FARMERS PERSPECTIVE ON LAND FRAGMENTATION A CASE OF SNNP-REGION,ETHIOPIA

WONDWOSEN HAILE TESSEMA

February, 2011

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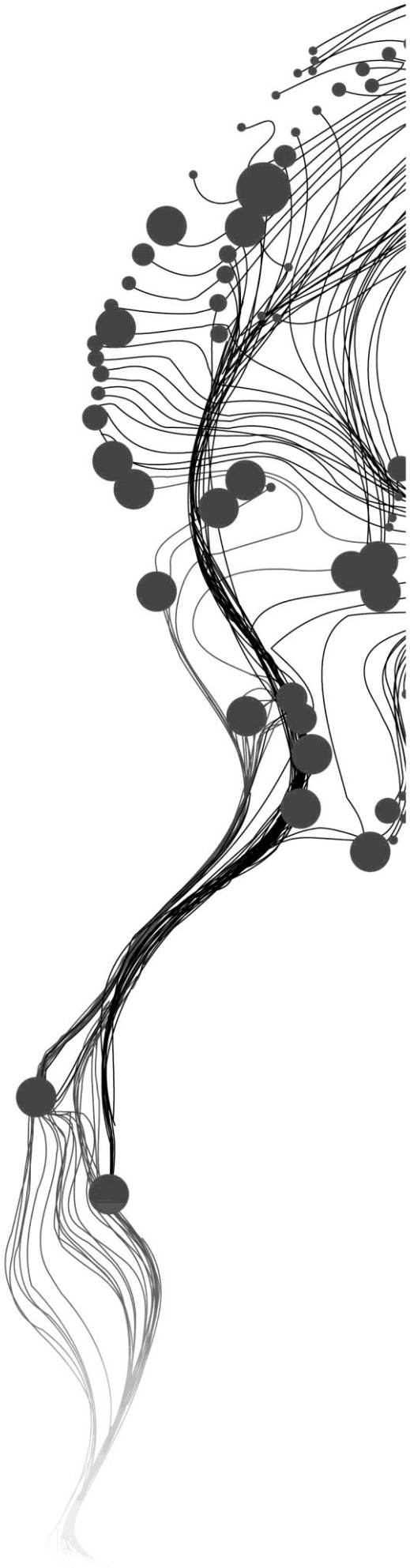

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WONDWOSEN HAILE TESSEMA

Enschede, the Netherlands, February, 2011

Thesis submitted to the Faculty of Geo-Information Science and Earth Observation of the University of Twente in partial fulfilment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation.
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…… Dedicated to my beloved father with due respect.

…. … ይህ የጥናት ሥራ መታሰቢያነቱ እጅግ በጣም ለምወደውና ለሚከብረው ለአባቴ ነው።

… … … посветен на баща ми с уважение.

ABSTRACT

Better understanding of rural land fragmentation as a process and interactions of primary land users and other stake holders is required to improve interventions that help farm households' wellbeing. Ethiopia is one of the countries in Africa with a lot of cultural and agro-ecological diversities and has adopted innovative and pro-poor land law. This research has been carried out in four villages of the SNNP-Regional state of Ethiopia with an objective of analyzing the process of land fragmentation, farmers' response to land fragmentation and their response to land policy with two sub objectives: describing the ongoing management of fragmented land holdings and the role of government policy in land management with respect to land fragmentation. The research methodology consists of literature review, case study and fieldwork, Individual interview, group discussion, field observation and documentary analysis.

The findings of the research show that most of the farm parcels in the study area are suitable for homestead agriculture because most farmers settled in the high land and undulating areas. Farmers in the study area are managing their fragmented land holdings with indigenous knowledge of physical and biological conservation methods supported with modern techniques by the extension program of the regional government. The government policy is focusing on rural land registration and certification. Establishing of commercial agriculture on unoccupied savannah lands and labour intensive manufacturing industry are also policy focus areas which will lead to an environment conducive to gradual shift in labour from rural to urban and eventually to a shift from small hold agriculture economy to large scale agriculture.

The following conclusions are drawn from the research work (i) The land management practices of the farmers are remarkable and indicating that with best management even small farms can survive.(ii)There is a high level of awareness of the importance of soil conservation measures on fragmented land holdings ,because it has always been part of their traditional farming system and also because of positive effects of the extension policy of the government.(iii)The certification program has been well accepted in the study area since the state ownership was also for the smallholder farmers sufficient tenure security as most received the land from the state in the agrarian reform of the former government. However geo-referenced mapping using hand held GPS receiver of low accuracy for boundary surveying at the current situation of fragmented nature of land holdings has to be revised. It might be a waste of resources to map all those numerous parcels which are going through high transaction rate of use right without having established a database management system that could be sustained.

Key words: ***land fragmentation, land use, land policy, land reform, land distribution, land tenure, tenure security,***

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Wondwosen.H.Tessema
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ACRONYMS

CSA	Central Statistic Agency
ELTAP	Ethiopian Land Tenure Administration Program
FAO	Food and Agricultural Organization
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
GPS	Global Positioning System
HH	Household
LF	Land Fragmentation
LEPA	Land and Environmental Protection Authority
MoARD	Ministry of Agriculture and Rural Development
RBoARD	Regional Bureau of Agriculture and Rural Development
RBoFED	Regional Bureau of Finance and Rural Development
SF	Soil Fertility
SNNPRS	South Nation Nationalities and people Regional State
UN/ECE	United Nations/Economic Commission of Europe
UNDP	United nation Development Program
USAID	United States Agency for International Development

1. INTRODUCTION

1.1. Background

Ethiopia is one of the countries in Africa with a lot of cultural and agro-ecological diversities and has adopted an innovative and pro-poor land law. It has a population of 73.9 million of which 83.9 percent lives in rural areas and the population grows at a rate of 2.6 percent annually (Central-Statistics-Agency, 2008) Agriculture is the backbone of the country's economy. Agriculture accounts for 46 %of its GDP and 90% of its export earnings and employs 85 5 %of the country's labour force and 70 % of the raw material requirement of agro-based domestic industries(UNDP, 2002).

Land is a fundamental asset for economic development, food security and poverty reduction in sub Saharan Africa and has a crucial importance to the economies and societies of the region contributing a major share of GDP and employment and constituting the main livelihood basis for a large portion of the population (Cotula, 2004).Likewise land is a vital asset for a country like Ethiopia where the country's economy is based on agriculture; where the opportunities for non-farm means of livelihood are limited and where land is considered as a significant and valuable means of livelihood and reflective of both symbolic and relating to interaction of people and material aspects by the local people (Lyous, 2001)
However, land was the point of controversy and political grievances during the past regimes and tenure insecurity was high in the country. The 1995 federal constitution of the country which is about property rights provides that the right to ownership of rural land and urban land as well as of all natural resources is exclusively vested in the state and in the peoples of Ethiopia. Land is stated as a common property and shall not be subject to sale or other means of exchange and it also states that Ethiopian peasants have right to obtain land without payment and have the protection against eviction from their possession (FDRE, 1995)

The government is the owner of land according to the constitution. Hence the Federal Democratic Republic of Ethiopia passed the rural Land Administration Proclamation of 1997 to the regional governments that provide power to enact laws to administer land. Following the enactment of the federal constitution and land policy, land has become a high profile issue in the country and rural land policy has remained one of the sources of discussion and focus of debate among academicians, politicians and other concerned parties in the country. In this regard, the rural land tenure system which is based on fragmented nature of land holdings and land rights security have taken seriously as one of the most debatable issues. Land fragmentation has become a continuous phenomenon in the country, since the land reform of the former government as most received the land from the state in the agrarian reform.

1.2. Problem Statement

A good understanding of the process of land fragmentation helps to choose the best interventions that intend to improve farm households' wellbeing .Little empirical research has been done on land fragmentation as a process and its relative importance. Depending on the nature of fragmented land hidings different approaches are required for the management of household land plots. Without understanding the realities on the ground there remain possibilities of missing out important developments. (McPherson, 1983) reviews the adverse and beneficial effects of land fragmentation in a renowned paper "land fragmentation in agriculture: Adverse? Beneficial? And for whom" Fragmented nature of land holdings associated with land tenure is an issue of central political and economic

importance as they have been at several junctures in Ethiopians' history. The life of the majority in the country depends on smallholder agriculture

Better understanding of rural land fragmentation as a process and interactions of primary land users and other stake holders is required to improve any interventions that help farm households' wellbeing. Ethiopia is one of the countries in Africa with a lot of cultural and agro-ecological diversities and has recently adopted innovative and pro-poor land law.

This paper intends to study systematically the positive and negative aspects of land fragmentation and examines the ongoing management of farmers' fragmented land holdings from the perspective of the farmers and the state at village and house hold level a case of South, Nation, Nationalities and people Regional state (SNNPRS) of Ethiopia. The paper is organized as follows: Literature review section briefly reviews available studies on the concept of land fragmentation and the origins and causes of land fragmentation in various countries. In method section, an analytical framework is derived that will form the basis for the empirical analyses. The results are presented and discussed in Analysis section. The paper ends with summary, conclusion and recommendations.

1.3. Research Objectives

1.3.1. Main Objective

- To analyze the process of land fragmentation, farmers' response to land fragmentation and their response to the land policy

1.3.2. Sub Objectives

- To describe the on-going management of farmers' fragmented land holdings
- To describe the role of government policies and regulations in land management with respect to land fragmentation

1.4. Research Questions

1.4.1. Main Question

- What effect does Land Fragmentation have on Farmers livelihood?

1.4.2. Sub Questions

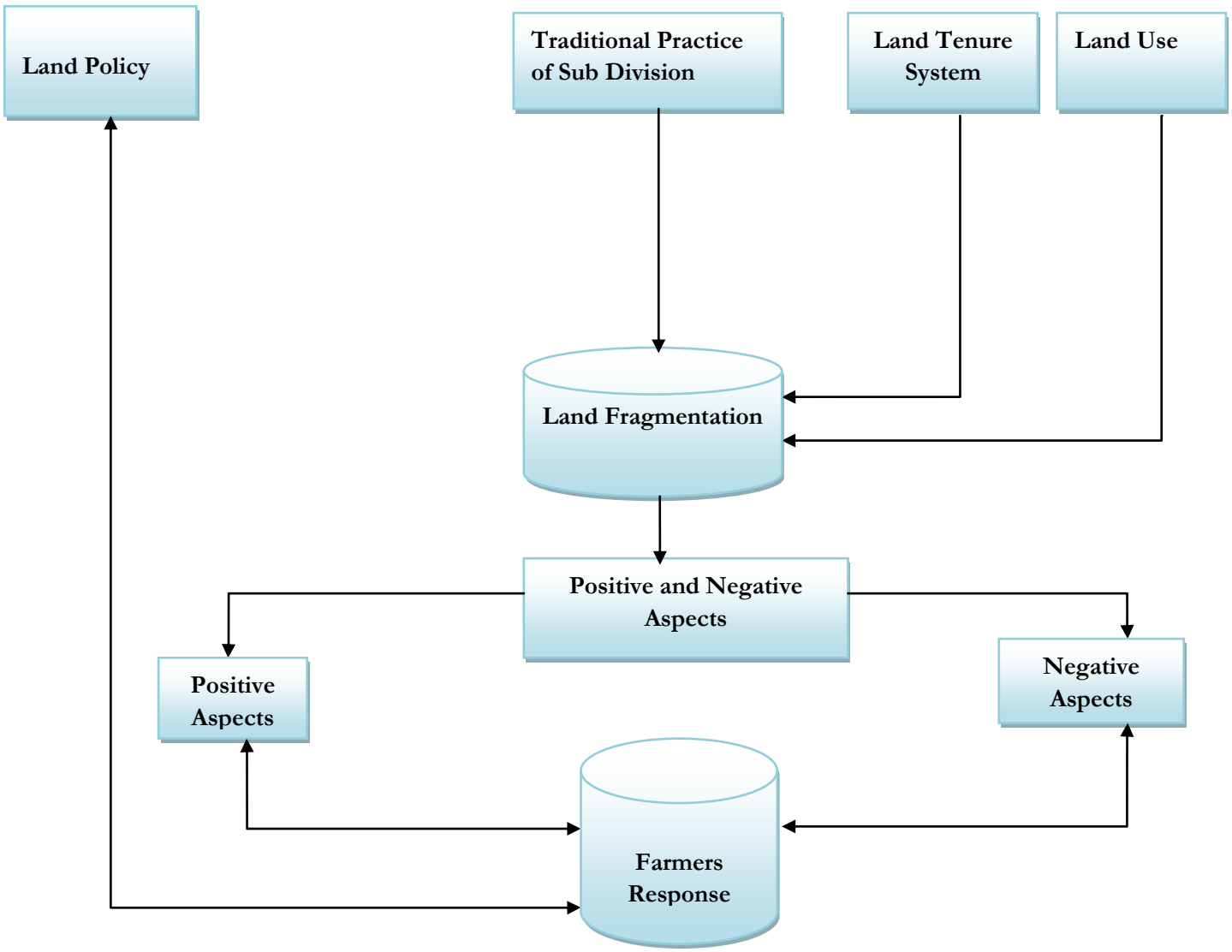
Table 1-1: Sub objectives and sub questions

Sub Objectives	Sub Questions
I. To describe the ongoing management of farmers' fragmented land holdings.	1. What are the driving forces of land fragmentation? 2.What are the positive and negative aspects of rural land fragmentation 3. How do farmers manage fragmented land holdings?
II. To describe the role of government policies and regulations in land management with respect to land fragmentation	4. What does the law provides? 5. Does land administration facilitate access to land? 6. Do farmers manage their land in compliance with the law?

1.5. Conceptual Framework

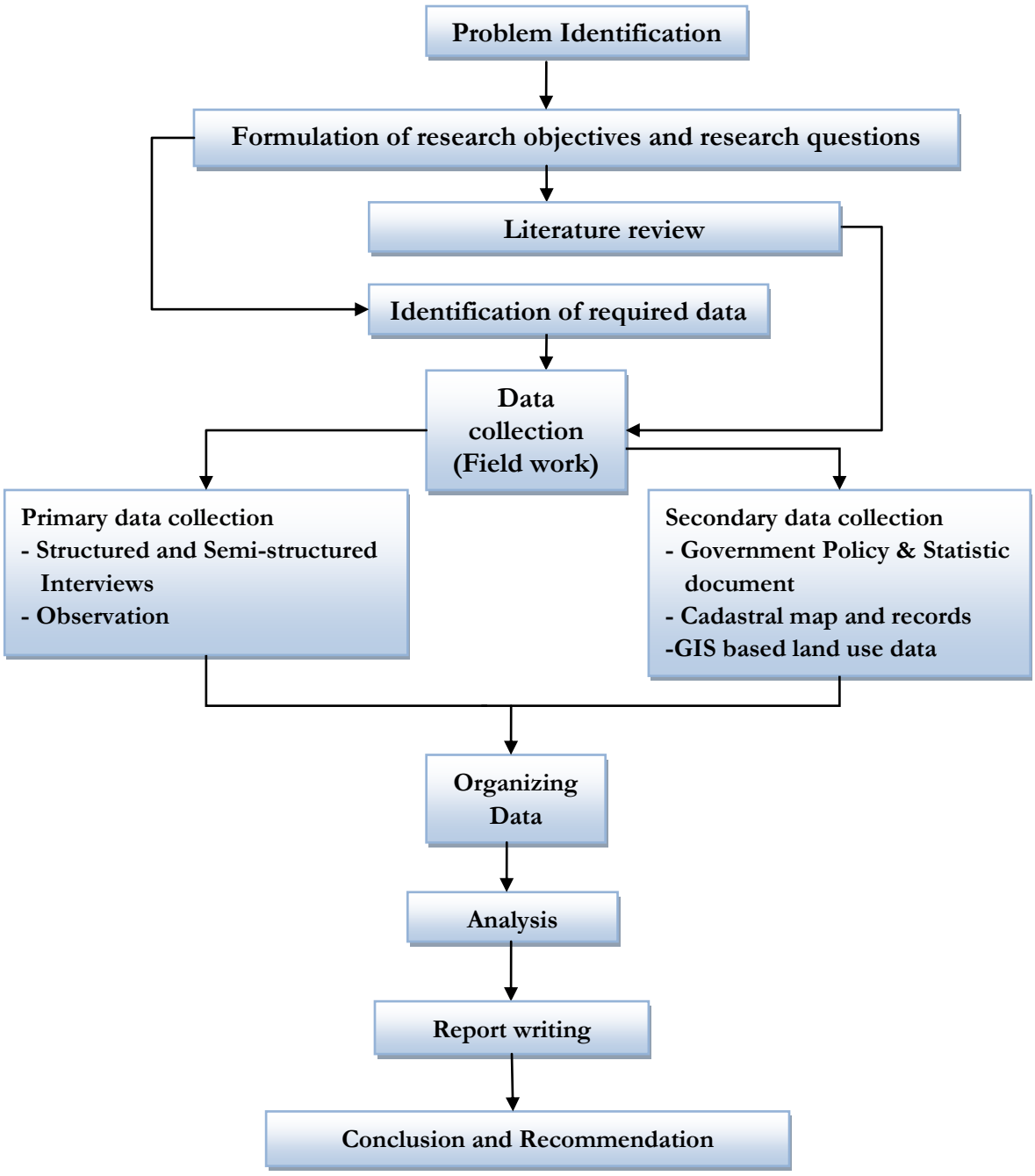
The general conceptual framework of this study constructed on the idea of the positive and negative aspects of land fragmentation, and its driving forces, within farmers perspectives. It also focuses on farmers' interactions and role in the process of land fragmentation, the role of the government, community or village leaders in the process. Figure 1.1 shows the relationship of the concepts used in this research.

