Assessment of the socioeconomic impact of soil erosion: The case of Dire and Dugda Dawa districts, Southern Ethiopia

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Received 01 December 2021; received in revised form 06 June 2022; accepted 07 June 2022

Abstract

Soil erosion is one of the biggest global environmental problems resulting in both onsite and off-site effects leading to land degradation. Assessing the impacts of soil erosion on society and the economy is important in finding alternative solutions to halt the problem. Soil erosion by the environmental agents of water and wind is a continuing global menace that threatens the agricultural base that sustains our civilization. This paper provides an implication on the causes and consequences of soil erosion and socio-economic impacts of soil erosions in the area. A total of 120 household heads were selected using cluster sampling and interviewed in six kebeles where erosion effects were more pronounced. The result reveals that the majority (91.7%) of household heads in the area were male; practicing livestock production (58.3%), farming (13.3%), and petty trading (8.3%). About 80% of household heads did not attend the formal school while about 41.6% of them stayed in the area for more than 25 years before this study conducted. About 75.8% of them earned annual income below 2000 Ethiopian Birr (ETB). The area losses were an estimated amount of 10 million ETB (an equivalent of 333,333 Dollars) annually due to soil erosion. Only about 8% of them indicated that their lost properties were relieved by the government and/ or non-government organizations. A majority (56.7%) were reluctant to accept soil erosion mechanisms introduced by the government. The government, community, local, regional, and international organizations should run in collaboration together to halt this environmental problem in the study area.

Keywords: Land degradation, Socio-economy, Soil conservation, and Soil erosion.

Introduction

Land degradation, specifically soil erosion is a threat to the majority of the ecosystems by taking away top fertile soil which contains a different nutrient essential for crop production/plant growth as a general. Once topsoil erosion is taken away by any agents it's tedious to replace within a year, decades, or century. Nature requires, on an average, about 1000 years building up 2.5 cm of topsoil, but wrong farming methods may take place on a few years to erode it from lands of average slope (Weil & Brady, 2016).

The population of the world is increasing at an alarming rate while the productivity and production of food crops is declining due to soil erosion and related problems. A decline in land quality caused by human activities has been a major global issue during the 20th century and remains high on the international agenda in the 21st century (Eni et al., 2010).

It can be considered in terms of the loss of actual or potential productivity or utility as a result of natural or anthropogenic factors. The processes included in soil erosion are a physical, biological, and chemical processes. The physical processes are

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decline in soil structure leading to crusting, compaction, erosion, desertification, environmental pollution, and unsustainable use of natural resources. Significant chemical processes include acidification, leaching, salinization, decrease in cation retention capacity, and fertility depletion. Biological processes include a reduction in total and biomass carbon and decline in land biodiversity. Thus, soil erosion is a biophysical process driven by socio-economic and political causes (Abegaz, 1995).

Soil erosion is the result of complex interactions between physical, chemical, biological, socio-economic and political issues. While the scale of the global processes may be vast, they may be in the state of dynamic equilibrium, easily upset by human activities. Some of the causes of soil erosion are natural hazards, population growth, expansion of agriculture on to forests and marginal lands, poverty, land ownership problems, political instability and maladministration, inappropriate agriculture (Tulu, 2002).

The direct causes of soil erosion including declining use of fallow, limited recycling of dung and crop residues to the soil, limited application of an external source of plant nutrients, deforestation, and overgrazing is apparent. And generally agreed issues primary to these unswerving (direct) causes include population increment, poverty, high costs and inadequate access to agricultural inputs, fragmented holdings and insecure tenure and insufficient information about appropriate alternative technologies (Tulu, 2002). Many of these factors are affected by government policies on infrastructures and market development input and credit supplies, land tenure, agricultural Research and extension, Conservation programs, Land use regulation, Local governance and collective action, and non-governmental programs. For instance, agricultural expansion into the most productive forest lands often results in rapid soil erosion, with a subsequent decline in production and productivity. The clearing of marginal forests and hills for food production or for timber production also challenges the maintenance of biological diversity (Tulu, 2002).

