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Land Degradation and Community Response to Environmental Management: The Case of Wayu Tuka Woreda, East Wollega Zone, Oromia, Ethiopia

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Abstract

Background: In Ethiopia, land degradation is a common environmental problem. Land Degradation is a critical issue resulting from prolonged soil erosion, deforestation, and farmers' lack of awareness of its impacts and of environmental management. With a growing population and global climate change, the problem is exacerbated, and communities are suffering from food shortages and famine. There is limited information on the impact of land degradation and the Community Response to Environmental Management in Wayu Tuka Woreda, in general, and in Kebele in particular.
Aims: The study aimed to examine land degradation and community responses to environmental management in the Wayu Tuka district of the Oromia region.
Methods: Primary data were collected using a household survey. Secondary data was collected from materials like published books and unpublished books. The collected data were analysed using descriptive statistics, such as means, frequencies, and percentages, and qualitative data were analysed using narrative and explanatory methods. The survey data were collected from 350 sample respondents through interviews. The study identified the following as the main causes of land degradation: deforestation, population growth, overgrazing, and lack of awareness.
Result & Conclusion: The respondents pointed out that lack of awareness and knowledge of land degradation and Causes of Land Degradation deals more deforestation; overgrazing, population increase and lack of awareness are the major causes for land degradation. And the soil conservation mechanism that is available in study area was traditional method of soil erosion mitigation which is filling the sack with soil or crop residue to protect the soil erosion in bar and step slop farmland.
Generally, findings from the study recommended that the government should introduce an effective forest conservation mechanism through public participation to inform everyone about the effectiveness of conserving the forest and to design appropriate land use policy and strategy to protect the land from degradation and community response to environmental management, to recommend to farmers and local government agents how to curb the problems.

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1. Introduction

Ethiopia is among the poorest countries, and land degradation has harmed its inhabitants. This physical deterioration of its area had left millions of its population in doubt about how to live

harmoniously with nature and manage their livelihoods smoothly. The land deterioration observed in early settlement areas of the north appears to be recurring in the rest of the country as a recent phenomenon. Areas abandoned or managed at low levels of productivity affect 20-50% of the land and some 6 - 11 million people each year. Still, land degradation lingers and presents the greatest threat to the survival of the nation (Hurni, 1996).

Presently, in Ethiopia, a land-use policy prohibits farmers from using such lands, but it is not implemented (Eyasu, 2003). Several factors, including poverty, land fragmentation, and high human and livestock population pressure, act as indirect drivers of land degradation. Human and livestock burdens lead to a significant reduction in vegetation cover to meet increasing demand for crops, grazing, and fuelwood.

Land degradation, driven by soil erosion and deforestation, impedes agriculture and threatens rural livelihoods in the country. Blaikie & Brookfield (1987). as cited in Bekele and Draike (2003), emphasises that Ethiopia is the world's most severely affected area by soil erosion. Due to land degradation in most developing countries, particularly in agriculture, productivity declined dramatically and fell below the household subsistence level (Kirui & Mirzabaev, 2014). Both the extent and the severity of the problem of land degradation vary spatially and depend on different relief, ecology, rainfall, land use, land cover, and soil types, which are proximate and underlying causes (Ayalnen, 2003). About 40- 75% of the world's agricultural land's productivity is reduced due to land degradation (Baylis *et al.,* 2012; UNCCD, 2013). Land degradation has negative consequences for agriculture (Olsson *et al.,* 2005). Addressing the root causes of the reinforcing cycle of declining crop and livestock productivity, natural resource degradation, high population growth and vulnerability among vast numbers of resource-poor farmers is crucial.

Challenge facing Ethiopia today (Alemneh, 2003). Therefore, understanding the current status and causes of land degradation is very important (Kirui, & Mirzabaev, 2014). The current "Intensified Package Approach" has overemphasised production at the expense of economic, social, and environmental sustainability (Alemneh, 2003). Sonneveld (2002) simulated several scenarios for potential agricultural production in Ethiopia. Sonneveld (2002) found that the loss of agricultural value due to land degradation between 2000 and 2010 was about $7 billion (an increase of about 12.62%). These previous studies relied on crop simulations with very limited data on farms and farming practices and measured only the direct yield-cost of soil erosion. Moreover, the wide range of estimates reflects substantial uncertainty of the impact of land degradation on agricultural production.

However, they do not depict the extent of land degradation or the community's response to environmental management in Wayu Tuka Woreda, Oromia Regional State, Ethiopia. This study examined land degradation and community responses to environmental management in Wayu Tuka Woreda, Oromia Regional State, Ethiopia. *The novelty of this study lies in its examination of both land degradation drivers and community environmental management responses at the local level in Wayu Tuka Woreda, Ethiopia, highlighting indigenous soil conservation practices and awareness-related challenges that have received limited attention in previous studies.*

2. Method

2.1 Description of the Study Area

Wayu Tuka is one of the districts of East Wollega, which is located in the Northern part of the zone. Today this district is sub divided into 10 kebeles and two urban centers for all its administrative purposes. Wayu Tuka is one of the historically known districts where the Italians invaded the area after 1935 and established their own ruling system. As a result, about 300 Ethiopian patriots had fought against their foreign enemy in Guto Wayu previous name of the district at the place called Bonaya, where many Italians were killed and some airplanes were burnt. Thereafter, Wayu Tuka was established as district and ruled under the local governors known as 'AxibiaDagna' during the Emperial Haile Sillasie of Ethiopia.

Finally, the district was departed from the previous district name Guto Wayu in 1998 E.C and today Wayu Tuka district has its own separate administrative power. Gute is the capital town of the district located at a distance of about 12 kilometers from the zonal capital of Nekemte. WayuTuka is among the 18 districts of East Wollega zone that has10 farmers associations and two urban centers

possessing a total area of 404.277 square kilometers. Wayu Tuka district is contiguous with Sibu Sire in the North and East, Nunu Kumba and Leka Dulacha in the South, and Guto Gida in west.

