fertility, though there is quite a bit of variation in the extent of these changes. In case of area enclosure for forest (which virtually restricts regular use and may be considered equivalent to reserve or conservation area), there has been major decrease in erosion and major increase in fertility.

Table 3.5 Perceived changes in soil erosion and fertility status of different types of land between 1991 and 199 in the sample PAs

Land use type	Mean change score	
	Erosion	Fertility
Rain fed crop land	1.0	-1.6
Irrigated crop land	0.6	-0.9
Common grazing land	0.9	-0.6
Private pasture	1.0	-0.7
Woodlots/woodland	-0.8	-0.1
Forest	-0.2	0.7
Bush/shrub land	0.2	0.1
Area enclosure for forest	-2.0	2.0
Homestead	-0.3	0.9
Waste land/swamps	1.1	-1.0
Fallow/graveyard	-0.1	1.0
Perennial crop land	-0.4	0.7
Wet land	0.0	-1.0

Note: score for change categories were -2, -1, 0, 1, 2 (see text for explanation)
Source: Community survey

Most of the net degradation of crop land in the PAs might have occurred because previous crop land might have degraded due to over or improper use, and cropland expansion might have occurred into less fertile land such as bush/shrub land or common grazing land which were already degraded due to overgrazing. The degradation of grazing land might have occurred due to overgrazing or over exploitation of the reduced grazing land resources. These reasons will be explored in detail below,

During the household survey, respondents were asked about their perception about the soil erosion and soil fertility status of each of their arable plots in order to verify the more general degradation status reported for the PA. Soil samples were also collected from all the arable plots to crosscheck the perceptions of the households and the PAs.

The households reported that about 50-52% of their plots had mild erosion level, 12-13% had severe erosion level and 36-37% had no erosion in both 1991 and 1999. Severe erosion was more prevalent in the HPC and Perennial crop domains and mild erosion was more prevalent in the low population density domain. In case of fertility status, about 17-19% of the plots had low fertility, 68% had moderate and 13-16% had high fertility levels in both the years. Plots with high fertility were more prevalent in the LPC and high population density domain.

Fertility and erosion levels of plots were found to be highly correlated (Table 3.6). In 1999, 76% of high fertile plots had no erosion, 58% of moderate fertile plots had mild erosion and 78% of low fertile plots had mild to severe erosion. About 6% of high fertile plots in 1991 became moderate fertile in 1999 and 18% of moderate fertile plots in 1991 became low fertile in 1999. The line of causation between erosion and fertility may not always be unidirectional. Low fertility may induce high erosion rate but the reverse may also occur.

Table 3.6 Distribution of arable plots (%) by fertility and erosion levels, 1999

Extent of erosion	Fertility level			
	High	Moderate	Low	All
None	76	33	22	37
Mild	19	58	44	50
Severe	5	9	34	13
All	100	100	100	100

Chi-square significant at les than 1% level

Source: Household and plot survey

Laboratory analysis of soil samples collected from all arable plots of the sample households also confirmed that fertility levels were not very high. Mean N, P and K availability was found to be 0.25%, 20.04 ppm and 2.24 meq/100gm, respectively and CEC was 26.02 meq/100gm. These were considered less than optimal for good soil health and good productivity. Mean levels of all three nutrients were significantly lower in the high population and high market access domains compared to the low population and low market access domains respectively. Among the agro-ecozones, mean P and K levels were significantly higher in the HPC zone.

Chapter 4

Reasons for Changes in Land Use Pattern and Degradation Status

In the conceptual framework, it was hypothesized that there are proximate as well as underlying reasons for land use change and land degradation. Community, household and plot level factors may influence these changes along with higher level policies and institutions that define the decision making environment and incentive structures. The pathways through which different factors impact on land use change and land degradation are not linear or unidirectional. Moreover, some factors may have more direct or independent impact while others may impact through interaction with one or more other factors. Therefore, it is difficult to identify and analyse causative factors in any particular order, so different factors will be discussed below highlighting their independent as well as interactive roles.

4.1 Changes in Human and Livestock Population Pressure

It was hypothesized that population pressure induces land use change and degradation by creating extra demand for food, wood, fuel etc which leads to expansion of cultivation to less fertile land, conversion of grazing land to crop land, and use of crop residues and dung as fuel rather the as manure and mulch. Livestock is often blamed for overgrazing and land degradation but concrete empirical evidence on how livestock may be implicated is scarce. Even when livestock overgraze, it is human decision and action that is responsible, not the animals themselves. In order to explain the significant land use changes and degradation including changes in the relative importance of feed resources and their degradation discussed earlier, evidence on changing human and livestock population pressures and their interactions are presented below.

The size of the sample PAs varied in terms of total land area, total number of households and population. In order to compare changes between 1991 and 1999 on an equitable basis, density of population per ha is shown rather than nominal population numbers. Between 1991 and 1999, the number of households per PA increased by 29% but population density per ha increased by 34% but (Table 4.1) indicating that along with number of households, average household size also increased to some extent. In the base year, the size of a Peasant Association (PA) in terms number of households and population density per ha were varied across the development domains. Among the agro-ecological zones, average number of households per PA was the lowest in the perennial zone and it was respectively 65 and 30% higher in the HPC and LPC zones. An average PA in a high population density area had 30% more households compared to a PA in a low population density area. But the difference between PAs in high and low market access areas was relatively small. Among the agro-ecological zones, the highest extent of increase in the number of households and population density per ha occurred in the perennial zone compared to the other two zones, and the increase was also higher in low population density areas compared to the high density areas, and in the low market access areas compared to the high market access areas. Overall, the perennial zone, low population and low market access domains experienced higher rates of increase in population density.

Table 4.1 Demographic changes in the sample Peasant Associations between 1991 and 1999

Development domains	1991		% change in 1999	
	Av no of households/PA	Average no of people/ha	No of households/PA	Av no of people /ha
Agro-ecology				
HPC	736	1.46	27	29
LPC	581	1.31	27	33
Perennial	447	0.91	39	52
Population density				
High	670	1.54	28	32
Low	519	1.03	34	38
Market access				
High	643	1.47	30	32
Low	600	1.12	29	37
Overall	621	1.29	29	34

Source: Community survey 2001

Changes in population occurred due to natural growth rate and net migration status. In a community number of households might have changed when adult children of existing households got married and established separate households and also due to in or out-migration of households. Natural growth and establishment of new households were the main sources of increase in population and number of households in the sample PAs but net migration status to some extent contributed to the varying rates of increase in the different domains. For the purposes of this study, if an entire household left the PA, it was defined as out-migration; conversely if an entire household settled in the PA coming from outside its boundary, it was defined as in-migration.

Among the sample PAs, about 16% reported some out-migration and 29% reported some in-migration. Overall, 2.4% of the households in the sample PAs out-migrated but 0.9% in-migrated. Search for farmland was the principal reason for in and out migration, other reasons are employment opportunities and joining the nearest family members. Among all the agro-ecological domains, the extent of in-migration was the highest in the perennial zone and moderate in low population density areas. Most out-migration occurred from high population density areas and HPC zone, which appeared logical, as otherwise pressure in those PAs would be still higher which would further worsen the land degradation status.

Generally there is a relationship between human and livestock population densities in smallholder mixed farming systems. So the densities of human and livestock populations in the sample PAs in 1991 and 1999 are shown to assess the nature of their changes. The means and standard deviations around means show that there were wide variations in human and livestock population densities across the sample PAs (Table 4.2). Moreover, mean human and livestock population densities changed significantly differently between 1991 and 1999. While human population density per ha increased by 34% between the two years, livestock population density per ha decreased by 4% but livestock holding per household decreased by 28% due to the double effect of increased human population and decreased livestock population.

Table 4.2 Human and livestock population densities in the sample communities, 1991 and 1999

	Year		% change
	1991	1999	
Human population, number of heads/ha	1.29 (0.79)	1.73 (0.93)	34
Livestock population, TLU/ha	1.48(1.21)	1.40(97)	-4
Livestock holding, TLU/household	5.41(3.88)	3.92(2.52)	-28

Note 1: TLU = Tropical livestock Unit. FAO defined conversion rates for different types of livestock have been used to estimate TLU as adding heads of different species and types is meaningless.
Note 2: TLU/household = total TLU in a PA divided by the number of households in the PA.
The figures in the parentheses are standard deviations.
Source: Community survey

Irrespective of the density of livestock population, ownership of different types of animals and birds was not universal. In 1991, about 60% of the households in the sample PAs owned different types of cattle (oxen, cows, other cattle), about 30-40% owned small ruminants and donkeys (a key means of transport of goods in the rural areas), and about 50% owned chicken (Table 4.3). In 1999, incidence of ownership and average ownership per household decreased in varying proportions for all types of animals, only incidence of ownership of chicken increased slightly but average ownership per household still declined. Among the various animal types, the decrease in incidence of ownership and number owned per household were more for cows and other cattle than for oxen and largest decrease occurred in case of sheep, goats and horses.

Thus livestock density per ha of total land remained almost stationary or even reduced a bit between the two years though the composition of the livestock population changed, yet grazing land quality has degraded significantly between the two years(see above). The explanation of this puzzle is a bit complex. However, a partial explanation is that grazing land area has decreased significantly due to crop land expansion but all crop residues from expanded crop land has not been available as feed (see later) so the pressure on the remaining grazing land increased leading to degradation. More detailed explanation will require understanding the relationship between human and livestock population growth, livelihood sources and activities of the population, and functions of livestock in the rural communities. These are discussed below.

Table 4.3 Changes in ownership of different types of animals between 1991 and 1999 in the sample PAs

Animal type	% household owned		Number owned per household	
	in 1991	% change in 1999	In 1991	% change in 1999
Oxen	62	-5	1.46	-21
Cows	65	-11	1.95	-31
Other cattle	62	-13	2.43	-31
Sheep	43	-28	1.52	-36
Goats	28	-25	0.90	-26
Donkeys	33	-6	0.42	-5
Horses	20	-25	0.31	-29
Chicken	53	9	2.26	-7
Beehives	11	-36	0.44	-39

Source: Household survey

4.2 Determinants of Livestock Density and Their Implications for Land Degradation

First , an analysis of the determinants of livestock density and livestock holding per household across the PAs in 1999 is presented. The findings for 1991 were also similar so are not discussed separately. Then the reasons for change in the density and livestock holding per household between 1991 and 1999 are discussed. In both cases, any direct or indirect relation of livestock with land degradation is highlighted.

Several factors were hypothesized as determinants of livestock density per ha and livestock holding per household in the sample PAs. This was tested by running multiple regressions using TLU/ha and TLU/household in 1999 as the dependent variables and the hypothesized factors as independent variables. The results of the best fit equations are shown in Table 4.4. The equation for TLU/ha explains 58% of the variation in livestock density while the equation for TLU/household explains 38% of the variation in average household ownership of livestock units across the sample PAs, For cross sectional data these are quite good estimates, especially for the density equation. However, it is also to be noted that the unexplained portion is quite large, especially in the second equation, indicating that unknown factors other than those identified in the two equations are responsible for the remaining variations. The implications of the estimated coefficients are discussed below.

Table 4.4 Factors influencing livestock density per ha and livestock holding per household in the sample PAs in 1999

Predictors	TLU/ha	TLU/household
Constant	0.034(0.385)	2.639(1.197)
Population density	0.455**(0.209)	-0.45 (0.651)
Population density square	-0.014(0.033)	0.047 (0.103)
Grazing land as a ratio of total land area	2.019**(0.850)	6.476** (2.647)
Crop residue major source of fuel (yes=1)	-0.538*(0.291)	-1.254 (0.906)
Local market in community (yes=1)	-0.013(0.158)	-0.292 (0.492)
Wholesale market in community (yes=1)	0.943(0.759)	1.717 (2.365)
Veterinary clinic in community (yes=1)	-0.890(0.544)	na
Seasonal road in community (yes=1)	-0.281(0.192)	0.152 (0.597)
All weather road in community(yes=1)	0.028(0.172)	0.316 (0.537)
Livestock common means of saving (yes=1)	-0.103(0.429)	0.347 (1.336)
Terms of trade (teff price/sheep and goats price)	1.152***(0.335)	2.503** (1.044)
Agro-ecology (cf HPC)		
LPC	0.021(0.207)	0.540 (0.644)
Perennial	-0.645***(0.201)	-1.835***(0.625)
R^2	0.57	0.38
N	84	83

***, ** and * indicate significant at 1, 5 and 10%, respectively.

Figures in the parentheses are standard error of the estimated coefficients

Source: Community survey

Among the independent variables, population density, grazing land as a ratio of total land, use of crop residue as feed or otherwise and terms of trade between cereal and small ruminants had significant influence- positive or negative - on the variation in livestock density as well as livestock holding per household. Other things remaining the same, livestock density per PA significantly increase as human population density increase. At very high level of population density (captured by the variable population density square), livestock density show a declining trend though the coefficient is not statistically significant. On the other hand, livestock holding per household decrease as population density increase and livestock holding per household increase at very high level of human population density but neither coefficient is statistically significant.

This relationship between livestock and human population density appear plausible under the prevailing situation in the highlands of Oromiya and also appear consistent with historical experiences elsewhere especially in the developing countries with high human and livestock population densities. Generally**,** at the early stages of agricultural and rural development when rural population density increase along with extensive and/or intensive agriculture, livestock population density also increase as people keep livestock for food (meat, milk), power and other needs. Once industrialisation and urbanisation lead to migration and net decline in rural and agricultural population, this positive relationship first becomes weaker, and is then reversed. Also in situations where technical change and general agricultural development is very slow and limits the carrying capacity of human and livestock population, a stage may be reached beyond which increased population density may lead to a decline in bovine, especially large animal, density (Jabbar and Green, 1983).[4] Empirical evidence in support of these general relationships between human and livestock population densities have been provided by Mukherjee (1938) for India, Jabbar and Green for Bangladesh, Lapar and Jabbar (2002) for Southeast Asia region and Mäki-Hokkonen (1996) for developing countries in general. The effects of population density and its square corroborate generally held perception that there is an overpopulation of livestock in the highlands of Oromiya and in Ethiopia in general in relation to its feed resources and that

[4] In a recent publication, this process has been described as 'involution'. See Steinfeld et al (1998), p.19.

a competition between human and livestock population for the limited land in the highlands is emerging. This conclusion is further supported by the effect of the grazing land and crop residue use variables as explained below.

Other things remaining the same, both livestock density per ha and livestock holding per household increase significantly as grazing land as a share of total land in the community increase. The effect of this variable on livestock holding per household is even stronger than the effect on livestock density. On the other hand, livestock per ha is significantly lower in communities in which crop residues are used as a major source of fuel compared to those where crop residues are used mainly as animal feeds. The negative relationship also holds in case livestock holding per household though it is not statistically significant. Reduced grazing land and increased use of crop residues as fuel are results of population pressure and expansion of crop land at the expense of pasture land and forest. Thus availability of grazing land and crop residues as feeds have significant influence on livestock density and inadequate supplies of these may lead to overgrazing – both pasture grazing and aftermath grazing of crop land- and land degradation. It may be recalled that the survey communities perceived these relationships while explaining reasons for decreased fertility and increased erosion.

