ADDIS ABABA UNIVERSITY, SCHOOL OF GRADUATE
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THE IMPACT OF RESETTLEMENT ON WOODLAND VEGETATION: THE CASE OF CHEWAKA RESETTLEMENT AREA, SOUTHWESTERN ETHIOPIA

BERHANU GENETI MORODA
ENVIRONMENTAL SCIENCE PROGRAM

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BY
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I

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LIST OF ACRONYMS

CRADO = Chewaka Woreda Rural and Agricultural Development Office
CSE = Conservation Strategy of Ethiopia
EFAP = Ethiopian Forestry Action Program
EIA = Environmental Impact Assessment
EHRS = Ethiopian High lands Reclamation Study
EMA = Ethiopian mapping Agency
EPRDF = Ethiopian Peoples Revolutionary Democratic Front
FAO = Food and Agricultural Organization of the United Nations
GPS = Geographic Positioning System
Ha = Hectares
ILRI = International Livestock Research Institute
IUCN = International Union for Conservation of Nature
Landsat ETM+ = Landsat Enhanced Thematic Mapper
m a.s.l. = meters above sea level
MORD = Ministry of Rural Development
NGOs = Non-Governmental Organizations
NMSA = National Meteorology Service Agency
RGB = Red, Green and Blue
SNNP = Southern Nations, Nationalities and Peoples
SPSS = Statistical Package for Social Sciences
WHO = World Health Organization of the United Nation

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ABSTRACT

Ethiopia has been practicing population resettlement either planned or spontaneous since the imperial period. The resettlements were and still are carried out mainly as a response to extreme land degradation in the highlands. Recurrent drought and famine also aggravated resettlement in the country. The large resettlement scheme carried out during the Derg regime has been criticized for its large social and environmental impacts. However, after suspension for some years resettlement has resumed by EPRDF government as planned and intra-regional resettlement program. This scheme, past and present, are implemented predominantly in the lowlands where population densities are low and unutilized lands are assumed to be found. The vegetation of the lowlands i.e. woodlands, play critically important role as a buffer ecosystems between the highland and arid environments and have limited capacity to endure intense human interference. Therefore, the impact of the current resettlement programs on these important ecosystems is not known despite the claim by governmentâ€™s that states it is environmentally friendly. The objective of assessing the land use/land cover change due to the resettlement program, identifying the conservation measures that the resettlers are implementing, identifying the forest product utilization patterns of the resettlers and tree species composition of the area. The study employed combined methods of remotely sensed data of Landsat TEM+ and ground-based survey to detect the land use/land cover changes. Questionnaire and checklists were used to assess the conservation efforts initiated and forest product utilization patterns. The SPSS version 13 was used for data analysis. Transect lines of 500m apart were used along which 30x30m plots at 300m intervals were taken to identify tree species composition of the area. The result of the study shows

that 42.4 percent of the woodland has been changed to farmland and settlement area contrary to the claim. The scheme resettled large number of the resettlers (60,000) in the area, which is well above the population density of the zone before the establishment of the resettlement site. This situation is compounded by few conservation efforts in the area which may jeopardizes the sustainability of the woodland and life in the area in general. About 22 species of trees with in 14 families were recorded in the area. The diameter class distribution of trees revealed that the number of seedlings and saplings on farmland and settlement areas is low contrary to the woodland and riverine areas which indicates that farmland will be devoid of vegetation unless tree planting activities are practiced. The resettlers depend on the natural vegetation for fuel wood and construction materials, calling for planting of tree seedlings to reduce the pressure on the woodland. Appropriate family planning practice to keep the population growth at optimum level and conservation measures compatible with the agro- ecological zone are also important. Continuous impact assessments in the area and through out resettlement sites in the country to take corrective measures also facilitates the achievement of the objectives of the scheme.

Key words: resettlement, environmental impacts, woodland vegetation, degradation

1. INTRODUCTION

1.1. BACKGROUND

Ethiopia is a country with a variety of agro-ecological zones ranging from desert to wurch. Its altitudes range from 200 m below sea level to highlands with altitudes of over 4500 meters above sea level. The country is considered as centers of diversity and origin for many cultivated agricultural crops. It is estimated that there are about 6000 - 7000 species of higher plants, of which 10-12 percent are considered to be endemic to Ethiopia (Tewelde- berhan, 1989). The complex topography and wide altitudinal range of the country made different variety of temperature and rainfall types to prevail in different regions.

The highlands of Ethiopia (above 1500m) occupy 44 percent of the countryâ€™s total area and support 88 percent of the population (IUCN, 1986). The high lands include two-thirds of the countryâ€™s livestock (FAO, 1988; IUCN, 1986 as cited in Kinfe, 2003). These areas have been supporting large portion of the countryâ€™s human and livestock population for relatively long period of time than the lowlands. They are also highly populated and agricultural activities have been practiced since long time ago.

The basis for early development of agricultural systems and high human population in this agro-ecological zone may have been the favorable climatic and ecological conditions, sufficient rainfall, moderate temperatures, and well-developed soils in these areas. It may be for this reason that the highlands have been settled for centuries and known for a similar long-standing agricultural history. This long history of settlement and high population pressure caused unsustainability in agriculture. The unsustainable agricultural practices along with many other physical, socio-economic and political factors have been the driving forces to a series of land degradation problems. This may be the reason why some sources consider the Ethiopian highlands to be amongst the most degraded lands in Africa (El-Swaify and Hurni, 1996; Tamirie, 1997).

In addition, the population growth rate of the country does not match the agricultural productivity. The population growth rate exceeds agricultural production. The per capita land holding declines with growing population. For example, the average per capita land holding in 1985 was 1.76 ha while it decreased to 1.1 ha in 2000 and expected to decrease to 0.66 ha in 2015 (CSE, 1997). This shows drought and land degradation caused by high population pressure brought about food insecurity in some areas of Ethiopian high lands.

The continued population growth and recurrent drought in some parts of Ethiopian highlands have brought increased pressures on the size of land holdings and increasing the cultivation of marginal lands and pasture. Therefore, severe soil erosion is a common phenomenon in Ethiopian highlands, which is the result of the past and present agricultural activities, mountainous and hilly topography, torrential rainfall, and low degree of vegetative cover. Soil loss through erosion on lands under cultivation is higher than other land use types, which, for example, averages 42 t/ha/yr as compared to 5 t/ha/yr on, pasture lands (Hurni, 1990). Some of the farming practices aggravate soil erosion because some crops need finely cultivated seedbed and ploughing down slope to facilitate drainage (Feoli et al., 2002). According to (EFAP, 1994), about 1.9 to 3.5 billion tons of topsoil is being removed from the Ethiopian highlands, every year. As a result, some areas of the country are totally out of production where land is irreversibly damaged and the highland farmers and livestock are commonly considered as the cause for such amazing depletion of the countryâ€™s natural resources.

EHRS (1984) reported that about 10 million farmers in the highlands could lose their farmlands due to land degradation. The immediate consequence of land degradation is reduced crop yield and livestock productivity followed by economic decline and social stress. Excessive land degradation, plant nutrient exhaustion, reduced soil moisture capacity and structure of the soil would lead to extremely low average crop yield per unit area. As agricultural productivity falls, new pressures arise for the land to provide subsistence, which in turn leads to renewed pressures on resources, migration and search for alternative forms of supplementing agricultural incomes. The highland areas were affected by these pressures during the later part of

nineteenth century, and population pressure sought a release to lowland areas which are being brought under the plough. In all cases growing demands placed up on land in stead of improvements in farming technology or agricultural practices are resulting in continued degradation of the local resource base.

The strategies and copping mechanisms to these natural and human induced problems vary. They include, among others, resettlement, either planned or spontaneous, to areas presumed to have relatively better resources and carrying capacity (Tesfaye, 2004). People may continue cultivating marginal lands causing further degradation of land where alternative means of subsistence is not available. Recurrent drought, famine and food self-insufficiency is becoming prevalent in different regions of the country at different times. The 1984/85 drought and famine as well as the recent drought that occurred in 2000/01 are among others. In response to the extreme land degradation, population pressure and recurrent droughts causing food insecurity the past and present Ethiopian

governments have been implementing large government-organized resettlement of people to areas with low population density and presumed to be more fertile mainly in lowland areas.

1.2. STATEMENT OF THE PROBLEM

Ethiopia has experiences of population resettlement since 1960s either spontaneous or planned. More than half million people were resettled by the Derg government mostly to the lowland areas of western and southern parts of the country in response to the 1984/85 famine (Dessalegn 2003b). Most of the resettlers were from northern highland areas where the land has been supporting relatively higher population for long period of time and experienced serious environmental degradation. This situation coupled with the recurrent drought caused famine and food insecurity. The population resettlement was planned to ensure food security by moving the affected community to presumably more fertile areas with less population density and to relieve the population pressure in the affected areas. This resettlement program was

criticized for its large social and environmental impacts involved during its implementation.

The country also planned recently huge intra-regional resettlement scheme in2002 after 18 years of suspension of such a program. The current resettlement by the EPRDF Government states that the program is based on voluntary approach. Therefore, the objective of ensuring food security can be achieved with minimum environmental impact because the settlers care for the resources based on the implementation manual prepared for this purpose though environmental impact assessments was not carried out for the program.

According to MORD (2003), the current resettlement program is environmentally friendly because the program is implemented intra-regionally and based on voluntary basis that avoids introduction of diverse cultures to the resettlement areas so that different conflicts among the host community and the resettlers will not occur. The discussion about the importance of the scheme held with the host community and the peoples to be resettled is believed to make the program to have minimum environmental impact. In addition, the document states that the re-settlers care for the resources based on the implementation manuals prepared for this purpose. The Agricultural Development Offices of the respective woredas carry out continuous environmental impact assessments and take corrective measures to minimize the impact of resettlement. The Bureau of Agriculture and Natural Resources is responsible to achieve this objective through the following activities:

null Study the impact of resettlement on natural resources
null Prepare guidelines on how settlers may utilize the natural resources for farm implements, fuel wood and construction of shelter and other facilities
null Advise settlers on development and utilization of own source of wood for private use and income source, etc.

However, whether this claimed environmental friendliness of the current resettlement program is little confirmed through fields based scientific studies. Therefore, this study is carried out to fill the gap in knowledge on whether the

resettlement program carried out in 2002 is environmentally friendly or not and whether the assumptions to conserve natural resources is already in place in Dhidhessa lowlands, particularly Chewaka resettlement site that hosted huge number of resettlers (60,000 people). Is the resettlement programs conducted after the year 2000 environmentally friendly as it is to be claimed by the responsible authorities? If not, how much area of woodland is affected by the scheme? These major and other related research questions were assessed.

1.3. OBJECTIVES OF THE STUDY

1.3.1. General Objectives

To assess the general impacts of resettlement program on woodland vegetation of western Oromia, which has been used by past and present Ethiopian governments for resettlement.

1.3.2. Specific objectives

â€¢ To examine the impact of resettlement on woodlands in terms of vegetation cover change and tree species composition;
â€¢ To identify the efforts initiated in the area to conserve soil and vegetation;
â€¢ To assess the forest product use pattern of the settlers;
â€¢ To recommend appropriate and timely intervention measures.

