

Research Article

Impact of Sustainable Land Management Program on the Livelihoods of Smallholder Farmers in Semen Bench District, South West Ethiopia

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Abstract

The Sustainable Land Management Programme was launched in 2008 to address to reduce land degradation, improve land productivity, contribute significantly to adaptation to and mitigation of climate change, to protect of soil erosion, conserve to natural resources, and improve of smallholder farmers' standard of living. The overall objective of the study is to impact of a sustainable land management program in southwest Ethiopia's Semen Bench district on the livelihoods of smallholder farmers. The study used to cross-sectional survey study design. Two Kebeles were purposively selected based on participation and coverage of soil and water conservation practices implemented by sustainable land management program established in the study area. systematic sampling techniques was used to select 124 respondents from the Kebeles household heads. The data were analyzed using descriptive statistics, chi-square test, and independent sample t-test. The study revealed significant differences in maize yield, taro and coffee yields. The results also showed a highly significant difference ($p < 0.05$) in the mean total yearly income of adopter and non-adopter households, at $24,963.8 \pm 2783.12$ and $14,927.9 \pm 2200.2$ birr, respectively. It is determined that the implementation of a sustainable land management program enhances agricultural productivity and household income by conserving land resources. To improve household income, crop productivity, and land resource conservation, this study suggests that farmers be incentivized and supported to adopt integrated sustainable land management approaches.

Keywords

Adoption, Ethiopia, Livelihood, Sustainable Land Management Program

1. Introduction

The most valuable resource for Ethiopia's rural inhabitants, whose livelihood is based on agriculture, is their land [1]. The development, poverty alleviation, and economic progress have all benefited greatly from the agriculture industry. "More than eighty-five percent Ethiopia's population inhabit rural areas and primarily depend on livelihoods that draw income from land resources" [2]. "Agricultural productivity

in Ethiopia is threatened by severe land degradation, resulting in significant reductions in agricultural gross domestic product" [3]. Approximately one-third of the land used for agriculture is affected by land degradation and desertification, which threatens farmers' livelihoods, productivity, and food security. [4, 5].

"Land degradation is an environmental problem that re-

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duces the productivity of all natural ecosystems and agriculture, which threatens the livelihoods of humans" [6]. "In addition, land degradation in the form of soil erosion and fertility loss has been the major factors responsible for the declining and low agricultural productivity, persistent food insecurity, and rural poverty in Ethiopia" [7]. "The problems related to land degradation are caused by the interacting effects of factors such as population growth, intensive farming, overgrazing, deforestation, and climatic change" [8]. "To curb the challenge of land degradation government and non-government organizations have been practicing land management measures in Ethiopia. Sustainable land management involves a range of complementary measures for the protection, conservation and sustainable use of land resources (soil, water, biodiversity) and the restoration or rehabilitation of degraded natural resources and their ecosystem functions" [9].

"The land management measures have been practiced under the food for work program, managing environmental resources to enable a transitional to a more sustainable livelihood, productivity safety net program, the community mobilization through free Labor Day and sustainable land management project" [10]. "Sustainable land management project has been a long-time partner of the Ethiopian government in its fight against land degradation and improvement of livelihood through enhancing agricultural production across the country" [11]. "In addition, the governments of Ethiopia and NGOs have invested substantial resources to develop and promote sustainable land management practices as part of the efforts to ensure sustainable natural resources and increased agricultural production, and reduce poverty" [12]. Similarly, Bewket, [13] in "the SNNPRs, to reverse and mitigate such widespread natural resource degradation, various efforts have been made by government and non-government organizations".

Approaches to sustainable land management (SLM) include strategies and tools that help and empower farmers to use, embrace, and modify SLM on their farms [14, 15]. In order to ensure the farmland's long-term productive potential and preserve natural functions, farmers must also employ appropriate methods on their land to meet the demands of the community and of individuals [15-17]. Simultaneously, it is anticipated that the implementation of SLM practices will be essential to boost agricultural output, guarantee food security, and enhance the standard of living for smallholder farmers [18]. The foundation for increased self-sufficiency in regional food production is provided by SLM's contribution, which includes increased yields and crop diversity for smallholder farmers [19].