Land degradation has become a serious concern generally in the world and Ethiopia in particular, due to its implication of food security and the environment. Ethiopia is known for its agricultural dependence, in addition to the associated, widespread, and prevailing land degradation (Hurni et al., 2015). One of the major causes of land degradation in Ethiopia is an inappropriate use of land for different economic activities. Land degradation is one of the serious problems in agricultural sector that posed a higher threat to current and future potential food production and the livelihood of the people of Ethiopia (Bekele-Tesemma, 2001; Nyssen et al., 2000).

Sub Saharan Africa (SSA) is of concern mainly because of its consequences for subsistence agriculture, from which about 75% of the population derives their livelihoods (Erkossa et al., 2015; Tully et al., 2015). Among the SSA countries, Ethiopia has a high level of soil erosion (Gessesse et al., 2016; Mekonnen et al., 2015). A continued soil erosion seriously affects the livelihood of peoples in drought-prone highland parts of the country at most, where there is a very scarce arable land (Anteneh Tesfaye et al., 2014). Over the past decades, government and international agencies have been trying to support good land use and introduce soil and water conservation (SWC) technologies to prevent and reduce soil erosion and improve the livelihood of peoples (Gessesse et al., 2016; Haregeweyn et al., 2017; Anteneh Tesfaye et al., 2014; Abonesh Tesfaye et al., 2014). However, (Bewket & Sterk, 2002; Anteneh Tesfaye et al., 2014; Abonesh Tesfaye et al., 2014) have implied a relatively low level of success in this respect across a wider landscape. About 42 Mg/ha/year of soil erosion have been reported on cultivated lands across the country (Bewket & Sterk, 2003; Haregeweyn et al., 2017; Anteneh Tesfaye et al., 2014) and recently an estimate by (Hurni et al., 2015) indicated rates of 20Mg/ha/year on newly

cultivated lands and 33 Mg/ha/year on formerly degraded cultivated land. Most of the studies in Ethiopia give prior attention to the highland part of the country alone while the lowland parts received little attention from the researchers and government. The Borana zone (study area) is one of the drought prone areas in the country which received negligible research attentions in this regard.

Soil erosion is a serious problem in Borana Zone particularly in Dugda Dawa and Dire district, causing severe land degradation. The livelihood of people in this area is mostly based on livestock production. The area is characterized by overstocking, high population growth, scattered patterns of settlement, and high temporal variability in rainfall patterns. Due to the clearance of natural vegetation without replacement, overstocking, overgrazing, and population growth, the land for grazing is being diminished over time. This area has faced serious land degradation. This has led to increased soil erosion and loss of soil fertility. The most overwhelming challenge that the area facing is food insecurity caused by overgrazing and recurrent drought (the majority of the population), subsistence farming, and rainfed agriculture (few of the population), together with high rainfall variability. The recurrent drought is also a critical issue in the area, with the potential for exacerbation by environmental changes. This directly affects the livelihood of the community. The study Kebeles are also prone to high soil erosion problems that result in poverty. Due to this and many other factors, out of total 31 rural kebeles more than 24 of them are food insecure and are supported by WFP, USAID, and PSNP, and many others not listed (pastoral office of the district, 2015). The lowland part of the country received little attention from the researchers. Most of the studies have relied on the highland part of the country. There was no comprehensive study with the primary focus of soil erosion's impact on the economy and society in this study area. These problems, therefore, initiated the researcher to conduct the research on the cause and consequences of soil erosion in relation to the socio-economy and to indicate the alternative means for reducing/alleviating the problem of soil erosion in southern Ethiopia.

