American Journal of Environmental and Resource Economics
2022; 7(3): 77-86
http://www.sciencepublishinggroup.com/j/ajere
doi: 10.11648/j.ajere.20220703.13
ISSN: 2578-7861 (Print); ISSN: 2578-787X (Online)

Restoration Efforts of Degraded Land, Challenges and Prospects: The Case of Soro Wereda, Hadiya Zone, Southern Ethiopia

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To cite this article:
Eyasu Estefanos Shanko. Restoration Efforts of Degraded Land, Challenges and Prospects: The Case of Soro Wereda, Hadiya Zone, Southern Ethiopia. *American Journal of Environmental and Resource Economics*. Vol. 7, No. 3, 2022, pp. 77-86.
doi: 10.11648/j.ajere.20220703.13

Received: July 14, 2022; **Accepted**: August 11, 2022; **Published**: August 24, 2022

Abstract: Land degradation is a global issue and it is more severe in developing countries like Ethiopia. In Ethiopia land degradation has become one of the most important environmental problems and still remains the major challenges that are adversely affecting the agricultural performance of the country: hence the call for improved land management practices. To address the problems of land degradation in Ethiopia, many efforts have been made since 1970s. From then onwards many attempts have been made and integrated watershed management in one among these. The study was undertaken in Soro Wereda, Hadiya Zone, and SNNPR with the objective of assessing restoration efforts and challenges and prospects of the restoration efforts being implemented. In order to achieve the stated objectives, both primary and secondary data were generated by employing qualitative and quantitative methods. Systematic sampling technique was used to select 97 representative households from three kebeles. The quantitative data was analyzed by using frequency, percentage, mean and standard deviation. The qualitative data was analyzed through narration. The findings of the study showed that the major restoration efforts to avert degraded land in the study area are physical SWC measure and area closure. Lack of awareness and sense of ownership, lack of skilled experts regarding SWC engineering works, lack of capital and material support, limited support of NGOs that are confined to only selected kebeles, poverty, and lack of support of biological measures to physical SWC measures are the challenges that constrain the sustainability of restoration process. Adopting of the participatory approach, promoting the awareness of rural communities as well as other stakeholders, management of restored land, and combining of the restoration efforts with local knowledge are core issues to the sustainability of the restoration process. In order to run the restoration efforts in sustainable way strengthening of community participation, capacity building of stakeholders, providing of incentives for those achieve the restoration process and scale up of the best practices are needed.

Keywords: Restoration Efforts, Degraded Land, Challenges, Prospects, Sustainability, Stakeholders

1. Introduction

Degraded land has been defined as due to natural processes or human activity is no longer able to sustain properly an economic function and/or the original natural ecological function. Land degradation is a global issue and it is more severe in developing countries [13].

Land degradation remains an important global agenda in the 21st century because of its advance on agronomic productivity, the environment and its effect on food security and the quality of life [2]. It is estimated that land degradation has affected between 6 million and 12 million square kilometers of land world-wide [24].

In Ethiopia, land degradation has become one of the most important environmental problems, mainly due to soil erosion and nutrient depletion. Coupled with poverty and the fast growing population, land degradation poses a serious threat to national and household food security. In Ethiopia, a significant number of studies have been done on land degradation and determinants of land management practices

in different parts of the country. These works mainly focus on determinants of land degradation, adoption of physical soil and water conservation structures, farmers' awareness about land degradation and their attitude towards land management practices, land degradation and farmers' perception, land degradation in Ethiopia: causes, impacts and rehabilitation techniques [7, 8, 2, 18, 1].

In response to increasing concerns about degradation of the natural resources and the sustainability of agricultural production potentials in many poor regions of the world, many national and international organizations have initiated research and development programmes for natural resource management (NRM) [4]. Recognizing land degradation as a major environmental and socio-economic problem, the government of Ethiopia has made several interventions. As a result large areas have been converted to terraces, covered by soil bunds, closed by area closures and planted with millions of tree seedlings [6].

