

Major Causes and Effects of Land Degradation and Rehabilitation Practices in Ethiopia: Systematic Review

Abdulbasit Hussein*

Department of Natural Resource Management, Haramaya University College of Agriculture and Environmental Science (HU CAES), P. O Box 138, Dire Dawa, Ethiopia

Abstract

In Ethiopia, land degradation has become a serious problem affecting all spheres of social, economic and political life of the population. It is one of the major challenges to agricultural development and food security of the country. In order to solve the problem of land degradation, a lot of efforts have been made since 1970s. However, at the end the intervention couldn't be sustainable and able to bring the intended impact. Thus, identification of challenges in relation to land rehabilitation practices is of paramount importance. The review compiled that the consequences of land degradation were: poverty, climate change, and gully expansion. The problem of land rehabilitation practices in the study region is solved by establishing awareness and continuing training, a resettlement program, creating chances for alternative means of subsistence, and encouraging NGOs to participate in land rehabilitation activities.

Keywords: Ethiopia; Land; Degradation; Rehabilitation; Practices

Introduction

The twenty-first century is a time by which the world is getting seriously confronted by issues of sustainable use of natural resources. Despite the emerging recognition of their decisiveness for the survival of humanity on the planet, these days, water and land ecosystems are being degraded at an alarming rate (Hannam, 2003 cited in Teketel, 2009). The situation is even worse in poor countries, since the bulk of the population relies on these resources to survive. As a result, land and water resource conservation and management for sustainable intensification of agriculture and poverty reduction in emerging regions has remained one of the most difficult policy concerns for a long time (Bekele et al., 2007). Soil, water, and vegetation, which are intrinsically interconnected and interdependent land resources, are at the forefront of most local, regional, and international policies, programs, initiatives, covenants, protocols, and conferences aimed at paving the way for sustainable development [1].

Land is the most important natural resource all over the world. It is a place from which human beings are exploiting a number of resources (Taffa, 2002). Almost all food production for the world population is derived from land, and the need to produce more is increasing from time to time due to an increase in population. For increasing production, either area under cultivation must be expanded or its productivity needs to be increased. Thus, fertility of land is decisive factor in addition to other technological input. However, land is losing its productivity due to a rising trend of land degradation (Woldeamlak, 2003). Land resources degradation, resulting from different causes, is threatening long-term productivity. Nowadays, land degradation is reducing yield significantly and it is more acute in some parts of the world than the others. For example, in Central America, 75% of cropland is seriously degraded while in Africa, 20% of the total land area is at risk of unrecovery (Sida, 2007) [2].

Land degradation has become a severe concern in Ethiopia, affecting many aspects of the population's social, economic, and political lives. It is one of the country's greatest obstacles to agricultural development and food security. The rate of land degradation in the country is extremely high. A considerable amount of the country's agricultural land, mostly in the highlands, is suffering from severe to moderate land degradation (Kruger et al., 1997) [3].

On the other hand, like many other developing countries, Ethiopia is characterized by agrarian economy and about 84% of its total population derives means of survival from agricultural activities. Moreover, the role of agriculture in the overall economy is quite significant. It contributes 50% of the total GDP and 85% of foreign exchange earnings. Thus, land productivity is one of the key elements for enhancing economic development of the country. In contrast, the level of land degradation has already reached an alarming stage (MoARD/WB, 2007 cited in Desta, 2009:2). This land degradation has been recognized to be one of the chronic problems in Ethiopia and many efforts have been made against it. However, the problem of land degradation is continuing and natural resource base is deteriorating at alarming rate (Yohannes, 1999; Genene, 2006).

The major causes of land degradation in Ethiopian highlands include cultivation on steep slopes, deforestation, and erosive rainfall pattern, lack of fallowing, overgrazing and lack of proper conservation measures. The underlying factor for the degradation of land is population pressure (Lakew et al., 2000). In response to heavy land degradation in the country, large-scale efforts for implementing natural resources conservation programs had taken place starting from the recent past [5]. Failure of Ethiopian agriculture to feed the population is partly resulted from cumulative effect of land degradation mainly in the highland part of the country (Kruger et al. 1997; Yohannes, 1999). Therefore, improving productivity of land is so crucial in improving the welfare of the agrarian population in particular, and the overall economy of the country in general (WB, 1989 cited in Desta 2009). Without the proper management of land resources, it becomes very challenging for Ethiopia to feed the increasing population. As a result, there should be appropriate land management systems to improve the