The livelihood activities that rural households participate in to raise income and so alleviate poverty may have a variety of environmental effects [51]. According to Etsay et al.'s [20] found that in the Tigray region of Ethiopia, SLM users' crop output went from 77% to 100% on average. Over the course of the last five years, farmers in the Semen Bench district of Southwest Ethiopia have implemented various SWC practices, such physical practices, biological, and agronomic measures, through community mass mobilization for the preservation of natural resources and the enhancement of smallholder farmers' livelihoods. These practices have been implemented by the SLM program. In addition, farmers utilize conventional methods like counter plowing, mulching, crop rotation, and runoff diversion canals to manage erosion and surface runoff on farmed areas. Nonetheless, the Semen Bench district continues to face the danger of runoff-induced soil erosion, which lowers crop productivity and land productivity. Since most rural poor people rely mostly on agriculture for their livelihood, this condition has a detrimental impact on their quality of life [52].

The low level of practice success can be attributed to several factors, including a lack of awareness of the significance of implementation practices, scarcity of scarce resources like farmland, high labor costs, and insufficient data on people's adoption of practices. Because of this, farmers continue to implement SLM methods at a low rate, and the district continues to lose a significant proportion of highly productive soil. The goal of this research is to better understand the contribution sustainable land management programs a rural livelihood, as indicated by changes in household income and crop yield.

2. Materials and Methods

2.1. Description of the Study Area

2.1.1. Location of the Study Area

The Bench-Sheko Zone in Southwest Ethiopia's Semen Bench area served as the study's location. Its latitude and longitude are 6°59' 0" and 7° 3'0" North and 35° 35'0" and 35° 42'0" East, respectively (Figure 1). It consists of 23 kebeles, the lowest administrative unit in Ethiopia, and occupies an area of 60,254 km². Yeki to the north, Chena to the northeast, Shay Bench district to the southeast, south bench woreda to the south, and Mizan Aman town to the west in the Bench Sheko Zone to the west, are the boundaries of the study district.