1.5. SCOPE AND LIMITATIONS OF THE RESEARCH

This study deals with the environmental impacts of resettlement in Chewaka resettlement site, Illubabor Zone of Oromia Regional State. The environmental impacts were assessed in terms of vegetation cover change by combining different spatial data sources (remotely sensed satellite images and ground based surveys). Unfortunately, due to access and resource limitations, recent images could not be acquired to make a change detection using compatible data sources. Thus, the data source of the pre-settlement was generated from satellite images, while the current land cover/land use was generated from ground-based survey. This difference in spatial data types used might cause a slight inaccuracy in area calculations.

Furthermore, the socio-economic survey could not include as many farmers as it should have been mainly due to shortage of resources such as time and budget.

Similarly, this study focused in Chewaka resettlement site, Illubabor Zone of Oromia Regional State. The outcome of the study, therefore, may be contextual, and should not be generalized as if the same holds true for all places with resettlement schemes. Nonetheless, the outcomes of this study could be used as an important indicator for decision makers to make environmental impact analysis of current resettlement programs in the various areas.

2. REVIEW OF LITERATURE

2.1. POPULATION GROWTH, DEFORESTATION AND LAND DEGRADATION

2.1.1. Population Growth and land degradation

Ethiopia, being a country with high population growth rate and huge population, over 77 million people, of which the majority (85 percent) are engaged in rural and

agricultural based economic activities, it has been facing problem of severe food insecurity. The agricultural production system is based on traditional technology and the farm lands are so fragmented that they are less productive and land degradation is common. Therefore, the major development challenge for Ethiopia is to reduce poverty and food insecurity at acceptable environmental and economic costs. The country faces a rapid population growth rate (3 percent) that contributes to the environmental problem, which manifests itself in land and other resources degradation and loss of biodiversity caused by low agricultural productivity.

Some sources argue that increasing population pressure will lead to adjustments in production and hence the quality and productivity of the land improves (Squire, 2000). The author considers the high population as a resource to carry out conservation and rehabilitation activities so that environmental degradation will not occur. Instead it will lead to improvement of productivity of the land. Contrary to the notion that increase in population will lead to increase in food production, it is generally argued that there is ecological limit to food production Ehrlich and Holdren, (1971). Population growth has an important influence on aggregate

consumption of common property resources such as forests, grazing lands, water bodies, atmosphere, etc. Other influences, such as increased per capita income (and hence consumption), government policies and instabilities, technological change, national and international markets for goods and agricultural products, are also likely to play key roles in consumption and depletion of such resources. The direct impact of population growth is increased consumption of resources, which would lead to increased demand for food and other basic needs that necessitates more intensive use of agricultural land. In the Ethiopian highlands for example, increased population has lead to more widespread use of marginal land in order to meet the increased demand of human needs. In this respect, different land uses compete with one another, and can degrade the future productivity of the land and the quality of the environment in general.

Some research studies indicate that instead of deteriorating and depleting natural resources population growth results in improved soil and water resources (Tiffen et al., 1994). This could be further explained by the number of trees and vegetative cover that has been increasing or at least has been maintained in the enset based farming systems of Welyta, Kembata, Sidama and others, despite these areas being few of the highly populated in the country. Some other sources, on the other hand, reported that increased population pressures in the high lands of Ethiopia are becoming the major causes of land degradation (EFAP, 1994). This shows that even though population growth will lead to increased aggregate demand for natural resources it is not possible to merely draw conclusion that population growth will lead to environmental degradation because it depends on the socio-cultural experiences of the community related to natural resource use, exploitation and conservation.

2.1.2. Deforestation and Land Degradation

The vegetation types of Ethiopia are the result of many factors working on different time scales. Of these, geology, topography and climate (rainfall and temperature) have worked for a very long time, while human influence, also a very important factor in Ethiopia, has worked for shorter span of time. Moderate human interference in a landscape works in a way that tends to diversify the vegetation- creating more

vegetation types than before the beginning of human activity- while strong and prolonged human interference can totally degrade a range of vegetation types to a badly eroded and denuded landscape with a very little differentiation of vegetation left (Sebsebe et al., 2003).

Although forests have more or less stabilized in the developed countries deforestation (change of forestlands in to non-forestry land use types) in tropics has increased. In these areas, depletion of forest is most significant where about 2.5 billion people depend on natural forest resources for many economic and social goods and services (Benura, 1997). Annual deforestation of tropics is estimated to be 17-20 million hectares Rowe et. al., 1992).

In Ethiopia, accelerated deforestation has been taking place since the beginning of the 20
th
century. Forests were thought to have covered nearly 35 to 40 percent (about 120 million hectares) of the countryâ€™s total area at the beginning of 20
th
century but todayâ€™s forest cover is estimated at only 2-3 percent (EFAP, 1994). The same source indicates that the rate of deforestation is calculated to be between 150,000 and 200,000 ha per annum. But estimates of original forest cover and deforestation rates differ greatly because information is derived mainly from indirect sources. It further adds that during the last century, the forests and woodlands of the country have been declining in size (deforestation) and quality (degradation) considerably. By the early 1950s high forests were reduced to 16% of the total land area, by the early 1980s to 3.6% and by 1989 about 2.7% remained only (EFAP, 1994).

The causes of deforestation could be agricultural expansion, overgrazing, fuel wood gathering, commercial logging, infrastructure and industrial development of which agricultural expansion accounts for 60% of the causes (Grainer, 1993). In addition, fire often set by shifting cultivators and other forest dwellers are major causes of deforestation. Market and policy measures failure, population growth, and poverty, state of economy drive these direct causes of deforestation, though their relative importance varies between countries. So solutions based on significant policy reforms are more likely to succeed if measures taken to control population growth and alleviate poverty. (Rowe et al., 1992).

There is no exception for Ethiopia as the causes of deforestation is concerned (EFAP, 1994). Large-scale deforestation of forest resources caused significant increase in cultivated lands, open areas and settlements at the expense of forest land in Ethiopia. Since land cover is one of the factors that play important role in influencing the rate of soil loss due to erosion the land that is devoid of its vegetation is vulnerable to erosion and eventually to degradation. This is because vegetation cover influences both the erosivity of the eroding agents and the erodibility of eroding subject.

Ethiopia loses considerable amount of topsoil every year which has implications on

the amount of grain lost due land degradation. Although some aspects of the environmental problems are caused by natural factors such as draught and desertification, most of it is due to poverty driven human activities. Conditions of high absolute poverty induce the poor to become both agents and victims of environmental degradation in Ethiopia (Sisay and Adugna, 2001).

In general, deforestation can result in the loss of biodiversity; which in turn results in declines in ecosystem integrity, and also genetic losses that may impede future scientific advances in agriculture and pharmaceutics. WHO et al. (1993) reported that as many as 80% of the world population depend on herbal medicine for primary health care needs which are mainly derived from forests. The consequences of deforestation will therefore be felt by the many poor because of lack of cash to buy modern medicine. In addition, deforestation can also affect hydrological processes, leading to localized declines in rainfall, and more rapid runoff of precipitation, causing flooding and soil erosion (Dagnachew et al., 2003).

Despite accelerating pressure on land and natural resources, which cause land degradation, it appears that relatively little was accomplished in the area of resource conservation in Ethiopia before the 1974 revolution mainly because of land ownership. Further, the quality of community forestry was considered to be poor with low seedling survival rates and poor maintenance. Conservation works accelerated rapidly following the 1974 revolution due to the land ownership reform. The conservation works through food for work also resulted in limited impact on land

degradation because of varying reasons. Resource conservation and rehabilitation in Ethiopia in general is very limited as compared to its loss and degradation.

Environmental Degradation in the Ethiopian Highlands

Environmental degradation is the depletion of natural resources such as vegetation, soil, biodiversity and water to the level that it may cause significant stress up on society through the physical and social constraints on production options available (World Bank, 1992 as cited in Feoli et al., 2002). Stocking and Murnaghan (2001) defined land degradation as temporary or permanent decline in the productive capacity of the land.

The authors noted that the causes of land degradation may include the conversion of unsuitable, low potential to agriculture, the failure to undertake soil conservation measures in areas at risk of degradation and removal of crop residues resulting in â€˜soil miningâ€™ i.e. extraction of nutrients at a rate greater than re-supply. These causes are surrounded by social and economic conditions that encourage land users to over graze, over cultivate, deforest or pollute.

According to Tesfaye (2003), the farmers in highlands of Ethiopia where crop and livestock is the livelihood system, crop remains the principal source of income and subsistence. Crop production in these areas has been declining because of two re-in forcing trends-declines in size and yields. Farm size is declining because of depreciating stock of productive land and growing population that no claims to land for cultivation. The rapid population growth has decreased the size of land holding leading to landlessness, food insecurity and environmental degradation. In addition,

these areas are pone to recurrent drought that caused crop failures and consequently famine, which affected the lives of many people. Therefore, land degradation in Ethiopian high lands coupled with population pressures and recurrent drought caused spontaneous resettlement of peoples and government organized resettlement programs to lowland areas, which have been implemented during different times in response to such problems.

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2.2. RESETTLEMENT

The definition of â€˜resettlementâ€™ in this paper is the movement of people from areas where there do not exist factors that are suitable for smooth maintenance of life to areas presumed to be endowed with potentials that could provide opportunities for the same end (Kassahun, 2000). According to the same source the destination of resettlement is to areas with under-utilized agricultural potential, and movement could take place either as a result of planned/organized intervention or spontaneously. Mengistu (2005) defined resettlement as the process by which individuals or group of people leave spontaneously or unspontaneously their original settlement sites to resettle in new areas where they can begin new trends of life by adapting themselves to the biophysical, social ad administrative systems of the new environment. Resettlement is becoming attractive as a way out of pressing problems caused by food shortage, land fragmentation, population pressure, rampant unemployment, marginality of land and decline in productivity (Chambers, 1969).

Resettlement could be classified into four types with in two main categories. The first category is non-planned resettlement s comprising spontaneous resettlement and emergency or forced resettlement. The second category is planned resettlements which comprises voluntary and involuntary resettlements (Mengistu, 2005). Usually, planned resettlements are those initiated and/or supported by governments and aid agencies. Planned resettlement projects have been undertaken with aim of relieving population pressure and promoting land consolidation and sound agriculture in areas of high population density (World Bank, 1978 as cited in Dessalegn, 2003a). It may be undertaken as a form of compensation for displaced populations whose lands have been utilized for development projects such as dams, national parks, etc (Colson, 1971 as cited in Dessalegn, 2003a). Similarly, settlements have frequently been planned to rehabilitate populations that have been adversely affected by natural disasters unfavorable climatic conditions and/or political conflict (Dessalegn, 2003a). Others call these displaced people because of natural calamities as environmental refugees.

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Spontaneous resettlements are those resettlement types that are accomplished by desperate movement of people from place of origin because of push factors (land scarcity, recurrent drought, loss of productivity due to land degradation) to new settlement areas with better potential to sustain life/pull factors (availability of uncolonized and productive land) (Mengistu, 2005).

Around the world, there also exist involuntary resettlement processes caused by development projects. They are caused by economic mobility, industrialization and urbanization, or by war, ethnic strife, or natural calamities such as droughts. Often the spatial distribution of people and resources do not coincide. Therefore, much of the impetus for population movements comes from efforts to match the people with the resources they need for sustenance and growth.

