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Socio-economic Impacts of Community-based Rehabilitation of Degraded Lands: Evidence from North Showa Zone, Oromia-Ethiopia

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ABSTRACT

A large part of research to date is devoted to the rehabilitation of degraded landscapes focused on technical aspects. This paper evaluated the socio-economic outcomes of Community-Based Rehabilitation of Degraded Land (CBRDL) in the North Showa area of Oromia Regional State, Ethiopia. Multistage sampling techniques were used. In the first stage, the research site is selected based on years of experience in community-based rehabilitation of degraded lands (CBRDL), then simple random sampling techniques were used to select households from two target populations. Data were analyzed using the Statistical Package for Social Science. The findings revealed that the CBRDL brought about reductions in soil erosion and flooding and increased water availability, increased vegetation cover, and crop productivity. Although a people-centered planning approach was promoted during the intervention, a top-down approach prevailed and much needs to be done to overcome the persistent top-down planning process. Lack of knowledge, low level of awareness, low income, and small household size were identified as the main factors affecting participation in the rehabilitation of degraded lands. The overall evaluation showed that the CBRDL is showing encouraging positive impacts.

INTRODUCTION

A growing number of people in many climate zones, but particularly in arid, semi-arid, and arid sub-humid regions, face significant challenges due to land degradation (UNCCD, 2013; Alemu and Zewide, 2021). Any loss or deterioration in the biological or physical productive capacity of soil as a result of human and/or natural activity is referred to as land degradation (UNCCD, 2015). Ecosystem services and functions may deteriorate as a result of the problem of land degradation, either temporarily or permanently (UNCCD, 2013; Kindu et al., 2015; Haregeweyn et al., 2015 Gedefaw et al., 2020). This has a profound impact on the majority of people worldwide. For instance, the UNCCD (2013) research found that land degradation directly affects over 250 million people globally, and the intensity and extent of land degradation is constantly increasing.

In African nations where natural resources are the primary source of income for the local people, the effects of land degradation are particularly severe (Gashaw, 2015). According to Hurni et al. (2010), Ethiopia is among the sub-Saharan African nations that have experienced serious land degradation for generations. An estimated US$ 1 to 2 billion is lost to erosion each year, or 1.5 billion tonnes, at a mean erosion rate of 42 t ha−1 yr −1. (Gashaw et al., 2014; Meshesha and Birhanu, 2015; Mesene, 2017). Furthermore, every year, 63,600 hectares of forest area are deforested annually (Negassa et al., 2020). In particular, the Ethiopian highlands, which cover almost 44% of the country's total area, have been affected by severe land degradation (Gebrehiwot & Veen, 2014; Meseret, 2016; Duguma et al., 2019). The Ethiopian highlands are more vulnerable areas due to repetitive farming, agricultural expansion to fragile and degraded slopes, long history of settlement, and high dependence on biomass energy (Mekonnen et al., 2015; Guadie et al., 2020).

However, the tragic drought and subsequent famine in the northern parts of Ethiopia is changing the direction of the Ethiopian government towards

greater emphasis on soil and water conservation measures and watershed management since the 1980s (Chimdesa, 2016; Gashaw, 2015). The intervention focused mainly on community-based land rehabilitation, such as building terraces on farmland and wetlands, planting native trees, and soil and water conservation structures (Chimdesa, 2016). Overall, the Ethiopian government, in collaboration with international development partners, has carried out a number of community-based rehabilitation of degraded lands in various regional states of Ethiopia. Community-based restoration of degraded land is an approach that includes not only the hydrological unit but also the biophysical and socio-economic unit, linking the production (immediate and long-term benefits), conservation, and sustainability of natural resources through multiple knowledge-based interventions at the landscape level (Shiferaw et al., 2012; Gebregziabher et al., 2016).

Even though the restoration of deteriorated landscapes has been the subject of several studies, the majority of earlier research has concentrated more on the technical side of the restoration process. Less research has been done on the social and economic effects of community-based restoration of degraded land, though. As a result, the main objective of this research report is to assess the socioeconomic results of community-based land restoration in the North Showa zone, Oromia Regional State, Ethiopia. To this end, an understanding of the social and economic factors related to the success/failure of brownfield restoration is essential, to learn from past experiences and improve those strategies that hinder future implementation of interventions.