In the study area a number of the efforts have been taken by the joint-efforts of government, agricultural office, local farmers, DAs and with the minimum role of the NGO's that began in 2010 to restore the degraded land. Land degradation has socio-economic problem in study area which resulted in soil erosion, loss of fertile soil, reduced production and productivity of land, loss of natural vegetation and poverty. These conditions create a desire on the researcher to conduct the research on it. Therefore, this study is going to examine the restoration efforts of degraded land, challenges and prospects in Soro Wereda.

1.1. Statement of the Problem

In the study area land degradation coupled with fast population growth contributes the loss of fertile soil, hunger, poverty and climate change. As the result of these the rural communities are involved in restoration process with collaboration and cooperation of other stakeholders to avert land degradation and to achieve food security. In a country like Ethiopia where a rapidly growing human population is inducing overexploitation of the available productive natural resources, restoration of the vast degraded landscapes that exist in the country will have a valid and important role in harnessing sustainable development [17].

To solve the problems of land degradation in Ethiopia, many efforts have been made since 1970s. A large number of soil and water conservation activities were implemented in different parts of Ethiopian highlands in the 1970s and 1980s with a huge resource obtained from international community, particularly World Food Program (WFP). However, at the end the intervention did not bring sustainability and was not able to bring the intended impact [27, 26, 25].

The application of community based watershed management (CBWM) is the most modern and recently developed method of land rehabilitation and climate change adaptation [15]. Integrated watershed management practices are the only possible solution for rehabilitation of degraded lands. Therefore, an integrated use of physical, biological and agronomic soil and water conservation measures through public investments with site suitability and their long-term agro-ecological and economic consequences should be considered [21].

1.2. Objectives of the Study

The general objective of the study was to examine the restoration efforts of degraded land and the challenges and prospects in the study area.

The study attempted to address the following specific objectives:

1) To identify the measures that have been taken to restore the degraded land;
2) To examine the role of stakeholders in the restoration efforts;
3) To explore the major challenges that have been affecting the sustainability of the restoration efforts; and;
4) To assess the continuity of the measures so far taken to restore the degraded land.

1.3. Research Questions

The following research questions were used to guide the research:

1) What measures have been taken for the restoration of degraded land in Soro Wereda?
2) What are the roles of stakeholders that engage in the restoration efforts?
3) What are the challenges that influence the sustainability of the programme?
4) How about the continuity of the restoration efforts?

2. Materials and Methods

2.1. Description of the Study Area

Soro is one of the weredas in the Southern Nations, Nationalities and Peoples Region of Ethiopia and part of the Hadiya Zone which is located at 7° 30'-7° 43' North latitude and 37° 35'-38° 05' East longitude. Soro is bordered in the south by the Kembata Tembaro Zone, on the Southwest by the Dawro Zone, on the west by the Omo River which separates it from the Oromia Region, on the north by Gomibora, on the northeast by Limo, and on the southeast by Duna. The administrative center of this wereda is Gimbichu.

2.2. Land Use and Vegetation Cover

The study area has an old history of land use with high erosion damages, especially with increasing slopes. As the remnants of tree species (scattered here and there) depict the area has once been covered by dense forest. However, the vegetation cover has been removed, and replaced by cultivation fields and plantation of exotic species such as eucalyptus species mainly *Eucalyptus globules* and *E camaldulensus* [12]. The major reason for this rapid decline of forest coverage was extensive deforestation due to the population growth and expansion of cultivation land.