As the terms of trade (relative price) of teff, the principal cereal crop, increase in relation to sheep and goats, the most frequently traded animals, livestock density per ha as well as livestock holding per household increase. This relationship may appear counter intuitive – normally the reverse would be expected. However, a plausible explanation is that higher teff price increases farm income and saving potential, and livestock, especially small ruminants, are a major form of saving in rural areas, so higher teff price may lead to increased livestock density per ha and livestock holding per household. This relationship is partly indicated by the fact that in the PAs where livestock is a common form of saving, livestock holding per household is higher than those PAs where it is not, though the coefficient is not statistically significant. It has also been observed that, other things being equal, when total herd size increase, the main source of increase is often small ruminants rather than cattle or equines because large animals require more feed, are more expensive to acquire and require significantly more money per unit while small ruminants can be acquired in small increments over time as they are less expensive.

Four market access variables were used in the equations rather than high vs low market access domains. access to local and wholesale market, presence of seasonal and all weather road in the PA. However, none of these factors has any significant influence on either livestock density per ha or livestock holding per household though the positive sign of the coefficients of whole sale market and all weather road variables are as would be normally expected. The less importance of these variables for livestock density and livestock holding may be explained by the fact that animals are mobile- they can be transported on hoof relatively long distances, so nearness of roads and markets may not be as important for livestock holding as, for example, in case of crops and vegetables.

Agro-ecology or production potential appears to be an important factor in livestock density and livestock holding. Other things being equal, both livestock density per ha and livestock holding per household are significantly lower in the perennial zone compared to the HPC, and there is no significant difference between HPC and LPC zones. This relationship is also consistent with the effect of population density on livestock density. The HPC and LPC zones have higher human population density so also have higher livestock density.

The overall decrease in livestock density per ha and livestock holding per household and uneven decrease of different types of livestock require some explanation especially as they relate to land degradation or otherwise. Even though there is decline in the aggregate, at an individual household or community level, the herd size and composition might have remained the same or increased between the two years; number of certain type of animals might have decreased while other types might have increased. . There may be some common reasons for the PA level changes and individual household level changes, but some reasons may be different. Also there may be community level factors as well as household level factors to explain these changes.

Lack of grazing land /vegetation is a major perceived reason for decline of all types of animals. The least decline in oxen ownership is explained by the fact that household number in each community increased between the two years and each household prefers to have its own oxen for tillage. Thirty nine percent of the sample PAs mentioned increased household number as a reason for increased oxen number or relatively small decline in oxen number in their communities**.** The most important predictor of number of ox ownership at the household level is the amount of total farm land owned per household as oxen are used for tillage and threshing (Table 4.5). However, an ox being a lumpy unit, cropland per ox may be higher or lower than the actual requirement of ox power for a particular household. Therefore, some farms may have more potential draught services in terms of work days or hours than is necessary for own farm while others may have less than is necessary for own farm. Such difference between stock and flow of services is normally equilibrated through draught power market, whether formal or informal. For example, among the sample households in the Oromiya Region, in 1991 77% household exported and 76% imported some oxen power while in 1999 100% of the sample households exported and imported some oxen power. Number of oxen days exported and exported also increased in 1999. However, most of these were either oxen for oxen exchange, i.e., farmers work in teams so that they work in each others fields in rotation. In some cases, oxen power was also exchanged for human labour as farmers not having oxen pay by labour.

Table 4.5 Average farm land ownership (ha) per sample household according to number of oxen owned in 1999

Oxen number	Land ownership/househol ha
0	1.15
1	1.50
2	2.25
3	3.08
4+	3.89
All	2.29

Source: Household survey

The larger decline of other types of animals – milk cows, other cattle, small ruminants and equines- in relation to oxen may be explained by the fact that in order to maintain adequate number of oxen in relation to the land to be cultivated, ownership of other types of animals has been reduced or sacrificed due to feed constraint resulting from reduced grazing land. Once the number of oxen to be owned or retained is decided, possibilities for holding the number of other types of livestock become primarily a function of availability of feed resources from own e.g. crop residues and private pasture as well as access to common resources e.g. common grazing land, bush/forest and road side grazing. Fifty six percent of the PAs mentioned reduced grazing land or vegetation in the community as the principal reason for reduced number of cows, 34% gave the same reason for reduced number of other cattle, 51% for sheep/goats but only 30% mentioned it as the main reason for reduced oxen number. Respondents also perceived that disease outbreaks and poor reproduction, a consequence of feed scarcity, were also additional reasons for the decline of various types of animals, and this was more important in case of cows and sheep/goats than for oxen. Where the herd sizes at household and community levels were adjusted to reduced feed resources shown earlier, the chances of overgrazing and land degradation was perhaps small if not fully removed but if such adjustments were not made, overgrazing and land degradation became inevitable as shown earlier.

4.3 Changes in Livelihood Sources and Activities

Increased population pressure impact on land use and land degradation through livelihood strategies adopted by land users. Increased population need more food, wood, fuel and income and how they derive these from available land and natural resources determine whether those resources will degrade in quality or not.

4.3.1 Changes in livelihood sources and activities at the community level

Rural people in the highlands of Oromiya are primarily involved in farming activities for livelihood. Because of the existing land laws prevailing in the country following the 1975 land reform measures, some households, especially new households formed by adult children of a larger household, may not have access to farm land to pursue farming activities for livelihood. The issues related to landlessness will be discussed later. Households having land may be engaged in farming to produce different types of agricultural commodities. Agricultural production in the Oromiya Region is still not highly market oriented – farmers prefer self produced food grains to assure household food security and protect them from the risks of market price volatility. However, they participate in the market in varying degrees for different commodities to generate cash income to meet other necessities. It is generally considered that moving away from subsistence to market orientated production, and moving from one or a few to more diversified sources of income are essential for improving people's income and livelihood. Diversification of income, especially if that extends to non-farm sources, may reduce pressure on land and help reduce the rate of land degradation.

In this context, group interviewees at the PA level survey were asked to rank five most important sources (farm enterprises and non-farm activities) of cash income in the PA in 1991 and 1999 to see if there has been any change in the source of cash income or market orientation in the PAs. Average ranks of different sources were found to be fairly similar for both the years, indicating that relative importance of different sources of cash income did not change significantly between the two years, so the results of 1999 are summarized in Table 4.6. Agricultural activities, especially cereals production, remained the dominant sources of cash income or livelihood in all the agro-ecological zones which was a direct impact of increased population- more cereals, pulses, oil seeds etc had to be produced to feed the increased population. Non-farm and off-farm work are minor sources of cash income and not much has changed ion this regard between the two years.

The ranking of different cash income sources varied slightly among agro-ecological zones. Rank of cereals as the source of cash income is the highest in HPC zone, which would be normally expected. While cereals followed by perennials and pulses were major sources of cash income in HPC and LPC agro-ecological zones, in the Perennial zone, perennials ranked as the major source of cash income followed by pulses and cereals. Vegetables and fuel wood collection from forest also played important roles in the perennial zone. Livestock ranked about fourth out of about 10 different activities in all the zones.

Sources of cash income for population density and market access domains are shown in Table 4.7. Cereals, perennials and pulses were three highest ranked sources of cash income in all population density and market access domains. It appears that ranking of agricultural activities as sources of cash income did not differ significantly between high and low market access or between high and low population density domains. There are some differences in ranking in case of non-farm and off-farm activities.

Table 4.6 Average rank of activities as sources of cash income in the sample Peasant Associations by Agro-ecology, 1999

Cash income sources	HPC	LPC	Perennial	All zones
Cereals production	1.2	1.4	2.1	1.5
Pulses/Oilseeds production	2.6	2.2	1.9	2.4
Perennials production	2.5	2.0	1.1	1.7
Livestock production	2.9	2.7	3.0	2.9
Trading	3.7	3.8	3.6	3.7
Handicrafts making	3.2	3.1	2.3	2.9
Fuel wood collection from forest	4.0	3.8	2.2	3.4
Off-farm work	2.9	3.7	2.9	3.1
Vegetables production	2.7	2.9	2.0	2.5
Others	2.8	2.3	4.2	3.1

Source: Community survey

Livestock as a source of cash income ranked quite low. In low market access domains, livestock ranked lower than vegetables, off-farm work and handicrafts. Mixed farming systems dominate the highlands, and it is generally observed that livestock in these systems perform multiple functions – provide food, draft power and manure for crop production, and serve as a form investment and saving. They also have several cultural functions such as payment of dowry in marriage. However, the low rank of livestock as a source of cash income in the sample PAs indicate that livestock is not yet highly market oriented but its non-cash functions may still be important. This will be discussed later as they have implications for land use and land degradation.

4.3.2 Changes in livelihood sources and activities at the household level

Changes in livelihood sources and activities at the household level were assessed to verify patterns observed at the PA level and also to look at the changes in more detail

Table 4.7 Average rank of activities as sources of cash income in the sample Peasant Associations by population density and market access domains, 1999

	Average rank by population density domain		Average rank by market access domain	
Sources of cash income	High	Low	High	Low
Cereals production	1.5	1.4	1.4	1.5
Pulses/oilseeds production	2.5	2.3	2.5	2.3
Perennial production	1.7	1.8	1.6	1.8
Livestock production	2.7	3.0	3.0	2.8
Trading	3.8	3.6	4.0	3.3
Handicraft making	3.5	2.3	3.2	2.7
Fuel wood collection	3.5	3.1	3.4	3.3
Off-farm work	2.7	3.6	3.5	2.6
Vegetables production	2.9	2.1	2.7	2.4
Others	4.7	2.0	3.3	3.0

Source: Community survey

as variations among households would be expected to be more than at the aggregate PA level. Since several activities at the community level as sources of cash income received low ranking, role of different activities in household livelihood in general rather than only as cash income is considered here. The changes were measured in terms of primary and secondary livelihood activities, form of saving, participation in labour and draft power market and sources of energy for cooking.

4.3.2.1 Primary and secondary livelihood activities

Sample households were asked to mention their primary and secondary activities for livelihood taking into account both agricultural and non-agricultural activities. Taking the entire sample, cereals production appeared as the primary activity of 88% of households in 1991 and of 86% in 1999 (Table 4.8). Secondary activates were more diverse. Perennials, small ruminants and cattle were most important secondary activities of 15-22% households in 1991. There was very little change in the relative importance of the activities in 1999. However, 16% of the households did not have any secondary activity in 1991 which decreased to 10% in 1999 indicating that more households were looking for additional sources of income. The relative importance of different primary and secondary activities varied significantly across agro-ecological zones, and to some extent across market access domains but very little across population density domains.

Table 4.8 Primary and secondary livelihood activities of the sample households (%) in 1991 and 1999

Activity	Primary activity (% households)		Secondary activity (% households)	
	1991	1999	1991	1999
None	-	1.7	15.9	10.1
Cereals production	87.9	85.8	11.2	13.4
Perennial production	4.7	8.3	22.4	24.4
House/community work	4.7	4.2	1.8	0.8
Handicrafts making/trading	0.9	-	2.8	3.3
Student	1.9	-	-	-
Cattle raising	-	-	15.0	16.0
Small ruminants raising	-	-	18.7	20.1
Poultry/apiculture	-	-	0.9	0.8
Herding labour	-	-	5.6	5.0
Farm labour	-	-	0.9	1.7
All	100	100	100	100

Source : Household survey

When activities were disaggregated by agro-ecological zones, it appeared that production of cereal crops was the predominant activity in all the zones in 1991 though the proportion was slightly lower in the perennial zone where a slightly higher proportion had perennial crops as the primary activity (Table 4.9). By 1999, the importance of cereals remained fairly unchanged in the HPC and LPC zones but in the perennial zone, fewer households had cereals as the primary activity while proportion of households having perennial crop as the primary activity increased. However secondary activities were more diverse in HPC and LPC zones compared to the perennial zone, where perennial and cereal production were the main secondary activities. Livestock production –cattle, small ruminants, poultry, apiculture- was the most important secondary activity among 45-50% of the household heads in HPC and LPC zones and in LPC zone the proportion increased substantially in 1999.

Table 4.9 Primary and secondary activities of sample household heads (%) by agro-ecology, 1991 and 1999

	% households in 1991			% households in 1999		
Primary activities	HPC	LPC	P	HPC	LPC	P
None	-	-	-	2.5	2.5	-
Cereals	94.4	88.9	80.0	92.5	90.0	75.0
Perennial	2.8	-	11.4	2.5	2.5	17.5
Housework	2.8	5.6	5.7	2.5	2.5	7.5
Handicrafts	-	-	2.9	-	-	-
Students	-	5.6	-	-	-	-
All	100	100	100	100	100	100
Secondary activities						
None	19.4	19.4	8.6	12.5	10.3	7.5
Cereals	11.1	2.8	20.0	17.5	-	22.5
Perennial	2.8	-	65.7	5.0	-	67.5
Cattle	13.9	30.6	-	17.5	30.8	-
Small ruminants	33.3	22.2	-	27.5	33.4	-
Poultry/apiculture	-	2.8	-	-	2.6	-
Herding labour	13.9	2.8	-	12.5	2.6	-
Non-farm work	2.8	8.3	2.9	5.0	5.1	2.5
Farm work	2.8	-	-	2.5	2.6	-
Trade/craft	-	8.3		-	10.3	-
House/community work	-	-	5.7	-	2.6	-
All	100	100	100	100	100	100

Source: Household survey

In HPC zone, due to higher cropping intensity, animals need to be tethered carefully, so herding labour is an important secondary activity of about 13% of the household heads but in LPC and perennial zones such intensive tethering is not required so herding labour is not that important. It is also noteworthy that 19% of the households in both HPC and LPC zones did not have any secondary activity in 1991, but only about 11% did not have it in 1999 indicating that more people in these zones were trying to diversify their activities; in the perennial zone, proportion of household heads with a secondary activity remained at about 8%.

Between the two market access domains, nearly a quarter of the households in the low market access domain were without any secondary activity in 1991 which decreased to 14% in 1999 (Table 4.10). Perennials remain an important secondary activity in both market access domains in both years. Livestock was an important secondary activity for 43% of the households in the high market access compared to 23% in low market access domain in 1991 and by 1999, the proportion in high market access domain increased to 50% households but no change occurred in the low market access domain. The role of cereals increased in the low market access domain but changed very little in the high market access domain. These patterns indicate that better market access promote certain activities, especially high value commodities, more than other commodities.

