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THE IMPACTS OF LAND DEGRADARTION ON AGRICULTURAL PRODUCTIVITY: THE CASE OF WEREDA TAHTAY KORARO

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Abstract

The title of this research is the impacts of land degradation on agricultural productivity in woreda Tahtay koraro. The main objective of this research is the overall aim of this research is to assess the effect of land degradation on the productivity of agriculture in woreda Tahtay koraro. For the successful of this study the research employed both primary and secondary data were used. This primary data were collected from the households of Semema and Kelakel Kebeles by using questionnaire, interview and personal observation (field observation). The secondary source of data also collected from the woreda agricultural and rural development office of woreda Tahtay koraro from published and unpublished source of data and books. After the necessary data were collected the activity of data analysis was carried out. A descriptive method of data analysis has been used. The result showed that the farmers of the area are highly affected high land degradation on agricultural productivity based on which acquired from the households. Crops of the area have different types of problems. The major problems are like; soil erosion, lack of knowledge to measure soil fertility, traditional farming system and also over cultivation.

Keyterms: Land degradation, Agricultural, Semema, Kelakel, and Woreda Tahtay koraro,

Introduction

Soil degradation can be defined as a declining of soil quality, encompassing the deterioration in physical, chemical and biological attributes of the soil properties. However, land degradation encompasses the whole environment but includes individual factors concerning soils, water resource, forests, grasslands, croplands (rain fed, irrigated) and biodiversity (George, 2005). Desertification refers to land degradation in arid, semi-arid, and sub-humid areas due to natural and anthropogenic activities (Reynolds et al., 2007). Land degradation is also defined as a temporary or permanent decline in the productive capacity of land, or its potential for environmental management, has significantly contributed to the low yield of crops and livestock of the area (Mekonnen et al., 2018).

The term "soil degradation" refers to a decline in soil quality that includes changes in the physical, chemical, and biological characteristics of the soil qualities. The entire ecosystem is included in land degradation, but it also includes specific variables relating to soils, water resources, forests, grasslands, croplands (rain fed, irrigated), and biodiversity (George, 2005). According to Reynolds et al. (2007), desertification is the term used to describe the degradation of the land in dry, semi-arid, and sub-humid regions. According to Mekonnen et al. (2018), the area's low yield of crops and animals is largely attributable to land degradation, which is also characterized as a temporary or permanent reduction in the productive capacity of land or in its ability for environmental management.

The natural factors causing land degradation includes high torrential and erratic rain fall, types of soil, topography, earth quack, volcanic eruption and steep relief is the major ones (Abdi et al., 2013). Impact of rain drop with tremendous amount of energy can directly strike the surface land and cause for degradation and detachment of soil structure which is more aggravated on bare soil. Generally, distribution frequency and intensity of rain fall are the major factor affecting land degradation which leads to disturb the nature of soil properties and ecosystem service (Sklenicka, 2016).

High torrential and irregular rainfall, different types of soil, topography, earth quakes, volcanic eruptions, and steep terrain are the main natural causes driving land degradation (Abdi et al., 2013). Raindrops with enormous intensity can directly impact the surface of the land, degrading

and separating the soil structure, which is worsened on bare soil. The main causes of land degradation, which disrupts the nature of soil properties and ecosystem services, are often distribution frequency and intensity of rain fall (Sklenicka, 2016).

Deforestation, overgrazing by livestock, mismanagement of agricultural land, overexploitation of the vegetative cover for domestic use, and industrial activities are the major anthropogenic causes of land degradation (Gizaw & Gan, 2017). Additionally, it includes production on steep slopes with inadequate soil conservation measures, lack using of fallow system, limited recycling of dung and crop residues to the soil, which leads to deforestation and fluctuation of environmental temperature (Yitbarek et al., 2013). The cause also includes proximate causes such as population pressure, poverty, low profitability of agricultural production, farmers' lack of information about alternative technology. These all are cause for natural resource deterioration and nutrient depletion which in turns affect the overall potential utility of land resource (Bore & Bedadi, 2015).

The main anthropogenic drivers of land degradation are deforestation, animal overgrazing, improper management of agricultural land, excessive residential use of vegetative cover, and industrial activities (Gizaw & Gan, 2017). Additionally, it involves farming on steep slopes with poor soil conservation practices, a lack of fallow periods, and limited recycling of crop residues and dung into the soil, which results in deforestation and temperature fluctuations (Yitbarek et al., 2013). Additionally, there are nearby causes like population pressure, poverty, the unprofitability of agricultural production, and farmers' ignorance of alternative technologies. All of these contribute to the degradation of natural resources and the depletion of nutrients, which in turn reduces the overall potential utility of land resources (Bore & Bedadi, 2015).

