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Review on Effect of Area Closure on the Rehabilitation of Degraded Hillside land of Ethiopia

Mr. Birhanu Bekele, Mr. Mekonnen Begna**

Department of Natural Resource Management, Mettu University Bedele Collage of Agriculture and forestry, P.O. Box 318. ***Bedele, Ethiopia***
** E-mail:* birebekele@gmail.com, ** E-mail:* *mekonnenbegna@gmail.com.*

Abstract

Land degradation is one of the main problems in Sub-Saharan Africa, threatening the lives of millions of people. It is becoming a major ecological and agricultural problem in Ethiopia. Reviewing the Effect of Area Closure on the Rehabilitation of Degraded Hillside land of Ethiopia is essential for addressing the proper land use and land management. In Ethiopia Land degradation is very serious especially on the hillsides land of the country which result decrease in Agricultural productivity on which the countries development depends on. To overcome this problem area closure is the major practice to improve species diversity, soil quality and ecosystem productivity for ecological rehabilitation and preservation by enhancing the diversity of ground cover; improving productivity by protecting soil from erosion; improving livelihood of the community and it also has other social; economic and political input value. This indicating that a need for application of integrated natural resource management in sustainable manner to optimize and maintain the soil physicochemical properties. In general, degraded land rehabilitation by grass different plant species resulted in significant contribution to improve species diversity, soil quality and ecosystem productivity for ecological rehabilitation of the area.

Keywords: *Rehabilitation, Degraded land, Hillside, Species*

INTRODUCTION

Land degradation is a serious problem in Ethiopia. The problem is more serious in highland part of the country. Declining agricultural productivity has resulted due to episodes of land degradation in the country (Yami *et al*., 2006). As a result sloppy areas are put under cultivation without effective soil and water conservation measures, which didn't sustain production. (Tefera *et al.,* 2005).

Area closure is one of the main practices to overcome such environmental problem. It is excluding of degraded lands from human and livestock interference and left to regenerate naturally. Among various rehabilitation and land management mechanisms, It`s flourishing strategies practiced to improve species diversity, soil quality and ecosystem productivity unless ecological rehabilitation and preservation are not well practiced, by the current trend, human societies will not survive on this planet for the future (UNEP, 2010).It is also the sources of wood for construction, farm implements, and non-timber forest products; play an important role in conserving remaining soil resources and improving soil fertility; improve soil fertility by augmenting soil nutrients from decomposed plant remains; limit nutrient loss from a site by controlling runoff (vegetation acting as a physical barrier to soil erosion) and improves the capability of the land to support other vegetation types, including exotic plantations, or otherwise support livestock. Nevertheless, in many cases success is obstructed by lack of clear management guidelines (Tefera *et al.*, 2005). Therefore, the objective of this paper was to review the significance impacts of area closure towards rehabilitation of degraded hillsides land of Ethiopia.

Literature review

Concept of land Degradation

The term land degradation describes a process. When something is degraded, its character is changed for the worse – damage is done. Much land is covered with a thin crust of soil (or earth) that has taken many thousands of years to form. A great deal of life on the planet – including human life – depends on it. But it is very vulnerable, and once lost or damaged, it is extremely difficult, sometimes impossible, to put back. The most extreme evidence of land degradation is *desert* (Veld and Lora, 2010).

The process of loss is often called soil erosion. When this happens, the structure of the soil and also sometimes the underlying shape or structure of the land is damaged (for example, through mining or quarrying). The plants and animals that live on the land are also harmed, or even wiped out Land degradation can happen on a local scale, or over vast areas. Desserts are currently spreading at an alarming rate in dry areas around the world. It has been happening for millions of years – some major deserts existed before human activities made any impact – but the accelerated soil erosion taking place today is always as a result of human activities. Generally; It's loss of function of the land or reduces the capacity of the land to provide 'goods' i.e; productive land uses, environmental reactor and social goods (Veld & Lora, 2010).

Degradation on the Hillsides of Ethiopia

On the Hillside land degradation is one of the major problems which occurs on the upper slopes of the land; affecting livelihoods of millions in Ethiopia. Although, comprehensive estimates of costs of land degradation is lacking in the country, it significantly affects agricultural production, with an estimated costs ranging from 2 to 6.75% of AGDP per annum (Yesuf *et al*., 2005). Although land degradation is recognized as a major development issue, sustainable land management (SLM) has

not however received desired attention in the development agenda of SSA countries due to the existence of a number of critical barriers, including an unorganized body of knowledge, and weak analytical underpinnings to support decision-making processes (SLMP 2006).