Materials and Methods

Description of the study areas

This study was based on the survey undertaken in Dugda Dawa and Dire district located at 4^0 44' 25'' N to 6^0 6' 0'' N-Latitude and 37^0 46' 30'' E to 39^0 40' 10'' E-Longitude and 3^0 31' 0'' N to 4^0 38' 10'' N-Latitude and 37^0 25' 50'' E to 38^0 58' 50'' E-Longitude respectively in Borana pastoral areas, southern Ethiopia (figure 1). The area is agroecological comprised of arid and semi-arid with bi-modal rainfall patterns of an average between 400mm-950mm. Rainfall in the area is the bimodal type with 60% occurring in the long rainy season (Ganna), which occurs from March to May, and the short rainy season (Hagayya) from September to November (Homann et al., 2008). The long dry season from December to February (Bona Hagayyaa), and the short dry season (Adoolessa)

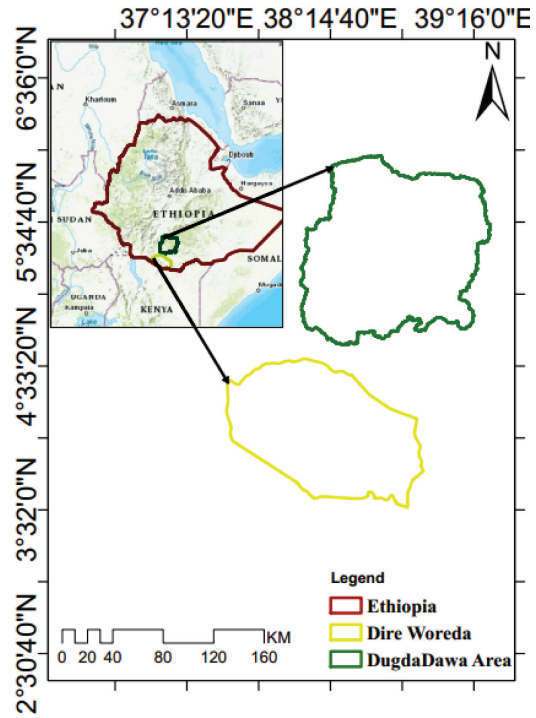

Figure 1. Location of the study site

from June to August. The dominant land cover types in the area are shrub (bushes) and grasses. The two study sites share similar ecology and common livelihood as expressed in CORDAID and FSS, 2009. The majority of populations in the area are pastoralists with the current extensive shifting towards agropastoral and/or growing crops. The livestock holdings mostly determine the level of household head wealth. It's estimated that 55.4% of the income in the zone is derived from the sales of livestock (Demeke, 2006). About 60-70% of household food requirements are met through the purchase of staple food. Subsistence agriculture and food reliefs contribute to a lesser extent to food needs.

Data types and sources

To conduct this study both qualitative and quantitative types of data were used. Primary data sources were collected using interviews, key informant interviews, observation, focus group discussions and questionnaires, and checklists related to the socio-economic effect of soil erosion in the study area. Interviews were undertaken from each kebeles of selected respondents. The key informant interview was taken place at Woredas pastoral office. Focus group discussion consisting of 20 individuals from both districts were taken. From the whole six kebele's, four of them were selected for FGD. Then accordingly 5 number of FGD respondents were set from each kebeles. Questionnaires were prepared both as open and close-ended to achieve the desired goal. Weekly repeated observation and focus group discussions were undertaken to triangulate and confirm the previously gathered information and/or to build trust and generate more accurate information.

The secondary data for this study were collected from the Agricultural and Pastoral office, Water, Mine, and Energy office of the districts, books, relevant websites, and other related documents. Existing works of literature on the topic globally and in relation to the study area were sought and cited.

Sampling Techniques and Sample Size Determination

Multi-stage sampling, which is, a combination of purposive and cluster sampling procedure was used to select the study area and interview sampled households, respectively. Based on this, the following sampling procedure was employed.

At the first stage of sampling, Dire and Dugda Dawa districts were selected purposively from the existing district in the area. Secondly, from the selected districts, six kebeles were selected as the study sites based on the inclusion criteria. i.e., three independent kebele's from both districts.