The African continent is the scene of massive population resettlement processes of all types, including painful involuntary displacements of people. Currently, however, Africa's most important forced displacements are not those caused by development programs, but those triggered by social and political causes such as civil wars, ethnic, racial and/or religious persecutions, or by natural causes such as droughts and famines. These result in millions of refugees - either "international refugees" who cross international borders to find protection, shelter and food in another country, or "internal refugees" who still remain within the borders of their countries but have abandoned their houses and lands. Displaced populations are not only themselves deprived of normal livelihood and pushed to the limits of poverty and starvation, but often represent an enormous burden on the host populations, thus compounding the complexity of the displacement-triggered problems. They may lower the hosts' standards of living and tend to rapidly deplete the natural resources of the areas of refuge (Cernea, 1997).

In Africa, planned resettlement has been tried in countries as diverse as Kenya, Tanzania, Sudan, Ghana, Senegal, Burkina Faso, Egypt, and Ethiopia. While several of these schemes did in fact improve the well being of participants, in general terms these efforts have fallen short of expectations. The expectations themselves may have been unrealistically high in many cases, given the resources available.

Nonetheless, both tangible achievements and indisputable drawbacks to large planned settlement schemes exist, including their high cost, reliance on prolonged public sector intervention, and the constraints they have placed on the private initiative of resettlers. Yet such settlements have created new opportunities and have often met the motivations and immediate needs of many settlers. Complex political, social and economic forces have been involved in such programs and, as Pankhurst (1992) argued in his monograph on Ethiopian resettlement, the "stereotypes of resettlement as either purely induced by famine or enforced by Government are equally misleading simplifications."

2.2.1. Resettlement in Ethiopia

State-sponsored population resettlement schemes have grown in importance in the past forty years in Ethiopia. In imperial times, resettlement became part of government planning from 1966 with establishment of the Ministry of Land Reform and Administration. Following this event, thousands of settlers were moved to several dozen schemes, mainly set up on the initiative of local governors, missionaries or NGOs. The type of settlers varied, and included urban unemployed, pastoralists, ex-soldiers and famine victims. The projects were set up with ambitious economic, social and political objectives: to deal with famine, provide land to the landless, increase agricultural production, introduce new technologies, establish co-operatives, remove urban unemployed, stop charcoal burning, settle pastoralists and shifting agriculturalists, form defense on the Somali border and repatriate refugees.

Similarly, the military government of Ethiopia resettled more than half a million settlers because of the incidence of famine in 1984/85 mainly from the North, notably Wello, Tigray and Shewa, to areas to the west, especially Wellega, Kafa, Illubabor and Gojjam. Though the resettlement was intended to be voluntary and a large proportion of settlers were famine-victims, targets were turned into quotas, food-aid was used as a trap, and coercion and victimization became common place. Two kinds of planned settlements were set up: large-scale â€˜conventionalâ€™ mechanized collectives in the lowlands on the western border, and small-scale â€˜integratedâ€™ settlements in the highlands, reliant on ox-plough cultivation.

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The EPRDF government also planned for resettlement program to relocate 2.2 million people in response to the drought and famine occurred in 2000/01. The objective of the scheme remains similar to that of the Derg i.e. ensuring food security. The resettlement scheme planned recently by EPRDF government is believed to involve minimum environmental impacts contrary to past resettlement programs.

2.2.1.1. Resettlement during the Derg Regime

Because of the drought and famine in 1984, the then government set in motion a resettlement policy that was initially designed to relocate 1.5 million people from areas in the north most severely affected by drought and famine to areas in the west and south that had experienced adequate rainfall. The government claimed that it was carrying out the program for humanitarian reasons, contending that it would remove the people from exhausted and unproductive land and place them in settlements with rich agricultural potential. In addition, the government argued that the new settlements would greatly facilitate efforts to provide social services.

The then government viewed resettlement program as a way out of the pressing problem of famine. It was proposed that the food security crisis would be addressed in a durable way through a dual strategy of relieving population pressure in the highlands, which were perceived as chronically drought prone, over populated and environmentally degraded, and, on the other hand, of making lowland areas, which were perceived to be fertile, under-populated, under-exploited and more productive. Resettlement was also considered as an opportunity to introduce social and economic change and pursue socialist transformation. It has been also suggested that it would be easier to convince or force people to move during the time of famine.

The decision to relocate such huge amount of people could also be explained by such factors as the Land Reform Act of 1975 that made public land available to be used for resettlement purposes and famine recurrence at short intervals calling for solutions in the form of embarking on resettlement in the areas with marked agricultural potential. The 1984/85 famine placed most affected localities in extremely precarious situation. The government responded to the famine by launching large-

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scale resettlement program. Accordingly, it was initially intended to resettle 1.5 million people to address the problem of recurrent food insecurity in risk-prone areas and some 600,000 people were resettled in the lowlands of western, southwestern and southern Ethiopia (Kassahun, 2000; Dessalegn, 2003b).

2.2.1.2. Resettlement during EPRDF Government

It seemed that planned resettlement was suspended in the years following the downfall of the Derg regime. However, the EPRDF government appears to be increasingly enthusiastic and in favor of launching planned resettlement schemes during 2002/03. The plan envisages relocating over 2 million people with in 3 years time. The basic assumptions behind the current resettlement program remain similar to those made during previous periods. But the later program is essentially different from the preceding ones in the following respects (Kassahun, 2003; Feleke, 2004).

null It would be based on free consent and willingness of resettlers,

null It would be implemented at intra-regional level there by ruling out possibilities of massive movement from one region to an other,

null Resettlers retain their land use rights and other immovable properties in the original home villages for about 3 years after being relocated and

null Resettles can return to their original villages for good whenever they have change of mind.

According to (MORD, 2003), the initiation of the voluntary intra-regional resettlement (access to improved land) rests on four major pillars that are important to avoid problems:

1. The program should be based on voluntary option of the potential settlers.
2. The availability of underutilized land. The survey conducted shows a total of 1.million ha of land is available in Amahara, Oromia,Tigray and SNNP regions
3. Consultation with the host communities. The regional governments have to hold discussions with host communities on the necessity of the program
4. Proper preparation before implementation of the program. The minimum infrastructure set in the plan should be in place before moving people.

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The document further states the government initiated a pilot resettlement program during 2000/01. This was carried out in response to the disparate movement of people to forests and national parks from hard-hit areas. Accordingly 45,000 households were resettled voluntarily in Amhara, Oromia and Tigray regions in the year 2002/03. This pilot project motivated the government to plan and implement large-scale resettlement program.

Table 1. Population to be resettled and cost estimates (Birr) by regional states

Region	HHd	Pop	Benefit cost	Infrast. Cost	Transp. cost	Credit Asst.
Tigrai	40,000	66,800,000	13,850,000	4,000,000	40,000,000	
Amhara	200,000	331,000,000	67,083,000	70,000,000	200,000,000	
SNNPR	100,000	165,500,000	30,000,000	20,000,000	100,000,000	
Oromia	100,000	165,500,000	30,000,000	35,000,000	100,000,000	
Total	440,000	728,800,000	140,933,000	129,000,000	440,000,000	

Source: MORD, 2003;

HHd =Household, Benefit cost = cost of food ration, hhd utensils, agri tools and seeds. Infast = Infrastructure.

The major differences between the resettlement programs carried out during the Derg and EPRDF governments are:

null The resettlement program by EPRDF is intra-regional while that of the Derg was not,

null The resettlement scheme by EPRDF is based on voluntary basis where as that of the Derg was carried out involuntarily,

null Discussion with host community and the people to be resettled was held in the resettlement program carried out by EPRDF while it was not in the Derg regime,
null The resettlers could return to their home land if they have change of mind and their immovable properties such as land are secured for three years in the recent resettlement scheme while it was contrary during the Derg regime,

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2.2.1.3. Resettlement in Oromia Regional State

Like other regions, chronic and frequent food shortage of varying degree is becoming prevalent at different times and provoked large-scale state-organized resettlements programs. Among the zones found in the region Borena, Eastern and southeastern part of Bale, East and West Hararge, North and Eastern extremes of Arsi, some parts of North Shewa and some pocket areas of Rift valley of Eastern Shewa are affected by food insecurity problems. 44 Woredas found in these areas were identified as severely food insecure areas and nominated for various development interventions, resettlement among others, as part of Regional Food Scurity Program (ONRG, 2001).

The pre-settlement feasibility study identified Illubabor and West Wellega zones of Oromia Regional State as potential areas for resettlement. The two zones have eight potential resettlement sites with total of 23,700 ha. Chewaka resettlement site is not among the sites for which feasibility study was carried out. According to official reports of MORD, (2003) about 100,000 people were planned to be resettled in the Region to areas where population density is relatively low and unutilized land is available.

2.3. CONSEQUENCES/IMPACTS OF RESETTLEMENT IN ETHIOPIA

The large scale resettlement program during the Derg regime has been criticized for a number of problems. First, consultation between policy makers, implementers, the resettles and the host population was minimal. Second, high handedness in implementing plans entailed resettlements often quelled through coercive methods, which thus undermined possibilities for commitment. Third, the resource and socio-economic support necessary for bolstering the chances of meeting the stated targets were not optimally rallied and disorganization and confusion was the result (Kassahun, 2003). In general, impact of resettlement could be classified in to two major categories-social and environmental impacts.

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2.3.1. Social Impacts of Resettlement

Many studies have been carried out concerning the social impacts of resettlement in Ethiopia. Resettlement can cause many social impacts, especially if the ethnic and cultural composition of the resettlers is heterogeneous. Wolde-selassie (2004) reported that the impacts of resettlement in Metekel carried out in 1980s involved several social impacts. Primarily, the scheme disintegrated the resettlersâ€™ social

institutions and organizations, which bind their infinite web of relations and interactions in manifold. The author also stated that resettlement program disrupted the resettlersâ€™ production systems and impoverished their livelihood. As a result uncertainties and confusions may happen until painful adaptive adjustments may occur to the new environment.

Resettlement can also bring about break-up of families. The 1980s resettlement in Ethiopia caused many families to be broken. The schemes were carried out in lowland areas where the climate is completely different from their original homeland. As a result they experienced difficulties since the new climate is less hospitable that led to excessive mortality due to diseases. They were also suffering from increased control to prevent escape. Village to village travel was only possible through pass letters obtained from village authorities. The scheme has also taken away traditional resources of the indigenous host communities that affected their livelihood because their lives are mainly based on shifting cultivation, hunting, fishing and honey collection,

Similarly, Dessalegn (2003b) reported that settlers experienced hardships due to changes in environment and diet. They were also subjected to lowland diseases such as malaria and trypanosomiasis. Therefore, the scheme claimed the lives of many peoples. In larger settlements settlers resented imposed collectivization. Although in some cases partnerships were formed with local people, in many areas settlers faced hostile relations with indigenous inhabitants. Ahmed (2005) reported that the host community particularly the youth started to develop negative attitudes as they view resettles as competitors over the use of natural resources.

2.3.2. Environmental Impact of Resettlements in Ethiopia

Planners sought to justify resettlement on the grounds that it would provide lasting solutions to the problem of food insecurity of the affected households. In fact, even if most settlers had remained in the resettlement areas, the removal of an overall average of 3% of the population in 1980s in the north would have had a negligible effect on reducing population pressure because the resettlers abandoned the scheme and returned to their home areas. Resettlement was also claimed to provide a more rational use of available land, by readjusting man-land ratios. However, this assumption rested on the myth of vast underutilized lands. Different source indicate that resettlement schemes in Ethiopia, both planned and spontaneous, involved environmental impacts.