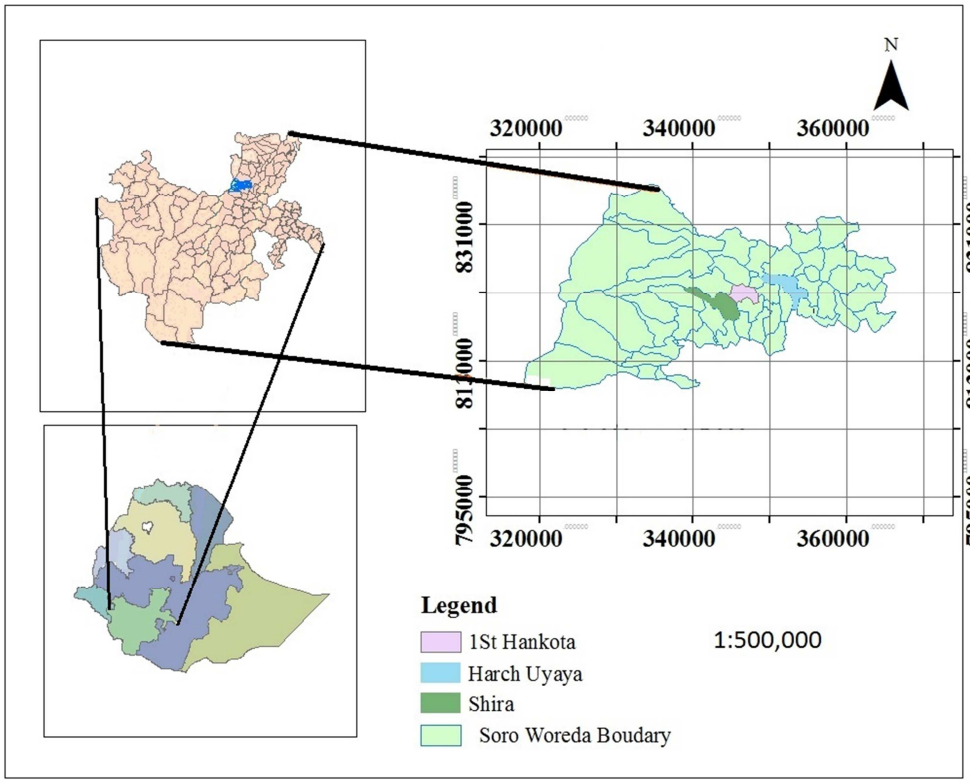

Figure 1. *Map of Study Area.*

Table 1. *The land uses of Soro Wereda.*

Land Use	Total area (ha)	Percentage
Annual crop land	36517	62.9
Perennial cropland	6200	10.7
Grazing land	2584	4.5
Bush and forest land	4890	8.4
Degraded land	4721	8.1
Others	3149	5.4
Total	58061	100

Source: Soro Wereda Agricultural and Rural Development office (2015).

The Soro Wereda is a typical of the moist weyna-dega agro-ecological zone (8% dega, 55% weyna-dega and 37% kola). The mean annual total rainfall is about 1260 mm and has average temperature of 19℃. Accordingly, it has two rainy seasons, Belg and Kiremt. Belg is the short rainy seasons and lasts between March and May. The kiremt season, which is the longest rainy season, lasts between June and September. The highest rainfall occurs in July and August. In terms of water resources in the study area, there are three main streams namely, Lintala stream (meaning the clean), Ajacho and Gamunna streams. Lintala stream originates from the foot of the Mount Shonkola. It is the tallest mountain in the Soro wereda.

3. Research Methodology

3.1. Research Design

The research design used in this research was mixed, a concurrent type. Both qualitative and quantitative data were employed as the research demands both.

3.2. Sample Size Determination and Sampling Techniques

Soro wereda has got 46 kebeles among which three of them were selected. The selection was based on the contact with Agricultural and Rural Development office especially with the Natural Resource Development and Conservation Work. The three kebeles are Harche uyaya, Shara and 1st Hankota.

The number of the households for Harche Uyaya, Shara and 1st Hankota were 1275, 782 and 855 respectively. Accordingly, the total households residing in the study area was 2912 [19], out of which, 97 Sample respondents were selected by using the following formula. $n = \frac{N}{1+N(e)^2}$ Where, n=sample size N=population size e=level of precision, i.e. 0.1. The above formula is used to calculate the sample size with a 90% confidence level and 0.1 errors [10]. For the triangulation of information 27 respondents were involved in focus group discussion and key informant interviews. Generally the total sample size of the researcher for this research was 124.

The sample size for each kebeles was determined according to the total number of households. The kebeles households were selected after the arranging of households in alphabetical order by using the following formula $K = \frac{N}{n}$ The researcher then asked the head of each kebele agricultural offices to facilitate the condition to contact with the sampled households at the farmer training center and finally the

interview was conducted.