Figure 1-1: Conceptual framework



1.6. Research Design

Figure 1-2: Research Design



1.7. Limitation of the Study

Like any other research work this study was not free of limitation, Because of time constraint the research was limited to certain sample areas and sample respondents. The limitation also includes lack of consistent and relevant data. Both are capable of limiting the findings of this study to some extent.

1.8. Thesis Structure

The thesis has been structured in six chapters and the outline of each chapter is mentioned below. The introductory chapter consists of background of the study and the problem statement. It also includes the research problem, research objectives, research questions, conceptual framework, research design and limitation of the study. The second chapter deals with the concepts and theories of land fragmentation based on literatures relevant to the study relating it to land tenure and land use also the effects and the driving forces of land fragmentation. The third chapter presents a detailed account to the methods carried out to accomplish the research task, including the research techniques, data acquisition methods and method of data analysis. Chapter four presents a brief introduction and background of the study area of SNNP-Regional state including profile of four sub districts. Chapter five presents analysis of the research on the effects of land fragmentation by examining the role of the primary land users and the government policy in the process of land fragmentation and its management aspect and finally chapter six ends with summary, conclusion and recommendation based on the result

2. LITERATURE REVIEW

2.1. Theoretical Studies

2.1.1. Definition of Land Fragmentation

Farmland fragmentation has been defined in different ways. Some studies divided the various definitions in to two distinct senses: subdivision of farm property into undersized units too small for rational exploitation; and the excessive separation and dispersion of the parcels forming parts of single farm(R. L. King, S. Burton, 1981). Both are normally termed as morcellment and parcellement respectively. Fragmentation thus relates into two problems: farm size (in terms of land area) and concentration of parcels.

Because of the deeply rooted tradition of dividing landholdings among household heirs, in developing countries, land parcels of different quality are equally divided among the eligible heirs when they decide to live separately. This leads not only to reduced landholding size, but also increased dispersion of land parcels. In most instances, each small holding is fragmented into several tiny parcels scattered over a wide area, with varying distance from the farmhouse, which hampers agricultural development in several ways.

When farm plots are fragmented, the increased cost of use not only can undermine operational efficiency, but also leads to unsuitable land use because farmers are compelled to adopt selective and extractive strategies. "From the farmers' perspective, dispersion of land parcels is more problematic than small holdings, as it contributes to depletion of soil fertility as well as weakening economic competitiveness of farmers through increased of cost of labor and other inputs, leading to reduced net income" (Paudel, 2001). Both reduced soil fertility and net income are symptoms of land degradation. In particular, land degradation related to soil fertility reduction has affected nearly 2 billion hectares of land worldwide, damaging the livelihood of up to one billion people (UNDP,2004)Land degradation directly consumes the product of labour, and also consumes capital inputs into production (Brookfield, 1987).

According to Terry Van Dijk the definition of land fragmentation is different depending on various aspects .In aspect of land tenure, land fragmentation is meant for number of land ownership or number of separated land parcels. Fragmentation of land generally refers to (i) the parcelling or (ii) the legal claims on land (tenure).The parcelling is a physical characteristics, and aspect that people can see, In the landscape, hedges, ditches, fences or adjacent crops mark the boundaries of the physical units in which land use is structured. The legal claims are an invisible layer consisting of the ownership and tenancy rights that are established on a parcel. The visible and invisible parcelling largely coincide in a region where owners-user dominate, but they theoretically can be totally different .So, land can be viewed a physical and a legal inclination. (Dijk, 2003)

2.1.2. Kinds of Fragmentation

Ownership Fragmentation

Ownership fragmentation was a popular way of painting a picture of central European Agriculture in the early 1990 s. (Dijk, 2003). But ownership alone does not give a complete image of fragmentation, because that do not always correspond with the functional parcelling of the landscape .The actual use of Agricultural land may be quite consolidated through tenancy.

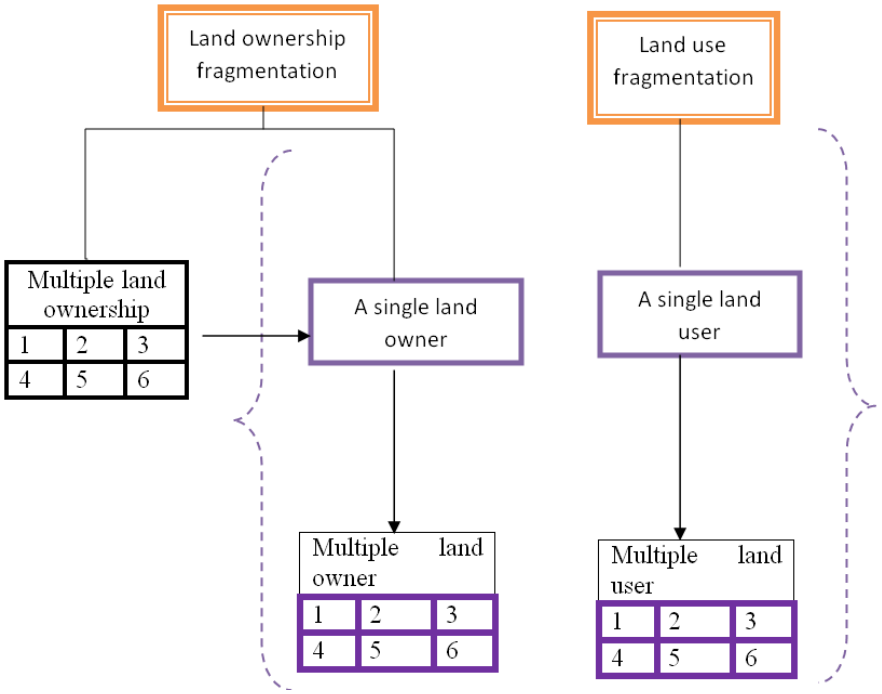
Land Use Fragmentation

Besides fragmentation of ownership, the number of users (or the size of use units) is a second type of fragmentation .The use situation is visible in the landscape . The overlap between these land users and land owners represents owners that at same time are users .i.e. the share of owners that are using their land themselves.

Internal Fragmentation

A third type of fragmentation is the number of parcels exploited by each users .This is the fragmentation with in a farm .Internal fragmentation has traditionally been the main subject of western land consolidation experts who tried to demonstrate the importance of land consolidation .Internal fragmentation is not only considers (1) parcel size, but (2) parcel shape and (3) parcel distance as well. Decreasing the distance of parcels to the farm saves time .a better parcel shape raises yields and increased parcel size both saves time and raises yields.(Dijk, 2003). In figure 2.2 below we can see six parcels which can be owned by one or more land owners. From practical point of view, these six land parcels may be farmed as one large scale or two to six fragmented farms .Land use fragmentation is one which can have effect on agriculture production directly. Figure 2.1 illustrates land use and ownership fragmentation

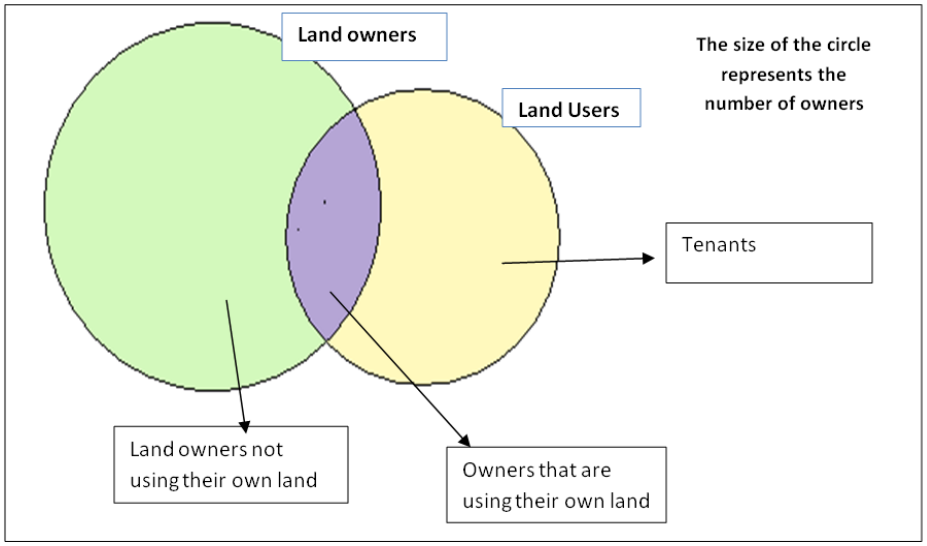
Figure 2-1: Ownership and land use fragmentation



2.1.3. Measurement of Land Fragmentation

Despite being a common phenomenon, measures of land fragmentation are diverse. In the past, many ways were used to measure land fragmentation. According to the measures, the extent of land fragmentation varies greatly across countries. Generally, a distinction can be made between single dimension indicators and integrated indicators. Single dimension land fragmentation indicators are used in many studies. For example, (Rembold, 2001)uses three single indicators: (1) the number of land owners per country (or region); (2) the number of users per country (or region); and (3) the overlap of these two. The area within the circles represents the number of owners and users. Shrinking of the circles and/or increase in overlap means reduction of fragmentation.(See figure 2-1 below)

Figure 2-2: Rembold's approach to measuring land fragmentation



Rembold's approach to measuring land fragmentation

2.2. Local Empirical Studies

Although land fragmentation may have different meanings in different countries or regions, it covers two main aspects: (1) it refers to the spatial dispersion of farmers' plots over a wide area; and (2) it implies the subdivision of farm property into smaller units. Such subdivision into small units may however be beneficial to farmers in certain circumstances (if markets for insurance, agricultural labour and so on are missing) and at certain points in time (depending on the technology level and institutional arrangements). Land fragmentation is not a new phenomenon in Ethiopia. However, a fragmented land holding causes land degradation if the land is poorly managed. The demographic and socio economic characteristics of rural households affect their capabilities to implement environmentally feasible conservation measure. These situations include farm practices and attitude towards rational use of resources (Tedla, 2003). The Demographic and socio-economic situations of farmers have an insightful effect on perception on the degree of environmental degradation and their response to the application of various conservation techniques. (Aredo, 1996))

Regarding to the response of farmers towards the impact of demographic and socio-economic characters tics on environmental degradation; many researchers at global scale and to some extent at national level have studied in different environmental issues. Farmers Perception of soil erosion problems and their attitude towards soil conservation showed that higher experience of farming is positively correlated with higher degree of farmer's knowledge about the soil erosion processes and associated problems (Shikur, 1993).Regarding to the perception of male and female; (Doss, 2001) confirmed that women farmers tend to adopt improved technologies at lower rate than men farmers because of limited access to information and resources. Many different studies ((Barrow, 1995), (Tedla, 2003) and (Arega, 2004)) showed that, farmers with relatively higher educational levels are have better understanding and response to environmental degradation .In Ethiopia, the ratio of people per hectare of land under cultivation as of 1998 was about 0.14 hectare. This means a family with seven members has only a hectare of land (Worku, 1998). Hence, pressure on land at household level has been increasing as long as the population growth is there. Studies have shown that households with small holdings are more likely to apply conservation measures than households with large holdings (Shikur, 1993).

According to (Shewarega, 2002) know-how about the effect of population on agricultural land shows higher percentage (87.6 percent) among farmers who have large farm size than farmers with small farm size (82 percent). However it has not shown any statistical significant differences as far as farm size concerned. Another studies indicated that farmers with small farm size make an effort to utilize their limited resources more efficiently and thus adopt new technologies at faster rate than those farmers who have large farm size (Allaudin, 1988),(George, 1990) and (Shewarega, 2002).

Other similar studies (Endrias Geta, 2005) indicated that a large family size, implying available of labour for different farm activities which means that a household with large family size is expected to implement wide range of conservation techniques compared to house hold with small family size. Others correlate household income positively and argued that households with relatively high income are even risk takers to implement new technique than households with low income (Lars, 2002).

Other studies (Endrias Geta, 2005)showed that the higher the frequency of extension contact the more likely a farmer will receive valuable information about the adoption of new techniques for land management. Moreover, the extension activities should give more attention to farmers with small farm size than farmers with relatively large farm size and the extension coverage should be widened by establishing additional development centers and increasing the number of extension workers .(Neka, 1992)also noted that farmers who had contact with conservation agents had a significant association with farmer's best practices in the management of their fragmented land holdings in particular and the environment in general.

2.3. Positive and Negative Aspects of Land Fragmentation

2.3.1. Positive Aspect of Land Fragmentation

There are some advantages of land fragmentation that have to be mentioned. According to (Melmed-Sanjak, 1998) the advantages of fragmentation are related to the ability of farmers to disperse risk by cultivating a diverse variety of crops on numerous plots, each with diverse characteristics. High production diversification in Ethiopia is possible due to the wide variety of microclimates and just because of these variations the farmers may gain benefits. The debate on why land fragmentation is persistent and widespread in rural societies focuses on the trade-off of its benefits and costs for the individual farmer or the society as a whole. The presence of social costs and benefits suggests that the optimal level of fragmentation for private farmers may not be the same as the social optimum.

McPherson (1983) reviews the adverse and beneficial effects of land fragmentation in a renowned paper "Land fragmentation in agriculture: adverse? Beneficial? and for whom?". He distinguishes two reasons why farmers prefer to fragment their plots: to reduce the risk through the spatial diversification of activities and to have access to land with different quality. Bentley (1987) supports this viewpoint. He claims that fragmentation allows farms with scattered plots to benefit from risk management through the use of multiple ecozones and the practice of crop scheduling. Farmers cannot only plant more diverse crops, but also grow the same crop on several different plots. Thus, fragmentation enables farmers to disperse and reduce risk by using a variety of soils and other micro-climatic and micro environmental variations. Fragmentation also makes it possible for farmers to grow a variety of crops that mature and ripen at different times, so that they can concentrate their labour on different plots at different times, thereby avoiding household labour bottlenecks.

It may be noted that the argumentation provided by McPherson (1983) and Bentley (1987) is very similar to the demand-side explanation of land fragmentation discussed in chapter 2.3. Private benefits are the basis for the demand-side explanation. In addition to private gains, fragmentation may offer social

benefits. Fragmentation induced by land distribution during land reform in many countries (Bulgaria, Vietnam and China, for example) realized a high degree of equity among smallholders and contributed to a high degree of national food self-sufficiency.