MATERIALS AND METHODS

Study Area Description

The study was conducted in the Yaya Gulele district which is geographically located between 09°29'30" to 09°41'30" latitude and 38°30'00" to 38°45'00" east longitude. Yaya Gulele District is located in the North Showa Zone of Oromia Regional State. It is about 152 kilometers from the capital of Ethiopia, Addis Ababa. The total area of Yaya Gulele is estimated to be 594.85 square kilometers with a population density of 190.2 people per square kilometer. According to the 2007 census report, the total population of the district was 54,992, of which 28,168 were males and 26,824 were females. The district has an annual rainfall of 1000 mm and the average temperature in the district is 25 °C (Getahun et al., 2020).

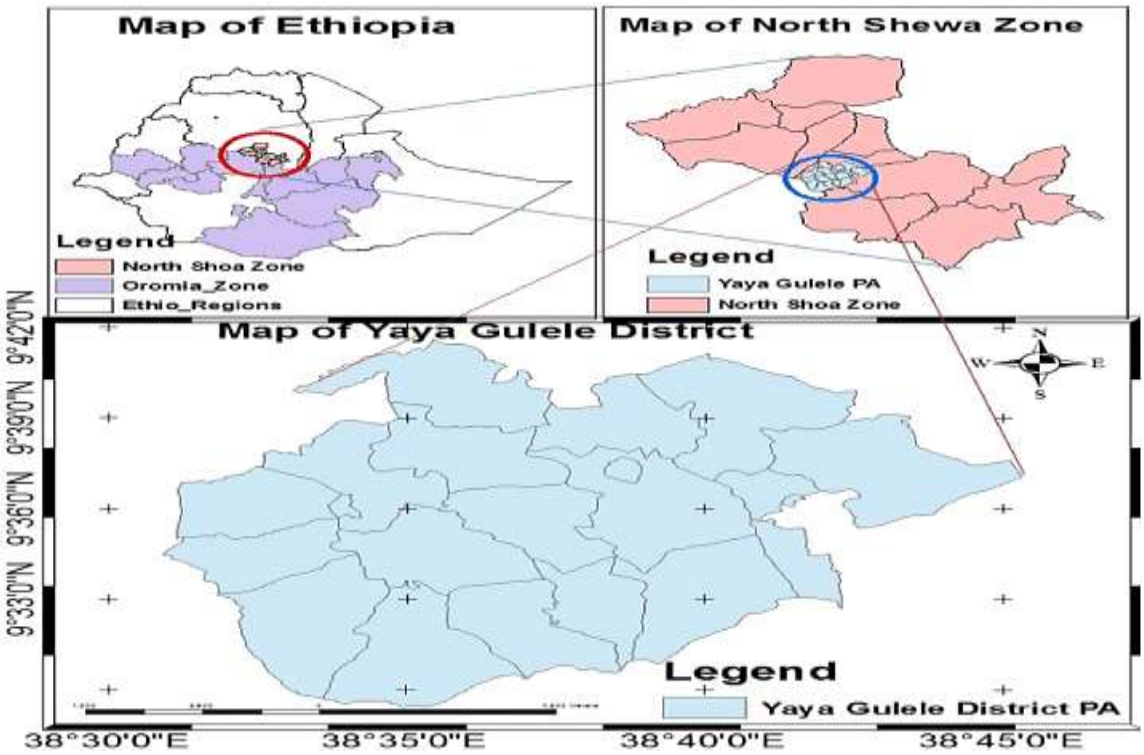

Figure 1. Map of the study area, adopted from Getahun et al., 2020

Data Collection Methods

The research used multiple methods of data collection. The data required for the study was obtained from both primary and secondary sources that combine both quantitative and qualitative methods. The quantitative method involves a standard household survey method, while the qualitative method involves a focus group discussion and key informant interviews. Overall, the collection, collation, and synthesis of both qualitative and quantitative information was carried out using appropriate sources, tools, and methods. To collect unbiased and reliable data to be used to generalize facts and findings, the use of an appropriate sampling strategy and representative sample size is essential. Two-stage sampling techniques were used to select research sites and household respondents. In the first phase, purposive sampling was used to select a specific research site. The Eluu Dire kebele research site, located in Yaya Gulele District, North Showa Zone, Oromia Regional State, was selected based on years of experience in carrying out community-based restoration of degraded lands. Second, a simple random sampling technique was used to select household survey samples from two target groups, users and non-users. Users are members of a community rehabilitation program and have the right to directly access products from the rehabilitation site, while no users are residents of the study areas but do not have the right to access the site. It is enough to take a sample size of 10% of the population from a total population of more than 1500(Gay, Mills, & Airasian, 2012). So we used 10% of households, which was 209 households; 120 user households and 89 non-user households were selected for the in-depth interview.

A semi-structured questionnaire was used to collect primary data from selected households. The questionnaire was designed to collect information such as demographic and socio-economic information, household assets, and necessary information on the impact of community restoration of degraded land from both users and non-users of the intervention. Only the male or female head of the household took part in the survey. Due to social, economic, educational, and cultural status in the community, some informants are more likely to provide better insight and understanding of the local environment than others. Focus groups (FGDs) and key informant interviews (KIIs) were therefore used to collect additional qualitative data. FGDs and KIIs were also conducted based on checklists and semi-structured questionnaires and in-depth interview was used for data collection. A sample size of FGD consisting of 4-6 persons consisting of elders, youth, women, and KII was conducted with 5 members including community leaders, local administration and women representatives, experts, and elders. Furthermore, field observation data and secondary data were also used to back up and verify the primary data.

