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Causes for Biodiversity Loss in Ethiopia: A Review from Conservation Perspective

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Abstract
Although there is ample theoretical evidence of the economic and social causes of biodiversity loss, empirical evidence for most of these relationships is fragmented, meager or non-existent. Important biological causes for the loss of biological diversity include the loss of habitats, the introduction of exotic species, over-harvesting of biodiversity resources, and homogenization of species in agriculture. The common factor of all these elements is that they are human-driven. More research in this area is imperative. It is also most questionable and expected whether current nature-conservation directions provide sufficient answers to these root causes of biodiversity loss and are able to counteract the loss of biodiversity-related cultural values, biological species and ecosystems in an effective way. This Review paper gives the overview on the economic and social root causes behind biodiversity loss and identifies potential opportunities in Ethiopia. Furthermore, it also identifies the challenges and future directions to put into practice. The analysis is based only on theoretical considerations and overviews on current estimates**.** To scale up biodiversity conservation loss, better promotion with practical conservation practices, community based management approaches and sector based conservation and integration should be implemented throughout the whole resource area.
Keywords: Biodiversity loss, conservation, climate change, Ethiopia

1. INTRODUCTION

Ethiopia is one of the world's rich biodiversity countries and it deserves attention regionally and globally. It has a very diverse set of ecosystems ranging from humid forest and extensive wetlands to the desert of the Afar depression. This is due to the variation in climate, topography and vegetation. As indicated by Edwards (1991), Ethiopia is one of the twelve known ancient countries for crop plant diversities in the world and has valuable reserves of crop genetic diversity, of which 11 cultivated crops have their centre of diversity in the country. The extensive and unique conditions in the highlands of the country have contributed to the presence of a large number of endemic species.

The flora of Ethiopia is very diverse with an estimated number between 6,500 and 7,000 species of higher plants, of which about 15 per cent are endemic. It has been said that Ethiopia is the fifth largest floral country in tropical Africa.

The country is also rich in its faunistic diversity. The larger mammals are mainly concentrated in the south and southwest border and adjacent areas of the country. Mountain massifs in the north are also home to many endemic species of mammals, particularly the Walia Ibex, Semien Fox and Gelada Baboon. About 277 species of mammals, 861 species of birds, 201 reptile species (over 87 snakes, 101 lizards and 13 species of tortoises and turtles), 145 species of freshwater fish, of which over 87 species are from Baro river and 16 from Lake Abaya, 324 butterflies and 63 species of amphibians are known from Ethiopia.

A total of 31 species of endemic mammals are found in Ethiopia. Among these five are larger mammals (Walia Ibex- Capra walle, Gelada Baboon-Theropithecus gelads, Starck's Hare Lepus Starcki, Mountain Nyala-Tragelaphus buxtoni and Ethiopian Wolf (Canis simensis) and the rest (83.9 per cent) are smaller ones including 2, 9 and 15 species of bats, insectivores and rodents, respectively.

The Globally threatened mammal species recorded from Ethiopia are: Black Rhinoceros Diceros bicornis, Grevy's Zebra Equus grevyi, African Wild Ass Equus africanus, Walia Ibex Capra walle and Ethiopian Wolf Canis simensis.

In terms of its avifauna, over 861 avifauna endemic species are recorded from Ethiopia. At present, 69 Important Bird Areas (IBAs) which are also important for large number of other taxa are identified by the Ethiopian Wildlife & Natural History Society (EWNHS) following scientifically defensible quantitative criteria. These include the already existing protected areas and many other additional sites. Accelerated biodiversity loss during the human induced effect is particularly serious, given growing evidence of the importance of biodiversity for sustaining ecosystem functioning and services and for preventing ecosystems from tipping into undesired states (Fisher and Turne 2008).

A diversity of functional response mechanisms to environmental variation among species in an ecosystem maintains resilience to disturbances. Consequently, ecosystems (both managed and unmanaged) with low levels of response diversity within functional groups are particularly vulnerable to disturbances (such as disease) and have a greater risk of undergoing catastrophic régime shifts(Brown and McLachlan 2002)

Currently, the global extinction rate far exceeds the rate of speciation, and consequently, los s of species is the primary driver of changes in global biodiversity. The average extinction rate. Accelerated species loss is increasingly likely to compromise the biotic capacity of ecosystems to sustain their current functioning under novel environmental and biotic circumstances (Zomer *et al.* 1999).

