International Journal on Food, Agriculture, and Natural Resources
Volume 06, Issue 02, Page 126-134
ISSN: 2722-4066
http://www.fanres.org

Original Paper

Farmers' Perceptions on Sustainable Land Management Practices in Sekota District, North-eastern, Ethiopia

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Received: 18 February 2025; Revised: 24 March 2025; Accepted: 03 June 2025
DOI: *https://doi.org/10.46676/ij-fanres.v6i2.479*

Abstract*— Land degradation is a substantial threat to agricultural productivity and economic growth in Ethiopia. Sustainable land management practices have been promoted by government and development agencies to improve agricultural productivity. However, the perception level among smallholder farmers remains low. The study objective was to analyze farmers' perceptions on sustainable land management practices and practices utilized by farmers. Data were collected from 267 randomly selected households using a multistage sampling technique, which included an interview schedule, key informant interviews, and focus group discussions from three sample kebeles in the Sekota district during in 2024 production season. Descriptive statistics was used for analyzing quantitative data while qualitative data was analyzed by narrations, interpretation, and conceptual generalization. The most common sustainable land management practices included crop rotation (30.71%), livestock manure (25.84%), integrated methods (20.97%), inorganic fertilizer (17.6%), and compost (4.87%). Our study shows farmers had positive perception index scores for sustainable land management practices, with livestock manure (4.78), livestock manure + inorganic fertilizer (4.14), compost (4.12), and crop rotation (3.99) respectively, although lack of transportation, high price inflation, and labor-intensive were mentioned as the major factors in livestock manure, inorganic fertilizer, and compost respectively. The majority (78.3%) of farmers believed that soil fertility would continue to decline, while 12.7% perceived it would remain unchanged, and 9% perceived it would improve. The finding of the study shows that almost all farmers in the study area had a good perception on land management practices, as well as the causes and consequences of land degradation. The major causes of land degradation perceived by farmers were over-cultivation without fallow, soil erosion, the slope of the land, and poor tillage practices. Whereas declining land productivity, declining crop production, land becoming out of cultivation, hunger, migration, and poverty were the major consequences of land degradation in the study area. Therefore, increasing farmers' perception about land degradation risks, enhancing extension service, improving access to training, improving land productivity per unit area, and addressing barriers specific to each practice are essential to promoting sustainable land management in the study area.

Keywords*— *Farmers perception, Land degradation, Sekota, Sustainable land management practices

I. INTRODUCTION

Land degradation is a global problem that reduces land productivity, leading to significant ecological and economic complications [1], and results from a multifaceted interaction of physical, chemical, biological, socio-economic, and political matters of local, national or global nature [2]. It is a decrease in land productivity, resulting from natural or human-made factors [3]. Around one in three people are being affected by land degradation in some way and it is estimated that every year, approximately 75 billion tonnes of soil are lost worldwide due to land degradation [4]. The rapid expansion and unsustainable management of cultivated land are the main direct causes of land degradation worldwide [5]. Globally, the annual costs of land degradation are estimated to be around $300 billion, from this Sub-Saharan Africa represents around 22% [6].

In Sub-Saharan Africa, land degradation is caused by several factors, including a high population growth rate and increasing population pressure, dependence on agriculture that is exposed to environmental change, and fragile natural resources and ecosystems [7]. Additionally, soil erosion is one of the major causes of land degradation and decreased agricultural productivity in Africa leading to an estimated annual yield loss of 280 million tons [8]. In Ethiopia, land degradation is a major cause of deterioration and decline in agricultural productivity, persistent food insecurity, and rural poverty which affects 23% of the land [9] & [10]. Hence, annual soil erosion ranges from 16-300 tons/ha/year, depending mainly on factors such as slope, land cover, and rainfall intensity. Land degradation negatively impacts Ethiopia's economy and agricultural output by diminishing soil fertility, declining crop productivity, reducing the amount of arable land available for cultivation, and increasing poverty levels among rural households [2]. In the Amhara region, land degradation also poses a significant challenge, resulting in the depletion of land resources and contributing to reduced agricultural productivity, increased poverty, food insecurity,

and social instability [11]. A study conducted in the Amhara region specifically found that the total annual soil loss in the watershed was around 255,283 tons year−1, with the most affected areas located in the upper, steeper slopes of the watershed [12]. Like other areas of the Amhara region, Sekota district is also a highly vulnerable area to the problem of land degradation and soil erosion, research in the Agew-Mariyam Watershed, located in the Waghimra Zone, revealed an average annual soil loss of 51,403.13 tons year−1 [13].