Data Analysis

Because triangulation of data analysis methodologies helps to better discuss, analyze, and explain study findings, we used different analytical approaches to analyze information obtained through quantitative and qualitative methods. Before data analysis, the collected data were checked for possible errors, ambiguities, and inconsistencies. Data quality checks are also performed by random comparison with hard copies and data entry records. Quantitative data were then processed, analyzed, and organized using IBM SPSS version 20 and Microsoft Excel. In addition, tables, charts, and graphs using descriptive statistics were used; as frequencies, percentages, mean, and other statistical analyses. On the other hand, qualitative data were analyzed using content analysis, transcription, synthesis, narrative, and thematic presentations. All interviews or field notes were translated from the local language into English before analysis. In general, qualitative data analysis followed five interrelated steps, namely reading, coding, display, reduction, and interpretation.

RESULTS AND DISCUSSION

Basic Profile of the Respondents

This section presents the basic profiles of the respondents about age, gender, marital status, education, and number of years of residence in the area. The survey shows that the user group contains more men (80%) than women (20%). Similarly, households headed by men make up the majority of non-users (90%). Almost all respondents were married. The majority of respondents fall into the age category of 25-44 years. This suggests that community-based rehabilitation of degraded land is carried out by people of working age. The age of a productive society may increase their potential to

have more opportunities to participate, enabling better and smarter thinking during and after degraded land restoration. In addition to the age factor, community restoration of degraded land is also influenced by educational attainment. The level of education will have a positive effect on community rehabilitation of degraded land because the level of education determines the level of knowledge, awareness, understanding, participation, and acceptance of the new intervention and perception of the intervention program. However, the level of education in our research area is low. As shown in (Table 1), the majority of users (64%) and non-users (71%) are illiterate. Finally, the result of our research showed that 69% of users and 56% of non-user respondents stayed in the research area for more than 30 years. So the data was collected from a person who knows the area firsthand.

Table 1. Demographic information of the survey respondents

Characteristics	Percentage (%)	
	User (120)	Non-user (89)
Gender of the household		
Male	80	90
Female	20	10
Lifespan		
25-44	55	50
45-64	38	35
>64	7	11
Marital status		
Married	93	98
Divorced	2	-
Widowed	5	2
Educational level		
Primary school	21	27
Secondary school	7	2
Adult education	7	-
Illiterate	64	71
Number of years stayed		
5-15	11	21
16-25	12	13
26-30	8	10
>30	69	56