Since the advent of the Anthropogenic, humans have increased the rate of species extinction by100–1000 times the background rates that were typical over Earth's history (Mace et al. 2005), resulting in a current global average extinction rate of ≥100 E/MSY. Currently about 25% of species in well-studied taxonomic groups are threatened with extinction (ranging from 12% for birds to 52% for cycads). Until recently, most extinctions (since 1500) occurred on oceanic Islands. In the last 20 years, however, about half of the recorded extinctions have occurred oncontinents, primarily due to land-use change, species introductions, and increasingly climate change, indicating that biodiversity is now broadly at risk throughout the planet. The average global extinction rate is projected to increase another 10-fold, to 100010 000 E/MSY during the current century (Costanza *et al*. 1997)

Overview on biodiversity loss

The importance of biodiversity management has acquired recognition only recently. Human kind has been using natural resources since his emergence as Homosapiens.Throughout the millennia, human knowledge and technology have grown in leaps and bounds. Such growth, although slow initially (e.g. Change from Stone Age to the [iron Age), had as time passed, the gaps in technological change (revolution) becoming shorter and shorter, and the rate of knowledge and skills acquisition growing faster and faster, respectively. Despite this vast accumulation of knowledge and skills, it is only recently that a simple truth has become obvious, and that is: unless natural resources of (Girma Tadese, 2001).

In dealing with the environment there is a need to focus activities at the local, national and regional levels, so that a global perspective could emerge in a more realistic manner. (Blackwell, J. M. *et al.* 1991) As the problems of developing countries, particularly the least developed countries, of which the majority are in Africa on which Ethiopia is included, became a subject of deliberation and Study, the vicious circle of 'poverty-biodiversity degradation-poverty' became recognized. Other words, in developing countries people are more dependent on natural resources, particularly renewable resources, than people in developed countries, and this dependence leads to resource depletion natural and degradation. Environmental degradation and depletion occur mainly due to anthropogenic impacts as human numbers increased, however, there were less and less natural resources to be utilized on sustainable basis, and an overexploitation and mining of resources had to occur in order to satisfy more and more people with less and less resources. The causes for this state of affairs are many and complex (Mekete B., 1996).

Purpose and Objectives of the Review

To review the nature and severity status of biodiversity, to assess and prepare the situation analysis scenario on biodiversity loss and to recommend prevailing situation in its future conservation with developmental issues, as well as to identify bottlenecks and opportunities for its loss.

Scope of the Review

The conceptual scope of this paper deals with biodiversity loss in Ethiopia with particular emphasis on managing and conserving it in a sustainable manner.

2. Major causes of Biodiversity loss

The major causes of biodiversity decline are natural land use changes, pollution, changes in atmospheric CO_2 concentrations, changes in the nitrogen cycle and acid rain, climate alterations, and the introduction of exotic species. the causes of human-induced loss on biodiversity are the fragmentation, threat fragmentation degradation or loss of habitats, the over-exploitation of natural resources; pollution of air and water (by several activities such as agriculture); the introduction of non-native (alien, or exotic) species and climate change-induced biodiversity loss, these factors being inextricably linked with some or all the loss of biodiversity is expected to continue at an unchanged increasing pace in the coming decades. The introduction of exotic species is also less of a problem than in temperate areas because there is so much diversity in tropical forests that newcomers have difficulty becoming established (Shibru Tedla and Kifle Lemma, 1999)

2.1 HABITAT DESTRUCTION AND FRAGMENTATION

Habitat destruction is the process in which natural habitat is rendered functionally unable t o Support the species present. In this process, the organisms that previously used the site are displaced or destroyed, reducing biodiversity. Habitat destruction by human activity is mainly for the purpose of harvesting natural resources for industry production and urbanization. Causes of habitat clearing habitats for agriculture are the principal cause of habitat destruction. Other important include mining, logging, trawling and urban sprawl (Bisanda S., 2003).