Thirdly, after a determination of representative sample size, the respondents were interviewed based on cluster sampling. This was due to the settlement patterns of peoples in the study area. The settlement pattern in the area is scattered. To determine the sample size and representatives of the target population, (Yamane, 1967) statistical formula was used.

$$n = \frac{N}{1+N(e)^2}$$

Where,

n= required sample size
N = total households
e = error terms (5%)
1 = Adjustment

The standard error of 5% and thus the confidence interval of 95% were adopted for this research. Then after the total sample size was obtained using the above equation, an equal number of samples were used for both study sites. Accordingly, 20 Households were selected from each sampled kebeles, to have a total of 60 Households from single study sites. Lastly, a total of 120 Households (HH) were included as a sample population for primary data source, from both study sites (Dire and Dugda Dawa district).

Inclusion criteria

The selection criteria of each study kebele's were undertaken based on: consultation with district pastoral development office regarding kebeles practicing agricultural practices and the severity of land degradation, field observation to the area (severity of soil erosion and susceptibility to soil erosion were taken in to consideration), and google earth visualizations.

Data Analysis

The HH survey data were coded, checked and feed into the Statistical Package for Social Science (SPSS), version 24, then was analyzed using descriptive statistics for quantitative data. The results were then presented in the form of tables and graphs. Whereas the qualitative data collected by different data gathering tools were analyzed using narration.

Results and Discussion

Socio-economic characteristics of household

The following section summarizes the social-economic behavior of the household head included in the study. Most of the respondents were male (91.7%) while the rest (8.3%) were female (Table 1). This implies that most of the household heads in the study area were male. Considering the educational status of the respondents the research reveals the majority of the respondents were illiterate (80%) while only a few were literate (20%) (Table 2). This implies the majority of the respondents are educationally backward. Table 3 reveals that about 70% of the respondents were pastoralists or practices livestock production while only a few per cent were civil servants (3.4%) and few practices petty trading (8.3%). This dictates the pastoralist takes the lion's share in the area. Considering the age distribution, the result dictates that majority of the respondents (68.3%) were above 46 years while 4.2% were below 30 years. This implies the most of the respondents included were old enough to know the area. This helps the researcher in knowing the area's background while the research was undertaken.

Result also reveals that the majority (41.6%) of the household have lived in the area for more than 25 years to the time of the research undertaken. Only 12.5% of the respondents had lived in their community for a short period of time (Table 6). This study also reveals that the majority of the respondents (57.5%) had a family size of 5-8 and only 1.66% had a family size of 13-16 (Table 7).

Table 1. Demographic characteristics of the respondents in the two Woredas (n= 120)

Sl. No.	Sex	Frequency	Percentage (%)
1.	Female	10	8.3
2.	Male	110	91.7

Table 2. Educational status of the respondents (n= 120)

Sl. No.	Educational status	Frequency	Percentage (%)
1.	Illiterate	96	80
2.	Literate	24	20

Table 3. Occupation of the respondents (n= 120)

Sl. No.	Occupation	Frequency	Percentage (%)
1.	Farming	16	13.3
2.	Petty trading	10	8.3
3.	Livestock production	70	58.3
4.	Civil servant	4	3.4
5.	Unemployed	8	6.7
6.	No response	12	10

Table 5. Length of stay on the home land (n=120)

Sl.No.	Length of stay	Frequency	Percentage (%)
1.	Below 5 years	15	12.5
2.	6-15 years	20	16.7
3.	16-25 years	35	29.2
4.	Above 25 years	50	41.6

Table 6. Age distribution (n=120)

Sl. No.	Age Group	Frequency	Percentage (%)
1.	25-30	5	4.2
2.	31-35	5	4.2
3.	36-40	12	10.0
4.	41-45	16	13.3
5.	Above 46	82	68.3

Table 7. Family group (n=120)

Sl. No.	Family group	Frequency	Percentage
1	Below 4	25	20.84
2	5-8	69	57.5
3	9-12	24	20
4	13-16	2	1.66

Source: Author field survey data, 2016

Agent and Causes of Soil Erosion in the Study Area

The perusal of data mentioned in table 8 revealed that both (Water and wind) are the agent of soil erosion as a majority of respondents (60%) replies; with which water (21.7%) is more likely to cause soil erosion in the area.

