
**The Effect of Rural Land Registration and Certification
Programme on Farmers' Investments in Soil Conservation and
Land Management
In
The Central Rift Valley of Ethiopia**



**MSc Thesis by Sabita Giri
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**The Effect of Rural Land Registration and Certification Programme on Farmers'
Investments in Soil Conservation and Land Management**

In The Central Rift Valley of Ethiopia

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Supervisor(s):

Dr. Aad Kessler, Wageningen University, The Netherlands

Iben Nathan, Copenhagen University, Denmark

Examinator:

Prof. Dr. Ir. L. Stroosnijder

Date: 26th August 2010

Wageningen University, Land Degradation and Development Group

Holetta Agriculture Research Center, Holetta, Ethiopia

Declaration

I hereby certify that the study entitled: “*The Effect of Rural Land Registration and Certification Programme on Farmers’ investments in Soil conservation and Land Management in The Central Rift Valley of Ethiopia*” has been submitted as a partial fulfillment of the requirements for the Agris Mundus Course in Sustainable Agriculture Development, training track Water Management: Operation and Design. The Joint programme / Double Degree leads to the fulfillment of Master Degree in International Land and Water management, Land Degradation and Development group, Wageningen University, The Netherlands and a master degree in Agriculture Development, Faculty of Life Sciences , University of Copenhagen, Denmark.

Date 26th Aug 2010

Student Sabita Giri

Supervisors Iben Nathan (Senior Researcher, PhD)
Aad Kessler (PhD)

Abstract

Land degradation is a major problem in almost all the countries. In most of the developing countries, population pressure and small farm sizes, land tenure insecurity, land redistribution, limited access to credits and limited education are the factors leading to unsustainable land management. In Ethiopia, among many factors, tenure insecurity is considered as a main problem for land degradation. The frequent land redistribution and the changing pattern of land ownership with the change in Government made the farmers insecure of their land resulting in not making land related investments. Considering this fact, the Government of Ethiopia started the Rural Land Registration and Certification Programme (RLRCP) since 1998/99 to provide land titling and tenure security to the farmers. The studies conducted to show the relation between tenure security and investments on land management show mixed results. There are cases where tenure security plays role in making investments on land management and there are also cases where tenure security has no any role in making such investments which made it difficult to draw a conclusion. In Ethiopia, even though most of the studies showed a positive influence of certificates in providing tenure security and investments on land management, most studies are concentrated only in Amhara and Tigray regions. So this study was carried out in SNNP and Oromia region where RLRCP has been implemented since 2004 to analyse its the initial impacts on investments in soil and land management and also to assess the perceptions of farmers about tenure security after getting land certificates. The main source of this study was primary data collected from eighty HHs, forty from each study area and the quantitative and qualitative data were gathered from the respondents using questionnaires, group discussion and interviews.

The results of the study indicate that the farmers perceive the importance of certificates in providing tenure security and land ownership. About the investments, it shows two different results for two study area. In Worja, where majority of the farmers acquired their land through redistribution, farmers feel more secure of their land after getting land certificates which motivated them to make land related investments. Generally when tenure security is concerned, more focus is given on long term investments on land and short- term investments are linked with insecure land tenure. But here tenure security is affecting not only long term investments but also short term investments like traditional ditches and soil bunds. In case of Beressa, the case is different where even though farmers perceive the importance of certificates, majority of them are not practicing soil and land management due to certificates. They were managing land before getting certificates and seemed to be more motivated by the extension services. Tree plantation which is considered as a long term investment on land is not affected by tenure security in both study areas. In Worja, even deforestation is considered as a main reason for erosion, very rare tree plantation has been found except for the naturally grown ones. The main reason for not planting trees is the lack of water. Other land practice such as crop rotation and intercropping are not influenced by tenure security and fallowing is not practiced due to shortage of land. Besides, certificates, there are certain other factors like land characteristics (slope of the plot, erosion and erosion extent) and household characteristic (education) that are affecting investments on land management. Farmers generally construct soil conservation practices in those plots where they feel erosion is a problem. In overall the influence of tenure security in making investments on land for soil conservation is found to be very less in Beressa whereas the influence is more in Worja.

Key words: Ethiopia, tenure security, RLRCP, investments, land management and soil conservation.

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This work is dedicated to my parents and family whose encouragement during my study abroad for two years has contributed to the successful accomplishment of this study.

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Abbreviations

RLRCP	Rural Land Registration and Certification Programme
HARC	Holeta Agriculture Research Center
SNNP	Southern Nations, Nationalities and Peoples
CRV	Central Rift Valley
AJK	Adamitullu Jidokombolcha
SLM	Soil and land management
HH	Household
TLU	Tropical Livestock Unit
CC	Contingency Coefficient

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1. Introduction

1.1 Introduction and Justification of the problem

Land is one of the most important assets of the people throughout the whole world especially for the rural and urban poor whose life basically relies on agriculture (USAID, 2007). But this valuable property is being degraded due to soil erosion and nutrition depletion (Amsalu and Graaff, 2007). In most of the developing countries, the major factor for land degradation is the improper and unsustainable land management due to population pressure and small farm sizes, land tenure insecurity, land redistribution, limited access to credit and limited education (IFPRI *et al.*, 2005). Land degradation is considered as a major global issue due to its adverse impact on agricultural productivity and sustainability which is a key source of the “poverty trap” (Hagos and Holden, 2006).

As in most of the countries, land degradation is a major problem in Ethiopia. In this country, agriculture is the predominant sector of the economy accounting for approximately 45% of the GDP, 85% of the employment and the major share of the export earnings (Abegaz and Bekure, 2009). However, the productivity of this economy is being a serious threat due to unsustainable land management practices. The main causes of these problems include a historical and changing pattern of land ownership, government control and low levels of investment in agriculture due to land insecurity (Berry, 2003). In Ethiopia, there is a frequent change in land tenure system with the change in Government causing tenure insecurity among farmers. According to Gebreselassie (2006), Ethiopia is one of the few countries in Africa where for over three decades no significant changes in its basic land policy have been made; except for some occasional land redistributions so as to cope with the growing population. The allocation of land to individuals was often used as a political instrument and sudden reallocations of land were common (Gebreselassie (2006).

The matter of land tenure has been a critical and sensitive political issue in the history of Ethiopia (Jemma, 2004). The frequent land redistribution especially during the Derge period and change in tenure system with the change in Government made the farmers insecure of their land resulting in not making land management and soil conservation practiced leading to land degradation. The tenure system is quite unstable and due to the general belief that the next land redistribution will take place at any time, the incentive to invest on land improvement is often minimal (Gebreselassie, 2006). Many lands were underutilized due to

insecurity of land which even leads farmers to mine their land resource by cutting, but not planting trees and not investing in soil and water conservation practices. ELTAP (Ethiopia Land Tenure and Administration Programme), a programme being executed by USAID and the Ministry of Agriculture and Rural Development, concluded that such actions were the major contributing factors leading to degradation of the rural landscape and declining farm productivity (ELTAP, 2007). So the Government started the process of Rural Land Registration and Certification Programme (RLRCP) since 1998-99 which is regarded as a milestone in providing land tenure security through land titling (Teshome, 2006). Land titling and legal enforcement of title are fundamental for the widespread adoption and sustainable use of conservation practices (Gebremedhin and Swinton, 2003).

One of the issues related to the land tenure is the extent to which the tenure arrangements encourage or discourage sustainable farm practices and land management. The general belief is that the more secure the farmers are about their land, the more they are interested in making investments for land management (EEA/EEPRI, 2002). Several researches had been conducted to show the relation between land security and investments on land management and soil conservation. The research conducted by Deininger *et al.*, 2009, Placea, 2009, Gebremedhin and Swinton, 2003, Holden *et al.*, 2009 etc showed that more secure land tenure and land rights enhance the farmers to make investments on land. However, there are also cases where tenure security has no influence on investments on land management. The study done by Holden and Yohannes, 2000, Zikhali, 2008 and Migot- Adholla, 1991 showed that tenure security is not always the reason to make land related investments.

This shows that there are different results about tenure security which makes it difficult to draw a conclusion about the influence of land title and tenure security on soil and land management (SLM) practices. In Ethiopia, even though many researches are conducted to see the influence of RLRCP in providing tenure security and investments on land management, most of them are done in Amhara and Tigray regions. So considering this fact, this study is done in two kebeles¹ which are located in Oromia and Southern Nations, Nationalities and Peoples (SNNP) regions.

¹ Kebele- lowest administrative unit in Ethiopia

1.2 Objective of the study and Research Questions

1.2.1 General Objective

- To analyze the impact of RLRCP on farmers' investments in Soil and Land Management (SLM).

In order to know the influence of RLRCP on investments in SLM, first of all it is necessary to know the perception of farmers about this programme. Unless and until, farmers do not perceive this program as a means of providing land title and tenure security, it is not easy to see whether they are making land related investments due to land security or not. So the first research question is based on the perception of farmers about RLRCP in providing tenure security. The second question is formulated to see the different kinds on investments that the farmers are making on their land to conserve soil. When investment is concerned, it is divided into long term and short term investments. Generally long term investment is associated with secure land tenure whereas a short term investment is linked with insecure tenure (Gebremedhin and Swinton, 2003). Finally the third question is formulated to show a link between the tenure security after getting certificates and investments on land and soil conservation and to see whether this tenure security is really influencing in making long term investments in SLM.

1.2.2 Research Questions

- What is the perception of the farmers about the RLRCP and what is its impact on perceived land tenure security?
- What are the different kinds of investments (long term or short term) that the farmers are actually making and planning to make in their land to increase its sustainable use?
- What is the influence of the RLRCP on farmers' investments in SLM and which recommendations can be given to increase its impact?

If all of these research questions can be answered, then it leads to the main objective of this study showing the influence of RLRCP in making land related investments.

1.3 Outline of the report

The above mentioned section has given a general overview of the research topic focusing on the problem statement which leads to the study objectives and research questions. The second chapter reviews the literature focusing on the changing land tenure system, RLRCF, soil conservation, tenure security and its impact on investments in SLM in Ethiopia as well as in other countries. The third chapter presents the methodology adopted for this study with a short description of the study area. The fourth chapter deals with the results which is the central part of the thesis followed by the discussion of the results. Finally, chapter five concludes the findings of the research with some recommendations.

2. Literature Review and Theoretical Framework

2.1 Literature Review

2.1.1 Overview of land tenure system in Ethiopia

This chapter gives the general overview of the land tenure system in the different time period of Ethiopia which provides the information about the changing land tenure system with the change in Government.

Land Tenure during the pre 1975 Period/Imperial time upto 1974

According to Deininger (2008), before 1975, the land tenure system in Ethiopia was complex and semi-feudal. Tenure was highly insecure and many tracts of lands were underutilized due to insecurity in land ownership issues. The geographical, ethnical, cultural diversity and historical background of the country were considered as those factors that produced highly differential forms of land utilization and ownership. Such complexity of the tenure system is a major hindrance in the progress towards a meaningful reform of the system and also resulted in variety of classifications and approaches in order to describe the land tenure system of the country (Aredo and Adal, 2001). The most common tenure types are described as follows:

Rist/ Kiship System

This was the most dominant tenure system in the northern part of the country in the provinces of Tigray, Gojjam, Gondar and some parts of Shoa and Wollo. Under this system, there were two variants of land rights- rist and gult. Rist is a right to claim to ancestral land based on kinship and customary laws require that rist rights be honored if proof of kinship can be established (Aredo and Adal, 2001). The acceptance or rejection for the claims to land was done by the representative of the *Rist Corporation* by consulting other members of the kinship group. Rist rights were inheritable and tradable in the form of rent but could not be sold or mortgaged as land was a common property of the village community and not a private property of an individual (Crewett, *et al.*, 2008). Gult is not a right on the land like Rist but it is the right to tax the benefit on the land and is not transferable. It is an ownership right acquired from the monarch or from provincial rulers who had a power to make land grants (Adenew and Abdi, 2005).

Private Tenure

This tenure system was generally found in the Southern and Southwestern parts of the country which was the most dominant system during the last period of the Imperial regimes affecting about 60% of the peasants and 65% of the country's population (EEA/EEPRI, 2002). It was the way of land granting by the crown to the soldiers, northern civil servants who came to administer new areas, peasants moving to the south due to the land pressure in the north, local tribes that didn't resist the conquest, local villages and clan chiefs to gain their support, church officials and institutions to facilitate the expansion of religion and a host of central and provincial elites close to the crown. Under this system, land was sold or exchanged without any restrictions if there were no any legal related issues. But the Ethiopian private ownership was different from the western concept of freehold system as all the land was state property originally and private holders had no absolute right (EEA/EEPRI, 2002 and Adenew and Abdi, 2005).

Church Tenure

During the pre-revolution period, the Ethiopian Orthodox Church used to be an important land holding entity. The Samon or Church land was the land granted to the Orthodox Church by the Government (Adenew and Abdi, 2005). This church holdings were found both in the South and North parts of the country; majority being on the South. But the exact amount of land holdings for the church was never determined. It was due to the complexity of the forms of the church ownership, the decentralized nature of ownership of church lands and the secrecy of the church's property (Aredo and Adal, 2001).

Government Tenure

This tenure reflected the predatory nature of the Imperial regime as it was established o those lands which were taken by force from the people in the pastoral and other areas of the country. Even though the exact land holding size under government tenure was not known, it was estimated to be nearly 47% of all the land of the country and about 12% of the agricultural land. Under this tenure, land was given as a reward to the political allies (EEA/EEPRI, 2002).

The tenure system of the Imperial system was considered as major obstacle for the overall development of the country. The tenure system was highly dominated by an imbalance between landlords and peasantry. The land policy was used as an instrument of “divide and rule” (Crewett et al., 2008). Lack of necessary legal frameworks, absolute arbitrary control of the land rights and lack of well organized land administration were the characteristics of the regime which finally led to the overthrow of the regime.

Land Tenure during the Derge Period (1975-1990)

After the overthrow of imperial regime in 1974, the Marxist-oriented government (the Derg) came into power. The land reform program which was launched in 1975 was a major step that eliminated large holdings, landlordism and landlessness. Under this reform, all customary and preexisting land rights were demolished and all lands were declared as a public property. Lands were redistributed among the peasant communities on a relatively equitable manner. Under the Proclamation 31, 1975, "Public Ownership of Rural Lands", there was a strict restriction on the private ownership of land, transfers of land by sale, lease and mortgage, and also the hiring of labor. Each individual HH could farm up to 10 hectares of land. The previous landlords had no rights over their lands and the lands were distributed among the individual HH, with HH size being the main criterion for land allocation. As the HH sizes change over time and new HHs appear, the land was redistributed so as to provide land to new landless HH. The former landlords could also own some land if they were interested to cultivate the land by themselves. But there was no compensation for their losses and tenants were also set free from all their obligations to their previous landlords (Hoben, 1995). Thus the reform implemented “land to the tiller approach” (Crewett *et al.*, 2008). The major changes during this regime were “agrarian socialism” which includes the individual small scale farms and the state farms (Islam and Parviainen, 2009).