(Dijk, 2003) also argues that the positive sides of land fragmentation are that for the ecological value of the landscape, as well as its scenic beauty, the benefits of fragmentation are obvious and generally acknowledged; It can also be a benefit for farmers. Arable farming enterprises are helped by some dispersion of parcels because it reduces risks. Especially arable crops like grains and soft fruits can be destroyed in a short time by climatic events .Due to unexpected or extreme variations in temperature or precipitation the work and input investments of a whole growing season can be erased. Hailstorms, drought, flooding or are known to be destructive. Diseases can strike equally local and disastrous

When one farm is divided into a number of parcels that differs in topology, it is to be expected that the risk of disasters also varies; the chance that a hailstorm or disease will destroy the entire crop in one growing season is small in a fragmented situation. Also in mixed farming and the dairy sector a number of activities need spatial separation .For mixed farming, separate parcels are used for crops and for cattle. Simply because these forms of land use cannot both take place on the same parcel. These different activities need different conditions .For mixed farming this applies to the moisture of the soil. Hilly and mountainous areas will result in a strong segregation of activities .Fodder crops will be best suited for the moist valleys, arable crops against fertile slops and animal grazing will be found on the higher ground .For dairy it mostly depends on where it is situated relative to the farm itself. The spatial spreading is not a prerequisite, but when present it can be fitted into the farming system. (Dijk, 2003)

2.3.2. Negative Aspect of Land Fragmentation

"In the small-scale private agricultural sector, the most common and frequently cited disadvantages of fragmentation include increased labor costs, increased transportation time and cost, land lost to border markings and access roads, and difficulty in accessing the parcels" (Melmed-Sanjak, 1998). Fragmentation may also affect the access to irrigation networks as well as inefficient use of modern agricultural technologies which on long run may cause less efficient production.

Ownership fragmentation is not a problem in itself .The land registry might experience some practical complication ,for instance when the law requires even very tiny ownership parcels to be physically marked in the field ,but they are not of direct societal importance.(Dijk, 2003)

Disadvantage of fragmented ownership are indirect, since they trigger a gap between ownership and use of land. According to (Dijk, 2003)Fragmentation in terms of small use units decreases the income that the farmer can make with his land .The size of a land-use unit restricts the maximum volume of produce that the unit generates, which in turn limits the income of the farmer .This limitation to the income is obviously a disadvantage to the farmer himself ,although he may have the possibility to choose for more intensive land use (like labor intensive crops) or additional off-farm income. Regardless of the limited farm production, in case each farm is physically separated from others by fences, ditches or hedgerows, these elements, together with infrastructure amount to a loss of productive land. However the loss of land by fence can be compensated through growing fodder crops on the ditches .Selected life fences also can make the land productive.

The disadvantages of internal fragmentation were highlighted in the western European large-scale campaigns on fragmentation reduction. The total length of parcel borders increases with fragmentation .Apart from the land loss by separating elements ,parcel borders generally receive less fertilizer and pesticides and they are more susceptible to wind damage and drought. When parcels are far apart, the time

and fuel involved in travelling is another disadvantage .Parcels at greater distance are generally cultivated less intensively.

The negative effects of land fragmentation in terms of separation of ownership and use mainly arise from the lack of sufficient investment in land. Investments like drainage, irrigation or soil improvement pay back over long periods of time. Tenancy may give too little security to allow such expenditure. Moreover, the essential loans for making investments in the first place cannot be obtained without suitable collateral. Production will fall below its optimal level (Niroula & Thapa, 2005). Low average farm size of cultivated land alone does not produce enough to earn a living. In certain regions, off-farm income can supplement the revenues from the farm, thus overcoming the farm-size restriction.

Land fragmentation causes both positive and negative effects on agricultural production. Literature studies also show the constraints imposed by land fragmentation on productivity and efficiency in agriculture are mixed and inconclusive .For example (Blaikie, 2000) highlight that land fragmentation is becoming a critical constraint in increasing productivity in Nepal ,India and other nearby regions .In contrast ,farmers in the highly land fragmented regions of Malaysia and Philippines do not consider it as a problem in Paddy farming (Hooi,1978,Wong and Geronimo, 1983;cited in Niroula and Thapa,2005). Because the large number of farmer and the tradition production method are suitable to small sized land parcels.

In case of China,(Wu, 2005)concluded that land fragmentation does not have any significant impact on productivity ,where as Wan and Cheng (2001)conclude that land fragmentation reduces productivity. Similar contrasting arguments exist on the effects of land fragmentation reduces on efficiency. For example,(Schultz, 1953)views land fragmentation as the misallocation of the existing stock of agricultural land ,implying it as a source of inefficiency. (Dovring, 1960) identifies distance between parcels as the main source of inefficiency created by land fragmentation. Recent studies (Sherlund, 2002) and (Tan, 2005)conclude that the increase in the number of plots has a positive relation with technical efficiency in rice production in Cote d'Ivoire and China. Whereas (Parikh, 1994)and Wadud and White (2000) report that land fragmentation reduces efficiency in rice production in Pakistan and Bangladish respectively (Rahman & Rahman, 2009)

2.4. The driving Forces of Land Fragmentation

Various studies have examined land fragmentation in different countries and regions. The causes of farm fragmentation listed in the literature can be divided into two broad categories. The first regarded fragmentation as a result of exogenous or so-called supply side factors. Apart from the natural restriction, other factors include (Arsalanbod, 2000) partial inheritance system or population pressure; (Binns, 1950) significant imperfections in the land market; and (3) the breakdown of common property system under the pressure of population growth. It is also logical to argue that partial inheritance leads to land fragmentation when land with similar quality is equally divided by heirs.

While the land fragmentation in the case of existing incentive for consolidation was explained as imperfection of the land market by many authors(Lipton, 1968),the breakdown of common property systems in some African countries due to the pressure of population growth was studied by some researchers (Dahlman, 1980),(R. King, 1977).Others argued that supply side explanations were not sufficient to explain fragmentation in many areas in which land fragmentation was not related to above factors. They argued that land fragmentation was a result of rational economic decision (Blarel, 1992),(Johnson, 1970), It assumed that private benefits of fragmentation exceeded its private costs, and the benefits mainly came from the risk reduction of fragmentation. Firstly, land fragmentation may be a perfect logical and sound response to soil and crop variations .Small field tends to lessen the damage of

soil erosion and protect crops in a severe climatic condition. Since crops have distinctive growth requirements, a diversification in agricultural production caused by land fragmentation may reduce risk in total agricultural production. Secondly, land fragmentation may be suitable for certain technological and natural conditions. Thirdly, the scattering land reduces the risk of total loss from drought, flood, fire and other natural disasters and price uncertainty and other changes in economic environment, by diversifying cropping mixtures across different growing conditions. This is particularly true when risk-spreading mechanisms, such as insurance, storage or credit, are not well developed.

Other studies indicated that high transaction costs in labour markets and failures in commodity market were also responsible for the land fragmentation. An attempt was made to explain the land fragmentation in Medieval England, and argued that when transaction costs in labour markets is high, the fragmented land enabled farmers to better fulfil their seasonal labour requirements and consequently to get high output (Fenoaltea, 1976). Some studies presented a model of land fragmentation in the case of lacking commodity market.

Landholdings and land parcels are undergoing fragmentation due to several socioeconomic and biophysical factors. Population growth is certainly one of the main factors. Particularly the problem of land-parcel fragmentation emanating from steadily growing population has been reinforced by the tradition of land inheritance.

2.5. Land Fragmentation in SNNP-Regional State

Fragmented nature of land holdings is a widespread phenomenon in the rural areas of the SNNP-Regional state of Ethiopia. Land fragmentation is a phenomenon of agricultural land distributed in small size holdings as well as holdings that consist of non-contiguous and spatially dispersed plots of land. In the region both types of fragmentation exist. Farmers are operating on smallholdings which are composed of numerous, spatially dispersed parcels. The process of traditional rural land sub division might be influenced by land policy and land tenure system of the country. Following the tenurial reform proclamation in the region, Rural Land registration program started in a pilot phase in 11 sub districts and later scaled up to cover all the rural areas of the SNNP-Region. The number of rural households is estimated to be 3 million in the regional state and the average number of parcels owned by each house hold is estimated to be 3 and the total number of land parcels is 9 million out of which 4.5 million parcels are registered and certified. The 1975 radical land reform has brought to an end the exploitative type of relationship that existed between tenants and landlords and as a result tenants became own operators with use rights, but with no rights to sell and mortgage.

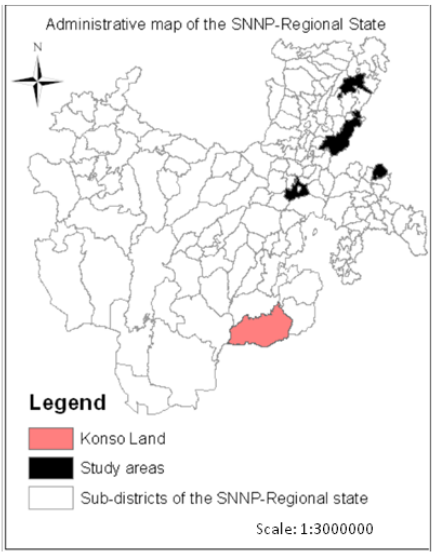
The change of government in 1991 has brought not much change in terms of land policy. The Current government that overthrew the Military government in 1991 has inherited the land policy of its predecessor. Even though the new government adopted a free market economic policy, it has decided to maintain land property under public and state ownership. The December 1994 Constitution of the Federal Democratic Republic of Ethiopia proclaimed that Land is a common property of the nations, nationalities and peoples of Ethiopia and shall not be subject to sale or to other similar means of transfer.(FDRE, 1997). It is assumed that rural land plays a social security role in terms of guarantying some sort of livelihood through granting free access to land.. Ethiopian policy makers voted for a constitution in 1994 that grants free access to land to every rural resident who wants to farm and earn income from farming.

Access to land is an important issue for the majority of Ethiopian people who, one way or the other, depend on agricultural production for their income and subsistence. Fragmented nature of land holdings associated with land tenure is an issue of central political and economic importance, as they have been at several junctures in Ethiopia's history.

2.6. Traditional Land Management in SNNP-Regional State

Since Konsos's traditional land management is considered to be model in the SNNP-Regional state in particular and in the whole country in general. It is able to represent the regional traditional land management and has significant importance to mention it for this research work to make use of it for comparative analysis in the land management aspect .The FAO has awarded the konso's community in the recognition of their agricultural system as an example for farming peoples elsewhere in the country to follow.

Figure 2-3: Map of Konso land



Of the nine regions which make up the Federal Democratic Republic of Ethiopia today, the Southern Nations, Nationalities and Peoples Regional State (SNNPRS) is far the most culturally diverse, comprising a tribal matrix of 56 different ethno-linguistic groups. One of them is the Konso, occupying a relatively small area of 650km2 in the highlands of Konso. The highlands of Konso run across the Rift Valley, bordered by the Sagan River in the east and south, the great plains of Gomida and Lake Chamo in the north and the Gidole Mountains and the Woito Valley in the west

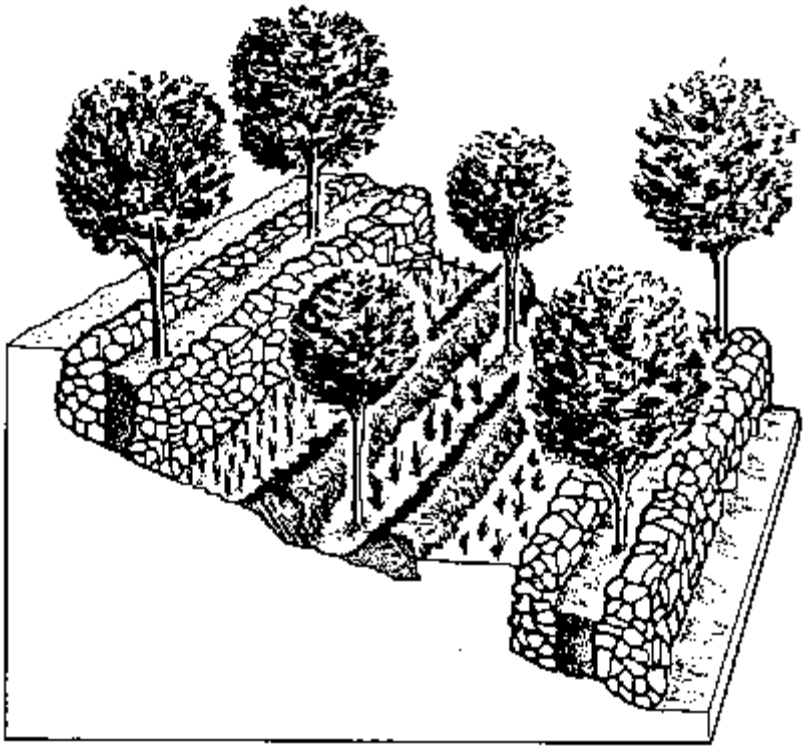
Of all the peoples in that ethnic tapestry, perhaps most remarkable are the Konso people; an industrious farming culture who populate a barren and rugged basalt outcrop, strung from east to west across the bowl of the Great Rift Valley, just parallel to the southern tip of the Ethiopian highlands. Surrounded by warlike nomads on three sides, the Konso are a notoriously hardy farming people and their lives are governed by a deep, draconian and quite unique social order (BoARD 2008)

Konso land is poor quality and is cut up by deep eroded gullies and canyons. Rain is unreliable, increasingly so in recent years. These harsh conditions have bred what some call 'the toughest farmers in Africa'. Tough, they certainly are. And the Konso are very good farmers. "The major economic base is agriculture (80%) and 20% only is butchery, weaving, pottery, black smithery, petty local brewery trades, tannery and local carpentry." (BoARD 2000) The most notable feature their renowned agricultural system is its terracing, constructed over large tracts of the rugged landscape by centuries of communal labour. The terraces reduce erosion and are carefully crafted to balance the competing demands of maximizing water infiltration, with allowing adequate drainage so that the terraces do not collapse in times of heavy rain.
The terraces are planted with sorghum and intercropped with a range of species; including trees, most importantly Moringa oleifera which is locally known as the cabbage tree (See figure 2-4 below). Terminalia

birowni, and Cordia Africana also grown for timber. Shrubs such as pigeon pea, coffee and chat and annual crops including, sunflower, maize, millet, chick peas, various beans, cotton and cassava are also among the crops mainly grown. They are fertilised with wastes from the villages, including partially burned plant residues mixed with animal dung, which acts to keep the soil fertile

The Konso people are more focusing on intercropping and agro-forestry systems because some crops are early maturing, some are drought resistant, and some are much productive even if they are less drought resistant to stand against side effects of inter-cropping systems. Konso folk have been taken to other areas of the country to train locals in dry-land agriculture. Konso's terracing is now due for designation as a UNESCO World Heritage Site.

Figure 2-4: Traditional Konso land management



Source (BoARD 2008)

The Konso of south of the region have developed a complex and sophisticated form of agriculture which has allowed them to subsist in a mountainous area with fragile soils and an irregular rainfall. Their farming is based on an elaborate system of terracing, a variety of soil and water management practices, and the integration of livestock and forestry with the rest of their agriculture. Their terraces are built with stone walls to hold the soil in place and protect it from erosion until the crop roots are sufficiently established to take over. (See figure 2-4 above) The terraces are often irrigated from collecting basins and by diverting runoff water from paths and roads. On flatter land, the fields are formed into basins with rectangular ridges on an approximate two by four metre grid. Crop stubble covers the ridges as a protection measure while crops are planted in the basins where water accumulates.