The impact of land degradation on agricultural productivity is a worldwide and complex phenomenon influenced by human intervention and natural factors (Ferrara et al., 2020). Land degradation reduce soil organic matter and its quality by exacerbate soil erosion, reduce land productivity in ecosystem ultimately reduce diversity, stability and propagation of plant, animal and soil biota other forms of life. It generally refers to the loss of the land‘s biological and/or economic productivity (Gedefaw & Soromessa, 2015).

An extensive and complicated global issue, the effect of land degradation on agricultural output is impacted by both natural and human-made variables (Ferrara et al., 2020). Land degradation lowers soil organic matter and quality by escalating soil erosion, reducing ecosystem production,

and ultimately lowering the diversity, stability, and procreation of various living forms including plants, animals, and soil biota. According to Gedefaw and Soromessa (2015), it typically refers to the decline in the ecological and/or economic productivity of the land.

Land degradation included yield losses may become more significant in relation to yield growth in the future, as yield growth rates are projected to fall below 1% per year over the next few decades. Land degradation‘s effects on more sever in some regions and local areas due to a combination of natural resource devastation, cultivation of marginal land, and top sequence of landscapes (Gashaw, 2015).

Given that yield growth rates are anticipated to decline below 1% per year over the following few decades, land degradation, which includes yield losses, may become more significant in relation to yield growth. Due to the destruction of natural resources, exploitation of marginal land, and topographic sequences, the effects of land degradation are more severe in specific regions and local areas (Gashaw, 2015).

Statement of the problem

Land degradation in the world stands at about 85% and this is associated with soil erosion, most of which occurred since the end of World War II, causing a 17% reduction in crop productivity. The extent of soil erosion shows that it’s a worldwide environmental problem with some areas such as the horn of Africa and majority of sub – Saharan region being extremely prone to erosion due to prolonged dry periods and heavy erosive rainfall, falling on steep slopes with fragile soils, causing in considerable amounts of erosion (Abdallah, 2016).

Around 85% of the world's land has been degraded, primarily as a result of soil erosion that has lowered crop productivity by 17% since the end of World War II. The extent of soil erosion demonstrates that it is a global environmental issue, with some regions—such as the horn of Africa and the majority of the sub-Saharan region—being particularly vulnerable to erosion as a result of protracted dry spells and heavy erosive rainfall falling on steep slopes with delicate soils, resulting in significant amounts of erosion (Abdallah, 2016).

According to Sileshi (2016), land degradation is one of the most serious environmental challenges and an issue in both developed and developing countries. However, the severity and magnitude of

its impact are much more pronounced in low income countries at which the livelihood of the majority is dependent on agriculture.

Land degradation is one of the most serious environmental challenges and a problem in both developed and developing countries, according to Sileshi (2016), but its severity and impact are much more pronounced in low income countries where the majority of people depend on agriculture for their livelihood.

According to Twagiramungu (2006), Land degradation specifically soil degradation is a major environmental problem in Rwanda, The degradation is particularly linked to hydrous erosion that affects a big portion of cultivated lands. It was assumed that the hydrous erosion reduces the capacity to feed 40 000 persons per year and causes annual losses of about 15 000 000 tons of soil.

Twagiramungu (2006) claims that soil deterioration, more specifically, land degradation, is a significant environmental issue in Rwanda. This degradation is especially related to hydrous erosion, which affects a considerable section of cultivated areas. The potential to feed 40 000 people annually was thought to be reduced by hydrous erosion, which also results in annual soil losses of around 15 000 000 tonnes.
According to Sileshi (2016), the vulnerability to land degradation needs to be assessed continually to take appropriate resource conservation measures. Therefore, the aim of this study was to assess the impact of land degradation on agriculture productivity in Nyabihu district through the integration of GIS and RS. More specifically, the study is targeted to map the spatial and temporal changes in agriculture land use and land cover, to assess soil erosion and landslide as factors of land degradation, as well as other factors that affect agricultural productivity.

In order to implement the proper resource conservation measures, it is necessary to continuously analyse the sensitivity to land degradation, according to Sileshi (2016). The purpose of this study was to integrate GIS and RS to evaluate the effect of land degradation on agricultural productivity in Nyabihu district. The project aims to map the regional and temporal changes in agricultural land use and land cover, to evaluate the role of landslides and soil erosion in the degradation of the environment, and to identify other factors that influence agricultural production.

Land degradation is one of the most serious problems facing most of Ethiopian highland include Tigray region. In Tigray renewable resources, that is soil, water, forest and trees as well as other biological or biodiversity's have been now deteriorated and affects to down ward level of productive (Wood, 1990).

