

Effect of Land Degradation on Livelihood

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ABSTRACT

Land degradation is a process in which the value of the biophysical environment is affected by a combination of human-induced processes acting upon the land. It is viewed as any change or disturbance to the land perceived to be deleterious or undesirable. Land degradation: A decline in the quality or performance of land. Or erosion of the earth land surface by water, wind, or ice. Land degradation affects people and ecosystems throughout the planet and is both affected by climate change and contributes to it. The prolonged effect of land degradation has resulted in erratic rainfall causing severe droughts at irregular intervals, and these droughts threaten the lives and livelihoods of millions of people. According to the FAO, the world's cultivated soils - meaning soils that have been rearranged - have lost between 25% and 75 % of their original carbon stock, which has been released into the atmosphere in the form of carbon dioxide. The simulated results of costs of loss of milk, meat, and costs associated with weight loss of animals not slaughtered or sold associated with land degradation in grazing biomass.

Key words: *Land Livelihood; Anthropogenic factor; Drought*

Introduction to Land Degradation

The Special Report on Climate Change and Land (SRCCL) defines land as “the terrestrial portion of the biosphere that comprises the natural resources (soil, near surface air, vegetation and other biota, and water), the ecological processes, topography, and human settlements and infrastructure that operate within that system” [1].

Estimates of the global area of degraded land range from less than 10 to 60 Mkm²[2]. Land degradation is a process in which the value of the biophysical environment is affected by a combination of human-induced processes acting upon the land. It is viewed as any change or disturbance to the land perceived to be deleterious or undesirable. Natural hazards are excluded as a cause; however human activities can indirectly affect phenomena such as floods and bush fires.

This is considered to be an important topic of the 21st century due to the implications land degradation has upon agricultural productivity, the environment, and its effects on food security[3]. It is estimated that up to 40% of the world's agricultural land is seriously degraded.

According to the Special Report on Climate Change and Land of the Intergovernmental Panel on Climate Change: "About a quarter of the Earth's ice-free land area is subject to human-induced degradation (medium confidence). Soil erosion from agricultural fields is estimated to be currently 10 to 20 times (no tillage) to more than 100 times (conventional tillage) higher than the soil formation rate (medium confidence)".

There are four main ways of looking at land degradation and its impact on the environment around it:

1. A temporary or permanent decline in the productive capacity of the land. This can be seen through a loss of biomass, a loss of actual productivity or in potential productivity, or a loss or change in vegetative cover and soil nutrients.
2. Action in the land's capacity to provide resources for human livelihoods. This can be measured from a base line of past land use.

3. Loss of biodiversity: A loss of range of species or ecosystem complexity as a decline in the environmental quality.
4. Shifting ecological risk: Increased vulnerability of the environment or people to destruction or crisis.

Land Degradation is Measured Through A Base Line in the Form of Pre-Existing Risk of Crisis or Destruction

Impact: The powerful or strong effect that something or somebody has. In the context of this study, impact refers to the effects of land degradation on activities that are means of livelihood in the study area such as crop and livestock productivity, firewood and water resource.

Land degradation: A decline in the quality or performance of land. Or erosion of the earth's land surface by water, wind, or ice.

Livelihood: Job, work or something that provides income to live. In the context of this study, livelihood refers to activities on which people depend to sustain their life like crop productivity, livestock productivity, and availability of water resource and firewood and others.

Sustainability: Able to maintained or exploiting natural resource without destroying the ecological balance of an area.

Equity: Actions, treatment of others, or general condition characterized by justice, fairness, and impartiality.

Capability: The power or practical ability necessary for doing something.

Asset: The property that is owned by a person or an organization.

Literature Review

Productivity Loss of Land

Land degradation affects people and ecosystems throughout the planet and is both affected by climate change and contributes to it. In this report, land degradation is defined as a negative trend in land condition, caused by direct or indirect human-induced processes including anthropogenic climate change, expressed as long-term reduction or loss of at least one of the following: Biological productivity, ecological integrity, or value to humans.

Traditional Biomass Provision and Land Degradation

Traditional biomass (fuelwood, charcoal, agricultural residues, animal dung) used for cooking and heating by some 2.8 billion people (38% of global population) in non-OECD countries accounts for more than half of all bioenergy used worldwide.

Climate change impacts may result in increased productivity and carbon stocks, at least in the short term. For example, longer growing seasons due to climate warming can lead to higher forest productivity [4].

Land degradation is an important problem in Ethiopia, with more than 85% of the land degraded to various degrees. Only about 51% of land degradation represents the loss of providing ecosystem services. The remaining 49% represents the loss of supporting and regulatory and cultural ecosystem services [5]. Processes like ground subsidence can be affected by climate change indirectly through sea level rise.

Due to land degradation in most developing countries, in particular, agricultural productivity showed a dramatic decline and reached the level beyond the subsistence requirement of a household (Table 1)[6].