*Corresponding author: Hussein A, Department of Natural Resource Management, Haramaya University College of Agriculture and Environmental Science (HU CAES), P. O Box 138, Dire Dawa, Ethiopia; E-mail: abdulbasithussein111@gmail.com

Received October 24, 2021; Accepted November 09, 2021; Published November 18, 2021

Citation: Hussein A (2021) Major Causes and Effects of Land Degradation and Rehabilitation Practices in Ethiopia: Systematic Review. J Earth Sci Clim Change 12: 591.

Copyright: © 2021 Hussein A. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

productivity of land particularly in highland areas where the problem of land degradation is severe (Berhanu, et al, 2004 Cited in Desta 2009) [4].

Different researchers have done studies on land degradation in different parts of Ethiopia. These researchers have mainly focused on: nature of land degradation; traditional farmers' land management practices, ongoing soil and water conservation by government and other actors; farmers' perception on soil fertility change and on causes of land degradation (Yeraswork, 2000; Eyasu, 2002; Taffa, 2002; Aklilu, 2006; Genene, 2006). Most of these researchers generally found out that there is high degree of land degradation in Ethiopia in general and in the highland areas in particular. However, as far as the researcher's knowledge is concerned, there is a research gap on the issue of what social, economic, and institutional factors determine the rehabilitation of degraded lands. The general objective of the review is to compile the challenges and prospects of land degradation and rehabilitation practices in Ethiopia [5].

Review of Literature

Definitions and concepts of land degradation

Land degradation: There is no single universally accepted definition for land degradation (Blaikie and Brookfield, 1987 cited in Hussien, 2006). It is a broad concept and defined by different people in different ways. UNEP (1992 cited in Desta 2009) defined land degradation as "a reduction of resource potential by one or a combination of processes including water erosion, wind erosion, a long-term reduction in the amount or diversity of natural vegetation, salinization, or sodification acting on the land." Similarly, World Commission on Environment and Development (WCED), (1987 cited in Taffa, 2002) defined land degradation as "the loss of utility or potential utility or the reduction, loss or change of features or organisms which cannot be replaced." Young, (1998, cited in Hussien, 2006) gave a more similar definition of land degradation as the process that causes temporary or permanent lowering of current or future productive capacity of land. Alemneh et al., (1997) also defined the concept of land degradation as the degradation of soil, water, climate, and fauna and flora.

In all of the above definitions, the common denominator is that land degradation is actual or potential reduction in the productive potential of land. Almost all countries, rich or poor; arid or humid; cool or tropical experience some form of land degradation, but the rate significantly varies among different countries based on variation in their biophysical, social and economic structure (WCED, 1987 cited in Taffa, 2002). For this study, land degradation is loss of soil fertility or substantial decreasing of land productivity and soil erosion, deforestation and degradation of grazing lands [6].

Land rehabilitation: Land rehabilitation is process of reforming the land in a given area to some degree of its former self, after some process (business, industry, natural disaster, etc) has damaged it. It's a re-engineering procedure that tries to return a piece of land to its natural state after it's been destroyed by some sort of disruption. Land rehabilitation in this study refers to the structural and ecological restoration of degraded areas [7].

Land rehabilitation practices: in the context of this study refers to the practices that people in the study area traditionally conserve forest, soil and water resources and/knowledge that they acquire through modern environmental education that could be from agricultural experts. It also indicates the activities carried out by other actors to rehabilitate degraded areas [8].

Conservation: The term is applied in general to the positive work of maintenance, enhancement and wise management or reducing the rate of consumption to avoid irrevocable depletion, ignored to benefit posterity as in the conservation of nature or of natural resource (the forest, soil, wild life, biodiversity and environment) or of building or work of art of special merit, etc (Clark, 1985 cited by Desta 2009). Specially, it is applied in this paper to the conservation activities like protecting from destructive influence, maintenance, enhancement and wise management or reducing the rate of annual depletion of the forest and soil resources in a given area [9].