In response to avert these challenges, the Ethiopian government and developmental agencies have implemented various sustainable land management initiatives aimed at rehabilitating degraded farmlands and improving soil fertility and agricultural productivity. In Ethiopia, land management practices were initiated three decades ago to combat land degradation and improve agricultural production [14]. Therefore, sustainable land management is considered an effective strategy to address the challenges presented by various forms of land degradation, improve soil fertility, and increase yields in Ethiopia. Sustainable land management practice is a means to enhance crop productivity while maximizing the agronomic efficiency of applied inputs, and can thus contribute to sustainable intensification and promote soil organic matter, and nutrient cycling [15].

Although various sustainable land management technologies implemented at the farm level to improve soil fertility in the study area over the years (SWOA, 2024). However, there is a noticeable gap in research regarding farmers' perceptions of land degradation and sustainable land management practices in the area. Consequently, there has been no significant increase in agricultural productivity or soil fertility. Therefore, analyzing farmers' perceptions on sustainable land management practices, land degradation as well as identifying these practices implemented by the farmers are vital concerns for smallholder farmers in Sekota district.

II. Research Methodology

A. Description of the Study Area

This study was conducted at Sekota district in Waghimra Administrative Zone, Northeastern, Ethiopia. Sekota district is one of the seven districts of Waghimra administrative zone of the Amhara region located at a latitude of 12° 37′ 31″ N and longitude of 39° 02′ 06″ E. The district has an altitude of 2119 m.a.s.l. It is bordered on the south by Gazgibla, on the west by Dehana, on the northwest by Ziquala, on the north by Abergele, and on the east by Tigray region. The district comprises 25 rural kebeles and covers an area of 167,156.07 hectares. It is estimated that about 112,259 populations live in the district. The mean annual maximum temperature of the district ranges from 23.1oC to 28.6oC and the area has an erratic rainfall pattern with the annual average rainfall ranges from 329mm to 833mm. Most of the rain is received from the fourth week of June to the end of August. The district usually receives erratic and uneven rainfall distribution not more than 2 months per year, typically from the end of June to the end of August with the short effective season has resulted in terminal dry spells, recurrent drought, and unreliable rain-fed cropping in the district. The major economic activity of the population in the study area is mixed agriculture. Thus, crop production and animal rearing are collectively carried out as a means of livelihood. The district is well-known for its potential for goat, cattle, and honey production. The usually grown crops in the district are sorghum, Teff, Wheat, Barely, and Fababean respectively. The district is frequently hit by natural hazards that frequently affect crop and animal production of the smallholder farmers and the main hazards of the district are drought, shortage of rainfall, crop pests and diseases affecting crop production and livestock sectors.

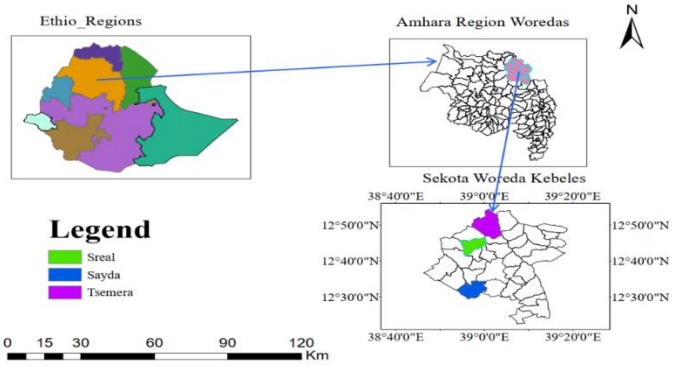

Fig. 1. Map of the study area. Source: Own sketch (GIS, 2024)

B. Data Sources, Types and Methods of Data Collection

The study used a cross-sectional survey combining quantitative and qualitative data to meet its objectives. Both primary and secondary data sources were used. Primary quantitative data were obtained from sample respondents through individual interviews using structured questionnaires, in addition, primary qualitative data collected from focus group discussions, and key informant interviews were carried out regarding farmers' perception on sustainable land management practices linked to the causes, and consequences of soil fertility depletion. Furthermore, the secondary data for the study was collected from zonal and district agricultural office reports, journal articles, books, and proceedings.