The low incidence of wage labour as a source of rural livelihood is not surprising for the Oromiya context or for Ethiopia in general. The 1975 land proclamation nationalized land as it was perceived as a means of exploitation of actual tillers and tenants by the feudal land owners. A land to the tiller policy was pursued so nationalized land was redistributed among peasants on a per capita basis and wage labour in rural areas was prohibited implying that cultivation would be family labour based. However, farmers continued to practice various traditional forms of labour exchange among neighbours to undertake land preparation, weeding, harvesting and threshing.

Overall 68% of the sample households reported exporting some family labour and 65% reported import in 1991, which imply widespread exchange of labour among neighbouring households (Table 4.11). However, degrees of exchanges varied across the development domains. Among the agro-ecological zones, incidence of exchange was highest in the perennial zone, and it was also higher in low population density and low market access areas. In 1999, incidence of exchanges increased marginally in all the domains so the figures are not shown in the table. However, the amount of labour exchanged increased significantly in 1999. The sample exporting households reported increase of export from 31 to 44 person days and the sample importing households reported increase in import from 60 to 95 person days. The extent of increase varied across the development domains. One of the main reasons for increased incidence and extent of labour exchange was increase in the intensity of land use.

Table 4.10 Secondary activity of household heads (%) by market access

Activity	% households in 1991 by market access		% households in 1999 by market access	
	High access	Low access	High access	Low access
None	8.9	23.5	6.7	13.6
Cereals	12.5	9.8	10.0	16.9
Perennial	19.6	25.5	23.3	25.4
Cattle	17.9	11.8	21.7	10.2
Ruminants	25.0	11.8	28.4	11.9
Herding	1.8	9.8	-	10.2
Non-farm	7.1	2.0	6.7	1.7
Farm work	1.8	-	1.7	1.7
Others	5.4	5.9	1.7	8.5
All	100	100	100	100

Source: Household survey

4.3.2.2 Form of saving

The form and extent of saving is a key indicator of livelihood as it indicates a community or household's capacity to ensure current consumption as well as investment for future growth. As a society moves away from subsistence to market oriented production, changes are expected to occur in the form and extent of saving and this may have impact on land use and land degradation directly or indirectly. In this survey only information on the form of saving was collected as accurate measurement of extent of saving turned out to be problematic in a single shot survey due to problems of definition of income, saving and consumption over a year.

Table 4.11 Distribution of sample households according to export and import of farming labour in 1991 and 1999

Development domains	% households in 1991		Person days exported per household		Person days imported per household	
	Exported	Imported	1991	1999	1991	1999
Agro-ecology						
HPC	75	70	37	47	88	85
LPC	60	58	22	36	34	83
P	87	87	33	50	55	117
Population density						
High	70	68	30	46	46	80
Low	78	75	32	42	73	110
Market access						
High	68	65	23	36	57	73
Low	80	78	39	52	63	117
All households	74	72	31	44	60	95

Source: Household survey

In 1991, 67% of the sample households saved in some form which increased to 78% in 1999 (Table 4.12). The highest increase in incidence of saving occurred in the perennial zone and also in high market access domain. Households saved in the form of either cereals or cash or livestock or coffee grain or a combination of two or more forms. The distribution of savers according to the primary form of saving shows that in 1991 over one half of the savers primarily saved in the form of cereals, over a quarter saved in the form of livestock followed by cash and coffee grain. Among the agro-ecological zones, cereals and livestock were the most important primary forms of saving in the HPC zone, cereals were the overwhelmingly important primary form of saving with livestock a distant second form in the LPC zone, and in the perennial zone, the choices were more evenly distributed among the different forms.

Table 4.12 Proportion of households saved and primary form of saving according to agro-eco-zone and market access in 1991 and 1999

Saving by agro-ecozone	% households by agro-ecology in 1991				% households by agro-ecology in 1999			
	HPC	LPC	P	All	HPC	LPC	P	All
% saved	60	72	69	67	73	75	88	78
Primary form of saving								
Cereals	48	74	39	54	45	77	37	52
Cash	9	4	35	16	21	10	31	21
Livestock	43	22	17	27	34	13	9	18
Coffee grain/others	-	-	9	3	-	-	23	9
All savers	100	100	100	100	100	100	100	100

Saving by market access	% households by market access in 1991		% households by market access in 1999	
	High	Low	High	Low
% Saved	70	63	83	73
Primary form of saving				
Cereal	62	43	60	43
Cash	14	20	20	23
Livestock	21	33	16	20
Coffee/others	3	3	4	14
All savers	100	100	100	100

Source: Household survey

Between the market access domains, cereals were the most important form in the high market access domain with livestock was the distant second form but in the low market access domain, the order was the same but the difference between the two forms was much smaller. Saving in the from of cash was more important in the perennial zone compared to the other zones, perhaps because of the importance of coffee in the perennial zone. Cash saving was also more important in the low market access areas than in the high market access areas, which seems counter intuitive as more market orientation is supposed to encourage more saving in cash rather than in the form of cereals or livestock. In 1999, the place of cereal as a form of saving remained fairly unchanged but the most important changes occurred in case of saving in the form cash and livestock and also coffee grain. The proportion of households saving in the form of livestock decreased while the proportion of households saving in the form of cash and coffee increased. The choice of cash saving increased more prominently in the HPC zone and it actually decreased to some extent in the perennial zone where saving in the form of coffee grain increased substantially. This could be due volatility id coffee price in the domestic and world market and the possibility of gains from saving coffee grain. Among the market access domains, choice of cash saving increased more prominently in the high market access domain, which would be expected. These changes also reflect changes in the primary and secondary income earning activities discussed earlier, and clearly show that nature of activities and production potential defined by agro-ecology and market orientation induced by ease of market access drive changes in production, marketing and saving behaviour.

Significant increase in the form of saving from livestock to cash would have made the livelihood activity more market oriented and reduce the pressure on grazing land and arrest the degradation process. Change in this direction has been very slow so far.

4.3.2.3 Sources of energy for cooking

Sources of household energy, especially for cooking, have several direct and indirect implications for livelihoods as well as management of land and livestock. Excessive deforestation or higher rate of deforestation than forestation may occur due to increased demand for fuel and construction material prompted by population and urban growth. Scarcity of fuel wood may lead to increased use of crop residues and dung as fuel rather then as manure and mulch. The consequences of such changes are loss of vegetative cover and soil fertility and increased erosion and other forms of degradation as well as loss of long-term productivity of soil to produce household food needs and food security. So sample households were asked about their preferred source of energy for cooking if easily available, before asking about sources in actual use. About 43% of the sample households would prefer fuel wood, 48% would prefer electricity and 9% would prefer kerosene. Preferences varied among the agro-ecological zones. About 65% of the households in the LPC areas would prefer fuel wood, while 70% in the perennial zone would prefer electricity.

However, the actual sources of energy used for coking were quite different. Over 90% of the households used fuel wood as the primary source in both 1991 and 1999, about 66% used crop residues as the secondary source followed by nearly 20% who used dung as the secondary source (Table 4.13). Few households used charcoal and a mixture of different sources.

Table 4.13 Proportion of households according to sources of energy for cooking in 1991 and 1999

Source of energy	% households using as primary source		% households using as secondary source	
	1991	1999	1991	1999
Fuel wood	92	91	3	4
Crop residues	7	2	68	66
Dung	1	7	20	17
Charcoal/kerosene	-	-	2	3
Mixtures	-	-	7	10
All sources	100	100	100	100

Source: Household survey

Given that overall changes are small between the two years, differences among agro-ecological zones and market access domains are discussed only for 1999. Among the agro-ecological zones, fuel wood was a primary source for 100% households in the perennial zone, 93% households in the LPC and 80% in the HPC zones. On the other hand, crop residues were a secondary source for 97% households in the perennial zone, 58% in the HPC and 43% in the PC zone. Dung was a secondary source for 33%

households in the LPC zone and 18% households in the HPC zone but none in the perennial zone. Among the market access domains, crop residues were a secondary source for 78% households in low market areas and 53% in high market access areas and dung was a secondary source for 32% households in the high market access areas and for only 2% households in the low market access areas. Thus the high incidence of use of dung as fuel rather than as manure in the cereal zones and in the high market access areas support the widely held notion that due to scarcity of fuel wood, extensive use of dung as fuel rather than as fertiliser is a major reason for soil degradation especially loss of soil fertility in these areas. This will be discussed further below.

Community and household survey results showed that livestock perform multiple functions – they are a source income and livelihood, a form of saving and a source of manure and fuel - and there have been some changes in these roles between the two years. It was further shown that due to population pressure land use patterns changed – area under crop production increased significantly over time and grazing land and forest areas declined significantly. Communities and households also perceived that soil erosion has increased over time while soil fertility has declined and among other reasons, overgrazing and lack of vegetation are major reasons. However, along with human and livestock population pressures, soil and crop management practices also contributed to degradation as discussed below.

4.4 Changes in Crop and Soil Management Practices

Respondents at the community survey were asked about the possible reasons for the perceived changes in erosion and fertility status. Those PAs which reported that erosion rate has increased gave frequent cultivation, overgrazing and removal of vegetation as the most important reasons. Those which reported that erosion has decreased gave increased vegetation cover and increased conservation practices as the most important reasons (Table 4.14). Those which reported decrease in soil fertility gave increased soil erosion and continuous cropping/grazing as the most important reasons and those which reported increase in soil fertility gave use of manure, and to a small extent decrease of erosion, as the important reasons. Differences in the nature of changes in erosion and fertility might be related to differences in soil management practices in the PAs.

Table 4.14 Perceived reasons for perceived changes in soil erosion and soil fertility in the sample Peasant Associations

Soil erosion		**Soil fertility**	
Reason for increase	% PAs	**Reason for decrease**	% PAs
Frequent cultivation and overgrazing	46	Increased soil erosion	40
Reduced vegetative cover	31	Continuous cropping/grazing	40
Lack of conservation practice	11	Planting Eucalyptus trees	6
Others	12	Overgrazing and erosion	7
		Others	7
Reason for decrease		**Reason for increase**	
Presence/increased vegetative cover	60	Use of manure, waste material	72
Increased conservation practice	27	Decrease in erosion	11
Others	13	Increased vegetative cover	6
		Others	11

Source : Community survey

These community level general perceptions were further verified by asking sample households about use of specific crop technologies, and soil and crop management practices. About 69% of the sample households adopted some new crop or soil management technology since 1991. Among the adopters, 43% adopted new crop variety principally of wheat and maize, 32% adopted fertilizer, 12% adopted new method of applying fertilizer, and 6% adopted a new crop. Fertilizer adoption rate was higher in the perennial zone and crop variety adoption was higher in the perennial, high population and high market access domains compared to their corresponding counterparts (Table 4.15).

Table 4.15 Proportion of sample households who adopted fertilizer and improved/new crop variety since 1991

Domain	% households adopted fertilizer	% households adopted improved/new crop variety
Agro-ecology		
HPC	30	35
LPC	15	33
P	60	63
Population density		
High	30	58
Low	34	28
Market access		
High	34	48
Low	30	38
All households	32	43

Source: Household survey

Household respondents were asked if they used one or more of a selected list of crop and soil management practices in their arable plots. The responses show that use of various soil management practices on specific plots did not differ significantly between 1991 and 1999 except in the case of DAP, urea, improved seeds and herbicides, whose adoption rates increased (Table 4.16). Among other practices used, grazing crop residues, contour ploughing, ploughing under crop residues, burning to clear plots, manure/compost use, reduced tillage are more prominent. Pattern of use of these practices did not vary significantly among the agro-ecology, population and market access domains. Some of these practices add organic matter and some nutrients to the soil while others lead to loss or transfer of organic matter and nutrients. The latter may eventually induce soil erosion and further loss of fertility.

Table 4.16 Proportion of arable plots of sample households in which selected soil management practices were used in 1991 and 1999

	% plots in which used by year	
Practices	1991	1999
Burning to clear plots	24	24
Ploughing under crop residue	36	38
Mulching	2	3
Green manure	4	5
Manure/compost	22	21
Contour ploughing	49	50
Grazing of crop residue	59	61
Reduced tillage	24	23
Zero tillage	5	4
DAP application	18	33
Urea application	5	19
Improved seeds	6	20
Herbicide application	13	21
Pesticide application	2	5

Source: Plot level survey

Conservation practices were used only on less than 10% of the 382 plots of the sample households Stone bund was created only around 17 plots, stone clearance on 10, soil bund around 9, and drainage ditch on 4 plots. Stone/live fence was created around 7 plots, and tree planting was done around 22 plots. Tree planning was more common in HPC, low population and low market domains, and stone bund in LPC, high population and high market access domains.

It was mentioned in the previous section that laboratory analysis of soil samples collected from the arable plots of sample households revealed that mean levels of N, P, and K were low and CEC was also below normal. In order to determine factors that influenced the variation in the levels of these nutrients across the sample plots, plot level values of these nutrients were regressed against agro-ecology, population density and market access domains and a number of soil management practices using them as dummy variables. Then estimated coefficients of the equation for a specific nutrient were tested for significant difference from the overall sample mean of that nutrient. Factors that explain significant deviation from the sample mean levels are shown in Table 4.17.

Table 4.17 Factors influencing significant difference from mean level of N, P, K and CEC in arable plots of land of the sample households

Factors influencing level of :	**N**	**P**	**K**	**CEC**
Population density (high=1)	-	-	-	
Market access (high =1)	-	-	-	
Agro-ecology (HPC=1)		+	+	+
(LPC=1)			+	+
Urea applied (yes=1)	-		-	
DAP applied (yes=1)	+	-	+	
Manure/compost applied (yes=1)		+		
Mulching (yes=1)		+	-	
Green manuring (yes=1)			+	
Burning to clear plots (yes=1)	+		+	
Grazing crop residues (yes=1)	+			
Ploughing crop residues (yes=1)				+
Intercropping (yes=1)			+	-
Soil type (black=1)				+
Slope of plot (flat=1)			+	
Extent of erosion (no/mild =1)				-
Contour ploughing (yes=1)				+
Used improved seeds (yes=1)				-
Land use (pasture =1)			+	+
R^2	0.23	0.39	0.32	0.44

Source: Plot and household survey

The results show that the levels of all three nutrients were significantly lower than the sample mean in high compared to low population density and high compared to low market access domains. Higher intensity of cultivation in these domains may partly explain this phenomenon. P and K levels were significantly higher than the sample means in HPC zones and only K was higher in the LPC zone compared to the perennial zone. The reason may be that in HPC zone, application of chemical fertilizers is higher due to intensive cereals cultivation. Further the results show that N levels are significantly higher than the overall mean level in plots on which burning was used to clear plot, crop residue was grazed, DAP was applied and it was lower than the mean where urea was applied. P levels were significantly higher in plots where mulching and manuring were practised. K levels were significantly higher in plots where burning was used to clear plot, DAP was applied, intercropping and green manuring were practiced, slope of the plot was flatter, and it was lower than the mean in plots where urea was applied and pasture was the main use. CEC was significantly higher in plots with black soil, crop residue being ploughed in, contour ploughing was used, and pasture was the use, and was lower in plots where strip cropping rather than intercropping was practiced, improved seeds were used, and there was no/mild erosion. These relationships generally confirm that population pressure market access and agro-ecology indirectly or directly influence soil fertility levels and several traditional soil management practices have enabled farmers to maintain above average levels of nutrients even where the average is less than the ideal for good crop yield.