Even though the proclamation had solved the problem of land inequality and the exploitation of the farmers who were under tenant –landlord relations during the imperial regime, there were many shortcomings of this reform. There was a problem of frequent land redistribution because of increase in population size and the growing number of HHs needed more land for cultivation (Alemu, no date). The fragmentation and the reduction of the land due to this frequent redistribution created a sense of tenure insecurity among the peasants which resulted in loss of incentives for investments towards SLM and agricultural production (Aredo and

Adal, 2001). Also, due to the restriction of hiring of the labor and renting of the land, the landless HHs had to suffer a lot (Holden and Yohannes, 2002). In the same way, while allocating the land, only the family size was considered. Other factors such as quality of land, size of family workforce and ownership of assets were not taken into account which can have major influence on the ability to use the land (EEA/EEPRI, 2002). In overall, the *Derg* regime failed to increase agricultural production due to its agrarian reforms (Islam and Parviainen, 2009).

Land Tenure under the current Government since 1991

The civil war that led to the fall of the *Derge* regime in 1991 caused a period of uncertainty about the future of land rights of Ethiopia. The transitional Government of Ethiopia announced the continuation of the land policy of the *Derge* regime and declared that the issue of private versus public ownership of land would be settled during the process of developing the new federal constitution (Crewett and Korf, 2008). The new government decided to adopt the free market economy but the land remained as a public property. Article 40 of the new constitution that was adopted in 1995 states that "The right of ownership of rural land and urban land, as well as of all natural resources, is exclusively vested in the state and the peoples of Ethiopia. Land is a common property of the nations, nationalities and peoples of Ethiopia and shall not be subject to sale or to other means of transfer" (Ahmed *et al.*, 2002). Sub Article 4 also states that "Ethiopian peasants have the right to obtain land without payment and the protection against eviction from their possession." Another important provision regarding property rights (Sub Article 7) states that "Every Ethiopian shall have the full right to the immovable property he builds and to the permanent improvements he brings about on the land by his labor or capital. This right shall include the right to alienate, to bequeath, and, where the right of use expires, to remove his property, transfer his title, or claim compensation for it"(Nega *et al.*, 2003). Even though land remained as a state property, farmers are allowed to rent their land for short term and also to hire labor. Land redistributions were restricted except for one land redistribution that occurred in the Amhara Region in 1997. This was politically motivated so as to punish those that had official positions under the previous regime, and some more limited local redistributions. In 1997, a new land law was developed which allocated legislative power to the Federal government and delegated implementation to the Regional States (Holden *et al.*, no date).

2.1.2 Rural Land Registration and Certification Programme (RLRCP) in Ethiopia

This section gives the background of necessity of RLRCP and the registration process in the four main regions of Ethiopia so as to understand the basic concept of this programme.

In Ethiopia, policy makers had been facing a problem of balancing the demand for the continued redistribution of land to the young landless families and ensuring the farmers that their land rights are secured so as to encourage them in making long-term investments in the land (Marquardt, no date). A large number of land redistribution that occurred in the previous time created a great sense of tenure insecurity. So the Ethiopian Government, in its Poverty Reduction Strategy, recognized the importance of tenure security as a necessary component of a plan to increase land productivity and had begun the process of RLRCP since 1998/99 in order to provide land title to the farmers (Teshome, 2006). In the case of Ethiopian land policy, registration refers to “a process of recording rights on land which provides safe and certain foundation of acquisition and disposal of rights in land, where disposition includes transfer, leasing and mortgage (investors) of the holding rights (Kanji *et al.*, 2005).

Land Registration System in the Four Regions:

Based on the Federal Proclamation (Proc.89/1997), four regional states (Amhara, Oromia, Tigray and SNNP) have issued region-specific land administration and use proclamations and commenced with land registration system. For land administration and registration, the Environmental Protection, Land Administration and Use Authority (Amhara and Tigray) and Natural Resource Sector within the Bureau of Agriculture (Oromia and SNNP) were delegated. “*Title registration*” is the registration system that works in the four regions which involves recording the right itself (title) with the name of rightful owner and object of that right. The general characteristics of the registration system in the four regions are more or less similar (see table 1). In the four regions, the process is handled by the lowest level of local government (Kebele and sub-Kebele). In Tigray region, high school graduates were trained in land registration techniques and traditional land allocators elected by the local community, who were involved in the original land redistribution process, are engaged in the registration process. Unlike in Tigray region, in the other three regions, Kebele and sub-Kebele land administration committees were elected by the local community and trained as land registrars. A local consultation process takes place before registration (Abebe, no date). Once registration has been completed and results have been discussed in public, HHs receive a preliminary registration certificate identifying their holdings. Once all the information for a

kebele is entered into the registry book, an official certificate is issued with holders' pictures and space for maps (Deininger, 2008).

The Ethiopian land certification provides only limited rights to the farmers. They can have user rights, rights to inherit, rights to obtain compensation for investments on land in the case of loss of land and rights to rent their land for a limited time period. However, in a country like Ethiopia where there is a history of changing tenure system and tenure insecurity, the provision of land certificates is a step towards improvement. Selling and mortgaging of land is prohibited (Holden *et al.*, 2009).

Table 1. Basic characteristics of registration system in four regions of Ethiopia

	Amhara	Oromia	Tigray	SNPP
Recording format	Manual and computer-based in pilot	Manual	Manual	Manual
Registration system	Low-tech. traditional title registration system and GIS-based title registration in pilot area	Low tech. traditional title registration	Low tech. traditional title registration	Low tech. traditional title registration
Right being registered	Use Right	Use Right	Use Right	Use Right
Registered right holder	Single or joint titling (spouse), local govt. and communities for communal land	Single or joint titling (spouse), local govt. and communities for communal land	Single or joint titling (spouse), local govt. and communities for communal land	Single or joint titling (spouse), local govt. and communities for communal land
Registration of polygamy	Joint titling with one wife	All wives are registered and get joint title	Joint titling with one wife	Joint titling with one wife

(Source: Abebe, no date. Land Registration System in Ethiopia)

2.2 Theoretical Framework

2.2.1 Soil Conservation and Investments in Soil and Land Management (SLM)

Here the terms like soil erosion and conservation, proper land management and long and short term investments on land will be discussed in brief.

Soil erosion is basically washing away of soil leading to soil degradation which is a key factor for the low and declining levels of agricultural productivity and conservation is any activity to prevent such erosion and degradation (Antle *et al.*, 2006). The investments on SLM deals with the combination of the appropriate land use and management practices that promotes the productive and sustainable use of soils and, in the process, minimizes soil erosion and other forms of land degradation (Sanders, 2004). The investments on SLM are categorized as long term and short term investments according to the time duration those investments benefits farmers and land as well. Short term investments refer to investments in land for short term benefit usually for one to two year that include crop rotation, fallowing, construction of soil bunds, application of inorganic fertilizers and construction of traditional ditches whereas long term investments include construction of stone bunds, terraces planting of perennial trees and application of organic manures whose benefit last for more than two years (Kaliba and Rabele, no date).

Ethiopia has been described as one of the most serious soil erosion areas in the world. Due to the population pressure, land has been utilized intensively and due to the insecurity of land holding, not much have been done in terms of SLM (Hagos and Holden, 2006).

2.2.2 Tenure security and Soil and Land Management Practices

This section attempts to build a conceptual analysis of the linkage between land tenure security due to land titling and investments on SLM practices. Land tenure security is “the individual’s perception of his/her rights to a piece of land on a continual basis, free from imposition or interference from outside sources, as well as the ability to reap the benefits of labor or capital invested in land, either in use or upon alienation”(Roth and Haase, 1998). Land tenure system is often considered as a milestone for the adoption of sustainable land management practices and for shaping of the farmers’ land use decisions. That is why the policy makers, government and non-government officers, the private sector, the donor agencies, researchers and public have given a major attention on this issue of tenure security

(EEA/EEPRI, 2002). When there is tenure insecurity, the risk of losing land will obstruct farmers from making investments in the field even though these investments provide higher benefit in their productivity (Deininger and Jin, 2006).

Conceptually tenure insecurity is associated with the lack of well defined property rights. Property rights in terms of land is defined as “the right to occupy, enjoy and use; to restrict others from entry/use; to dispose, buy, or inherit; to develop or improve; to cultivate; to sublet; to realize financial benefits; and to access services in association with land”. Property right helps to resolve conflicts, defend rights, administer and manage land resources which are considered as a foundation for economic growth (USAID, 2007).

According to Deininger (2003), secure property rights will increase the incentives to invest on land and also provide them with better credit access which will help them make such kind of investments. There are many evidences to show that the secure and easily transferable property right are major factors to make higher level of investments in terms of SLM, access to credits and allow economic diversification and growth. Land rights also enhance the gender equality and bargaining power by women, improve governance, reduce conflict potential, and lower transaction costs for productivity-enhancing land transfers through either rental or sale (Deininger *et al.*, 2008).

The lack of property rights and insecurity of tenure often made farmers not to care much about the land use, investments on SLM and use of input efficiently and focus mainly on the short term profit which may result in land degradation (Tenaw *et al.*, 2009). Many studies are carried out to show the link between tenure security and investments in terms of land management. A study carried out in China, Thailand, Latin America and Eastern Europe showed that more secure land tenure had a positive impact on investments and land values in rural areas (Deininger *et al.*, 2009). A study made by Deininger and Jin (2006) also revealed that transfer rights to land tenure security enhanced farmers to make investments on land. Similarly, results of studies in African countries about the effects of tenure security, land rights, land disputes, and land titling showed that stronger land rights and presence of land titles are often linked with a positive impact in making certain types of investment, for example, tree planting, fencing, and manuring (Placea, 2009).

Perceived tenure security plays an important role for making investments in land management, land improvements and adopting best cropping system which is possible through land titling. In Amhara region of Ethiopia, land titling due to distribution of certificates has increased the perception of tenure security among farmers which improved tree plantation and other SLM activities and also the incidence of land disputes has declined due to the proper land demarcation (Palm, 2010 and Deininger *et. al.*, 2009). Gebremedhin and Swinton (2003) found that in Northern Ethiopia, farmers' perceived tenure security was positively linked with investments on long term durable soil conservation structures like stone terraces. Long-term investments in stone terraces are associated with secure land tenure, whereas short-term investments in soil bunds are strongly linked to insecure land tenure.

In the same way, study made by Holden *et al*, (2009) to know the HHs' perceptions about the low cost land certification program, which was implemented on a broad scale in the Tigray region of Ethiopia in the late 1990s, also showed that this program contributed to increasing tenure security and reducing land disputes among the households. The results from the farm plot panel data set covering the year before implementation of certification and upto 8 years after certification also showed that land certification has contributed to increased investments in trees, better management of soil conservation structures and enhancement of land productivity. Another study made in Tigray region of Ethiopia also showed that people having certificates are more interested in making long term land-related investments and also the high use of chemical as well as organic fertilizers (Ghebru and Holden, 2008). Similar is the case for Kenya where tenure security plays an important role for the adoption of soil conservation practices (Kabubo-Mariara, 2007).

In contrast to these findings, there are certain other results which do not show the positive link between tenure security and land related investments. The study carried by Zikhali, 2008 in Mashonaland central province in Zimbabwe to investigate the impact of Zimbabwe's fast track land reform program on perceptions of tenure security and investments on land management showed that the program had created some tenurial insecurities among the beneficiaries and had an adverse impacts on soil conservation practices. It is assumed that this program might have failed to provide tenure security to the farmers who had got land under reform program (Zikhali, 2008). Holden and Yohannes (2002) found no evidence of tenure insecurity having a negative effect on investment in trees in southern Ethiopia, whereas poverty had a significant negative impact on such investments. In the same way, the survey

conducted in Ghana, Rwanda and Kenya also showed that land registration didn't play a major role on productivity, land improvements or access to credits. Rather physical infrastructures, effective credit systems and marketing institutions had a greater impact (Migot-Adholla, 1991).

There are also some cases in which investments are made to increase tenure security rather than a result of higher level of tenure security. A study made by Neef (2001) in four countries (Niger, Benin, Thailand and Vietnam) suggested that tenure insecurity does not always led to decreasing investments in land. The uncertainty of land rights can also enhance tree planting and adoption of soil conservation practices. The main reason behind this is farmers' belief that if they make these types of investments, then it will help to obtain tenure rights and as such increase long term tenure security (Neef, 2001). The same case is also found in Burkina faso where land- related investments are made to increase tenure security rather than as a consequence of more secure rights (Brasselle *et al.*, 2002). However, in context of Ethiopia, it is more likely that land security promotes investments rather than investments are made to increase tenure security (Negatu, 2005).

The above explanation shows that the existing literature on the empirical analysis of the link between land tenure and investment on SLM has mixed results. In Ethiopia, most of the studies done in Amhara and Tigray regions showed that land titling due to certificates provide tenure security among farmers which motivate them to make different kinds of SLM practices. But as this study is done in SNNP and Oromia regions, where not much studies have been done, it is necessary to know whether land titling has really influenced on increasing tenure security among farmers and their investments on land in these two regions also. So considering this fact, the conceptual frame is formulated.

As a part of conceptual frame, a systematic representation of a relation between land titling and investments on SLM is formulated (figure1). From the literature, it is known that there are different views regarding tenure security and investments. So in this study, it is first tried to know whether land titling through certificates really provides tenure security among farmers or not as the perception of farmers in the study area is unknown. Then the second thing that is considered is the effect of this tenure security on access to credits and investments on SLM. Do farmers really consider that increase in tenure security improves access to credits and their

investment on SLM is a big question. If this question is solved, then it can be known that whether tenure security is motivating farmers to make land related investments and use of the farm inputs through an easy access to credits. The issue of access of credits will be discussed only briefly to see how farmers perceive of getting access to credits by using certificates. Investments in terms of SLM include tree plantation, construction of some physical structures, adopting the best cropping system, fallowing, crop rotation and intercropping which helps to reduce land degradation and the use of the farm inputs such as manure and fertilizers to improve soil fertility finally leading to the better productivity. But in this research, this productivity aspect is not going to be discussed as it is a long term process and time is the limiting factor for this study.

Apart from the land tenure, other factors which influence directly or indirectly to the farmers' investments in land management are also taken into consideration which includes household characteristics, livestock characteristics, land characteristics and perception of farmers about the erosion and soil degradation even though those factors are not shown in the framework.