Attribution in the Case of Land Degradation

Precipitation involves local processes of larger complexity than temperature and projections are usually less robust than those for temperature. Changing rainfall regimes also affect below ground biological processes, such as fungi and bacteria.

Reduced in agricultural soils through the increase of respiration rates by tillage and the decline of below ground plant biomass inputs, soil organic matter pools have been diminished also by the direct effects of warming, not only in cultivated land but also under natural vegetation [3].

Interlink Between Land Degradation and Livelihood

The prolonged effect of land degradation has resulted in erratic rainfall causing severe droughts at irregular intervals, and these droughts threaten the lives and livelihoods of millions of people [7]. Drought caused by erratic rainfall brings incapability of farmers to acquire food and hence causes extreme food crises. Land degradation in the form of soil erosion and nutrient depletion affects household's production and investment decision.

Table 1: The total economic value (TEV) of land ecosystem services in Ethiopia.

Region	TEV 2001 (million USD)	TEV 2009 (million USD)	Change in TEV (%)
Addis Ababa	72	55	-23.65
Afar	11,700	12,600	7.69
Amhara	34,300	33,100	-3.50
Benshangul	10,600	10,400	-1.89
Dire Dawa	240	185	-22.92
Gambela	6090	5620	-7.72
Harari	<1	69	-29.35
Oromia	73,800	68,400	-7.32
Somali	49,200	48,200	-2.03
Southern	28,500	26,800	-5.96
Tigray	11,000	9730	-11.55
Total	226,000	215,000	-4.87

Simultaneously, soil provides living space for humans and all other species of life, ecosystem services which are essential for water storage, regulation and supply, climate regulation, bio-diversity conservation and carbon sequestration [8].

Soils provide anchorage for roots and holds water and nutrients. Soils are home to myriad micro-organisms that fix nitrogen and decompose organic matter, and armies of microscopic animals as well as earthworms and termites. We build on soil as well as with it and in it [9]. Thus, soil is one of the most precious resources for sustenance of life

A limited resource also leads to differentiation of livelihoods due to unequal access to land and natural re-sources. Gessese, also mentioned when the cultivation of land cannot support livelihoods, off-farm income becomes crucial (Table 2) [10].

Estimated Impacts of Soil Loss on Livelihood by FAO

With more than 90% of the world's food grown from soil, it's a problem that impacts the health, incomes and livelihoods of billions of people on the planet. Soil erosion - when the uppermost layer of soil is shifted or worn away - is a growing threat and one that has the potential to impact the entire world.

In Malawi, for example, soil erosion shaved between 0.6 and 2.1% off the country's gross domestic product (GDP), according to data from the Food and Agriculture Organization of the United Nations (FAO). Such a reduction in GDP is particularly painful for the low-income country. World Bank data shows per capita income in the African nation was roughly \$389.40 in 2018 in comparison to the United States, where per capita income topped more than \$62,641 in 2018, according to the World Bank. While it occurs naturally, soil erosion has been on the rise as a result of what the FAO calls "unsustainable" agricultural practices and "improper" land-use changes such as deforestation.

Soil erosion can lead to as much as a 3.5% increase in food prices as a result of a decline in agricultural production [11]. This in turn can lead to tighter food supplies and higher prices. "Degraded soil is no longer a source of income for farmers," Ronald Vargas, a soil scientist and the secretary of the FAO's Global Soil Partnership, told Al Jazeera. "Because of this, they then need to find alternatives such as migrating to cities."

Soil degradation, Vargas explains, is "a cause for rural poverty and triggers migration". At the same time, he adds, "food security, adaptation and mitigation, and even sustainable development is severely affected" by the problem.

Soil Erosion also Poses a Threat to the Environment

According to the FAO, the world's cultivated soils - meaning soils that have been rearranged - have lost between 25% and 75% of their original carbon stock, which has been released into the atmosphere in the form of carbon dioxide.

The agency says this is mainly due to unsustainable land management practices such as over pumping groundwater into soil and improper plowing - and that such land degradation lowers a soil's ability to maintain and store carbon, in turn contributing to climate change.

On World Soil Day, the FAO is imploring stakeholders - especially the largest greenhouse gas emitters - to not only practise sustainable soil management (such as mulching and covering crops to protect the soil's surface), but to also practice more sound environmental policies (Table 3).

Table 2: Change in land use land cover in case of our country in 2009 relative to 2001 (%).