Accordingly, Dessalegn (2003b) reported that government sponsored resettlement programs that were carried out during 1984/85 involved considerable environmental damage by clearing large areas of vegetation to build homesteads, to acquire farmland, and to construct access roads. He also indicated that the scheme failed to adapt farming practices to agro-ecological conditions of the lowlands, and as a consequence the environmental damage involved was quite considerable.

Like wise, spontaneous resettlement/migration of people from drought-hit areas of Hararghe and Arsi zones to Bale zone of Oromia Regional State may have also caused environmental damage to the new area. The reasons for their migration first and foremost results from years of cumulative effects and sufferings from gradual

and consistent natural resource degradation in their home areas and secondly triggered and initiated by recurrent drought conditions that made their livelihood conditions to be below subsistence which allowed them neither survival nor livelihood improvements. In other words: for most of the people who decided to leave their homes in Hararghe and Arsi lowlands, the conditions did not leave them with any other alternative or option. The migration was intensified in May 2002 and most of the resettlers have settled in Mana Hangatu, Berbere and Gololcha woredas of Bale Zone. Some parts of these areas fall in Bale mountains National Park and the impact

on the wildlife and their habitat may be considerable. Until the end of October 2002, 20,093 people were registered by the respective woredas. The number could be more because the flow of people arriving continued despite the regional government trial to stop these migratory movements (Dechassa, 2002). The Government claims that such disparate movement of peoples initiated the pilot resettlement projects after which large scale resettlement schemes were planned to organize such movements.

Likewise, the current resettlement program launched during 2002/03 is suspected of environmental damages. Getachew (2005) states the environmental consequences involved in the current resettlement as follows. The smallholder farmers clear the area for house construction and agriculture. Selling of fuel woods by settlers was also on the increase but the woreda officials banned this activity by using the police to enforce the ban. The settlement was experiencing extensive destruction of woody plants.

Assefa (2005) reported that the recent resettlement programs conducted in different parts of the country may have involved environmental damages despite differences in scale which includes huge loss of natural forests with great impact on sustainability of the environment contrary to what has been set out in the implementation manual of the scheme. Social tensions due to the recent resettlement have also arisen in one of the site found in West Showa Zone of Oromia Regional State between the host community and the resettlers because of competition over resource uses (Misganaw, 2005). He proposed rehabilitating the target population at their home of origin instead of relocating them, which can be accomplished by the huge amount of money invested in the program to avoid such environmental and social impacts. Similarly Ahmed (2005) reported that the recent resettlement program has resulted in large damage to the natural forest of the resettlement areas as well as the killing and fleeing of wild animals. About 5613.7 hectares of forestland in Haro Tatessa resettlement site was removed due to the resettlement program. The study also states that some of the damages caused on forest and wild animals are not easily reversible, even may lead to extinction of some species.

2.4. POLICY ISSUES

The environmental policy of Ethiopia recognizes control and monitoring tools and ensuring Environmental Impact Assessment in development programs of the country. Other supportive legislations such as Environmental Impact Assessment proclamation no 299/2002 states that "... no person shall commence implementation

of any project that requires environmental impact assessment as determined in the directive..." without providing EIA document to the pertinent agency and getting permit. The country also approved CBD (Conservation of Bio-Diversity) to sustainably manage and utilize biological resources.

As the efforts to control deforestation in Ethiopia is concerned, the â€œForestry Conservation, Development and Utilization Proclamation number 94 of 1994â€™â€™ is the current policy statement that governs the management and conservation of forests in the country (EFAP, 1994). The proclamation states that â€œsustainable utilization of the countryâ€™s forest resource is possible through the participation of people and benefits sharing by the concerned communities.â€ The proclamation recognizes three types of ownership: state forests, regional forests and private forests. Additional issues such as formulation of land use and forest policies are also important to consider since the country lacks such policies to enforce the proclamations. Therefore the effort of conserving and sustainable utilization of the resources is difficult with out policy frameworks to enforce the proclamations.

According to environmental impact assessment (EIA) Proclamation No. 299/2002 development projects or public instruments (policies, programs, and plans) have to be subjected to EIA scrutiny. It means that EIA is a legal requirement for development projects and public instruments to be implemented. Accordingly, MORD (2003) states that Environmental protection Authority is responsible to carry out Environmental impact Assessment of the recent resettlement program before implementation to minimize the environmental impacts encountered during the last resettlement programs.

Environmental Impact Assessment (EIA) is the process to identify and evaluate the likely environmental impacts of proposed project, new program, plan or policy taking in to account inter-related socio-economic, cultural and health impacts, both beneficial and adverse. EIA has the ultimate objective of providing decision-makers with an indication of the likely consequences of their decisions. The resettlement programs carried out in 2002/2003 are based on field reports of short-term feasibility studies despite MORD, (2003) states that the Federal environmental Protection Authority should carry out EIA.

2.5. VEGETATION AND WILDLIFE OF THE WOODLANDS

Woodlands are lands covered by the open stand of trees taller than 5 m but shorter than 20 m and with a canopy cover of more than 20 % (EFAP, 1994). According to the land use planning repot of the region the virgin woodland resources found in Illubabor and Jimma are 1141280 and 1317760 ha respectively totaling to 49074753 ha. Woodland resources mixed with agricultural areas found in Illubabor, Jimma, East and West Wellega Zones cover 2696264, 666880, 7280632 and 8467464 ha respectively (ONRG, 1998).

The woodlands are important sources of fuel wood and construction materials for the rural as well as for the urban community. They are also sources of non-timber forest products such as natural gums, myrrh and honey. Woodland provides habitat for large number of plant and animal species. The plant and animal species are adapted to these areas and it may be difficult for them to survive out of these areas that

makes them important for biodiversity conservation. In addition, they are important for buffering function between arid areas and highland plateaux. Unfortunately these areas are rapidly depleting by wildfire, shifting cultivation and growth of human population due to resettlement to these areas and other reasons. Woodlands are characterized by low annual incremental yield (1.2m
3
/ha) (EFAP, 1994). The increasing
number of human population in these areas may lead to extraction of the resource beyond its annual growth and eventually its disappearance.

Constraints and issues concerning the management, conservation/protection of woodlands include lack of knowledge of the location and extent of these resources and the management system of these lands by the local communities. Because of these the establishment of sustainable woodlands is one of the most difficult tasks facing the country at large including the region.

3. MATERIALS AND METHODS

3.1. DESCRIPTION OF THE STUDY AREA

3.1.1. Location

Chewaka resettlement area is located in Bedele Woreda of Illubabor zone, Oromia Reginal state about 570 kilometers southwest of Addis Ababa. It used to bbe administered as part of Bedele Woreda but recognized as one administrative woreda of the zone since the establishment of the resettlement site in 2003. It covers a total area of 342.167 km
2
. It is situated in lowland areas of Dhidhessa valley, which lies
below 1500m above sea level. The area is found between Dabena and Dhidhessa rivers. Dhidhessa River bounds the Woreda from east to north and at the same time it is the boundary between Illubabor and East Wollega zone. On the other hand Dabena River bounds the area from west to north which joins Dhidhessa and finally leads to Blue Nile. Chewaka resettlement site is among areas that hosted large number of settlers in Oromia Regional State. About 12,000 households (60,000 people) from Western Hararghe resettled in the area since 2003. The area has not been used for settlement before the establishment of the resettlement scheme (Figure 1).

3.1.2. Climate

There was no record of climatic data for Chewaka resettlement area but weather records of nearest station were used to describe it. The station near the area is Dhidhessa valley administered under National Meteorology Service Agency (NMSA). Dhidhessa valley meteorological station has been operating as grade one level station, which records relevant data of the weather but degraded to level four since 1994. This station is located in the lower Dhidhessa valley, which has similar climatic condition with the study area and can be considered to describe it. The area is classified as Kolla Agro-ecological Zone. The area experiences defined wet and dry seasons. The wet season is between May and October during which high precipitation is recorded. The maximum mean monthly precipitation is in June and July i.e. 275.28mm and 292.8mm respectively (Table 2). The dry season lasts

from November to April, which is marked by high temperature. The minimum mean annual (for the years1995- 2000) temperature of the area is 14.76 0 C and the mean maximum temperature for the same years is 30.99 0 C (Annex 8).

Table: 2. Total Monthly Rainfall (2000-2005)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Mean Yearly
2000	0.0	-	-	-	-	-	157.8	296.3	216.2	179.2	34.6	15	128.44
2001	0.0	9.5	55.7	67.7	-	227	220.7	205.2	196.9	137	13.3	33.3	106.03
2002	10.3	1.2	40.4	87.1	134.6	158.8	186.7	109.5	183.6	40.2	1.3	33.1	82.23
2003	0.0	35.1	50	0.0	73.1	365.9	416.7	302.3	192.8	67	-	--	150.29
2004	0.0	5.2	5.5	34.8	105.7	251.7	427.2	315.5	139.5	146.5	36.2	0.0	122.32
2005	6	0.4	107.3	18.8	110	373.3	347.8	173.4	251.8	123.7	-	-	272.44
Average monthly	2.72	10.28	51.78	41.68	84.68	275.28	292.82	233.7	196.8	115.6	21.5	20.35	

Source: National Meteorology Service Agency (NMSA)

Figure: 1 Map of Study Area (Chewaka Woreda).

According to Sebsebe et al. (2003) the vegetation of the area falls in Combretum-Terminalia broad-leaved deciduous woodland vegetation type. It is characterized by small to moderately sized trees with large deciduous leaves. Species of Terminalia, Combretum, Lannea, Boswellia papyrifera, Anogeisus leiocarpus and Stereospermum kunthianum are common. The vegetation has been burned annually for such a long time that the plants show clear adaptation to fire and controlled annual fire may be important for maintenance of many species. This vegetation type occurs along the escarpment of western plateau. At the upper limits it abuts with the Afromontane Moist evergreen forest which is one of major coffee growing areas in the country (Tadesse, 2003).

Reports from Chewaka woreda Agriculture and Rural Development Office show that there are wild animals found in the study area. These include lion (Panthera leo), leopard (Panthera pandus), hyena (Crocuta crocuta), African buffaloes (Syncerus caffer), bushbuck (Tragelaphus scriptus), common baboon (Papio cynocephalus), warthog (Phacochoerus africanus), bush pig (Potamochoerus larvatus), python (Python sebae), porcupine (Hystrix cristata), colobus monkey (colobus guereza (abyssinicus)), common duiker (Sylvicapra grimmia), Vervet monkey (Cercopithecus aethops) among others. Like wise Dhidhessa river is habitat for crocodile (Crocodylus niloticus) and hippopotamus (Hippopotamus amphibius).

3.1.4. Soil and Geology

According to TAMS Agricultural Group, (1975) the area forms part of the tertiary trappean lava composed largely of basalts and basaltic tuffs. Even though soil types vary with in very short distances, it is important to indicate the report carried out in the near upper Dhidhessa valley and identified its soil types. This is because information regarding soil type of the study area is not available. The report indicated that red and brown soils prevail on hills while black soils have developed on slightly slopping plains. Near the tributary streams and Dhidhessa river stretches of colluvial and alluvial soils are found.

3.1.5. Population

The area has been administered under Bedele Woreda of Illubabor Zone, Oromia regional State before the establishment of the resettlement site. It used to represent the low land areas of the woreda with very low population density due to vector-borne diseases such as malaria and trypanosomiasis. The population of Illubabor Zone according to the 1994 population census was 847048 with total area of 16555.36 km ^{2} (Annex 4).