Majority of the respondents (71.7%) believe deforestation is the major cause of soil erosion in the area. They used the wood as a source of energy, income, and construction materials which may fasten deforestation resulting in erosion in forests and shrubland. Additionally, from key informant perspectives researcher suggests that overgrazing and overstocking were the major causes of soil erosion which leads to land degradation. This might relate to the livelihood of the community which mainly depends on livestock production. Most of the pastoralist believes as there will not be life without livestock and the person with a small number of cattle and/ or no cattle is considered to be poor and his respect within the community is less. Due to this respondent's perception was more inclined to deforestation as a major cause of soil erosion. Overstocking and overgrazing were also leading to conflict because the pastoralist moves in search of free space to graze their cattle's during which they usually cross the border of their territory. This extensive grazing has accelerated soil erosion. Another major cause of soil erosion in the study area are the insecure land tenure system. The land tenure system in the study area was a predominantly communal type for grazing land and family land for cropland. However, the constitution of the country prohibits the private ownership of arable land, which may decrease credit access, investment, and environmental opportunities. In communal type, there is clear ownership over land resources which open doors for overutilization and degradation of resources. Lack of secure land tenure is, exacerbate the loss of soil by erosion.

Socio-economic effect of soil erosion

Table 9 reveals the socio-economic effect of soil erosion on the lifestyle of communities in the area. The table depicts desertification is the most common (35%) natural disaster which affects the livelihood of peoples in the study area. This is followed by gully and sheet/rill erosion, which are nearly equal according to the respondents or 20.8% each. Flooding and deposition had a percentage of 3.4% and 7.5% respectively. The remaining 12.5% did not respond to the question on the disaster they experienced.

The result also shows the majority (68%) of respondents did not receive any compensation or benefit either from government or non-government organizations for their loss due to soil erosion. Only 8.3% of them admit as they had received the benefit mainly from a non-governmental organization. The

Table 8. Agents and causes of soil erosion (n=120)

Sl. No.	Agents of soil erosion	Frequency			Percentage (%)		
1.	Water	26			21.7		
2.	Wind	15			12.5		
3.	Both	72			60		
4.	No response	7			5.8		
Causes of soil erosion and/or reduction of grazing land productivity (Is the following being causes of soil erosion and/or reduction of grazing land productivity in your area?)		Yes	No	No response	Yes%	No %	No response %
1.	Overgrazing and overstocking	43	66	11	35.8	55	9.2
2.	Deforestation	77	34	9	64.2	28.3	7.5
3.	Land use mismanagement	61	48	11	50.8	40	9.2
4.	Insecure land tenure	86	31	3	71.7	25.8	2.5

Table 9. Socio-economic effect of soil erosion on the people of Dire and Dugda Dawa Woredas of southern Ethiopia(n=120)

Sl.No.	Variable				
	Natural disaster	Frequency	Percentage (%)		
1.	Sheet/Rill erosion	25	20.8		
2.	Gully erosion	25	20.8		
3.	Flooding	4	3.4		
4.	Deposition/siltation	9	7.5		
5.	Desertification	42	35		
6.	No response	15	12.5		
	Victims relieved by government/NGO	Frequency	Percentage (%)		
1.	Yes	10	8.3		
2.	No	68	56.7		
3.	No response	42	35		
	Major property affected by soil erosion	Frequency	Percentage (%)	Estimated value in million Birr and Dollars	
	Property			Birr (ETB)	Dollars ($)
1.	Cropland/farming	15	12.5	1.31	0.05
2.	House	10	8.3	0.123	0.005
3.	Livestock	33	27.5	23.7	0.967
4.	Mixed property	60	50	4.3	0.175
5.	No response	2	16.7		
6.	Total	120	100	29.433	1.197

Source: Author field survey, 2016

left 35% did not respond to the question of whether they receive a benefit or not.