Habitat destruction is currently ranked as the primary cause of species extinction worldwide. It is a Process of natural environmental change that may be caused by habitat fragmentation, geological processes, and

climate or by human activities such as the introduction of invasive Species, ecosystem nutrient depletion, and other human activities. Throughout the world, fragmentation is one of the most critical threats to biodiversity and ecosystem services, such as pollination, seed dispersal, herbivore, and carbon sequestrate (Brooks *et al* 2002).
In the tropics, for example, millions of hectares of forest are destroyed each year typically leaving small islands of forest surrounded by a sea of Pastures, crops, and scrub by regrowth. Hence, the fragmented landscape is rapidly becoming one of the most ubiquitous features our planet. Habitat fragments are ecologically different from intact habitat, and they are often biologically depauperate. This occurs for several reasons. First, habitat destruction is often non-random. Humans tend to clear areas overlaying productive, well-drained soils and to avoid areas with steep or strongly dissected topography consequently, habitat remnants are often topography confined to areas with poor soils, rugged, and low species richness. Second, because they are limited in area, habitat fragments contain only a fraction of the habitat diversity found in a particular area (Wilcox, 1980).

2.2. EDGE EFFECT

"Edge" is the boundary, or interface, between two biological communities or between an different landscape elements. Edges exist, for instance, where older forested patches border newly harvested cut blocks, or where forests verge on rock outcrops, riparian areas, grasslands, or other different harvest types or sera stages. Acetone is the zone of transition along the edges of two adjacent ecological communities (Forman, 1995). The creation of edge effects depends on numerous factors including the type of edge present. Edges are either "inherent" or "induced" . An inherent edge is a natural, usually long-lasting, feature of the landscape, which may be related to: topographic differences (e.g., the so-called tree line, the boundary where tree growth gives way to alpine conditions on mountains or to grasslands in low-elevation dry valleys) soil type (e.g., the shift from boggy, peat soils to upland humus soils); presence of open water (e.g., lake or geomorphic, or landform, factors (e.g., divides, peaks, and ridge crests) (Thomas et al. 1979).However, when an opening is of suitable orientation and size, winds may penetrate some distance into the forest before diminishing. If the winds are sufficiently strong, they may cause Wind throw along the upwind edges in the forest interior (Chen *et al*. 1991).

2.3. AN INVASIVE SPECIES

A species is a plant or animal that is not native to a specific location (an introduced species invasive); and has a tendency to spread, which is believed to cause damage to the environment, human economy and/or human health. Sometimes the term is used to describe a non-native or introduced species that has become widespread. However, not every introduced species has adverse effects on the environment (Charles Elton ,1958). Ecosystems in which are being used to their fullest capacity by native species can be modeled as zero-sum systems, where any gain for the invader is a loss for the native. However, such unilateral competitive superiority (and extinction of native species with increased populations of teinvader) is not the rule .Invasive species often coexist with native species for an extended time, and gradually the superior competitive ability of an invasive species becomes apparent as its population grows larger and denser and it adapts to its new location

2.4. POLLUTION

Air pollution affects biodiversity on a great scale. The atmosphere, lithosphere, and hydrosphere are all negatively affected by pollution. Air pollution affects lower life forms more than higher life forms. Plants are generally more affected than animals on land, but not in fresh water. A decline in most species due to pollution is evident except for a minority that increases. Plants constantly take up atmospheric gases i.e. air everyday to sustain their biological processes. Pollution can be derived from two kinds of sources namely, stationary and multiple point sources. Stationary point sources include for example wood-burning fires(on a small scale) and the burning of coal in coal-fired electrical power plants (on a large-scale). Multiple point sources are usually mobile and include automobiles and other vehicles EPA (Environmental Protection Authority) (1997).

The vehicles are the most important source of atmospheric pollutants as they release carbon monoxide. This is followed by industrials sources which release sulphur oxides, steam and electric power plants, space heating and lastly refuse burning. Ruthless exploitation and pollution of the environment has disturbed the operation of the all-important biogeochemical cycle (Bodkin and Keller, 1998).