One of the most critical issues facing the majority of Ethiopia's highlands, including the Tigray region, is soil degradation. Renewable resources, including soil, water, forests, and trees, as well as other biological variety, have degraded in Tigray and have an impact on productivity levels (Wood, 1990).

Generally, human and natural events are the major factor for the cause of land degradation and connected with environmental degradation coupled with shortage of rain fall have remained as major cause of recurrent drought and famine in Tigray region. Such activities are varying from area, rural communities, and even from one nation to another nation due to peculiar features of a nations and behaviors of land management system. In this Woreda Tahtay Koraro, the variable rainfall and dissected nature of terrain with nearly 70% of the land having slopes in excess of 30% favor severe soil erosion once the vegetation is reduced and agricultural productivity is decline or reduced (agricultural and rural development documentary office, 2000 E.C).

In general, human and natural occurrences are the main contributors to land degradation, and this environmental degradation, combined with a lack of precipitation, has remained the main cause of repeated droughts and famine in the Tigray region. These activities differ by region, rural community, and even by country due to specific characteristics of a nation and behaviours of land management system. The uneven terrain and variable rainfall in this Woreda Tahtay Koraro, where nearly 70% of the land has slopes greater than 30%, favour severe soil erosion once vegetation is reduced and agricultural productivity is reduced or declines (agricultural and rural development documentary office, 2000 E.C.).

Therefore, this study solution to the problem land degradation in the study area.

The overall aim of this research is to assess the effects of land degradation on the productivity of agriculture in Woreda Tahtay korero.

Description of the Study Area

Physical Aspects: the study is conducted in woreda Tahtay koraro which is found in north west part of Tigray, which is 345 km far from the capital city of national regional state of Tigray (Mekelle) , woreda Tahtay koraro is located latitude is 13°19´00´´ -14°13´00´´ E and longitude is 38°20´00´´ -38°21´00´´ N, and also bordered by northern medebay zana, in the eastern also by medebay zana, in the western by laelay adyabo and in the southern by Asgede tsembla; its annual rainfall is 700-1000 mm and a temperature, average maximum temperature is 35°c and the average minimum temperature is 25°c. The rainfall season is started from June up to the beginning of September and its elevation (attitude) is 1,600 – 2,300 meters above sea level and the natural resource is fertile soil, water resources and labor. The climate characteristics or agro-ecology is also dega is 2%, wenadega is 75%, and kola is 23% and also the soil type of this woreda have common crops are extends, tiff is 44%, maize is 30%, millet is 10%, sorghum is 10% and other crops are also 5%, and the amount of livestock populations; cattle is 98,570, sheep is 16,967, goat is 41,623, donkey is 5,660, equine is 119,and camel is 115 (document in woreda Tahtay koraro office of agriculture and rural development, 2002). Thus woreda Tahtay koraro consists of 12 Kebeles and farmer's average family size is 5. The total area of the woreda is about 66,214 hectare from this total area is about 18,577 hectare is used for ploughing to produce crops and about 47,637 hectare is not cultivable for ploughing rather it uses for grazing land, cliff and very few area covered by forest (local green park) is called den which is established by the regional government in each kebele (Ibid).

Socio-Economical aspects: The livelihood or farmer of the woreda Tahtay koraro have been adopted sedentary way of life which produce different types of crops and husbandry. In addition to the above the livelihood of the society of woreda Tahtay koraro depends on private sectoral investment; that is small business enterprise. The society culture and custom depends on the traditional wearing of cloth and some wearing of modernized clothe adopted and the style of wearing or the culture is Tigrigna. Their religion or believes of most of them are the followers of Christianity and it accounts more than half of percent. There are also other religion followers such as: Muslim, protestant etc… are the main believes of the societies. After that which comes for my issues or topics, land degradation is facilitated by traditional way of cultivation of land, illegal cutting of trees and vertical ploughing are the major causes that affected to the natural fertility of the soil. Therefore, the level of the land productivity of farmer degenerated as a result increasing

of hungry, drought and also famine from time to time (Document in woreda Tahtay koraro office of agriculture and rural development, 2002).

Table 1: Acquiring product per year from 1993/94-2002/3 E.C

No.	Measurable area per hectare in a year in woreda Tahtay koraro	Acquired productivity per quintal	Expective product per quintal	Acquired quintal per hectare (%)
1	1993/94	16,534	222,319	13.4
2	1994/95	16,539	224,930	13.6
3	1995/96	16,944	203,328	12
4	1996/97	16,953	240,732	14.2
5	1997/98	18,262	285,256	15.6
6	1998/99	18,419.8	291,032.84	15.8
7	1999/2000	18,430	298,566	16.2
8	2000/2001	18,577	413,020	22.2
9	2001/2002	18,577	288,904	15.5
10	2002/2003	18,577	567,287.5	30.5

Sources: (Document in woreda Tahtay koraro office of agriculture and rural development, 2002).