The study utilized various data collection methods, including field observation, structured interviews, focus group discussions, and key informant interviews. The survey was conducted in March and April 2024, five trained enumerators conducted structured interviews to support illiterate respondents, with a pre-test of survey questions involving thirty farmers to ensure clarity. Focus group discussions in three kebeles included eight participants each, selected for gender, education, wealth, and age, discussing soil fertility decline in local languages. The researcher moderated and recorded these discussions, which were later transcribed and anonymized. Additionally, fourteen key informant interviews with community members and experts explored perceptions of sustainable land management practices, focusing on causes and effects of land degradation maintaining respondent anonymity and potential harms through reference codes.

C. Sampling procedures and sample size determination

The study was carried out based on cross-sectional data that were collected from a representative sample of smallholder farmers. A multistage sampling technique was employed to

select the sample household heads. First, Sekota district was selected purposively due to the occurrence of high land degradation problems, soil fertility losses, and a variety of sustainable land management practices introduced in the woreda besides its accessibility. In the second stage, three representative kebeles (Tsemera, Sayda, and Sireal) were selected from 25 rural kebeles in the Sekota district by using random sampling. Finally, a total of 267 sample households that adopt sustainable land management practices were selected using a simple random sampling technique based on the size of each kebeles. The sample size was determined through the Cochran formula (1963) described in [16] and [17].

$$n = \frac{Z^2 - Pq}{e^2} \quad \text{.....(1)}$$

$$n = \frac{1.96^2(0.5x1-0.5)}{(0.06)^2} = 267 \quad \text{.....(2)}$$

Where:- n is the sample size, Z is statistical certainty related to the error risk, which equals 1.96 for an error risk of 5% level of significance; P is the proportion of total farmers adopter of sustainable land management practices, in this case, it was assumed to be 0.5 because 50% of the smallholder farmers are user/adopter sustainable land management practices; q equals (1-p) representing the weight variable assumed to be proportion farmers do not adopt sustainable land management practices from the total farmers while e is the level of precision, 0.06.

D. Method of Data Analysis

In the study, the quantitative data obtained from 267 households were analyzed, summarized, and presented in the form of tables and graphs by using appropriate descriptive statistics to assess the characteristics of household heads and sustainable land management practices. Farmers' perceptions of sustainable land management were measured using a Likert scale, analyzed through frequency and percentage with SPSS version 22. Additionally, qualitative data obtained from observations, focus groups, and interviews were analyzed through narration, summarizing, and interpretation.

1) Farmer's perception measurement technique

This study employed the Likert scale to offer an ordinal-level measure of respondents' perceptions about sustainable land management practices. Likert scaling is a psychometric scale commonly used in questionnaires and is the most extensively used scale in survey studies, especially in social science research [21]. In our study, twenty-one statements from three indicators (problem, causes, and effects of sustainable land management practices) were composed to capture the respective practices; that are, livestock manure, compost, inorganic fertilizer, crop rotation, and integrated practices. Farmers responded against the positive statements on attitudes or perceptions towards sustainable land management practices which helped to understand their actual perception on sustainable land management practices. In the case of positive statements, the score "5" stands for strongly agree, "4" for agree, "3" for undecided, "2" for disagree and "1" for strongly disagree. On the other side, for negative statements those scores were reversed except for undecided "3" and others were given 1, 2, 4, and 5 for strongly agree, agree, disagree and strongly disagree, respectively. The extent of attitude presented by farmers towards sustainable land management practices was determined by using AS (Attitude score). Then these statements were ranked based on obtained scores [18] & [19]. Each statement's frequencies were then multiplied by their respective codes and divided by the total number of respondents for the particular practice. The values were summed up to get the mean index scores for each statement. These mean indexes for the statements were in turn summed up for each sustainable land management practice to get its perception index [20].