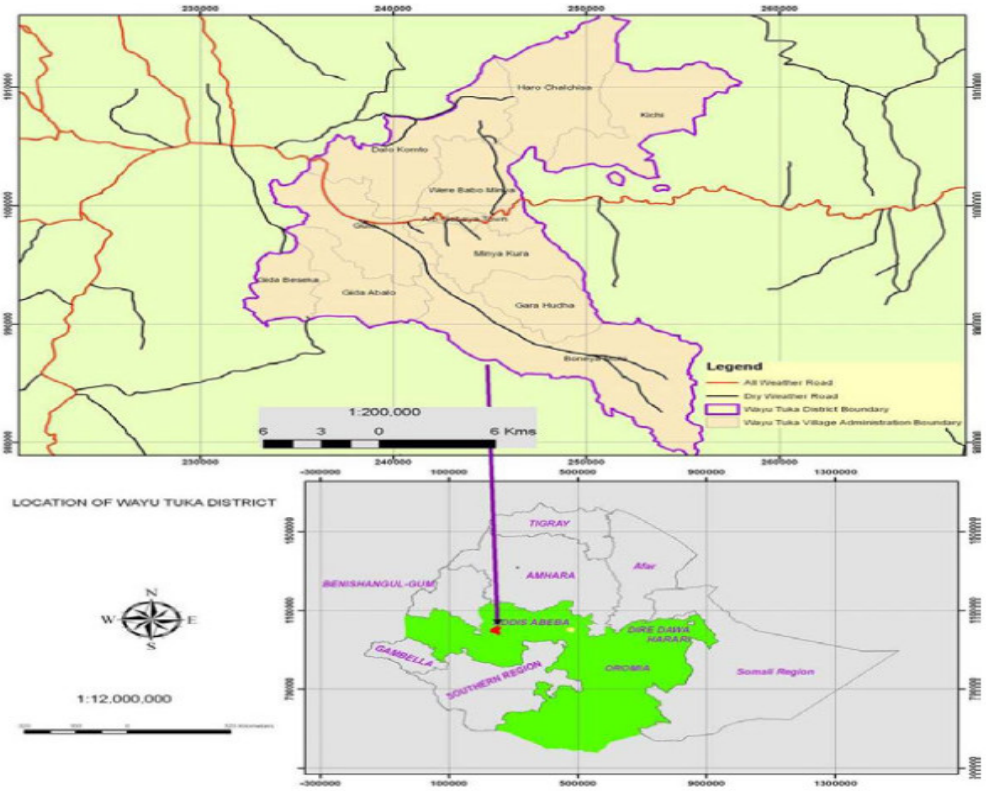

Figure 1. Map of the Study Area
Source, WTAO (2013)

2.1.1 Topography

This district is divided into three distinct geographical areas with different proportions; namely the high land 37.66 percent, midland 49.22 percent & the low land 13.12 percent which is very small part of the district. Wayu Tuka area land features which is characterized by its full of ups and downs land feature with some hills and mountains. Komto, Chalchis, and Gordomo mountains with 2350, 3350 and 2800 meters above sea level respectively. Moreover, the district is varied with different elevations (altitudinal ranges) hills, ridges and mountains were found in the districts.

2.1.2 Drainage

Wayu Tuka is endowed with numerous streams and rivers such as Beseka (5000m), Alaltu (4000m), Fite (3500m), Gibe (7000m), Wachu, Adiya, Tato, Oda and YayaJabo which are permanently flowing throughout the year. Since the district is situated at an altitude range from 1300 to 3140 meters above sea level with various topographic landform of 1200 plateaus, 2350 hills and 3350 mountain meters above sea level.

2.1.3 Climates and Temperature

The district has a dominant climatic condition of a sub-tropical type. As a result, this area is experienced mean annual temperature of 250c and 350c and means annual rainfall of 1400mm to 1800mm of minimum and maximum respectively.

2.1.4 Soil Types

The major soil types and spatial coverage of the district are clay loam 50 percent, sandy 20 percent, loam 20 percent and clay 10 percent which is suitable for agriculture for Cereal crops, such as Maize, Sorghum, Teff and others production in the district.

Table 1. Major types of soils in the district

Soil Type	Spatial coverage (in percentage)	Suitability for agriculture
Loam	20	Best
Clay loam	50	Medium
Silt sand	20	Low
Clay	10	Low

Source: Woreda Agriculture Office.

2.15 Vegetation and Wild Life

Previously the district was highly covered with dense forests and bush land. Today the district has natural and manmade forest which is today found under the savoir condition. Now a day the natural high forest and woodland with area coverage of 218.25hectare and 105 hectare respectively needs close control in order to save for future ecological balance for the surrounding. These forests are also the home for different wild animals including very attractive seasonal birds, which are not found in areas where there is no forest. Deforestation is highly practiced by the local farmers through which they gain an income by selling charcoal, firewood and different lumbering materials. The greatest portion of fuel wood consumption of the capital town neighbor district GutoGida (Nekemte) has obtained from this district, in which the major areas in the district where fuel wood possibly comes at large to the town is expected from these forests. Major types of wild animals found in the district are Hyena, pig, Monkey, Ape, and etc.

2.1.6 Population

Wayu Tuka is one of the recently departed districts from the previously known district Guto Wayu in1998 E.C. Based on the 1999 E.C population and housing census result is the base of population projection all over the district. Based on this census result, the population of Wayu Tuka district is projected to be 78640 with 8.4% percent urban population in 2005 E.C. From the total population in the district 91.6 percent is the rural population, which directly sustains his life and the neighboring urban dwellers by the agricultural and similar activities.

Table 2. Total populations projected Based on 1999 population and Housing census for the year 2004-2005

Year (E.C)	Rural			Urban			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
2004	31,976	33,954	65,930	3,592	3,815	7,407	35,568	37,769	73,337
2005	36,447	35,527	71,974	3,077	3,589	6,666	39,524	39,116	78,640

Source: Health Office Wayu Tuka (2013)

2.1.7 Agriculture

The Agricultural Development Led Industrialization (ADLI) Strategy is among the pillars of Sustainable Development and Poverty Reduction Program (SDPRP). In order to accelerate and expand industrial development and increase overall economic growth, it is essential to develop the agricultural sector which is crucial to ensure the provision of inputs for industries as well as to fulfill food requirements.