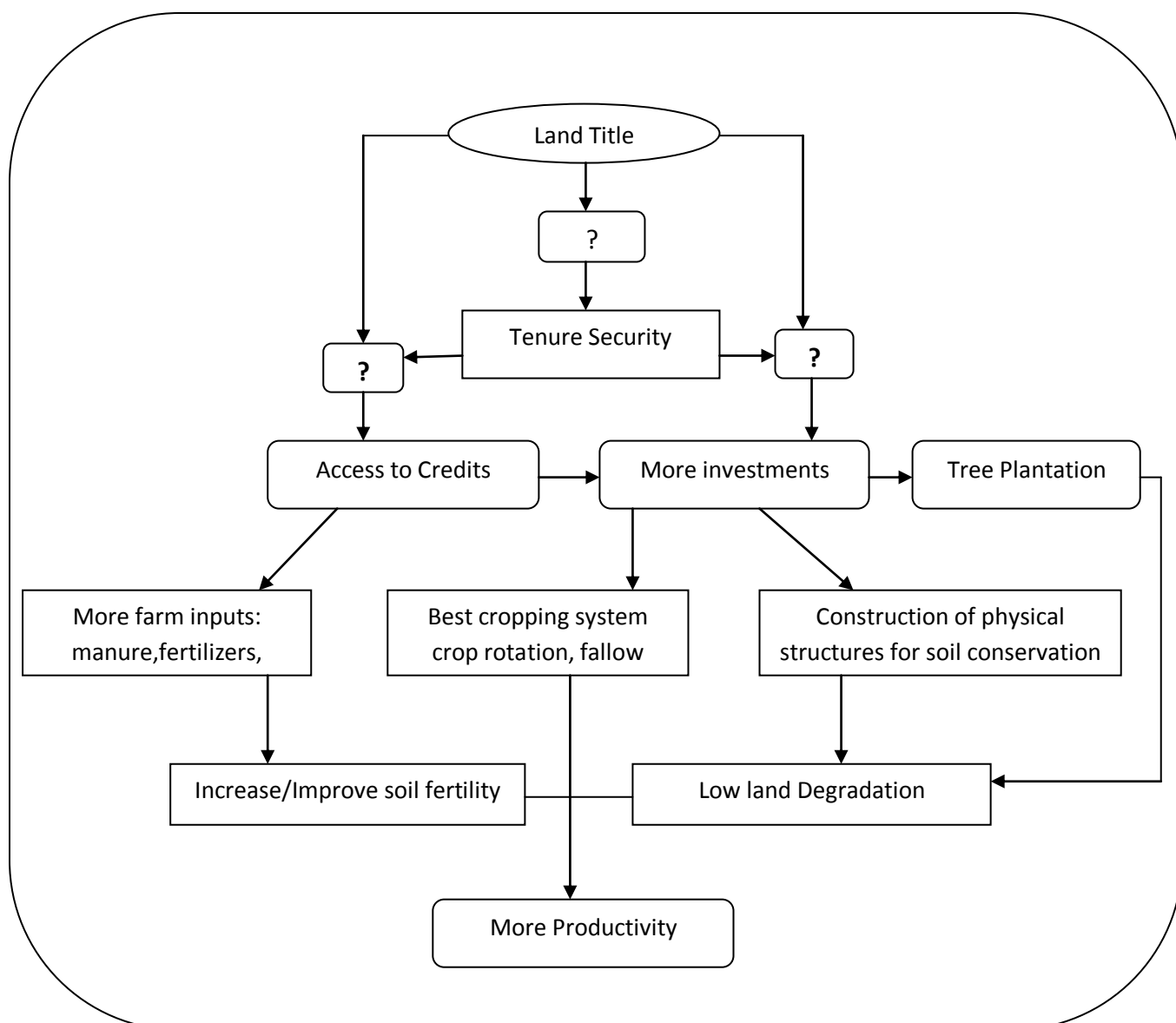


Figure 1. Systematic representation of relation between land titling and investments on land management

3. Materials and Methods

This chapter gives a description of the study area followed by the methods used for data collection.

3.1 Selection of the study area

The study was carried out in two different wereda²: Meskan and Adamitullu Jidokombolcha (AJK) which are located in SNNP and Oromia regional state of Ethiopia. The selection of the study area was done with the help of Zenebe Adimassu, a local advisor who is working in HARC, Holetta, Ethiopia. The two regional states are selected because RLRCF was implemented in these states since 2004 and not much study regarding its initial impact has been done. In Meskan wereda, there are forty kebeles and in AJK, there are forty three kebeles. The particular kebeles (Beressa in Meskan and Worja in AJK) were selected because almost all the people in these kebeles had already received certificates. Also a local supervisor is working in the same kebeles for his PHD which makes it easy to contact with other personnel especially the development agents and the Government officers at the wereda level.

3.2 Description of the study area

The description of the study area provides the general information about the area where the research has been conducted. Some of the information like soil, vegetation cover, farming system and socio-economic conditions are based on the survey, group discussion and transect walk during the field visit.

3.2.1 Location and Topography

Meskan and AJK are located in the Central Rift Valley (CRV). The CRV is situated between approximately 38°15'E and 39°15'East and 7°10'S and 8°30'S at 150 km South of Addis Ababa in the administrative regions Oromiya and the SNNP covering an area of approximately 10000km² with the total population of around 1.5 million. It is a closed basin consisting of chains of lakes and streams. CRV is one of the very vulnerable areas in terms of soil erosion in Ethiopia (Jansen *et al.*, 2007).

² Wereda: District (Administrative unit above kebele)

Meskan wereda is found in Gurage zone of SNNP regional state. The area is located 130 km South of Addis Ababa and 50 km to the west of Ziway town in the Rift Valley, 8.2° North latitude and 38.5° East longitude. The topography ranges between dry lowlands at altitudes around 1,500 m (tropical climate) to cool mountainous areas of up to 3,500 m above mean sea level (temperate climate). The main wet season occurs between June and October, with the remaining months predominantly dry. Daytime temperatures are typically 20–30°C, with nighttime temperatures falling close to freezing at higher altitudes. The average annual rainfall (1996-2005) is 1233 mm according to Butajira station (Jansen *et al.*, 2007).

AJK is found in Misraq Shewa Zone of Oromiya Regional State. The area is located 167 km from Addis Ababa, 7°37'-04'North latitude and 38°32'-39°04'East longitude. The topography ranges between altitudes around 1,500m to 2,300 m above mean sea level. The monthly maximum temperature varies from 25–30°C and the minimum temperature ranges between 10-20°C. According to Ziway station, the average annual rainfall (1996-2005) is 734 mm (Jansen *et al.*, 2007).

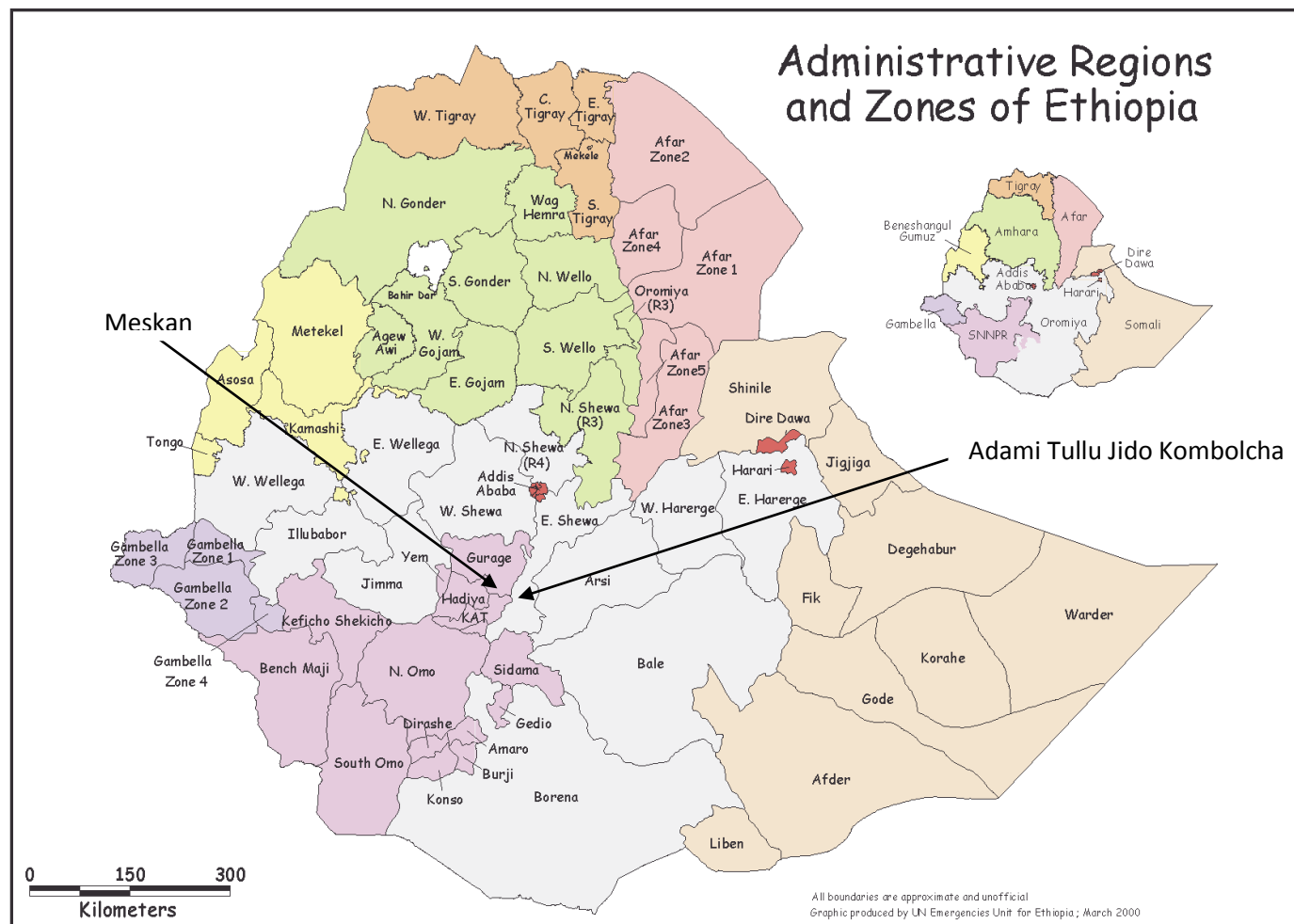


Figure 2. Map of Ethiopia showing the study area

Source: UNDP Emergencies Unit for Ethiopia, 2003

3.2.2 Soils

Farmers in the study area have a good knowledge of the soil in their area and also the difference among the major soil types. According to the farmers, *Merere* is a dominant soil in both of the study areas (92% in Beressa and 69% in Worja) which is followed by *Gurraacha* (31%) in Worja kebele. *Merere (Vertisols)* is characterized by its vertic nature and water logging property. This soil is too hard when dry and too heavy when wet. This soil has two classes: *tikur Merere* which is black vertic soil and *key Merere* which is red vertic soil. *Tikur Merere* is highly vertic and also water logging is high than *key Merere*. *Gurraacha (Mollisols)* is a dark top soil with high organic matter content. This soil is more fertile and suitable for almost all the crops (Erkossa and Ayele, 2003).

3.2.3 Vegetation cover

From the transect walk and key informant interviews, different types of trees/shrubs species are identified. In Worja, most of the trees are *Acacia* species which are naturally grown. In Beressa, *Eucalyptus* trees are grown near the homestead generally for the household purposes and also for economic purposes. Naturally grown trees consist of *Wanza (Cordia Africana)*, *Girar (Acacia bussei)*, *Gishita (Annona senegalensis)*, *Gesho (Rhamnus prinoides)*, *Bisana (Croton macrostachyus)*, *Baddane (Balanites aegyptiaca)* etc. Other tree species which are grown by farmers mainly in Beressa are *Avocado (Persea Americana)*, *Birtukam (Citrus sinensis)*, *Mango (Mangifera indica)*, *Chat (Catha edulis)*, *Zeitona (Psidium guajava)*, *Papaya (Carica papaya)* etc. Fruit trees are not common in Worja. The visual observation shows that the vegetation cover is low in Worja than in Beressa.

3.2.4 Farming system and socio- economic conditions

The study areas have a mix farming system consisting of both livestock and crops. Agriculture is rainfed and the main agricultural crops grown are *Tef (Eragrostis tef)*, *wheat (Triticum aestivum)*, *barley (Hordeum vulgare)*, *maize (Zea mays)*, *horse bean (Vicia faba)* and *field pea (Pisum sativum)*. Other crops include *tomato*, *onion* and *cabbage* mainly in Beressa. Most of the farmers in Worja do not cultivate vegetables due to the lack of water. In Beressa, *chat (Catha edulis)* and *coffee* are grown as cash crops to their field near homestead.

Livestock is an important part of the farming system with the main animals being *cow*, *oxen*, *goat*, *sheep* and *donkey*. *Donkey* is mainly used as a draft animal. Other animals include *bull*, *horses*, *mules* and *chicken*. From the survey and group discussion, it is found the number of

animals have been decreased now that they used to be before seven years. The main reason for this reduction is due to the livelihood problem which forces them to sell their animals. This is also due to the lack of the grazing land as most of the community area is now under the closure area where grazing is not allowed especially in the case of Worja.

Most of the farmers in the study areas are small scale farmers whose life basically depends on subsistence farming. The family size is in the range between 2/3 to 14. Maximum ages of the household heads are 22 and 92 year in Beresa and 28 and 95 years in Worja with mean ages of 45 and 51 respectively. The minimum and the maximum number of economically active family members are 1 and 11 respectively in Beresa and 1 and 10 respectively in Worja. The illiteracy rate is high in Worja.

In Beressa, average land holding for cultivated land is 2.62 timad³. The majority of the sampled households do not have grazing land 60% (24 farmers) while the remaining 40% has the grazing land in the range between 0.20 to 2 timad. In Worja, the average land holding size is 7.34 timad which is almost three times more than that of Beressa. In this kebele, 90% of the households do not have grazing land and the remaining 10% has in the range between 0.50 to 4 timad.

3.2 Data Collection Methods

3.2.1 Sampling

Initially, random selection was tried for the selection of the HHs but there was a problem with a kebele registry. The names of the farmers mentioned in the registry were not found on the village anymore.⁴ So with the help of the development agents in the kebele and interpreters, a visit to the kebele was done and a simple map was developed. HHs were represented by a dot in a map in such a way that they cover the whole map. From there, the sampled HHs were selected in such a way that they will almost cover the whole kebele. In Beressa and Worja, according to the office of development agent and kebele administration, there are 695 HHs and 575 HHs respectively. As per the suggestion of a local supervisor, forty HHs from each kebele was selected considering a time limitation.

³ 1 timad = 0.25 hectare

⁴ Some of the people were already dead and his land is divided among the sons in the home which are not found to be registered in the kebele register.

3.2.2 Primary data collection methods

Transect walks

Transect walks were done in both of the study area before conducting the main survey to understand the topography, soil types, shrubs and trees types, the extent of soil erosion, the different SLM practices that the farmers are adopting for preventing soil erosion, livestock types, the HH types and the living condition of the farmers in the area. Informal talk with the farmers on the way was also done to have some general information of the topic.

Questionnaire survey

Structured questionnaires with some open-ended questions were used to collect the primary data from the sampled HHs. The questionnaires were designed to fit into the objectives of the study (Appendix 1). Before finalizing a questionnaire, discussion was done with a local supervisor so as to refine them. Data collection was done from the end of February to the second week of May with the help of the interpreters. Due to the difficulty in finding a local interpreter in Beressa, an interpreter was hired from Addis Ababa who is good in both English and Amharic language. But he was unable to work in another kebele due to the language problem as in Worja kebele, farmers speak Oromic language. In Worja kebele, a local interpreter was available. It was easier to conduct survey with the help of a local interpreter as he is familiar among the farmers. In Beressa, sometimes, farmers did not feel comfortable to speak with a stranger. But there is also a drawback of having local interpreter as farmers hesitate to speak about some critical issue related to Government which is experienced during this study. Before starting the survey, the interpreters were briefed about the purpose of the study and made them familiar with the questionnaires.

The questionnaires include information regarding the HH characteristics, livestock characteristics, land characteristics, details of the field (plot size, distance, soil type, slope class, fertility status, erosion and the extent of the erosion) land registration and certification, farmers' perceptions after getting certificates, investments that the farmers are making in their field for SLM and the relation between the investments and the land certificates. Pre-testing of the questionnaire was conducted before conducting a real survey in order to check its reliability and validity and as an exercise to introduce the questionnaire to local interpreter and assistant. Afterwards, some of the questions were modified and refined. The survey was conducted with a time period of 60 to 90 minutes. Sometimes, it even took more than two

hours as the farmers just raise their own personal issues and spent lots of time. Also due to the ploughing season, it was difficult to get farmers as most of them went to the field.