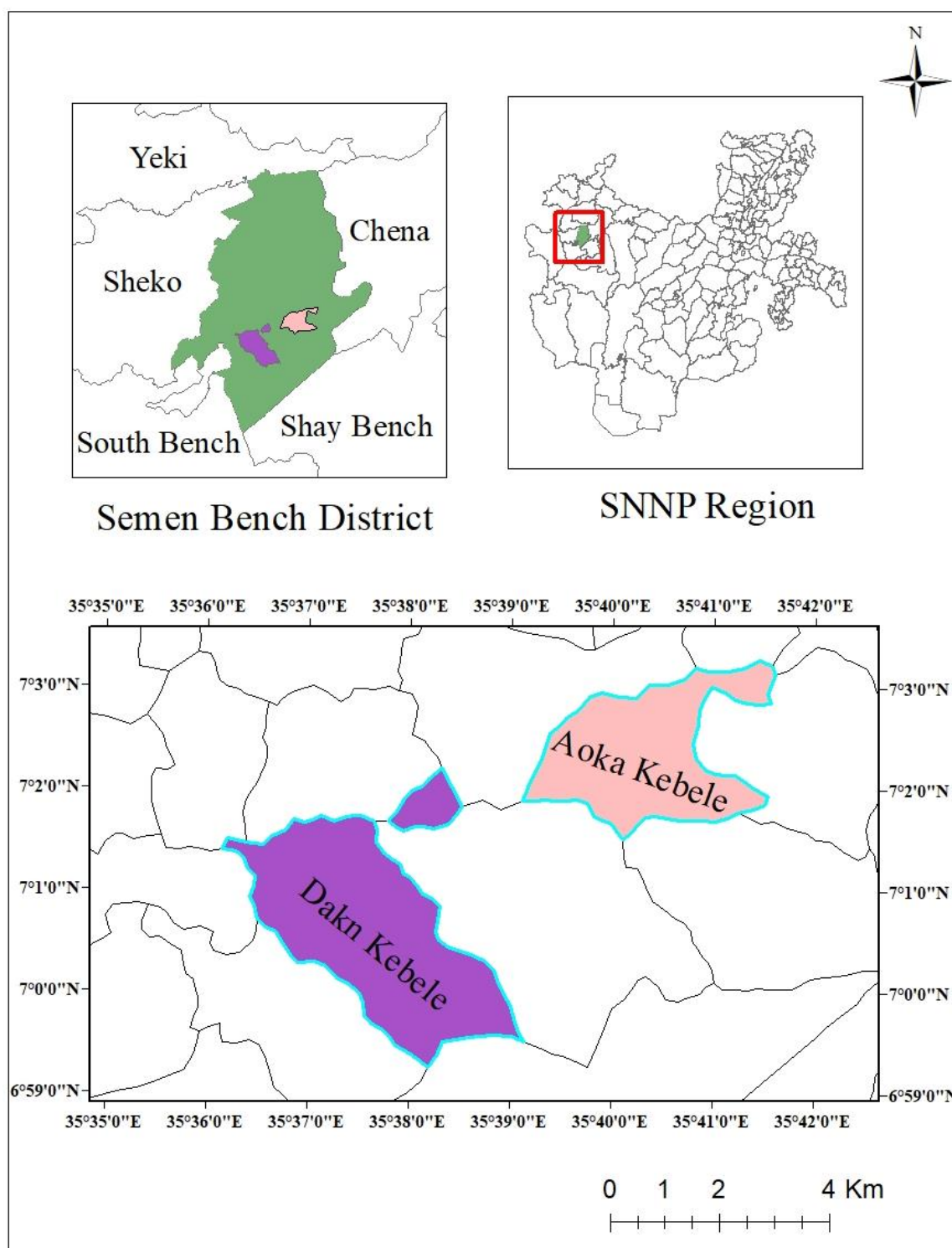


Figure 1. Location map of the study area.

2.1.2. Topography, Soil Type and Climate

The topography feature are few plains, rough terrain, an undulating landscape, plateaus, and steep slopes define the geography. Semen Bench District's topography shows an altitude range of 1001–2500 meters. The typical annual temperature fluctuates between 15 and 27 °C, and the estimated

annual rainfall ranges from 400 to 2000 mm [21]. The climate is primarily warm and humid. Leptosols predominate on crests in the Bench Sheko Zone, whilst nitesols are found on hill slopes and fluvisols are found in the flat valley bottoms where meandering rivers are abundant [22]. The soil type of Alisols with a stony phase and sandy clay predominates in the Semen Bench District [50].

2.1.3. Population and Socio-Economic Activities

The district is home to several ethnic communities, including the Kaffa, Bench, Amhara, Oromo, and Wolayita. The Central Statistics Agency's 2019 population projection for the Semen Bench District estimates that there will be 137,407 people living in the study area overall. 66,902 men and 70,505 women made up the entire population [53]. The Semen Bench District's agriculture system is distinguished by its mixed farming approach. In the study area, bananas, avocados, papayas, coffee, mangoes, and maize are farmed. Moreover, root and tuber crops like taro, enset, and sweet potatoes. For the people living in the study area, raising live-

stock is their primary source of income. In the study, the primary livestock species raised were donkeys, cattle, sheep, goats, and poultry (SBD AO, 2020).

2.1.4. Land Use/Land Cover

The estimated area of the Semen Bench District is 60,254.173 square kilometers per hectare. This total land area is divided into crop land, pasture land, forest land, bushes and shrubs, construction, and other areas that have not yet been classified, according to data from the Semen Bench District Agricultural Office, 2020.