Chapter 5

Land Tenure, Land Management and Degradation

The nature and evolution of institutions- rules and norms and the organizations established to make decisions about or to enforce such rules and norms - set the context and constraints within which land management decisions are made.[5] Land tenure or property right is one such institution that evolve over long period time in a given society. Land tenure defines the nature of rights in the use of land. On the other hand, property rights define the mode of access and transfer of a property and the nature of rights in the use of the property. In this sense, scope of property rights is wider than land tenure. However, in this study, for convenience land tenure and property rights are used synonymously and land tenure may be mentioned more frequently.

Land tenure is one of the most important institutional factors affecting farmers' decisions with regard to land use and management. Such issues as tenure security, entitlement, modality of ownership or management of land, size and fragmentation of landholding, the right or ability to mortgage and transfer land by sale, lease, or bequeth etc. are therefore pertinent with regard to their impact especially on the land degradation process. Land tenure rights may provide incentive or disincentive for sustainable use of land and for investment for improving productivity and conservation (Teferra et al., 2002).

Since land tenure currently prevailing in the region and in Ethiopia in general has evolved over a long period and the current land degradation problem is the cumulative effect of the land tenure changes that took place over a long period, a review of the evolution of land tenure is presented before presenting the survey results on current community and household perspectives on land tenure and its impact on land use and degradation.[6]

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[5] Institutions here are defined as complexes of norms and behaviours that persist over time by serving collectively valued purposes, and are distinct from "organizations, which are defined as structures of recognized and accepted roles (North, 1990).

[6] A more detailed account of the evolution of land tenure in the Oromiya Region is given in Teferra et al. (2002)..

5.1 Evolution of Land Tenure in the Oromiya Region

The Oromos had their own customary tenure systems for a long time. Among many Oromo communities in the Shewa region, land was a clan or lineage resource until their incorporation into the Shewan kingdom in the 19th century as a result of Emperor Menilik's conquests. Individuals had the right to use this resource but could not claim ownership. However, due to the continuous wars, subjugation by conquerors and changes in governments following the adoption of new political doctrines, tenure systems have changed over time (Kaba, 1994).

During the feudal period lasting until 1974 when the *Derg* regime came to power, the most common tenure systems in Ethiopia were the "kinship and village", the "private ownership", the "nomadic" and the "government ownership". The kinship and village tenure system was common in the northern parts of the country while it was non-existent in Oromiya except in some areas bordering the Amhara region (Debele et al., 1998a).

The private ownership type of tenure system, where areas of land were held in freehold by individuals, was dominant in central and southern Ethiopia (Shewa, Arsi, Sidamo, Wellega, Kefa, Illubabor, Gamo Gofa, Bale, Hararghe and Wollo), most of which form the present day Oromiya Region. Prior to the great territorial expansion of the late 19th century, most peasants worked on land not held under private tenure. The private type of tenure system expanded more during the reign of Emperor Menilik II, during which sharecropping relationships were common (Debele et al., 1998a).

The private tenures were created when the crown confiscated land conquered by its armies and granted vast blocks to a wide range of people and institutions. Grants were made to soldiers, civil servants who came to administer the new areas, peasants moving south because of land pressure in the north, church officials and a host of central and provincial elites close to the crown. Local tribe, village and clan chiefs that did not resist the conquest were also given the title of *balabat* and one third of the conquered land was left aside for them (locally termed as *siso gult*) so that they would help in administrative needs and stifle opposition from the natives. Thereafter, most highland peasants worked privately held land as either small-scale landholders or tenants (Cohen and Weintraub, 1975).

The types of contracts and mode of payments between tenants and landowners varied from place to place and even from individual to individual within the same place. For instance, over 90% of the tenants in Arussi province (perhaps the same areas as present day Arsi zone) were sharecroppers and 50% of the sharecroppers paid one-quarter to one-half of crop as rent. About 20% of the sharecroppers were provided with oxen by the landlord. Only 7% of the tenants in Arussi paid rent in cash while in Illubabor province, 66% paid in cash and 25% paid as crop share (IGE, 1967 and 1969a).

The church also held *gult* rights over some land, a tenure known as *semon gult*. The conquered people who lived on this land became either tenants or tribute payers. Those who farmed land granted as *gebbar, semon*, or held by the government, became tenants. Those who worked land granted as *siso gult* or *rist gult* took on the appearance of tenants but were really tribute payers. This distinction became crucial with tax reforms of 1966, which turned many tribute payers into private owners of *gebbar* tenure. Many of those who held *gebbar* tenure were absentee owners (Cohen and Weintraub, 1975). In the mid 1960s, over 40-50% of land holders in Illubabor, Arussi and Bale provinces held *gebbar* tenue, and other most common tenure form were *semon, mengist and gebretel*. Absentee owners accounted for 42%, 28% and 15% of the land owners respectively in Illubabor, Arussi and Bale provinces, and they controlled respectively 42, 27 and 12% of the total land (IGE, 1967, 1969a, 1969b).

The government ownership type of land tenure was applicable to that land which was neither communal nor private. These lands were registered under government holding and included forested areas, free grazing land and abandoned land, i.e. land for which taxes were not paid by the owners (Debele et al., 1998a).

The pastoralist type of land tenure included the lowlands of Hararghe, Bale, Awash Valley and the lowlands bordering the Sudan. The nomads who lived in these areas had well-established grazing and water use rules and regulations. Out of lack of capacity, the feudalists had no strong control of these areas (Debele et al., 1998a).

The land tenure systems prevailing in the region during the feudal era created problems with regards to such issues as utilization, continuity and security of cultivation, rent, tribute, tax exploitation, etc. For instance, owing to the ever present possibility that another kin could claim one's share of the family lands, occupants in the kinship or village tenures were often reluctant to improve their fields, which might thereby stimulate claims by others (Cohen and Weintraub, 1975). There are also indications that the same was true under the private ownership type of tenure in the southern and eastern parts of Ethiopia. These tenure arrangements also gave rise to many disputes and court cases. A survey conducted in Illubabor and Bale provinces showed that inheritance was the source of disputes on agricultural land in 85% and 47% of total dispute cases, respectively. Likewise, in Kuni wereda court (Harar province), landlord–tenant relations and ownership issues constituted respectively 79% and 7% of total disputed cases (IGE, 1969a, 1969b and 1969c).

Because of the different origins and forms of land tenure prevailing during the feudal period, tenancy was far more common and onerous in the south than in the north of the region. Generally, the land rented to tenants rarely exceeded 10 hectares, and the average tenant cultivated 1-1.6 hectares. Moreover, 10-42% of southern landlords were absentees, controlling 12-48% of the cultivated land and 27-67% of total land (Cohen and Weintraub, 1975). During the feudal period the Emperor confiscated and granted land as he chose, sometimes every year or many times per year. Moreover, population pressure combined with the tendency of Ethiopian land tenure systems to promote fragmentation of plots resulted in a general diminution of operating units. In the mid 1960s, about 50% of the farms in Arussi, Shoa and Gojjam provinces has 1-2 plots, about 34% had 3-4 plots and another 16% had 5- 8 plots.

After coming to power, the d*erg* regime undertook the agrarian reform programme in 1974, proclaimed all rural farmlands as belonging to the "people" but to be controlled by the government. This was largely a response to the popular discontent about the highly exploitative tenure systems prevailing in the country and large-scale eviction of tenants and smallholders following the policy of establishing large commercial farms during the third Five Year Plan (1968-73). The 1975 proclamation (No 31/1975) abolished private ownership of land and the practice of tenancy and wage labour, other obligations and all claims to land through paternal or maternal lines and allowed claims only on the basis of residence and it conferred user right to individual farmers. The responsibility for land administration and distribution was given to Peasant

Association, the lowest level civil organization. Land was nationalized and distributed after the proclamation and redistribution of land to newly established families was envisaged as when necessary either from common undistributed sources or by taking back part of the land from existing users. Land transactions between individuals, such as selling, sharecropping, and renting were outlawed. The government also established cooperatives and they were favoured institutions for resource allocation compared to private farmers. Through villagisation and cooperative policy of the government, private forestry and hillside closure, including communal grazing resources were taken over by the state (Rahmato, 1994).

The implementation of the 1975 land policies combined with other policies caused widespread destruction of natural resources of the country and production almost stagnated in the face of a growing population, and a quota system was imposed to extract marketed surplus from the peasants through the cooperatives. Consequently, in the face of political and economic pressure, the government decided to revise its policy in March 1990 and promote what was called mixed economic policy. Membership of producer co-operatives was made voluntary, use rights in land were guaranteed, tenancy and hiring of labour was permitted and grain quota was abolished. As a result many of the producer cooperatives were dissolved.

Before the amended provisions of the land laws could be fully implemented, the *derg* regime was overthrown and a transitional government came to power in 1991 which retained state ownership of land and other natural resources and granted usufruct in land by users. This was conceived primarily as a preventive measure against possible massive peasant displacement and as providing a means of safety-net instrument for the majority poor peasants. After an elected government was installed, a new proclamation was made in 1994 which was modified in 1997 (No 89/1997), that declared land as the 'common property of nations, nationalities and people's of Ethiopia' and was prohibited from sale or other means of exchange. However, the 1997 amendment included a clause that permits the right to acquire property by one's labour or capital and sale, exchange and bequeath the same, though no clear rule was formulated to define to whom land could be bequeathed and how.

The new law delegated power to the regional states to administer land and other natural resources, and further provided the responsibilities and mechanisms of administrations of land (GPDRE, 1997a). However, the responses to the Proclamations regarding allocation and land redistribution and compensation from regional states were different. While the Amhara and Tigray National states have issued some form of rules and regulations regarding the distribution of land, neither allocation nor land redistribution have been undertaken in the Oromiya Regional state since 1991. Thus, the problem of landlessness is very serious in some parts of Oromiya Region. It is estimated that close to 50% of the population is landless in some localities (Debele et al, 1998a).

How these proclamations were actually implemented, and what effects these had on rural land tenure have not been extensively studied in the region. Some local case studies e.g. Gavian and Teklu (1996), Gebru (1997), Gebremedhin and Nega (2005) and a recent study by the Regional Government of Oromiya (which is unpublished) are exceptions. The results of the present study covering a large sample are presented below to fill this gap. It may however be noted that several studies have been conducted on the productivity and efficiency effects of different contract arrangements, which will be discussed later.

5.2 Land Tenure in the Oromiya Region after the reform in 1975

5.2.1 Land redistribution

Land was nationalized in 1975 and each PA redistributed land within its boundary among its resident peasants on the basis of family size. Thus farm size varied within and between PAs. PAs were authorized to redistribute land in the future if some existing PA members apply for additional land due to increase family size or newly formed families (adult children forming independent families after marriage) apply for land allocation. Theoretically redistribution could be made from any unallocated land such as common land retained during earlier distribution, or by retaking land from PA members whose family size became smaller for one reason or another, or by reallocating the entire land among all members based on new membership size. Such redistribution could be made as frequently as the PAs chose to do meet demands of the members.

So the sample PA respondents were asked how many redistributions occurred after the initial distribution in 1975 until 2000. In response, out of the 85 PAs, 23% said no other redistribution occurred, 29% had one, 21% had 2, 12% had 3, 8% had 4-5 and 7% had 14-15). Those who had redistribution were asked when the redistributions were done. Responses show that 31% had it within one year of the initial redistribution in 1975, 25% had done it between 1977-88 and 42% had it between 1987-91, and 2% had in 1998.Thus it appears that local circumstances determined the frequency and timing of redistribution though, as discussed below, it did not solve the problem of demand for land from new families.

In the sample PAs, 21% of the households were reportedly landless in 1991, which increased to 30% in 1999 (Table 5.1). In 1991, extent of landlessness was highest in the perennial zone followed by LPC and HPC zones. Landlessness was also higher in low population density areas compared to high density areas, and in low compared to high market access areas. But by 1999, landlessness increased by a larger extent in PAs in HPC zone and in high market access areas. The reasons for this and other issues related to property rights in rural land as perceived by the PAs and the households will be discussed in detail in a later chapter. Some of the landless households farm by renting or borrowing land mainly from parents or close relatives (more on this below). Others may engage in livestock rearing primarily based on grazing on common land or forest or in wood collection from forest, which is most often illegal. All of these activities may contribute to land degradation.

5.2.2 Mode of land acquisition

Although no other means than the PA was supposed to be the source of land after 1975, casual observations and local case studies such as Gavian and Teklu (1996) and Gebru (1997) in Taiyo wereda in the region revealed that in the absence of PA reallocation, both PA members and newly formed families have been accessing land or extra land, as appropriate, by making informal contract with PA-member households. The major types of such informal contracts for cropland include renting, sharecropping, gifts and borrowing. Although such practices were illegal, from the point of view of a strict interpretation of the land law, they nevertheless emerged in varying degrees and forms due to land shortage and lack of official redistribution of land. In order to assess the scale of such practices, sample households were asked how they acquired land currently in their possession.

Table 5.1 Changes in the extent of landlessness in the sample Peasant Associations between 1991 and 1999

Development domains	% households in PAs landless		% change in landlessness
	1991	1999	
Agro-ecology			
HPC	18	28	56
LPC	25	32	28
Perennial	27	34	26
Population density			
High	20	28	40
Low	24	34	42
Market Access			
High	19	27	42
Low	25	33	32
All PAs	21	30	43

Source: Community survey

Responses show that the sample households actually acquired access to land through various means other than PA. Among these there are formal (purchase, gift, inheritance) and informal (borrowing, leasing, renting, sharecropping) means (Table 5.2). Some households used more than one means to access land between 1991 and 1999. Taking all combinations into account, 65% of the plots were PA allocated, 24% were acquired through formal means and 11% through informal means. Among the plots acquired through formal means, 63% were inherited, 29% were in the form of gift and 8% were purchased. On average about 4 plots were acquired but those who acquired through both formal and informal means had more then 4 plots. This may indicate that households that increase in size after the initial allocation resorted to other means to acquire extra land in the absence of official PA reallocation.