Thus, Wayu Tuka district is sub divided in to 10 farmers associations having a total of 11,169 male, 1567 female and total 12,736 members of farmers association and with 39,524 male and 39,116 female and total 78,640 of farmer's member families in the district. At the end of 2005, a total of 37 Development Agents (DAs) were trained through the agricultural Technical Vocational Education and Training (TVET) initiative which is designed to train DAs and farmers in leadership skills. Assisted by DAs, several farmers were trained and encouraged to shift to small-scale modern farming practices.

2.1.8 Crop Production

Major crops produced in this district are cereals under private peasant holdings in the Meher season of agricultural calendar. The Performance of this sub-sector in the past two years indicate that the area covered under different crops shows an annual increasing trend and the total production obtained in 2004 is better than that of 2005 production.

Table 3. Area cultivated for major crops under private peasant holdings and production obtained in the year 2004-2005 E.C

No.	Crop type	2004		2005	
		Area (ha.)	Prod. (qt.)	Area (ha.)	Prod. (qt.)
In'meher''season					
	Maize	2,080	126,804	2,622	181,994
	Sorghum	1253	16935	1,202	37,262
	Teff	1953	27964	1,980	33,439
	Wheat	1933	74956	1976	67263
	Barily	607	8455	550	9542.5
	Millet	1052	18484.5	956.15	15,489.5
	Ote(aja)	133	1184	89	1398
	Fabor bean	533	5388	491	8293
	Beans	156	1200	129	1899
	Soy bean	310	3380	8	145
	Niger seed	1225	3700	1430	10730
	Sesame	98	646	93	755
In'belg ''season		0	0	14	217
	Haricot bean	0	0	194	3990
	Rape Seed	0	0	179	2846
	Chick pea	0	0	5	24
	Total	11,333	289,096.5	11,918.5	375,287

Source: Wayu Tuka District Agriculture and rural development office.

2.1.9 Livestock

Livestock play a key role in day-to-day life of the society, especially in the peasant sector. They provide meat & milk, transport, manure, skin & hide & furnish regular & easily realizable cash income. But in contrast to the size of the livestock population, physical & value productivity are low. The following table indicates the size of livestock in the district.

Table 4. Livestock population

Year	Cattle	Sheep	Goats	Mules	Horses	Asses
2004 E.C	67,220	17,320	8,419	745	4,185	3,580
2005 E.C	67374	19120	8800	1050	5800	4800

Source: Wayu Tuka district Livestock Development, Health and Marketing Office.

2.1.10 Mining

Mining is the process of extracting useful minerals from the surface of the Earth, including the seas. One of the economic activities with the great role in economic development of a nation is mining. The basalt stone, mineral used for construction was among the minerals found in the district and it was found with 2,470,000 ton in which 3,038 ton was produced by the year 2005 E.C. This mineral was found in D/Komto, B/Molo, G/Jimata, W/B/Migna, G/Basaka, M/Kura, H/Chalchis, and G/Badiya peasant association.

2.2 Research Design

Descriptive method is used for this study. The research utilizes both quantitative and qualitative methods to clarify concepts, characteristics, descriptions, counts and measures to demonstrate

implications of the examine land degradation and community response to environmental management in Wayu Tuqa district in Oromia region. Data present in the study is obtained from primary and secondary sources. Primary data is collected directly from respondents using questionnaires, interviews, focus group discussion and personal observation, Secondary data is collected through related documents.

2.2.1 Target Population

This part presents the total household heads in the target kebeles in Wayu Tuka catchment. The District encompasses ten kebeles from rural (Haro, Walane, Dalokomto, Warababomigna, Migna kura, Garahuda, Bonayamolo, Gidaabalo, Gidabasaka Gutebadiya and two kebeles from town Gute 01 town, Gabajimata town). From these target kebeles are walane, Dalo komto and 01 kebele from Gute town. The study population is the list of all household heads in the selected kebeles. There are 936 household heads in walane, 933 Dalo komto and 931(01) kebele from Gute town kebele. The total household head in the target kebele is 2800 the reason for the selection of these kebeles is there is severe land degradation in those areas. This is because of the fact that households in these kebele face the problem of land degradation. So it is important to focus on these households in order to understand the examine land degradation and community response to environmental management.

2.2.2 Sample Selection and Sampling Technique

The main objective of this study was to examine the impact of land degradation and community response to environmental management in three selected kebeles Depending on total population size and total number of farmers' kebeles of the study area the most appropriate techniques of sampling design will be employed. For the selection of farmers' kebele administrative unit and household head, researcher will use three steps.

In the first step researchers will classify 12 kebeles in the woredas' into geographical location of the kebeles namely Dalo komto from north, walane from west and 01 kebele from the center of woreda. Then, researcher was select three kebeles from each location purposefully. Those kebeles was being selected on the basis of their vulnerability to the issue under study in woredas'. The next step will be selection of key informants' persons from farmers and kebeles Development Agents for interview and focus group discussion. The total household head in the target kebele is 2800 the reason for the selection of these kebeles is there is severe land degradation in those areas. Samples were taken from each kebeles considering household head sex (male and female).

2.2.3 Sample Size Determination

To take sample, we always have a stage if deciding a sample an appropriate sample gives high precision, accuracy and confidence with the minimum cost. In order to have the optimum sample size, there are a number of issues and points one has taken into account, by applying by the Yamane's formula(Yamane.T,1967)

Formula of the sample size n=N/ (1+Ne2),

Where n= sample size
N= population size
e= level of precision (usually represented by (0.05)

Thus, n= $\frac{2800}{1+2800(0.05)2} = 350$

n=350 samples HHs was selected for the study from the total lists of Kebele HH

3. Results and Discussion

3.1 Age and Sex characteristics

Out of 350 surveyed household heads, 200(57%) are male while the remaining 150 (43%) are female respondents. The majority of the respondents are male households in the study area.