According to the above table, in woreda level in 1993/94 , acquired productivity per quintal is 16,534 but the expected productivity per quintal is 222,319 or in percent 13.4, because in this year land degradation was highly expanded because of lack of awareness of the society about the use of land, in 1994/95, acquired productivity per quintal is 16,539 or 13.6% quintal per hectare, but the expected or potential productivity per quintal is 224,930 because of the expansion of land or soil degradation, in 1995/96, the acquired productivity is 16,944 or 12% quintal per hectare, but the expected product per quintal is 203,328 because of a greatly practiced of illegal cutting of trees, over grazing, over cultivation, traditional ploughing and other causes of land degradation are the main factors to reducing the productivity of the woreda Tahtay koraro, in 1996/97, the average acquired productivity per quintal is 16,953 or 14.2% quintal per hectare, but the expected or potential product per quintal is 240,732,because of some (little) awareness about the impact of land degradation, but as compared to the previous year with this year is somehow modified in terms of productivity even the problem of land degradation is here, and 1997/98, 18,262 quintal or 15.6% quintal per hectare was acquired productivity also the expansion of education about the soil and water conservation and used artificial fertilizer, but the expected productivity is 285,256. And in 1998/99, 18,419.8 quintal or 15.8% quintal per hectare was acquired the productivity because some understand from the previous year about the impact of land degradation, but the

expected productivity is 291,032.84 quintal even land degradation also here. In 1999/2000, acquired productivity per quintal is 18,430 or 16.2% per quintal, but the expected product per quintal is 298,566, because of lack of full participation about the impact of land degradation but as we compared with the previous years is the good one in productivity quintal per hectare. In 2000-2003, both are the same productivity quintal per hectare that is 18,577, but the only different the potential productivity quintal per hectare and also the percentage productivity quintal per hectare that means, 413,020, 288,904 ,and 567,287.5 and also 22.2, 15.5, and 30.5 percent quintal per hectare respectively because of the variation participation among them about the land degradation and the use of agricultural productivity, but as we compared from all of the above years the 2002/2003 productivity is high because of more practicing soil and water conservation, forest conservation and the expansion education about the land use and also used of addition artificial fertilizer into natural fertilizer and finally the output product is very good.

Research Methodology

Research design

The researcher use cross sectional case studies also known as one shot. Because cross sectional study or design is useful in obtaining an overall picture as it stands once collected the data. It is simple in design on what the researcher wants to find out, it identifies the studies population, select a sample and contact the researcher's respondents to find out the required information. It is comparatively cheap to undertake and easy to analysis.

Source of data / nature of data

The nature of data for these studies are both primary and secondary data. Primary data was obtained through designing questionnaires at local language which is Tigrigna on both close-ended and open-ended questions and fill out these questions and also translated in to English language, field observation (personal observation) and in depth interview to the development agents. Secondary data was also collected by referring from different published and unpublished sources (materials like book, journals, internet etc.)

Data collection instruments

Different methods or instruments of data collection were employed that enables to acquire reliable data to address the research questions and possible led to credible research findings. This instruments or methods mainly includes:-

Personal Observation: Personal observation is one of the sources of information uses as collecting primary source of data or information. Under this method the researcher was personally and directly observed the condition on the spot. Information obtained under this method related to what is currently happening.

Questionnaires : The research Questionnaires was employed to conduct data from the farmer's either delivered by hand to be answered by respondent or they trained interviewer was read the question to the respondents and record the answers was given.

Interviews: Interview was conducted for the development agents from each kebele by using predetermined question and standardized technique, where by respondents ask any question on the bases of his/her insight in the problem. The researcher was used these methods a primary source of data because personal information was easily gathered and also the secondary data was collected from the agricultural and development bureau.

Sample size and sample techniques

According to the statistical bureaus of woreda Tahtay koraro (2002 E.C), there are 12 Kebeles in woreda Tahtay koraro, out of these the researcher was selected only two kebele purposely to make the sampling process easy and thereby to minimize cost and save time.

The study populations are household farmers of woreda Tahtay koraro as follows;

No.	Kebeles	Male	Female	Total
1	Semema	854	372	1226
2	Kelakel	885	422	1310
Total		1739	794	2536

Source: (woreda Tahtay koraro statistical bureau, 2002 E.C).