The cabbage tree (*Moringa stenopetala*), from which young green leaves are collected as a vegetable, is planted together with fruit trees in the cropped fields, with increasing densities on the wetter sites. On

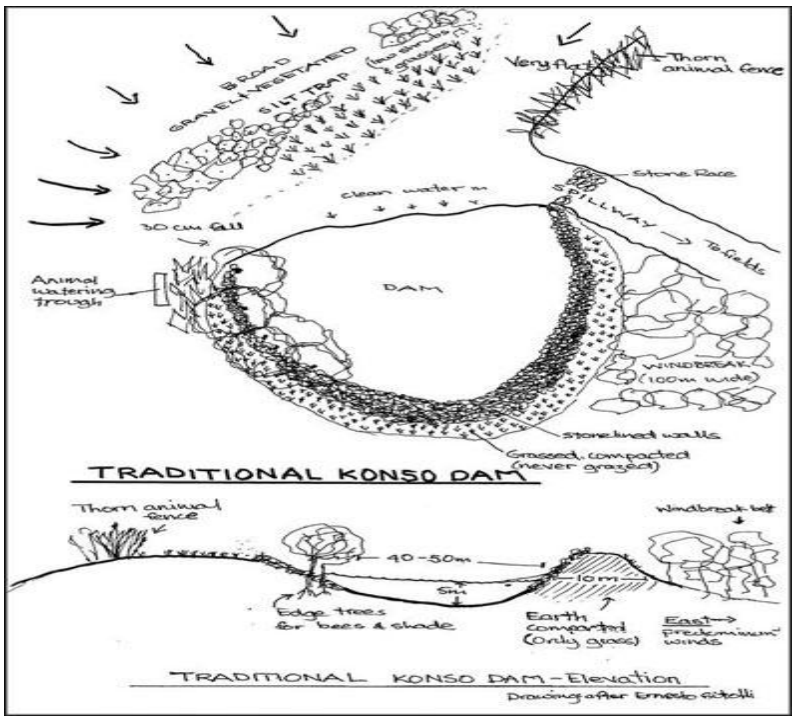
steeper slopes, terrace walls are made from double layers of rock, and the space between them is filled with soil and planted with leguminous crops.

Over many generations the Konso have thus developed an elaborate conservation system which includes:

- A range of effective conservation practices such as manuring, mulching, use of trash lines (contour lines of crop residue) and fallows;
- A complex cropping system which includes the use of a wide range of leguminous and non-leguminous plants and trees; and
- A flexible system of land use which can cope with harsh climatic conditions and erratic rainfall. Elaborate terracing systems developed by the Konso are backed up by extensive manuring, mulching and fallow practices.

On-farm water harvesting practices using ridges and small dams (figure 2-5) are also part of konsos' traditional farming system. Some farm ponds took a hundred years to build and were well maintained until recent time: Custom forbade growing large trees on the harta wall, nor was animals allowed to drink or graze around it. In this way the structural and water integrity were maintained.
The dams were normally placed at the end of a ridge or high on the land to give control of water distribution to all the fields below it through a series of channels when the pond overflowed.

Figure 2-5: Traditional konso dam



Source :(BoARD 2009)

The Konso people are outstanding in working with water and stone. For more than six hundred years they have built subtle water systems which snake across the landscape and deliver water to fields considerable distances away, without flooding or eroding the land. All the land works are essentially designed through indigenous knowledge of contours.

This Konso 'architecture' because that is what it is, supported crops, animals and fields through elaborate, sophisticated agricultural designs in stone which took hundreds of years to build with whole village

participation and strict social and environmental controls to maintain Hillside terracing (figure 2-6) is one of the landscape 'architectures' of konso community. It is a degraded bench terrace used to retain rain drop inwards across the benches.

Figure 2-6: Traditional konso hill side terracing

Source: BoARD, 2009

2.7. Land Policy

Land and land tenure is a hot policy issue in Ethiopia. The Ethiopian government has in recent years tried to address the problems related to rural land tenure security through issuing certificates of land use right to peasants .More over four regional states including the SNNPR-Regional state formulated rural land administration laws. The policy is providing a framework for encouraging and formalizing land rentals and associated labour migration while avoiding the downsides of rapid moves to consolidation and landlessness. The rural land certification encourages land rental market and share cropping .land market helps land transfer from relatively old and resource poor farmers to young healthier and /or relatively resource rich farmers. Land rental markets can improve the efficiency of factors of production and so expand the use of purchased farm inputs like inorganic fertilizers and improved seeds .Farm house holds that rent-in or share-in lands not only applied more improved technologies ,but also got the opportunity to use labour and oxen that otherwise would be under-or unutilized.

Along with rural land certification, the current agriculture policy of the country is aiming at extending labour intensive commercial agriculture on large amount of unoccupied savannah lands in the low land areas giving them to domestic and external investors through leasehold .This is assumed to gradually create employment opportunity to those land less and very small sized landholders .Establishment of labour intensive manufacturing industries such as leather and textile industries are also part of the current policy which is also believed to create employment opportunity. Thus labour will become expensive and as a result there will be a shift of excess labour from rural to urban.

2.8. Concluding Remarks

In this chapter, basic concepts of land fragmentation and different types of fragmentation were discussed as fragmentation in this study refers to the parcelling and the legal claims on land (tenure). Parcelling is a

physical characteristics, and aspect that people can see in the landscape, the boundaries of the physical units in which land use is structured .The legal claims are an invisible layer consisting of the ownership and tenancy rights that are established on a parcel. Advantages and disadvantages of land fragmentation were also discussed in details .What we can see from the above analysis is that land fragmentation may not affect the efficiency of production significantly in some cases, especially in countries where the method of production is based on small holder agriculture or in countries where the landscape is suitable for homestead agriculture. But it has a negative effect on modern agriculture which is based on large scale production unit to make use of more technology and mechanization .Modern agriculture requires large-scale and good shape of farm land and also requires relatively plain terrain, but in a landscape with steep slope might be a problem for the implementation of mechanization. Therefore depending on the farming system, the landscape and other factors land fragmentation can be advantageous in some cases might not be advantageous in other cases. The existing land fragmentation situation in the regional state and the traditional land management of konsso in the SNNP-Regional state is described as konso's practice is an exemplary practice to the regional state in particular and the country in general. The current agriculture policy of the government is also described along with the situation of the existing farming system of the study area.

3. RESEARCH METHODOLOGY

This chapter gives the details of how the research was conducted the methods used in data collection, selection of the study area and it explains techniques used for data presentation and data analysis.

3.1. The Research Technique

There is an increasing application of qualitative and quantitative method as a research strategy .Using the two methods allows benefiting from the insight that the two methods provide clarity in research when used in combination .Moreover, it is suggested that the most effective evaluation type of research is one that combines qualitative components (Babbie 2003).Hence, in this research both qualitative and quantitative research methods are employed in combination as a research strategy. Qualitative method is used to collect data about the opinion and view point of the land users (Farmers) on the effects of land fragmentation on their farming system and their coping mechanism using semi structured and structured questionnaire. Quantitative data on number of parcels and total land size, total house hold size, type of crop yield and other basic information were collected from sample households using structured questionnaire.

3.2. Description of Sampling

The study area consists of four villages from four different sub districts in SNNP-Regional State. The villages were selected from each sub districts. I used some criteria in selecting the study villages that they should qualify. The names of four Sub districts; Sub district 1, 2, 3, and 4 are Wondogenet, Alaba, Sodozuria and Silte respectively.

Criteria used in selecting the study villages

- Road access
- Land registration and certification project focus areas.
- Composition of different ethnicities.

The region is known to be home of 56 ethnic diversities which accounts 80% of the total ethnic groups that live in the whole country. Some have different and some have similar culture and tradition. Ten households from each village totalling 40 were selected in cooperation with the respective land administration staff. In order to maintain the proportion of male and female households' eight male and two female households were randomly selected from each village. The book of register at sub district office was used for the selection sample households.Questionnaire, structured and open ended type were prepared.

The ethnic groups are: Sidama ethnic group from sub district 1, Alaba ethnic group from sub district 2 , Wolayita ethnic group from sub district 3 and Silti ethnic group from silti sub district .All have different culture , traditions and religious beliefs. The ethnic groups of sub district 2 and 3 all are Muslim religion followers whereas others are the Christian religion followers.

3.3. Data Source and Acquisition Method

Data collection is based on both primary and secondary sources of information. Primary data was collected through individual interview, group discussion, field observations, and documentary analysis

Secondary data was collected from government organizations at regional, and sub district level .The sources and methods used to obtain data for the research are described below.

3.3.1. Primary Data

In order to obtain data required to answer the research questions, individual interview with the selected 40 households from four villages were conducted and necessary data were collected .Group discussion and field observation were also employed. These tools were used to collect data such as land size, total house hold size, type of crop grown, agricultural yield from fragmented land holdings, off-farm activities,income, past history and current situation of the land, the positive and negative aspects of fragmented land holdings and the ongoing management of small holds and their attitude towards the land law and policy with respect to land fragmentation.

Four assistants, one from each sub-district were selected to crosscheck the size of land holdings of sample respondents using hand held GPS. They have also participated in data collection process organizing meetings with interviewees and local farmers.

Figure 3-1: Field work Group interview

Group interview and discussion with local farmers

Group discussion was held with 5-7 village elders and local administrators in each village to get information about how sub division works and how they manage fragmented nature of land holdings .In addition to this discussion with 4 regional and 8 sub district level staff from agriculture and land administration office was held to enrich the first hand information

3.3.2. Secondary Data

Secondary data was collected to support the analysis of the positive and negative aspects of land fragmentation rural. Secondary sources of information include government annual reports , policy documents and statistical documents.

A visit was made to the ministry of Agriculture and rural development, the southern regional bureau of agriculture and rural development including Sub district offices, the southern regional land and environmental protection authority, the southern regional bureau of finance and economic development and southern regional Health bureau. The reference materials include land policies, land proclamations, reports, GIS based land use study documents. Secondary data collected during field work is presented in table 3-1.

Table 3-1: Secondary data

No	Type of data	Year	Data source
1	Rural House hold head and population	1997-2010	Bureau of Agriculture and rural development
2	Crop cultivation land size	1997-2010	Bureau of Agriculture and rural development
3	Registered land holdings	2009	SNNP-Regional land and Environmental Authority
4	Regional land holding size	2009	SNNP-Regional land and Environmental Authority
5	Regional Gross domestic product	1994-2000 2002-2007	Regional Finance and Economic development bureau
6	GIS based land use study documents	1985	Ministry of Agriculture

3.4. Data Preparation

The primary data collected as the result of household survey was entered after field survey in excel spread sheet and SPSS software .The secondary data obtained from different sources in a hard copy format were changed in to an appropriate data format for analysis.

3.5. Methods of Data Presentation and Analysis

The primary data collected from household survey is organized in Excel spread sheet and SPSS software which shows percentages and frequencies to make easy the descriptive statistical method of data analysis which is used in the task of survey result analysis.

3.5.1. Qualitative Analysis

The research strategies employed in this study combine both qualitative and quantitative data analysis method. Qualitative data collected from the review of documents is compiled, organized, summarized and interpreted. In addition to this discussion results with key informants is qualitatively described.

3.5.2. Quantitative Analysis

The primary data collected from household survey is analyzed by employing statistical tools. Based on the proportion in percentage of the summarized data descriptive statistical method of interpretation for major survey results is discussed.

4. BACKGROUND OF THE STUDY AREA

SNNPRS (South nation nationalities regional state) is selected for this study, because it is one of the regions where land fragmentation is widely spread, and is the region that has topographic setup of very diverse nature. Four sample villages were selected for which data availability was possible. This chapter gives brief introduction about location, administrative division, physical and demographic characteristics of the region and profiles of the selected sub districts.

4.1. Location

The Southern Nations, Nationalities and peoples Regional state (SNNPRS) is located in the southern and south western part of Ethiopia between 4°27'- 8°30'North Latitude and 34° 21' – 39°11' East Longitude bordered by Kenya to the South, Sudan to the South West, the Ethiopian region of Gambela to the North West and the Ethiopian region of Oromiya to the North and East.

4.2. Administrative Division

The SNNP-Regional state is structured into 13 administrative zones (district) and eight special sub districts and 126 sub districts (woredas). The sub districts are also further sub divided into 3927 kebeles which are the lowest administrative units in the regional government. Hawassa is the capital and the seat of the regional government which is located Near lake Hawassa .

4.3. Physical Characteristics

The SNNPR state has an area of about 110,931.9 sq .km. and accounts for ten percent of the total area of the country and has topographic setup of very diverse nature low land, middle land and high land plains, mountains undulating land forms and plateaus are common land features in the region.(BoARD ,2008)

Topography of the region is mainly the catchment of Omo and Gibe rivers. The rift valley catchment bisects and crosses the western part of the region. The lowest place with altitude 736 meter above sea level is located at delta of Omo River to Lake Turkana. The highest place with altitude 4200 meter above sea level is Mountain-Gugie which is located in Gamogofa district.

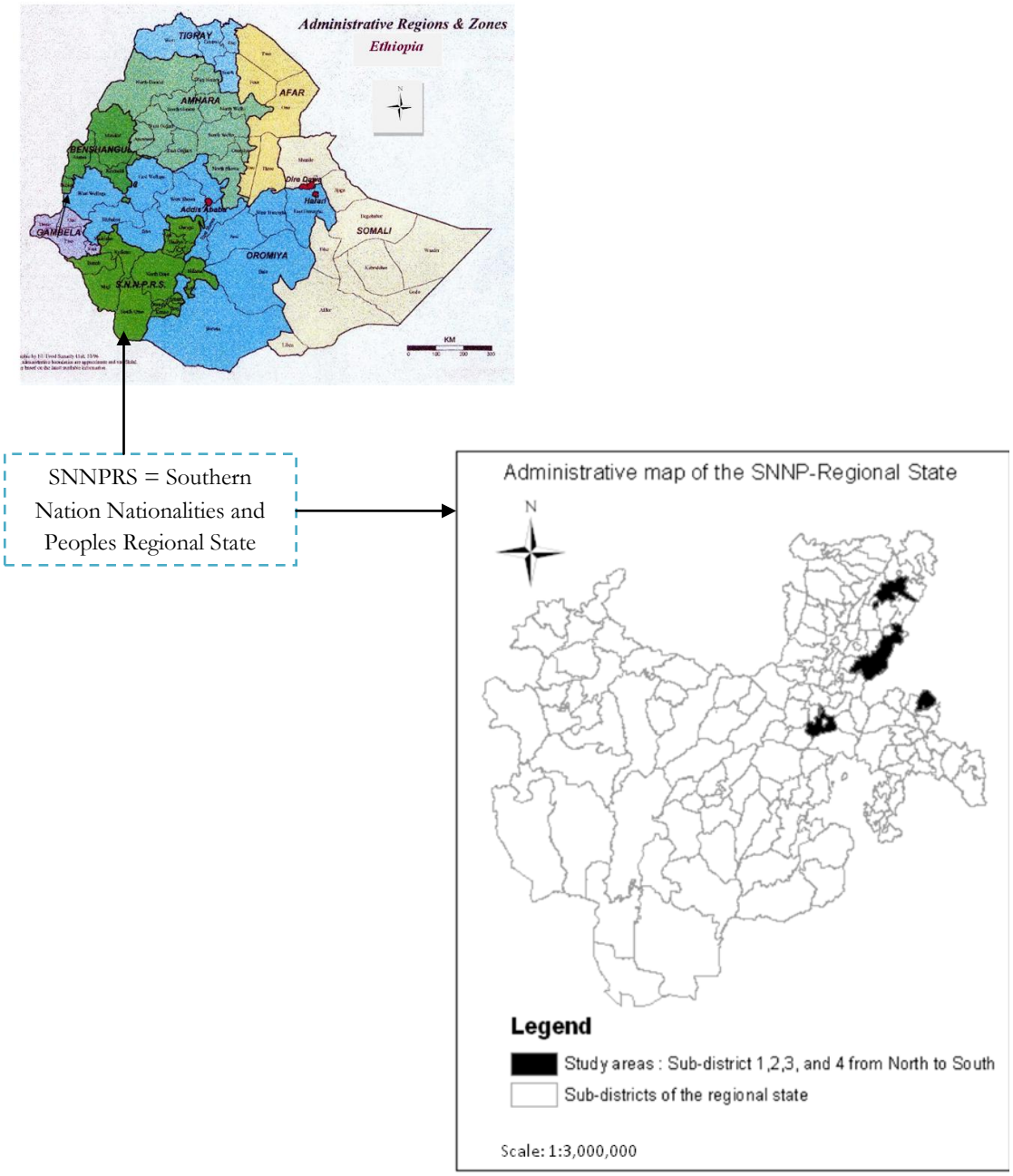
It is a region of immense ecological and cultural diversity ranging from arid to Humid (lowlands to high lands). The low land areas are inhabited by pastoralists whereas the high lands by sedentary peasants. The region is the home of varieties of food crops with the diversified agro-ecology climate, soil and cultural practices. The major food crops growing in the region are maize, wheat, barley, teff, sorghum, pulses, enset and other root crops. Coffee is the major cash crop which is widely grown in the region. (BoARD 2008)

4.4. Demographic Characteristics

Of the nine Regional States which make up the Federal Democratic Republic of Ethiopia today, the Southern Nations, Nationalities and Peoples Regional State (SNNPRS) is the most culturally diverse, comprising a tribal matrix of fifty six different ethno-linguistic groups

The size of the population in the region is estimated to be 15 million which is 20 percent of the country's total population. The average density is about 136 persons per square kilometres. Out of the total population, 90% dwells in rural areas 10% in urban centres. It is estimated that 70% of the population is settled in the high land areas which covers 42% of the region and the remaining 30% of the population is in the low land areas which covers 58% of the region. (Central Statistics agency, 2008)

Figure 4-1: Location map of the study area



Source: Regional Land and Environmental protection authority 2010

4.5. Profile of Study Sub Districts (Woredas)

Sub district-1 (Wondogenet-woreda)

The land area of this woreda is estimated to be 21,994 hectare, administratively, the woreda is divided in to 38 kebeles and two towns. The population of the woreda reside in the different agro-ecological zones and practice sedentary agriculture. Mixed farming is widely practiced.Agriculture is the mainstay of the economy of the woreda. It is a source of employment and subsistence for the population. Teff, , maize, wheat, barley, beans and enset are the main food crops growing in the woreda. Coffee and fruits are the main cash crop. It has good potential of promising perennial rivers with a relatively reliable discharge suitable for irrigated agriculture hydropower.In general, the available socio-economic data indicate that wondogenet has a potential for economic development. The main potential resources include productive farmland with conducive climate for grain, fruit and cash crops production, industry, animal husbandry and bee keeping. The rivers that offer opportunity for irrigated agriculture, waterfall, springs and historical places are potential for eco-tourism development.