Table 5.2 Proportion of sample households according to means of acquisition of land and average number of plots acquired

Means of acquisition	% households	Average no. of plots per household			
		PA allocated	Formal means	Informal means	Total
PA allocated	39.7	3.7	--	--	3.7
Formal means	13.4	--	2.1	--	2.1
Informal means	0.8	--	--	4.0	4.0
PA + formal means	21.0	2.4	2.1	--	4.5
PA + informal means	15.1	3.7	--	1.6	5.3
Formal + informal	2.5	--	3.0	1.3	4.3
All three means	8.4	2.1	2.3	1.9	6.3
All sources	100	2.7	1.0	0.5	4.2

Source: Household survey,

Rented fields are associated with a cash sum paid in advance by the tenant to the landholder. The renter-tenant pays for all inputs and reaps all the benefits (or losses) of his cropping activities. Where as, sharecropped fields involve a commitment by both partners to share output with or without sharing the cost of the inputs. The cost of renting and size of output to be shared from sharecropped lands varies from place to place and even within the same area depending on the quality, location and other features of land. Gift fields are given free of charge for an indefinite period or until the PA re-allocates land; Borrowed fields are also given free of charge but for a defined period of time. Both gift and borrowed fields are almost always given by relatives, usually parents, who give part of their holdings to their newly married sons .

Plots allocated by the PAs were acquired throughout the entire period since 1975 but 1975-76 and 1987-91 were the two peak periods (Table 5.3). This is an indication that major reallocation took place during 1987-91 after the initial allocation in 1975-76.

Acquisition through other formal means such as inheritance, purchase and gift also took place throughout the entire period with peaks in 1975-76 and 1987 onwards though in the strict sense of the 1975 proclamation such transactions were supposed to be illegal . On the other hand, of all the plots acquired through informal means such as renting, borrowing and share cropping, two thirds were acquired after 1992. This coincided with the period after the fall of the *derg* and coming to power of a new regime that still retained land under public ownership and PA allocation was still the official means of land acquisition. Only the 1997 amendment to the proclamation included a clause that permits the right to acquire property by one's labour or capital and sale, exchange and bequeath the same, though no clear rule was formulated to define to whom land could be bequeathed and how. So it seems that official PA reallocation was inadequate to meet demands for extra land by PA members and new land by newly formed families which resorted to other means for land acquisition almost throughout the entire period since 1975 but after keeping a blind eye to the illegal informal land transactions that have been taking place in the absence of official reallocation by the PAs, the 1997 amendment only gave official recognition to the reality.

Table 5.3 Distribution of plots acquired through different means by period of acquisition

Year acquired	% plots under each mode of acquisition			
	PA Allocated n = 316	Inherited, gift, purchased n = 118	Rented, leased, borrowed n = 56	All n = 490
1975-76	29	35	12	29
1977-81	7	7	-	6
1982-86	18	12	4	15
1987-91	39	25	18	33
1992 or later	7	21	66	17
All	100	100	100	100

Source: Plot survey

The land acquisition pattern varied to some extent across agro-ecological, population pressure and market access domains. Among the agro-ecological domains, acquisition through both formal and informal means other than PA allocation was significantly higher in the perennial zone. Formal means other than PA allocation were also significantly higher in low population density and low market access domains compared to high population and high market access domains (Table 5.4). Among various formal means of acquisition, in the perennial zone 81% was inherited and the remainder were purchase or received as gift; in the HPC 49% was received as gift and 40% was inherited while in the LPC, 60% was received as gift and 32% was inherited; purchase accounted for 8% of the plots in both zones. The reasons for these differences are unclear but it is possible that HPC, high population and high market access domains are settings in which pressure and popular demand for PA reallocation are likely to be stronger due to higher scarcity of land.

Table 5.4 Proportion of plots acquired through formal and informal means in different agro-ecology, population pressure and market access domains

Mode of acquisition	Agro-ecology			Population density		Market access		All
	HPC	LPC	P	High	Low	High	Low	
PA allocated	76	70	50	68	60	71	58	65
Formal means	15	18	36	21	28	16	33	24
Informal contracts	9	12	14	11	12	13	9	11
All	100	100	100	100	100.0	100	100	100

Source: Plot survey

Plots allocated by the PA are supposed to be backed by some form of official document or certificate confirming use rights. Other means of acquisition being illegal until 1997, normally no official certificate would be expected but some written documentation of transaction between the parties would be expected. In reality, some form of certificate of ownership/control was available only for 27% of the PA allocated and 36% of formally acquired plots and none for informally acquired plots though 65% of the informal transactions had some written agreements while others were only verbal.

Since most of these transactions take place among extended family members or close relatives, trust is the main basis of transaction and deals are often kept secret for fear of loosing land to the PA administration for reallocation.

Respondents were asked if they had disposed of any plot for which no detailed record would be collected in this survey as they were no longer under their possession. Responses show the sample households in all reported about disposal of only for 23 plots, of which 8 (34%) were given out due to redistribution by PA and 15 (66%) were gifted or given away to other members of the family. Compared to acquisition, disposal records are few which may be an understatement of the actual situation.

5.2.3 Tenure security

Several questions were asked to determine sense of security in land among the PAs and the households. During group interviews at PA level, asked if majority of the population in the sample PA expected land redistribution in the near future, 71% of the PAs said yes. Of these, 67% expected redistribution within one year, 5% in two years, 22% in 5 years and 6% in 6-10 years. Asked if majority of the population in the PA felt more or less secure about land holding 1999 than in 1991, 93% said they felt more secure in 1999. The reason being, there was no land redistribution undertaken in recent years. Those few who felt less secure did so due to rumour about possible redistribution and increased landlessness, which might prompt redistribution.

At the household level, for all the plots of the household surveyed, the owner/user was asked if he/she would operate each of the individual plots next year, in five years and in 10 years. In case of 96% of the plots, they expected to operate next year and in five years, in 94% cases, they expected to operate in 10 years. The very small proportion of plots (4-6%) which were not expected to be operated in future years were designated as such due to expiry of contract (of informally acquired plots), bequeathing to somebody and renting out etc. This means that even when they expect land redistribution, and they do not really have ownership except inheritable use rights, they expect only a small fraction of the plots or land area to be affected. Thus post-1992, especially post 1997 policy statements and practices have provided an environment in which farmers feel a much stronger sense of security in land compared to the 1975-1991 period.

Land allocated by PA is inheritable, so can be bequeathed but not sold outright. So households were asked if they planned to bequeath the plots under their control, and 74% of the respondents said yes. The reason given is that they wanted help establish new families by younger members who do not have land (65%) and also because of old age that did not allow them to use the land fully (35%). Although the 1997 amended proclamation permitted transfer through bequeath, it did not specify to whom one could bequeath and when and how. Those who expected to bequeath wanted to bequeath to son(s) in 72% cases and 16% were unspecific. Brothers, daughters and grand children also are mentioned as possible beneficiaries, indicating that even if not specified in law, some attention is given to women inheritors in the decision to bequeath. Those who said no about bequeath, did so because they felt it was illegal (35%), or they did not have enough land (51%) or there was no one to bequeath to (16%).

Another indicator of sense of security was the extent of land related disputes in 1991 and 1999. Asked whether land related disputes among PA members increased or decreased or remained the same between the two years, 24% PAs said decreased, 75% said increased and 1% said remained the same. Among those who said decreased, 88% said the main reason was increased respect for others' rights. Asked whether disputes between PA and outside members increased, decreased or remained unchanged, 25% said decreased, 38% said increased. The main reason (31% cases) for decrease was that there was now well established and documented border between the Pas. The main reason for increase was scarcity of land. Asked if the number of households that lost land due to dispute increased, decreased or remained the same between the two years, 19% said decreased, 35% said increased, and these changes occurred principally due to better enforcement mechanism of the land allocation.

5.2.4 Perceived changes in land rights

While mode of acquisition is an important aspect of tenure or property rights, mode of transfer and use are also important for proper use of land. In order discern perception of the communities about some specific rights in relation to transfer and also use of land under their ownership/control, during group interviews, questions were asked if certain types of rights such as lease out, sharecrop out, exchange, planting trees, grazing animals etc were practiced in the PAs and if they felt that they actually had those rights. In order to crosscheck at the individual household and plot level, the same questions were asked to the household respondent in relation to each plot the household owned/controlled irrespective of the type of tenure.

The responses from the community survey show that some of the specific rights were not in practice in some PAs, so the question of perception about having or not having that right did not arise (Table 5.5). Where a practice was in use, only few of the rights e.g. lease/share out to PA members, bequeath to family members, loan to PA members and pledging user right for loan were actually exercised, but most PAs felt that they had the right to do so, and there were only marginal changes between the two years. Where any change occurred, the general trend was that the proportion of PAs which felt they had the right increased in 1999 compared to 1991.

The same trend was observed from the individual plot level information. In over 90% cases, respondents reported that they had the various specific rights in relation to the plot in question; only in a few cases the answer was that they did not have that right or had it subject to permission from the PA or the original land holder, as the case may be. Thus there is a correspondence between community perception and the actual practice at plot level about various specific rights in relation to transfer and use of land.

In 2005, the federal government issued a revised proclamation, the Rural Land Administration and Land use Proclamation. No. 456/2005 (which replaced 89/1997). The revised proclamation follows the trajectory that “the right to land is exclusively vested in the state and in the people” and grants only “holding rights” to users. Holding rights include leasing rights and inheritance rights. Following the proclamation, a land registration and certification programme has been implemented with the aim to foster land holding with enforceable rights in land (Deninger et al., 2007). The implementation has been relatively slow in the Oromiya Region compared to the other regions. However, it is anticipated that the programme itself will create legally defensible claim to land and thus create a sense of security in the long run due to certification. However, during the survey period for the present study land certification programme was not operational but the findings clearly show that the 2005 amendment of the land law and the follow up land registration and certification programme was a positive response to the underlying problem with land tenure security.

Table 5.5 Number of peasant associations practicing specific land transfer and use rights and proportion that perceive they have those rights in 1991 and 1999

	1991 (n=85)		1999(n=85)	
Type of rights	No. of PAs practice the right	% PAs perceive having the right	No. of PAs practice the right	% PAs perceive having the right
Transfer rights				
Lease/share out to PA members	85	100	85	100
Lease/share out to outside PA	85	86	85	100
Bequeath to family members	80	94	80	100
Loan to PA members	82	94	82	100
Loan to outside PA member	82	93	82	99
Pledge use right for a loan	32	84	32	100
Use rights				
Crop choice on imported land	43	98	44	100
Plant Eucalyptus trees on imported land	5	100	5	100
Plant agro-forestry trees	4	100	4	100
Plant fruit trees	2	100	2	100
Cut trees from imported land	1	100	1	100
Present others from cutting trees	78	99	78	99
Aftermath grazing on imported land	83	99	84	100
Exclude others from aftermath grazing	77	99	78	100
Exclude others from yr-round grazing	24	96	24	96

Source: Community survey

5.2.5 Effect of land tenure on productivity, land degradation and conservation

The prevailing land tenure arrangements in different periods had implications for production efficiency and investment for productivity improvement and conservation of resources. However, no detailed analyses of these relations were done in the past in an extensive manner. Available evidence from the literature is summarized below.

During the feudal era, the uncertainties about frequent reallocation of land by the Emperor led to disincentive in investment in land improvement (Pankhrust, 1969). Moreover, fragmentation of farms due to population pressure increased costs as more time was required for travelling from plot to plot, and advantage of economies of scale could not be derived. Also, smallholdings reduced access to credit, which was needed to improve land and obtain agro-technology (Cohen and Weintraub, 1975). Small landholding and fragmentation may undermine farmers' interest in undertaking some types of land improvements, regardless of tenure security or private management. For example, farmers may find the costs of hauling manure or other organic materials to distant and small plots not worth the considerable effort required.

The consequence of the land policy under the *derg* and later on productivity are not yet fully assessed. Results of empirical studies presented below show that there are difference of opinion about the outcome of the land reform measures. Critics of this reform process mention drawbacks in terms of constraints on agricultural productivity, natural resource management, and household wellbeing. After examining agricultural output between 1961 and 1988, Kifle (1992) was sceptical that the land reform resulted in any significant improvement in land use. On the other hand, Teklu et al. (1999), after analyzing the informal land markets in Ethiopia, have indicated that households transacting land in the informal markets improved their net income and farm equity positions. Kibret (1999) concluded that agricultural output would not have been higher if land distribution were not undertaken; but the margin of improvement due to land distribution was minimal.

Using data from a survey in the highlands of Oromiya, Gavian and Ehui (1999) found that total factor productivity on informally contracted plots (rented, share cropped, borrowed) were 10-16% less than on PA-allocated plots but input intensity was higher on informally contracted plots. They thought that the lower productivity of informally contracted plots could be due to the inferior quality of inputs or lack of skills in applying them rather than a lack of incentive to allocate inputs, so land tenure was perhaps not a constraint to productivity in the given context.[7] Using the same data set, Ahmed et al. (2002) found by using frontier production function that sharecropped and borrowed land were less technically efficient than owner-cultivated or fixed rental land due to restrictions imposed on them by landowners and the interactions of land market with other imperfect and absent input markets. On the other hand, using the same data set, Pender and Fafchamps (2001) compared "Marshallian" theory (unenforceable labour effort), "New School" perspective (costlessly enforceable effort), and 'transactions cost theory' (land leasing being influenced by transaction costs of enforcing labor effort, risk pooling motives and availability of non-tradable productive inputs), and they did not find empirical support for the "Marshallian" prediction of inefficient sharecropping, since factor intensity and output value were not significantly different on tenants' own vs. sharecropped fields. They found that factor intensity differed between tenants and landlords, contradicting the 'New School' perspective but consistent with the transactions cost theory. Thus, the debate on land tenure and productivity remains unresolved and needs further investigation.

In the previous section, perspectives of communities and households on different forms of degradation and relations of degradation with some land and crop management practices have been presented. It can be reasonably assumed that along with human and livestock pressure, and land and crop management practices, prevailing institutions and policies at different periods also contributed to the degradation status perceived by the communities and the households at present or in the recent past. The consequences of the post–feudal land reform were more drastic and pervasive. It is known from experiences elsewhere that people may behave differently on common properties as opposed to private properties. At times, communal tenure system may undermine the incentives to manage land in a sustainable manner for various reasons including the problem of free

[7] The rented or sharecropped plots could also be of lower quality or fertility because the land holders might have retained better quality plots and rented out the lower quality ones.

riding, breakdown of social norms, short time horizons and problems associated with carrying capacity (Olson 1965). This means that the common properties could be prone to misuse and damage. Similar consequences were observed in the Oromiya Region following the 1975 reforms. Though quantitative measures are not available, it has been reported that the implementation of the 1975 land policies combined with other policies caused widespread destruction of natural resources of the country and production almost stagnated in the face of a growing population.