Table 5. Composition of Sampled Households by Age and Sex

Age	Sex				Total	Percentage	valid
	Male	%	Female	%			
Adult (18-34 years)	65	19	44	13	109	32	32
Elderly (35-50 years)	82	23	70	20	152	43	75
Old age (>51 or greater than 51 aged)	53	15	36	10	89	25	100
Total	200	57	150	43	350	100	

Source: surveyed Data (2021)

As displayed in table 5, 43% of the households were grouped under the age category of 35-50 years and 25% of the respondents were above 51 years old and 32 % of the households were grouped under 18-34 years. The result implies that the majority of the respondents were located in 35 -50 years age category. This indicates that large numbers of population in the woreda is found in productive age group farmers and they have better understanding of problems of soil erosion due to their long farming experience. Moreover, the younger groups who are more active and interested in soil and water conservation in the study area.

3.2 Marital Status and Family Size of the Respondents

Table 6. Marital status of the respondents

No	Category	frequency	percentage	valid
1	Married	259	74	74
2	Single	32	9	83
3	divorce	23	7	90
4	widowed	36	10	100
	Total	350	100	

Source: Field survey (2021)

As shown in the table 6, out of 350 the total sample respondents, 74% were married, 9% were single, 7% were divorced and 10% of the respondents were widowed. The Majority of the respondents were (74%) have got married. However, change in the distribution of marital status has important impacts on the size and structure of the families and households.

This agreed with the findings of Baylis *et al.,* (2012) that farmers' marital status has a strong relation with the perception of the existing environmental degradation. This shows that ever married farmers had better perception for land degradation effects than their never married counterpart.

Table 7. Household Family Size of the Respondents

Family Size	Frequency	Percentages (%)
1-3	92	20.
4-6	99	31.6
7-9	103	36.7
10-12	38	8.3
≤ 13	18	2.5
Total	350	100

Source: Field Survey (2021)

Therefore, most of the household in the study area have the large family members because of marrying two or more wives as a result of cultural and religious practices and the family planning practices are not well developed in the study area. So, farm households have a large number of children who are less than 15 years. Hence, owning large family size has great effects on land

resources (may be over cultivation of limited land resource and deforestation for arable land expansion for rapidly growing population) in the study area.

3.3 Educational Status and Land Size of the Respondents

The first variable that is considered as independent variable is educational status of the respondents. It is expected to have significant positive influence on awareness of land degradation cause and effects and the land management practices due to its impact in raising the level of farmers' awareness and improving their planning horizon. According to table 8, Out of 350 sampled respondents 29% of them were illiterate, 36% of them were attended grade 9 to 12, 17% of the respondents were diploma holders and the left 5% of them were master's degree holders in the study area. The study implies that majority of the sample d respondents were attended their education up to grade 9-12 grade.

Table 8. Respondents Distribution by Educational Level

Educational status	No of respondents	Percentage	valid
Illiterate	45	13	13
Elementary level (1-8)	100	29	42
Secondary level (9-12)	125	36	78
Diploma and above (12+3)	60	17	95
MA holders	20	5	100
Total	350	100	

Source: Field Survey (2021)

This indicates that farmers in the study have low level of education that affects their awareness and access to information on land and other natural resource degradation since adequate education enhances farmers' level of soil or land degradation awareness and their management practices. Besides, longer education leads to a better understanding of the new technology by assessing the different extension materials, which increased the continued use of soil and water conservation technology. However, according to the opinion survey of interviewed sampled households, all the respondents have the knowledge of soil erosion regardless of level of education. This shows that soil erosion is a well-recognized problem within the area.

Table 9. Land Size of the Respondents (ha)

Category	Frequency	Percentages
≤ 0.5	138	39.4
0.51-1.00	87	25.1
1.01-1.50	70	14.1
≥1.51	55	4.5
Total	350	100

Source: Field Survey (2021)

Table 9 indicates land holding size of households. The result also shows that average land holding size per household was 0.7. But more than half of them have holdings less than 0.5 hectare. Thus, most of them are small-scale farmers who repeatedly over cultivated their land as a result of land shortages. Moreover, lands are sub-divided and fragmented into a number of small pieces of plots for food crop and cash crop (coffee and chat) production. Survey results indicate that the sample respondents grow a variety of crops which include maize, teff, wheat, barley and cash crops like coffee. Maize and wheat which are the major staple crops are grown by the majority of the respondents.

3.4 Knowledge of Land Degradation

Awareness and knowledge of land degradation may be determined different demographic and socio-economic characteristics of the farmers. But according to the interviewed sampled farmer households, all the respondents have awareness of existence of soil degradation regardless of their sex, age, marital status, level of education, and farm size. Therefore, land degradation is the main local problem affecting the farmers' livelihood in the study area.

Table 10. Knowledge of Land Degradation of the Respondents

Knowledge of Land Degradation	Frequency	Percentages (%)
Yes	350	100
No	0	0
Total	350	100

Source: Field Survey (2021)

The sampled households were asked to describe whether or not they were aware of the existence of land degradation. Irrespective of their gender, age and educational level, all the respondents had awarded the existence of land degradation on their own farmlands. Households understand land degradation problems when they face the challenge such as soil erosion, decline in land productivity and crop production (Table 10). This shows that land degradation is a well-recognized problem in the woredas' and the farmer's has greater awareness of this problem. But according to the interview conducted with Woredas' Agricultural Development and Land and Environmental Protection Bureaus and Development Agent (DAs) in three sampled kebeles, farmers lack of awareness about the causes and consequence of land degradation in the woreda is other causes of soil erosion.

3.5 Causes of Land Degradation

The responses of many household farmers on the causes and effect of land degradation in their fields were nearly comparable. However, they responded differently on the methods of soil conservation and land management practice on their farmlands. As noted by many farmers, the most important causes of land degradation in the study area is deforestation, soil erosion by water (flood), overgrazing, population growth, over cultivation, ragged topography, and absence of fallowing and soil conservation measures for a long period of time. Similarly, larger proportion of surveyed farmers in kebeles explained the decline of crop production; seasonal shortage of food; poverty and environmental changes are the main consequence of land degradation in the study area.