The study population in each Kebeles are numerous in number, since it is difficult, time consuming and economically costly to integrate (or engage) the whole population in to my sample, the

researcher was selected 58 and 62 sample size from each two Kebeles (Semema and Kelakel respectively) by applying mathematical formula.

$$\text{ni} = \frac{n}{N} * Ni$$

Where:

ni: sample size of a given kebele

Ni: the total household population of one kebele

N: the sum total household population of the given Kebeles

n: the total sample size from the given Kebeles,

Which means Semema has nj=(N1/N)*n=(1226/2536)*120=58 households sample size and also Kelakel has nj=(N1/N)*n=(1310/2536)*120=62 households sample size. Hence, the researcher was generally selected 120 sample size from the two Kebeles through proportional stratified sampling techniques from purposely identified Kebeles ,due to or because of provide less cost (luck of finance), reliable to the study and also understand key informant or respondents to provide sufficient information about the topic. In addition to the above sample size the researcher was also selected one development agents (which works in agricultural office) from each of two Kebeles to solicit the necessary information in depth interview.

Methods of data analysis and presentation

After collecting the data about the topic and prospective of impacts of land degradation on agricultural productivity in the woreda Tahtay koraro The raw data was analyzed and interpreted by using descriptive analysis qualitatively (statement used) and quantitative (using statistical and mathematical formula) methods and also the raw data was presented by using the percent, tables, diagrams, graph etc.

Result and Discussion

Table 2: Major factor leads to land degradation on the study area

Numbers	Variable	Number of respondents	Percentage (%)
1	Deforestation (illegal cutting of trees)	15	12.5
2	Traditional ploughing	18	15.00
3	Over population	20	16.67
4	Over grazing	22	18.33
5	All of the above	45	37.50
Total		120	100.00

As the result of the study indicated, in the above table 2, the major factor contributed to the land degradation was from multi-factors, those factors which listed in the above tables which about 12.50% number of respondents responded that land degradation is formulated or created due to deforestation which are the people of the woreda usually cutting of trees for freely purposively and non-purposively, and the farming system is very traditional ploughing method is used. And which about 16.67% respondents answered that our arable land is degraded because of an increasing of population of the human beings and animals due to thus the land or the area is very crowded and fragmented into species of land. Population pressure on land is not a simple relationship depending on the absolute number of people and area available for farming is very complex. It means population is increasing in alarm rate with poor technology farming system is contribute for degradation of the land. 18.33% respondents said that overgrazing is refers to decrease in its capacity to support livestock, that means the number of livestock which settle beyond its capacity of land or areas. 15.00% respondents told that land degradation in our surrounding happened due to the practice of traditional ploughing which are applies farmers cleared a filed by cutting down trees and bushes several months before the rain season. They cut vegetation and kept on the ground to dry out. Then the farmers moved on to a new fields to begin again cutting, burning the vegetation cover and saw the grain such types of farmers way of living condition is negatively affects environmental degradation. According to the above table 37.50% respondents said that land degradation is intensified by multi-factors like illegal cutting of trees, traditional ploughing and

also overgrazing. In line with this, the major component that may cause reduction in productivity is the combination of bio-physical land degradation within the rhizosphere. The most important reason for increased land degradation and soil erosion in wide area are deforestation, urbanization, and intensive agricultural practice (Deresa & Legesse, 2015).

Accordingly, the combination of bio-physical land degradation within the rhizosphere is the main factor that could lead to a decrease in productivity. Deforestation, urbanisation, and intensive farming practises are the main causes of increased land degradation and soil erosion in large areas (Deresa & Legesse, 2015).

Table 3: How much land degradation influence on agricultural productivities

Numbers	Variable	Number of respondent	Percentage (%)
1	High	30	25.00
2	Less	13	10.83
3	Medium	17	14.17
4	Very high	60	50.00
Total		120	100.00

From the above table 3, 50.00% respondents indicated that land degradation exist here and mostly affects our agriculture productivity via by loss of nutrients either via soil removal (fertile soil) or from the removal of from residues and animal manure and loss of soil structure through repeated tillage and compaction due to the use of heavy machinery, and also 25.00% respondents said that land degradation is here, sometimes crop production may have harvested a good feasibility. According to the other 14.17% respondents which are land degradation on medium level and also 10.83% respondent answered that soil erosion slowly affects that productivity. in line with this, it is estimated that 2.6 billion people are affected by land degradation and desertification in more than a hundred countries, influencing over 33% of the earth's land surface in which it is severely widespread in Sub- Saharan Africa and affecting about 20-50% of the land and some 200 million people (Gebreselassie et al., 2016).

Accordingly, it is estimated that 2.6 billion people live in more than 100 countries that are affected by land degradation and desertification, which affects over 33% of the earth's land surface. In Sub-Saharan Africa, it affects between 20 and 50 percent of the land and about 200 million people (Gebreselassie et al., 2016).