Region	Cropland	Forest	Grassland	Shrublands	Woodland	Urban	Barren	Water
Addis Ababa	54.8	-82.6	-13.5	134.6	-60.1	0	0	0
Afar	-36.3	3.5	-23.5	44.8	-77.8	0	-22.5	-28.9
Amhara	53.9	-72.9	6.5	-6.6	-47.2	1.1	-7.7	-2.1
Benshangul	-64.7	-89.5	-1.3	658.3	3.6	0	0	0
Dire Dawa	7.8	-100	-69.7	114.3	-1.7	0	0	0
Gambela	101.1	31.6	-60.4	1622.2	34.3	0	-53.3	26.5
Harari	750	-89.8	-43.2	49.8	-57.1	0	0	0
Oromia	21.4	-30.5	-11.2	2.2	13.5	0	-1.6	-8.1
Somali	-29.4	-90.3	-45.7	70	-15.9	0	0	0
Southern	31.9	-15.9	-8.5	0.4	5.8	0	-59.5	-11.7
Tigray	48	-95.8	-24.7	61.6	-55.6	0	-25.3	-36.6
Total	32.9	-25.8	-10.5	6.7	-1.8	0.1	-12.3	-7.8

Table 3: Changes in land use land cover classification in Ethiopia between 2001 and 2009 (million ha).

Land use/cover	2001	2009	Percentage change (%)
Cropland	8.51	11.3	32.7
Forest	5.49	4.07	-25.9
Grassland	28.5	25.5	-10.5
Shrublands	41.8	44.6	6.7
Woodland	22.4	22	-1.8
Urban	0.07	0.07	0.1
Barren	5.65	4.96	-12.2
Water	0.64	0.59	-7.8
Total	113.06	113.08	-

Cost of Loss of Milk and Meat Production Due to Land Degradation in Grazing Lands

The simulated results of costs of loss of milk, meat, and costs associated with weight loss of animals not slaughtered or sold associated with land degradation in grazing biomass [12]. The below table results shows that land degradation in rangelands had a negligible effect on milk and meat production. The bigger proportion of milk and meat losses is experienced in warm semi-arid (\$10.8 million), and warm sub-humid (\$8.5 million) (Table 4).

Based on farmers' responses, six SLM practices were considered including crop rotation, intercropping, improved seeds, use of manure, use of chemical fertilizers, and soil erosion control (such as soil bunds, stone bunds, gabions, grass strips, terraces among others) were selected as major SLM technologies/practices adopted by small farmers in Ethiopia.

As shown in Figure 1, below crop rotation, chemical fertilizer use and inter-cropping are the most common SLM practices adopted by most farmers. Crop rotation was practiced in about 56% of the plots while fertilizer was used in about 39% of the plots.

Conclusion

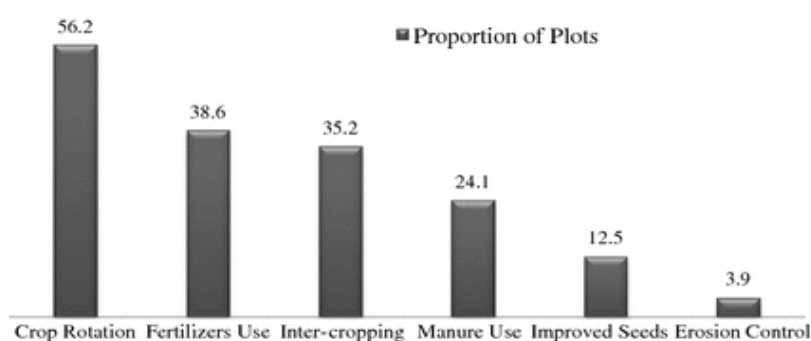
The solutions to land degradation need to be based on through addressing their local drivers. Better understanding of households' behavior about land management as well as policy and institutional factors that affect such decisions are crucial, but usually underestimated in most measures to address land degradation in Ethiopia.

Many forms of land degradation occur in Ethiopia: Water and wind erosion; salinization and acidification, and both physical and biological degradation of soils. More than 85% of the land in Ethiopia is estimated to be moderately to very severely degraded, and about 75% is affected by desertification. Recent estimates using satellite imagery show that land degradation hotspots over the last three decades cover about 23% of land area in Ethiopia.

Table 4: Cost of milk and meat production loss due to degradation of rangelands in case of our country.

Agro-ecological zones	Milk	Meat	Total loss (Milk and Meat)	Total gross loss-includes weight loss of animals not slaughtered
Tropic-cool semi-arid	4.535	0.338	4.873	6.194
Tropic-cool arid	0.003	0.003	0.006	0.004
Tropic-cool humid	0.145	0.005	0.15	0.198
Tropic-cool sub-humid	7.64	0.315	7.945	10.435
Tropic-warm semi-arid	10.262	0.507	10.769	14.016
Tropic-warm arid	7.087	0.922	8.009	9.68
Tropic-warm sub-humid	8.177	0.327	8.504	11.168
Total	37.849	2.417	40.266	51.696

Source: Authors' compilation

**Figure 1:** Common SLM practices adopted by most farmers.

Source: Kirui (in press) unpublished Ph.D. thesis [6]

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