Some regulations regarding the conservation and utilisation of land and other natural resources were not clearly defined. Issues such as land administration, measurement, registration, and planning were not clearly demarcated, and hence, create a problem in implementation by different involved agencies. This created serious problems in soil conservation and land improvement measures such as drainage, gully rehabilitation and controlled grazing (considered mainly as collective activities). For instance, in Melkedera PA, communal grazing areas were poorly managed, as herd owners paid little attention to maintaining the grass cover, community management of resources was very weak and neither traditional nor governmental organizations appeared to have either the will or ability to induce proper management of these resources. On the other hand, farmers practiced conservation measures and tree planning on privately held homesteads and croplands (Kaba, 1994). Many of the community plantations were destroyed and many soil bunds previously established for conservation purposes were ploughed out. Many trees were cut down to build new houses by dismantling the structures built under the villagisation programme and hillside farming was expanded without due consideration of the environment (Sutcliffe, 1995). In the absence of appropriate land policy, population pressure, particularly in the highlands of Oromiya, induced farmers to cultivate land that should not be cultivated because of the fragile nature of their agro-ecology or steepness of their slopes. Such practices have accelerated active erosion resulting in high rates of degradation. This effect was especially observed in parts of Wello, northern Shewa, southern Ethiopia and some parts of Hararghe and Bale.

During the post-1975 reform period, lack of long term security in the PA allocated land served as a disincentive for productivity and conservation enhancing investment which in the long run contributed to land degradation. For instance, a study in Tiyo wereda in the region showed that 82% of the PA households interviewed had experienced land distribution, with about 3.5 redistributions per household while 17% of all PA members had experienced five or more redistributions since their first allocation in the mid-1970s (Gavian and Teklu, 1996). Those who accessed land privately from other farmers through renting, leasing or borrowing experienced even less security. The use farmers make of a land and the outcome depends on the individual's or the family's entitlement and rights, which have a direct influence on farmers' decisions on investment. Most farmers in Tiyo wereda felt that they are able to exercise several usufruct rights and make such investments as building wells, stone bunds or permanent fences of metal or stone on PA-allocated fields (Table 5.6). Farmers who rented, leased or borrowed fields from other farmers, however, feel significantly more restricted in all activities, except the right to choose the crop they planted. Structural changes, fallowing and subcontracting out the land were usually not possible for these farmers. This, therefore, exemplifies the fact that tenure security has an impact on the type and level of investment to be made on land, and hence, the degree of land degradation.[8] More specifically, the higher the security of tenure, the better is the level of investment, and hence the higher the endeavour to maintain or at best improve the condition of land.

[8] In a study conducted in the Amhara region, Kassie and Holden (undated) compared all sharecropped plots against tenants' own plots and found that sharecropping was not inefficient. They also found that plots were rented from either kin or non-kin landlords and plots rented in from non-kin landlords were more efficient than plots rented in from kin-landlords though both the groups had similar resource endowments. They explained the efficiency difference by the relatively higher tenure insecurity (high probability of eviction) of plots rented from non-kin landlords, which induced tenants to make efforts to achieve higher productivity to avoid eviction. Kin-landlords on the other hand would have difficulty supervising kin-tenants and evict them for poor performance. Similar situation might prevail in the Oromiya Region.

Table 5.6 Nature of contracts for croplands in a Peasants Association in the Oromiya Region

	PA-allocated plots	Contracted plots
Number of fields	166	151
No. of years farmer has used this field	8	2
Duration of Current contract (% fields)	100	100
One year	na	59
Two years	na	5
Three or more years	na	1
Indefinitely*	100	35
% fields for which user holds the following right(s)		
Plant whatever crop he wants		
Fallow for 1 year	100	99
Fallow for more than 1 year	96	48
Plant trees	95	30
Install a well or pump	92	37
Build stone bunds	77	37
Build fence from natural materials	79	54
Build fence from stone/metal	93	59
Share out	79	38
Rent out	98	48
Lend out	97	43
Bequeath	96	43
	99	42

* indefinitely means until next redistribution of land by the PA, if any.

Source: Gavian and Teklu (1996)

Chapter 6
Summary and Policy Recommendations

6.1 Summary of Findings

An extensive review of the literature related to formal or institutional research on land degradation in the Oromiya Region identified soil erosion, biological, chemical and physical degradation as principal forms of degradation in the region. Among these, erosion has been found as the most important form of degradation caused by population pressure and continuous cultivation, rugged topography and steep slope, concentrated rainfall in a short period, loss of vegetative cover, excessive tillage and dominance of vulnerable soil types. Fertility decline has been found to be caused by removal of biomass from fields, use of inadequate manure and fertilizers, continuous cropping and grazing. Most immediate impact of degradation was found to be loss of crop yields but long term effects are decline in soil productivity, poverty and malnutrition (Teferra et al., 2002).

Alleviation of these problems require appropriate policies, technologies and institutions but at the end of the what matters most is the response of households and local communities to the problems and available options to address them. Therefore, it is useful to complement formal research on the physical, chemical and biological process of land degradation with understanding of the perceptions of households and communities about the manifestations of land degradation, their causes and consequences. When the formal research and household and community perceptions are highly synergistic or complementary, the probability of adoption of recommended options for addressing the problems may be higher than when recommendations are made without taking cognisance of end user perceptions. It is in this context that this study was undertaken in 85 Peasant Associations in 36 weredas in the highlands of the Oromiya Region. Community, household and plot level information were collected to understand the processes, causes and consequences of land degradation and their potential solutions.

The community, household and plot surveys in the region indicate that in the past decade demographic pressure caused major land use change and degradation. Area under crop land and homestead increased while that under forest and bush land and pasture decreased. Reduction of forest areas was also due to increased demand for timber and fuel. And the general quality of forest, bush and cropland decreased. Reduction in grazing land led to reduction of livestock population density and composition of the livestock herds yet pressure remained on the reduced grazing resources which contributed to degradation. Livestock contribute significantly to total income but still rank low as sources of cash income. Saving and asset function of livestock remain prominent. Decline of traditional feed sources is a general problem but it is more prominent in HPC and high population and high market access domains leading to changes in herd dynamics in which cows and followers have decreased in number while draft animals are preferred to be retained as these are required for crop production. In theory, reduced livestock population should not be a cause of concern if productivity increase significantly, as this is the ideal way to enhance the role of livestock in income generation without causing environmental degradation but livestock as a diversification strategy in these areas is constrained by feed shortage.

Although livestock is often blamed for overgrazing and land degradation, the analysis in this study shows that human population pressure has been the main driving force behind land degradation in the study region and that households and communities tended to adjust livestock population and herd composition with the reduced grazing resources but such responses have not always been adequate to arrest the degradation of the declining grazing resources. On other hand, inadequate use of improved crop and soil management practices also led to increased erosion and decreased soil fertility. Traditionally animal dung and crop residues are used as manure and mulch to maintain soil organic matter and fertility but increased use of these materials as fuel has also been responsible for increased land degradation.

Degradation problems are more in high potential cereal (HPC) and high population density areas, and conservation investments, though generally low, are also found in these domains. In general, there is little change in primary occupation or primary source of income of people in all the domains, which is cereal production. Proportion of people involved in secondary/tertiary occupations and secondary/tertiary sources of income increased and diversified during the decade. Such changes are more prominent in HPC, high population and high market access domains as expected but certain activities have changed significantly in other domains, e.g., importance of chicken and small ruminant increased more in low potential cereal zone (LPC) while bee keeping declined in HPC areas. Off-farm employment and trading or handicraft is also more important in LPC and low market access domains. Productivity increasing investments have occurred more in HPC and perennial zones, and in high market access domains though extension contacts increased more rapidly in perennial and LPC zones.

Most drastic land policy changes occurred in the mid 1970s when land was nationalized and distributed among peasants on a per capita basis. Officially there was no land redistribution in the region after the initial distribution following land nationalization and distribution enacted in the mid 1970s although such redistribution has occurred in other regions, especially after 1993. However, local communities in many Peasant Associations have undertaken one to several redistributions to accommodate local needs of newly formed farming families. Also informal land contracts such as cash and share renting and leasing have emerged to accommodate the needs of newly formed as well as land surplus and land deficit families.

The initial drastic measures led to uncertainty about tenure which contributed significantly to land degradation, especially in case of forest and common grazing land. Investment in conservation measures suffered due to lack of tenure security and incentives. Evidence on impact of new tenure system on crop productivity and efficiency is mixed – some studies show negative effective of tenure while others show neutral effect of tenure. The informal contracts such as share and cash renting that emerged lately did not appear to significantly affect input intensity and productivity any differently than the officially administered tenure system.

These findings are consistent with the findings from the review of the formal research literature on land degradation.

6.2 Technology and Policy Options for the Development Domains

The conceptual framework used in the analysis of land degradation shows that some causes of land degradation are proximate while others may be considered underlying and overall the causes are multi-layer, multidimensional and complex. And there are significant differences in the extent of degradation and its causes across the various development domains defined by combining production potential or ecology, population pressure and market access. Therefore, there are no one-size-fits all solution to the problems across the domains. Technology and institutional options suitable for different domains to increase productivity and reduce degradation need to be introduced.

The most important driving force behind low productivity and high degradation in the Oromiya highlands appears to be population pressure. But several factors are currently limiting the chances of reducing population pressure on rural land. First, population growth rate is still quite high; on the other hand, the sizes of the non-agricultural sectors are small and they are growing at an inadequate rate to absorb the natural increment in the labour force, so the question of net reduction in rural labor force is still far fetched. Second, there is no surplus land, especially in high population density domains, to be distributed among newly formed families, so an increasing number of people are compelled to derive livelihood out of a relatively fixed stock of land. The current land certification and laws keep people tied to the land and almost prohibit movement away from land as households only have use rights and right to bequeath among inheritors in the family but no right to sell or transfer and leave land, so leaving land means losing it altogether. The land laws have been successful in keeping people in rural areas and preventing them from migrating to the cities and create big slums as commonly found throughout the developing world but it has done little good, if any, to the development of agriculture. The certification is expected to create an incentive to plant crops and trees which take long to mature but result in better income and gives more leeway for landlords to rent out their plots.

So without reducing population pressure on rural land, technological and institutional innovations for increasing productivity and reducing degradation may not go very far. Brief examples can be given from historical experiences in both distant and recent past from the capitalist and the communist world to illustrate how population pressure had to be tackled one way or another in order to accelerate agricultural as well as overall development in a country.

First, medieval Europe was overpopulated. The rate of urbanization was not high enough to absorb natural rural increment in population. When North America and Oceania provided the opportunity, emigration, particularly large scale exodus in the nineteenth and early twentieth centuries, became a major factor in moderating the problems of underdevelopment and population pressure in European countries. Thus, taking place in a short period of demographic history, emigration had a pull effect on rural-urban migration (see for example, Grigg 1980; Boserup 1981; Jabbar 1982). No such 'safety valve' exists for the third world countries today. Opportunities for migration to the developed countries are limited and highly controlled. Middles East and some of the other emerging economies like Malaysia provided an outlet and some relief to some of the Asian poor countries, as without this outlet, unemployment rate and pressure on rural land in those countries would be much higher than they are at present.

Second, the American civil war and the abolition of slavery were not just motivated by a desire for establishing liberty, freedom and human dignity. The war was very much prompted by two main forces: on the one hand slave based agriculture became unsustainable as it tied labour to land and created bottlenecks for technological progress and productivity improvement; on the other hand, industrial progress required increased supply of cheap labour which could not be ensured without dismantling slavery and making labour market open and free. Thus, abolition of slavery paved the way for advancement of capitalist agriculture as well as industrialisation (Dunman, 1975).

Third, Chinese communes tied labour to land and initially practiced highly labour intensive production methods. One-child policy kept population growth in check yet pressure on rural land for livelihood increased over time. When policy reforms and economic expansion through massive investment in infrastructure, industry and service sectors were started in the early 1980s, labour became a constraint. Gradual de-collectivization, allocation of land to individual households and flexibility in land rental market played a key role along with market liberalization policies to accelerate both agricultural and industrial growth ((Luo, 2005). Without release of labour from communes, pressure on rural land would increase and neither agriculture nor non-agricultural sectors could prosper to contribute to the rapid and high rate of economic growth achieved in recent years.

Fourth, after the unification of Vietnam in 1974, producer collectives already in place in the north were introduced in the south. But it followed a period of reconstruction of the war ravaged economy but slow economic growth, declined food production, and near famine, so the Vietnamese government in 1986 enacted a series of reforms to transform Vietnam from a centrally planned to a market-oriented economy. This *Doi Moi* reform not only dismantled the rural collectives, but also assigned land rights to farmers. Later, agricultural markets were liberalized, and even wider economic reforms were implemented. In part, because these reforms unleashed a new entrepreneurial spirit that resulted in intensified rice production, diversification into new crops such as coffee, and improved food quality. Agricultural growth reached 3.8 percent a year during 1989–92, and Vietnam became the world's third-largest exporter of rice by 1989, alleviating national food shortages. Agriculture became a driver of overall economic growth. Within five years (from 1993 to 1998) the share of people living in poverty fell by 21 percent. From 1993 to 2002, poverty incidence dropped from 58 to 29 percent (Kirk and Tuan, 2009). Without land reform, more labour would remain tied to land and slow down the growth of the economy.

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It has to be recognized that the current resource base and structure of the Oromiya, or the Ethiopian, economy is not the same as any of the countries illustrated above at the time they pursued the specific reform policies. Therefore, none of those reform measures may be directly applied in the current context of the Oromiya economy. The Government of Ethiopia in a major policy document on agriculture and rural development defended the current land policy and answered critiques who argue that public ownership of land create disincentive for productivity improving investment and restrict farm size and commercialization of agriculture and restrict labour mobility. The document argues that the issue is not just public vs private ownership of land and the criticisms about disincentives, lack of labour mobility and bottleneck for commercialisation are unfounded as the current land policy is not a hindrance to any of these. Farmers are being issued land certificates to assure use rights and rights to bequeath to inheritors, which should alleviate any uncertainty about tenure security. The government argues that problems of population pressure in the highlands needs to be solved by planned resettlement in low density areas, especially in low lands, and productivity improvement has to be achieved by pursuing proper land use methods appropriate for different agro-ecologies and by disseminating appropriate modern inputs and labour intensive technologies (Government of Ethiopia, 2001). Subsequently, another major policy document adopted 'agricultural development led industrialisation' as the strategy for long-term development of the economy and market orientation as the main driver of agricultural development (Government of Ethiopia, 2007).

During 1993-2003, real national GDP grew by 3.7% annually, slightly above the rate of population growth rate but non-agricultural sector grew by 6.4% from a low base. In more recent years, the economy performed better: during 2003/4-2006/7, real per capita income increased by 7% but agriculture sector grew by about 16% in 2003/4 which declined to 13, 11 and 9% in the subsequent years. Moreover, these growth rates were achieved primarily due to the traditional export crop coffee and newly promoted high value export crops like floriculture and vegetables (Tolina, 2007). Statistics on the growth performance of the Oromiya economy are not readily available but most of the new sources of growth of the national economy - high value crops and coffee- are based in the Oromiya highlands. Export oriented high value crops are produced by large scale greenhouse based capital intensive enterprises rather than involving smallholders through contract farming or other forms of organisation. Therefore, smallholders are left behind by the emerging growth process and the problems of population pressure and low productivity and degradation of land under smallholder agriculture sector in the highlands of Oromiya remain basically unsolved. It is highly unlikely that these problems can be solved only by planned resettlement, which is yet to be implemented, without gradually allowing to develop an active land and rental market within the framework of the national land laws and policies. As shown by the survey results, an informal rental market is already emerging. The government apparently believes that the registration and certification will provide a legal basis for rental transactions and dispute settlement.. However without proper policy attention to the forms of rental contracts and their roles in the rural society, land rental market may not be able to play its due role in the process of agricultural development..