Causes of land degradation in ethiopia

The cause/contributing factors for land degradation in Ethiopia are complex and diverse. It is the result of complex interaction between physical, chemical, biological, socioeconomic and political issues of local, national or global nature. Among the cause of land degradation, some are population growth, expansion of agriculture to forests and marginal lands, poverty, land ownership problems which are related to land tenure and government policy, political instability and land administration, overgrazing, inappropriate agriculture, and large-scale expansion of irrigated agriculture (Taffa, 2002; Gete, 2002; Betru, 2003; Aklilu, 2006) [10].

Population pressure: An increasing rate of population growth is among the major causes of land degradation in Ethiopia. This is because the increasing population leads to the requirement of more agricultural production, which requires more land with the existing technology level. Getting this new agricultural land is not a simple task and it resulted in the expansion of farming activities to erosion prone marginal areas, serious deforestation, a decrease in fallow period and continuous cultivation (Habtmu, 2006; Hussien, 2006). Dense population and inappropriate farming practices combined with intensive rain and rugged topography intensified land degradation problem in the country. The high population growth made steep fragile areas to be included into cultivation, thus accelerating rate of soil erosion (Betru, 2003) The country has already lost its forest resources, mainly due to population pressure. Different scholar as cited in Hussien, (2006) indicated the declining trend of forest cover in Ethiopia through time [11].

In the 1960s, Brieten (1961) estimated that about 37% of the total area of the country was covered by forest. UNDP, FAO and MOA (1984) estimated that at the beginning of 20th century about 35.4% of the country's landmass was covered by forest. IUCN (1990) also estimated that 87% of the highland area of the country was covered by natural forest in the early 20th century and reduced to 15% in 1955 and to 4% in 1984. NCS (1990) and EPA (1997) further estimated the country's current forest reserve to be less than 3%. The annual rate of deforestation in the country is estimated to be 80,000 to 200,000 hectares (Gete, 2002). EFAD (1994 cited in Hussien, 2006) also estimated annual rate of deforestation in Ethiopia to be 150,000 to 200,000 hectares. Another author (Badeg et al, 2003) also estimated deforestation rate of natural forest at 160,000 - 200,000 hectares per annum. The increasing population, which leads to increasing demand for more agricultural land, fuel wood, construction material and other forest products, is the major cause for this deforestation (Gete, 2002) [12].

This deforestation caused shortage of firewood and other forest products. Consequently, people are using animal dung and crop residue for household fuel rather than being added to the soil to improve soil fertility. This in turn reduces the quality of soil and thus

further exacerbates the problem of environmental degradation (Badeg et al, 2003; Hussien, 2006; Aklilu, 2006) [13].

Poverty: Poverty and natural resource/environmental degradation are mutually reinforcing, in the sense that when land degradation occurs, agricultural production declines, resulting in decreased incomes and food security. As a result, poor people in both rural and urban regions are compelled to engage in activities that further degrade land resources and the environment in order to supplement their income and make a living. (Badeg and colleagues, 2003). For a variety of factors, poverty is very likely to lead to land degradation. When people don't have access to alternate sources of income, they tend to put additional strain on the meager resources they have. Natural resources are under more stress than ever before. Land deterioration is one of these pressures [14]. Drought and a decrease in household assets have resulted as a result of the circumstance (Shiferaw and Holden, 1999). As a result of people's inability to pay or lack of alternate fuel sources, deforestation, dung burning, and agricultural residue burning have grown. For example, electricity and kerosene are expensive and, in most cases, not available for the rural people. Even households with electricity supply avoid using it except for lighting at night. For cooking, most households prefer the three stone open fire. This is believed to be only about 10 percent efficient in the overall thermal energy production and use. Improved stoves such as improved biomass, fuel saving stove, etc are believed to be around 45-82 percent more efficient than the three stone open fire. However, they are not used since they are not affordable by rural households (Lakew et al., 2000) [15].