Therefore, the population densities of the zone in 1994 and 2006 (projected) are 51.16 and 74.3 persons/km ^{2} respectively. The total population of Bedele woreda (projected) in 2006 was 143483 with total area of 1678.44 km ^{2}

(CSA,
2006 (see Annex 5)). This shows that the population density for the same year is 85.49

persons/km
2
. Note that the projection excludes the population of resettlers. Since its establishment the resettlement site became one administrative woreda with total population of 79803(see Annex 6) and covering 342.167 km
2
. Accordingly, the
population density of the study area is 233.23 persons/km
2
. The settlement patterns
observed in the area closely spaced settlement pattern in seven sub-sites of 27 kebeles (Annex 6). The individual households were provided with 0.025 ha of home garden and farmland that ranges between 1 and 2.5 ha.

3.1.6. Agriculture

Reports of the Woreda Agriculture and Rural Development Office show that farmers of the study area produce agricultural crops for consumption and commercial purposes. The major crops produced in the area include maize and sorghum mainly for consumption while sesame and soybean are produced for sale. Other crop types produced include sweet potato, ground nut among others. It is one of the areas that produce cash crops mainly sesame and soybean. The farmers slash and burn the area to prepare farmlands.

The livestock production system of the resettlers differs from the local indigenous farmers in that they own only few and fatten them for sale (Annex 9). This practice is more environmentally friendly than having high number of livestock as the local indigenous people do.

3.2. METHODOLOGY

Preliminary survey of the study area was conducted before data collection. This was important to generate some ideas about the vegetation type of the area so as to decide on sampling methods such as spacing between transect lines and spacing of plots along the transect lines. The study employed different methods to generate information on the current status of the woodland, forest product utilization pattern by the community, existing conservation measures (efforts) and the impact of resettlement on the woodland.

3.2.1. Vegetation Cover Change Study

Vegetation cover change (area of woodland recession) following resettlement was assessed using combinations of remotely sensed data and ground-based survey of the study area. Landsat ETM+, number p170-r054 (February 2001), was obtained for pre-settlement site cover assessment, while the image was visually interpreted using ERDAS 8.6 as image display software.

For post settlement land cover/land use assessment, ground survey was conducted using geographic positioning system (GPS), and fed into ArcView GIS software where it is converted into maps of the area. Maps from the two sets were raster transformed and area difference in the various land cover/land use of the pre-and post-settlement compiled. The topographic map of the study area with the scale of 1:50000 was obtained from Ethiopian Mapping Agency (EMA) as a base map.

Figure 2. Procedures followed in land cover/change detection

3.2.2. Socio-economic study

Qualitative data related to forest utilization pattern of the settlers and assessment of conservation efforts was collected from 140 sample households in 27 kebeles of the woreda which were randomly selected. Individual interview of sample household heads and group discussion was held with development agents and local community leaders. The number of sample household heads interviewed was determined according to Cochran (1977) with the following equation:

2
2
d
pqZ
no =
N
no
no
n
1
1
â^'
+
=

Where, no= the desired sample size when the population is greater than 10,000,

LandSat Image
2001 (170-054)
Digitizing and
geo-referencing
Study area
Topographic map
(1:50000)
Rasterizing
Geo-referencing
Image
Clip Landsat
Image using
study area
Land cover
2001

Ground- based
survey with
GPS
Coordinate points
Converted to Polygon in
GIS
Detection of change
Land use/cover 2007

n = the desired sample size when the population is less than 10,000,
Z = 95% confidence limit i.e. 1.96
P = 0.1 (population proportion to be included in the sample i.e. 10%)
q = 1-0.1 i.e. 0.9
N = total number of population
d = margin of error or degree of accuracy (i.e. 0.05)

Random sampling method was used to select respondents to avoid subjective biases. Semi-structured questionnaires (Annex 1) and checklists (Annex 3), which were translated to Afan Oromo language to be responded by sample household heads.

3.2.3. Vegetation study

Transect line survey was employed to collect data on tree species composition of the woodland. Sample plots of 30mx30m size was laid was along transect lines. Systematic sampling design was used to lay parallel transects at regular distance of 500m apart. Plots were laid along transects 300 meters distance from each other. A total of four transect lines with six kilometers length were taken totaling to 80 sample plots. The first plot was laid randomly and the subsequent plots at regular distance. Complete list of tree species encountered, dbh (diameter at breast height) and height of the trees in each sample plot was recorded. In addition, the land use type on which the sample plots are located was also recorded on data sheet prepared for this purpose (Annex 2).

3.3. MATERIALS USED

Topographic map with scale of 1: 50000 was used as a base map. GPS (Geographic Positioning System) was used to read coordinates of the current land use. Caliper to measure diameter at breast height, hypsometer to measure tree height, rope to lay out sample plots, measuring tape to measure distances and manual of dendrology to identify tree species were used during the study.

3.4. DATA ANALYSIS

The tree species data collected from the sample plots were listed to know the total

species and family of the plants. Diameter class and abundance distribution of the trees for different land use/cover types were done as a scatter plots to understand the trend of growth of these vegetation types. The Landsat ETM+ image 2001 was visually interpreted using ERDAS 8.6 as image display software to generate information on land use/land cover types before resettlement. The post-settlement land use/land cover type information was generated by ground-based survey using GPS and fed in to ARCView GIS Software to produce the map of current land use/land cover. Questionnaire and checklists were used to assess the conservation measures and forest product utilization pattern that were subjected to SPSS 13 to be analyzed. Descriptive statistics were used to analyze the soci-o-economic data.

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4. RESULTS

4.1. VEGETATION COVER CHANGE

The pre-settlement image analysis shows that the woodland was intact, and there was neither settlement nor agriculture in it (Fig.3). This was also confirmed through the socio-economic survey that showed all the settlers have settled after 2003 by clearing virgin woodlands.

Figure 3. Landsat image of the study area before the establishment of the scheme (2001) showing intact woodland with no agriculture and settlement areas

However, the post settlement map based on ground survey revealed that nearly 145 km^2 of the woodland has been converted into combinations of agriculture and settlement (Fig. 4). This also means that the woodland has shrunk by the same magnitude i.e. 42.4 percent decline of the woodland.

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Figure 4. Area of land converted to agriculture and settlement (2007)

4.2. TREE SPECIES COMPOSITION

Plant communities have several characteristics by which they can be described: structure, life form, spatial pattern, species composition, successional stage, biomass and functional process (energy flow and nutrient cycling). The current study tries to describe the vegetation of the study area by its species composition. Accordingly, the result of survey revealed that 22 tree species in 14 families were encountered (Table 3).

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Table 3. Total tree species recorded in the study area
Species Family Local name
Adina microcephala (Del.) Hiern Rubiaceae
Albizia schimperiana Oliv. Mimosoideae
Bridelia scleroneura Muell. Arg. Euphorbiaceae
Comberatum adenogonium A.Rich. Combretaceae
Comberum molle R. Br. Ex G.Don Combretaceae Agalo (Am)
Cordia africana Lam. Boraginaceae Wadessa(Or)
Diospyros abyssinica (Hiern) White Ebenaceae
Entada africana Steud. Ex A.Rich Mimosoideae
Ficus dicranostyla Mildbr. Moraceae
Ficus sur Forssk. Moraceae Harbu (Or)
Gardenia lutea Fres. Rubiaceae
Grewia millis Juss. Tiliaceae
Loncocarpus laxiflorus Guill. & Perr. Papilionoideae
Mytenus arbutifolia (A.Rich) Wilczek Var.
arbutifolia Celastracceae

Ozoroa insignis Del. Anacardaceae
Stereospermum kanthianum Cham. Bignoniaceae Botoro (Or)
Syzygium guineense (Wild) DC. Subsp
macrocarpum Engl. Mytaceae

Goosu (Or)
Terminalia brownii Fresen. Combretaceae Abalo (Am)
Terminalia laxiflora Engl.& Diels. Combretaceae
Terminalia macroptera Guill. & Perr. Combretaceae
Terminalia schimperiana Hochst. Combretaceae
Vitex doniana Sweet. Verbenaceae

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The result of vegetation survey shows that few trees were found on farmlands and settlement areas with very limited number of seedlings and saplings. This suggests that the population structure of the trees found on this land use type is â€˜Jâ€™-shaped indicating declining population (Figure 5b). The population structure of trees found on woodlands with limited human interference on the other hand shows that the number of seedlings and saplings is high i.e. the population structure is inverted â€˜Jâ€™ shape indicating that it is growing population or not declining population (Figure

5a,c).

As shown in Table 3 the total species recorded in the woodland areas with no human interference and around riverbanks are higher than the settlement and agricultural areas indicating the effect of human activities on the woodland.

Table 4. Tree species recorded in Agriculture and settlement areas

Species Local Name	Family	Density (Stem/ha)
Albizia schimperiana Oliv.	Mimosoideae	8.03
Comberatum adenogonium A.Rich.	Combretaceae	10.70
Cordia africana Lam. Wadessa(Or)	Boraginaceae	13.38
Ficus sur Forssk. Harbu (Or)	Moraceae	8.03
Gardenia lutea Fres.	Rubiaceae	5.35
Ozoroa insignis Del.	Anacardaceae	5.35
Stereospermum kanthianum Cham. Botoro (Or)	Bignoniaceae	7
Terminalia laxiflora Engl. & Diels.	Combretaceae	10.70
Terminalia macroptera Guill. & Perr.	Combretaceae	5.35
Total		85.62

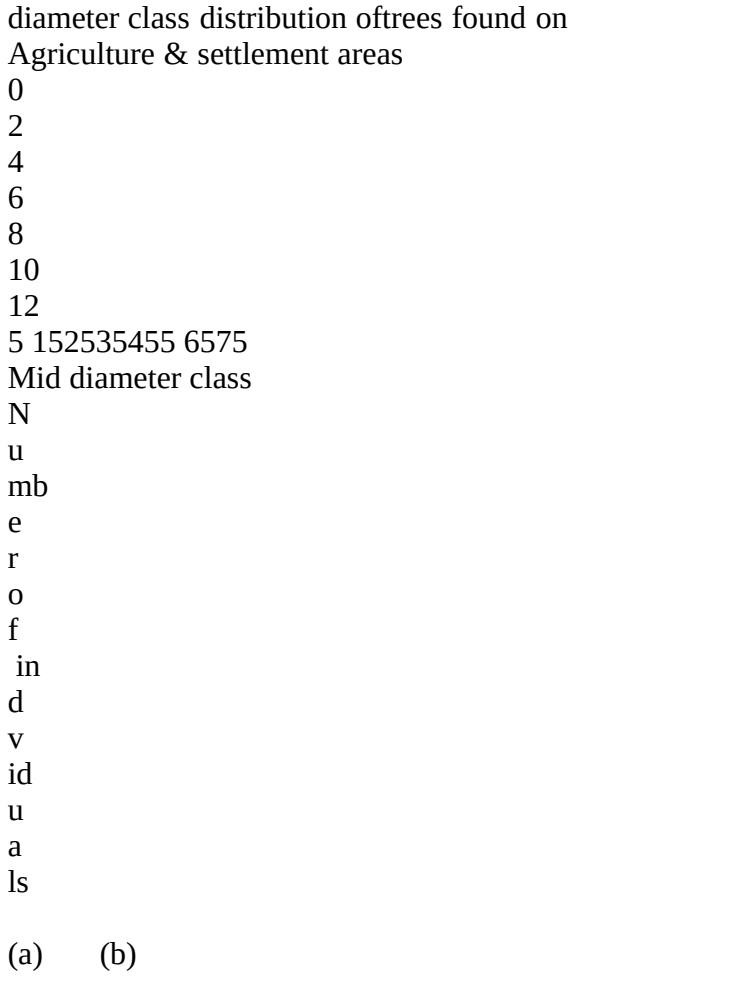
Table 5. Tree species recorded in Riverine vegetation

Species Local Name	Family	Density (Stems/ha)
Adina microcephala (Del.) Hiern	Rubiaceae	14.45
Bridelia Scleroneura Muell. Arg.	Euphorbiaceae	9.63
Comberatum adenogonium A.Rich.	Combretaceae	19.26
Cordia africana Lam. Wadessa(Or)	Boraginaceae	24.08
Diospyros abyssinica (Hiern) White	Ebenaceae	14.45
Ficus dicranostyla Mildbr.	Moraceae	24.08
Grewia millis Juss. Dhokonu(Or)	Tiliaceae	9.63
Loncocarpus laxiflorus Guill. & Perr.	Papilionoideae	24.08
Ozoroa insignis Del.	Anacardaceae	14.45
Stereospermum kanthianum Cham. Botoro (Or)	Bignoniaceae	4.82
Syzygium guineense (Wild) DC. Subsp .macrocarpum Engl.		