$$AS = (N_5x5) + (N_4x4) + (N_3x3) + (N_2x2) + (N_1x1) \quad \text{.....(3)}$$

Where, AS= Attitude Score

N_5 = No. of respondents who strongly agreed

N_4 = No. of respondents who agreed

N_3 = No. of respondents who undecided

N_2 = No. of respondents who disagreed

N_1 = No. of respondents who strongly disagreed

The average Likert scale ranges from 1.00-1.50 strongly disagree, 1.51-2.50 disagree, 2.51-3.50 not decide, 3.51-4.50 agree and 4.51-5.00 strongly agree [21]. Overall, respondents' perceptions toward livestock manure, compost, inorganic fertilizer, crop rotation, and integrated methods were computed using frequency tables.

III. Result And Discussion

A. Descriptive Results

1) Demographic characteristics of the households

The result of the descriptive analysis on the personal characteristics of the sampled households is given in Table I. From the total respondent samples, 82.4% and 17.6% were male-headed and female-headed households, from this 96.3%, 2.6%, and 1.1% are married, divorced, and widowed respectively. The average age of the sample respondents was 49.76. This result indicated that most of the household heads were relatively young and belonged to the economically active age and productive labor forces. The education status of farmers is assumed to increase the ability to obtain process and use information relevant to the use of improved agricultural technologies. Regarding education about 73.4% of the respondents were illiterate, while only 26.6% of the respondents have various education levels ranging from the

ability to read and write up to diploma completion. From the total respondent samples average family size of respondents was 5.1 in adult equivalent. The average farm experiences of the household in sustainable land management were 22.44 with a standard deviation of 8.16 which was enough to perceive land management practices.

Training is a vital component for capacity building of farmers about land management practices. In the study, 56.2% of households had accessed training related to sustainable land management practices, while the other 43.8 of respondents did not have training access to sustainable land management practices. The provided training was mainly on conservation agriculture, compost preparation, integrated soil fertility management, and technology package application. Extension service is one of the important parameters for changing smallholder farmers' perceptions regarding with land degradation and disseminating a given technology so in the study area 49.4% of respondents had received extension service once a month, 15% twice a month, and 6% three times a month, while 29.6% of respondents did not access any extension service in a month.

TABLE I. DEMOGRAPHIC CHARACTERISTICS OF THE HOUSEHOLDS (N = 267)

Variables		Frequency/Mean	Percent (%) /SD
Sex	Male	220	82.4
	Female	47	17.6
Marital status	Married	257	96.3
	Divorced	7	2.6
	Widowed	3	1.1
Educational status	Literate	71	26.6
	Illiterate	196	73.4
Training on land management practices	Yes	103	38.8
	No	164	61.4
Frequency of extension contact in a month	No contact	79	29.6
	Once	132	49.4
	Twice	41	15.4
	Three times	15	5.6
Age of household		49.42	9.69
Family size		5.1	1.21
Farm experiences		22.44	8.16
Current soil fertility status of the farmland	Decreasing	209	78.3
	Increasing	24	9
	No change	34	12.7

Source: Own survey computation (2024)

2) Farmers' participation on community informal institution

The farmers' participation in different types of informal community institutions was addressed and presented in below Table II. It was found that the community in general has good participation in the informal institution. In the study, almost 90% of the sample respondents were members of at least one of the informal institutions. As a result, 44.6%, 29.2%, 16.5% 5.6%, and 4.1% of sample households were members of Mahiber+Zikir, Zikir, Mahiber+Zikir+Deb, Mahiber, and Debo or Webera respectively. According to the data gathered during the focus group discussions, in the study area women farmers did not actively participate in an informal institution and instead spent most of their time in household activities, which is similar to the findings of [22]. These community informal institutions have a great role in farmers' technology implementation and diffusion in order to discuss issues related with land management practices in the periodic meetings of the event. Mahiber and Zikir are monthly Orthodox Christian meetings honoring Angels or Saints, where farmers pray, share food, drink Tela, and discuss agricultural issues. Debo or Webera are rotational working groups in rural communities of Ethiopia, based on kinship and proximity, focusing on shared labor to discuss issues regarding to land degradation and agricultural challenges [23].