Table 11. Causes of Land Degradation

Causes of Land Degradation	Frequency	Percentages
Deforestation	56	20
Soil erosion	45	16.77
Poor farming practices	40	13.54
Over cultivation	38	12.25
Absence of soil conservation measures	34	9.67
Over grazing	32	8.38
Population growth	30	7.09
Rugged topography	29	6.45
Others	24	3.2
Not Aware	22	1.9
Total	350	100

Source: Field Survey (2021)

Table 11 shows respondents' awareness of the causes for land degradation problems. The result indicates that deforestations and soil erosion are the main causes of land degradation in the study area. As indicated in the table 11, deforestation, soil erosion, poor farming practice, over cultivation, absence of soil conservation measures, over grazing, population growth and ragged topography which accounts 20%, 16.8%, 13.5%, 12.3%, 9.7%, 8.4%, 7% and 6% respectively, are among the major causes of land degradation. However, 3.2% of the respondents replied to other causes of land degradation whereas 1.9% of the respondents are unable to identify the causes of soil degradation of their lands. This shows that, the problem of land degradation in the study area is caused by deforestation and soil erosion.

In relation to this, the study conducted by (Assefa *et al.,* 2017) indicated that there are multiple interacting forces, which have caused and are causing land degradation in Ethiopia. According to Assefa et al. (2017) these proximate causes include clearing of woodlands and forests, unsustainable arable farming techniques, the use of dung and crop residues for fuel and overstocking of grazing lands. Thus, the responses of the households as to the causes of land degradation is in line with studies conducted by Baylis *et al.,* (2012), who report that the most frequent cause of land degradation stem from excessive human pressure or poor management of the land, overgrazing, over-cultivation of crop land and deforestation. According to Wayu Tuka Woreda Agricultural Development Bureau (WTWADB, 2012) the woredas' forest coverage has declined to 5% because of continuous clearing of forest for expansion of arable land. This exacerbates soil erosion by water and wind through the fertile topsoil depletion from land resources and through extinction of plant and animal species that maintain the soil fertility of the land.

On the other hand, 13.5% and 9.7% of the surveyed household respondents are indicated poor farming practice and the absence of soil conservation measures are the primary causes of land degradation in study area. This implies that farmers fail to practice methods/techniques such as fallowing, crop rotation scheme, and inter-cropping, mulching and using manure on the farm fields. The farmers plow their land across the slopes thus exposing the soil to rill and gully erosion. They lack the facility to employ appropriate improved farming technologies. In line with this, the response of household to the causes of land degradation is supported the finding of Gebremariam, (2010), who states that, a continuous cultivation of the land without any improvement in land management and farming practice have led to severe soil erosion. It is widely believed that land degradation is mainly caused by unscientific cultivation. Thus, poor farming practice as causes of land degradation is deals with the specific techniques of farmers' ways of plowing their crop lands.

In addition to this, the result of interviewed households shows that over cultivation (12.5%) and population growth (7%) as the main causes of land degradation. According to the responses of the surveyed household farmers, productivity loss of land is caused by continuous over cultivation of arable land without any soil fertility management a long period of time. The participant of FGD confirmed that fallowing was nearly absent due to land shortage and the increased continuous cropping and the absence of fallowing for soil management that caused for land degradation. As such, over cultivation is happening and has eventually leads to land degradation as limited land is being used by ever growing population in the study area.

In addition to the response obtained from household survey, the participants of FGD have confirmed that the high population growth in the study area resulted in land fragmentation and decrease in size overtime. According to the findings of FGDs, population is a triggering factor which initiates other causes of land degradation as it resulted in deforestation, expansion of farming to marginal areas and grazing lands. As they reported, due to absence of diversified economic system, and lack of other means of acquiring land, nowadays sharing parents land become the most important way for newly formed households. Thus, as stated by (Aklilu, 2001) a growing population on limited land resources often leads to a division of land into smaller pieces of land in the inheritance process. As such, rapid population growth could be the major cause of land degradation which leads to an increase in the demand for crop and grazing land, wood for fuel and construction.

Similarly, 6% of survey household responded that ragged topography as the major causes of land degradation since the topography of the study area is characterized by mountainous and steep slope that is naturally vulnerable to soil erosion. In other words, the information obtained from key informant interviews revealed that more than half of the farmers are cultivating erosion prone areas.

It was revealed that there are some sloppy areas that shouldn't be under cultivation due to their nature but are now coming under cultivation due to population pressure. The farmers have been forced to cultivate the sloppy lands due to their survival. This is a major challenge that seems to exacerbate land degradation.

3.6 Consequences of Land Degradation

Land degradation is one of the major causes of declining agricultural productivity and continuing food insecurity and rural poverty in Ethiopia. It is a severe problem that resulted in natural capital asset depletion, drought, environmental and ecological imbalance. Land degradation in the study area is high and it is well recognized by the farmers. Regarding the impact of land degradation in the study area, the study respondents expressed that land degradation is seriously affecting the livelihood of rural farming local community.

Table 12. Response to Consequences of Land Degradation

Consequence of Land Degradation	Frequency	Percentages (%)
Loss agricultural productivity	63	23.8
Shortage of food and famine	57	19.3
Decline of soil fertility	51	15.4
Poverty and economic backwardness	43	11.6
Desertification or climate changes	38	10.3
Increase the requirement of fertilizers	33	7.09
Loss in livestock productivity	35	5.8
Migration	30	3.2
Total	350	100

Source: Field Survey (2021)

The consequence of land degradation was ranked according to the response of the farmer households. The concern was that the consequences of land degradation on their lives, respondent households were also requested to describe the possible negative effects of land degradation as well. Table 12 shows that the respondents' responses to the effects of land degradation in their locality. Accordingly, the results opinion survey indicated that all of the respondents have understood the negative impacts of land degradation livelihoods.