3.3. Data Sources and Methods of Data Collection

Data for this research was collected or gathered from two sources. These are primary and secondary sources. The primary sources are farmers, kebeles Administrators, Agricultural experts and DAs. In addition, secondary sources of information was used as other tools for acquiring the relevant information to the study which includes journal, books, census, research works, project reports and seminar paper. The instruments of data collection that used were field observation, structured interviews, focus group discussion and key-informants interview.

3.4. Methods of Data Analysis

The quantitative data was tabulated and analyzed. Statistical Package for Social Scientists (SPSS) version 20 software was employed to analyze data gathered from interviewed households. Descriptive statistics such as frequency, percentage, mean and standard deviation were used. The data was presented in tables, graphs, plates and figures. Qualitative data was gathered through focus group discussion, field observation and key informant interviews was analyzed by narration for description and first discussion was made with the experts who work at natural resource development and conservation work and land management office and development agents and then during the discussion the important points were taken through writing on issues. Pictures were also used as evidence and to support the qualitative data where necessary.

4. Results and Discussion

4.1. Source of Income of the Sample Households

Most of the households 93 (95.9%) responded that on-farm activities, whereas 4 (4.1%) of the respondents source of income was off-farm activities. On-farm activities have a positive effect for the restoration of degraded land. This is clearly stated by Habtamu [8] majority of farmers that did involve in off-farm activities indicated that they removed conservation structures installed in their cultivation fields completely.

4.2. Land Size of Sampled Households

The study indicated that the average household land holding size was 0.83 hectare, which is below the average land holding of Ethiopia in 2013, 1.37 ha [5]. This study shows that there is a shortage of land due to the rapid population growth among the households in the study area and this result in the shortage of fallow lands and reduces the fertility of soil and then contributes to degradation of land. So, small land holding size affects the efforts to restore the degraded land. This was similar to the finding of Tesfaye *et al.,* [22] majority of the non-adopter respondent farmers that have lower farm size made decision to remove soil conservation measures totally. On the other hand, large land holding stimulates the restoration efforts through encouraging of households to put certain proportion of land for fallowing, mulching and constructing of physical soil and water conservation measures and the like.

4.3. Restoration Efforts Being Conducted in the Study Area

Various measures have been taken by stakeholders by considering the impacts that exist as the result of land degradation. The abundantly used measures to restore the degraded land are physical (structural) conservation measures and area closure. From these almost all (100%) and 92.7% of interviewed households have used these two restoration efforts. In addition, about 80.4%, 44.3% and 30.9% of sampled households also confirmed that biological conservation measures, agroforestry and agronomic measures have been undertaken in the Soro Wereda respectively in order to stimulate the restoration efforts (See table 2).

Table 2. *Response of Sampled Households for the Restoration Efforts.*

Major restoration efforts made by the local people	Frequency	Percent
Agronomic measures	30	30.9
Biological measures	78	80.4
Physical measures	97	100
Area closure	90	92.7
Agroforestry	43	44.3

Source: Field Survey 2015.

Although the restoration efforts started some years back, the participation of the local community was not ensured. The participation of the local community was less when the restoration efforts were introduced. The reason mentioned behind the less participation of the rural community was the approach followed. The introduction of watershed development program encourages the local community to involve in the restoration process. In past five years the government implemented the participatory approach than top-down approach. The current approach that much contributed for success is community based participatory integrated watershed management, which requires involvement and contribution of local people. The Ethiopian government understands the essence of this approach as evidences from successfully implemented [11].

4.4. Structural Soil and Water Conservation Measures

A structural measure is one of the restoration efforts that

are taken to restore degraded land in the study area. Almost all of the households reported that structural conservation measures were used for the rehabilitation of degraded land through controlling of erosion. The structural measures that are commonly used by the farmers include soil bunds, stone bunds, terraces, water way and cut off drain (figure 2).