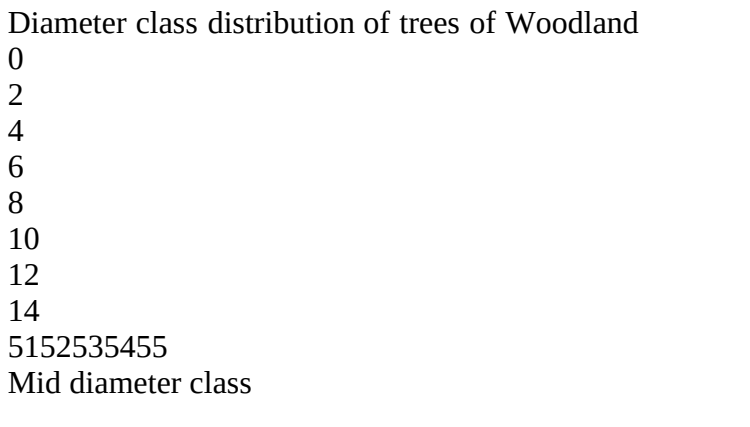
Vitex doniana Sweet.
Mytaceae
Verbenaceae
28.89

16.05
Goosu (Or)
Total Species 203.87

Table 6. Tree species recorded in Woodlands
Species Family Density
(Stem/ha)
Local Name
Albizia schimperiana Oliv. Mimosoideae 16.05
Comberatum adenogonium A.Rich. Combretaceae 12.04
Comberum molle R. Br. Ex G.Don Combretaceae 12.04 Agalo (Am)
Entada africana Steud. Ex A.Rich Mimosoideae 16.05 Ambeta (Or)
Ficus dicranostyla Mildbr. Moraceae 12.04
Gardenia lutea Fres. Rubiaceae 12.04
Grewia millis Juss. Tiliaceae 10.70
Mytenus arbutifolia (A.Rich) Wilczek Var.
arbutifolia
Celastracceae 8.02
Ozoroa insignis Del. Anacardaceae 12.04
Stereospermum kanthianum Cham. Bignoniaceae 20.07 Botoro (Or)
Syzygium guineense (Wild) DC. Subsp
macrocarpum Engl.
Mytaceae 12.04 Goosu (Or)
Terminalia laxiflora Engl.& Diels. Combretaceae 12.03
Terminalia macroptera Guill. & Perr. Combretaceae 8.02
Terminalia schimperiana Hochst. Combretaceae 8.02
Vitex doniana Sweet. Verbenaceae 16.05
Total species 187.25


diameter class distribution oftrees found on
Agriculture & settlement areas
0
2
4
6
8
10
12
5 152535455 6575
Mid diameter class
N
u
mb
e
r
o
f
in
d
v
id
u
a
ls

(a) (b)


Diameter class distribution of trees of Woodland
0
2
4
6
8
10
12
14
5152535455
Mid diameter class

N
u
m
b
e
r
o
f
i
ndv
i
dua
l
s

(c)
Figure 5. Diameter class distribution of trees around Riverbanks (a) Settlement and Agriculture (b) and wood lands (c)

4.3. SOCIO-ECONOMIC STUDY
4.3.1. Forest resource utilization Pattern

Like other developing countries and rural areas of the country, the farmers of the study area depend on biomass for their fuel wood sources. All of the respondents
Diameter class distribution trees around
riverbanks
0
1
2
3
4
5
6
7
8
5 152535455 6575859510515
Mid diameter class
N
u
m
b
e
r
of
i
ndv
i
d
u
a
l
s

depend on biomass (both on natural forest and crop residues) for energy source out of which 11.4 % of them do not use crop residues. The remaining 88.6% of the respondents use both fuel wood from natural vegetation and crop residues (Table 7).

Table 7. Sources and use of fuel wood

Source of fuel wood	Frequency	Percent	Cumulative Percent
Wood from natural vegetation	16	11.4	11.4
Both crop residues and wood from Natural vegetation	124	88.6	100.0
Crop Residue only	0	0	
Total	140	100.0	

The socio-economic survey revealed that 11.4 % of the farmers responded that they involve in selling fuel wood and charcoal (Table 8). This number is high if we extrapolate to the total number of the resettlers i.e. about 9097.54 people are involved in such activities which could be destructive to the woodland. The exploitation of the resource may increase in the future when the road network improves to transport the resources to urban centers where the demand is high. Planning and implementing other means of additional source of income instead of cutting down trees should get emphasis to rescue the woodland.

Table 8. Proportion of farmers engaged in fuel wood and charcoal production

Activity	Frequency	Percent	Cumulative Percent
Those who produce charcoal and fuel wood for sale	16	11.4	11.4
Those who do not produce charcoal and fuel wood for sale	124	88.6	100.0
Total	140	100.0	

It is also evident that the local people totally depend on construction materials harvested from the natural vegetation to construct their shelter and for different household utensils and farm implements. Accordingly, all of the respondents use the

natural forests as a source of construction materials. On the other hand, the proportion of the respondents that have experience of hunting is small (22.9 %). The purpose of hunting, according to the survey, is to protect their crops from wild animals such as baboons and warthog. They claim that they have no experience of hunting for wild meat and cultural values. The Woreda Rural and Agricultural Development Office and other stakeholders could take this opportunity to create better awareness among the community so that they will benefit a lot from conserving and sustainably utilizing the resource.

4.3.2. Land holding and conservation Activities

The land allocated to the resettlers ranges from 1 to 2.5 hectares. About 47.1 % of the farmers own 2 hectares while 44.3 % own 1.5 hectares which will add up to 90.7 %. The remaining 7.1% and 2.1 percent hold 1 and 2.5 hectares respectively. The average weighted land holding of the area is 1.732 hectares (Table 9). The respondents pointed out that they could access other areas of land whenever the fertility of land they own gets deteriorated. The survey conducted to evaluate the conservation measures initiated indicates that all of the respondents leave tree on farmlands. But the purposes of these trees left on farmland differ. Half of the respondents (50%) leave the trees because the trees are so big to cut down, 27.9% of them for shade purposes and 22.1% for agro-forestry purposes (Table 11). One of the cash crops produced in the area, sesame, as explained by the farmers, is not shade loving that forced them to cut down all the trees on the farmland during land preparation. This shows that considerable portion of the resettlers clear vegetation indiscriminately to prepare the land for agriculture.

Table 9. Area of farmland allocated to household heads

Area of farm land	No of respondents	Percent	Cumulative Percent
1.0	10	7.1	7.1
1.5	62	44.3	51.4
2.0	66	47.1	98.6
2.5	2	1.4	100.0
Total	140	100.0	

The average family size of the area is high indicating high population growth i.e. 6.04 (Table 10). This suggests that the demand for agricultural land grows and there will be large area of woodlands to be cleared for this purpose. In addition, whenever the soil fertility of the land they own declines the farmers responded that they could shift to new areas clearing more areas of land.

Table 10. Average family size, number of livestock and area of farmland.

	n	Min	Max	Sum	Mean	Std. Deviation
Family size	140	2	11	845	6.04	1.707

Area of farm land 140 1.0 2.5 240 1.714 0.3238
No of live stock 140 0 18 636 4.54 3.372

The survey indicated that only 0.71% of the respondents are carrying out soil conservation practices (terraces) while the remaining 99.29% are not involving in such activities (Table 12). This may be because no soil fertility exhaustion is recognized as the resettlement scheme is new. It may also be due to the fact that the areas are mainly flat (less than 5% slope) to implement soil conservation measures like terraces. The education provided by the development agents may also be not sufficient enough to create awareness among the resettlers about the importance of conservation measures.

Table 11. Purpose of trees left on farmlands as responded by farmers

43

Purpose of trees on farm land
No of
respondents
Percent Cumulative Percent
For shade 39 27.9 27.9
Agro-forestry 31 22.1 50.0
Difficult to cut 70 50.0 100.0
Total 140 100.0

The other important point to raise is the number of livestock owned by individual farmers. 51.4% of the respondents own 4 to 6 livestock while 32.9% and 12.7% of them own 0 to 3 and 8 to 18. This shows that more than 90% of the respondents own less than eight livestock (Annex 9). The farmers experience in livestock management is that fattening of limited number of cattle instead of raising so many numbers of cattle with lower productivity is common activity. It has an implication in reducing the impact of cattle on environment.

Table 12. Proportion of farmers engaged in soil conservation activities

Activity Frequency Percent Cumulative Percent
Engaged in soil conservation
activities
1 0.71 0.71
Do not engaged in soil
conservation activities
139 99.29 100.0
Total 140 100.0

44

5. DISCUSSION
Vegetation Cover Change

Combinations of the remotely sensed data analysis and ground-based surveys can be used to detect the land use/land cover changes where access to remotely sensed Landsat images of the recent or ancient times is limited. The two sets of data should be converted in to similar formats so that comparison to detect the changes is possible. For example, Ermias et al. (2006) used participatory GIS where by local peoples who have been living in the area since long time ago tried to map the land cover of the study area before 50 years on the ground and survey of the boundaries of the areas using GPS to produce land use/ land cover map of the area. The co-ordinates were fed in to GIS and converted in to shape files. Then the land use/ land cover before 50 years was produced and superimposed with the current land use/land cover obtained from remotely sensed Landsat imagery to obtain the change in land use/land cover. This shows that the methodology followed was similar with the current study.

The current study depicts that the vegetation cover of Chewaka resettlement site has been reduced considerably (by 42.4 percent) due to different human activities. This may lead to removal of topsoil by erosion causing loss of fertility and consequently loss of productivity. This is in line with Mekuria (2005) that states resettlement in forest regions cause considerable damage of natural resource base. This implies that the threats to vegetation cover becomes threat to achievement of the objective of the resettlement program i.e. achievement of food security. Removal of vegetation cover may also result in increased runoff causing flooding of areas found in the lower valley of Dhidhessa. These floods could affect agricultural fields, settlement areas and other infrastructures. The amount of available water in the ground water table can be depleted since the rainfall water that recharges ground water aquifer is lost through runoff. Dagnachew et al. (2003) states that clearance of vegetation cover leads to change in hydrological cycle and depletion of ground water. The depletion of ground water has an implication on the future development of potable water for domestic uses.