Water pollution: - Water pollution has, among other consequences, the tendency to cause long term modifications of biodiversity. Water pollution is the result of the introduction of various substances into water bodies that have negative effects on ecosystems, health and water-based activities (swimming, diving, fishing, etc.). Heated water from nuclear power stations for example and microorganisms from untreated waste cause serious water pollution. Its effects are far-reaching and include contamination of underground and surface fresh water, the oceans and rainwater (in the form of acid rain). In most modern industrial societies industry is the greatest source of pollution, accounting for more than half the volume of all water pollution and for the most deadly pollutants. The waste-bearing water, or effluent, is discharged into streams, lakes, or oceans, which in turn disperse the polluting substances and discharge large quantities of chemicals, nutrients and organic

material(Walday, M. & Kroglund, T., 2002)

2.5. EUTROPHICATION

Eutrophication is one of the most noticeable long-term alterations. This phenomenon occurs within aquatic environments that are fed only little new water: lakes, ponds, slow rivers, river mouths. The constant supply of nutrients (essentially phosphorus and nitrogen) contributes to the proliferation of certain algae. The decay of these algae results in an excessive consumption of oxygen. Such asphyxia of the aquatic environment reduces the number of species that it can support. Competition for space between humans and wildlife is prevalent worldwide (Mekete Belachew, 1996)

2.6. CLIMATE CHANGE

Climate change poses major threats to biodiversity. Although a certain variation of climate is compatible with the ecosystem survival and its function, the very rapid shift is detrimental to the variety of life. Climate change is expected to exacerbate biodiversity loss in the future. Many species might simply be unable to adapt to the rapidly changing, probably unsuitable conditions and thus will be threatened by extinction. As atmospheric CO2 upsurges over the next century, it is predicted to become one of the major drivers of global biodiversity loss global average temperatures increased by 0.2 °C per decade since the 1970s, global average precipitation increased by 2% in the last 100 years. Moreover, climate alterations are spatially assorted (Pearce, D (1991). Tropical forest ecosystems for example experience much greater changes than global means, while other ecosystems and regions of the world are exposed to secondary effects. In addition to changes in averages of temperature, precipitation or sea level, anthropogenic climate change is also linked to changes in the frequency and intensity of extreme events, which can also affect biodiversity. Climate change may have already resulted in several recent species extinctions. Many species ranges have moved pole ward and upward in elevation in the last century and this is likely not to cease. Local communities are disaggregating and encompassing more warm-adapted species .Phonological changes in populations, including shifting breeding cycles or deferred peaks of growth periods, are decoupling species interactions. Phonological shifts in flowering plants are potentially initiating the incompatibilities between plant and pollinator population. This may lead to the extinctions of both the plants and the pollinator with expected consequences on the structure of such mutuality networks (Blackwell, J. M. *et al*. (1991).

The multiple components of climate change *i.e.*, temperature, rainfall, extreme events, CO2 concentrations and ocean dynamics are anticipated to affect all levels of biodiversity: gene-, species- and habitat-diversity. At the very basic level of biodiversity, climate change is able to lessen genetic diversity of populations due to directional selection, genetic drift, population differentiation and rapid migration. As a consequence the probability of population adaptation to new environmental conditions is reduced and thus the risk of extinction increases. Increased competition for natural resources among multiple stakeholders with diverse interests is occurring worldwide within the current trends of globalization (Omann and Jaeger Clim approach. Ecol. Econ., 2009)

2.7. POPULATION EXPLOSION

Important habitats are being lost and degraded, ecosystems are being Biodiversity is vital to human well-being because it underpins the functioning of ecosystems upon which human life depends Short for ‘biological diversity’; the term describes the genetic pool, extent and variety of species and ecosystems. Human activity over the last century, and particularly since 1950 coinciding with unprecedented levels of human population growth, has placed ecosystems under considerable changes and stress (Rockström *et a*l.2009).

Destabilized through pollution, climate change and direct human impacts, and many species are declining to critical population levels. In 2002, the Convention on Biodiversity (CBD), an international agreement aimed at maintaining the planet’s biodiversity and equitably sharing its benefits, adopted a target to “significantly reduce” the rate of biodiversity loss by 2010, but this target was not met(Rockström, J *et al.* 2009).