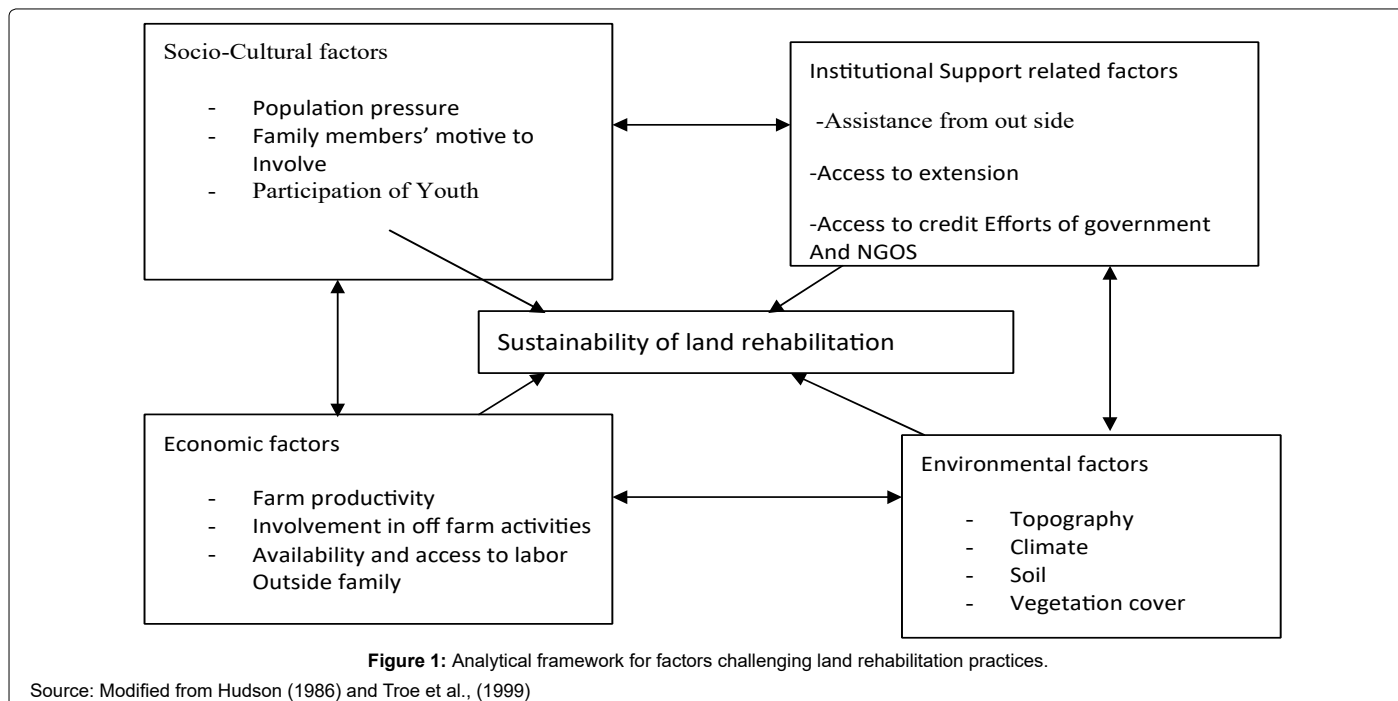
Consequence of land degradation in ethiopia: In general, the global store of arable land and grazing land continues to decline due to degradation emanating from urbanization, unsustainable agricultural practices and deforestation. Moreover, a significant portion of the remaining arable and gazing land is under considerable pressure from compaction by livestock and farm implements, overuse fertilizers and pesticides, salinization, alkalization or acidification, depletion of nutrients, water and wind erosion and deterioration of drainage.

Especially, sub-Saharan Africa where in Ethiopia is found is facing serious environment and development problem (Taffa, 2002) [16].

For Ethiopia, the issue of land degradation is so vital since the livelihood of the biggest portion of the country's population and the overall economy of the country depend on agriculture. Land degradation is seriously affecting agricultural production and food security of the country's population. Nowadays, it is becoming one of the important problems of food security in the country (Aklilu, 2006). This is for the reason that, the high degree of land degradation in Ethiopia, especially the degradation in the form of soil erosion is one of the major environmental problems that have negatively affected the performance of agricultural sector as the overall economy. Accordingly, the livelihood of Ethiopian population is threatened by the increasing trend of land degradation (Aklilu, 2006, Habtamu, 2006).