The role of vegetation in maintaining microclimate of the area could also be lost due to the establishment of the scheme followed by woodland vegetation degradation. Aridity and desertification, in extreme cases, could occur in the area. Mengistu (2005) indicated that deforestation may result in local environmental changes. Deforestation releases the sequestered carbon in the plants that contributes to global warming. Woodlands are important in supporting wildlife especially large mammals. The reports of Chewaka woreda Agricultural and Rural Development Office shows that large game animals such as African buffaloes, lion, hippopotamus, etc are found in the area. The resettlement scheme is becoming a threat to the habitat of these important game animals causing their migration and eventual loss. Removal of vegetation could result in loss of microorganisms that are important for different ecosystem functions. Biodiversity in general could be affected a result of removal of vegetation of the woodland.

Different ecosystems support flora and fauna unique to them. These plants and animal species face difficulties to survive out of these areas. Therefore, destruction of these ecosystems destroys their habitat that may cause their extinction. Each species of these floras and faunas has its special function in the web of life that could be critical in the sustainability of the ecosystem. This very important role of individual species in the web of nature could be lost that could cause eventual loss ecosystem

integrity. Therefore, the species of flora and fauna found in the woodland ecosystem could be subjected to threat and eventually extinction because of the increased pressure from the resettlement scheme, which may have many economic and ecological implications.

In addition to the growing population, the other challenge of Ethiopiaâ€™s development effort is that lack of appropriate forestry and land use policies. These policies are important in putting a land for appropriate use that maximizes its benefits with less environmental impacts. Moreover, the country fails to put into practice some proclamations and international conventions it already adopted. For example, EIA proclamation No. 299/2002 states that every government plan, project and program is subjected to environmental impact assessment scrutiny. Contrary to this proclamation, EIA was not carried out for the resettlement programs carried out by

the government itself. The country also adopted other international conventions such as Convention on Biological Diversity (CBD) but it seems that the government plans and programs themselves are not following the criteria. The government plans and programs should be exemplary in ensuring biodiversity conservation and reduction of environmental impacts. In general, policies and proclamations such as EIA proclamation No. 299/2002 and CBD should be respected to minimize environmental impacts and ensure ecosystem integrity. Forest and land use policies should also be in place to enforce the proclamations.

The governmentâ€™s manual for the resettlement program stresses its voluntary nature and lays out the guidelines for its management and implementation. However, there is reasonable evidence to believe that the implementation of the program has been deviated from the procedures laid down in the guidelines. The feasibility study report of the recent resettlement program by team of experts in Oromia Regional State indicates that only Illubabor and West Welega zones were with potential eight resettlement sites (ONRG, 2001). Contrary to this report many other zones of the region have hosted large number of resettlers. Jimma, West Shewa and East Wellega are among others. Chewaka resettlement site was not included in the report as potential site for resettlement. The deviation of the scheme from its proposed schedule starts from this point. Failure to carry out EIA for the schemes based on the Environmental Impact Assessment (EIA) proclamation No. 299/2002 is the other point of deviation from the procedures. Thompson and Winer (2004) reported that during 2003 and 2004 the program was implemented in an inconsistent and hurried manner resulting in a variety of different problems during registration, transport, site preparation and service provision, leading to a variety of health and environmental problems which is in line with the result of the current study. The Environmental Protection Authority-EPA (2004) guidelines for environmental, social and ecological impact assessment in resettlement areas and implementation manuals are not followed.

EPA (2004) states that impact assessment needs to be carried out on the planned activities aimed at implementing the settlement program in order to predict their positive and negative impacts on the environment, and on social and economic

conditions so as to strengthen the positive and, when possible avoid (or at least minimize) the negative consequences. The document appreciates the impacts that could be involved and proposed guidelines to be followed during impact assessment to predict possible negative impacts at the planning stage. This document was not put in to practice that caused the impacts in the resettlement areas to happen.

It further adds that economic and social development activities carried out in settlement areas should be based on a coherent environmental management plan that enhances the quality of the environment and maximizes its productivity sustainably. Special care and protection must be given to fragile natural and human made environments that can be easily damaged or destroyed and can not be easily replaced. Similarly, utilization and management plan of the areas should be prepared based on the environmental audit of any activity being undertaken to implement the settlement program. The scheme failed to put in to practice that the need for carrying out EIA and necessities set out in the guidelines that resulted in clearance of large areas of virgin woodlands for settlement and agriculture.

The impoverishment of vegetation cover and the consequent soil erosion by water and wind in and around each village can be avoided through helping the village community organize itself, raise its awareness and build its capacity to take the cooperative action it believes in. The reduction in the impoverishment of vegetation cover and soil erosion following increased capacity for action also eases the problem of reducing water availability. In general, the involvement of such huge impact in the area may have resulted from deviations set out in the guidelines and failure to carry out environmental impact assessment.

The diameter class distribution of trees on different land cover types shows that the extent of disturbance by anthropogenic factors. In undisturbed vegetation type the number of seedlings and saplings are high and shows gradual decrease towards the higher classes of diameter. This shows that the higher population of seedlings and

saplings will grow to larger trees and therefore, it is not declining population. The total frequency of trees on farmlands and settlement areas is low and the smaller diameter classes are still lower in these land use types (Figure 5a, b, and c). The low number of seedlings and saplings on the farm and settlement areas show that the population is declining and no tree will be found in the near future when the existing ones on farm lands and settlement areas die or harvested. This is in line with the result that revealed the farmers leave only few trees on their farmland for different purposes (Section 4.3.2).

Number of species and families recorded in the farmland and settlement area are lower than that of the woodlands with lower human interference. This implies that the scheme has involved change in species composition of the trees, which could be continuous since the population of the settlers is growing fast.

Forest Product Use

Like other developing countries, the rural people of Ethiopia depend mainly on biomass for energy. Mercer and Soussan (1992) reported that fuel wood accounts for more than 75% of the energy used in countries such as Nepal, Bangladesh, Ethiopia,

Burkina Faso and Nigeria. Cooking consumes most of this energy which is supplied by biomass fuels (fuel wood, crop residues and cow dung) that are collected freely from local environment. The dependence of large segment of people on biomass fuel for energy source has contributed to the degradation of vegetation of different developing countries like Ethiopia (EFAP, 1994). Likewise, the people of the study area exploit the vegetation for their daily needs. In addition to the household consumption, they also involve in selling of fuel wood and charcoal as additional source of income. This implies that there is high pressure on the woodland vegetation, which may lead to extreme degradation.

Considerable proportion of the resettlers depends on natural vegetation and on crop residues during dry season after crop harvest. The use of crop residues for fuel wood reduces the organic matter that would have been added to the soil so that the soil fertility improves. It also has implication on the amount of crop lost due to fertility loss. Crop residues left on farmland after harvest improves soil physical and

chemical properties by enhancing infiltration of rainwater, providing physical protection to the soil against erosion. Therefore, removal of crop residues from farmland after harvest contributes a lot to the degradation of the soil. Sttocking and Murnaghan (2001) stated that failure to carry out soil conservation measures and use of crop residues can cause soil degradation that makes conservation measures important in the study area.

Conservation Efforts

The result of the study shows that there are no conservation measures initiated in the area. This may have resulted from failure to deliver appropriate education to the settlers by concerned bodies. MORD (2003) and EPA (2004) on the other hand state that special care should be given to fragile environments and appropriate conservation measures should be in place to insure the sustainability of the environment. The woodlands can be considered as fragile environment with little potential to endure human interferences. So special care should be in place to ensure the sustainability of the environment. Despite this fact the scheme failed to ensure any conservation measures in the area. It also failed to backup the settlers with appropriate technical knowledge so that they will be aware of environmental problems and take appropriate conservation measures. The only conservation measure in the area is scattered trees on farmland left for different purposes. Most of the trees left on farmland are not for agro-forestry purposes but they are to be cut down after some time according to the responses from the farmers. Some trees found on farmlands whose barks are removed (girdled) to kill them could confirm this.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. CONCLUSIONS

The present study showed that Chewaka resettlement program brought environmental impacts despite the claims by government authorities that state the recent resettlement programs are environmentally friendly. The guidelines set by

EPA were not followed nor the scheme was well planned. Its failure to be well planned can be checked by failure to conduct EIA, establishment of resettlement sites in areas that were not listed as potential sites to host settlers and moving huge number of people to fragile areas, which could not support them. It calls for intervention measures to be taken if the scheme should be sustainable. The objective of the program is difficult to be met, loss of ecosystem integrity and environmental degradation, in extreme cases, may occur otherwise. The settlers heavily depend on natural resources for fuel wood and construction materials as well as production of charcoal and fuel wood as additional sources of income facilitates the depletion of the woodland. The high population growth of the settlers has an implication on the future demand for natural resources making the problem more complex. Failure to plant tree seedlings for domestic use that minimizes the pressure on the woodlands and inadequate conservation measures are also contributing to the degradation of the resource. This shows that the woodland is under great threat calling for corrective measures to be taken.

In general, resettlement should not be viewed as the only way out of poverty and ensuring food security. Other options such as appropriate population policies that maintain population growth at acceptable level are necessary. High population growth where most part of the community depends on natural resources for their livelihood can cause environmental problems. The aggregate demand of the community could grow beyond the supply that nature provides which leads to environmental degradation. Therefore, to ensure sustainable use of natural resources with minimum environmental impacts appropriate population growth control measures should be put in to practice. Rehabilitation of degraded areas

should also be focused that could improve the productivity of the area and reduce the number off migrants to other areas. Combined efforts of rehabilitating degraded areas and population growth control measures could result in better outputs than moving people with out good preparation. Well-planned resettlement schemes, in fact, could result in better outputs with minimum environmental impacts.

6.2. RECOMMENDATIONS

1. Continuous impact assessment to take corrective measures in the study area and other similar resettlement sites;
2. Tree planting activities by individual households to grow their own trees around homestead and farmlands so that the dependency on natural vegetatio could be reduced;
3. Appropriate training by the development agents and extension workers to increase the awareness of the community about the use of natural resources and the need for conservation;
4. Appropriate training and practice of family planning to reduce the high population growth rate the resettlers experiencing currently;
5. Appropriate education by the development agents so that the community will practice conservation measures compatible with the agro-climatic zone of the area.
6. Further detailed study of the environmental impacts of the current resettlement programs in different parts of the country to take corrective measures

7. The high population pressure on this fragile ecosystem may need to be released to other areas with better carrying capacity because the population density of the settlers is high which can damage the environment.