Field Observation

Farmers' fields were also visited after conducting the survey so as to see the different kinds of SLM that they are practicing in their fields. In some of the cases, even though farmers mentioned about the different conservation practices and tree plantation during survey but in field, such practices could not be seen. So this visual observation acts as a triangulation to cross check the data obtained from the survey regarding the SLM that the farmers are adopting on their fields.

Group discussion

A focus group discussion with open- ended questions was done in both of the kebeles who includes young, old and both males and females. Discussion was done after conducting the survey so that the issues related to tenure security and SLM which were not clear during the formal survey were raised to get the better understanding of the issues

Key informant interview

Semi- structured interviews were conducted with a certain number of key informants in the study area. Such key informants included the experts from the bureau of Agriculture and Rural Development of the wereda, members of the land use and land use management committee including the head of the committee at the kebele level who were dealing with land issues for a long time. These interviewees were selected through snowball method after reaching the field. The questions included some information regarding the problems in the area associated with land management and how the land security (land certification and registration) are helping them to solve these problems.

5.2.3 Secondary data collection

In order to understand the study area, subject matter and background of the research, secondary data were collected from the beginning since the formulation of research proposal. Such secondary data include study reports, manuals, survey reports, officially published data and other related published papers. Also some of the local literature and some unpublished papers were obtained from the offices at the local and national level. From these studies, it

helped to get a better insight of the topic regarding the evolution of land tenure system in Ethiopia and SLM practices that the farmers are adopting. The previous findings related to the similar researches even help to compare and contrast the findings from this study.

3.3 Data Management, Analysis and Information Processing

Secondary data including the data collected during survey, group discussions and interviews were organized and tabulated. Data coding was done for questions that were not pre-coded. Texts recorded during the interviews were condensed and compiled into short forms and categorized into different themes. Statistical package for the Social Sciences (SPSS) was used for data analysis. Descriptive statistical analysis was carried through cross tabulation where by percentage, means, median and standard deviation were computed. Frequency analysis was used to list out each variable and to tabulate the number of times each value of a variable occurs and also to show the distribution of the responses of a variable. Contingency coefficient (CC) through cross tabulation was done to compare the qualitative data whereas t-test and correlation (r) was done to see the difference and the relation between the quantitative variables. Comparisons of the data obtained from the literature and the field work was done whenever needed. Finally, all the related information obtained from literature review and other methods were managed, examined and analyzed to get the final report.

4. Results and Discussion

This chapter deals with the results obtained by the analysis of the questionnaire survey and the qualitative information of the focus group discussion, other informal talks and interviews. These results are further discussed in detail.

4.1 General Characteristics of the sampled households

The sampled HHs include small scale farmers whose life basically depends on the subsistence farming. As the study was done in two different kebeles of two different regional states, the analysis is done separately for each one so that comparisons can be done whenever necessary.

The given table 2 presents the general HH and livestock characteristics of the two kebeles in two different regional states. Majority of the respondents in both of the kebels are male (82.5% in Beressa and 87.5% in Worja). As shown in table, the minimum and the maximum ages of the HH heads are 22 and 92 year in Beresa and 28 and 95 years in Worja with mean ages of 45 and 51 respectively. The family size is in the range between 2-3 and 14 in both of the kebeles. The minimum and the maximum number of economically active family members are 1 and 11 respectively in Beresa and 1 and 10 respectively in Worja. The farming experience ranges in between 7 and 75 years in Beresa and 11 and 57 years in Worja.

Table 2. General Characteristics of the sampled HHs

Characteristics	Beressa				Worja			
	Minimum	Maximum	Mean	Std.Deviation	Minimum	Maximum	Mean	Std.Deviation
Age of the HH head (yr)	22	92	45	14.5	28	95	51	16
familiy size	2	14	7	2.7	3	14	7	2.5
Number of EAFM	1	11	4	2.7	1	10	3.5	2
Number of EDFM	0	6	2.5	1.7	0	8	3.8	2
Farm experience in years	7	75	30	15.1	11	57	29.5	13.5
TLU_1	0	40	6	7	0	34	10	9.2
TLU_2	0	7	2.1	1.6	0	12	4.3	2.6

where, EAFM (Economically active family members >14 and <65 years)

EDFM (Economically dependent family members <14 and >65 years)

TLU_1 (Tropical Livestock Unit before 7 years)

TLU_2 (Tropical Livestock Unit now)

Livestock is an important part of the farming system in both of the study areas with the main animals being cow, oxen, goat, sheep and donkey. Donkey is mainly used as a draft animal.

Other animals include bull, horses, mules and chicken. In the table, livestock is converted into Tropical Livestock (TLU) unit which is a convenient method for quantifying a wide range of different livestock types and sizes in a standardized manner (For conversion factor see Appendix 2). In both of the study area, the numbers of animals have been found to be decreased in recent days than before 7 years mostly. The results of T- test analysis also showed that there is a significant difference ($p=0.00$) between the number of animals before 7 years and now in both of the kebeles especially for cows and oxen (Appendix 3). Also there is a significant difference in two kebeles in the number of economically dependent family members and economically independent family members (Appendix 4). The main reason for the reduction of these animals is found to be due to livelihood problem which forces them to sell their animals. This is also due to the lack of grazing land as most of the community area is now under the closure area where grazing is not allowed especially in the case of Worja.

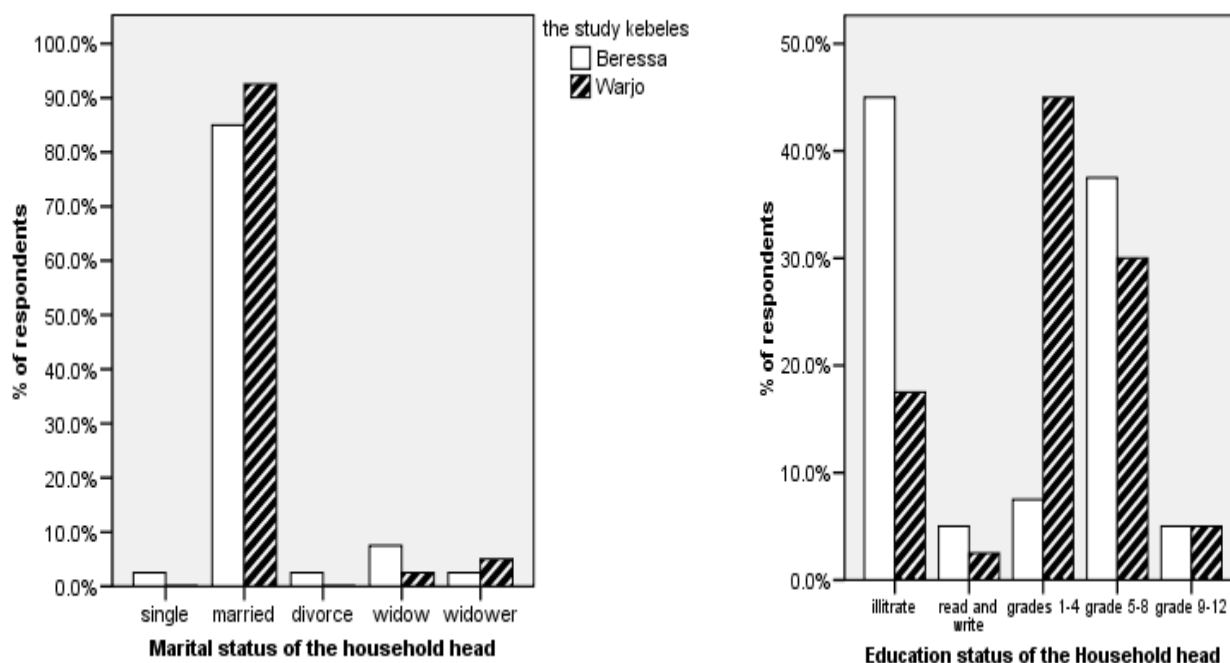


Figure 3. Marital and education status of respondents in two kebeles

The given figure 3 shows marital and education status of the HH heads in both of the kebeles. Majority of them are married in both Beressa and Worja (85% and 92.5% respectively). 2.5% of them are single and 2.5% are divorced in Beressa whereas there is no single and divorced in Worja. About the education level, it can be seen from the graph that the illiteracy rate of the HH head is higher in Beressa with 45% whereas in Worja, it is 17.5%. In case of Worja, majority of the people (45%) has the education level ranging from grade 1 to 4.

4.2 Land Characteristics

Physical and environmental characteristics of land such as farm size, slope and degree of erosion affect the adoption of conservation practices (Bayard et al., 2006). Here land characteristics basically deal with the ownership of the land, how the land is being acquired and also the perceptions of the farmers about erosion in their field. Until farmers do not perceive erosion as a problem in their field, then they may not be conscious about making soil conservation practices and other land management practices in their fields.

In both of the study areas, farmers have their own land. None of the farmers have been found renting their land to others and others land being rented. The land has been acquired through inheritance, purchase (Imperial period) and got through redistribution. The following table gives an overview of how the farmers acquired their land.

Table 3. Land acquired by the HHs

Land acquired	Beressa(N=40)		Worja(N=40)	
	Frequency	Percent	Frequency	Percent
inherited	18	45	13	32.5
redistribution	10	25	26	65
inherited and purchased	2	5	0	0
inherited and redistribution	10	25	1	2.5
Total	40	100	40	100

Source: Own survey

From the given table 3, it is seen that there is a variation in the method of land acquired by the farmers in two kebeles. In Beressa, majority of the farmers inherited their land (45%), 25% of them got the land through redistribution, 5% of them got their land by both purchasing and inheritance and 25% got their land through both inheritance and redistribution. Purchasing and selling of the land is not allowed in the current Government system but during the Imperial period, it was possible if there were no any legal related issues (EEEA/EEPRI, 2002). So only the minority of the farmers, who were from the imperial period, bought the land. In case of Worja, majority of the farmers got their land through redistribution (65%), 32.5% of them inherited their land and 2.5% of them got their land through both inheritance and redistribution but there is no one buying the land.

Table 4. Land holding size in two kebeles

Kebeles	Land size	N	Minimum	Maximum	Mean	Std. Deviation
Beresä	cultivated	40	1	9	2.6	1.7
	grazing	40	0	2	0.2	0.4
Worja	cultivated	40	2	16	7.3	3.1
	grazing	40	0	4	0.2	0.7

Source: Own survey

The land holding size also varies in two kebeles. The maximum and minimum land holding size in Beresä is 9 and 1 timad for cultivated land with the average being 2.6 timad. Majority of the sampled HHs in Beresä (60% i.e. 24 farmers) do not have the grazing land while the remaining 40% has the grazing land with an average of 0.2 timad. In comparison to Beresä, the land holding size in Worja is high for cultivated land with maximum 16 timad and minimum 2, average being 7.3 timad. In this kebele, 90% of the HHs do not have grazing land and the remaining 10% has grazing land with an average of 0.2 timad. T- test analysis for the difference in land holding size between two kebeles shows a significant difference ($t=-14$, $p=0.00$) for cultivated land whereas there is no significant difference for grazing land.

The total cultivated land is divided into different plots. Even though the cultivated land size in Beresä is low, the numbers of plots are more in Beresä than in Worja. This means that the land is more scattered in Beresä than in Worja. From the survey, it is found that the minimum and maximum numbers of plots in Beresä are 1 and 7 respectively with the average of 2.27 whereas in Worja, it is 1 and 4 respectively with the mean of 1.72.

4.3 Perceptions of farmers about erosion

Soil erosion is a slow process. So it is necessary to understand farmers' perception of soil erosion and its impact in order to see SLM practices that farmers are implementing in their field (Chizana *et al.*, 2007). Here it is tried to see how farmers perceive soil erosion in their plots. 100% of the respondents in Beresä and 85% in Worja mentioned that they have erosion problem either in some or in all of their plots. Soil erosion is also determined at the plot level as some plots are not susceptible to erosion. Out of 156 plots in Beresä, majority of the plots (78%) are affected by erosion 22% of the plots do not have erosion problem whereas in Worja, 67% of the total fields are affected by erosion. Not only the erosion matters for soil conservation but also the extent of erosion is important. According to farmers, if the erosion

rate is low, then most of the time they ignore it and do not give much emphasis on the conservation measures.

Erosion is more severe in Beressa affecting 26% of the total plots. In Worja, only 2% of the plots are prone to severe erosion. 40% of the total plots are moderately affected and 12% are affected by low erosion in Beresa whereas majority of the plots (53%) in Worja are moderately affected and 12% of the plots have low erosion rate. One of the reasons that the less number of plots in Worja are affected by severe erosion is due to the slope of the land.

In Worja, very few plots (4.65%) are located in steep slope and the remaining plots are located either in medium slope or in flat to gentle slope and there is no plot located in very steep slope whereas in case of Beresa, about 28% of the plots are located in steep slope which are more severe to soil erosion. The remaining plots are located in moderate and flat slope and 1.9% of the plots are located in a very steep slope. Statistically significant positive correlation ($r= 0.60$, $p=0.00$ for both kebeles) has been found between extent of erosion and slope of the plot. The steeper the slope, the higher will be the erosion extent.

Farmers perceive erosion as a problem in both of the kebeles either in all or in some of their plots even though the rate and susceptibility varies. In both of the kebeles, majority of the farmers (42.5% in Beressa and 60% in Worja) perceive decrease in soil depth and productivity as a main indicator of the erosion. In Worja, the formation of visible gulley and rills does not seem as a big problem in comparison to Beresa where 40% farmers perceive it as an indicator including decrease in soil depth. In case of Worja, decrease in soil depth alone is perceived as an indicator by 32.5% of the farmers (Table 5).

Table 5. Indicators of soil erosion in two kebeles

Indicators	Beressa		Worja	
	Frequency	Percent	Frequency	Percent
Decrease in soil depth	1	2.5	13	32.5
Decrease in soil depth and productivity	17	42.5	24	60
Decrease in soil depth, productivity and visible gulley and rills formation	16	40	1	2.5
Decrease in soil depth and visible gulley and rills formation	6	15	2	5
Total (N)	40	100	40	100

Source: Own survey

There are different opinions of farmers about the reasons of erosion in two kebeles. Majority of the farmers (55%) in Worja revealed that deforestation is the main reason of erosion whereas this reason is not mentioned by the farmers in Beresa. In Beresa, erratic rainfall, steepness of land and improper land management are that main reasons of erosion which is mentioned by 50% of the sampled population. The other reasons are in minority which affect either singly or in combination with other reasons. Heavy or erratic rain has not much impact on erosion in Worja as farmers mentioned that rainfall is too low to cause erosion. Although some of the farmers did not perceive erosion as a major problem in their field, they just mentioned the reasons considering the surroundings and their neighbours.

The trend of erosion i.e. increasing or decreasing and the reasons behind it is also necessary to know in order to see how farmers perceive erosion and what kind of management practices they are doing in order to conserve soil. From the analysis, it is seen that majority of farmers in Beresa (77.5%) mentioned that erosion extent is increasing and remaining 22.5% feel that it is in decreasing order since 10 years whereas in Worja, the case is opposite. 72.5% farmers feel that the erosion rate is in decreasing order and 27.5% perceive there is decrease in erosion rate. According to the farmers, the reason for this decreasing trend is due to low rainfall.