Causes of Land Degradation

Arable land mismanagement

Most arable land (70%) in the highlands is occupied by cereals, with wheat and barley in the higher ground and teff, sorghum and maize in the lower elevations. All these crops leave bare areas of soil during some of the growing season exposing soil to erosion. Twenty percent of the cultivated area is in perennial crops including coffee, enset (*Ensete ventricosum*), oil seeds, fruit trees and cotton. Pulses occupy the remaining ten percent. Inset in particular provides good ground cover, needs manure, and is a good crop to maintain fertility (Berry, 2003 cited in Abinet 2011).

Overgrazing

Overgrazing destroys the most palatable and useful species in the plant mixture and reduces the density of the plant cover, thereby increasing the erosion hazard and reducing the nutritive value and the carrying capacity of the land. It decreases ground cover and leading to wind and water erosion, reduced soil depth, soil organic matter and soil fertility that hurt the land's future productivity (FAO, 2005 cited in Abinet 2011).

Deforestation

Deforestation is large-scale removal or partial removal of trees from forested areas, which may be deliberate or due to natural causes or human action (AGI, 2007 in Kibret, 2008). The Ethiopian forests are being depleted at an alarming rate. At the turn of the last century, around the year 1900, the forest cover in Ethiopia was 40 %, and in 1989 estimated put it at only 2.3 % of the land mass (EFAP, 1994).

Effects and Extents of Land Degradation

In general, the global store of arable land and grazing land continues to decline due to degradation emanating from Overgrazing, unsustainable agricultural practices and deforestation. Especially, sub Saharan Africa in where Ethiopia is found is facing serious environment and development problem

and 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. (Taffa, 2002 cited in Mesfin, 2010).

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 severally 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 (Mesfin, 2010).

Area closure as major rehabilitation practices in Ethiopia

Since the entire problem faced on the land; there must be Rehabilitation And restoration technique like Area closure. In Ethiopia, establishment of enclosures to restore degraded communal grazing lands has been practiced for the past many years. It facilitate for the fast vegetation rehabilitation vegetation which protect soil from erosion and enhance productivity and Diversity of woody plant and important for Biodiversity conservation (Mekuria *et al*., 2009).

What is Area Closure?

The context and definition of area enclosure vary from country to country, but (Betru *et. al*, 2005) stated area enclosures in the Ethiopian context as the degraded land that has been excluded from human and livestock interference for rehabilitation. Primarily, human and animal interference is restricted in the area enclosures to encourage natural regeneration. It is the process of restoration and rehabilitation of degraded ecosystems by natural means. Historically the motivation for protecting natural areas has ranged from the religious to resource or species management including initiatives such as designating sacred groves and limiting or prohibiting the exploitation of particular species in certain areas (Grove, 1995).

Establishing enclosures is considered advantageous since it is a quick, cheap and lenient method for the rehabilitation of degraded lands .The regeneration of natural grasslands and forest areas increase biomass production and improve the plant species diversity, resulting in more diverse soil

biota and other associated beneficial organisms. Which is may be more reliable where land is not productive (FAO, 2005).

Hillside Closure

It is the closure of areas and denying access to all human and livestock activity, and allowing it to recover by natural process. These areas have been closed to improve land affected by severe erosion, limited vegetation and low fertility through natural regeneration. In order to facilitate the natural process, such areas have been planted with different low fertility and moisture level tolerant species. When it is ensured that the area is recovered, the produce will be harvested in a rational way to ensure sustainable productivity. So far 800 ha of land have been closed from human and livestock access. Trees planted in such areas include Eucalyptus of different species (mainly *Eucalyptus globulos, E camaldulences*) *Accacia saligna, Accacia decarence,* and *Omedilla oblingata*. Such areas are also treated with other physical conservation measures such as hillside terraces and micro basin which play a great role in the rehabilitation of the area (Habtamu,2006).

Soil erosion protection and enhancing productivity

Rapid vegetation restoration though area enclosures are an efficient measure for soil and water coation because of their increased capacity for infiltration and sediment trapping. If vegetation coverage is chosen to be the best alternative form of land use, not only is prevent the loss of soil prevented, but also that it is not deposited in river bottoms, lakes and dams (FAO, 2001). Enclosures played an important role in conserving remaining soil resources and improving soil fertility. They improved soil fertility by adding soil nutrients from decomposed plant remains. Enclosures also reduced nutrient loss from a site by controlling runoff (vegetation acting as a physical barrier to soil erosion). This eventually improves the capability of the land to support other vegetation types, including exotic plantations and/or support livestock (Tefera *et al*., 2005). This Improve the species diversity, density, basal areas, regeneration status & similarity.