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ANNEXES

Annex 1. Socio-economic survey format at house hold level

1. Name of respondent_____
2. Sex_____
3. Age_____
4. Family size_____
5. What is your main production system?
a. Farming agricultural crops (1)
b. Animal husbandry (2)
c. Mixed (3)
d. Others (specify)_____
6. Area of farmland owned_____
7. No. of cattle owned_____
8. Do you use chemical fertilizer to raise crops?
a. Yes (1)
b. No (2)
If no, what alternative mechanisms do you use to increase yield when soil fertility gets decreased?
a. Shifting cultivation (1)
b. Compost (2)
c. Intercropping (3)
d. Fallowing (4)
e. Crop rotation (5)
f. Others (specify)_____
9. Do you use fire to clear and prepare farmland?

a. Yes (1)
b. No (2)
If yes, what fire management techniques do you use to control fire damage to natural forest?
a. Prescribed fire management (1)
b. No management used (2)

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c. Others (specify)_____
10. What additional source of income other than agricultural crops do you have?
a. Charcoal making (1)
b. Pit sawing/lumbering (2)
c. Fuel wood (3)
d. Selling labor (4)
e. Honey production (5)
f. Others (specify)_____
11. Do you leave scattered trees on farmland?
a. Yes (1)
b. No (2)
If yes, for what purpose?
a. For shade (1)
b. For agro-forestry and conservation purposes (2)
c. Big to cut (3)
d. Others (specify)_____
12. Do you practice soil conservation measures?
a. Yes (1)
b. No (2)
If yes, what are they?
a. Terracing (1)
b. Leaving scattered trees on farm land (2)
c. Cut off drains and water ways (3)
d. Cut and carry system (4)
e. Others (specify)_____
13. Do you have the right of acquiring an other area of land for farming if the fertility of the land that you currently own depleted?

a. Yes (1)
b. No (2)
14. Do you practice hunting of wild animals?
a. Yes (1)
b. No (2)

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If yes, for what purpose?
a. For flesh/food (1)
b. Skin and hides (2)
c. Ivory (3)
d. Culture (4)
e. Others (specify)_____
If no, why?

a. No wild games 9(1)
b. For conservation of wildlife (2)
c. No experience of hunting (3)
d. Others (specify)_____
15. What is your source of firewood?
a. Natural forest (1)
b. Cow dung (2)
c. Agricultural crop residues (3)
d. Plantation (4)
e. Others (specify)_____
16. Do you plant trees around homestead and farmland?
c. Yes (1)
d. No (2)
If yes, for what purpose?
a. Fuel wood (1)
b. Construction wood (2)
c. Forage (3)
d. Shade (4)
e. Others (specify)_____
17. What is your source of construction wood?
a. Natural forest (1)
b. Plantation (2)
c. Others (specify)_____
18. Is the crop yield produce enough for consumption through out the year?
a. Yes (1)
b. No (2)

19. If not enough, what coping mechanisms do you have food deficit time?
a. Waiting for relief assistances (1)
b. Selling labor (2)
c. Collection of wild fruits and roots(3)
d. Others (specify)_____
If your answer to question number 18 is (b) what is your future plan to solve the problem of food self-insufficiency?
a. Returning to home village/place of origin (1)
b. Increasing agricultural inputs to increase yield (2)
c. Increasing the area of farm land (3)
d. Others (specify)_____
20. Is there natural forest that is owned or controlled by government?
a. Yes (10
b. No (20
21. Do you have free access to use natural forest around you?
a. Yes (1)
b. No (20
If no, why?
a. Because it is government owned (1)
b. Because I use tree grown around my homestead (2)
c. Others (specify)_____
22. Do you produce charcoal and lumber?
a. Yes (1)
b. No (2)

Anne 2. Vegetation Survey Record Form

Area (Site No.) _____ Plot No. _____
Transect line No. _____ Grids: Lat _____
Land use/cover type_____ Long_____

Seedling Sapling Tree
Species Species Species
Scientific
name
Local
name
Scientific
name
Local
name
Scientific
name
Local
name
dbh(cm) Ht (m)

Annex: 3 Check lists of Conservation Measures

Soil Conservation Measures Practiced in the Area
Make a tick(âˆš)
Remark
1) Physical measures
â˜’ Terraces
â˜’ Cut-off drains
â˜’ Water ways
â˜’ Check dams
â˜’ Bench terraces
â˜’ Half moon trachions
â˜’ Others
2) Biological measures

â^’ Trees on farm lands
â^’ Inter-cropping
â^’ Live fences
â^’ Hedges
â^’ Alley cropping
â^’ Wind breaks
â^’ Hedge row inter-cropping
â^’ Others

Annex 4. Population of Illubabor Zone by age and sex (1994)

Age group	Total Both	Total Male	Total Female	Urban Both	Urban Male	Urban Female	Rural Both	Rural Male	Rural Female
All ages	847048	416456	430592	80290	38836	41454	766758	377620	389138
0-4	131821	66024	65797	9352	4641	4711	122469	61383	61086
5-9	135017	67318	67699	11003	5429	5574	124014	61889	62125
10-14	110676	56166	54510	11767	5606	6161	98909	50560	48349
15-19	82787	41868	40919	10191	4623	5568	72596	37245	35351
20-24	63876	30856	33020	7317	3370	3947	56559	27486	29073
25-29	56942	27224	29718	6851	3537	3314	50091	23687	27404
30-34	46411	21394	25017	5010	2626	2384	41401	18768	22633
35-39	44190	20034	24156	4587	2240	2347	39603	17794	21809
40-44	38027	17469	20558	3254	1700	1554	34773	15769	19004
45-49	27812	13856	13956	2449	1205	1244	25363	12651	12712
50-54	29518	13500	16018	2429	1117	1312	27089	12383	14706
55-59	16478	8774	7704	1444	718	726	15034	8056	6978
60-64	23974	11142	12832	1743	759	984	22231	10383	11848
65-69	11065	6169	4896	939	453	486	10126	5716	4410
70-74	11927	5685	6242	840	336	504	11087	5349	5738
75-79	4806	2864	1942	367	206	161	4439	2658	1781
80-84	7190	3454	3736	465	151	314	6725	3303	3422
85-89	1574	939	635	121	60	61	1453	879	574
89+	2957	1720	1237	161	59	102	2796	1661	1135

Source: CSA

Annex 5. Population of Bedele Woreda by age and sex (1994)

Age group	Total Both sexes	Total Male	Total Female	Urban Both sexes	Urban Male	Urban Female	Rural Both sexes	Rural Male	Rural Female
All ages	97477	47353	50124	13243	6331	6912	84234	41022	43212

0-4 15379 7751 7628 1461 740 721 13918 7011 6907
5-9 15596 7751 7845 1765 865 900 13831 6886 6945
10-14 13459 6754 6705 1968 907 1061 11491 5847 5644
15-19 10576 5271 5305 1845 830 1015 8731 4441 4290
20-24 7650 3582 4068 1358 584 774 6292 2998 3294
25-29 6430 3070 3360 1214 629 585 5216 2441 2775
30-34 5071 2296 2775 877 460 417 4194 1836 2358
35-39 4700 2081 2619 783 373 410 3917 1708 2209
40-44 4008 1771 2237 509 282 227 3499 1489 2010
45-49 2904 1395 1509 327 157 170 2577 1238 1339
50-54 3187 1393 1794 343 152 191 2844 1241 1603
55-59 1670 901 769 197 96 101 1473 805 668
60-64 2511 1121 1390 215 82 133 2296 1039 1257
65-69 1098 580 518 130 61 69 968 519 449
70-74 1325 635 690 106 46 60 1219 589 630
75-79 499 283 216 39 28 11 460 255 205
80-84 852 387 465 68 20 48 784 367 417
85-89 176 107 69 15 10 5 161 97 64
89+ 386 224 162 23 9 14 363 215 148

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Source: CSA

Annex 6: Population of Chewaka woreda
Site (No.) Name of Kebele No. of
Households
Total population Remarks
Chamen 305 1525
Mirgisa 408 2518
Chokorsa 529 2621
Kanani-janata 422 2911
Gabina 546 3496
Site 1
Baha-biftu 542 2841
Tarkanfata misoma 430 2450
Shimal-toke 525 3292
Duki 379 2582
Gudure 529 2484
Site 2
Damaksa 612 4761
Dursitu misoma 454 2582 Site 3
Wal-tasis 551 4196
Jagan 569 5478
Sire gudo 550 3419
Dire misoma 540 3638
Site 4
Burka-anani 521 3989
Danana 348 2424
Jiru-balina 326 2336
Walda-jalala 326 1854
Site 5
Oda-qabana 414 2431

Tokuma-harar 698 4170
Boneya 206 1508
Site 6
Haro chawaka 500 2978
Chafe magartu 505 1927
Biftu Ayana 427 2261
Site 7
Urji Oromia 527 3131
Total 12390 79803

Source: CWRADO

Annex 7: Monthly minimum Temperature

Source: National Meteorology Service Agency (NMSA)

Year Jan Feb Mar Apr May Jun Jul Aug Sept Oct Nov Dec Mean
1996
13.1 12.8 17.4 18.1 16.6 16.5 16.7 15.9 16.1 14.2 13.1 -
15.5

1997
12.3 10.9 16 16.9 16.7 16.5 16.1 16.8 15.1

- 14.4 11.5
14.84

1998
11 11.4 17.4 18.6 18.3 16.8 16.9 16.7 16.7 16.4 13.3 9.3
15.23

1999

11.1 12.6 12.7 16.8 16.5 15.3 15.6 15.6 15.3 15.5 11.4 11.8
14.18

2000
10.8 11.4 14.5 17.1 17.1 16.1 15.6 15.8 15.5 15.4 12.6 10.5
14.37
Mean
11.66 11.82 15.6 17.5 17.04 16.24 16.18 16.16 15.74 15.38 12.96 10.78
14.76

Annex 8: Monthly maximum Temperature

Source: National Meteorology Service Agency (NMSA)
Year Jan Feb Mar Apr May Jun Jul Aug Sept Oct Nov Dec Mean
month
1995 33.1 33.8 34.4 33.3 31 29.9 26.2 26.1 28.3 29.3 29.4 31.3 30.51
1996 32.1 34.7 34.2 33.4 29.3 27.7 27 26.4 28.2 30 30.4 - 30.31
1997 32.7 34.3 35.3 32.3 29.5 28.7 27.9 28.2 30.4 - 30.8 32.1 31.11
1998 32.2 34.2 35.4 46.5 31.9 28.1 26.8 26.5 28.1 29.4 31 32.6 31.89
1999 32.7 35.9 35.9 35.2 30 29 26.8 27.1 29 - - - 31.29
Mean 32.56 34.58 35.04 36.14 30.34 28.68 26.94 26.86 28.8 29.57 30.4 32 30.99

Annex 9: Number of livestock owned by the farmers

No. of livestock No. of respondents Percent Cumulative Percent

0 15 10.7 10.7
1 7 5.0 15.7
2 14 10.0 25.7
3 10 7.1 32.9
4 31 22.1 55.0
5 27 19.3 74.3
6 14 10.0 84.3
7 4 2.9 87.1
8 7 5.0 92.1
9 3 2.1 94.3
12 3 2.1 96.4
15 3 2.1 98.6
18 2 1.4 100.0
Total 140 100.0
Source: current study

Annex 10: Family size of the study is (Chewaka Woreda)

Family size No of respondents Percent Cumulative Percent
3 5 3.6 3.6
4 11 7.9 11.4
5 45 32.1 43.6
6 31 22.1 65.7
7 26 18.6 84.3
8 12 8.6 92.9
9 6 4.3 97.1
11 4 2.9 100.0
Total 140 100.0

DECLARATION

I the undersigned declare that this Thesis is my original work and has not been presented for any degree in any university and all the sources of materials used for the Thesis have been duly acknowledged.
Name: Berhanu Geneti Moroda
Signature: _____

This Thesis has been submitted for examination with our approval as university advisors.

Name and Signature
Dr Tadesse Woldemariam _____

Dr Mulugeta Lemenih _____

Date and place of submission: School of Graduate Studies, Environmental Science Program, Addis Ababa University
May 2007