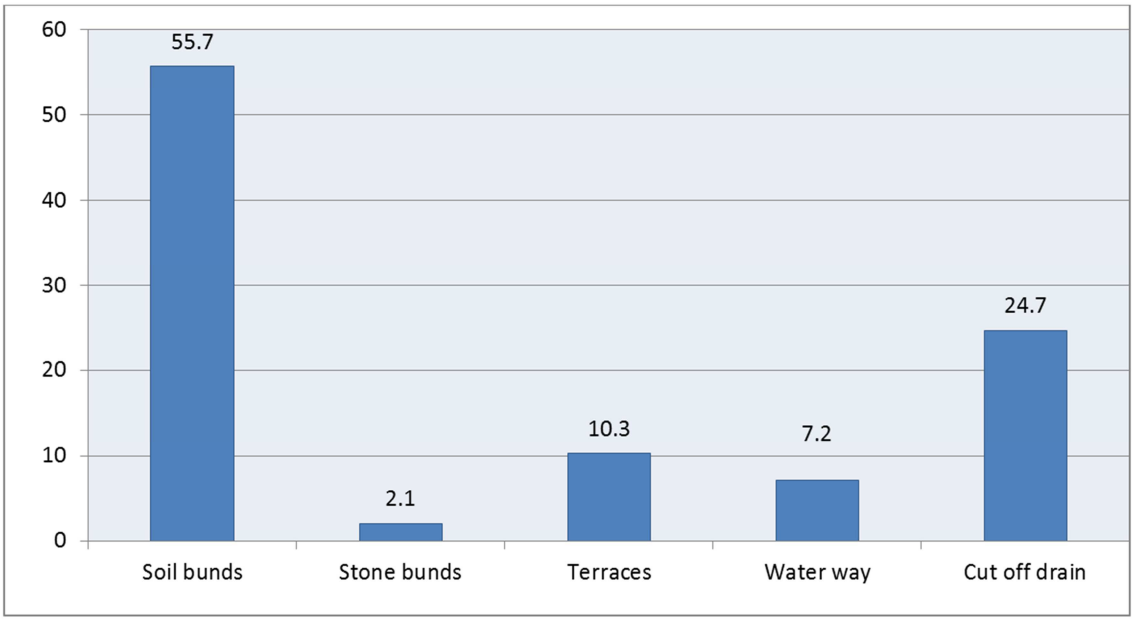

Figure 2. *The Structural soil and water conservation measures practiced by the households.*

Soil bunds were structural conservation measures that were widely practiced by 55.7% of the surveyed farmers for restoration program as it is indicated in figure 2. Cut off drain is reported as the other means to rehabilitate degraded land from the structural measures, and about 24.7% of sampled households reported that they have been practicing cut off drain on their farmland. This measure is constructed to intercept and divert the surface runoff from higher ground| slopes and protect downstream cultivated land or village and suitable mostly in moist areas of the country with medium to high rainfall. This safely diverts the run-off to a waterway, river, gully and the like [14]. Based on field observation, study area is found at the steep slope and this contributed to degradation of land and currently the rural community is involved in participatory watershed development program in order to rehabilitate the degraded land that is found at the bottom (See figure 3).

Figure 3. *Practice of cut off drain in study area, Photo by Researcher, 2015.*

In the study area based on survey solely 2.1% of interviewed farmers used the stone bunds due to the shortage of stone. About 10.3% of households used terraces and the remaining 7.2% was practicing water way. A Water way is a natural or artificial drainage channel constructed along the steepest slope on in a valley to receive accommodates runoff from cut-off drains and graded terraces/ bunds. This measure was used to carries the run-off to rivers, reservoirs or gullies safely without creating erosion [14] (See figure 4).

Figure 4. *Practice of water way Photo by Researcher, 2015.*

4.5. Biological Soil and Water Conservation Measures

Biological soil and water conservation measure is one of the major restoration efforts under taken by the local farmers in the study area to overcome the issues of land degradation through the understanding. Some of the biological soil and water conservation measures that practiced by the sampled farmers were: crop rotation, inter cropping, grass strip and wind breaks (figure 5).