In overall, it is seen that erosion is susceptible in Beressa than in Worja due to the slope of the land and also the trend of erosion is increasing Beressa.

4.4 Land Registration and Certification

This section gives a short description about the distribution of land certificates. In Beressa, out of the sampled HHs, 32.5% got certificates in 2005, 20% in 2006, 27.5% in 2007, 17.5% in 2008 and 2.5% in 2009. In Worja, 35% got certificates in 2007, 32.5% in 2008, 20% in 2009 and 12.5% in 2010. In both kebeles, certificates are issued jointly by the name of husband and wife mentioning the name of other family members and also the plot size. In the case of death of husband or wife, certificate is issued in the name of a single person. In Beressa, in case of polygamy, one certificate is issued in the name of husband and wife who are living together and another in the name of other wife mentioning the name of her husband and separate land is given to her whereas in Worja, all wives are registered and get joint titling. Certificates are not issued to those people whose age is below 18 years.

All the sampled HHs feel the importance of the certificates and keep them in a safe place and even ready to pay for the replacement in case they loss their certificates. They also mentioned

that their lands had been measured properly but there was some conflict during land demarcation especially with the neighbors whose plot is adjacent to theirs. In Beressa, 97.5% of the sample mentioned that there was no any conflict during land demarcation while 2.5% had conflicts with neighbours whereas in Worja, 90% has no any conflicts and remaining 10% had conflicts. Such kind of conflict is solved by discussion with the elder members of the kebele including the officers from the kebele office (development agent). If the problem cannot be solved by such kind of mutual understanding, then the case goes to court and until it is not solved, the certificates are not issued. While asking about the rights and responsibilities of farmers after getting certificates, most of them mentioned legal ownership of land as their rights and paying tax and conserving their land as their responsibilities which shows that almost all the farmers have some kind of awareness about the importance of certificates.

4.5 Perceptions of farmers after getting certificates

Perception of the farmers about the certification programme plays an important role on their investments in SLM (Deininger *et al.*, 2009). So before knowing the conservation practices that they are making in their field, it is necessary to see their perception about this programme. Perception is generally difficult to predict as it is very subjective and not directly measurable matter. So here, perception is tried to see from different views and is categorized into inheritance of land, reduction of border conflict, getting credits for farm inputs, increase tenure security and investments in SLM, receiving compensation if land is taken away, promotes gender equality and increasing female willingness to work. The perception is described in 5 scale categories individually for two kebeles.

4.5.1 Certificates help to inherit land to the children

From the survey, it is found that in both of the kebeles, farmers are quite confident that the certificates will help them to inherit their land to their children as they have a proof of their land ownership. There is not even a single negative view against this opinion. 100% of the farmers in Worja and 97.5% in Beressa completely agree that they will inherit their land and 2.5% of them just agree in this matter which also shows the positive response of the farmers.

4.5.2 Certificates reduce border conflicts

One of the problems associated with land conflict in the study kebeles is about the border conflict. Some of the farmers mentioned that their neighbors used to plough some part of their plot at the border and there is no any proof for the ownership of land. But after the distribution

of these certificates, farmers are quite confident that nobody can claim their land and in case of some conflicts, the certificates can be used as a proof of their holdings.

Table 6. Certificates reduce border conflicts

	Beressa		Worja	
	Frequency	Percent	Frequency	Percent
completely disagree	2	5	0	0
slightly disagree	1	2.5	0	0
slightly agree	0	0	1	2.5
completely agree	37	92.5	39	97.5
Total	40	100	40	100

Source: Own survey

In Worja, 97.5% of farmers completely agree and 2.5% of them slightly agree that their land certificates will help to reduce border conflict with their neighbors and there is no any disagreement on this matter. In case of Beressa, majority of the farmers (92.5%) believe that certificates will help to reduce border conflict but there are also few cases where 5% of the farmers completely disagree and 2.5% of them slightly disagree. The very few case of disagreement in Beressa is due to the fact that few people are still in problem of this border conflict and is on the process of solving with the help of the elder members of the kebele.

The study made by Tefera and Holden (no date) in Tigray region found that certificates reduce border conflicts especially due to good plot border demarcation and plot size measurement which are the same reasons mentioned by the respondents in the study area. According to Tefera and Holden, there is more conflict on redistributed land which is solved by certification programe. From this survey also, it is found that the perception of the farmers about certification is affected by the way in which they acquire their land. In Worja, a significant relation has been found between the way of land acquired and certificates reduce border conflicts ($CC= 0.71$, $p=0.00$) (Appendix 6). 68% of the farmers who obtained their land by redistribution completely agree that certificates help to reduce border. The focus group discussion and interview with land management committee also revealed that after getting certificates, the border conflict has been solved especially for the redistributed land as the plot is demarcated in all four sides mentioning the total area of each plot. But in Beressa, statistically no any significant relation has been found.

4.5.3 Certificates help in getting credits for farm inputs

Most of the time farmers do not apply fertilizers, pesticides and other inputs to their field due to the financial problem which is also the main case in the study area. As most of the farmers are subsistence farmers and due to the financial problem, they are not being able to use these farm inputs. One of the benefits of having certificates is that they can use certificates as collateral to the financial institute and can get credits to buy farm inputs (Deininger, 2003).

Table 7. Certificates help in getting credits for farm inputs

	Beressa		Worja	
	Frequency	Percent	Frequency	Percent
completely disagree	4	10	4	10
slightly disagree	1	2.5	1	2.5
slightly agree	1	2.5	2	5
Agree	1	2.5	0	0
completely agree	33	82.5	33	82.5
Total	40	100	40	100

Source: Own survey

The table shows that in both of the kebeles, majority of the farmers(82.5% in both) completely agree on getting credits by using certificates as a collateral whereas 10% of them completely disagree on this matter. The remaining 7.5% of the sampled farmers are little bit confused and were not being able to completely agree or disagree as they were not aware of this thing and had not applied for credits till now. So here it seems to be the lack of awareness among the farmers about using certificates as a means of getting credits for farm inputs.

4.5.3 Certificates increase tenure security

Does the provision of certificates for land titling really increase tenure security among the small scale farmers is a matter of discussion. Land tenure is the system of rights and institutions that governs access to and use of land and other resources (Maxwell and Weibe, 1998). Here it is tried to know the how farmers perceive about tenure security after getting certificates.

Table 8. Certificates increase tenure security

	Beressa		Worja	
	Frequency	Percent	Frequency	Percent
slightly disagree	2	5	0	0
slightly agree	1	2.5	0	0
Agree	1	2.5	0	0
completely agree	36	90	40	100
Total	100	40	40	100

Source: Own survey

Table 8 shows that in Worja kebele, 100% farmers completely agree that the certificates increase tenure security whereas in case of Beressa, 90% of them completely agree and 5% of them slightly disagree. So in both kebeles, almost all the farmers perceive that this certificate will help to increase land tenure security. This finding is similar to the finding of the study made by Holden and Tefera (2008) in Southern Ethiopia which showed that the land reform has contributed to increase perceptions of tenure security among small scale farmers. The reason behind the disagreement of 5% of people in Beressa is that there were secured before also as they are paying land tax.

4.5.4 Certificates increase investments in land management

One of the main motives of providing certificates is to increase land related investments for SLM (Deininger *et al.*, 2009). So, here it is tried to see whether perception of farmers about tenure security affect their perception on investments on land management or not.

Table 9. Certificates increase investments in land management

	Beressa		Worja	
	Frequency	Percent	Frequency	Percent
completely disagree	9	22.5	0	0
slightly agree	3	7.5	9	22.5
completely agree	28	70	31	77.5
Total	40	100	40	100

Source: Own survey

The survey results (table 9) shows that in Worja, 77.5% farmers completely agree that certificates increase investments in SLM and 22.5% slightly agree and there is no any case of disagreement. In Beresa, even though majority (70%) of farmers completely agrees that certificates will increase investments in SLM, there are also cases where 22.5% of them

completely disagree and 7.5% slightly agree. The reason behind the disagreement of 22.5% of farmers in Beressa is that they are not making soil conservation practices and other land management because of certificates. They mentioned that land is a basic source of their livelihood and it is their duty to protect the land from extremities in order to have better production for themselves and for their family whether they have certificates or not.

4.5.5 Certificates help to receive compensation if the land is taken away

From the informal talks with farmers before conducting the formal survey and from the focus group discussion, it was found that before getting certificates, they have some kind of fear that their land will be taken away without any compensation if there is any work for urban expansion and there are also few cases where they had not got any compensation. Now the farmers are more confident that they will get compensation if their land is taken away as they have a proof of their land ownership. The confidence level is more in Beressa where 97.5% mentioned that they agree whereas in Worja, 85% of them agree on this. Some farmers do not think that they will get compensation as they believe that land still belongs to Government and it is difficult to say on the issue of Government. Majority of the farmers (80.8%) who got land by redistribution (N=26) perceive that they will get compensation now if their land is taken away for any purposes. The informal talks with the farmers and the focus group discussion also revealed the same fact that those farmers who got their land through redistribution were uncertain about getting compensation before getting certificates but now they are completely sure of getting compensation in any case. So it can be said the redistributed land are more secure after getting certificates than before. Megeleta Oromia, 2009 and Debub Negarit Gazeta, 2007 SNNP have also mentioned about the provision of giving compensation in case farmers are evicted from their land holding for public purpose.

Table 10. Certificates help to receive compensation if the land is taken away

	Beresia		Worja	
	Frequency	Percent	Frequency	Percent
completely disagree	1	2.5	5	12.5
slightly disagree	0	0	1	2.5
slightly agree	1	2.5	0	0
Agree	2	5	0	0
completely agree	36	90	34	85
Total	40	100	40	100

Source: Own survey

4.5.6 Certificates promotes gender equality and female willingness to work

One of the basic fundamental of certification program is women empowerment and gender equality. Traditionally, in Ethiopia, women have less power and weak position in HH and in society than male. They are less involved in farming activities and males are always responsible for those activities. Now certificates help them to have land rights (Holden and Tefera, 2008). The result shows that majority of the respondent in both kebeles (100% in Worja and 90% in Beressa) agree that certification program promotes gender equality. Out of 5 female respondents in Beressa, all mentioned that as their names are mentioned on the certificates, they believe that they will get the land in case of death or divorce to their husband which also makes them strong and motivate to work in field. The result also shows that female are more willing to work more in the field (100% in Worja and 80% in Beressa). 20% of the respondents who are men believe that there is no difference in the contribution of female in field before and after certificates as they are always motivated to work in the field for the benefit of the family and are always ready to help male members of the family.

4.6 Farmers' perceptions about the redistribution in future

There was frequent land redistribution in past days in Ethiopia so it also necessary to know the perception of farmers about the redistribution in future as this may also affects their investment in land management. The survey result showed that in Beresa, majority of the respondents (62.5%) mentioned that they do not know what will happen in future. According to them, it all depends on Government and their policy which is difficult to predict. 17.5% of them think that there will be redistribution in future and 20% think that there will not be any redistribution. So it seems that people are still quite unsure about what will happen in future. About the land holding size in case if there will be redistribution, 42.5% of respondents feel their land size will be decreased, 27.5% feel their land size will increase and 15% respond as they do not know and 15% mentioned that their land size will remain same.

In case of Worja, 15% respondents responded as they don't know, 60% think there will not be redistribution and 25% think there will be redistribution again in future. Most of the respondents (82.5%) in Worja feel that their land holding size will be decreased in case if there will be redistribution as they feel that their land holding size is more. The reason behind saying that there will be redistribution again in future is due to the change in family size. As the land was distributed according to the family size and now as the family size has been

changed, they feel that there will be redistribution as the low family size has more land and vice versa.

4.7 Perception about security of land before and after certificates

There is a difference in perception of farmers about the security of the land before and after getting land certificates. Certificates provide them land titling and land rights and they can use their certificates as a proof of their land ownership.

Table 11. Security of land before and after certificates in two study kebeles

		Beressa		Worja	
		Frequency	Percent	Frequency	Percent
Security of your land after getting certificates	slightly secure	1	2.5	0	0
	secure	2	5	0	0
	completely secure	37	92.5	40	100
Total	N	40	100	40	100
Security of your land before getting certificates	completely insecure	6	15	16	40
	slightly insecure	28	70	18	45
	slightly secure	2	5	4	10
	completely secure	4	10	2	5
Total	N	40	100	40	100

Source: Own survey

While asking about the security of land before and after getting certificates, only 10% of the respondents in Beressa mentioned that they were completely secure of their land before getting certificates but now 92.5% mentioned that they are completely secure due to certificates. In case of Worja, after getting certificates, 100% of the respondents feel full confident about the security of their land whereas before getting certificates, only 5% of them were completely secure. So it is seen that there is a quite change in the perception of farmers before and after getting certificates. In both of the kebeles, almost all the respondents are completely secure about their land now after getting certificates where before they were insecure. But during the focus group discussion in Beressa, farmers mentioned that they will never be completely secure of their land just due to certificate as certificate is not a “Bible” or “Qur’an” and it can be changed anytime if there is change in Government. They are not sure about what will happen in future as they already experienced a frequent land redistribution and change in Government with the change in land system in past days in Ethiopia.

4.8 Perceptions about the current land holding system

Here it is tried to know whether the farmers like the current land holding system or not and what kind of land holding system do they prefer. The survey results showed that 95% of the respondents in Beressa mentioned that the current land holding system is good for them and 5% of them mentioned as they do not know about such kind of issue. About the land holding system, 67.5% prefer public ownership but secure rights and whereas 32.5% prefer freehold or private ownership so that they can sell and mortgage their land. In Worja, 100% of the respondents mentioned that they like the current land holding system and 100% of them prefer public ownership but secure rights. There is no respondent found who prefer private ownership of land. The belief of the respondents for preferring public ownership is that if the land is allowed to sell then at the time of emergencies, the land will be sold and afterwards they will be in a great problem as land is the only source of their livelihood. In case of Beressa, even majority of people supports the current system of land holding, there are also people (32.5%) of people preferring private land ownership. As the issue of land holding is a matter of a political debate in Ethiopia and also as the election was coming near during this study time, farmers do not feel more comfortable to talk about this issue.

The above description shows that majority of the respondents in the surveyed HHs have a positive response towards RLRCF, especially in Worja even though there are minority of farmers who do not consider this. In both kebeles, above 80% of the respondents agree that certificates will help them in providing tenure security through different perspectives. The only exceptional is in Beressa where even though majority of the farmers (77.5%) perceive that certificates help in increasing investments, there are also cases of complete disagreement. During focus group discussion also, it is found that in Beressa, few farmers do not care about whether they have certificates or not and mentioned that are always secure about their land as they are paying land tax and always willing for SLM practices as land is the only source of their livelihood.

4.9 Impact of certificates (tenure security) on Investments in Soil and land management (SLM) practices

The previous explanation already shows the perception of the farmers. Now it is necessary to see whether this perception really has any role in making investments in SLM practices or there are some other factors which are affecting in making those investments.

The investments have been distinguished as public and private investments. Public investments in conservation are done in a group by mobilizing people through the Safety Net program and food for work incentives especially for the construction of bunds. Only private investments at the farmers' plot level are taken into consideration. The SLM practices that the farmers are practicing in the study area include construction of traditional ditches, application of inorganic and organic manure, construction of bunds, tree plantation, crop rotation and intercropping.