Biophysical Impact of Community-based Rehabilitation of Degraded Lands

1. Impact of community-based rehabilitation of degraded lands on Enhancing Crop Productivity

Agriculture is the main source of livelihood for the community living in our study area. The majority of farmers engaged in producing crops. The three principal grains farmed in the region are barley, wheat, and teff. The primary legume grown in this region is beans. The agronomic practices employed by all survey participants were identical; the intervention was the sole distinction. 97% of respondents felt that CBRDL had a favorable impact on agricultural productivity in the research area. As compared to the yield they obtained before the intervention, the productivity of the teff, wheat, barley, and beans increased following the intervention (Table 2). Simultaneously with this finding, the results of Dimtsu et al., 2018 confirmed that the highest yield of barley and wheat is reported after the rehabilitation of degraded land. In addition, the findings of Gashaw,2015; Dessalew,

2016; Meshesha and Birhanu, 2015; Tereza and Guteta, 2018; Dimtsu et al., 2018; Assefa et al., 2021) also confirmed the benefit of restoring degraded land to increase crop productivity. This can be attributed to less soil erosion and biological soil and water conservation measures that improve soil fertility and water holding capacity at the site of intervention.

Table 2. Cereal crop production (quintal /year)

Crops	Area of land (mean per ha)	Cereal crop production (qu/ha/year).			
		Before intervention		After intervention	
		Mean	Std. Deviation	Mean	Std. Deviation
Teff	0.6	3.9885	3.29638	7.1444	5.69360
Wheat	0.5	4.3365	3.53348	8.2990	6.03491
Barley	0.37	2.8804	2.18628	5.5625	3.42802
Beans	0.38	3.4879	2.14363	5.9790	3.61296

2. Impact of community-based rehabilitation of degraded lands on increasing vegetation cover.

As a result of preventing encroachment by people and livestock, the primary causes of deforestation the community-based restoration of degraded land has a significant positive impact on the development of vegetation cover. The improvement of the degraded land's vegetation cover is guaranteed by the intervention. The influence of CBRDL on vegetation cover is classified by respondents in the research area as significantly increased, increased, somewhat reduced, and highly reduced. After the intervention was put into place, a significant portion of users and non-users reported that the amount of vegetation cover had increased (Table 3). The findings of Gebrehiwot and Veen (2014), Meshesha and Birhanu (2015), Teressa and Guteta (2018), and Wordofa et al. (2020) are all in line with this outcome. Therefore, our research indicates that community-based land restoration that has been degraded contributes positively to the improvement of vegetation cover in the study area.

Table 3. Distribution of respondents' rating trends of vegetation cover

Trends of vegetation cover	No of respondents		Total	Mean	P value
	User	Non-User			
Highly increased	111	66	177	1.3729	0.000
Increased	7	19	26	1.7308	
To some extent		4	4	2.0000	
Decreased					
Highly Decreased					

3. Impact of community-based rehabilitation of degraded lands on the extent of soil erosion and level of flooding

The respondents' expressions of their opinions regarding the level of soil erosion—very increased, increased, reduced to some extent, and substantially reduced—make clear how they perceive the trends in soil erosion. The statistical test results, which are displayed in Tables 4 and 5, demonstrated that the respondents' answers varied significantly and that community rehabilitation of degraded areas greatly reduced the amount of soil erosion and had a great deal of advantages in reducing the rate of flooding. As demonstrated by the independent t-test result in Table 4, there was a substantial decrease in flooding in the repaired site when compared to the pre-intervention level. It is caused by a change in the vegetation cover and water infiltration capacity of the rehabilitated site. These therefore indicate that the intervention has a positive benefit in reducing the extent of soil erosion and the rate of flooding in the intervention area. Similarly, information gathered from key informant interviews and group discussions confirmed that the rehabilitation of degraded land has reduced the rate of soil erosion and flooding in the area. This result is consistent with the findings of Awulachew et al., 2010; Meshesha and Birhanu, 2015; Woldemariam and

Harka, 2020; Teressa and Guteta, 2018, in which different soil and water conservation measures implemented in the restoration of degraded land reduced soil erosion compared to no intervention areas.