Sub district 2 (Alaba-woreda)

Agriculture is the main stay of the economy of the woreda.Teff, maize, wheat, barley and beans are the main food crops growing in the woreda. Pepper is the main crop grown at large and serves as cash crop with which the woreda is known. The use of improved agricultural technologies found at low level. Besides, the productivity of the land has been declining attributed to the loosened farm management and poor cultural practices. As to the livestock holdings, there are 161,728 cattle, 24,538 equine, 30,750 sheep, and 36,552 goats and 10,420 bee hives in the woreda. The land area of this Special Woreda is estimated at 94768 hectares, administratively, it is divided in to 76 kebeles. Farming system is based on sedentary agriculture growing different varieties of crops with a mixture of animal husbandry.In general, the available socio-economic data indicate that Alaba woreda has a potential for economic development. The main potential resources include productive farmland with conducive climate for pepper, haricot bean, maize and teff crops production, a river that offer opportunity for irrigated agriculture, mineral water, waterfall, historical place for eco-tourism development. However, as these resources are not yet developed the economic potential of the woreda is low.

Sub district 3 (Soddo Zuriya-woreda)

It has total area of 53112 hectares. Agriculture is the major economic and livelihood system of the woreda. The climate and drainage of the woreda is conducive for the development of irrigation farms. Agriculture is the major economic and livelihood system of the woreda. The agricultural activities in the woreda are mainly dependent on rainfall which is erratic in nature. Soddo Zuriya woreda has wide variety of potential resources for development and investment activities. The population characteristics, the land area, cultural setup of the community and other topographic features are all vital for future development interventions.

Sub district 4 (Silti-woreda)

It has a total area of 548.6 square kilometres, which accounts for around 21.4% of the total area of Silte zone and it also covers about 0.5% of the total area of the region.Silti woreda takes a share of 20.5 % and 1.1% of the total population of the Sile zone and the SNNPRS, respectively. Agriculture is the main economic activity of the woreda and is basically peasantry economy. The majorities of the population resides in rural areas and are peasants. Mixed farming is the main livelihood patter. A variety of cash and food crops are suitably cropped in the area. The woreda is densely populated and, as a result, households own fragmented and small land size.

Table 4-1: Ecological and socio-economic characteristic of sample study sub districts

Sub-district	Altitude	Climate		Total area(ha)	Rural Population	Household
		Rainfall	Temperature			
1	1729-2620mt	1200-1600m	12-26 oC	21,993.95	133,000	29580
2	1501-2500mt	601-1200mt	18-29 oC	94,768.5	210,243	35719
3	1300-2950mt	1250-1800	18-28 oC	46,008.3	173,406	29,580
4	1650-3100mt	875-1213mm	12-25 oC	53,112	123,954	37186

Source: Local agriculture department offices, 2010

5. ANALYSIS

5.1. Land Fragmentation.

5.1.1. Ownership Fragmentation

In chapter 2.1.1 fragmentation of land is discussed as it refers to 1, the parcelling (the physical characteristic) and 2, the legal claims on land tenure. In the case of the SNNP-Regional state the ownership of the land is vested in the state. According to the land law of the regional state, the farmers have land use right instead of ownership right. Here, I will only discuss the land use fragmentation and the physical land fragmentation. Ownership fragmentation has no meaning in the context of the study area.

5.1.2. Land Use Fragmentation

Discussion on land use fragmentation as type of fragmentation can make sense in the study area. According to the house hold survey data the main means of land acquisition is inheritance from parents (see table 5.1) when family members of a house hold get married, a portion of land is given to him by parents. In this case we see land use fragmentation and the physical land fragmentation as well. When a unit of land held by a house hold get split in to two or more and shared with the family members then both land use type of fragmentation and parcelling (the physical land fragmentation) are taking place.

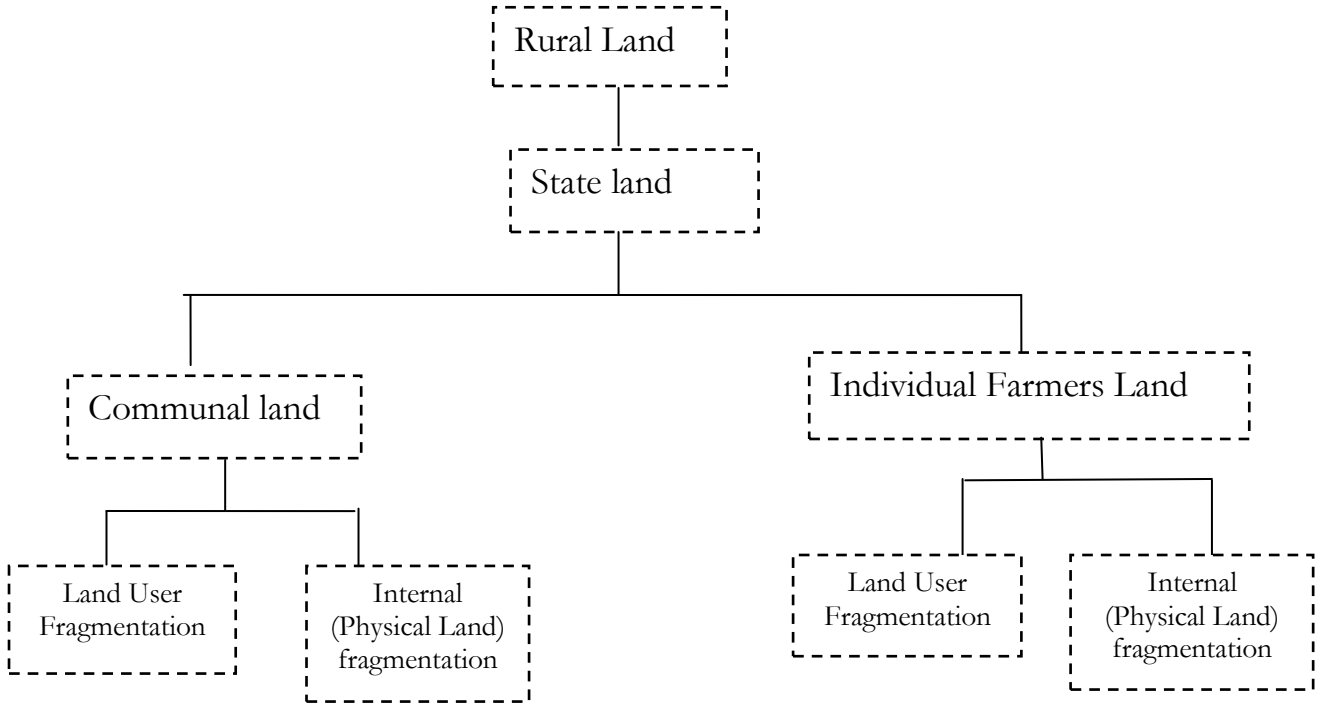
The second means of land acquisition according to the field survey data is communal land. Out of forty households six households held land during the national land distribution program and four households obtained land from village administration from the communal land. Land use fragmentation is also taking place when part of communal land is given to landless individual farmers

Table 5-1: Means of land acquisition

Village	No of Households	Means of land acquisition		
		Inheritance	Land Distribution	Local Administration
1	10	10	-	-
2	10	6	4	-
3	10	6	-	4
4	10	7	2	1

Source : Field survey data ,2010

Figure 5-1: A diagram showing kinds of fragmentation in the study area



5.2. Advantages of Fragmentation

The SNNP-Regional state is the home of varieties of food crops with the diversified agro ecology climate, soil and cultural practices. One of the advantages of land fragmentation discussed in chapter 2.3.1 is the ability of farmers to disperse risk by cultivating a diverse variety on numerous plots; each with diverse characteristics. Production diversification in the regional state is possible due to the wide variety of microclimates.

Data obtained from local land administration office from four sub districts and the regional state office shows that the average number of parcels that an individual farmer holds is three .The house hold survey data shows that out of 40 households 12 households have 2 parcels each, 8 households have 3 parcels each and 20 households have 1 parcel each and their average number of parcels is 2. (See Appendix 1 table3, 4 and 9) .The maximum number of parcels held by an individual farmer in the regional state is 14 parcels which are registered in sub district 4, but not part of the studied village. Therefore farmers that have two or more parcels have a possibility of growing different local crop varieties. Some of local crop varieties are draught resistant and others are hail storm resistant. Out of forty households 30 people grow a food crop which is locally known as ***Enset*** .It has high potential of draught resistance. Those who have two and more parcels in the study area also grow varieties of indigenous crops that get matured and ripen at different times. This enables households those with limited labour to concentrate their labour on one area at a time.

5.3. Disadvantages of Fragmentation

One of the disadvantages of fragmentation in the study area can be associated with land administration, I mean with the current rural land surveying and registration process. Basically the statutory law of the SNNP-Regional state requires all rural parcels to be registered and supported with Geo-referenced map and the regional state launched rural land registration and certification program in two phases since 2005, first and second phase registration program. The first phase certification does not include geo-referenced

mapping of rural land parcels. Neighbour land holders of each and every parcel from each corner, North, South, East and West are registered in the certificate as a reference. According to the regional state 2009 annual report of the SNNP-Regional bureau of Agriculture, one million five hundred thousand farmers have received the first phase certificate since the commencement of the program in 2005.All of forty respondents in four study villages have also obtained the first phase certificate for their land use right from the local land administration office.

The second phase certification which intends to include geo-referenced mapping of each and every parcel has started following the first phase certification program as pilot project in six sub districts among which four study villages are included. ELTAP (Ethiopian Land Tenure Administration Program funded by USAID) supports the SNNP-Regional state with hand-held GPS receiver and other resources, but these GPS receivers have accuracy of plus or minus 7-15 meters. Basically hand held GPS is intended for use of navigation purposes. During field work survey I tried to trace farmers parcel boundary after having uploaded registered boundary coordinates from the local land administration office and I found a discrepancy of 1-3 meters in some cases a bit more than 3 mt from the actual location of parcel boundaries. The multipath error of the global positioning system could be accounted for this difference for some parcels are located under the shade of tree canopies. This could be a serious issue during the process of land dispute resolution or during land reallocation in irrigation projects.

The existence of numerous parcels and frequent change in right of land because of inheritance makes the mapping process complicated. Experiences at the local land administration office also show that editing and updating of fragmented land holdings with field data captured with a hand-held GPS receiver is more difficult and complicated. Apart from fragmentation condition, the hand held GPS being used for spatial coordinate data acquisition has low accuracy and is unreliable for fixed boundary surveying.

According to secondary data collected from local rural land administration offices (see table 5-2 below) and primary data from group discussion conducted with farmers and village elders, I understood that most of boundary and use right disputes are resolved by village elders at village level based on the first phase certificate. Therefore, if the first phase certification works and benefits the land users as first start of establishing land administration system in the study area, it would be better to carry out further research to find out spatial data acquisition methods for the second phase certification that could be feasible in terms of cost effectiveness and level of adoptability in the current context of land tenure system of the study area. Instead of using a hand held GPS of low accuracy. The hand held GPS used in the study area is shown in figure 5.2 below. The maximum measurement accuracy of which is plus or minus 7 meters.

Table 5-2: Boundary and use right dispute cases among heirs 2010

Sub district	Number of disputes	Cases resolved by village elders	Cases taken to court
1	Data not available	Data not available	Data not available
2	70	62	8
3	80	68	12
4	35	35	-

Source local rural land administration offices 2010

Figure 5-2: Hand held GPS (Garmin GPS 60). Accuracy + or - 7 meter.

5.4. Dispersion of Parcels and Border-markings

Other disadvantages of land fragmentation cited in literature are (1) Inappropriateness of use of mechanization,(2) The distance of parcel from the homestead as it matters on the increased transportation time and cost and (3) the border marking with in parcels as it causes loss of land on the border marking.

Data obtained from the central statistics agency shows that 70% of the population the SNNP-Regional state is settled in the high land area which covers 42% of the region and the remaining 30% of the population is in the low land area which covers 58% of the region (see table 5.3). The same is true in the study villages out of 40 household respondents 75 % settled in the high land and undulating areas and because of the nature of the topography of the fields, most of the farm parcels are not suitable for mechanization, instead they are suitable for traditional smallholder agriculture except those lands located in the low land where the terrain is relatively plain.

Table 5-3: Highland and Lowland settlement

Area of the region	Population of the region	High-Land settlers			Low-Land settlers		
		Settlers	Area coverage	Farming system	Settlers	Area coverage	Farming system
110,932sq.km	15million	70%	42%	Crop cultivation	30%	58%	Mixed farming

Source: RBoARD, 2010

As for the distance of parcels from the homestead, it is observed during field survey that farmers have one, two or three parcels and they built their houses on one of their parcels. 92.5 % of the respondents are walking less than 300 mt from their homesteads to their plots (see table 5.4).Less walking distance has contributed to transporting manure and other agricultural inputs easily to the farm and encouraging more intensive farming, since the option for expansion of land is limited. Most of the fields were well maintained and had at least some kind of soil conservation works such as use of compost manure (natural organic fertilizer prepared at homestead level from animal wastes and weeds or other green substances) which maintains the soil fertility of the plots, intercropping of perennial crops with annual crops. (See figure 5-5, 5-6, and 5-7 below on page 33 and 34)

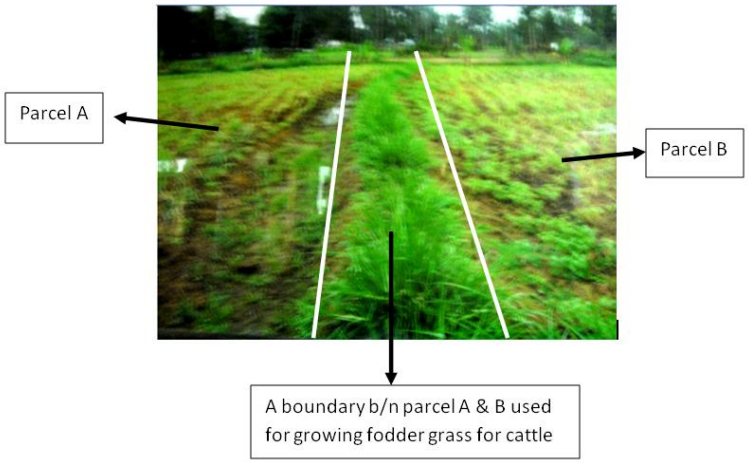
Table 5-4: Distance b/n parcels and farmhouse

Distance in (m)	Village 1	Village 2	Village 2	Village 3	Total
< 100	50%	50%	40%	40%	45
100-200	20%	30%	30%	30%	27.5
200-300	20%	20%	20%	20%	20
>300	10%	-	10%	10%	7.5

Source: Field survey data, 2010

In order to compensate the land that is likely to be lost on the border of parcels, farmers are making use of parcel borders for growing fodder crops for their cattle (see figure 5.3)a grass locally known as ***desho*** is grown on the border of two parcels that belong to two of the households in village 3. The farmers also grow the same grass and leguminous trees on terraces that are constructed in their farms.