TABLE II. FARMERS' PARTICIPATION IN COMMUNITY INFORMAL INSTITUTIONS (N = 267)

Informal institutions	Frequency	Percentage (%)
Mahiber	15	5.6
Zikir	78	29.2
Debo or Webera	11	4.1
Mahiber & Zikir	119	44.6
Mahiber, Zikir & Debo	44	16.5

Source: Own survey computation (2024).

B. Major Causes of Land Degradation in the Study Area

The smallholder farmers perceived the most significant causes of declining soil fertility in the study area with higher percentage points across identified parameters (Table III). Most farmers in the study area have good knowledge and understanding of the causes of soil fertility decline. Thus, it is acceptable to infer that most respondents were mindful that the decline of soil fertility is not something natural phenomenon, rather it is a human-made problem initiated by the unwise use of natural resources and poor corrective measures to misuse natural resources. As a result, farmers' perception on the causes of soil fertility decline was in agreement with focus group discussants‟ and key informant interview‟ perceptions. Hence, both focus group discussion and key informant interview respondents properly mentioned over-cultivation without fallowing, soil erosion, inadequate compost, inadequate livestock manure, poor tillage practice, the slope of the land, improper crop rotation, and shortage of rainfall. Based on the Likert scale result, the sample respondents strongly agreed that on the over-cultivation was the major cause for the decline of soil fertility with a Likert mean score of (4.64). According to the respondents in the study area, the potential arable land in the district is limited due to challenging topography. As a result, farmers are cultivating the land without fallowing this trend exposing the land to different land degradation hazards. Followed by soil erosion, slope of the farmland and poor tillage practice with Likert mean scores of 4.63, 4.6, and 4.59 respectively. The sample respondents also mentioned that inadequate compost and high rainfall were the least recorded with Likert mean scores of 4.31 and 4.3 respectively. This finding is in line with [24], whose result indicate that all of the respondents were aware of soil erosion, topography, overcultivation and cultivation of marginal land as causes of land degradation. These were other factors that farmers mentioned that contributed to the loss of soil fertility. This shows that farmers are brainstormed about the soil fertility issues affecting agricultural production and food security. Hence, farmers are willing to invest in measures that will preserve and improve soil fertility.

TABLE III. THE MAJOR CAUSES OF LAND DEGRADATION IN THE STUDY AREA, RESPONSES FROM 5-POINT LIKERT STATEMENT (N = 267)

Likert items/ statements of causes for the decline of soil fertility	Frequency				Sum of score	Likert Mean	Rank
	SA	A	ND	DA			
Inadequate compost	100	154	10	3	1152	4.31	**7**
Improper crop rotation	153	110	4	0	1217	4.56	**5**
Inadequate livestock manure	135	130	1	1	1200	4.49	6
Soil erosion	175	88	3	1	1238	4.63	2
High Rainfall	99	153	11	4	1148	4.3	8
Poor tillage practice	171	84	11	1	1226	4.59	4
Slope of the land	171	87	8	1	1229	4.6	3
Over-cultivation	175	89	2	1	1239	4.64	1

Where, SA= Strongly agree, A = Agree, ND = Not decided, DA = Disagree
Source: Computed from own survey data of 2024

C. Major Consequences of Land Degradation in the Study Area

The sample respondent farmers related the decline in soil fertility with a reduction in crop productivity and soil fertility. Therefore, almost all respondents (89.5%) experienced crop productivity reduction with various degrees of effect on their livelihood in the last years. The survey result indicated that soil fertility decline effects were mainly: a decrease in crop yield, decreasing in land productivity, land becoming out of cultivation, hunger and migration, and poverty. Accordingly, the sample respondents declining of land productivity with a Likert mean score of (4.9) was the major consequence of soil fertility decline in the study area, followed by decreases in crop productivity with a Likert mean score of (4.83), land becoming out of cultivation (4.62), hunger and migration with Likert score mean of (4.51), and poverty (food insecurity) was the least mentioned effects of soil fertility decline only on about the Likert mean score of (4.5) in the study area (Table IV). This result is supported by the view of [24] that the main impacts are declining in yield productivity, food insecurity, drought and famine. Furthermore, key informants, natural resource department, and focus group discussion members confirmed that the problem crop productivity declining and food insecurity is increasing year to year in the study area.