Table 4. Distribution of respondents rating extent of soil erosion

Extent of soil erosion	No of respondents		Total	Mean	P value
	User	Non User			
Highly increased	3	20	23	1.8696	0.000
Increased	2	12	14	1,8571	
To some extent	0	12	12	20000	
Decreased	28	19	47	1.4043	
Highly Decreased	87	26	113	1.2301	

Table 5. Distribution of respondents rating extent of flooding

Level of flooding	No of respondents		Total	Mean	P value
	User	Non User			
Highly increased				1.5000	.0.049
Increased				1,0000	
To some extent				2,.0000	
Decreased	29	37	66	1.5606	
Highly Decreased	89	50	139	1.3597	

4. Impact of Community-based rehabilitation of degraded land on water supply/availability

Respondents to the survey were asked to rank the degree to which the CBRDL had increased, moderately reduced, significantly decreased, or raised overall effect on changing water availability. Most of the respondents believe that water availability in the examined locality has increased over time (Table 6). The research results show statistically significant differences in water availability in the study area compared to the pre-intervention period (Table 4). This is due to the soil and waterproof structure built on the reclaimed area, which contributed to better water infiltration instead of runoff, increasing the moisture content of the area. This result is consistent with the findings of Behera & Singh, 2011; Meshesha & Birhanu, 2015; Teressa & Guteta, 2018; Dutta, 2022). Therefore, the research results showed that community restoration of degraded land or watershed management as a whole increases water availability in the research site.

Table 6. Percentage of respondents rating of water availability.

Trends of water supply	Response %		Total	Mean	P value
	User	Non User			
Highly increased	89	41	130	1.3154	0.000
Increased	31	48	79	1.6076	
To some extent					
Decreased					
Highly Decreased					

Social Impact of Community-based Rehabilitation of Degraded Lands

Community remediation of degraded land results in numerous positive impacts on social aspects. The results of this study showed that CBRDL is effective for strengthening social assets, creating social networks, increasing participation, building trust between actors, and also increasing the degree of awareness of natural resource conservation and management. The most important socio-economic indicators identified in this study are shown in Figure 2.

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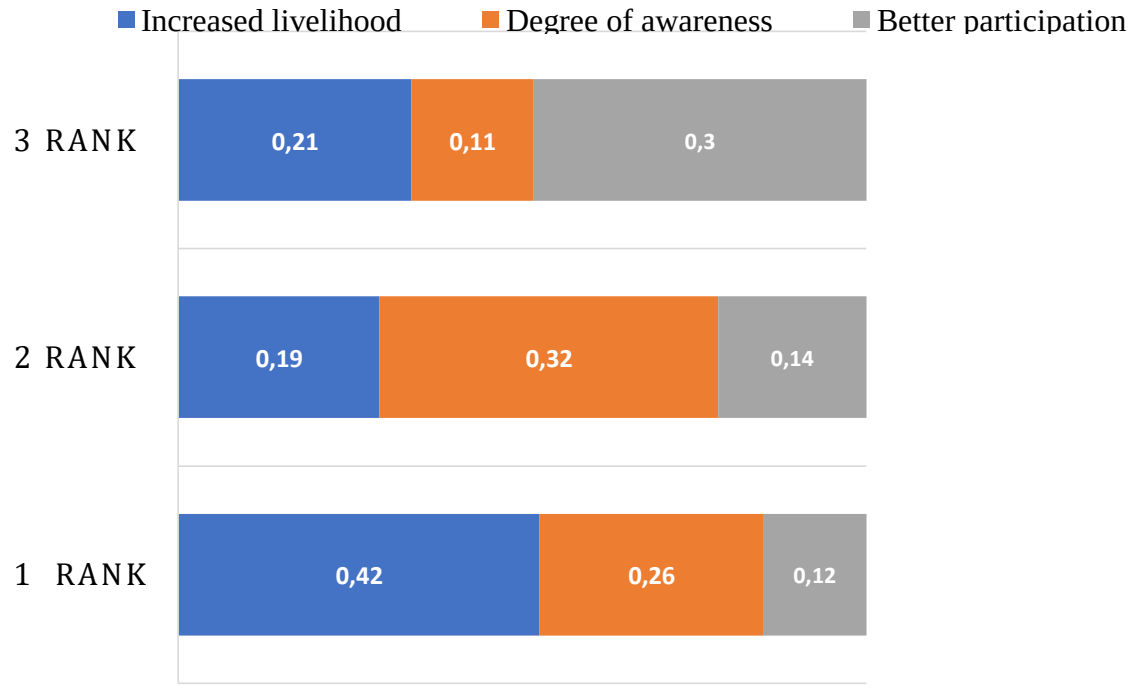