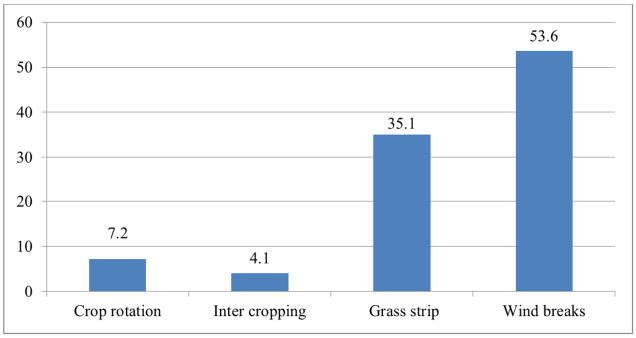

Figure 5. *Biological soil and water conservation Measures practiced in the study area.*

Crop rotation as it is showed in the (figure 5); this measure has been practiced by 7.2% of the sampled households. The most practiced crops in the study area are wheat and teff; instead of wheat they have been using pea and haricot bean in the highland area and in the place of teff the farmers have been using maize and sorghum in the lowland area interchangeably year after year in order to improve the fertility of soil. This measure is also useful to improve soil organic matter and through the minimizing of erosion stimulates the restoration of the degraded land in the study area. In parallel, a study by Tolera [23] crop rotation is mainly a common practice exercised by many farmers as compared to other practices in the middle altitude and lowland areas for soil fertility maintenance, weed and diseases control.

Inter cropping is one of the biological measures that was used by 4.1% of the local farmers. It is mainly targeted towards minimization of soil erosion which is the one of the major causes for land degradation in the study area. The crops that are used in the inter-cropping are sorghum, teff, haricot bean, wheat, pea, maize and enset. At the areas where there is soil erosion the farmers practice the erosion resisting crops and contrary to this in the areas where there is low soil erosion problem exercises the other crops. So, among these crops the erosion resisting crops contributes for soil erosion reduction through protecting of the soil loss and maintaining of the soil fertility.

Grass strip has been practiced by 35.1% of the sample households. The grass is either planted or naturally grow in narrow strips along the contour at intervals across the slope of a field for the purpose of reduce runoff, nutrient loss and for the improvement of the fertility of soil. This measure also involves the growth of natural grasses between croplands across the contour and planted grasses between the crops across the contour line (See figure 6).

Figure 6. *Grass strip by the local farmers at 1st Hankota Kebele Photo by Researcher, 2015.*

The most commonly practiced biological soil and water conservation measure in study area was wind breaks. The survey conducted indicated that 52 (53.6%) of the sample households have been practicing wind break. This measure is more permanent methods as compared to other measures and that involves shrubs or trees that are mainly implemented to control erosion and has own impacts to solve the problem of land degradation.

4.6. Area Closure

Based on survey in the study area, area closure is one of

the major restoration measures to degraded land that are followed by physical measures. From the total of 97 sampled households 90 confirmed this measure (Table 2). Most of area closure in the study area is practiced by closing area from the livestock and people, besides of that in order to stimulate the restoration of degraded land the local community are planting trees, grasses and applying the soil and water conservation measures (See figure 7). The zero management makes it also the cheapest method for rehabilitation of degraded areas. Nonetheless, in a few cases, enclosures are supplemented with enrichment planting of native and |or exotic species as well as and soil and water conservation measures to speed up the recovery process.

A B

Figure 7. *Live fencing to protect closure areas from human and livestock interference for restoration purpose A and B at Shara and Hirche Uyaya Kebeles respectively (photo by Eyasu Estefanos, 2015).*

4.7. Agroforestry

Agroforestry is an old set of land-use practices. It is an integrated approach to solve land-use problems by allowing farmers to produce food, fiber, fodder, and fuel simultaneously from the same unit of land. A common characteristic feature of all forms of agroforestry is that a tree component is deliberately grown or retained in an agricultural setting [3]. Based on survey, in the study area from the total 97 sampled households majority of them have been growing certain trees on their farmland. The trees that are growing in the study area are gravila (*Gravilia robusta*), tid (*Juniperus procera*), bisana (*Croton macrostachyus*), wanza (*Cordia africana*), sholla (*Ficus sur*) and the like. This is one of measures used as restoration efforts to degraded land. This is supported by Tolera [23] agroforestry are particularly effective as windbreaks and are frequently used to control erosion and reclaim badly degraded land. As it is responded by sampled households in terms the habit of using agroforestry in the study area, most of interviewed farmers acknowledged the medium about the degree of agroforestry and a few of them responded that low and high about the degree of agroforestry for rehabilitation purpose.