The impact of land degradation on Ethiopia's agricultural economy is very large. Ethiopia is losing 30,000 hectares of land on annual basis due to degradation and so far, more than 2 million hectares have already been severely damaged (WB 2007b). The country is losing a significant volume of soil every year due to soil erosion. The annual loss of soil in highlands of Ethiopia was estimated to range from 20 to 100 tons/hectare per year which leads to an annual productivity loss on cropland of 0.1% to 2% of total production for the country (Lakew et al., 2000). In general, the agricultural economy of the country is highly threatened by land degradation induced by specifically accelerated soil erosion [17].

Land rehabilitation practices in ethiopia: Traditionally through time, farmers have developed different soil conservation and land management practices of their own. With those practices, the farmers are able to sustain their production for centuries. Until now, those technologies are playing a significant role in the production of subsistence agriculture. Among the traditional land management techniques that have been practiced by Ethiopian farmers, the major ones include: ploughing of narrow ditches on sloping fields to control run-off, farmland terraces, traditional ditches and furrows, contour



ploughing, fallowing, crop rotation, farmyard manure and agroforestry (Betru,2003) [18,19].

Large-scale efforts for implementing natural resource conservation and development programs had taken place to reverse the problem of land degradation in Ethiopia starting from the 1970s. The programs mainly focused on soil and water conservation and rehabilitation of degraded land through building physical structures and afforestation measures (Alemneh, 2003; Woldamlak, 2003; Akililu, 2006; Alemayehu, 2006). These projects were supported by development food aid and the first food for work-supported soil and water conservation activities were started in Ethiopia in 1971 and that was in Tigray. Next to that in 1972, it was started in Wello, these activities were supported by U.S. food under PL 480 project to carry out afforestation, and construction of low-cost rural roads and small water projects. Then it was replaced by food for work projects that were funded by World Food Program (WFP) in 1974, commenced primarily due to drought and famine of 1973/74. The main activities under those projects were reforestation and soil and water conservation in the drought prone areas of the country (Betru, 2003) [20].

The efforts to tackle the problem of land degradation starting from the 1970s have been significant. The largest of all the efforts was the one that has been undertaken between 1976 and 1988 with international communities' support, particularly WFP. During that period, 800,000 km of soil and stone bunds and 600,000 km of terraces were installed. Moreover, 500 million tree seedlings were planted, 100,000 hectares of degraded lands were closed for natural regeneration and check dams were constructed along gullies of tens of thousands of kilometers long (Eyasu,2002; Woldeamlak, 2003). These conservation and rehabilitation works were undertaken on only 7% of the total land area that needs treatment and with that rate it was estimated that treating all the remaining could take seven decades (Woldeamlak, 2003). Moreover, the achievements of the intervention were at the end evaluated to be ineffective, insufficient and unsustainable (Woldeamlak, 2003) [21].

Conclusion and Recommendation

The findings of the review indicated that the livelihood of the farmers in the study area depends on subsistence agriculture. The major economic activity for all sampled households is based on farming (about 92%). The average size of farm land owned by farmers is less than one hectare which limits the amount of production in the study area.

On the other hand, the findings indicate that Ethiopia has serious land degradation problems as observed on highland Ethiopia. This problem appeared to be one of the major challenges for crop production. Sheet and rill erosion are commonly observed in farmland whereas gullies are common in communal lands and edges of farmlands. Limited use of conservation structures, lack of fallowing, cutting trees for fuel and construction purposes, ploughing steep slopes and overstocking are the major immediate root causes of land degradation. The underlying causes of land degradation as identified by the study are population pressure, steep slope nature of the area and erratic rain fall pattern. More than half of the farmers in the study area are practicing crop production in erosion prone areas and still there is an expansion of cultivation in to marginal lands due to population pressure. This expansion of farming towards marginal area resulted in shortage of grazing land, deforestation and increasing trend in land degradation.

The livelihood of the community in the study area is affected by these land degradation problems. The productive lands become less productive and subsequently left uncultivated. About 98% of the

sampled households recognized that there is land degradation in their locality and about 57% of the sampled households agreed that leaving lands due to loss of quality is the main cause of decreasing trend in land holding in the study area. Regarding response to land degradation problem, there have been a range of land rehabilitation practices underway in the study area by local communities, government and non-government organizations. The activities practiced in the study area include soil fertility improvement activities, soil and water conservation structures and rehabilitating degraded lands by agroforestry, afforestation and area closure system. The survey results and personal observation indicates that there are a marked change occurred on the land resource as the result of land rehabilitation practices. However as compared to the magnitude of the problem, these land management and rehabilitation practices are not enough to curb land degradation problem. There are also challenges that affect land rehabilitation practices in the study area.