Table 12. Number of respondents making different land management practices

		Beressa		Worja	
		Frequency	Percent	Frequency	Percent
Traditional ditches	No	24	60	3	7.5
	Yes	16	40	37	92.5
Total		40	100	40	100
Organic fertilizers	No	2	5	1	2.5
	Yes	38	95	39	97.5
Total		40	100	40	100
Inorganic fertilizers	No	8	20	36	90
	Yes	32	80	4	10
Total		40	100	40	100
Soil bunds	No	19	47.5	7	17.5
	Yes	21	52.5	33	82.5
Total		40	100	40	100
Stone bunds	No	33	82.5	36	90
	Yes	7	17.5	4	10
Total		40	100	40	100
Stone-soil bunds	No	32	80	0	0
	Yes	8	20	0	0
Total		40	100	40	100
Treeplantation	No	1	2.5	26	65
	Yes	39	97.5	14	35
Total		40	100	40	100

Source: Own survey

4.9.1 Traditional Ditches

Traditional ditches (*Boi*) are the short term investments that the farmers are making in their plots during the time of ploughing. These ditches are constructed using a *Maresha* (wooden

plow) and plough pull by oxen to allow excess water to infiltrate easily and drain out of cultivated land acting as a cut off drain. It helps to protect soil from being washed away by runoff and reduce surface runoff generated within a cultivated land. The spacing, depth, length and gradient of these ditches depend on the types of crops grown, erosion extent, water logging condition, depth of the soil and length of the field (Erkossa and Ayele, 2003).



Figure 4. Traditional ditches (left) and Oxen plough (right)

The number of respondents using traditional ditches varies in two kebeles. Table 12 shows that 60% of the respondents do not construct and 40% of them construct ditches on their plots in Beressa whereas in Worja, majority of the farmers (92.5%) construct ditches. The farmers do not construct ditches in all of their plots. Even though the total number of plots in Beressa is higher than in Worja, more ditches are constructed in Worja than in Beressa. In Beresa, only 16% (N=156) of the plots have traditional ditches whereas 84% donot have those ditches. In case of Worja, 86% (N=86) of the plots have ditches whereas 14% of plots do not have ditches. While asking the farmers whether they are making those ditches due to certificates, then, in Beresa, only 3% of the respondents mentioned that they are making those ditches due to certificates and 97% of them are not making due to certificates. In case of Worja, the case is different. Majority of them (70%) mentioned that are making ditches due to certificates for having secure land and 30% mentioned that it is not due to certificates.

Traditional ditches in Beressa

In Beressa, statistically no significant relation is found between the perception of farmers⁵ after getting certificates and the construction of traditional ditches which is also proved by the

⁵ Perception of farmers after getting certificates include certificates help to inherent land to children, reduces border conflicts, helps in getting credits for farm inputs, increase tenure security, increase investments in land management and receives compensation if the land is taken away.

fact that majority of farmers (97%) mentioned that they are not making ditches due to certificates. Rather, they consider it as their duty and responsibilities to protect their land whether they have certificates or not as land is the only basic source of their livelihood. So here it shows that perception about tenure security is not always the reason to make investments. There are certain other factors which have some impact on the construction of ditches. Contingency coefficient (CC) shows that there is a significant association of construction of ditches with the education level of the HH head ($CC= 0.3$, $p=0.03$) in Beressa (Appendix 7). Even though, the relation is not strong, 72% of the total ditches ($N=25$) are found to be constructed by the literate farmers whose education ranges from read to write to grade 9 to 12. They also mentioned that they are getting some information about the benefits of making these ditches by the development officers whereas illiterate farmers donot mention those things.

Traditional ditches in Worja

In Worja, a significant relation of the construction of traditional ditches has been found with the perception of the farmers that certificates reduce border conflicts ($CC= 0.36$, $p=0.00$), perception of the farmers that certificates help to get credits for farm inputs ($CC= 0.3$, $p=0.04$) and compensation for land ($CC= 0.3$, $p=0.01$) (Appendix 7). 86% of the total plots which have ditches are on the plots of the farmers who completely agree that certificates reduce border conflicts, 85% of the total plots which have ditches are in the plots of the farmers who completely agree that certificates helps in getting credits and 89% of the total plots which have ditches are in the plots of the farmers who completely agree that certificates helps in getting compensation. Although the relation is significant, it is not strong enough. But the response of 70% of the sampled HHs that they are making those ditches because of land security after getting certificates shows that they are influenced by certificates. Generally when tenure security is concerned, more emphasis is given on long term investments. But the case found in Worja is different where tenure security is even influencing short term investments on SLM which is in contrast of the findings obtained by Gebremedhin and Swinton (2003) in Northern Ethiopia. Another reason is that in Worja, majority of the farmers obtained land through redistribution and after getting certificates, they become secure about the land which motivates them to make these ditches. There are certain other factors which also have influence on the construction of ditches. Contingency coefficient (CC) through cross tabulation shows that there is a significant association of construction of ditches with

erosion ($CC= 0.25$, $p=0.04$), extent of erosion ($CC= 0.31$, $p=0.03$) and the way land is acquired ($CC= 0.4$, $p=0.00$) [Appendix 7]. More ditches (68%) are found in those plots which are obtained through redistribution. More ditches are constructed in such plots where there is erosion problem but the rate of erosion is moderate to low as these traditional ditches cannot withstand the heavy erosion.

4.9.2 Construction of Bunds

Bunds are the physical structures which are constructed across the contour lines in order to reduce the steepness of the land (Gebrernichael *et al.*, 2005). Soil and stone bunds are the dominant types of conservation structures in the study areas. Stone bunds are more durable than soil bunds. Also, a combination of stone and soil bund has been found in some plots in Beressa. According to the farmers, they construct such bunds when the erosion is high but there is lack of stones to construct the full stone bunds. Soil bunds are considered as short term investments on SLM whereas stone and combination of stone and soil are the long term investments for SLM (Kaliba and Rabele, no date).



Figure 5. Soil bund (left) and Stone bund (right) in farmers' plot

Soil bunds are common in Worja than in Beressa whereas stone bunds are more in Beressa than in Worja and combination of stone and soil bunds are found only in Beressa. In overall, at the plot level, bunds are constructed more in Worja than in Beressa. The construction of soil bunds is more than other bunds in both kebeles. As erosion is not much severe in Worja as in Beressa and also due to the lack of stones, farmers are making more soil bunds in Worja than other bunds. Farmers also mention that they don't construct bunds when the plot is in flat land and erosion is not much severe. Another reason for not constructing bunds especially in Beressa is that they are waiting for the group mobilization program to make such bunds. In

the kebele, if any plots of farmers have severe erosion, then with the help of the development agent, the farmers are mobilized for the construction of bunds and farmers help each other.

Bunds in Beressa

From the survey, it is found that in Beressa, 52.5% of the respondents constructed soil bunds, 17.5% constructed stone bunds and 20% constructed combination of soil and stone bunds. At the plot level, 23% of the total plots (N=156) have soil bunds, 6.4% have stone bunds and 8.3% have combination of soil sand stone bunds. In this kebele, all the respondents start getting certificates from 2005 onwards. While comparing the date of getting certificates with the date of construction of soil bunds, then 45% of the total soil bunds (N=36) were constructed before 2005, 36% after 2005 and 19% in 2005. So it is difficult to generalize whether they are making more soil bunds after getting certificates or not as the bunds that are constructed on year 2005 (19%) is difficult to consider the one made after getting certificates due to the quick response. In the case of stone bunds, 50% (N=10) are made before 2005, 10% in 2005 and 40% after 2005. Only for the combination of stone and soil bunds, majority of them are constructed after 2005 (83%) which can be considered as an influence of certificates but again while asking farmers whether they are making those bunds after getting certificates, 97% of them mentioned that that are not making those bunds due to certificates which shows that there is no influence of certificates on either soil bund or stone bund construction in Beressa..

In Beressa, the construction of soil bunds has a significant relation with the perception of farmers that certificates reduce border conflicts ($CC= 0.2$, $p=0.01$) (Appendix 7). Even though this relation is not strong, 98% of the plots which have soil bunds are constructed by those farmers who believe that certificates reduce border conflicts. For stone bund, no any relation has been found with the perception of farmers after getting certificates and the construction of stone-soil bunds has a significant relation with the perception of farmers that certificates increase tenure security ($CC= 0.4$, $p=0.00$) (Appendix 6). 100% of the plots which have stone bunds are constructed by the farmers who agree that certificates increase tenure security and this relation is moderate ($CC=4$). Even though statistically some significant relation has been found between the construction of bunds and perception of farmers after getting certificates, the comparison of date of construction of bunds and date of getting certificates and also the

response of farmers for not making bunds due to certificates reveal that there is no impact of certificates for construction of bunds in Beressa.

There are other HH and land characteristics which are affecting the construction of bunds in Beressa. CC shows a significant relation of construction of soil bund with erosion (CC= 0.2, $p=0.03$) and erosion extent (CC= 0.32, $p=0.01$) (Appendix 7). Even though the relation is not so strong relation, 91% of the plots which have erosion had constructed soil bunds where the extent of erosion is low to moderate as soil bunds cannot withstand severe erosion. A significant relation of construction of stone is found with education level (CC= 0.3, $p=0.01$) and slope class (CC= 0.25, $p=0.02$) [Appendix 7]. 90% of the total plots which have stone bunds are constructed by the literate farmers. Stone bunds are mainly constructed in the plots having moderate to steep slopes. About the combination of soil and stone bund, a significant relation is found with the education status of the HH head (CC= 0.3, $p=0.01$) [Appendix 7] with more bunds constructed by the literate farmers.

Bunds in Worja

In Worja, 82.5% of the respondents construct soil bunds, 10% constructed stone bunds and there are no farmers using the combination of stone and soil bunds. At the plot level, 57% of the total plots (N=86) have soil bunds and 2% have stone bunds. In this kebele, respondents start getting certificates from 2007 onwards. While comparing the date of construction of bunds with the date of certificates, it is found that most of the soil bunds (66%) and all the stone bunds that are constructed are after 2007 which shows that there is influence of certificates on bunds construction in Worja. Also, majority of them (70%) mentioned that they construct those bunds due to certificates for having land secured and sense of belongingness which also shows the influence of certificates.

The construction of soil bunds has no any significant relation with the perception of farmers after getting certificates but the construction of stone bunds has a significant relation with the perception of farmers that certificates increase investments (CC= 0.2, $p=0.03$) (Appendix 6). 100% of the plots which have stone bunds are on the plots of those farmers who agree that certificates increase investments. Even though, statistically the relation is not strong, there are proof from the date of certificates and construction of bunds which verify that in Worja, the construction of bunds are influenced by certificates. Also majority of the respondents (70%) mentioned that they are making bunds after getting certificates due to land security.

In case of Worja, even though more respondents are educated than in Beressa, no any significant relation has been found between the construction of bunds and the education level. CC shows a significant relation of construction of soil bund with the slope class (CC= 0.6, $p=0.00$), erosion (CC= 0.6, $p=0.00$) and erosion extent (CC= 0.6, $p=0.00$) (Appendix 7). Most of the soil bunds are constructed in a moderate slope plot where the erosion rate is medium. According to farmers also, they donot construct soil bunds in a steep slope where erosion is high as soil bund cannot withstand such erosion. Statistically no any relation of the construction of stone bund has been found with the land characteristics.

Maintenance of bunds

Maintenance of the bunds also shows the effect of getting certificates. In Worja, 100% of the respondents who made bunds in their fields mentioned that they maintain bunds in their field and majority of them (70%) also mentioned that they are doing this maintenance due to security of land after getting certificates. According to them, before getting certificates, they were not much interested in doing such activities but now they are more conscious about their land and are motivated to implement SLM practices. But the case in Beressa is again different. Even though 97% of the respondents mentioned that they maintain bunds in their plots, only 37.5% of them mention that they are maintaining these bunds due to security of their land after getting certificates whereas other 62.5% mention that it is not due to certificates. They do the regular construction especially during ploughing time in to conserve soil from erosion and for this, it does not matter them whether they have certificates or not.

Thus it shows that in Worja, the construction of traditional of ditches and bunds are influenced by both land characteristics and tenure security after getting certificates whereas in Beressa, it is only influenced by the HH and land characteristics. Even though the erosion rate is high in Beressa than in Worja, not much soil conservation structures have been found constructed in Beressa. It seems like farmers in Beressa are waiting for the group mobilization to construct those structures. Also the distance of the plot from the home and the plot size which are considered as a major factor for determining the adoption of conservation practices (Featherstone and Goodwin, 1993) have no affect on the construction of these structures. No relation has been found between the perception about future redistribution and the construction of those structures even though it is mentioned that the fear of future redistribution will obstruct farmers in making investments on SLM (Gebreselassie, 2006).

4.9.3 Organic fertilizers (Compost)

Loss of soil organic matter is one of the important factors for soil degradation. So it is necessary to maintain a satisfactory level of organic matter in soils as it plays a major role in soil functions and quality such as a source of nutrients, promotion of favorable soil physical condition, soil biotic population and plant nutrients absorption (Budhaka and Srikajorn, 2002). Application of organic manure is considered as a long term investments in SLM.



Figure 6 . Compost making in farmers' homestead

Organic manure in the form of compost is being used in the study areas in order to improve and maintain the fertility and productivity of soil. Composting is the product which is obtained by the process of decomposition of waste products from farmlands and byproducts of agro - industry microbial activities (Budhaka and Srikajorn, 2002). As shown in the Table 12, in both of the kebeles, there is a high response of the farmers for the application of organic fertilizers. 95% of the respondents in Beressa and 97.5% of the respondents in Worja applied manure on their plots. But when considering the number of plots receiving manure, the case is different. In Beressa, only 37% of the total plots (N=156) received organic manure and 63% did not receive any manure whereas in Worja, 93% of the total plots (N=86) received organic manure. Here, only the application of manure is not a big concern. It is necessary to know whether they are applying this due to certificates or not.

Organic manure in Beressa

In Beressa, by the statistical analysis, no any significant relation has been found between the perception of farmers about certification and the application of manure. Also, a very few respondents (3%) mentioned that they are applying manures due to certificates while the rest

97% mentioned that they are not applying this manure due to certificates. This weak response is due to the trainings that the farmers are getting on compost making at the local scale which motivates them to apply rather than due to certificates. A significant relation has been found with other factors such as slope class (CC= 0.25, $p=0.02$), soil fertility (CC= 0.3, $p=0.00$) and erosion extent (CC= 0.3, $p=0.01$) (Appendix 7). From the survey result and as per mentioned by the farmers, it is found that more manures are applied in moderate to flat and gentle slope where the erosion rate is low or there is no erosion. Also, manure is applied more in the soil with medium fertility as they found no response of applying manure in low fertility soil. In Beressa, the low application of organic manure at the plot level is due to the lack of transportation. From the survey also, it is found that distance matters for the manure application as most of the manure applied (93% of the total plots getting manure) are near to the homestead (upto 10 min walking distance from home).