Figure 2. Socioeconomic indicators identified in the study area

1. Participation and empowerment in community-based rehabilitation of degraded lands

In Ethiopia, participation has a long history of cooperation in practicing traditional associations in rural parts of the country. The results of our research showed that although community participation starting with planning is considered realistic, a top-down approach still prevails in the research area (58%). However, a people-centered planning approach (40%) was also implemented and prevalent in the study area. In contrast to the top-down approach, people-centered approaches are promising strategies that enhance a sense of ownership and responsibility in line with the sustainable use and management of common resources. Furthermore, the successful implementation of degraded land remediation can best be addressed when the community participates and serves as planners, users, managers, and social controllers of community-based degraded land rehabilitation, not just as beneficiaries. Since the local community understands the real causes of the problems, they can address them by providing valuable inputs that are based on indigenous knowledge and years of experience(Suparwata et al., 2016). Thus, the active participation of the local community is key to the sustainable use and management of community-based rehabilitation of degraded land.

The participation of men and women in community-based rehabilitation of degraded lands

Local communities are involved in various activities during and after the restoration of degraded land. Participants were mostly involved in soil and water conservation, dike repairs, plantations, decision-making, committees, and others (Fig. 3). Although the active involvement of women in community-based rehabilitation of degraded lands is vital, women's participation in all activities is very insignificant and requires serious attention for the sustainability of future intervention.