TABLE IV. MAJOR CONSEQUENCES OF LAND DEGRADATION IN THE STUDY AREA, RESPONSES FROM THE 5-POINT LIKERT STATEMENT (N = 267)

Likert statements of effects of the decline of soil fertility	Frequency			Sum of score	Likert Mean	Rank
	SA	A	ND			
Decrease of crop productivity	222	45	0	1290	4.83	**2**
Decrease in land productivity	239	28	0	1307	4.9	1
Land becomes out of cultivation	166	100	1	1233	4.62	3
Poverty (food insecurity)	134	133	0	1202	4.5	5
Hunger and Migration	136	130	1	1203	4.51	4

Where, SA= Strongly agree, A = Agree, ND = Not decided, DA = Disagree
Source: Computed from own survey data of 2024

D. Major sustainable land management practices in the study area

Farmers' willingness to sustainable land management practices is largely determined by their knowledge of the problem of soil fertility loss. One of the research objectives was to identify sustainable land management practices implemented by smallholder farmers in the study area. To achieve this, both field research and observations were carried out which provided a clear insight into various sustainable land management practices currently implemented by smallholder farmers in the district. The survey results show that the major sustainable land management practices implemented in the study area were more soil fertility management practices including crop rotation, livestock manure, compost, inorganic fertilizer, and integrated methods as shown in Fig II below.

Crop rotation is one of a traditional practices of diversifying crop varieties that involve a legume and a cereal crop since the legumes fix nitrogen to the soil through biological nitrogen fixation [25]. One method the farmers can mitigate a decline in soil fertility is by practicing crop rotation. About 30.71% of the respondents have applied crop rotation as a sustainable land management practice. Hence this practice was easy to use and apply because of this reason most of the respondent farmers used crop rotation. Accordingly, farmers, key informant interviews, and focus group discussion teams crop rotation practice is easy to implement and does not need labor and extra cost for application and they accumulate more experience in this land management practice. It is used mainly a farmers who are unable to access manure, purchase inorganic fertilizer, and have less labor force for compost preparation.

The application of livestock manure in the study area is used by many farmers (25.84%) in order to improve the fertility status of the land. Livestock manure consisting of animal dung and urine, is the one form of organic fertilizer [26]. The application of livestock manure was related to ownership of livestock. Farmers applied manure mainly near the homestead. Throughout the focus group discussions with key informants and subject matter specialists at the district

level, farmers (especially, those who were poor) have increased the use of livestock manure because of the current price inflation of inorganic fertilizers and transporting the manure too far farmland is the main constraint in use of livestock manure. This is because transporting the manure requires a lot of labor and time. Hence, livestock manure is mostly applied around homestead farmlands.

An integrated soil fertility:- improvement practice in this study is understood as, the use of inorganic fertilizers and organic fertilizers combined in the same field. It interacts with environmental quality by reducing nutrient losses to the environment and enhancing crop productivity per unit of nutrient applied [27]. This is practiced by 20.97% of the sample respondents. The real price inflation of inorganic fertilizer has increased in recent years. Therefore farmers use organic and inorganic fertilizers in combination (integrated methods). It is one of the additional options under farmers and focus group discussion teams' investigation. The main reasons for integrating organic and inorganic fertilizers as described by farmers include; farmers wanting to organic fertilizers especially livestock manure to supplement the available inorganic fertilizers, improve crop productivity, decrease fertilizer costs, improve soil health, and enhance land productivity.