Organic manure in Worja

In Worja, statistical analysis shows a significant relation of application of organic manure with the perception of farmers that certificates reduce border conflicts (CC= 0.5, $p=0.00$), helps to get credits for farm inputs (CC= 0.3, $p=0.02$) and can get compensation for land (CC= 0.4, $p=0.01$) [Appendix 6]. 100% of the plots which have applied organic manure are on the plots of those farmers who believe that certificates reduce border conflict, 85% of the plots which have applied organic manure are on the plots of those farmers who believe that certificates help to get credits and 89% of the plots which have applied organic manure are on the plots of those farmers who believe that certificates help to get compensation. This relation is not very strong except for the certificates reduce border conflict which is moderate but the response of 70% of the respondents that they are applying organic manure due to certificates verify the fact that in this kebele, certificates play an important role. In Worja, no any significant relation of application of manure has been found with the HH and livestock characteristics but a significant relation is found with the method of land acquired (CC= 0.5, $p=0.00$) (Appendix 7). 67% of the plots which are applied with organic manure are on the plots of those farmers who acquired by redistribution. Even though statistical analysis does not show any relation between the application of manure with the distance of the plot, farmers mentioned that it is difficult to apply manure to the far plots due to the lack of transportation. In such cases, they used to hire animals from neighbor and used to transport manures.

4.9.4 Application of inorganic fertilizers

Inorganic fertilizers are considered as a short term investment on land which is applied for a quick response and better production in a short time period. Even it is short term investment on land, it is more influenced by an access to credits which is, in turn, influenced by the certificates as certificate can be used as collateral to get access to credits for farm inputs. In the study areas, Urea and DAP has been found to be applied by farmers in their fields.

Inorganic fertilizers in Beressa

The application of inorganic fertilizers is found to be more in Beressa. 80% of the respondents apply fertilizers in their plots and 51% of the total plots receive fertilizers (N=156). Even though the use of fertilizers is higher in Beressa, they are not applying it due to certificates. No any significant relation has been found between the perception of farmers after getting certificates and the application of inorganic fertilizers. This is also verified by the fact that none of the farmers mentioned that they are applying fertilizers due to certificates. Rather a significant relation has been found with the extent of erosion (CC= 0.2, $p= 0.02$) (Appendix 7). According to farmers, they usually apply fertilizers in those plot where they have low to medium erosion rate. The use of fertilizers in plot having severe erosion is of no use as they don't see any response of fertilizers.

Inorganic fertilizers in Worja

In Worja, only 10% of the respondents apply fertilizers and 7% of the total plots (N=56) receive inorganic fertilizers. A significant relation of application of inorganic fertilizer has been found with the perception of farmers that certificates reduce border conflicts (CC= 0.5, $p= 0.00$) and certificates helps in getting compensation (CC= 0.5 $p=0.00$) [Appendix 6]. But this does not seem to have a major implication as the factor like certificates help to get credits for inputs, which mainly affect the application of fertilizers, has no any relation with the application of fertilizers. Also the use of fertilizers is in minority in Worja and all the farmers have already mentioned that they are applying fertilizers not due to certificates. Farmers prefer more organic manures than inorganic fertilizers. Farmers mentioned that their crops are burnt when they apply fertilizers due to lack of rainfall and they even lost their whole crops. They also don't want their fields to be used to for such fertilizers as they noticed that once the fields are applied with inorganic fertilizers and next time if they are not able to apply, then the crop yield is reduced drastically.

In Beressa, even though farmers are applying fertilizers, it is not as per the recommended proportion which is mainly due to high price of fertilizers. Price is the major hindrance for not applying fertilizers which is mentioned by all the respondents in both kebeles. As the farmers are the small scale farmers, they cannot afford to buy fertilizers. Even though, majority of farmers (82.5%) perceive that certificates helps in getting credits for farm inputs, later on they mentioned that they have never applied for this credit and nobody has told them about this. So it also seems to be due to the lack of knowledge.

The application of organic manure is not affected by tenure security in Beressa. Even though farmers mentioned that they are getting training in compost making which motivate them to apply compost, at the plot level, the application is low due to lack of transportation. In case of Worja, farmers are influenced by tenure security and the application rate is also high at the plot level. For fertilizers, in both kebeles, the main problem is high price and there is no relation with tenure security.

4.9.5 Tree Plantation

The investments in tree plantation are considered as a long term investment in land management. So it is expected to be influenced by the certification programme.

In the case of Beressa, 97.5% of the respondents mention that they planted trees in their fields whereas in case of Worja, only 35% mentioned that they plant tree in their fields while 65% do not plant trees. But they have trees grown on their field naturally long time before and they maintain them. No fruit trees have been found planting in Worja.

In Beressa, no any statistically significant relation has found between the perception of farmers after getting certificates and the tree plantation. Also, no any significant relation has been found with the HH and land characteristics. Even though majority of the farmers (85%) planted trees, they revealed the fact that they are not planting due to certificates. Most of the trees planted are chat (cash crop) which are grown nearby to home. Fruit trees such as mango, papaya, avocado, kazmir are also found near the homestead. Farmers mentioned that they plant more trees near home but statistically no significant correlation has been found between the distance of the plot and the amount of tree planted. Some other types of trees are also found in their fields which are planted long time before (List of trees in Appendix 8). These trees are mainly planted for construction, firewood and also for economic purposes. Some

farmers even mentioned they are planting trees to conserve soil but the effect is not due to certificates even though they plant some trees after getting certificates.

Like in Beressa, in Worja also, no any statistically significant relation has found between the perception of farmers after getting certificates and the tree plantation. But a significant relation has been found with the education level of the HH head (CC= 0.6, $p=0.02$), slope class (CC= 0.5, $p=0.01$) and erosion extent (CC= 0.6, $p= 0.00$) (Appendix 7). In Worja, even though not much trees have been planted, the trees which are planted are by the literate farmers. Also more trees are found in medium to flat slope plot where the extent of erosion is medium. Here according to the farmers, the main reason for not planting trees is due to lack of water and also due to animal problems. According to them, if they plant trees near homestead, animals destroy them and in the distant field, it is difficult to manage trees and some people even cut their trees especially at night for charcoal making.

The results show that tree plantation does not seem to be influenced by certificates even there are studies showing that certification and tenure security motivates in making long term SLM practices like tree plantation (Palm, 2010 and Deininger *et al.*, 2009). In both of the kebeles, farmers also mentioned that they are not getting seedlings for free and when they buy seedlings and plant, these seedlings get wilted within few days. According to them, this is mainly due to soil problem. The other problem in both study area is the lack of water. The farmers mentioned that if they have irrigation facility, then they are always motivated for tree plantation.

4.9.6 Crop rotation, Intercropping and Fallowing

Crop rotation is a “planned order of specific crops planted on the same field” in order to improve or maintain soil fertility, reduce erosion, destroys the pest and weed life cycle, reduce risk of weather damage, reduce the application of chemical fertilizers and pesticides and in overall increase net profits (Peel, 1998).

Crop rotation is a common and simple practice in both of the study areas. All the respondents in both areas are practicing crop rotation as a traditional way of SLM practices and aware of the fact that it helps to improve the soil fertility and replenish the exploited nutrients. Farmers choose which crops to grow in rotation according to how they adapt to the soil and the rainfall

pattern. The main crop rotation practiced by the farmers in the study areas include Barley – wheat – barley, Teff – barely/wheat – teff, Barley – pea – barley. In both of the study area, farmers mention that this crop rotation has nothing to do with the certificates. They are doing this since a long time for better production of their crops.

Intercropping is growing two or more crops on the same piece of land either at the same time or within some intervals. This is also a common practice in both of the study area which is done by all farmers in order to utilize the spaces between the crops, to improve soil fertility and to diversify the crop production from the same piece of land almost at the same time. In the study intercropping of maize with pea and sorghum is common. According to the farmers, when sorghum is grown with maize, then the production is also high. This practice is also not influenced by certificates and tenure security like crop rotation.

Fallowing is a traditional method of restoring soil fertility where the field is left empty for some duration. According to the farmers, many years ago, it used to be the most common method of improving the soil fertility but now none of the farmers in the study area follow this practice due to the shortage of land and they can't afford to keep their land fallow due to their livelihood problem.

4.10 Future planning for soil and land management practices

In both of the kebeles, all the farmers mentioned that they are planning to make SLM practices like the construction of soil bunds, stone bunds, check dams, proper method of land ploughing, tree plantation etc in future. While asking farmers whether they are planning to make these investments due to certificates, then only 17.5% respondents mention it's due to certificates and majority of them 82.5% mention it's not due to certificates in Beressa whereas in Worja, 75% of them mention that they are planning due to certificates. According to them, now they become more conscious about their land due to the ownership of land after getting certificates and want to protect their land for better production.

5. Conclusions and Recommendations

5.1 Conclusions

Land degradation is a main problem in Ethiopia. One of the major factors related to this is the insecurity of land tenure among farmers (Gebreselassie, 2006). So this study deals with the effect of RLRCP in providing tenure security among farmers and their investments on SLM. The main source of this study was primary data collected through HH survey from two kebeles which are located in two different regional states Oromia and SNNP in Ethiopia.

In both of the study kebeles, almost all the farmers perceive the importance of certificates in providing tenure security through different perspectives. They feel secure of their land after getting certificates as they have a proof of their land ownership. Especially, in Worja, where most of the farmers got their land through redistribution, seemed to be more influenced by certificates because before getting certificates, they were insecure of their land and now all of them are completely secure of their land.

Even though farmers perceive the importance of tenure security after getting certificates, this positive perception is not always the reason to make SLM practices. Similar to the most of the studies done previously, which showed the mix result of the relation between tenure security and SLM practices, this study also shows two different results for two kebeles. Erosion is considered as a problem in both of the study areas either in all or in some of their plots and farmers also constructed some SLM practices such as construction of ditches, bunds, application of organic and inorganic manures, practicing crop rotation and intercropping but these SLM practices are not always the consequences of tenure security.

In Beressa, majority of the respondents mentioned that they are not making conservation practices due to certificates which is in contrast of the study made by Palm (2010), Deininger *et al.* (2009) and Gebremedhin and Swinton (2003) in other parts of Ethiopia. Most of the bunds were found to be constructed before getting certificates and farmers are motivated by group mobilization and extension services in making such structures and also the application of organic manure is due to the training that the farmers are getting in compost making. Here, farmers seem to be more influenced by the extension services that are given to them by the development workers in making such investments. Even the tree plantation, which is considered as a long-term investment on land, is not influenced by tenure security after getting certificates. They are planting trees mainly for the construction, economic and other

HH purposes. According to the farmers, it is their responsibilities to conserve soil whether they have certificates or not for the better production and support their family. This shows quite weak and unclear effects of land tenure security in making not only long term investments but also for short term investments. There are other HH and land characteristics that are influencing the construction of conservation practices and the application of organic manure and fertilizers which includes education level, slope class, erosion and erosion extent and soil fertility. Even though fertilizers are applied to the field, it is not as per the recommended dose due to the price being high. The erosion is higher in Beressa but the adoption of SLM practices is not found to be as per the requirement. So it can be concluded that farmers are still waiting for the group mobilization to implement such activities.

In case of Worja, mix results have been found. Farmers seemed to be more influenced in making SLM practices due to certificates. Even though it is said that tenure security influence more in making long term investments, the case found in Worja is different. Traditional ditches and soil bunds which are considered as short term investments are also influenced by the certificate which is in contrast of the result obtained by Gebremedhin and Swinton (2003) in Northern Ethiopia. Most of the respondents in this kebele acquired their land through redistribution and before getting certificates they were insecure of their land due to the lack of proof for the ownership of their land. But now as they have certificates, they are motivated in making SLM practices. But again tree plantation is not influenced by tenure security. They are not planting trees even after getting certificates which is mainly due to the problem of managing tress and lack of water. As in Beressa, there are other HH and land characteristics that are influencing the construction of ditches, bunds and the application of organic manure and fertilizers which includes education level, slope class, erosion and erosion extent and soil fertility.

In both kebeles, other land management practices such as crop rotation and intercropping are also not influenced by tenure security as they are practicing this since a very long time as a traditional practice of SLM and fallowing is not practiced due to lack of sufficient land for cultivation and their livelihood problem. Also about the future planning of land management practices, in both kebeles, they are motivated in making such practices but again the motivation is only due to certificates in Worja whereas in Beressa, it is not due to certificates. So in overall, this study confirms the complexity of investments in SLM practices making it difficult to draw a clear conclusion about the impact of tenure security on SLM.

5.1 Recommendations

Based on the study, following recommendations are given.

1. Only tenure security is not enough to motivate farmers for making SLM practices. As SLM practices are knowledge and skill intensive, role of extension service and farmers' training plays an important role.
2. Community mobilization should also be encouraged which seems to have more influence on making SLM as seen from the case of Beressa.
3. Before distributing certificates, farmers should be given information about the uses of certificates as it is seen that there is lack awareness among farmers about using certificates as collateral for getting credits for farm inputs.
4. Irrigation should be more focused as water scarcity is the main problem for not planting trees.
5. Free distribution of some farm inputs such as seedlings should be provided to motivate farmers for tree plantation.
6. The study addressed mainly the relation between tenure security and SLM practices. Hence, to have a comprehensive analysis, further empirical study focusing on biophysical potential of the land and income of the HH which affect the construction of the physical structures is important.

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Appendices

Appendix 1. Household Survey Form

1. Code..... 2. Date of interview 3. Kebele.....

A. Household characteristics

- 1) a) Name of the respondent:
- b) Sex of the respondent: 1) Male 2) Female c) Age of the respondent:
- d) Position of respondent in household: 1) Husband 2) Wife 3) Son 4) Daughter
- e) Marital status: 1) Single 2) Married 3) Divorced 4) Widow
- f) Education: 1) Illiterate 2) Read and Write 3) Grade 1-4th 4) Grade 5-8th 5) Grade 9- 12th 6) Collage
- g) Head of the household: 1) Male 2) Female
- h) Age of the household head: i) Family number (family size):
- j) Number of male and female members: Male..... Female.....
- k) Age of the male members:
- l) Age of the female members:
- m) Farming experience: Number of farming years:

2) Livestock characteristics:

Animal Category	Quantity		Remarks
	Before 7 years	Now	
Oxen			
Cows			
Bulls			
Heifer			
Calves			
Sheep			
Goats			
Mules			
Horses			
Donkey			
Chicken			
others			

B) Land Characteristics:

- 3) Do you have your own land? 1) Yes 2) No
- If no, then please give reasons.....
- 4) If yes, then please specify how you acquired your land?

1) Inherited 2) Purchased 3) (re)distribution 4) Others, specify.....

5) How many hectares of land do you have? 1) Cultivated..... 2) Grazing.....

6) Details of the field:

Field No	1	2	3	4	5	6	7	8	9	10
Plot size										
Distance in walking minutes										
Soil type										
Slope class										
Fertility status										
Erosion ^a										
Extent of erosion										

Description:

Soil type (Local name): 1) Ashawama/sancha/, 2) Merere Tikur , 3) Merere key 4) Key 5) Giracha 6) other(specify).....

Slope class: 1) Very steep 2) Steep 3) Medium 4) Flat to gentle slope **Fertility status:** 1) Low 2) Medium 3) high

Extent of Erosion: 1) Severe/High 2) Medium 3) Low 4) No erosion a= 1 if Yes or a=0 if No

7) If there is soil erosion in your plot, then what are the indications of soil erosion?

1) Decrease in soil depth 2) Decrease in productivity 3) Both decrease in soil depth and productivity 4) visible gully and rills formation 5) All 6) Others, specify.....

8) What are the reasons for soil erosion in your field? 1) Overgrazing 2) Deforestation 3) Improper plough 4) Heavy rain 5) Steepness of the land 6) Improper land management 7) Others, specify.....