The research also reveals that the most affected types of properties by soil erosion in the study area include house (8.3%), farming land (12.5%), Livestock (27.5%). The household head that lost more than one of their properties had a percentage of 50% which is almost half of the respondents. The remaining 16.7% did not respond to the question.

Common Soil and Water Conservation Methods and Community Perceptions

Table 10 reveals the common practices used to reduce soil erosion and the perception of the community regarding soil and water conservation in the study area. Contour farming, crop rotation, and application of animal manure had a percentage of 65%, 35%, and 14% respectively. These were practiced on farmland traditionally either to reduce soil erosion or improve soil fertility. The rest 6% did not respond to the type of practice they used to reduce soil erosion. The table also shows area closure (65%) and rotational grazing (26.7%) were practiced to manage pasture land. The rest 8.3% did not respond to the question regarding how they increase the productivity of their grazing land. The majority of respondent reflects, they practice area closure for improving their grazing land. However, as the researcher understands from focus group discussion, the practice area closure and rotational grazing for the purpose of conservation not directly (it's not their primary objective) but they practice area closure and rotational grazing with the primary objective of, as a reserve during drought time so that their cattle can survive the drought.

The respondents also reflect that they were practicing the modern soil and water conservation method but they did not fully accept as the method of soil and water conservation is advantageous. Physical and biological soil conservation measures had a percentage of 56.7% and 15% respectively. Only 21.7% of the respondents practiced both physical and biological soil conservation methods. The remaining 6.6% refused to respond to the type of activity they were practiced. This implies the most commonly (56.7%) practiced activity was the physical method. However, this alone is dangerous because it opens the door for more soil erosion problems.

Table 10. The common practices used to reduce soil erosion and/or to improve soil fertility by the local community in the study area and perceptions of communities to operate the modern Soil Conservation Methods (SCM). (n=120)

Sl. No.	Indigenous Practices to reduce soil erosion and/or improve soil fertility	Frequency	Percentage
	For crop/farmland		
1.	Contour farming	65	54.2
2.	Application of animal manure	14	11.6
3.	Crop rotation (Mono cropping)	35	29.2
4.	No response	6	5
	For pasture land		
1.	Area closure	78	65
2.	Rotational grazing	32	26.7
3.	No response	10	8.3
Modern soil and water conservation methods		Frequency	Percentage
1.	Physical soil conservation measures (PSCM)	68	56.7
2.	Biological soil conservation measures (BSCM)	18	15
3.	Both	26	21.7
4.	No response	8	6.6
Acceptability of modern SWCM		Frequency	Percentage
1.	Accepted	8	6.7
2.	Medium	7	5.8
3.	Not accepted	68	56.7
4.	No response	37	30.8

Source: Author field survey, 2016

The finding also reveals more than half (56.7%) of respondents have not accepted the modern soil and water conservation method as they were doing it as an imposed obligation. Only 11.5% were accepted and managing it. The left 30.7% did not respond to the question. This implies the lower acceptability of soil and water conservation in the study area.

Trends in forest coverage and grazing land productivity (respondents' perception)

This was based on the responses from respondents while undertaking the interview and questions for comparison of the two districts. The discussion was also made with the key informants and focus groups to triangulate the respondent's perception. The author organizes their response and tried to illustrate using percentages of graphs. The figure 2 implies the decrement in both forest coverages and grazing land productivity in both areas over time. About 65% and 84.2% of the respondents from the Dugda Dawa area say the forest cover and grazing land productivity showed the decline at an alarming rate respectively. While 92.5% and 97.5% of the Dire respondents say the forest cover and grazing land productivity showed the decline at an alarming rate respectively. Generally, more than half of the respondents believed the decrement of both forest and grazing land productivity at an alarming rate. Yet, few of the respondents say there was a slight decrement.