Table 4: What extent soil degradation has in your localities (kebele)

Numbers	Variable	Number of respondents	Percentage (%)
1	Worst	55	45.83
2	Bad	42	35.00
3	Medium	23	19.17
Total		120	100.00

According to the above table 4, indicated that 45.83% respondents answered that the soil degradation is worst in agricultural production and 35.00% respondents said that soil degradation is constraints for feasibility farmer productivity and as well as 19.17% respondents answered that soil degradation is on medium level of the arable land. Soil erosion generally tends to increase with slope and length of the slope of the land. Soil erosion (degradation) increase sloppiness and intensity of rainfall. In arid areas where there is little or no vegetation at all winds has a great role to play in erosion and sand dune formation moreover, factor affecting soil degradation are physical factor. Intensification of land use and shortening of fallow period leads to further deterioration in soil fertility and low productivity. Low and declining agricultural production per capita leads to less income. As a result farmer's consumption likes feed malnutrition, disease and physical weaknesses and further declining in labor productivity. In line with this, Kumar & Pani (2013), soil's physical degradation affects crop growth and yield by decreasing root depth, water availability and nutrient reserves. Hence, the soil erosion vulnerability assessment is a critical activity to be adopted by planners in order to reduce effects of soil degradation on agriculture productivity.

According to Kumar & Pani (2013), soil physical degradation reduces root depth, water availability, and nutrient stores, which has an impact on crop development and production. In order to lessen the consequences of soil degradation on agricultural output, planners must implement the soil erosion vulnerability assessment.

Table 5: Is there soil and water conservation is as available option to reduce soil degradation

No.	variables	No. of respondents	Percentage (%)
1	Yes	69	57.50
2	No	51	42.50
Total		120	100

According the above Table 5, shows that 57.50% respondents said that soil and water conservation is very important for mitigating the land degradation and also 42.50% respondents said that the soil and water conservation is important in practical process of that methods is not equal to theoretical perspective. Example planting trees on some area after some months ignoring the protection of plants. Even though soil and water conservation always applied in each year but soil erosion and destruction of forest is not stopped. Moreover, destruction of the rainforest on a large scale may result in modification of the local climate, especially as a result amounts of the moisture of land reaches in dry land which puts pressure on the original inhabitants of the rainforest or those who live on its area. Producing the forestland may lead to environmental degradation by forcing shifting cultivation to adopt unsustainable farming practices (Gupta and Asher, 1998).

A large-scale destruction of the rainforest may also alter the temperature in the area, especially if land moisture levels rise in dry areas, which would impose stress on the rainforest's original occupants or anyone living nearby. By requiring shifting agriculture to use unsustainable farming methods, the process of creating the forestland may contribute to environmental deterioration (Gupta and Asher, 1998).

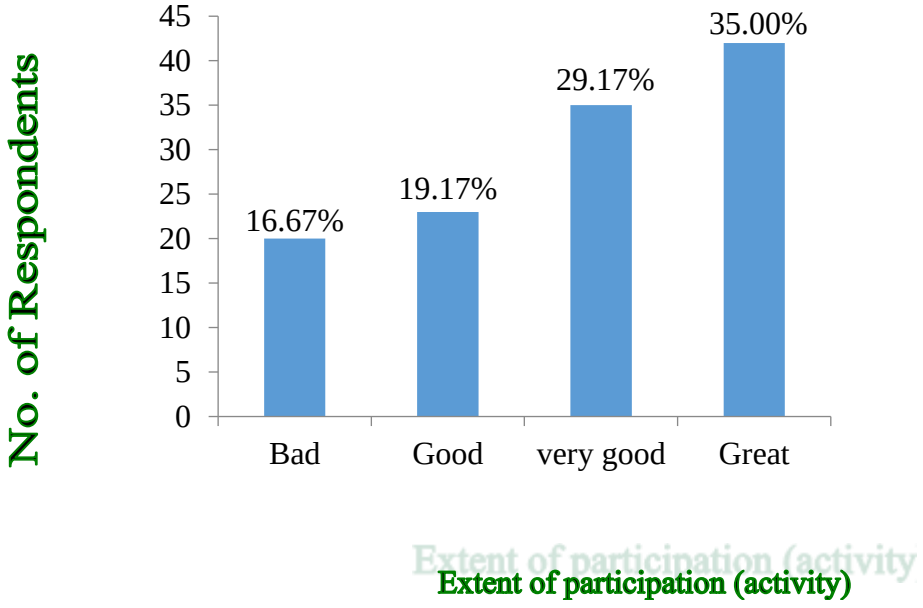
According to the respondents the way of farming system is a traditional ploughing methods caused for the destruction of dams and other terraces lands and local government should give high attention in protecting dams and plants by providing awareness about the importance of green forest in the local and employ a person for keeping the forest area. Furthermore, traditional husbandry systematic change into modern system which decrease quantitatively breeding system. It means produce cattle breeding system qualitative one and also identify the major constraints, potentials and threats of the farming and production system.