Table 1. Land use types and their coverage in Semen Bench district.

No.	Land use	Coverage in hectares	%Coverage m
1	Crop land	46534.07	77.22%
2	Forest land	5489	8.76%
3	Grazing land	3745	5.97%
4	Bushes and shrubs	670	1.06%
5	Construction	593	0.95%
6	Unclassified land	3816.1	6.18%
Total		60254.173	

Source, SBD AO, (2020)

2.2. Sampling Technique and Sample Size Determination

The study employed a multi-phase sampling strategy. The study district was purposefully chosen in the first stage of the sampling approach based on the SLM program's execution in the Bench Sheko Zone districts. Additionally, two Kebeles were purposefully chosen based on their involvement in and coverage of soil and water conservation measures carried out by the research area's community of households and sustainable land management program. Finally, a systematic sampling procedure was used to choose the sample households. Thus, 124 sample households were selected from the total of 1172 household by a systematic random sampling technique. The Cochran [23] sample size

determination formula was used to establish the size of the respondent sample.

Consequently, a suitable sample size was taken from each kebele in accordance to their representation of the entire target population, and it was discovered that the overall sample size was 124 households (80 adopters and 44 nonadopters) (Table 2).

For calculation of the sub-sample size refer to the each Kebeles

$$n_i = \frac{N_i}{N} * n$$

Where: n_i = the required sample size from each selected Kebeles, N_i =Total number of households in each selected Kebeles, N =Total number of households in all selected Kebeles, n = Total sample size from the target population.

Table 2. Distribution of sampling household in the research Kebele.

Kebeles	Total housed hold			Sample Housed hold		Total Sample
	Adopter	Non- adopter	Total	Adopter	Non-adopter	
Dakn	403	215	618	42	23	65
Aoka	357	197	554	38	21	59
Total	760	412	1172	80	44	124

Source: SBD AO, (2020)

2.3. Data Sources and Data Gathering Methods

Using primary and secondary sources, a mix of quantitative and qualitative data types were gathered. Primary data were gathered from farm household respondents, district agricultural experts, Kebele development agents (DAs), and through focus groups, key informant interviews, and direct observation. Household questionnaire survey, was used as the main data collection techniques. The questionnaire included both closed and open-ended questions. The questionnaire enabled to collect the necessary socio-economic, environmental, about the general aspects of sustainable land management practices and their contribution to livelihood data from the household. In order to make the required changes to the questionnaire before it is finally administered, a pre-test survey was also carried out. Additionally, relevant published and unpublished materials such as journal articles, district annual report documents, census records, project reports, research papers, and data files from websites were consulted in order to gather secondary data.

2.4. Data Analysis

The version 21 of the Statistical Package for Social Sciences (SPSS) program was utilized to examine the quantitative data. The percentages and frequencies for the variables pertaining to land management practices and their impact on household livelihoods were calculated using a straightforward descriptive analysis. To examine the relationship between categorical and dummy factors and farmers' perceptions of the contribution of sustainable land management, chi-square tests were utilized. Additionally, a test was performed to assess the statistical differences between the income and crop output of households that have accepted and have not adopted sustainable living methods.

3. Results and Discussion

3.1. Perception of Community Towards Contribution of Sustainable Land Management to Livelihood

Farmers' perception of adoption SLM significantly contributed to improves their livelihood. The results of descriptive statistics indicated that all the adopter and 73% non-adopter of the households-controlled soil erosion (Table 3). Regarding the two groups' perceptions of the role that SLM techniques play in limiting soil erosion in their cropland, there is a very highly significant difference in practice implementation ($p < 0.01$). This is consistent with the findings of Tibebe et al. [24], who found that in a few Ethiopian watersheds, free community labor mobilization enhanced the effectiveness of land management practices for controlling soil erosion. In a similar vein, Melku et al. [25] found that 93.5% of farmers thought the techniques had a beneficial impact on lowering issues with soil erosion.