Inorganic fertilizers;- are applied by 17.6 % of the sample respondent farmers in the study area. It is easy to use, not bulky, and has an immediate effect on crop production; therefore farmers prefer to use inorganic fertilizer as compared to organic fertilizer. According to focus group discussions with key informants and subject matter specialists high price inflation is a major constraint for farmers' use of inorganic fertilizers. Likewise, the use of inorganic fertilizer is risky because; happen yield penalty diminishes crop productivity widely on a year-to-year basis, so farmers fear that in any given year their crop income will not be able to cover their costs. Besides crop yields depend on rainfall patterns, in rainfall shortage the crop response to fertilizer can be reduced.

Compost; The combination and distribution of a variety of organic compounds that include soil, livestock waste, crop residue, and food waste [28]. It was the least used sustainable land management practice in the study area and it is inexpensive and easy to make from a combination of sorghum stalks and other decomposable local substances. However, the survey results show that only 4.87% of the sample households used compost as a soil fertility improvement technology option. Accordingly, the respondent farmers and focus group discussion members described that compost was affected by labor availability, time, and availability of composting material. Hence compost decomposition duration time was one of the limiting factors in using compost. In order to decompose and be ready to use it can take approximately 3 to 6 months. Therefore it is time consuming to make adequate compost for total farmlands. Labor intensiveness and transportation are the major constraints in the use of compost as described by the farmers using compost in the study area.

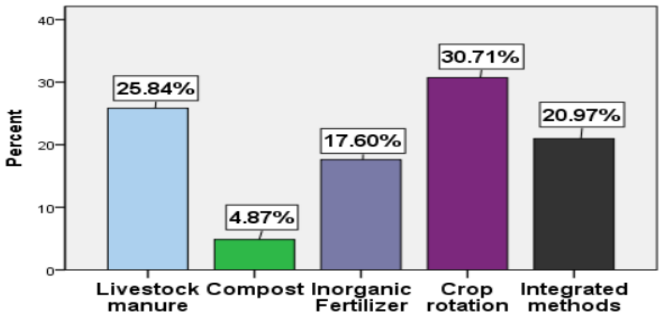

Fig. 2. The major sustainable land management practices
Source: Computed from own survey data of 2024.

E. Farmer's Perception on Sustainable Land Management Practices

Understanding the soil fertility problems from farmer's perspectives is vital in the analysis of the adoption potential of sustainable land management practices/technologies. Farmers will use technologies that contribute positively to their livelihood. Hence, if soil fertility problems are viewed as critical for their livelihood; farmer's likelihood of adoption is increased. Farmers possess a lot of knowledge about the trend of soil fertility in the study area. According to survey result the majority of farmers are mindful of the soil fertility problems, as 63.7% of the interviewed farmers perceive the current level of soil fertility in their farms as low, while 30.3% believe that the soil fertility is still moderate (manageable) whereas only 6% perceive the fertility in their farms as still high. Introduction of the low cost, organic soil fertility improvement technologies gives farmers an option for resorting soil organic matter and improving fertility levels.

Based on the Likert scale result (Table V), the sample respondents agreed the problems of the decline of soil fertility were perceptible with varying degrees of influence on crop productivity and soil fertility. Therefore, out of eight identified the indicator in the problem of soil fertility decline in the district; accordingly, to sample respondents the highest Likert mean score was recorded in livestock manure (4.78) this implies the farmers were strongly agreed on the livestock manure technology, followed by compost, and livestock manure + inorganic fertilizer with Likert score mean of 4.12, and 4.14 respectively, this infers farmers were agreed on compost and integrated practices. Intercrop and legume integration were the lowest Likert means cores recorded in the study area with 3.26, and 3.24 respectively. The positive perception indexes imply that farmers are more willing to apply all the practices on their fields but were more likely to choose livestock manure over other mentioned sustainable land management practices. This positive perception index of livestock manure possibly depends on farmer-to-farmer information exchanging or experiences sharing. The finding agrees with the results that the application of livestock manure and compost, highly improves soil fertility [20].