The poor education status and low income of the community pose a serious problem to halt a situation of soil erosion (Albert et al., 2006). The result of our paper agrees with this judgment. The secondary source of data revealed that the government of the area was not willing to commit more than 700,000 Dollars to the erosion problem in any area of the southeastern states of Ghana (Olori, 2006). According to a result of our research, there is no data illustrating the will of the government to commit or compensate for the property loss by soil erosion in the study area. This implies the minimum emphasis paid for soil erosion in the study area from the government during the past years.

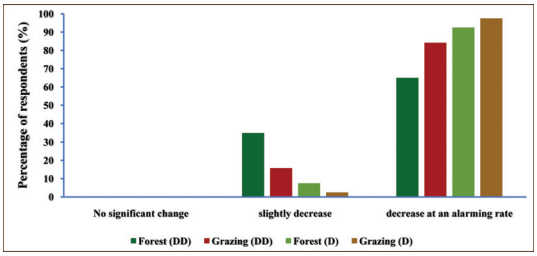

Figure 2.Trends in forest coverage and grazing land productivity (respondents' perception)

Note: DD and D represent Dugda Dawa and Dire districts respectively.

The result of this study implies that soil erosion is the most urgent problem, which presents major jeopardy to land productivity in the study area. For instance, in the case of agricultural land, with escalating population pressure, the land is constantly cultivated. Cropland is characterized by a lack of

comprehensive land management practices, which contribute to severe erosion problems. Farmers in the study area practiced complete tillage, while minimum or zero tillage was completely abandoned. Minimum or zero tillage as it reduces soil erodibility is an important soil conservation mechanism in Sub-Saharan African countries (Ndah et al., 2015).

The farming system in the study area is rotational monocropping. According to (Kangalawe et al., 2008) intercropping and/ or mixed cropping practice is an essential way that farmers may utilize to reduce soil degradation and unfavorable climatic conditions because these allow growing more than two types of crops within the same field. This practice also reduces the risk of crop failure and increase the cultivable land (Gowing & Palmer, 2008). The management of cropland is carried out solely, which made the success of land rehabilitation considerably vary among land cover; there are cases in which farmers may abandon land management technologies. The exploitation of cropland without land management can results in soil degradation, mainly due to loss in organic matter, leading to reduced infiltration and water holding capacity (Ndah et al., 2015). Another explanation for the severity of soil erosion in cropland could be the minimum/diminished application of manure in the study area. Dispersing domestic wastes (animal waste) on cultivated land is an old traditional farming practice. It's a nutrient as well as an ameliorative instrument for eroded soil (Ligonja & Shrestha, 2015). Results from a study by (Bizoza, 2014) also showed that soil amendments through animal manure reduce bulk density and compaction, increase pore spaces and infiltration, which ultimately reduce surface runoff and soil erosion. However, during the discussion with respondents, the researchers understand that the application of manure in the cropland was insufficient in the study area.

For the case of grazing land,Ndah et al. (2015) reveal that, reduction in number of livestock as conservation means, will likely reduces surface runoff and soil erosion in the grassland, as a result, more land may be left for cultivation. However, this argument seems impossible in the study area due to the role livestock played in sustaining the livelihood of the communities. In the study area, livestock is the source of labor, power, income, prestige, and transport. This results in the overstocking of livestock in the study area, which leads to overgrazing of grassland. This extensive grazing will result in an accelerated soil erosion in area.