Descriptive data revealed that the households surveyed believed that soil erosion could be managed by implementing SLM on their farms (Table 3). For instance, 40 and 54% of the adopters indicated the role of SLM practice in controlling soil erosion as high and medium respectively, while 59 and 41% of non-adopters rated it as medium and low respectively (Table 3). According to the results of the chi-square test, there was a highly significant difference ($p < 0.01$) between the two groups regarding the farmers' recognition of the function of SLM in controlling soil erosion. According to this agreement by Mekuriaw *et al.* [54], the primary goals of projects implementing sustainable land management were to reduce erosion, replenish soil fertility, and restore damaged land.

The results of the survey showed that 71% of adopted farmers said that crop production increased when SLM methods were adopted, while 22.7% of non-adopter households said that crop output increased when SLM practices were introduced in the research region (Table 3). In accordance, Table 3's chi-square test revealed a very highly significant difference ($P < 0.01$) between the two groups' crop yields.

This demonstrates that one of the key elements that can raise crop output in the study are implementation of land management practices. The outcome is consistent with the research conducted by Kassie et al. [26], who said that the adoption of sustainable land management has raised crop yield values in Tigray and Amhara. Similarly, Araya et al. [27] state that in order to see a discernible rise in crop yield, SLM structures need to be maintained for an average of five years. Confirmed, Woubet et al. [28] discovered that SWC measures enhanced land adaptability, which enhances major crop output even more.

As revealed in Table 3, about 73.8% and 22.7% of adopter and non-adopter of the household perceived that status soil fertility is improved respectively. Similarly, the adoption of SLM methods and increased soil fertility are significantly correlated ($P < 0.01$), according to the Chi-square analysis (Table 3). This suggests that consistent use of a variety of land management techniques, such as crop rotation, intercropping, crop residues, manure, and compost, along with addressing the effects of erosion, may enhance soil fertility. This outcome was consistent with Woodfine's [29] findings, which said that the use of SLM improves soil fertility and structure, increases soil biomass, conserves soil and water, and in-

creases the diversity and activity of soil fauna. Similar to this, Alemayehu [30] claimed that the adoption of stone bund terraces on agricultural land was employed to improve the moisture condition and promote soil fertility.

About two thirds of the adopted respondents in this study stated that the adoption of SLM has enhanced the amount of vegetation cover. The chi-square results also demonstrate that, following the adoption of a sustainable land management program within a given area, there is a statistically very highly significant difference ($P < 0.01$) in terms of increasing the vegetation cover between adopters and non-adopters. According to the district expert, community involvement, government intervention, and non-governmental organization planting of several seedling species resulted in increased vegetation cover when area closure was implemented. This was consistent with research by Baye and Terefe [31], who found that introduced vertiver grass is essential for stabilizing steep slopes in coffee, fruit, and cereal fields, reducing runoff, and preventing soil erosion. Similarly, Endale and Buchura [32] found that vertiver grass also has a significant impact on lowering soil erosion, runoff, and enhancing soil fertility and moisture in Ethiopia.

Table 3. The community's perception of the contribution of SLM practices.

Item	Category	Responses				Test	
		Adopter		Non-adopter		Chi-square (X ²)	P-value
		Freq.	%	Freq.	%		
SLM practices can control soil erosion?	Yes	80	100	32	72.7	24.16	0.000***
	No	-	-	12	27.3		
Level of erosion control SLM	High	32	40	-	-	36.13	0.000***
	Medium	43	53.8	26	59.1		
	Low	5	6.2	18	40.9		
Crop yield	Increase	57	71.3	10	22.7	33.66	0.000***
	Decrease	10	12.5	26	59.1		
	No change	13	16.25	8	18.2		
Soil fertility	Improved	59	73.8	10	22.7	39.43	0.000***
	Decline	9	11.2	28	63.7		
	No change	12	15	6	13.6		
Vegetation cover	Increase	51	63.8	-	-	48.03	0.000***
	Decrease	17	21.2	29	65.9		
	No change	12	15	15	34.1		

Source: Survey data, (2020)

3.2. Methods of Sustainable Land Management

The research area has implemented many sustainable land management practices, including crop rotation, intercropping, contour plowing, agroforestry, stone bund, fanya juu bund, cut-off drain, and bench terrace. These practices have been adopted as the predominant methods.