While land reform as a means to tackle the problems of low productivity and land degradation is being debated, it should be possible to make some progress through proper implementation of the other policy measures proposed in the agriculture and rural development policy documents mentioned earlier (Government of Ethiopia, 2001 and 2007). Such measures include promotion of appropriate land use methods for different agro-ecological zones and dissemination of appropriate modern inputs and technologies. Technology and institutional innovations for development in a country or society may be derived from indigenous knowledge and practices, home based research and /or introduced from science based findings and experiences from elsewhere. In a given situation, choice of options to be pursued and adopted depends on profitability and comparative advantage, which in turn depends on several factors, e.g.

- Ecology, which determines biophysical suitability and boundaries
- Population density, which determines land/labour ratio, rent, wage rate
- Market access, which determines price, costs, incentives and disincentives and suitability of different institutional options
- Interactions among ecology, population density and market access.

Therefore, the development domains defined in the present study by combining agro-ecology, population pressure and market access provide a more objective framework than just agro-ecology alone as emphasized in the agriculture and rural development policy document. Practically it may be impossible to define detailed recommendations for each specific domain or location based on current scientific knowledge and information. So some options may apply across domains while others may have more domain specific application. Using this principle as a general guide, a preliminary menu of recommendations for sustainable land management for improvement of productivity and reduction of degradation rate in the various development domains in the Oromiya highlands was presented as hypotheses to be discussed with experts and stakeholders at project progress workshops as well as with community respondents in the survey areas (Teferra et al., 2002). The feedback from the stakeholders and the community level respondents largely confirmed the hypothetical recommendations, which are summarized in Table 6.1.

Productivity improvement and land degradation are interlinked problems so the list of recommendations includes options to address one or the other or both problems. Some of the recommendations appear similar across several domains, e.g., low input cereals, woodlots but the specific crop or crop variety and tree species will vary depending on ecology, available knowledge and supply of seeds or planting material. Similarly soil/water conservation, soil fertility management are mentioned as generic recommendations for several domains but the specific intervention will vary across domains and locations. For example, on steep slopes stone bunds/terrace will be more appropriate than on flat surface where other options may be more appropriate. In case of soil fertility, specific intervention will be defined by slope, soil types, soil nutrient status, moisture level, type of crop to be grown, planting season and profitability of different options. For example, a study in the Amhara and Tigray regions found that minimum tillage and farmers' traditional practices are more sustainable and economic options than use of commercial fertilizers in areas of low agricultural potential while the opposite is true for areas of high agricultural potential (Kassie et al., 2010).

Further, it is known from the literature on adoption and impact of various conservation measures under conditions of poverty that resource degradation is both a cause and an effect of poverty. Technologies or measures that address the problem of poverty through improved productivity and have resource conservation potential are more likely to be adopted than those that address conservation or productivity along (Jabbar, 2000). Returns to investment in conservation measures may accrue over a longer period compared to investment in productivity improving measures. Therefore, the farmer may have to be paid to love the land in order to maintain its future productivity because even when the farmer is the owner of the land, he may not see too far into the future (Weinschank 1986, Jabbar, 1990). Such incentives may be provided in the form of input subsidy, investment support or in other ways depending on the type of intervention, the cost involved, the number of beneficiaries and social vs private costs and returns.

Intensive dairy is recommended for high population-high market-HPC domain and in other domains where market access is high because market is a primary requisite for expansion of this enterprise. For example, in Machakos district in Kenya, high population pressure led to high degradation and loss of productivity of soil but once this process reached an unsustainable level, individuals and communities responded due to survival instinct to reverse the trend by making conservation as well as productivity improving investments. Access to the Nairobi market, which is not too far from the district, very much influenced the nature of enterprises and the types of profitable investments that were pursued. Dairy was one such enterprise which created jobs both on-farm and off-farm (Tiffen et al., 1994).

In other domains, small ruminants, cattle fattening etc are considered more appropriate due to availability of feed resources and since animals can be transported on hoof or by transport to longer distances, local market access is not a major requirement. Off-farm employment is more appropriate for domains with high market access because market creates backward and forward linkages between farm households, communities and the wider economy, and so creates opportunities for trade, commerce and other employment (Pender et al., 2006).

The approach used in the analysis and in making the domain specific recommendations presupposes that a one-size-fits all general approach is inappropriate for sustainable land management and productivity improvement in the Oromiya highlands because of the diversity of its micro-environments. The multi-factor based development domains do not fully address the extreme diversity of the micro-environments but for the given context for which much basic information required for site specific optimal technology recommendations are not available, the multi-factor based classification of domains is a step in the right direction. Site specific approach emphasizes spatial and inter-temporal variability in input use based on land quality and other socio-economic conditions. Ben et al. (2000, 2005) used a watershed level bio-economic model with data from Ginchi watershed in the Oromiya highlands to illustrate the usefulness of site specific technology use. They divided the watershed according to land type and slope to define domains and showed that without domain specific technological intervention and supporting policy, soil loss levels, income and nutrition could not be substantially or sustainably improved for the watershed community. Although cash incomes could rise by more than 40% over a twelve-year planning period, average per ha soil losses could be as high as 31 tonnes per ha. With the adoption of an integrated package of new technologies, however, results show the possibility of an average two-and-a-half-fold increase in cash incomes and a 28% decline in aggregate erosion levels even with a population growth rate of 2.3%. Moreover, a minimum daily calorie intake of 2000 per adult equivalent could be met from on-farm production with no significant increases in erosion. However, higher rates of growth in nutritional requirements and population introduce significant strains on the watershed system. From a policy perspective, there was a need for a more secure land tenure policy than currently prevailing to facilitate uptake of the new recommended technology packages, and a shift from the current subsistence oriented livestock management strategy in which food and input functions are dominant to one that encourages livestock keeping as a commercial enterprise.

The bio-economic model exercise clearly shows the importance of adaptive research in many micro-environments to fine tune technology options generated by station-based research which has more broad recommendation domain. Most agricultural innovations generated by experimental station based research evolve as they diffuse because an innovation may be changed or modified by a user in the process of its adoption and use in specific environments. A high degree of 'reinvention' may occur through the diffusion process in that "an innovation is changed or modified by a user in the process of its adoption and implementation" (Rogers 1983). However, such voluntary farmer adaptation to suit specific local environments may be a very slow process (Thirtle and Ruttan, 1987). Therefore vigorous efforts will be needed on adaptive research if domain based or site specific technology dissemination is to be used as a strategy for sustainable land management for improvement of productivity and reduction of degradation.

Since research should be aimed at solving farmers' problems, involving farmers in the research process quite early on, rather than waiting for them to be passive recipients of formal research results at some future date, may yield three advantages in relation to diffusion and adoption of technologies (Jabbar, 1990).

First, the length of time required for standardization and adaptation of the technology to various specific farmer situations may be shortened through contributions from the participating farmers. Farmers' own adjustment mechanisms and experiences will be important input towards the adaptive process.

Second, farmer participatory research may demonstrate the viability of the technology and thus create "neighborhood effects" whereby "innovation waves" may spread from the centre to the periphery (Mahajan and Peterson 1979). Since on-farm farmer participatory research is likely to be conducted in many locations across the region, the innovation waves will spread from many centres and thus speed up both generation and diffusion of the technology. A large extent of horizontal (farmer to farmer) diffusion is likely to take place due to lateral learning within each research location.

Third, one of the functions of farmer participatory research is to promote collaboration with extension and development agencies in order to improve the efficiency of the technology generation and diffusion process (Merril-Sands 1989). Involvement of extension and development agencies as partners/participants in the technology generation process will bring them directly in contact with the farmers as well as making them acquainted with the salient features of the technology as it is generated. This is a step ahead of the situation where such agencies have to wait until some best practice technology package is made available to them for their own dissemination. Suitability of the existing institutional frame-work for proper delivery of the technology to the users may also be tested during farmer participatory research stage. For example, in the Oromiya Region crop, livestock and forestry extension services are not fully integrated rather they operate fairly independently with little collaborative activity, and the crop extension service is much better organized than the other two. Since many of the recommendations for land management for productivity and conservation will cut across all three fields, appropriate mechanisms may be developed at the technology generation stage to integrate the roles of these various agencies in the diffusion process. Mechanism for using non-government and traditional institutions such as cooperatives, village associations, local leadership structures, in the diffusion process may also be found out at on-farm participatory research stage. The role of such institutions may be highly complementary to governmental institutions in the diffusion process.

A critical constraint for dissemination of domain-specific recommendations is inadequate and responsive technologies available in the region and inadequate number of extension agents with proper training on the specific characteristics and requirements of the various domains. It is well known that extension is a high pay-off public investment activity for a developing country. The government has recently given attention to this problem and has established a good number of extension training institutes and Farmers Training Centres throughout the region to train large number of extension agents. However, the training materials used in these training institutions contain more general description of production characteristics and solutions rather than domain specific characteristics and solutions. Along with number of agents, improvement in the training content to serve the needs of various domains will go a long way to achieve sustainable land management in the region.

Table 6.1. Technology options and strategies for sustainable land management in various development domains in the highlands of Oromiya Region

Population Density (PD) and Market Access (MA)	Agro-ecological zone		
	Low Potential Cereal (LPC)	High Potential Cereal (HPC)	Perennial
High PD High MA	• Low input cereals • Stronger crop livestock integration • Small ruminants and small scale poultry • Fruits and Orchards • Root crops • Woodlots • Off farm employment • Soil and water conservation • Soil fertility management	• High input cereals, pulses and oilseeds • Fruits and vegetables • Intensive dairy • Limited woodlot/ agro-forestry • Soil and water conservation • Soil fertility management • Resettlement/ migration	• Coffee, tea, chat, enset • Limited dairy and fattening • Fruits and vegetables • Non-farm employment • Bee keeping • Agro-forestry
High PD Low MA	• Low input cereals • Stronger crop-livestock integration • Fruits and Orchards • Root crops • Woodlots • Soil and water conservation • Soil fertility management • Resettlement/ migration	• High input cereals, pulses and oilseeds • Fruits and vegetables • Limited woodlot/ agro-forestry • Soil and water conservation • Soil fertility management • Resettlement/ migration	• Coffee, tea, enset • Low input cereals • Limited livestock intensification • Bee keeping • Agro-forestry

Low PD High MA	• Low input cereals • Livestock fattening • Woodlots/ Agro-forestry • Bee keeping • Off farm employment • Soil and water conservation • Soil fertility management	• High input cereals • Fruits and vegetables • Limited dairy and fattening • Pulses and oilseeds • Limited woodlot/ agro-forestry • Soil and water conservation • Soil fertility management	• Coffee, tea, chat • Fruits, vegetables • Dairy and fattening • Woodlots/ agro-forestry • Bee keeping
Low PD Low MA	• Low input cereals • Pulses • Limited livestock • Woodlots • Bee keeping • Soil and water conservation • Soil fertility management	• High input cereals • Pulses and oilseeds • Bee keeping • Woodlots/ agro-forestry • Soil and water conservation • Soil fertility management	• Coffee, tea • Low input cereals • Livestock fattening • Woodlots/ agro-forestry • Bee keeping

Note: By 'high input', it is meant here that chemical fertilizers, high yielding seeds and/or high labour or capital input and/or irrigation and extension will be used as appropriate.

References

Abate, Solomon. (1994) Land use dynamics, soil degradation and potential for sustainable use in Metu area, Illubabor Region, Ethiopia. University of Berne, Switzerland. 135pp.

Abebe. A. (1992) Assessment of runoff and soil loss under different cover crops and slope length. In: *Proceedings of a workshop on NRM for conservation and development*. 10-13 May, 1990. Institute of Agricultural Research, Addis Ababa, Ethiopia. Pp.50-57.

Ahmed, M A, Gebremedhin, B, Benin, S, and Ehui, S. (2002) Measurement and sources of technical efficiency of land tenure contracts in Ethiopia. *Environmental and Development Economics* 7:507-527.

Baland, J.M., and Platteau, J.P. (1996). *Halting degradation of natural resources: is there a role for rural communities.* Oxford University Press, Oxford, UK. 423pp.

Bardhan, P. (1987) Alternative approaches to the theory of institutions in economic development. In: P. Bardhan (ed.). *Population growth and agricultural change in Africa*. Oxford University Press, Oxford, UK. 19pp.

Binswanger, H.P. and McIntire, J. (1987) Behavioral and material determinants of production relations in land-abundant tropical agriculture. *Economic Development and Cultural Change* 36(1):73-99.

Boserup, E. (1965) *The conditions of agricultural growth: the economics of agrarian change under population pressure*. Aldine, New York, USA. 124pp.

Boserup, E. (1981) *Population and technology*. Basil Blackwell, Oxford, UK

CSA (Central Statistical Authority). (1999) *Agricultural sample survey report on livestock, poultry, and beehive populations.* Statistical Bulletin No 206. Volume II. CSA, Addis Ababa, Ethiopia.

Cohen, J.M. and Weintraub, D. (1975) *Land and peasants in imperial Ethiopia*: *the social background to revolution*. Van Gorcum & Comp. B.V. Assen, The Netherlands. 115pp.

Constable, M. (1985) *Ethiopian highlands reclamation study: Development strategies*. Ethiopian Highlands Reclamation Study Working Paper No. 24. Ministry of Agriculture, Land Use Planning and Regulatory Department, Addis Ababa, Ethiopia. 274pp

Debele, B, Feyissa, R and Berhanu, W. (1998a) *Regional conservation strategy Volume I: the resource base, its utilisation and planning for sustainability.* Land Use Planning and Resource Management Project, Oromiya National Regional Government, Addis Ababa, Ethiopia. 143pp.

Debele, B, Feyissa, R and Berhanu, W. (1998b). *Regional conservation strategy Volume II: identification and analysis of constraints and issues.* Land Use Planning and Resource Management Project, Oromiya National Regional Government, Addis Ababa, Ethiopia. 66pp.

Dinka, Haile-Yesus. (1996) Population pressure and some of its effects in the highlands of Oromiya Region: an environmental assessment. Paper presented at the workshop on Environmental Problems in Oromiya, Nazreth, Ethiopia, June 5-7, 1996. 35pp.