2.8. OVEREXPLOITATION

Overexploitation, also called overharvesting, refers to harvesting a renewable resource to the point of diminishing return. In ecology; Overexploitation describes one of the five main activities threatening global biodiversity. Overexploitation can lead to resource destruction, including extinctionOverexploitation can lead to resource destruction, including extinctions. However it is also possible for overexploitation to be sustainable, as discussed below in the section on fisheries. In the context of fishing, the term overfishing can be used instead of overexploitation, as can overgrazing in stock management, over logging in forest management, over drafting in aquifer management, and endangered species in species monitoring. Overexploitation is not an activity limited to humans. Introduced predators and herbivores, for example, can overexploit native flora and fauna need not necessarily lead to the destruction of the resource, nor is it necessarily unsustainable. However, depleting the

numbers or amount of the resource can change its quality (Grafton *et al*.2007).

3. CHALLENGES AND OPPORTUNITIES ON BIODIVERSITY CONSERVATION

3.1 Challenges:

Lack of awareness: Lack of environmental awareness concerning the gaps as well as constraints that fostered the problem of environmental degradation and inhibited the implementation of successful practices for environmental management have been identified by (Pender et al. ,2002),(Mahmud et al. ,2005),(MoARD and WB ,2007). The linkage between environment and development in general, weak participation of the people and community based organization in environmental management activities are some of the environmental challenges of Ethiopia face now days. In addition poor agricultural practices together with lack of awareness and consciousness contribute a lot to the degradation of natural resources such as destruction of forests, degradation of soil and water resources (Girma, 2001).

***Lack of professionalism and technical standards*:** Another very important constraint, not among policy makers but also among many experts, is that construction of physical soil and water conservation measures is considered as the main solution to halt land degradation. In almost all cases, the results are hastily evaluated and criticized without understanding their purpose. Moreover, the technical requirements for the effective maintenance and use of these measures are often forgotten (Ruttan and Vernon W., 1988)

***Top-down planning approach to technical assistance*:** Although overcoming the current level of poverty in the country is a pressing concern, technology dissemination requires time and a careful approach to address community needs, build capacity and trust, and to demonstrate flexibility and share risks. Long-term sustainability is more likely to be achieved development is driven from the bottom-up and if it addresses farmers' and communities' immediate needs and constraints. Quick solutions rather than sustainability, quantity rather than quality, area coverage rather than impacts, command and control rather than participation, are the approaches that have dominated the extension system (Yeraswork Admassie, 2000).

Weak linkages among various disciplines: According to Gete *et a*l. (2006), although the government has invested huge sums of public money in setting up the institutional framework for the national agricultural research, education, and extension systems, there seems to be no strong functional linkages among them. Poor coordination among research, extension and education has affected formal technology development and the transfer of technologies from researchers to local experts and local communities, particularly the farmers

Policy, legislation and implementation constraints: Ethiopia has designed a number of important policies and strategies related to the environment. However, setting sound policies and strategies is not an end by itself. The goals stated in the different policies can only be achieved if, and only if, that policy is properly implemented. Although poor implementation of policies and strategies remains a major constraint, some other policies and strategies are hindering proper implementation of effective and sustainable practices for resource management, for example, the investment policy or policies of the regions. There is still a need for more policies and strategies to be developed or some to be modified (Pender *et al*.2002)

Socio-economic and bio-physical constraints: There are many socio-economic and biophysical constraints that hinder decisions to invest and sustain appropriate practices for overcoming environmental degradation. To begin with, poverty is one of the fundamental problems affecting environmental resources management, which most of the Ethiopian population continues to face. It is a chronic problem which causes enormous environmental damage as the poor are forced to mine the rapidly deteriorating natural resources in their surroundings. Thus, there is a strong nexus between environmental degradation and worsening poverty in the country (MoARD & WB, 2007). Of the biophysical constraints, climate variability is a significant factor. The dry lands (arid, semi-arid, and dry sub-humid areas) of Ethiopia, which cover some 70 percent of the total area of the country, are particularly vulnerable to climate change, desertification and drought.

***Frequent restructuring of government institutions*:** According to Gete *et al*. (2006) and MoARD & WB, (2007), even though tackling land degradation through the rehabilitation of degraded lands has been a priority for the country, institutions dealing with natural resources Management have frequently been restructured, and this undermines a sense of ownership by program staff, results in high staff turnover, wastes institutional capacity, and causes discontinuity of activities and initiatives and loss of institutional memory.