As provided in table 12, out of the total interviewed household farmers responded that loss of agricultural productivity, shortage of food and famine, poverty and economic backwardness, desertification or climate change, increased requirement for fertilizers, loss of livestock productivity and migration which accounts 23.8%, 19.7%, 15.4%, 11.6%, 10.3%, 7%, 5.8% and 3.2% respectively, are the prime negative consequences of land degradation that adversely affecting their lives. This shows that the highest proportion of the respondents are assuming loss of agricultural production and shortage of food and famine as the main negative effects of land degradation on their lives. This implies that farming communities are facing the reduction of food crop production that caused for seasonal food shortage or famine in the area. Other than this as indicated in the table 12 above, more than fifty percent of the respondents are described poverty and economic backwardness, desertification or climate change, increased requirement for fertilizers, loss of livestock productivity and migration as the major consequences land degradation on lives of rural farming population in the study area.

Considering the effects of land degradation on agricultural production, household farmers were also asked whether the productivity of their land is increasing or decreasing. The result indicated that 81.9% of the respondents argued that currently their land productivity is decreasing. The remaining 11.1% and 7% of the respondents reported that their agricultural productivity of land is fluctuating and increasing respectively. This shows that the overall effect of land degradation means a loss of agricultural productivity directly affects the livelihoods of the rural population with in the area. Similarly, the participants of FGD three selected kebeles explained that, due to soil erosion land becomes out of cultivation and this leads to hunger and consequently to poverty. They said this

resulted from continuous clearing of forests for agricultural land expansion for growing population and inappropriate farming practice for long period of time in the area.

Regarding the consequence of land degradation, discussions were conducted with members of FGD and key informant interviews to ensure or cross check the results of household survey and to explore what they know or think about the research problem. During discussion, they agreed that loss of agricultural productivity, shortage of food and famine, decline of soil fertility and migration as the consequence of land degradation. They linked changes in the environment such as increases in daily temperature, and decreasing rainfall and the erratic nature of rainfall, to a decline in availability of trees. According to the views of the members of FGD, collecting water for drinking presents a further challenge and they are forced to travel long distances to get wood for fuel. Therefore, as to they argued, land degradation reduces and ultimately depletes soil fertility resulting in failure in crop production, damaged land and ultimately land with no productive potential.

In relation to change in environmental conditions, they confirmed that they had observed changes such as a decrease in vegetation cover, with a decline in soil fertility as a result of soil erosion. In general, the situation they find themselves in now, when compared to the time when most of them were young, has deteriorated. Now it is very difficult to make a living because there are a whole range of new problems including serious reduction in soil fertility and frequent crop failure. And they recommended that all stakeholders (farming communities and government at all levels) has to work together in collaboration to enhance the already started nationally environmental rehabilitation programs and other livelihood strategy has to be applied.

3.7 Soil Conservation Measures for Land Management

The current pressure on land is already recognized and land degradation becomes a problem of the people in the study area. There is a general understanding that the better the farmers perceive problems of land degradation, the better they can act to achieve sustainable land management practices.

Table 13. Response to Knowledge of Soil Conservation Methods

Responses	Frequency	Percentages (%)
Yes	222	80
No	128	20
Total	350	100

Source: Field Survey (2021)

Table 13 shows the respondents awareness of land management practices. The result indicate that out of the total interviewed households the highest percentage (80%) of the respondents indicated that they have their own traditional knowledge of soil conservation measures of their farmlands (Table 13). They practice a short-term benefit-oriented soil fertility management and long-term benefit-oriented land resource management activities. This shows that, farmers at individual level practice different land management activities mainly to increase agricultural yields of their plot of land in the study area. But as indicated in Table 13 few (20%) of the respondents reported that they don't know any methods of soil conservation for soil fertility managements.

3.8 Soil Conservation Measures for Land Management

Table 14 shows the respondents measure of soil conservation for land management practices. The result indicates that not all interviewed households have traditional knowledge of soil fertility managements. But most of the respondents' reported that they are aware of and using tree planting, contour plowing, terracing, crop rotation, crop rotation, fallowing and making water ways which accounts 34.1%, 27%, 20%, 7.7%, 5.8% and 5.1% respectively. This shows that, the majority of respondents are using different methods of soil conservation measures to protect soil erosion from their farmlands in the study area. Therefore, farmers at individual level have been trying to solve this problem though the issue of land degradation is still increasing at alarming rate with rapidly growing population pressure in the study area and recurrent global climatic change.

Table 14. Response to Soil Conservation Measures for Land Management

Practiced Soil Conservation Measures	Frequency	Percentages (%)
Crop rotation	88	34.1
Contour plowing	74	27
Terracing	63	20
Tree planting	44	7.7
Fallowing	41	5.8
Making water ways	40	5.1
Total	350	100.0

Source: Field Survey (2021)

According to survey results, crop rotation (34.1%) is one of the most important methods of improving soil fertility as well as conserving soils on cultivated fields. It is a method through which the nutrient content of the soil is improved by cultivating different crops on the same plot of land interchangeably. According to the information obtained from participants of FGD, this system is one of the widely practiced systems of soil fertility improvement in the study area which helps to obtain more outputs from the cultivated land. The crop rotation system mostly consists of cereals such as maize, teff, wheat, burley, sorghums etc in the farmland in different seasons and years of cultivation. But recently the method of crop rotation for improving soil fertility has declined as some cereals gives very low yields per farm plots and other crops (like maize) will give better production with the use of inorganic fertilizers in the study area.

Among soil and water conservation measures, which is used by farmers in the study area, is contour ploughing. Out of total sampled interviewed households, 27% of the respondents confirmed that they used to protect their land from erosion through contour ploughing of their lands. To establish the structure, the farm plots are ploughed horizontally; following contours so that those contour furrows are created with the help of iron plough. The furrows that are formed along contours help to hold the water until it infiltrates into the ground and hence reduces the damaging or erosive effect of surface runoff on plots of land.

Table 14 indicated that 20% of the respondents reported, hillside terracing and check-dams were among the method used for soil and water conservation in the study area. However, it was noted from the discussion held with FGDs and key informants that the terracing and check-dams were of poor quality that stay only for a short period of time, in fact until they face a repeated heavy rainfall. According to the information obtained from Wayu Tuka woreda bureau of Agriculture and field observation made, more than 80% of the landscape is hilly and mountainous; hence farmers are forced to plough very steep slopes. Regarding fallowing to improve soil fertility, the survey result indicates small contribution. Only 5.8% of the respondents used fallowing to improve soil fertility respectively. In view of FGD participants, no fallowing that can contribute to soil fertility improvement in the study area because of high population density, farmers have no chance to leave the land uncultivated. On the other hands, small proportion (5.1%) of the respondents indicated that making water at the top of the slope is their method protecting soil erosion. It helps to protect the crop fields from being damaged by powerful run-offs that come in such steep sloppy area.