TABLE V. FARMER'S PERCEPTION ON SUSTAINABLE LAND MANAGEMENT PRACTICES, RESPONSES FROM 5-POINT LIKERT STATEMENT (N = 267)

Likert items/ statements of problems for declining soil fertility	Frequency				Sum of score	Likert Mean	Rank
	SA	A	ND	DA			
Livestock manure increases soil fertility	217	41	9	0	1276	4.78	1
Compost increases soil fertility	118	77	72	0	1114	4.17	2
Inorganic fertilizer increases soil fertility	47	146	67	7	1034	3.87	5
Crop rotation increases soil fertility	31	204	31	1	1066	3.99	4
Intercrop increases soil fertility	10	76	154	27	870	3.26	7
Legume integration increases soil fertility	6	76	162	23	866	3.24	8
Fallowing increases soil fertility	25	168	74	0	1019	3.82	6
Integrated methods increase soil fertility	54	196	17	0	1105	4.14	3

Whereas, SA= Strongly agree, A = Agree, ND = Not decided, DA = Disagree
Source: Computed from own survey data of 2024

F. Farmers' Perception on the Benefits of Sustainable Land Management Practices

Farmers in the study area were identified with the importance of applying sustainable land management practices. Accordingly, to multiple response analysis, the respondent farmers in the study area recognized that increased crop productivity (46.4%), increased soil fertility (18.3%), and increased crop biomass (19.7%) were the major benefits that farmers obtained from using sustainable land management practices and technologies (Table VI). It was in agreement with the focus group discussion member's perspective as they explained farmers had been using the mentioned sustainable land management practices because can offer yield and improve soil fertility of the land for the next generation.

TABLE VI. BENEFITS OF SUSTAINABLE LAND MANAGEMENT PRACTICES

Benefits of implementing sustainable land management practices	Farmers' multiple responses	
	Frequencies (N)	Percentages (%)
Enhance soil fertility	183	34.0
Increase crop production	250	46.4
Increase biomass	106	19.7
Total	539	100.0

Source: Computed from own survey data of 2024

IV. CONCLUSION AND RECOMMENDATIONS

Sustainable land management practices are of innumerable importance for their significant positive impacts on reducing land degradation, enhancing agricultural productivity and ensuring food security. Thus, assessing farmer's perception on land degradation and land management practices has become a very important issue. Concerning this, the researcher assessed the perception of farmers on land degradation and sustainable land management practices, as well as the major land management practices implemented by farmers. In the study, the majority of farmers had good awareness and perceived land degradation as a major problem and the sustainable land management initiatives as their primary focusing area and recognized positively. The findings show that there is a land degradation problem and its extent is mainly found moderate to high. In the study area, the majority of farmers believed that soil fertility would continue to decline year-to-year. The causes of land degradation perceived by farmers were over-cultivation without fallowing, soil erosion, the slope of the land and poor tillage practices. Likewise declining land productivity, declining crop productivity, and land becoming out of cultivation, were identified as the major impacts of land degradation which leads to serious poverty.

In order to avert land degradation in the study area there has been undertaking several soil fertility enhancement and restoration mechanisms by smallholder farmers, government and developmental organizations. The major activities that are undertaken to restore declined soil fertility are biological and agronomic soil management methods. The most practiced biological and agronomic soil fertility management methods are crop rotation, livestock manure, integrated methods, inorganic fertilizer, and compost. Furthermore, in the study farmers were strongly agreed on the livestock manure

technology, followed by compost, and livestock manure + inorganic fertilizer respectively. This study showed that sustainable land management practices were limited to a small area of the cultivated fields due to labor and resource constraints. The findings from the survey indicate that sustainable land management practices in the area have a significant role in enhancing agricultural productivity and sustainably improving soil quality, as well as achieving the food security of smallholder farmers by reducing poverty. Therefore, the important issues to raise the soil fertility enhancement efforts in sustainable ways are raising the awareness of smallholder farmers and other stakeholders about the importance of conserving soil fertility, adopting the participatory method, motivating the farmers to adopt sustainable land management practices on their farmland and integrate indigenous farmers' soil fertility management practices with newly introduced sustainable land management practices. Integrating indigenous soil fertility management with newly introduced land management practices is essential for improving livelihoods and sustainable land use, finally; addressing challenges specific to each practice are indispensable to promoting viable land management.

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