Furthermore, the result also shows that there was extensive deforestation in the study areas. According to the discussion held with focus groups and key informants, the severe destruction of forests (woodland) was tied with the fall of Dergue regime (the military government which leads Ethiopia for more than 13 years (1974-1987)) in Ethiopia. During dergue regime, the community was forced to plant and conserve trees (This wasn't depended on the consent of the community). This might be considered as the reason for massive deforestation following the fall of Dergue regime. From this, it's understandable that any kind of green legacy need to be applied in a way that includes the community from the beginning for the sustainability of the project. Moreover, community needs to be aware about what's going on in their area. Additionally, demand for source of energy, construction material and source of income also contributes significant destruction of forests in the area. This result supports, the finding by Adugna et al. (2015), which states demand for wood as a source of energy and construction material may instigate deforestation which is likely to have triggered erosion in shrubland and forestland.

Land tenure insecurity has a positive relation with soil erosion. This indicates that if farmers don't have secure land rights, they will have few incentives for engaging in sustainable soil erosion control measures. While secure land tenure plays role in reducing soil erosion. (Tsue et al., 2014) indicate that tenure security can also influence the long-term environmental impact of over exploitation of the

land resources. Degraded lands can be regenerated, managed, and protected when people have a secure land rights, for example, through community forestry and leased forestry (Lal, 2001).

There is limited soil erosion related research in the lowland or pastoralist part of Ethiopia. The majority of research is conducted around the highland part of the country. However, lowland areas of the country are suffering from soil erosion which leads to the degradation of the rangeland since the majority of a community in the lowland are pastoralists, they are experiencing a serious problem. This research aims at assessing the socioeconomic effect of soil erosion in the southern part of Ethiopia (Dire woreda of Borana Zone and Dugda Dawa of West Guji zone).

The result reveals that the majority (91.7%) of the household head were male practicing farming (13.3%), petty trading (8.3%), livestock production (58.3%), civil servant (3.4%), and unemployed (6.7%) with which 68.3% of them were above the age of 46 and 41.6% of them were staying in the area for above the year of 25. As well as most (80%) of the respondents were illiterate or either they don't join formal or informal schools. Because the majority of the respondents were pastoralists, they don't have a clear daily income other than a few of them who practice petty trading. Due to climate change and/recurrent drought, they were losing their livestock on which their livelihood depends; currently a majority of them were seeking help. Half (50%) of the household responded that they had lost one or more of their property due to this problem; while few (8.3%) of them were received compensation from an external body. The household heads responded that were practicing indigenous conservation method like contour farming (54.2%), application of animal manure (11.6%) or crop rotation (29.2%) either to reduce soil erosion or improve soil fertility; in addition, area closure (65%) and rotational grazing (26.7%) were practiced to improve pasture land status which indirectly contributes for soil erosion reduction. The majority (56.7%) of the household head were reluctant to accepted the modern soil conservation method. However, most (68%) of them were practicing physical soil conservation methods to get incentives. This indicates the community does practice conservation because of some incentives gained from different organizations other than for environmental protection. This may arise from lower awareness of the community which will lead to the failures of conservation practices.

The result also reveals that forest coverage declines at an alarming rate in the selected areas. Grazing land productivity also got diminished at a higher rate. This again intensifies the problems of soil erosion in the area.

There is a need to create awareness for the local community so that they will accept the soil erosion control method and manage their lands.

The government strategy to halt the soil erosion problem is mainly focused on highland areas of the country. However, the low land areas are also experiencing such environmental problems; so, attention should be paid either to halt problems or compensate for the loss due to the soil erosion problems.

There should be diversification of income for the community. The community should be shifted from pastoralist to agro-pastoralist as much as possible. This way the effect of overgrazing and deforestation may be reduced. There is a need to regulate a livestock population due to recurrent drought and the carrying capacity of the environment is surpassing.

To conclude, government, community, local, regional, and international organizations should run together to halt environmental problems in the pastoralist area. Further studies should also focus on the number of gullies created, the effect of erosion on the productivity of land, and others.

Acknowledgement

The author would like to thank the local community, government offices, and all responsible individuals who share the information, provide valuable comments and suggestion without whom this work couldn't be accomplished. We are also grateful to all friends who provide support by giving comments and suggestions during the preparation of this paper. The author would like to extend a warm appreciation to our host university (Bule Hora University).

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