According to the view of key informant interviews, biological treatment of soil and water conservation activities are being practiced in combination with the physical soil and water conservation structures. These practices were introduced to the area recently by government and local NGOs. According to the information obtained and observation made by the researcher a multi-purpose trees and shrubs, legumes and grasses are some of the biological methods that help to protect the land from erosion. The treatment of the land takes place in comprehensive way in all land use types such as in cultivated lands, grazing lands, forest areas and marginal lands of the study area. Moreover, the importance of awareness creation among community members was also considered as a means among measures to be taken. Respondents stressed the supreme importance of government effort in land rehabilitation practices with the involvement of the society as a whole through awareness raising activities.

The report of Wayu Tuka woreda participatory watershed development team, the trend in land rehabilitation practice among the community members is increasing over time in the woredas. According to the key informant most of the people are willing to practice soil and water conservation

activities either on their own farmland or together with neighbours on community land at village level. Before this time, most of the people were reluctant to cooperate and even they seek other benefits for the construction of physical structures on their farmland. But now, despite some, they are practicing these structural conservation measures and even support the act of closing degraded areas from the reach of people and other animals.

3.9 Farmers Use of Fertilizers to Improve Land Productivity

In addition to their practical knowledge of physical soil conservation measures, the interviewed households were also asked which types of fertilizers they are using to improve agricultural production of their lands. As fertile topsoil was eroded from the farmlands by different human induced causes of land degradation, application of different productivity improvement fertilizers are inevitable decisions and action of the farmers in the study area.

Table 15. Response to Farmers Uses of Different Fertilizers to Improve Land Productivity

Types of Fertilizers applied by the Farmers	Frequency	Percentage
Animal dug or Organic fertilizer	103	33.5
Chemical or Inorganic fertilizer	93	29.
Both organic and inorganic fertilizers	85	23.9
Not using any fertilizers	69	13.5
Total	350	100.0

Source: Field Survey (2021)

Table 15 shows the respondents types of fertilizers used for the improvement of land productivity. The survey result indicated that the farmers are using different organic and inorganic types of fertilizers to increase the crop production since soil fertility was seriously degraded in the study area. Accordingly, as indicated in table 15, 33.5% of the respondents reported that they are using natural organic (animal dug) to improve yield per farmland. As the view of FGD participants, the organic fertilizer can be used for more than one production seasons. However, the existing individual farmers' limited livestock is not enough for using animal dug as soil fertility improvement in the study area.

On the other hands, out of the total interviewed households 29% responded that they are using chemical inorganic fertilizer to increase the production per farmland. In addition, the survey result of household respondents, the information obtained from FGD revealed that the applications of inorganic chemical fertilizers are increasing over time in the study area. They noted that using inorganic fertilizers are more effective than natural organic fertilizer resulted from enough land preparation and their treatment on the fields. In similar way 23.9% of the respondents confirmed that they are using both organic and inorganic fertilizers to increase their production. But 13.5% of the respondents are not using any fertilizers on their land for the improvement of agricultural land productivity in the study area.

3.10 Farmers Sources of Information to Land Management Practices

Table 16 shows the information sources of the respondents on land management practices. The result shows that friends and relatives were indicated by majority (40.6%) of the respondents' as the most significant source of information. About 23.9% of the respondents used extension agents as a source of information for their land management practices. Relatively small numbers of the respondents indicate radio, training, and schools as a source of information which account for 14.2%, 9.7%, 6.4% respectively and the remaining 5.2% of the respondents replied that they have no any information about land management practices. These findings supported by the view Baylis *et al.,* (2012) that the rise in farmers preferring other farmers as a first-hand information source may be due to the apparent ineffectiveness in the public extension in developing countries.

Table 16. Response to Farmers sources of Information to land management practices

Sources of Information	Frequencies	Percentage
Friends and relatives	98	40.6
Extension agents	69	23.9
Radio	54	14.2
Trainings	47	9.7
Schools	42	6.4
Have no information	40	5.2
Total	347	100.0

Source: Field survey (2021)

As shown in table 16, the highest percentage of the respondents viewed that relatives and friend were their most significant sources of information for land management. This indicates that farmer's access to training is very limited in the area. Accordingly, the participants of FGD said that they have no access to training and good contact with extension agents and have gained experience from their neighbours and traditionally from their elders. Farmers adjacent to each other can acquire experience in either strength or weakness of specific soil conservation measures from nearby farmers and neighbouring kebeles. As such, most of the farmers didn't get training on soil conservation. About 67.2% of surveyed farmers never get training on soil conservation applications and 32.8% have got only a limited training. Therefore, training and education on soil erosion and conservation need to be provided to create further awareness on resources conservation. Moreover, giving training on soil conservation measures improves the relationship between farmers and DAs and encourages them to implement new conservation measures.

Access to extension services is assumed to improve the farmers' land management practices. This is because farmers with access to extension services are expected to have better access to information which could play a significant role in improving land management practices. However, this is not practically observed on grounds in relation to the service development agents are giving for the farmers. The time which Development Agents stay on their respective working area/kebele was very limited. The longer they reside with peasants in the rural kebele, the more have contact with farmers. But they work only 2 or 3 days per week with farming people. In the selected kebeles there were 9 DAs and one supervisor. As noted, majority of them were involved in other administration duties and serve as cabinet member. Moreover, they gave attention for collecting tax, fertilizer and other credit services rather than for soil conservation. As survey result reveals, the current experts on soil fertility management and conservation measures were less effective and need special attention.