According to the respondents, the traditional farming system of ploughing caused the destruction of dams and other terraced lands. Local government should pay close attention to protecting dams and plants by raising awareness of the value of green forests in the area and hiring someone to maintain the forest area. Additionally, modern systems of husbandry that reduce the quantitative breeding system have replaced traditional systems. It entails producing a high-quality cattle breeding system as well as identifying the main obstacles, opportunities, and dangers facing the agricultural and production system.

In line with this, Conserving and restoration of natural resource with application of integrated soil fertility management, bio-physical measures, and others mechanisms are the possible solution to mitigate land degradation and enhance the crop production and productivity (H. Hurni et al., 2010).

Accordingly, preserving and restoring natural resources through the use of integrated soil fertility management, bio-physical measures, and other mechanisms is a potential way to reduce land degradation and increase crop production and productivity (H. Hurni et al., 2010).

Figure 1: the role of local government in soil and water conservation



According to the figure 1, 35% of the respondents responded that the rule of the local government in the soil and water conservation was greatly full in participation (mobilization) the people to the

work in protecting land degradation. 29.97% respondents told that local government has a very great attention to applying soil and water conservation practices and also 19.17% respondents indicated that the rule of local government has in a good condition. Moreover, 16.67% of the respondent said that the activities of local government is soil and water conservation is bad, even if the activities of local government usually working such function there is not improvement the degraded area.

As the result indicated that, farming system in the crop producing areas are highly complex and diversified and vary between and within agro-ecologies and socio-economic between condition which identify the major constraints threats to the farming and production system. For substitute for crop failure the farmer also produce animal production which are adopted the land degradation like goats, donkey and sheep. And also farmers role to reduce land degradation is important to reduce a numbers of livestock, i.e., understanding the importance of quality then quantity in a cattle in explaining the ideas even if the number of cattle increase nowadays, there is no enough food and water to those number of livestock it is inevitable to death. So the condition regulates to decrease a number of livestock in a qualitatively and also select seeds when producing crops which are harvested in a short months and adapted drought. The farmers used rainfall to harvest for irrigation of fruit and other crop production.

Table 6: response on practice of afforestation and reforestation in the localities

Number	Variables	Number of respondents	Percentage (%)
	Afforestation		
1	Yes	68	56.67
2	No	52	43.33
Total		120	100.00
	Reforestation		
1	Yes	47	39.17
2	No	73	60.83
Total		120	100.00

From the above table 6, 60.83% of the respondents responded when we cutting trees for different, there is not as such awareness about restoring or reforesting trees. Traditional cutting of natural forest for any purpose without considering the important of forest and the impact of environment because of cutting trees, Cutting trees illegally for cattle food, goats, sheep, and other domestic purpose is in evitable for decreasing forests, that is, creating of land degradation. 39.17% of the respondents told that even if reforesting activities is conducted, it is not as such replacing the cutting of trees because almost planting is not growing. 56.67% of the respondents said that in a bare land, afforestation is activities on our communities, but the common problem is careless about protecting the growing of plants when planting have taken place in the area. After seeding process finished, it is going to home without keeper of the planting. Hence, the planting is destructed by overgrazing. 43.33% of the respondents said that there is no awareness the importance of afforestation because the society is a traditional and not concerned about the environment rather the day to day consumption for their family.

According to the development agents, response that in our Kebeles, there are many peoples, cutting trees for different purpose like, boys cutting trees for goats sheep, cattle and as a satisfactory believe, women unwisely used for firewood of domestic consumption, adults for construction of house, market coal, ploughing materials, agricultural expansion. These activities and other practices makes destruction of local forests. Moreover, farming system is traditionally cultivati0on system it means when one year generate crop production in one place, the next year shift to the other place by cutting trees also to produce crop production. And also according to the development agents in arable land soil erosion is occurred by different factors. A wide range of practice is involved, all having various ramification for land erosion. Stubble burning and excessive ploughing are considered responsible for the destruction of soil aggregates in the area ploughing down the slope, lack of protection of natural drainage ways and inadequate rotation of crops are amongst the principle factor contributing to the acceleration of erosion. On the hand, rains with a high erosive potential occur during the months of June and July precisely when the seeded lands present the lowest vegetation cover. During the winter season the follow lands are exposed to significant soil loss by wind erosion, mainly due to the low bulk density of the soil. Cultivation practices frequently result in land degradation when insufficient care is taken. It is well known that the deeper the ploughing the more extensive the more damage to the soil structure and compositions. Things are worst when ploughing practiced in down slope instead of a long the

counters. Erosion risk is especially high in areas cultivated with rain fed cereals for one or two months after sawing winter cereals the land remains almost bare and rains of high intensity (coacher and sala, 1998).