Figure 5-3: Boundary marking used for growing fodder crops.



5.5. Land Consolidation

In chapter 2.3, in the literature review it is discussed that when the number of land users reduces then the process of fragmentation reduces which eventually can lead to land consolidation. The number of land users can be reduced gradually through creating employment opportunity. In general in countries like Ethiopia where the national economy depends on small hold agriculture, where majority of the people are based on small hold agriculture, where manufacturing industries and urbanization are not yet developed; it is difficult to implement the idea of land consolidation.

Naturally the number of farmers becomes smaller and smaller as urbanization as well as manufacturing industry takes over the economy .This is how economic process goes on. So it means that the number of small holder will diminish and the large scale farming will continue gradually .The transition from small holder agriculture to large scale agriculture will become real through time by creating employment opportunity. Employment opportunity could be created by establishing labour intensive manufacturing industries in accordance with the resources that are available in a given country.

Labour will become expensive when industry moves to the area. The current economic policy of the government leads to gradual transition from small scale to large scale agriculture .The small holder farmers are residing in high land and middle land. (See table 5.5 below). It is not easy for them to go to low lands (savannah Lands) because of malaria infestation, but this savannah land is suitable for commercial

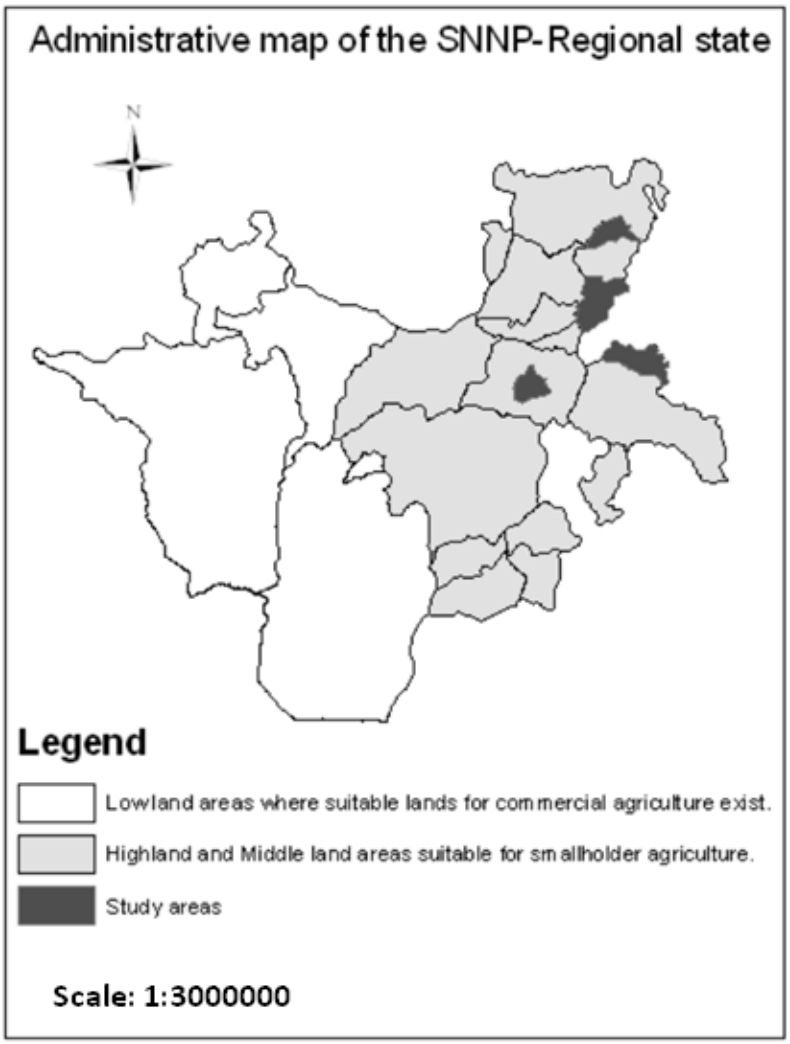
agriculture and is being given to domestic and external investors. Some low lands where malaria infestation is less are used for settlement of farmers on voluntary bases facilitated by the government.

Table 5-5: Land use data of the SNNP-Regional state.

Total area	110,931.1 sq.km	Ownership	Remarks
Cultivated land	26%	Individual farmers	Located in high and middle land area
Unoccupied land	22%	state	Being used for commercial agriculture (located in low land area)
Grazing land	12%	Community	For common use
Forest and bushes	19%	Community and state	For common use and access to land
Others	21%	Community and state	For common use

Source RBoARD.2010

Figure 5-4: Map of high land and low land areas of the SNNP-Regional state.



5.6. Ongoing Management of Fragmented Land Holdings

One of the disadvantages of land fragmentation discussed in chapter 2.3.2 is that as land is fragmented, it is likely that depletion of soil fertility will occur. Depletion of soil fertility could possibly occur (i) when there is loss of top soil by any erosion agents like surface run-off water due to intensive rainfall and

improper use of land resources. However this can be controlled in two ways. (1) physical soil conservation techniques such as constructing terraces, check dams, drainage ditches etc. and (2) Biological conservation methods such as strip cropping, rotational cropping, enter cropping, mulching, application of organic fertilizer like compost, and planting some leguminous nitrogen fixing plants in farm areas which are capable of improving the soil structure.

The physical soil conservation techniques protects the soil from being eroded by impeding the running water where as the biological conservation improves the soil structure and replenish the soil nutrients into the farm land .Planting leguminous trees within farm plots has a great role in improving the soil fertility. The technique is part of agro forestry practices. Leguminous plants help the conversion of atmospheric nitrogen into compounds that the crop can absorb from the soil.

In chapter 2.6 the traditional land management of konso people of the SNNP-Regional state is described in details. These two basic scientific methods of soil conservation and soil fertility management are traditionally well known and practiced by konso people since centuries. Their best practice is extended and replicated into other parts of the regional state in particular and throughout the country in general through agricultural extension program of the government. According to the house hold survey data eight farmers out of forty households got a chance to go to konso area for experience sharing where as the other 30 farmers participated several times in farmers' training program. The government has assigned three agricultural extension workers (development agents) for each village. These development agents are graduates of junior agricultural colleges and are responsible to teach konso's best practices and bring other innovative ideas to the farmers and work together with them preserving the local indigenous knowledge of the farmers

The following figures are taken from the study villages. Figure 5-5 shows biological soil conservation methods applied on the lands that belong to three respondents from village 3. Figure 5-6 and 5-7 show terracing and water diversion ditches on a hill side farm lands. The land belongs to respondents in the study village 1 and 3. Figure 5-8 shows enter cropping with rain water harvesting pond within the plot of one of the respondents in village number 2.

Figure 5-5: Best land management practices.

Figure 5-6: Terracing

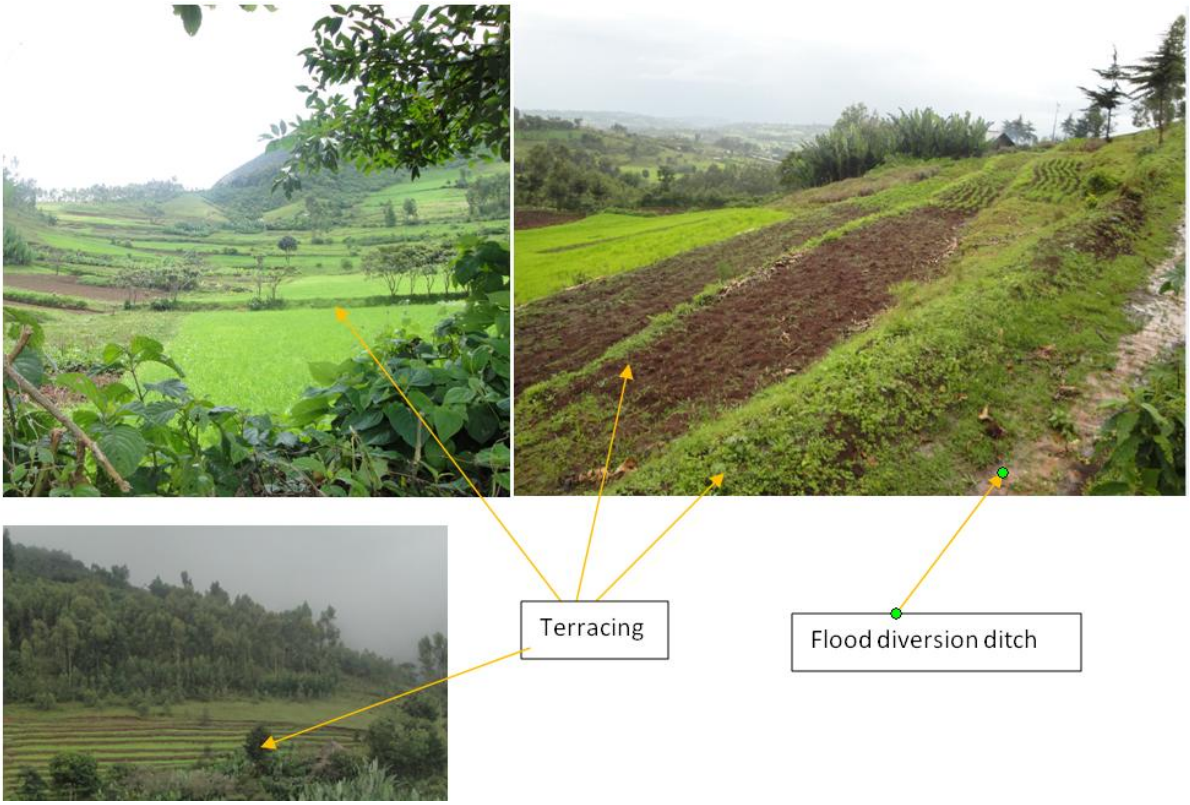
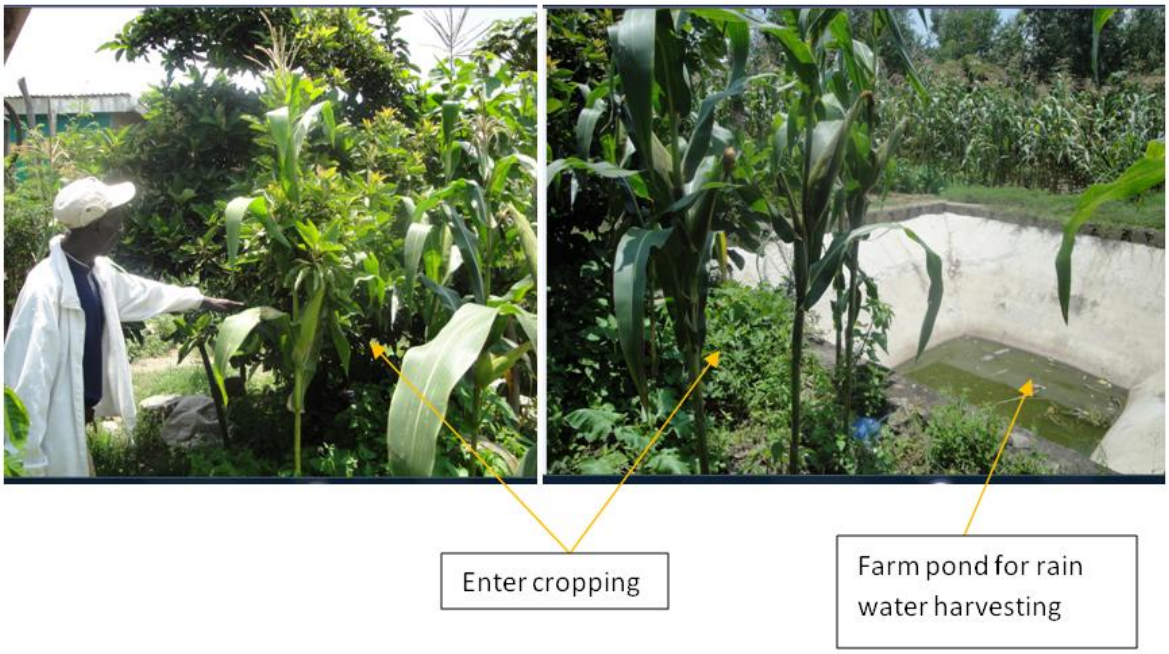


Figure 5-7: Water diversion ditch

Figure 5-8: Enter cropping and farm pond.



5.7. Farmers' Land Use and Off-farm Activities

In smallholder agriculture farmers are using their land for growing cash crops along with food crops .The types of crops that the farmers are growing in the study area are shown in table 5-6 below. Enset, which is also known as false banana, is one of the crops which are grown almost at every homestead in the study area. Women are responsible for the cultivation and food processing of Enset. Food is processed from its root. The women are also responsible for the local varieties of cash crops such as vegetables whereas the men are responsible for the land management aspect such as ploughing, sowing crop seeds, weeding and harvesting. Respondents from village 1 and village 4 use more land for cash crop growing. The major cash crop they are growing is a perennial tree plant which is locally known as Chat. Because of the suitability of the soil for this crop, they grow more on their land. The market price of this crop is also higher than for other crops. Respondents from village 2 and 3 have relatively larger size of land holdings and they also grow cash crops, local varieties of vegetables that have good market price (see figure 5-7)

Table 5-6: Varieties of crop grown in the study area.

Sub district	Food crop		Cash crop	
	Annual	perennial	annual	perennial
1	Maize, Barley and wheat	False banana(Enset)	Vegetables	Chat ,Sugar cane and Fruits
2	Maize, Sorghum Teff, Wheat, Finger Millet Barely	-	Hot Pepper and vegetables	Chat and Fruit trees
3	Maize,Wheat,Teff,Barely and Beans	False Banana (Enset)	Vegetables	Fruit trees
4	Maize,wheat Teff	False banana(Enset)	Hot pepper	Chat

Source: Local Agriculture department office, 2010

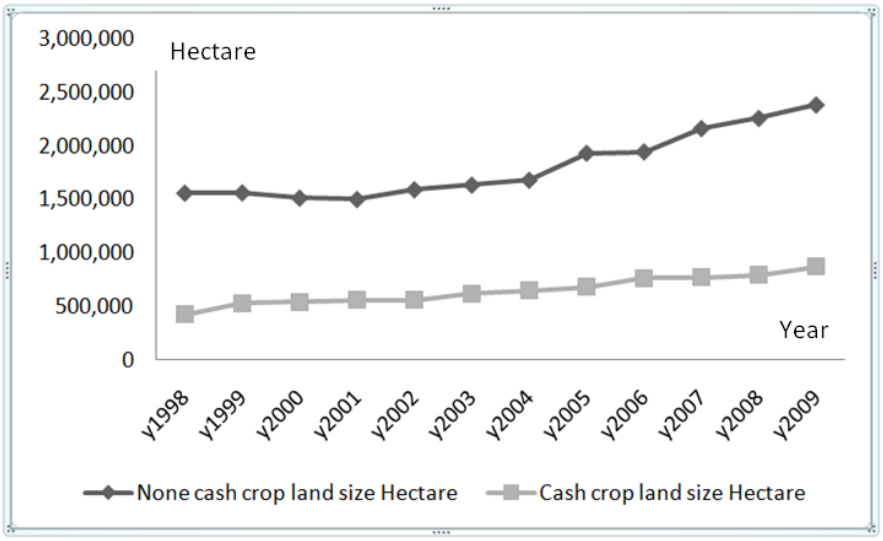
Table 5-7: Farmers' land use at Household level

Village	No of HH	Total land size (ha)	Food crop land size (ha)	Cash-crop land size (ha)	Cash crop land %	Average land holding size per village
1	10	5.21	0.21	5.0	96%	0.52
2	10	17.17	12.88	4.29	25%	1.7
3	10	9.72	5.82	3.9	40%	0.97
4	10	4.53	1.83	2.7	60%	0.45
Total	40	36.63	20.74	15.89	43%	

Source: Field survey data, 2010

Figure 5.9 shows a 12 year annual land use by farmers of smallholder agriculture region-wide. Varieties of indigenous cash crops such as fruits, vegetables and coffee are grown along with food crops in the smallholder agriculture in the SNNP-Regional state.