3.11 Government Efforts to Rehabilitate Degraded Lands in the Study Area

Currently, the issue of natural resource conservation has given a great attention by all levels of government in Ethiopia. In an effort to conserve the natural resource of the nation, Ethiopian government has been designing and implementing different land and environmental rehabilitation policies in collaboration with other stakeholders. Part of these governmental organizations, government at the woreda levels have discharged with a huge responsibility of formulating and implementing natural resource conservation policies in respective woredas' with local communities. In line with this, the report of Wayu Tuka Woreda Agricultural Development office indicates that the government and peoples have done and are doing a lot of works in relation to land and environmental rehabilitations.

According to Wayu Tuka woreda bureau of land and environmental protection, the participatory watershed development which aimed at construction of physical soil and water conservation measures was started lately in 2004 E.C budget year (WTWBoLEP, 2013). However, the great effort was also conducted to conserve natural resource base in the woredas' before by the local communities and government under Safety Net Program food for work, particularly in dry and

drought prone areas of the woredas'. In addition to these, farmers' at individual level have been practicing different land management activities mainly to increase the agricultural yields and to conserve the natural environment on their plot of land.

However, land rehabilitation practices, as issues of special concern were started recently by the implementation of currently being practiced participatory watershed development in the Wayu Tuka Woreda. Due to increase in human population pressure, terrain nature of land, over-cultivation, deforestation and irregular rainfall pattern, the agricultural production in the study area has been decreasing over time. In order to increase the farm productivity and to conserve the resource base of the woreda, different physical soil and water conservation measures and afforestation and agro-forestry practices are designed and are underway.

3.12 Soil and Water Conservation

As presented in the report of three years plan and performance of Wayu Tuka Woreda (2002-2004 E.C), soil and water conservations are among different major activities planned and conducted in the woredas' in an effort to conserve the land and environment. For instance, as indicated in the report soil bund construction for soil and water conservation work was planned in 2002 E.C to construct 293 km of lands and finally soil bund construction was performed on 310 km of land which was 1005 % of performances.

Accordingly, in 2003 E.C soil bund construction for soil and water conservation work was planned to construct on 263 km of land and at the end of the year soil bund construction was practiced on 234.9 km land which was 89.3 % of achievements. Similarly, soil bund construction for soil and water conservation work was planned in 2004 E.C to construct 179 km of land and finally soil bund construction work was performed on 180 km of land which was 100.5 % of performances. Accordingly, all these and other planned physical soil and water conservation activities have performed in the woredas' and some activities actual performance exceed the designed annual plan 2002-2004 E.C. From this, one can conclude that, there are different physical soils and water conservation measures planned and being conducted at the woreda level by the local communities and woreda government commonly in the woredas'.

3.13 Afforestation

According to the report provided in the afforestation is also another major component of land and environmental conservation methods in the woreda. As shown in the report, Nursery Establishment, Seed collection, Seedling production, pitting, seedling planting and compost making are among the sub-activities planned and performed under a forestation program to conserve land and environment. From those activities when we see the plan and actual performances' of seedling planting, in three years the report indicate that the good performance was recorded in 2002 and 2004 E.C. As observed in the report in 2002 E.C 1800000 seedlings was planned to be planted and at the end of the year 1765477 seedlings was planted which is 98% of work performances'. Similarly, in 2003 E.C 900000 seedling was planned to be planted in different areas of the woredas' and actually 841670 seedling was planted which was 93.5% of the final achievements. However, relatively low performance of seedling planting was recorded in 2002 E.C which was 47.5 % of expected plan.

Generally, there are also other different major activities such as rural infrastructure, water development, rainwater harvesting and irrigation development package that was planned and implemented in different areas of the woredas' as observed in three successive years (2002-2004) plan and actual results. As such, in an effort to rehabilitate the degraded land and environment in the woredas' the overall performance recorded in three years was 112.8%, 74.18% and 96.7% in 2002, 2003 and 2004 E.C respectively according to the government report. Therefore, according to the Annual Report of Wayu Tuka Woreda Agricultural Development Bureau, currently the local government is making a great effort to protect woredas' natural resource by designing and implementing different land and environmental rehabilitation policies.

4. Conclusions

The paper shows that the study area is characterized by more Land Degradation and Community Response to Environmental Management with high population pressure and scarcity of arable land

due to population increase which in turn limit agricultural land. The respondents pointed out that lack of awareness and knowledge of land degradation and Causes of Land Degradation deals more deforestation; overgrazing, population increase and lack of awareness are the major causes for land degradation. And the soil conservation mechanism that is available in study area was traditional method of soil erosion mitigation which is filling the sack with soil or crop residue to protect the soil erosion in bar and step slop farmland. The livelihood of household was identified as highly affected by the land degradation by affecting the household production both in crop production and livelihood production which in turn impact in household consumption.

5. Recommendations

Based on the above findings and lessons drawn from the impact of Examining Land Degradation and Community Response to Environmental Management: The Case of Wayu Tuka District in Oromia, Ethiopia. The key remarks are made to be implemented by government, extension agent, community and other concerned non-government organization to target the problem of land degradation. The following amending actions should be taken both by government and other actors to target the problem. These are. The government should have to introduce effective forest conservation mechanism through public participation to inform each and every one about the success of conserving the forest.

a. The percentage between deforestation and afforestation should be balanced by good policy from the government or by making reforestation project available and clear to the farmers
b. Government should have to improve the educational level of household members to allow the family unit to make the right choices about their livelihoods, including access to new technologies to use the existing land more efficiently; adoption of new varieties to enhance crop productivity; and family planning to reduce the pressure on limited resources.
c. High priority should be given to family planning action to decreasing population growth.
d. Government should identify opportunities to improve reporting mechanisms to let the farmer know what causes their suffering and how to tackle the problem as well as reporting from farmer to government about the stage of land degradation.
e. Government should advance the community participation for the conservation and management of bar land to reduce the soil erosion.
f. Government and other actors must have to create other employment opportunity to rural youth to minimize the dependency on land resource.
g. Government should enable to improve farmer to implement land use policy or by renewing or creating of new land use policy which will meet the needs of peoples. ϖ Local farmers should adopt Anti-free grazing land and improving the feeding of animals to minimize land degradation caused by overgrazing.
h. Government should evaluate and check the right application of the land use policy and strategy in the farmers systems

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