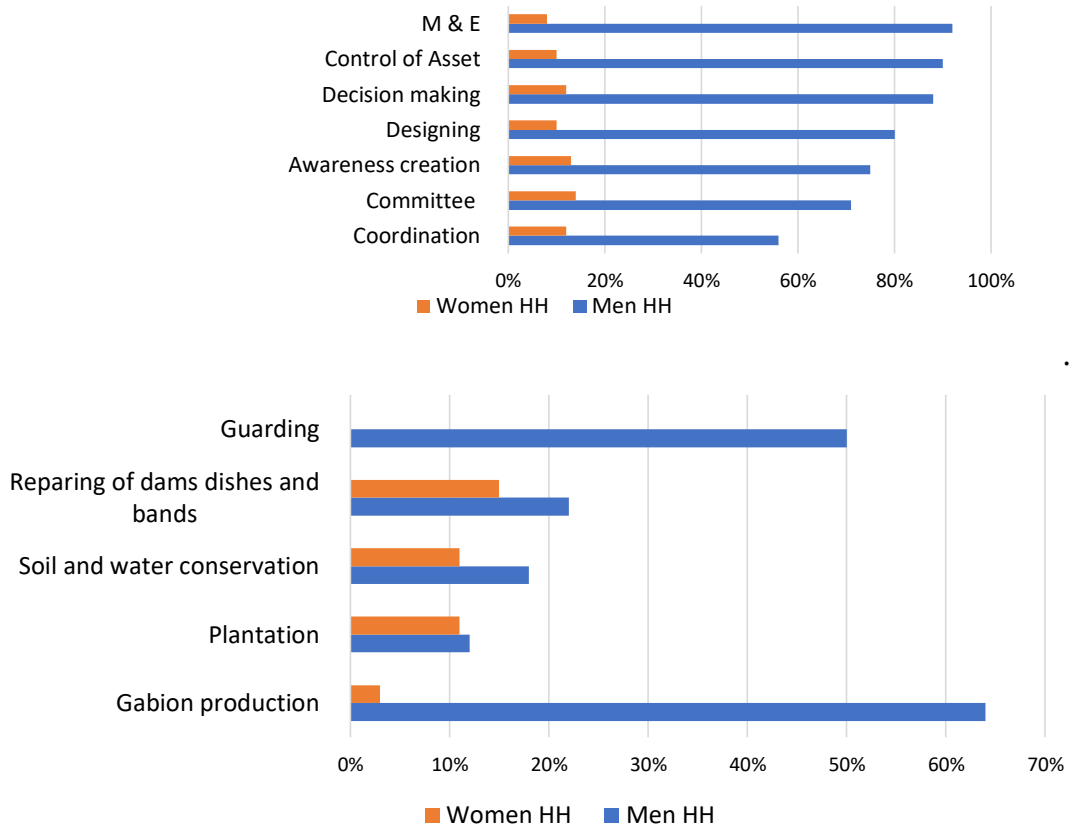

Figure 3. Activities performed by the local community in RDLs

The major factor affecting the level of participation

The majority of survey respondents are illiterate, which is one of the barriers affecting participation rates in community-based restoration of degraded land. They lack awareness (60%) and insufficient knowledge (79%) about the advantages and impacts of community restoration of degraded land. This implies that people participate better the more informed or conscious they are. This result is similar to the findings of Nuraeni et al., 2013. In addition, Golrang et al., 2012 identified a positive correlation between awareness and participation in natural resource conservation. Therefore, efforts need to be made to bring new skills and knowledge about the participatory approach and ways of thinking through capacity building. In addition, more than half of the respondents identified low income and small household size as the main factors affecting participation. Total empowerment for user groups to have full right of use, management, and responsibility from the beginning initiates people's willingness and interest to participate in community restoration of degraded land.

2. Local bylaws for sustainable management of community-based rehabilitation of degraded lands.

Local bylaw plays a significant role in mobilizing local communities to restore degraded land. Community-based organizations develop their local regulations or traditionally established norms and rules that govern their participation in governance, benefit sharing, and control of free riders. Indigenous institutions and influential people such as elders and religious or traditional leaders along with local communities are involved in formulating, legalizing, and enforcing these rules and regulations (Winberg, 2010; Gebrehiwot and Veen, 2014).

A committee mandated by the local community has established these dispute resolution mechanisms with regard to the use and management of restoration of degraded lands. Approximately 99% of respondents in the surveyed areas confirmed the availability of local regulations responsible for the management and use of community restoration of brownfield sites. However, implementation of local laws has been limited by a lack of policy support, low levels of enforcement, youth

unemployment, low court fines, strong social capital, and carelessness on the part of users to detect parasites. This result is consistent with the findings of Yami et al., (2013). In addition, monetary sanctions in the form of payment of fines were introduced in our research area to punish users who violated local regulations. The main objective of establishing fines as monetary penalties was to alert and educate those who violate the rules and to prevent an open access situation in community restoration of degraded land. In our study site, a person who lets animals in a rehabilitated site be relocated is judged by the District Court and fined 50 Ethiopian birr for each animal. Overall, local regulations are very effective in our study area, and local communities follow rules and regulations and users act as guardians of their resources. Total community restoration of degraded land has shown encouraging results for improving economic and social status at the household, community, and country level and plays a significant role in the sustainability of natural resources along with creating an enabling environment for the local community.

Table 7. Benefits of Community-based rehabilitation of degraded lands

Household	Local community	Country's development
Enhanced land productivity and water availability	low risk of erosion, flooding	Increased water supply both for agriculture and domestic purposes
Multipurpose benefits (fuel, fodder, and wild fruit)	improved vegetation cover & land productivity	Improved natural resource management, restoration of degraded lands
High resilient /low vulnerable	Strong social network	Low sedimentation on water bodies
Alternative income (employment)	Better water availability	Minimizing conflicts between highland and downstream farmlands
Diversification of livelihood (fatting, beekeeping…).	Resilient community	More resilient community
Strong social network	Develop ownership, accountability, and responsibility	Increased productivity and sustainability of natural resources
The degree of awareness about NRM increased	Enhanced community participation	Contribute to climate change adaption and mitigation strategy of the country

Source: own survey result

CONCLUSION

In Yaya Gulele Woreda, Ellu Dire Kebele, the socioeconomic effects of community rehabilitation of degraded land were successful in a number of ways. Results demonstrated that CBRDL enhanced crop yield, vegetation cover, and water availability while lowering soil erosion and flooding. There has been good community participation in the CBRDL. Men participate extensively in the majority of activities. Nonetheless, women's involvement in the majority of activities is quite low. In the research area, top-down planning still predominates, despite the intervention implementing a human-centered planning method. In the study area, low income, small household size, lack of knowledge, and lack of awareness were shown to be the main barriers to community-based restoration of degraded land. Despite some limitations, the overall evaluation showed that CBRDL performed well in the study area.

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