Figure 5-9: Farmers land use SNNP-Region-wide



Source: RBoARD, 2010

5.7.1. Off-farm Activities

Survey respondents were asked whether they undertake off-farm activities or not. Off-farm income is derived from different sources. Those who have more family members are much more likely to be in off farm employment. They re-arrange their work activities in the household, and undertake off farm activities such as labour employment in cities and trading farm produces. The response for those with off-farm work is presented in Table 5.10. Majority of the respondents undertake off-farm activities. (See table.5-8)

Table 5-8: Off-farm activities of farmers in study area

Off-farm activities	Number of households	Percent
Labor employment	5	12.5%
Trading in farm produces	20	50%
Raising silk worm	4	10%
Fattening/for sale	3	7.5%
No-off-farm	8	20%
Total	40	100%

Source: Field survey data, 2010

5.8. Legal Provisions, Obligations and Restrictions.

Provisions

According to the regional land administration and utilization proclamation there are provisions, obligations and restrictions. (See table5.10) Free access to land from community or state land and the right to get land by settlement is provided .This enables people to move from densely populated area to open area .The government also has a role in facilitating settlement program on voluntary basis which is one way of reducing the population from a place where agricultural land is scarce.

The current rate of population growth is 2.7% (See table 5.9) by the year 2050 the population in the region will be 36 million which is more than double of the current population number. So the government, apart from its long term plans of creating employment opportunity through establishing labor intensive manufacturing industries and commercial agriculture has to invest in rural education and training. The regional health and educational systems need to be directed towards rural areas to reduce fertility and mortality, and enhance educational opportunities. Simultaneously, concentrated efforts should be made to generate imparting skills through education and trainings.

Table 5-9: SNNP-Regional state rural population data

Year	Birth rate	Population
1998	3.2	11,753,000
1999	3.1	12,132,000
2000	3.1	12,515,589
2001	3	12,903,000
2002	2.9	12,293,000
2003	2.9	13,686,000
2004	2.8	14,085,000
2005	2.8	14,489,705
2006	2.8	14,909,057
2007	2.8	15,336,328
2008	2.7	15,760,743
2009	2.7	16,186,283
2010	2.7	16,386,283

Source: RBoARD, 2010

The farmers have right to use land perpetually including the right of transferring their land holdings by gift or by inheritance. According to secondary data collected from the regional bureau of agriculture (see table.5:12) and the group discussion conducted with farmers and village elders certification is creating sense of ownership and security and as a result farmers dare to rent out their land without fear of any possible eviction.

Obligations

Protecting land from damage, farming on steep terrain following conservation strategy, and protection of degraded land from human and animal contact are the main legal obligations to protect fragmented land holdings from destruction. (See table5.10)

Table 5-10: Legal provisions and restriction

Provisions of the law	Free access to land from community or state land
	Right to hold land and use
	Right to get land for communal use (social, cultural and religious use)
	Right to hold land by settlement.
	Right to rent out land holdings
Obligations the law	Protect land from damage
	Farming on steeper terrain has to follow conservation strategy
	Steep and degraded land should be protected from human and animal contact so that it may rehabilitate
Restriction the law	No sub division of land below 0.5 hectare

Source: Regional land Administration and use proclamation No 110/2007

5.8.1. Farmers' Knowledge on Legal Obligations.

Table 5-11: Farmers' knowledge on legal obligations

No	Main obligations and restriction	Frequency	Percent
1	Protect land from damage	38	95
2	Farming on steep terrain has to follow conservation strategy	37	92.5
3	Steep and degraded land should be protected from human and animal contact .	38	95
4	No sub division of land below 0.5 hectare	33	82.5

Source: Field survey data, 2010

From the field observation it is not difficult to understand that the farmers in the study area are basically practicing their indigenous knowledge of land management, However in order to examine how much farmers are close to information and are aware of legal obligations and restrictions regarding land use, they

were asked an open ended question and data was collected as shown in table 5.11. The legal obligations on how to use the land are known by the majority of respondents.

As for the restriction of subdivision of farm land below 0.5 ha is known by 82.5 % of the respondents. Though the majorities are aware of this restriction, they hardly comply with this law. During the land registration process many land parcels of size below 0.5 hectare were registered. Realizing this fact the regional government has made amendment to the law in such a way that the restriction will work on future sub division process; that means if the size of a land becomes less than 0.5 ha when sub divided then the heirs should use it in common with out sub dividing it.

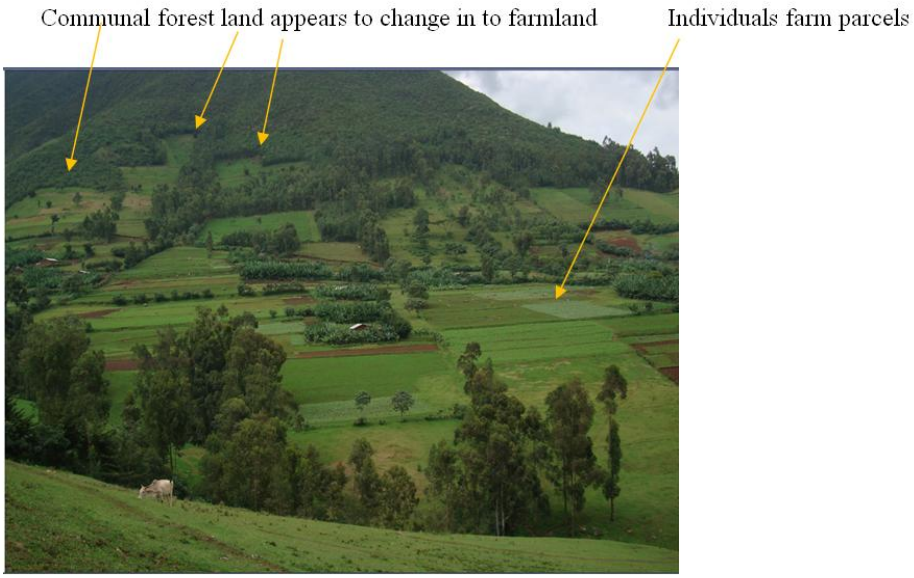
5.9. The role of Government in Management of Fragmented Land Holdings

As discussed above, apart from the long term plan, the government has also short term plan and is currently working with farmers in the land improvement activities of small land holdings. The government is working closely with farmers. Three trained development agents are being assigned in each village. These development agents are working as extension workers closely with the farmers bringing new innovative ideas to the farmers.

5.9.1. Discussion with Village Administrators and Elders.

A discussion with village administrators and village elders regarding adjudication process was held during the field work. Semi-structured questions were used for the discussion. During the adjudication process of fragmented land holdings of the farmers, the boundary disputes between individual farmers' plots and communal lands has been arising according to the discussants. However, because of time limitation, I could not gather data regarding how many disputes and on which land have been arising. Most communal and individual land disputes have been settled at village level through mediation and arbitration. The role of elders in this case is high in rural areas of the region. Based on the survey results and the field observation, the current management and utilization of communal lands is controlled by village administrators. Figure 5-10 below shows a communal land in village number 3 protected from illegal encroachment. Realizing the effectiveness of the dispute resolving role of village elders, the government has given legal recognition to village elders' role. (Rural land administration proclamation No. 110/2007 article 12:1-5 .SNNP-Regional states)

Figure 5-10: Communal land controlled by village administration



During the discussion a question was posed to understand how rural youth can have legal access to land in accordance with the provision of land administration proclamation. They responded that wherever there is availability of land based on approval of land administration committee of the village they can have access or else they can be registered for voluntary settlement program which is facilitated by the government.

5.9.2. Promoting Tenure Security

The regional government is currently working on strengthening rural land registration and certification process for rural land tenure security in collaboration with nongovernmental organizations.

The Regional land measurement, registration and certification activities started with the pilot program in 11 kebeles (village level Administrative unit) of 11 sub districts located at different areas of the region in 2005 .This was a moment that the whole idea of land certification and issuance of land use right was disseminated in the region. From 2005 up to 2009 farm plots of one million and five hundred households (50 % of the households of the regional state) were measured and certified.

From the discussion with existing local land administration staff and village elders, I learnt that the number of farmers who rent in land and who rent out land increases at sub district level after certification. However because of time limitation I could not gather sub district-wide data, but the house hold survey data shows that out of 40 farmers four farmers from village 3 have rented land from others in addition to their own plots. According to the regional data about model farmers (table 5.12) the first phase certification creates an environment conducive for them to rent additional land from old and resource poor farmers in the other hand these old and resource poor farmers also obtain labour employment opportunity from the model and innovative farmers. The contract agreement is registered at village level if the contract agreement duration is short-term and also at sub district land administration office level if the contract agreement is long-term. The Government also supports and encourages model farmers that are capable of investing capital in their land and in a rented land as well.

5.9.3. Support and Encouragement for Model Farmers

The Farmers' Day Celebration started three years ago, to encourage, acknowledge and reward farmers for their role in the regional economic development. In the past three years, 375 model farmers from different parts of the SNNP-Regional state received rewards for exemplary deeds in agriculture sector. Other professionals and organizations also received awards for their efforts to support the farmers in bringing locally suitable and improved seed varieties of crops to them. It is assumed that awarded farmers will contribute a lot toward expanding the valuable experiences registered in the agriculture sector to all parts of the regional state.

According to the regional government land law, farmers have the right to rent out their land holdings for short-term and long-term. Using this opportunity, 375 model farmers invested in their own land and on land rented in from neighbouring farmers (figure5-12) .This has two advantages; one is through renting several small sized parcels; dispersed parcels can be cultivated together, and on the other hand those who rent out their parcels can have labour employment opportunity.

Table 5-12: Model farmers investing on their own land and on rented land.

District Name	No of model farmers	Owned land on average (ha)	Rented in	Capital on average (eth.birr)
Bench maji	18	3.3	Additional land	377,255
Dawro	15	3.5	>>	2,429,986
South Omo	6	3.5	>>	601,667
Gamogofa	51	2.8	>>	699,308
Gedeo	18	2.7	>>	1,581,427
Gurage	39	2.7	>>	1,113,971
Hadiya	30	3.2	>>	795,370
Kaffa	30	3.9	>>	768,698
K/Timbaro	21	3.3	>>	1,265,176
Shaka	9	4.2	>>	1,434,956
Sidama	57	3.2	>>	1,350,998
Siltte	24	3.8	>>	1,028,696
Wolayita	36	3	>>	967,772
Amaro	3	3	>>	814,571
Basketo	3	3	>>	267,867
Burji	3	3	>>	1,417,167
Derashe	3	3.3	>>	636,895
Halaba	3	3.3	>>	1,367,840
Konsso	3	3.7	>>	527,266
Konta	3	3	>>	106,666
Yem	3	3.7	>>	1,364,181
Hawill	3	3.3	>>	2,333,332

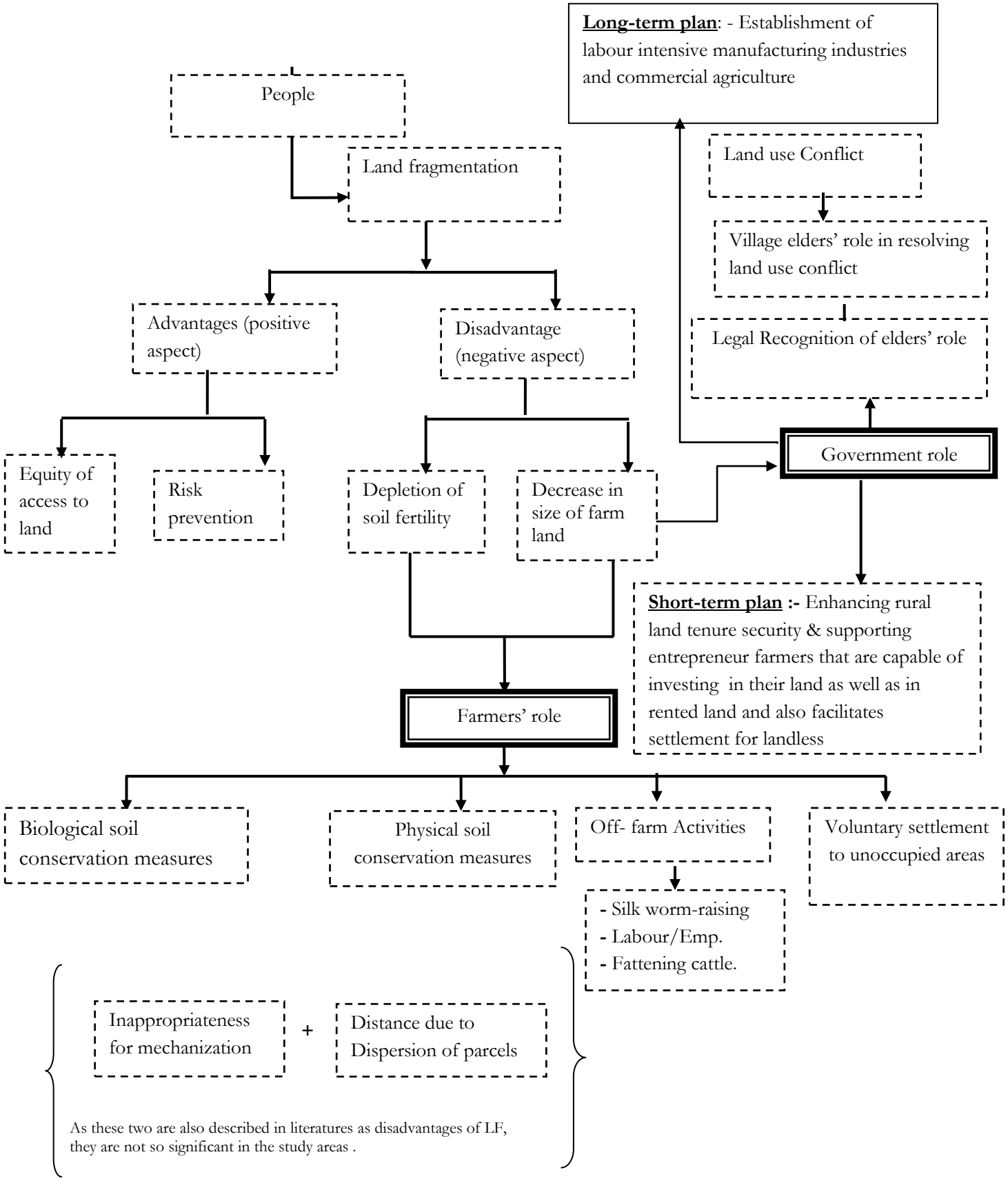
Source BoARD, 2010

The potential of farmers in an organized manner is crucial to increase productivity and to ensure them benefits. Honouring model farmers motivates others and the number of model farmers will increase.

The regional agriculture bureau is undertaking various agriculture packages that will help farmers' productivity. The bureau is striving to distribute modern technologies suitable to specific ecologies. The government is exerting efforts toward expanding the valuable experiences and inputs used by the awarded farmers to all farmers of the regional state. Awarding the farmers has created healthy competition among farmers towards boosting agricultural production of small holders.