Incomplete technology packages: Lack of proper integration of introduced practices with 13 indigenous knowledge and practices, incompleteness of available technologies to address the requirements of the diverse agro-ecological conditions of the country, and lack of proper consideration of the socio-economic setting of the different communities during introduction of technologies are some of the other factors reported by stakeholders as negatively affecting the success improvements to land resource management (Nair, P. K. R. and Muschler, R. G. ,1993). ***Lack of Participation in Resource Management:*** Absence of popular participation in resource management has resulted in the rejection of government policies implemented from the centre, policies such as collectivization, Villagization, and resettlement, campaigns for reforestation and soil conservation, and Prohibition of tree cutting. In addition, the state sector land development efforts have been made with little, if

any, consideration for the traditional users of the land. Examples include delineation of national parks in areas traditionally used by pastoralists and/or agro-pastoralists; development of large fuel wood plantations in areas of mixed small-holder agriculture; large (FAO, 1986).

3.2 Opportunities

Attempts by the government and non-governmental actors in halting biodiversity degradation have shown some valuable examples of successful projects and many opportunities. It is believed that making good use of these examples should be the starting point to promote successful initiatives for improving ecosystem resource management in the country. The focus of many studies has so far been more on pinpointing problems or constraints rather than capitalizing on opportunities. This section points out some key opportunities to help improve the quality of interventions and up-scale successful practices.

Existence of environmental policies and strategies: Ethiopia has made admirable efforts in terms of policy and strategy responses to address environmental degradation (Gedion, 2001). One of the most important umbrella polices is the Environmental Policy of Ethiopia. This policy addresses a wide variety of sectoral and cross-sectoral environmental concerns in a comprehensive manner. The major aim is to ensure sustainable use and management of natural, human made and cultural resources and the environment (EPA, 1997).

Rich experience on participatory watershed management: The need for genuine participation of communities at all levels of the decision making process is one of the key requirements for successful land resource management undertakings. Although there are many issues which need further study, there are very good experiences in the country.,(Lakew et al., 2000).

Organizational setup of MoARD and National Research System: The organizational set-up of the MoARD, with regional and local bureaus of agriculture extending down to the kebele level with three development agents in each kebele have taken the process of decentralized governance to the local community level. The national agricultural research system, which is composed of one federal and regional institutes with research centres that cover almost all the major agro ecological zones, and the system of higher learning institutes together offer key opportunities that could be exploited to successfully implement sustainable land management in the country. The existence of international research organizations in the country is another opportunity to bring in international experience (MoARD & WB, 2007).

Availability of both indigenous knowledge and scientific technologies: Local communities are rich in indigenous knowledge and practices that can be further enhanced to maintain sustainable land resource management. Moreover, over the last four decades, many technologies for land resource management have been introduced or generated by research in the country (Yeraswork, 2000, Gete et al., 2006), including many new and innovative measures for soil and water conservation

Existence of donor support and development partners: According to Pender et al. (2002) and the MoARD SLM Secretariat (2008), there are several donors and development partners interested to assist interventions for improving land resource management. The key issue here is the effective utilization of the resources available. This is related to the high level of bureaucracy in using resources, most of which emanates from donor procedures and requirements, and lack of donor resource harmonization.

Conservation Oriented Crop Combination Land Management: The underlying principles include making conservation part and parcel of the farming work cycle; and making farming practices involve not only a few new inputs but also provide farmers with short-term economic benefits (Wood, 1990; Nair and Muschler, 1993). This method appears to combine the three broad techniques of controlling soil erosion referred to by Belay (1992): agronomic methods, which aim at controlling erosion by improving the vegetative cover; soil management techniques, which try to control erosion by improving the aggregation of the soil particles; and structural soil conservation methods, which control erosion by shortening the length and minimizing the gradient of the ground slope. This technique involves construction of tied ridges, bunds, fanya juu terraces, bench terraces, hillside terraces; diversion ditches (cut-offs) waterways and special water harvesting structures (Thomas, 1984; MOA, 1986). These include intercropping and relay or sequential cropping; crop rotation; integration of livestock farming with arable cultivation; the cut and carry method of using degraded pasture, controlled grazing and tethering; widespread use of semi-permanent crops like enset (false banana) and cassava or self-seeding and volunteering crops, such as legumes and sweet potatoes. It is not surprising that emphasis has now been put on agro forestry (Nair and Muschler, 1993; Blackwell, 1991; MOA, 1986).