3.2.1. Crop Rotation

One of the most popular native methods for enhancing soil fertility on crop areas in the research area is crop rotation. The practice of growing several crops alternately from year to year is known as crop rotation. Crop rotation is being used by well over 90% of the households surveyed in their farm plots. In the research region, farmers rotated their crops, such as sowing maize with haricot beans, to improve soil fertility, boost agricultural diversification, and reduce soil erosion. The findings of Teshome et al. [33], who said that crop rotations are a crucial component of Ethiopian farming systems and incorporate nitrogen-fixing leguminous crops in cropping sequences for improved yield, were supported by our result as well.

3.2.2. Intercropping

Intercropping is a practice of growing two or more crops simultaneously in the same plot in a fixed pattern in one season. Intercropping growing two or more crops concurrently in the same plot according to a predetermined schedule in a single season. Inter-cropping implementation of taro with enset with Maize, as well as Maize with bean was observed in the study district to enhance the soil fertility. As shown in table 3, about 65 and 68% of the respondents implemented intercropping in Aoka and Dakn Kebele respectively. This result is in agreement with the findings of Ministry of Agriculture (MoA), [34] which stated that the purpose of intercropping is to boost land productivity and prevent soil erosion. Likewise, Himanen et al. [35] noted that intercropping can improve soil nutrient content and aid in the regulation of water dynamics.

3.2.3. Contour Ploughing

Farmers practice contour ploughing on farm lands located on steep slope to minimize the negative impacts of erosion. The result of descriptive statistics showed that well over all 90% of the surveyed households have implemented contour ploughing (Table 4). This action was taken to improve agricultural productivity, decrease soil erosion in the croplands, and enhance water infiltration. This outcome was consistent with the study of Branca et al. [36], which found that contour farming techniques can raise crop yields by improving soil quality and reducing erosion. Similarly, Motuma [37] also stated that counter farming, which involves tilling the land along the slope's contours to lessen runoff on steeply sloping areas, is a typical traditional technique.

3.2.4. Agro Forestry

The classic SLM approach known as "agro forestry" involves planting and caring for trees or bushes in cropland and/or pasture lands in order to reap the benefits of integration in the study area, both ecologically and economically. In Darkn and Aoka kebele, respectively, 69 and 73% of the studied families practiced agroforestry, one of the predominant SLM measures. This strategy was implemented with the intention of achieving food security in the area by improving farmland productivity through increased water infiltration, runoff control, and soil erosion prevention. This result is in agreement with the findings of Temesgen *et al.* [38], which describe how agroforestry helps maintain the area's balance between the socioeconomic and environmental demands while also improving soil fertility, access to water, and feed. Agro-forestry, on the other hand, has been shown by WOCAT [39] to increase land productivity by fostering permanent cover, a suitable microclimate, improved soil structure and organic carbon content, higher infiltration, and improved soil fertility.

3.2.5. Stone Bund

It is a contour-built embankment that is constructed across an aslope. Increased water retention, increased soil fertility, and increased land production are all made possible by stone-bound structures. Over half of the surveyed farmers employed this method in their farm plots. In this study, stone bund is used to reduce of soil erosion and improves land productivity. Moreover, the farm households narrated in the focus group discussions how stone-bound structures enhance soil fertility and land production, decrease soil erosion, and retain more water. The result was in accordance to the finding of Kassie *et al.* [40] who found that in the northern region of Ethiopia, the value of crop production on introduced stone bunds used on cultivated land varied significantly between adopters and nonadopters.