References

1. Taye AA (2006) caring for the land: best practice in soil and water conservation in Beressa watershed, highlands of Ethiopia.
2. Tafesse A (2006) Watershed management approach in reversing soil degradation: Ethiopian experiences and lesson learnt. In Proceedings of Nile Basin development forum: the role of the river Nile in poverty reduction and economic development in the region Pp: 174-195.
3. Dejene A (2003) Integrated natural resources management to enhance food security. The case for community-based approaches in Ethiopia. Environment and Natural Resources. Working Paper (FAO).
4. Abderkadir A, Bishaw B (2003) Agroforestry and community Forestry for Rehabilitation of Degraded watersheds on the Ethiopia Highlands. In Proceeding of International Symposium on Contemporary Development Issues Pp: 11-12.
5. Shiferaw BA, Okello J, Reddy RV (2009) Adoption and adaptation of natural resource management innovations in smallholder agriculture: reflections on key lessons and best practices. Environ Dev Sustain 11: 601-619.
6. Tegene B (2002) Land-cover/land-use changes in the derekolli catchment of the South Welo Zone of Amhara Region, Ethiopia. East Afr Soc Sci Res Rev 18: 1-20.
7. Ermias A (2014) The challenges and prospects of land restoration practice the case of Misirak Badawacho Woreda of Hadiya Zone, SNNPR, Ethiopia. Belay Kassa and Million Tadesse.
8. Ervin CA, Ervin DE (1982) Factors affecting the use of soil conservation practices: hypotheses, evidence, and policy implications. Land Econ 58: 277-292.
9. Population Census Commission (2008) Summary and statistical report of the 2007 population and housing census. Population size by age and sex.
10. Desta D (2009) Determinants of Farmer' s Land Management Practice: The Case of Tole District, South West Shewa Zone Oromia National Regional State (Doctoral dissertation, A Thesis Submitted to School of Graduate Studies, Institute Of Regional and Local Development Studies).
11. Elias E (2002) FARMERS'PERCEPTIONS OF OIL FERTILITY CHANGES AND MANAGEMENT. Inst Sustain Dev.
12. Ermias A (2014) The challenges and prospects of land restoration practice the case of Misirak Badawacho Woreda of Hadiya Zone, SNNPR, Ethiopia. Belay Kassa and Million Tadesse.
13. Tsegaye G, Dadi L (2006) farmers' perceptions of land degradation and determinants of household food security status at middle catchment of Bilate watershed (Doctoral dissertation, Haramaya University).
14. Zeleke G (2002) Resourse Use and Poverty in the Ethiopia Highlands: In: TilahunAmede (ed.) Proceeding of a conference on Natural Resource Degradation and Environmental Concerns in the Amhara National Regional State: Impact on Food Security. Bihar Dar Pp: 109-125.
15. Ertiro H (2006) Adoption of physical soil and water conservation structures in Anna watershed, Hadiya zone, Ethiopia (Doctoral dissertation, Addis Ababa University).

16. Hagos F, Pender JL, Gebreelassie N (1999) Land degradation in the highlands of Tigray and strategies for Sustain land Manage.
17. Esser K, Vågen TG, Haile M (2002) Soil conservation in Tigray. *Soil Conserv* 5: 1-21.
18. Haycho H (2006) Land Use Change and Challenges of Land Degradation in Adaba Area, BaleZone (Doctoral dissertation, A Thesis Submitted to School of Graduate Studies, Institute of Regional and Local Development Studies, AAU).
19. Irwin B (2000) Managing forests as common property: collaborative forest management in Ethiopia. In *Environment and Development in Ethiopia: Proceedings of the Symposium of the Forum for Social Studies*, Addis Ababa Pp: 15-16.
20. Ermias A (2014) The challenges and prospects of land restoration practice the case of Misirak Badawacho Woreda of Hadiya Zone, SNNPR, Ethiopia. Belay Kassa and Million Taddesse.
21. Mebrat W, Gashaw T (2013) Threats of woody plant species diversity and their conservation techniques in Ethiopia. *Eur J Bot, Plant Sci Phytol* 3: 10-17.