According to respondents of development agents responses are mobilizing farmers to construct check dams and awareness creation about how to use land and suitable environment for modern agricultural practices and also done in afforestation, keeps their own cattle in the home and provide to them by cutting the grass from their own land.

Conclusions

Unwisely used and over using of crop lands and forests accelerated by recurrent climatic variations have greatly affected the highlands. In woreda Tahtay koraro particularly in those areas where rainfall is scarce is severely degraded mainly due to loss of soil by water erosion. Losses of soil by erosion ultimately reduce the productivity of soil by adversely affecting soil nutrients, infiltration of water and air in to soil and soil water holding capacity. The effect of soil losses on productivity of curse depends on land use type and land use management. Loss of soil by water erosion in the study area not only threatens productivity in the short term but it also threatens long term productivity. Generally, although the rapid increase in population calls for an increase in crop production. Productivity of most of the originally fertile land is significantly deteriorating from time to time and it is a serious problem particularly in the low rainfall areas which is leading the land to land degradation. The continuous unwise use of the natural resources (both soil and vegetation) coupled with climatic variation is accelerating the land degradation to the point of zero economic return by reducing the fertility and reducing depth of soil and by changing the species composition of pasture lands, since the use of natural resources in the peasants still lack of proper management. This study has tried to show some of the impacts of the land degradation on agricultural productivity and their relationship between land degradation and productivity. There is no single cause for the degradation of land there are a number of entreated and interconnected reasons. Some of the reasons directly affects land degradation on agricultural productivity. Some of them affected also indirectly, still others do both ways. Most of the findings here confirm with the hypothesis. Some of the findings are different and even contradictory with what others scholars provide information on the issue. Most of the factors affecting land productivity is similar with those scholars have written on the problem of land degradation understanding about the need for

increased effort to improve resources management has grown and its extreme urgency also has become clear among both the central government and the most concerned local government.

Accordingly this study, although data are scarce soil conservation practices are being implemented in different parts of the woreda Tahtay koraro. Out of them Kelakel is the most important example where extensive soil erosion highly practices are carried out. And also highly practiced irrigation in Semema kebele because of the change of awareness of the society.

These modern conservation methods however are not fully accepted by the peasants. Since there is shortage of land the application of the structural conservation methods in most area of the Tahtay koraro. Due to the disappearance of vegetation cover, intensive cultivation, cultivation of slopes and marginal lands, soil loss by water erosion is a major problem on the north-west of Tigray, in which millions of tons of fertility top soils. Largely from crop lands are lost annually. As a result a considerable amount of fertile lands have been changed bed rock. In spite of such serious problems of land degradation due to soil loss by water erosion, modern conservation methods are not well adapted due to lack of awareness, resource, financial and economic performance. Generally, the north-west of Tigray, particularly the lower rainfall areas are experiencing one of the severest degradation of land in Ethiopia which leads the land to desertification.

If the present conditions of soil loss and deforestation continue, unchecked land degradation will be more serious and stress and human suffering will be high. The major types of conservation methods used in Tahtay koraro are vegetative methods and structural measures vegetative measures employed either by planting trees on degraded slopes or by closing them from human and animal accessed for natural regeneration. Structural methods on the other hand including the planting of grass strips, construction of soil and stone bands on slopes and construction of check dams on gulley’s.

Recommendations

Based on the major finding of the study, the researcher provided useful suggestions were recommended. Awareness about the extreme urgency of natural resource conservation should be increase both among government officials and the farmers, the people as a whole.

- The existing crop lands are being used intensively, steeper slopes and marginal lands are cultivated due to the increasing demand for crop lands to feed the rapidly growth population. Hence the present rapid rate population growth should be reduce (decrease the growth rate of population) in order to minimizing the impacts of land degradation on agriculture productivity.
- Incentives such as training and motivation should be given so that the farmers may be encouraged to improve and protect their land from erosion.
- Local government should give high attention to natural resource conservation as well as agricultural production by providing training on the field, financial supports and public participation should also be increased.
- Water and soil conservation strategies should be done particularly via the construction of soil and stone bands mountains and construction of check dams point on a gulley's of land and water management knowledge by skillful means, with the goal of protecting soil resource from exploitation, destruction arable lands.
- The development agents give attention the advantage or the important of the reforestation and afforestation towards or in order to reduce the impact of land degradation on agricultural productivity.
- Other measures, apart from agricultural productivities should be created by which peasants can earn their livelihood so that the pressure on land may be reduced.

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