3.2.6. Fanyajuu Bund

According to survey results, this approach was used on farm land by well over one-third of farmers. On their cultivation land, farmers install these structures to get several advantages like managing runoff velocity, decreasing soil erosion, replenishing groundwater, preserving soil moisture, and boosting land production.

The present outcome aligns with the research conducted by Eleni [41] and Menale et al. [42], which suggested that Fanya juu buildings are valued for their ability to manage erosion and enhance land production.

3.2.7. Cut off Drain

A cutoff drain in order to securely divert runoff from the uplands to a river or waterway and prevent excessive erosion

of the surrounding land, cutoff drains are diversion channels. Descriptive statistics revealed that less than one-third of the respondents used this technique in their plots. The outcome was consistent with Fikru's [43] findings, according to which a cut-off drain structure is a graded channel built mostly in damp areas to catch and redirect surface runoff from higher slopes in order to safeguard villages or cultivated land downstream.

3.2.8. Bench Terrace

It is the least popular and frequently adopted measure when compared to the others; only 18.6% and 21.5% of the homes in Aoka and Dakn Kebele, respectively, installed bench terraces to reduce runoff or low-slope areas to allow for the drainage of excess flows. This outcome was consistent with research by Nyangena and Kohlin [44], who found that bench terraces used on steep slopes increase agricultural productivity in Kenya's Kiambu, Meru, and Machakos districts.

Table 4. Types of Sustainable Land Management Practices.

Practice	Aoka kebele		Darkn kebele		Overall	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Crop rotation	54	91.5	58	89.2	112	90
Intercropping	38	64.5	44	67.7	82	66
Contour ploughing	51	86.4	61	93.9	112	90
Agro forestry	43	72.9	45	69.2	88	71
Stone bund	31	52.5	40	61.5	71	57
Fanyajuu bund	19	32.2	25	38.5	44	36
Cut off drain	18	30.5	18	27.7	36	29
Bench terrace	11	18.6	14	21.5	25	30

Source: Survey data, (2020)

3.3. Impact of Sustainable Land Management Program to Livelihoods of Households

3.3.1. Impact of Sustainable Land Management Program on Crop Yield

For most sample household in the study district, their primary source of income is cropping productivity. The statistical analysis's findings indicate that the average crop yields for adopters and non-adopters were, respectively, 5.75 and 4.6 quintals of maize per household. In accordance with this, there is a statistically significant ($p < 0.01$) difference in maize yield between adopters and non-adopters. Accordance to done by Eshetu et al. [45], who found that the use of fanyajuu increased maize production by up to 87% when compared to not using it. Similarly, Schaller et al. [46] found that SLM ap-

proaches like agroforestry raise maize yields in Malawi by 110–190%.

The mean crop yield for adopter households was an average of 4.95 and 2.26 quintals of taro and coffee per household respectively, while it was an average of 4.48 and 1.93 quintals of taro and coffee per household respectively for non-adopters (Table 5). Furthermore, taro and coffee production differ statistically significantly ($p < 0.05$) between adopter and non-adopter household. This result is consistent with research by Woodfine [29], who found that increased and more stable agricultural yields, improved livelihoods, and increased food security are anticipated to be the primary advantages of using sustainable land management techniques. In contrast, Nyangena and Kholin [44] found that the yield values per hectare were higher in plots without SWC than in those with implementation of SWC practice.

Table 1. Mean of crop yield (Quantal) for adopter and non-adopter households.