The following diagram summarizes Farmers and Government role in the process of Land Fragmentation

Figure 5-11: A diagram showing Farmers and Government role in the process of LF



6. SUMMARY,CONCLUSION AND RECOMMENDATIONS

6.1. Summary

The major driving force behind the on-going fragmentation of land parcels in the study area is the steadily increasing population and scarcity of non-farming employment. As per the law of inheritance, individuals get a few tiny parcels of land as their share from the paternal property. Currently, the level of land fragmentation varied from place to place depending on the type and the nature of resources based on farmers' different demographic and socio-economic characteristics. The major findings of this study from farmers and state perspective are listed below.

Farmers in the study area are jointly managing their fragmented land holdings using their indigenous knowledge of (1) physical soil conservation techniques and (2) biological conservation methods. The indigenous knowledge of farmers is currently supported by agricultural extension program of the government. The physical soil conservation techniques protect their soil from being eroded by impeding the running water where as the biological conservation improves the soil structure and soil fertility. Farmers are practising planting leguminous trees within farm plots which has a great role in improving the soil fertility. Leguminous plants help the conversion of atmospheric nitrogen into compounds that the crop can absorb from the soil.

The positive aspects of fragmented land holdings in the study villages are that farmers having two or more parcels have a possibility of growing different local crop varieties. Some of local crop varieties are draught resistant and others are hail storm resistant. Out of forty households thirty households grow a food crop which is locally known as ***Enset*** .It has a level potential of draught resistance. Those who have two and more parcels in the study area are growing varieties of indigenous crops that get matured and ripen at different times. This also enables households with limited labour to concentrate their labour on one area at a time.

The negative aspects of fragmented land holdings in the study area could be associated with land administration, I mean with the current rural land measurement and registration process. Basically the statutory law of the SNNP-Regional state requires all rural parcels to be registered and supported with Geo-referenced map. However the existence of numerous parcels and frequent changes in right of land because of inheritance makes the mapping process expensive and complicated. Apart from fragmentation condition, the hand held GPS being used for spatial coordinate data acquisition has low accuracy and is unreliable for small size parcels.

The regional state launched rural land registration and certification program in two phases since 2005, first and second phase registration program. The first phase certification does not include geo-referenced mapping of rural land parcels. Neighbour land holders of each and every parcel from each corner, North, South, East and West are registered in the certificate as a reference. According to annual report of the SNNP-Regional bureau of agriculture 2009, one million five hundred thousand farmers have received the first phase land use right certificate since the commencement of the program in 2005. All of forty respondents in four study villages have also received the first phase certificate for their land use right from the local land administration office. All of my study villages are undergoing the second phase program which is intended to support the first phase certification with geo-referenced map of every parcel. During

field work survey I tried to trace farmers parcel boundary after having uploaded registered boundary coordinates from the local land administration office and I found a discrepancy of 1-3meters from the actual location of parcel boundaries the higher discrepancy is found on parcels located under a canopy of tall trees. Multipath error of the Global Positioning System is the account for this error. It is much more under the shade of trees. Experiences at the local land administration office also show that editing and updating of fragmented land holdings with field data captured with a hand-held GPS receiver is more difficult and complicated.

As for the distance of parcels from the homestead, it is observed during field survey that farmers have one, two or three parcels and they built their houses on one of their parcels. 92.5 % of the respondents are walking less than 300 mt from their homesteads to their plots. Less walking distance has contributed to transporting manure and other agricultural inputs easily to the farm and encouraging more intensive farming

In order to compensate the land that is likely to be lost on the border of parcels, farmers are making use of parcel borders for growing fodder crops for their cattle (see figure 5.2)a grass locally known as ***desho*** is grown on the border of two parcels that belong to two of the household respondents in village 3. The farmers also grow the same grass and leguminous trees on terraces that are constructed within their farms just not to lose the land on which terraces are built.

The process of land fragmentation reduces when the number of land users becomes smaller. The number of farmers becomes smaller as urbanization and manufacturing industry takes over the economy .This is how economic process goes on, which means that the number of small holder will diminish and the large scale farming will continue gradually .The transition from small hold agriculture to large scale agriculture will become real through time by creating employment opportunity. Employment opportunity could be created by establishing labour intensive manufacturing industries in accordance with the resources that are available in a given country. Labour will be becoming expensive when industry moves to the area. The current economy policy of the government is based on the principle of gradual transition from small scale to large scale agriculture

6.2. Conclusion

This research has been carried out with an objective of analyzing the process of land fragmentation, farmers' response to land fragmentation and their response to land policy. The objective is supported by two sub objectives and the following conclusions are drawn on the basis of the results obtained from this research work.

- Farmers in the study area are managing their fragmented land holdings with indigenous knowledge of physical and biological conservation methods supported with modern techniques from the agricultural extension program of the regional government.
- There is a high level of awareness of the importance of soil conservation measures, because it has always been part of their traditional farming system and also because of positive effects of the extension policy of the government.
- Farmers in the study area have small and fragmented farms, but nonetheless there is income and food security.
- Their land management practice is remarkable and indicating that with best management even small farms can survive.
- Farther fragmentation seems not to be occurring because of the legal restriction.

- The certification program has been well accepted in the study area since the state ownership was also for the smallholder farmers' sufficient tenure security as most received the land from the state in the agrarian reform of the former government.
- Geo-referenced mapping using hand held GPS receiver of low accuracy for fixed boundary surveying at the current situation of fragmented nature of land holdings has to be revised. It might be a waste of resources to map all those numerous parcels which are going through high transaction rate of use- right without having established clear and appropriate database management system that could be sustained
- The role of village elders in resolving boundary disputes and disputes related to inheritance is of great significance.
- The government policy is focussing on rural land registration and certification. Establishing of commercial agriculture on unoccupied savannah lands and labour intensive manufacturing industry are also policy focus areas which will lead to an environment conducive to gradual shift in labour from rural to urban and eventually to a shift from small hold agriculture economy to large scale agriculture.

6.3. Recommendations

1. Better employment and educational opportunities for poor especially the female population should be promoted

2 Creating of an alternative income source and employment opportunities to farmers may partly reduce complete domination of land resource. This should be kept going.

3. Expansion of awarding incentives such as social value, financial and material support for those farmers who are participating in good land management individually or in groups should continue.

4. A research has to be conducted to find out a database management system and method of spatial data acquisition for boundary surveying which is clear and appropriate in terms of technical matter and cost effectiveness in the context of the current fragmented nature of land tenure system of the study area.

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APPENDIX 1: DATASET: REGIONAL, SUB-DISTRICT, VILLAGE AND HOUSEHOLD LEVEL.

I, Regional Data

Table 1: SNNPR-State Land use

Total land size	110,931,100 sq km
Arable land	26%
Cultivable land	22%
Grazing land	12%
Bushes and forest	19%
Other	21%

Table 2: land use of cash crop and food crop

Year	Food crop land size	Cash crop land size	Total	Cash crop %
	Hectare	Hectare	Hectare	
y1998	1,560,404	426,049	1,986,453	21.45
y1999	1,563,254	531,426	2,094,680	24.37
y2000	1,513,457	541,814	2,055,271	26.36
y2001	1,501,128	560,709	2,061,837	26.19
y2002	1,592,017	560,862	2,152,879	27.76
y2003	1,635,005	621,059	2,256,064	27.53
y2004	1,680,730	647,329	2,328,059	27.81
y2005	1,934,322	683,070	2,617,392	27.90
y2006	1,946,704	767,386	2,724,090	28.17
y2007	2,164,955	772,154	2,937,109	25.95
y2008	2,259,985	794,106	2,824,091	27.06
y2009	2,385,910	872,405	3,258,315	28.47
2010	2,314,225	927,291	3,197,554	29.00

Table 3: Population house hold and land holding size of the state

Year	Birth rate	Population	House hold	Arable land (ha)	Av.no of parcels
1998	3.2	11,753,000	2,209,000	1,986,453	-
1999	3.1	12,132,000	2,276,363	2,094,680	-
2000	3.1	12,515,589	2,342,626	2,099,271	-
2001	3	12,903,000	2,408,213	2,100,837	-
2002	2.9	12,293,000	2,472,217	2,152,879	-
2003	2.9	13,686,000	2,536,717	2,256,064	-
2004	2.8	14,085,000	2,600,517	2,328,059	-
2005	2.8	14,489,705	2,665,517	2,617,392	3
2006	2.8	14,909,057	2,713,135	2,724,690	3
2007	2.8	15,336,328	2,793,635	2,937,109	3
2008	2.7	15,760,743	2,880,635	2,990,091	3
2009	2.7	16,186,283	2,950,000	3,258,315	3
2010	2.7	16,386,283	3,015,000	3,297,554	3

RBoARD,2010

II, Sub District data

Table 4: Population

Sub district	population	HH	Av.Land holding	Av.no of parcel
1	105,000	15000	0.58	2
2	210,243	35719	0.96	3
3	173,406	29,580	0.74	3
4	123,954	37186	0.54	3

Local Agriculture department, 2010

Table 5: Climate

Sub-district	Altitude	Climate		Total land area (ha)
		Rainfall	Temperature	
1	1729-2620mt	1200-1600m	12-26 oC	21,993.95
2	1501-2500mt	601-1200mt	18-29oC	94,768.5
3	1300-2950mt	1250-1800	18-28oC	46,008.3
4	1650-3100mt	875-1213mm	12-25oC	53,112

Local Agriculture department, 2010

Table 6 Land use (2001)

Sub district	Arable land (ha)	Food crop Land (ha)	Cash crop land (ha)	Cash crop land %	Forest land (ha)	Grazing land (ha)	Cultivable land (ha)	Uncultivable land (ha)	Others (ha)	Total (ha)
1	-	-	-		-	-	-	-	-	-
2	38020	28895.2	9124.8	24	20592	8316	20000	3102.7	4738	94768
3	-	-	-		-	-	-	-	-	-
4	-	-	-		-	-	-	-	-	-

Local Agriculture department, 2010

Table 7 Land use (2010)

Sub district	Arable land (ha)	Food crop Land (ha)	Cash crop land (ha)	Cash crop land %	Forest land (ha)	Grazing land (ha)	Cultivable land (ha)	Uncultivable land (ha)	Others (ha)	Total (ha)
1	7572	5376	2196	29	3800	757	1515	754	454	14852
2	44632	30796	13836	31	18060	5120	18300	3103	5550	94765
3	27756	19429	8327	30	4020	9440	-	590	2710	44516
4	36673	26966	9707	28	3471	5211	1337	861	5559	53112

Local Agriculture department, 2010

Table 8 type of crops

Sub district	Food crop		Cash crop	
	Annual	perennial	annual	perennial
1	Maize, Barley and wheat	False banana(Enset)	Vegetables	Chat ,Sugar cane and Fruits
2	Maize, Sorghum Teff, Wheat, Finger Millet Barely	-	Hot Pepper and vegetables	Chat and Fruit trees
3	Maize,Wheat,Teff,Barely and Beans	False Banana (Enset)	Vegetables	Fruit trees
4	Maize,wheat Teff	False banana(Enset)	Hot pepper	Chat

Local Agriculture department, 2010

III Village level (kebele) data

Table 9. Population

Village	population	HH	Av.Land holding	Av.no of parcel
1	5600	800	0.58	1
2	5400	900	0.96	3
3	4476	746	0.74	2
4	2490	830	0.54	2

Table 10 Land use 2010

Village	Arable land (ha)	Food crop Land (ha)	Cash crop land (ha)	Cash crop land %	Forest land (ha)	Grazing land (ha)	Cultivable land (ha)	Uncultivable land (ha)	others	Total (ha)
1	464	325	139	30	135	27	54	27	16	804
2	864	613.44	250.56	29	140	67	110	41	70	1292
3	755	528.5	226.5	30	129	304	-	19	87	1294
4	448	313.6	134.4	30	91	137	35	22	146	879

Local Agriculture department, 2010

IV. Household data

Table 11

Village	No. of house holds	family size	married adult men	married adult women	Total kids	Moved to cities	Moved to settlement	average plot number	ave.land size
1	10	78	9	9	41	2	4	1	0.52
2	10	84	6	15	46	6	-	3	1.7
3	10	56	2	2	36	2	3	2	0.97
4	10	99	5	7	63	9	5	2	0.45
Total	10	328	21	34	186	19	12	2	0.8925

Source: Field Survey data

Table 12 Means of land acquisition

Village	Inheritance	Land Distribution	Local Administration
1	10	-	-
2	6	4	-
3	6	-	4
4	7	2	1

Source: Field Surve

Table 13: Percentage distribution of respondents by Land holding size

Farm Size (In hectare)	No. of households	Percent
< 0.5	16	40
0.5-1	13	32.5
1-1.5	4	10
1.5-2	4	10
>2	3	7.5
Total	40	100

Source: Field Survey data

Table 14: Ratio of people per hectare

Village	No of Households	family size	ave.land size (ha)	Total land size (ha)	Share of each family member	Ratio of people/hectare
a	b	c	d	e	f	g
1	10	81	0.52	5.2	e 5 / c 5	1 hectare / 0.11 hectare
2	10	84	1.7	17		
3	10	64	0.97	9.7		
4	10	99	0.45	4.5		
5 (Total)	40	328	0.8925	36.63	0.11 hectare	9 people/1ha

Source: Field Survey data

APPENDIX 2: QUESTIONNAIRE

Questionnaire for farmers

Section A

Land use and land fragmentation situation, current situation of the land and Households' family information.

1. How many Adult men are in the family?
2. How many Adult women are in the family?
3. How many Kids are in the family?
4 Is there sufficiency of food for your family?

☐ Yes No ☐

5. How many plots of land do you have?
6. Are the shape of the parcels regular or not?

☐Yes, quite regular ☐ almost regular ☐ no, not regular

7. What's the size of each parcel? —
8. What is the total area of your holding?
9. Are the parcels far away from your house or not? Describe it in meteres

☐ Very far ☐ Fair ☐ close ☐ Very close

10. Are you satisfied with the current use of fragmented parcels?

☐ Fully satisfied ☐ moderately satisfied ☐ Not satisfied

11. If not satisfied, what are the reasons for it?
12. What's the land quality of each parcel?

☐ Fertile ☐ Moderate ☐ Poor

13. What type of crop do you grow?

☐Cash-crop or☐ non-cash crop ☐ both

Section B

Household income and Social welfare situation

Assets

i, Yield per hectare

Yield of agriculture from parcel farming? —

18 How much yield do you earn from your land holdings?
19. How much do you consume?
20. How much do you take to the market?

ii, Cattle

21. How many cattle do you have?
22. How much do you consume?
23. How many do you take to the market?
24. What's the total income of your household monthly?

☐ <1000
☐ 1000--2000
☐ 2000--3000
☐ 3000--4000
☐ >400

25. How many members of the family are employed?
26. How many household members work on agriculture?
27. What are the main income resources of your household?

☐Agriculture ☐ private business ☐ employment outside of village

Section C - Land tenure

28. What is your relationship with the parcels you are using currently?

☐ Land holder ☐ Tenant☐ share cropping

29. Do you need to sign the written contract when you rent out your land for limited period of time?

☐ Yes ☐ No

30. Does the local government office issue rural land contract right certificate?

☐ Yes, it has ☐ No, it hasn't ☐ I don't know

Section D- Policy and Legal issues

31. What type of tenure arrangement do you prefer?

Private ☐ ☐ State

32. How did you get your land?

☐ By inheritance ☐ land distribution ☐from local Administration

Farmers' knowledge on legal obligations

No	Main obligations and restriction	No of respondents	Percent
1	Protect land from damage		
2	Farming on steep terrain has to follow conservation strategy		
3	Steep and degraded land should be protected from human and animal contact .		
4	No sub division of land below 0.5 hectare		

Discussion points with farmers

Past history of your land ?
Future of your land (Carrying capacity, as the population grows up)?
Regarding land policies and regulations?
Regarding access to land ?
Regarding traditional management of fragmented land holdings. ?
Regarding government's role in the management of fragmented land hidings?

Discussion points with Governmental office staff

What is the size of arable land in your regional state?
What types of crops are grown in your region?
What are the rural population number and the number of households in the regional state?
What plan and strategy does your organization have for the management of small hold agriculture (fragmented land holdings)?