Deninger, K, Ayalew,D, Holderness, S, and Zevenbergen, J (2007) Rural land certification in Ethiopia: Initial impact and implications for other countries. World Bank Working Paper Series No- 4218. Washington D.C., USA

Dunman, J. (1975) *Agriculture – Capitalist and socialist*. Lawrence and Wishart, London.

Rahmato, D. (1994) *Land tenure and land policy in Ethiopia after the Derg.* Working Papers on Ethiopian Development No 8. Institute of Development Research, Addis Ababa University, Ethiopia. 305pp.

FAO. 1986. *Ethiopian highland reclamation study*. Final Report. FAO, Rome, Italy. 123pp.

Gavian, Sarah and Teklu, Amare (1996) Land tenure and farming practices: the case of two woredas, Arsi, Ethiopia. In: Mulat Demeke, Wolday Amha, Tesfaye Zegeye, Solomon Belete, and Ehui, S. (eds) *Sustainable intensification of agriculture in Ethiopia*. Proceedings of the Second annual conference of the Ethiopian Agricultural Economics Society. Addis Ababa. 269pp

Gavian, S. and Ehui, S. 1999. Measuring the production efficiency of alternative land tenure contracts in mixed crop-livestock systems in Ethiopia. *Agricultural Economics* 20:37-49.

Gebremedhin, B and Nega, B (2005) Land and land policy in Ethiopia in the eyes of Ethiopian farmers : An empirical investigation. In: Proceedings of the Second International Conference on the Ethiopian Economy, Volume II. Ethiopian Economic Association, Addis Ababa, Ethiopia.

Gebru, G. (1997) Land access and management of grazing resources in highlands mixed crop-livestock systems: a case of Tiyo Woreda, Arsi, Ethiopia. Paper Presented at the Workshop on “Access to Land and Resources Management”, Institute of Development Research, Addis Ababa University, Addis Ababa, Ethiopia. 13pp.

Government of Ethiopia (2001) *Rural development policies, strategies and instruments.* Ministry of press and Information, Addis Ababa, Ethiopia. .

Government of Ethiopia (2007) *Emerging Ethiopia : The agricultural development led industrialization (ADLI) strategy.* Ethiopian national presentation at the 2007 Annual Ministerial Level Substantive Review of the Economic and Social Council of the United Nations on "Strengthening efforts to eradicate poverty and hunger, including through the global partnership for development", held on 3 July at the United Nations Office, Geneva.

GPDRE (Government of the Peoples Democratic Republic of Ethiopia). (1997a) *Proclamation for rural land administration* (draft in Amharic**).** Addis Ababa, Ethiopia **.** 42pp

Grigg, D B (1980) *Population growth and agrarian change: A Historical Perspective*. Cambridge University Press, Cambridge, UK.

Hagmann, J. (1991) *The soils of Dizi, Illubabor: their genesis, potential and constraints for cultivation.* SCRP Research Report 18, Berne, Switzerland. 136pp.

Hayami, Y., and V.W. Ruttan. 1985. *Agricultural development: an international perspective*, 2nd Edition. Baltimore, MD: Johns Hopkins University Press. 506pp.

Hurni, H. (1993) Land degradation, famine and land resources. Scenarios in Ethiopia. In: *Soil erosion and conservation*, Edited by D. Pimentel. Cambridge University Press, Cambridge, U. K. pp 27-62

IGE. 1967. *Report on land tenure survey of Arussi province*. Ministry of Land Reform and Administration, Department of Land Tenure, Addis Ababa, Ethiopia. 31pp.

IGE. 1969a. *A study of agricultural land disputes in Kuni wereda and Chercher awraja courts (Harer province*). Ministry of Land Reform and Administration, Department of Land Tenure, Addis Ababa, Ethiopia. 84pp.

IGE. 1969b. *Report on land tenure survey of Bale province*. Ministry of Land Reform and Administration, Department of Land Tenure, Addis Ababa, Ethiopia. 32pp.

IGE. 1969c. *Report on land tenure survey of Illubabor province*. Ministry of Land Reform and Administration, Department of Land Tenure, Addis Ababa, Ethiopia. 33pp.

Jabbar, M A (1982) Technological change, agricultural development and the relevance of crop-livestock interaction. *Bangladesh Journal of Agricultural Economics,* 5(1-2): 55-72.

Jabbar, M. A. and Green, D. A. (1983). The Status and Potential of Livestock within the Context of Agricultural Development Policy in Bangladesh. Department of Agricultural Economics, The University College of Wales, 113 pp.

Jabbar, M A (1990) Socioeconomic aspects of diffusion and adoption of alley farming. Paper presented at the Alley Farming Training Course, International Institute of Tropical Agriculture IITA, Ibadan, 12-26 March, 1990. 10pp

Jabbar, M A (2000) From vertisols to highlands. Case study no 5 in : *Equity, well-being and ecosystem health – Participatory research for natural resource management.*

Participatory Research and Gender Analysis Programme, Consultative Group on International Agricultural Research, Cali, Colombia. pp.23-25

de Janvry, A., M. Fafchamps, and E. Sadoulet. 1991. Peasant household behavior with missing markets: some paradoxes explained. *The Economic Journal* 101:1400-1417.

Kaba, Mirgissa. (1994). Land tenure and resource management in a West Shewa Oromo Community. In: Desalegn Rahmato (ed) *Land tenure and land policy in Ethiopia after the Derg*. Working Papers on Ethiopian Development No 8. Institute of Development Research, Addis Ababa University, Addis Ababa, Ethiopia. Pp.111-127.

Kassie M and Holden, S (undated) Sharecropping efficiency in Ethiopia: The role of social distance and marking-up tenant output share. Agricultural University of Norway, Oslo. Unpublished draft. .

Kassie, M, Zikhali, P, Pender, J and Kohlin, G. (2010) The economics of sustainable land use practices in the Ethiopian highlands. *Journal of Agricultural Economics*, 61(3): 605-27.

Kibret, Haile. (1999) Land reform: revisiting the public versus private ownership controversy. Paper presented at the Ninth Annual Conference on the Ethiopian Economy. Department of Economics, Addis Ababa University, Addis Ababa, 23pp

Kifle, Mengisteab. (1992) *Ethiopia: failure of land reform and agricultural crisis*. Greenwood press, New York. 216pp.

Kirk, Michael and Tuan, Nguyen Do Anh (2009) *Land-tenure policy reforms – Decollectivisation and the Doi Moi system in Vietnam*. IFPRI Discussion Paper 00927. IFPRI, Washington, D C, USA.

Kubsa, Abdurahiman (ed.). (1998) *Strategy to conserve Adaba-Dodola forest priority area*. Proc. workshop on Strategy to Conserve Priority Forests in Oromiya, held in Ghion Hotel, Addis Ababa, August, 1998. Unpublished, 38pp.

Krauer, J. (1988) *Rainfall, erosivity and isorodent map of Ethiopia*. SCRP Research Report 15. University of Berne, Switzerland. 132pp.

Lapar, L. M Aand Jabbar, M A. (2003) A GIS based analysis of livestock and feed resources in the humid and sub-humid zones in five countries in Southeast Asia. A CASREN Paper, ILRI, Nairobi, Kenya.72pp.

Luo, Xiaopeng (2005) How the venture for property was started in China: an insider's story of china's economic reforms in the 1980s. In Eleni Gabre-Madhin (ed) *Unleashing markets for agricultural growth in Ethiopia.* Summary of proceedings of the MoARD-IFPRI workshop held in Addis Ababa, Ethiopia, 18-20 May, pp.95-97.

Mahajan, V and Peterson, R A.. (1979). Integrating time and space in technological substitution models. *Technological Forecasting and Social Change*, 14(1): 231-41.

Mäki-Hokkonen, J. (1996) Integrated Systems of Animal Production in Asian Region: FAO's Studies into the Asian Livestock Production Systems, FAO's Programme Priorities. In: Proceedings of the 8th AAAP Animal Science Congress, Vol. 1. Tokyo, Japan, pp. 307-313.

Merril-Sands, D. (1989) Introduction to the ISNAR study on organization and management of on-farm client oriented research, in M.A. Jabbar and Md. Zainul Abedin, *The evolution and significance of on-farm and farming systems research in the Bangladesh Agricultural Research Institute*. OFCOR case study No.3. International Service for National Agricultural Research. The Hague, The Netherlands.

Mohamed Saleem, M A. (1995). Fragile east African highlands ; a development vision for smallholder farmers in the Ethiopian highlands. *Outlook on Agriculture* 24(2): 111-116.

MOA (Ministry of Agriculture) 1998. *The forest resources management study in the southwestern part of Ethiopia: Volume 1*. Japan Forest Civil Engineering Consultants Foundation, Kukusai Kogyyo Co., Ltd., Tokyo, Japan. 195pp.

MOFED. (2002). Development and poverty profile of Ethiopia. Ministry of Finance and Economic Development, Addis Ababa, Ethiopia

Mukherjee, Radhakamal. (1938) Food Planning for Four Hundred Millions. Macmillan, London. 240pp

North, D.C. (1990). *Institutions, institutional change, and economic performance*. Cambridge: Cambridge University Press. 152pp.

OBPED (Oromiya Bureau of Planning and Economic Development. (1997a). National *atlas of Oromiya*, Addis Ababa, Ethiopia**.** 205pp.

OBPED. (1997b). *Condensed physical geography of Oromiya*. Physical Planning Department, Addis Ababa, Ethiopia. 136pp.

Okumu, B, Jabbar, M A, Colman, D, Russel, N, Mohamed Saleem, M A, and Pender, J. (2000) Technology and policy impacts on nutrient flows, soil erosion and economic performance at watershed level: application of a bioeconomic model. Paper presented at the Global Development Network Conference on Beyond Economics – Multidisciplinary Approaches to Development, Tokyo, Japan, 11-13 December, 24pp. (Awarded second place medal by GDN under Social and Environmental Sustainability theme).

Okumu, B N, Russell, N, Jabbar, M A, Colman, D, Mohamed Saleem, M A, and Pender, J (2004) Economic impacts of technology, population growth and soil erosion at watershed level: The case of the Ginchi in Ethiopia. *Journal of Agricultural Economics* 55(3): 503-23.

Olson, M. (1965) *The logic of collective action: public goods and the theory of groups*. Harvard University Press, Cambridge, MA. 176pp.

Ostrom, E. (1990) *Governing the commons: the evolution of institutions for collective action.* Cambridge University Press, Cambridge, UK. 280pp.

Pankhrust, R. (1969) Some historical aspects of land tenure in Ethiopia. In: *Proceedings of the seminar on agrarian reform,* held on 25th November – 5th December 1969. The Ministry of Land Reform and Administration, Addis Ababa, Ethiopia. Pp.36-49.

Pender, J. and Fafchamps, M. (2001). Land lease markets and agricultural efficiency: Theory and evidence from Ethiopia. Paper presented at the American Agric Economics Annual Meeting, 5-8 August, Chicago, USA. 50pp.

Pender, J, Place, F and Ehui, S (eds) (2006a) *Strategies for sustainable land management in the East African highlands.* International Food Policy Research Institute, Washington, D.C., USA.

Pender, J, Place, F and Ehui, S (2006b) *Strategies for sustainable land management in the East African highlands.* IFPRI Policy Brief. International Food Policy Research Institute, Washington, D.C., USA.

Pingali, P.L., Y. Bigot, and H. P. Binswanger. (1987) *Agricultural mechanization and the evolution of farming systems in Sub-Saharan Africa.* Baltimore: Johns Hopkins University Press. 216pp.

Rogers, E M. (1983). *Diffusion of innovations*, 3rd ed. Macmillan and Co., New York

Scherr, S., Bergeron, G., Pender, J., and Barbier, B. (1997) *Policies for sustainable development in fragile lands: MP-9 field research methodology*. International Food Policy Research Institute, Washington, DC., USA. Mimeo. 21pp.

Singh, I., Squire, L., and Strauss, J. (1986) *Agricultural household models: Extensions, applications, and policy.* Johns Hopkins University Press, Baltimore. 335pp.

Steinfeld, H., Haan, C., and Blackburn, H. (1998) Livestock and the environment: Issues and options. In: Lutz E. (ed) *Agriculture and the environment : Perspectives on sustainable rural development*. The World Bank, Washington DC., USA. Pp.283-301.

Stoorvogel, J. J., Smaling, E. M., and Janssen, B. H. (1993) Calculating soil nutrient balances in Africa at different scales. *Fertilizer Research* 35(3):227-235.

Sutcliffe, J.P. (1995) Soil Conservation and Land Tenure in highland Ethiopia. *Ethiopian Journal of Development Research,* 17(1): 63-88.

Teferra, B, Ayele, G, Atnafe, Y, Jabbar, M A, and Dubale, P (2002) Nature and causes of land degradation in the Oromiya Region: A review. Livestock Policy Analysis Working Paper No. 36. International Livestock Research Institute, Nairobi, Kenya. 78pp

Teklu, T, Tadesse, B, Haile, A and Tesfaye, S. (1999) Emerging land markets in Ethiopian Highlands: A descriptive analysis. In : Proceedings of the fourth Annual Conference of the Ethiopian Society of Agricultural Economics, Addis Ababa, 23-24 November, 1999. Addis Ababa, Ethiopia. Pp.157-173.

Thirtle, C G and Ruttan, W V. (1987). *The role of demand and supply in the generation and diffusion of technical change.* Harwood Academic Publishers, London.

Tolcha, Thomas (1991) *Aspects of soil degradation and conservation measures in Agucho catchment, west Hararghe*. SCRP Research Report 19. Bern Switzerland. 125pp.

Tolina, Eyob T (2007) Agricultural development led industrialisation strategy of Ethiopia. http://www.law.drake.edu/centers/docs/intlAgLaw/tolina.pdf.

Wakjira, A, Anabe-Sakyi,C, Fininsa, C, Padilla, N and Peacocke, B. (1996). *Supporting agricultural innovation in two districts of western Hararghe*. Working document series # 52. Institute of Agricultural Research, Addis Ababa, Ethiopia. 41pp.

Weinschenk, G.. (1986). Pressure on natural resources–implications for research and policy, in Allen Maunder and U F Renborg (eds.), *Agriculture in a turbulent world economy*. Gower, London. pp. 754-67

Poverty, malnutrition, low agricultural productivity, severe land degradation, shortage of water and fuel wood are common problems in the highlands of Ethiopia. A complex set of natural, political, and socio-economic factors have been responsible for the degradation of land resources. This study was conducted to characterize the nature of land use practices, nature and extent of land degradation in the highlands, assess the causes of land use change and land degradation, identify knowledge gaps and some options about the possible pathways of overcoming the problems and improve agricultural productivity. This study shows that the perspectives of local communities and households about the dynamics of land use, management and the degradation process and possible solutions are very useful and practical contribution to the research, extension and policy making community as well as the generality of citizens in the region.

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