Agro forestry: Agro forestry is described as a new name for a set of old practices (Nair and Muschler, 1993). It is a collective term for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboo, etc.) are deliberately used on the same land-management units as agricultural crops or animals, in some form of spatial arrangement or temporal sequence. Agro forestry, according to Nair and Muschler, represents an interface between agriculture and forestry and encompasses mixed land-use practices that have developed in response to the special needs and conditions of the tropical developing countries. Agro forestry denotes practices ranging from simple forms of shifting cultivation to sophisticated hedgerow intercropping systems. All the diverse

systems have something in common: the purposeful growing or retention of trees with crops or animals in interacting combinations for multiple products or benefits from the same management unit (Nair and Muschler, 1993). Since trees are dispersed on farms rather than concentrated in plantations, agro forestry makes trees more accessible and spreads their benefits more widely. Furthermore, agro forestry programmes are known to cost only 10-20% as much as government-established fuel wood plantations (Postel and Heise, 1988).

CONCLUSION

Protection of earth's biological diversity is an important goal in its own right. Biodiversity has direct consumptive value in food, agriculture, medicine, industry etc. It also has the aesthetic and recreational value. The greatest threat to biodiversity is not destruction of plants and animals' per see, but rather the destruction of their habitat. Population growth leads to expanding human settlements and increasing demand for food, fuel and building materials. Modernization of agriculture also threatens potentially valuable local crops. It is estimated that in the worldwide perspective slightly over 1000animal species and sub-species are threatened with the extinction rate of one per year, while 20,000 flowering plants are thought to be at risk (UNEP, 2004). This review examines some real world situations where causes of biodiversity loss are explained by an interaction of a variety of socio-economic forces and, what turns out to be, as decision-making and policy choices for a range of ecosystem contexts. By concentrating on marine, coastal, wetlands and forest ecosystems, the focus in this review is on real examples and giving perspective to the substantial literature and on-going research on biodiversity loss taking place at the moment. The loss of biodiversity is expected in most scenario studies to continue at an increasing pace in the coming decades. A number of frameworks for assessing the complex interplay of pressures and drivers affecting biodiversity have been developed in the past. The common thread amongst these frameworks is that most of the pressure on biodiversity stems from human-induced disturbance to ecosystems via a number of complicated pathways across different physical and temporal scales. Specific mechanisms whereby biodiversity is lost differ according to biome, geography, and climate, type of pressure (i.e. over-exploitation of wildlife as opposed to habitat conversion), economic context in the biodiversity host country, trade patterns, type of governance structure, and other factors.

The environmental effects like air pollution, edge effect, invasive species, habitat destruction and fragmentation; and climate change (e.g. global warming) are of growing concern owing to increasing biodiversity loss levels. However, those problems associated to biodiversity loss not only lead to deteriorating environmental conditions but also have adverse effects on countries Economic, sustainable development and health of people and finally result on species extinction.

THE WAY FORWARD:

Having established a link between human population and a biodiversity loss as well highlighting the effect a degraded environment on the human health, it be becomes necessary to suggest a way out so as to achieve a sustainable environment.

- Underlying every environmental problem is the issue of human population and the solution relays on peoples of the area. Awareness campaign should be intensified in the country (Alcala, 1994; Population Reports, 2002).
- This can be achieved through media publication and other means of creating awareness.
- As per solving the problem of environmental degradation, it is suggested that alternative source of energy should be developed to reduce the risk posed by use of hydrocarbon as fuel environmental education should be encouraged.
- Environmental law which has been enacted should be thoroughly enforced through task forces. Also the multinational companies and other industries with tendencies to generate pollution should be forced to carry out environmental impact assessment and put in place mitigation measures before carrying out production.
- Finally the Ethiopian government need to invest more in the biodiversity conservation on each sector with the respective commodities implemented on the ground.
- Due attention should be given for biodiversity conservation institutions, parks and all flora, fauna, mammals and other tourist attraction resources of the country.
- Integration of concerned government sectors and updating with research systems should avail with economic, cultural, biological and ecosystem values.

To sum up, there is an integrated need to control biodiversity loss and poverty, conserve and protect natural resources and the environment for healthy human beings and continue the current planned sustainable development.

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