9) What is the trend of soil erosion in your farm over the last 10 years? 1) Increasing 2) Decreasing 3) Remain same 4) Do not know

10) If increasing/decreasing, specify the reasons.....

D) Land Registration and Certification:

11) Is your land measured /registered? 1) Yes 2) No 3) Do not know

12) Did you already have your land certificates? 1) Yes 2) No 3) Do not know

13) If you have land certificates, when did you get that? Please mention the date.....

14) How is the certificate issued?

a. By the name of the husband

b. By the name of the wife

c. Jointly by husband and wife

15) Who is handling the certificate? 1) Husband 2) Wife 3) Both

- 16) Where do you keep your certificate?
- 17) Do you think your land has been measured properly? 1=Yes 0= No
- 18) If no, reasons.....
- 19) Was there any conflict with someone during demarcation/ land registration? 1=yes 0= No
- 20) If yes, with whom?
- 21) If yes, why?
- 22) If yes, how did you manage the conflict?
- 23) What are the responsibilities and rights of farmers which are written on the land certificate?
.....

24) Perception of farmers after getting land certificates:

S. N.	Farmer's perceptions On LRCP	1=Completely disagree	2= Slightly disagree	3=Slightly agree	4=Agree	5= completely agree
1	Helps to inherit my land to my children					
2	Reduces border conflict					
3	Helps in getting credits for farm inputs					
5	Increases tenure security					
6	Increase investments in land management					
7	Receives compensation if the land is taken away					
8	Promotes gender equality					
9	Increases female willingness to work in field					

- 25) Do you think that there will be land redistribution again in future? 1) Yes 2) No 3) Do not know
- 26) If yes/no, please mention the reasons.....
- 27) What do you feel about your land holding size in case if there will be land redistribution in future?
- 1) Increase in land holding size 2) Decrease in land holding size 3) Remain same 4) Do not know
- 28) How you feel about the security of your land now after getting land certificates?
- 1) Completely insecure 2) Slightly insecure 3) Slightly secure 4) Secure 5) Completely secure

29) How you feel about your land security before getting land certificates?

1) Completely insecure 2) Slightly insecure 3) Slightly secure 4) Secure 5) Completely secure

30) Do you think that the current land holding system is good for you?

1) Yes 2) No 3) Do not know 4) No response

31) Are there any other alternatives that you think would be better than the current land holding system? Please rank in order of priority starting from the most favorable one.

1) Freehold/private ownership so that you can sell and mortgage your land 2) System that allows for better security (e.g. leasing for a long time) 3) Public ownership but secure rights 4) others, specify.....

32) If you lose your land certificates, then are you ready to pay for a replacement certificate?

1) Completely not ready 2) Slightly not ready 3) Slightly ready 4) Ready 5) Completely ready

33) **Investment that farmers are making in their field:**

Field No	1	2	3	4	5	6	7	8
Plot size								
Cut off drain ^a (Golena)								
Length of cut off drain								
Manure ^a								
Amount of manure								
Fertilizer ^a								
Amount of Urea (kg)								
Amount of DAP (Kg)								
Soil bund ^a								
Length of soil bund								
Year of construction								
Stone bund ^a								
Length of stone bund								
Year of construction								
Trees								
Name of tree 1								
Year of planting								
Amount of tree 1								
Name of tree 2								
Year of planting								
Amount of tree 2								
Name of tree 3								
Year of planting								
Amount of tree 3								

Description:: Tree name: 1. Key bahirzaf, 2. Kawa/buna , 3. Avocado, 4.Wanza, 5. Girar, 6. Birtukan, 7.Gishta, 8. Kazmir, 9. Mango, 10. Gesho, 11. Kindo berbere, 12. Bisana/Mekenissa/, 13. Yehabesha Tsid , 14. Yeferenji Tsid , 15. Zigiba, 16. Giravillea, 17. Chat

34) If you apply fertilizers only in some of the plots, then why?

35) If you are not applying fertilizers in any of the plot then why?.....

36) If you do not apply manure in any of your plots, then why?

37) If you apply manure only in some of your plots, why?

38) If you are not making any stone/soil bund in any of your field, then why?

39) If you make stone/soil bunds, do you maintain them? 1=Yes , 0= No

40) If yes, how often you maintain?

41) If No, then why?

1) High maintenance cost 2) Others, specify.....

42) Do you maintain stone/soil bunds in all of your fields? 1) yes 2) No

If yes/no then why?

43) Are you maintaining these stone and soil terraces after getting your certificates? 1) Yes 0= No

44) If you are not making any tree plantation, why?

45) If you are making tree plantation only in some of the plots, then why?

.....

46) Do you practice crop rotation? 1=Yes 2=No

47) If yes/no then why? Please

specify.....

48) Do you practice intercropping? 1= Yes 2= No

49) If yes, which crops do you

mix?.....

50) If Yes/No, Why? Please specify.....

51) Do you practice fallowing? 1= Yes 0= no

52) If no, then why?

53) If yes, then for how long ?.....

54) If you made the above mentioned investments (only in case if they made) in land management, then is it due to land security after getting certificates?

1) Yes 2) No 3) Do not know 4) Others, specify.....

55) If you are not making any soil conservation practices now, are you planning to make in future? 1= yes 0 =No

56) If no, why?

57) If yes, what kind of soil management practices will you make? Please specify.....

58) Do you feel that you will make these investments due to security of land after getting certificates for your land? 1=yes 0=no

Appendix 2. TLU (Tropical Livestock Unit) values for Ethiopia

Animal Type	TLU value
Oxen/Bull	1.1
Cow	0.8
Horse	0.8
Mule	0.8
Donkey	0.65
Heifer	0.36
Calf	0.2
Sheep/Goat	0.09
Chicken	0.01

Source: Sharp, 2003

Appendix 3. Pair sample t-test for the difference in animals before 7 years and now

Pair Samples Test

			Mean	Std. Deviation	t	df	Sig. (2-tailed)
Beressa	Pair 1	cow1 - cow2	1.18	1.72	4.31	39.00	0.00
	Pair 2	Bulls1 - Bulls2	0.88	1.49	3.72	39.00	0.00
	Pair 3	heifer1 - heifer2	0.40	1.45	1.75	39.00	0.09
	Pair 4	Calves1 - Calves2	2.60	8.04	2.04	39.00	0.05
	Pair 5	sheepgoat1 - sheepgoat2	0.08	0.62	0.77	39.00	0.45
	Pair 6	Mule1 - Mule2	0.13	0.33	2.36	39.00	0.02
	Pair 7	HORSE1 - HORSE2	0.25	1.10	1.43	39.00	0.16
	Pair 8	donkey1 - donkey2	2.80	11.36	1.56	39.00	0.13
	Pair 9	chicken1 - ckiken2	3.65	6.30	3.67	39.00	0.00
	Pair10	TLU_1 - TLU_2	5.68	8.52	4.52	39.00	0.00
Worja	Pair 1	cow1 - cow2	3.8	5.32	4.52	39.00	0.00
	Pair 2	Bulls1 - Bulls2	0.3	0.72	2.62	39.00	0.01
	Pair 3	heifer1 - heifer2	0.83	2.95	1.77	39.00	0.08
	Pair 4	Calves1 - Calves2	1.15	2.78	2.62	39.00	0.01
	Pair 5	sheepgoat1 - sheepgoat2	5.03	12.63	2.52	39.00	0.02
	Pair 6	Mule1 - Mule2	-0.08	0.47	-1	39.00	0.32
	Pair 7	HORSE1 - HORSE2	0.18	0.5	2.21	39.00	0.03
	Pair 8	donkey1 - donkey2	0.58	1.75	2.08	39.00	0.04
	Pair 9	chicken1 - ckiken2	2.03	7.33	1.75	39.00	0.09
	Pair10	TLU_1 - TLU_2	5.68	8.52	4.21	39.00	0.00

Appendix 4. Pair sample t-test to show the difference of some household characteristics between two kebeles

Household Characteristics		Paired Differences			df	Sig. (2-tailed)
		Mean	Std. Deviation	t		
Pair 1	Age of household head 1_AgeHHH 2	-3.43	23.52	-1.35	85	0.18
Pair 2	Familiy size 1 - Famsize 2	0.17	2.98	0.54	85	0.59
Pair 3	Number of male family members 1 - malemembr2	0.16	1.98	0.76	85	0.45
Pair 4	Number of female members 1 - femalemembr2	0.01	1.77	0.06	85	0.95
Pair 5	Number of EAFM 1- NEAFM 2	1.33	3.17	3.88	85	0.00
Pair 6	Number of EDFM 1 - NEDFM 2	-1.15	2.57	-4.15	85	0.00
Pair 7	Farm experience 1 - Experience 2	4.43	20.72	1.98	85	0.05
Pair 8	TLU now 1 - TLU now 2	-2.53	2.88	-8.15	85	0.00
Pair 9	landsizecultivated 1 - landsizecultivated 2	-4.58	3.03	-14	85	0.00

Where 1= Beressa, 2=Worja

Appendix 5. Contingency coefficient (CC) between land acquired and perception of farmers after getting certificates.

	Beressa		Worja	
	CC value	Approx. Sig.	CC value	Approx. Sig.
Land acquired*Certificates help to inherent land to the children	0.17	0.74	40 ^c	
Land acquired*Certificates reduce border conflicts	0.43	0.16	0.71	0.00
Land acquired*Certificates help in getting credit for farm inputs	0.39	0.83	0.33	0.54
Land acquired*Certificates help in increasing tenure security	0.39	0.61	40 ^c	
Land acquired*Certificates help in increasing investments	0.29	0.70	0.15	0.62
Land acquired*Certificates help in getting compensation	0.29	0.93	0.44	0.05
Land acquired*Certificates help to promote gender equality	0.23	0.53	40 ^c	
Land acquired*Certificates increases female willingness to work	0.41	0.52	0.22	0.34

c: No statistics are computed because variable being constant

Appendix 6. Contingency coefficient of perception of certificates with investments on land

	Beressa		Worja	
	CC	Approx. Sig	CC	Approx. Sig
Reduce border conflict				
Traditional ditches	0.12	0.32	0.36	0.00
Organic manure	0.11	0.37	0.50	0.00
Inorg. Fertilizers	0.17	0.94	0.50	0.00
Soil bunds	0.24	0.01	0.02	0.84
Stone bunds	0.08	0.61	0.24	0.82
soil-stone bunds	0.08	0.58	86 ^c	
Credits for farm inputs				
Traditional ditches	0.16	0.40	0.30	0.04
Organic manure	0.13	0.57	0.32	0.02
Inorg. Fertilizers	0.18	0.25	0.12	0.71
Soil bunds	0.17	0.30	0.15	0.56
Stone bunds	0.80	0.90	0.71	0.93
soil-stone bunds	0.15	0.48	86 ^c	
Tenure security				
Traditional ditches	0.15	0.30	86 ^c	
Organic manure	0.20	0.08	86 ^c	
Inorg. Fertilizers	0.14	0.40	86 ^c	
Soil bunds	0.21	0.61	86 ^c	
Stone bunds	0.10	0.67	86 ^c	
Soil-stone bunds	0.40	0.00	86 ^c	
Investment in land management				
Traditional ditches	0.10	0.44	0.11	0.31
Organic manure	0.33	0.92	0.12	0.24
Inorg. Fertilizers	0.13	0.25	0.12	0.24
Soil bunds	0.06	0.78	0.04	0.71
Stone bunds	0.14	0.23	0.24	0.25
Soil-stone bunds	0.12	0.29	86 ^c	
Getting compensation				
Traditional ditches	0.13	0.42	0.31	0.01
Organic manure	0.13	0.43	0.40	0.01
Inorg. Fertilizers	0.20	0.11	0.50	0.00
Soil bunds	0.13	0.44	0.14	0.41
Stone bunds	0.09	0.75	0.65	0.83
soil-stone bunds	0.10	0.65	86 ^c	

c: No statistics are computed because variable being constant

Appendix 7. Contingency coefficient of investments on land with HH and land characteristics

	Beressa		Worja	
	CC	Approx. Sig	CC	Approx. Sig
Education				
Traditional ditches	0.25	0.03	0.21	0.38
Organic manure	0.94	0.85	0.30	0.65
Inorg. Fertilizers	0.11	0.73	0.24	0.25
Soil bunds	0.20	0.20	0.18	0.55
Stone bunds	0.31	0.01	0.10	0.92
soil-stone bunds	0.30	0.01	86 ^c	86 ^c
Acquire land				
Traditional ditches	0.20	0.15	0.40	0.02
Organic manure	0.70	0.87	0.50	0.00
Slope class				
Traditional ditches	0.25	0.70	0.14	0.43
Organic manure	0.25	0.02	0.80	0.82
Inorg. Fertilizers	0.20	0.27	0.70	0.82
Soil bunds	0.22	0.05	0.60	0.00
Stone bunds	0.25	0.02	0.13	0.48
Soil-stone bunds	0.17	0.10	86 ^c	86 ^c
Fertility status				
Traditional ditches	0.07	0.68	0.16	0.32
Organic manure	0.30	0.00	0.25	0.06
Inorg. Fertilizers	0.11	0.41	0.14	0.40
Soil bunds	0.16	0.13	0.85	0.73
Stone bunds	0.90	0.53	0.82	0.75
Soil-stone bunds	0.12	0.31	86 ^c	86 ^c
Erosion				
Traditional ditches	0.10	0.19	0.25	0.04
Organic manure	0.44	0.60	0.01	0.90
Inorg. Fertilizers	0.10	0.20	0.92	0.39
Soil bunds	0.18	0.26	0.62	0.00
Stone bunds	0.75	0.35	0.17	0.32
soil-stone bunds	0.10	0.20	86 ^c	86 ^c
Erosion extent				
Traditional ditches	0.13	0.45	0.30	0.30
Organic manure	0.26	0.01	0.60	0.95
Inorg. Fertilizers	0.24	0.02	0.17	0.48
Soil bunds	0.32	0.00	0.62	0.00
Stone bunds	0.14	0.35	0.14	0.62
soil-stone bunds	0.24	0.03	86 ^c	86 ^c

c: No statistics are computed because variable being constant.

Appendix 8. List of trees in the study area

Local Name	Scientific Name	Local Name	Scientific Name
Kaiye Bahirzaf	<i>Eucalyptus grandis</i>	Warka/Shola/oda	<i>Ficus sycomorus</i>
Kawa/Bunna	<i>Coffea robusta</i>	Zeitona	<i>Psidium guajava</i>
Avocado	<i>Persea americana</i>	Papaya	<i>Carica papaya</i>
Wanza	<i>Cordia africana</i>	Turmantree	<i>Schuneous mule</i>
Girar/Garbi	<i>Acacia bussei</i>	Korch	<i>Eruthrina brucei</i>
Birtukan	<i>Citrus sinensis</i>	Akash	<i>Acacia decurrens</i>
Gishita	<i>Annona senegalensis</i>	Neem	<i>Azadirachta indica</i>
Mango	<i>Mangifera indica</i>	Wodesa	<i>Cordia africana</i>
Gesho	<i>Rhamnus prinoides</i>	Baddanne	<i>Balanites aegyptiaca</i>
Bisanna/Mekenissa	<i>Croton macrostachyus</i>	Amlaka	<i>Celtis africana</i>
Gravillea	<i>Gravillea robusta</i>	Kurkura	<i>Ziziphus spina-christi</i>
Chat	<i>Catha edulis</i>	Kartafa	<i>Acacia sp.</i>