Enhance Diversity of woody plant species

Woody species diversity and Density in the enclosure is better conditions than in the open site. As levels of species richness in ecosystem typically characterized that ecosystem as healthy and robust. In comparison enclosure and open sites, enclosure site is healthier than the open site. Since a loss of

biodiversity can significantly affects the functioning different species in the ecosystem by reducing the interactions (Kibret, 2008). Woody species diversity in the enclosure is better conditions than in the open site. As levels of species, richness in ecosystem typically characterized that ecosystem as healthy and robust. In comparison enclosure and open sites, enclosure site is healthier than the open site. The protection and restoration of degraded lands can significantly improve the functioning of the ecosystem though increasing the diversity of species and their interactions in the protected areas. (*Kibret, 2008)* The protection and restoration of degraded lands can significantly improve the functioning of the ecosystem though increasing the diversity of species and their interactions in the protected areas.

Biodiversity conservations

Restoration of degraded lands reduces the loss of biodiversity. As biodiversity, which plays a critical role in overall sustainable development and poverty eradication, is essential to the human well-being and to the livelihood and cultural integrity of people. High levels of biodiversity of species in ecosystem typically characterized that ecosystem as healthy, robust and integrity. Since a loss of biodiversity can significantly affects the functioning of the ecosystems (Kindeya, 1997). According (Haile, 2012) found biomass of area closure twice of free grazing. Biomass of some species higher in closed than non-closed and he estimated aboveground carbon stocks increased by 39-68% through the conversion of degraded grazing lands to enclosures (Mekuria, *et al*., 2009)

Enclosing areas has been helpful towards the major goal; achieving conservation based sustainable agriculture (Emiru, 2002). The successful colonization of many of the native species in many of the degraded lands, underline their potential in wasteland reclamation. These would serve as sources of fuel-wood, fodder (using cut-and-carry system) and other tree products while reclaiming the marginal lands. Its contribution in augmenting the high demand of tree products might be of paramount importance (Kibret, 2008). Sustainable management of resorted and planted forests for non-timber products is essential to achieving sustainable development as well as a critical means to eradicate poverty, significantly reduce deforestation unlike timber harvesting.

In Ethiopian agriculture is heavily dependent on animals where forage and browse for all the animals comes from natural vegetation and crop residues. The Ethiopian flora is rich in grass and legume forage species. Although the magnitude of the diversity in the indigenous forage crops is not well studied, recent observations indicated that Ethiopia is a centre of diversity for *Trifolium* where of its twenty six indigenous species, ten are found to be endemic (Kibret, 2008).

Community livelihood improvement

The main contributions of area enclosure is that provide forest products including trees that can make to the livelihoods of the rural poor though increasing incomes, improving food security, reducing vulnerability and enhancing well-being (FAO, 2001). Rehabilitation of mountain supports livelihoods by increasing productivity and biodiversity of fragile ecosystems. In addition it protect downstream areas from flood hazard and clotting with silt concomitantly improving infiltration and ground water conditions besides replenishing springs and providing water for longer periods of time for downstream communities (Mitiku and Kindeya , 1997).

Summary and Conclusion

This review indicates that area closure is the major practice to improve species diversity, soil quality and ecosystem productivity for ecological rehabilitation and preservation by enhancing the diversity of ground cover; improving productivity by protecting soil from erosion; improving livelihood of the community and it also has other social; economic and political input value. The actual and potential role of enclosures in enhancing the recovery of vegetation on degraded Hillside land, provided that they are properly protected and sustainably managed. These recoveries of vegetation protect soil from erosion and enhance productivity and Diversity of woody plant; important for Biodiversity Conservation and sources of non-Timber product as well as support community lively wood. However, success in maintaining these enclosures with the developing vegetation depends on locality-specific and community-based management systems, including provision of benefits to the local communities in the form of both products and services to the community. Since land degradation is multidimensional and complex so should be the design of its solutions.

Prospective

From this review it could be concluded that more of the rehabilitation of degraded land resources is essential to make any change in the natural ecosystem. Since more of area closure is practiced on the individual land owner it's better to conduct research on the policy which promote the sustainability with income augmentation of those individual. In area closure it`s important to practice controlled grazing to improve the regeneration vegetation and benefit distribution and also to consider which and in what ways livestock might be grazed in the area. Since it conserves water, and also increases effective root volume on poorly drained soils and on nutrient deficient soils, it is recommended for practical application by rural farmers and agriculturist farming .There is the need for further and more detailed study on soil and soil-related properties to generate sufficient data for modeling soil nutrient transfer from upper catchments to the valley.

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