Variables		Adopter	Non- adopter	Test	
		Mean \pm SE	Mean \pm SE	t-value	p-value
Main crop	Maize	5.75 \pm 0.058	4.61 \pm 0.153	6.94	0.000***
Yield	Coffee	2.26 \pm 0.112	1.93 \pm 0.076	2.45	0.016**
	Taro	4.95 \pm 0.117	4.48 \pm 0.196	2.07	0.042**

Source: Survey data, (2020)

***, ** and * shows significant at 1%, 5% and 10% level of significance respectively.

3.3.2. Impact of Sustainable Land Management on Household Income

Mean income from crop/fruit: For non-adopters and adopters, the mean annual income from crop/fruit was 10,358.9 and 14,793.13 Ethiopian Birr, respectively. A statistically significant difference ($p < 0.01$) in crop/fruit revenue exists between adopters and non-adopters, according to the results of the t-test (Table 6). The outcome was consistent with Kassie et al.'s [40] results, which stated that households that implement new soil and water conservation techniques have higher agricultural yields than non-adopters. In a similar vein, Adgo et al. [47] verified that agricultural output, food security, and household income were all improved by investments in soil and water conservation techniques. On the other hand, Masila et al. [48] also noted that households' food security and rural livelihood in Kenya are ad-

versely affected by the implementation of sustainable land management practices.

The average household income for adopters was 24,963.8 ETB, whereas the average income for non-adopters was 14,927.8 ETB. The t-test result showed that the mean yearly income of adopter and non-adopter families differed statistically significantly ($p < 0.05$). These suggest that the adoption of high-yielding crop and livestock types, increased agricultural and livestock production, and livelihood diversification could have increased the income of rural households through the execution of the SLM program. The outcome was supported by the discovery of Heyi and Mberegwa [49], who stated that the mean annual income of households in Tole District, Southwest Shewa Zone, has greatly increased as a result of farmers' adoption of physical structures like terraces on farm land.

Table 2. Mean annual income (ETB) for adopter and non-adopter households.

Livelihood activities	Adopter	Non-adopter	Test	
	Mean \pm S	Mean \pm SE	T-value	P-value
Crop and fruit income	14,793.13 \pm 356.57	10,358.9 \pm 366.13	8.03	0.000***
Livestock income	2,815.15 \pm 79.38	2,373.5 \pm 92.47	3.47	0.001***
Income cash payment	4,764.5 \pm 142.19	-	33	0.000***
Annual total income	24,963.8 \pm 2783.12	14,927.8 \pm 2200.2	2.45	0.016**

Source: Survey data, (2020)

***, ** and * shows significant at 1%, 5% and 10% level of significance respectively

4. Conclusion and Recommendation

One of the main issues affecting agricultural productivity and output is land degradation. The Ethiopian government has been making significant efforts to extend its sustainable land

management program across the nation in an effort to mitigate the impacts of land degradation. sustainable land management programs effect of smallholder farmers' livelihoods and the preservation of natural resources. The study area employed conventional indigenous land management practices, namely intercropping, crop rotation, and counter plowing. On the other hand, fannjuu, bench terrace and soil bund were intro-

duced implemented practice.

The study's findings show that adopting sustainable land management practices (SLM) has a considerable positive influence on annual income and crop output. As a result, households that have implemented SLM are now better positioned to enhance their standard of living than those that have not implemented. The overall finding of the study indicates that adoption of various sustainable land management activities was being practiced in order to conserve land resource, maximize agricultural production, and simultaneously control soil erosion. The adopters and non-adopters' mean total annual income was 24,963.8 and 14,927.9 birr per year household, respectively, which indicated highly significant difference ($P < 0.05$). Therefore, in order to increase household income, crop productivity, and land resource conservation, farmers should be inspired and motivated to implement integrated sustainable land management practices. Additionally, efforts will be made by local governments and communities to effectively implement SLM methods that are appropriate for the local environment.

Abbreviation

ATVET	Agricultural Vocational Education Training College
DAs	Development Agents
ETB	Ethiopia Birr
MoA	Ministry of Agriculture
SNNPRs	Southern Nations Nationalities and Peoples Regional State
SLM	Sustainable Land Management
SBDAO	Semen Bench District Agricultural Office
SE	Standard Error
SWC	Soil and Water Conservation
WOCAT	World Overview of Conservation Approaches and Technologies

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Author Contributions

Assen Yesuf Ali is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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