Based on the field observation in the study area the rural community practiced the agroforestry through planting of trees and shrubs and besides of that they plant coffee (*Coffea arabica*) and edible fruits such as mango (*M. indica*), apple (*Malus domestica*) and avocado (*P. Americana Mill*) with combination of enset (*Ensete Ventricosum*) and other crops like maize, teff and sorghum on their farmlands with the aim of, to minimize the soil erosion from land (See figure 8). This measure has also contributed to rehabilitation of degraded land through reducing soil erosion and increasing the fertility of the soil.

Figure 8. *Practice of Agroforestry by local community at 1st Hankota Kebele (Photo by Researcher, 2015).*

4.8. Agronomic Measures

Agronomic measures are one of soil and water conservation measure that is used with combination of other measures for effectiveness purpose. As other means the agronomic measures used in the study area for rehabilitation purpose. From the total of 97 sampled households 30 confirmed this measure. Based up on the survey the majority of interviewed farmers 70 (72.2%) confirmed contour cultivation from the agronomic measures and followed by this confirmed 13 (13.4%), 2 (2.1%) and 12 (12.4%) the application of manures, chemicals and cover crops respectively.

The local people claim that physical measures are found to be better than other conservation activities in terms of restoration of degraded land. Most claims that the construction of physical structure had brought an increase of yield through reducing of soil erosion and since the major causes for land degradation in the study area is soil erosion, the structural measures brings crucial changes by protecting their land from soil erosion. This study is supported by Amare *et al*., [1] throughout history, efforts to combat land degradation is focused on physical conservation structures. However, use of vegetative measures is very much limited.

4.9. The Challenges of Restoration Efforts and Its Remedies

The main challenges that constrain the sustainability of restoration efforts are lack of sense of ownership, unwillingness to work in group, farmer understanding capacity, lack of expert's skill regarding soil and water conservation engineering, lack of capital and material support, limited support from NGOs and lack of training by government. Besides, the constructed soil and water conservation structures are not scientific in some cases; skill gap and the lack of support exist when it comes to biological measures.

Some of the group discussant rose that poverty is one of core factors that hinders the sustainability of the restoration programme. During the planning and implementation of the restoration, some of the farmers are unable to participate due to economic problem because at that time they engage in non-farm activities (petty trade and labor work) in order to get daily income for their livelihood purpose. This finding is moreover supported by Hagos *et al*., [9] as poor farmers generally possess less land; they are more often engaged in off-farm activities such as petty trade. This can decrease their interest to invest on soil conservation practices. Small farm holdings and land fragmentation may undermine farmers' interest in undertaking some kind of land improvement.

4.10. Prospects of Restoration Efforts to Degraded Land in the Study Area

The practice of soil and water conservation measures, afforestation, area closure and the like bring vital changes in the restoration process. One of the major indicators of the progress of the restoration efforts to degraded land is increasing the production and productivity of land. This study is supported by the findings of Mesfin [16] respondents were requested to mention any changes observed in land condition as a result of land rehabilitation practices. Some of the changes, according to them include natural regeneration of severely degraded areas, better growth of crops along soil and water conservation structures due to entrapped sediments During the FGD, Some of discussants regarding the significance of restoration efforts they stated that to reduce soil erosion and then increases the fertility of soil and finally, the overall goal of restoration efforts is towards of increasing the production and productivity of agricultural land and all these shows that the effects of restoration program on production and productivity of the land.

Another indicator is change on land time to time in terms of coverage of land with vegetation; increase the volume of ground water and the like. In parallel, a study by Temesgen [20] reported that some of the success of watershed management was reduced run off, soil erosion and associated downstream siltation, increased vegetation cover and surface roughness, increased soil depth, increased recharge of groundwater table, increased production area and green environment, increased crop production and productivity and improvement in fodder availability. The major changes that are observed in the study area due to restoration efforts are increasing of yield and reducing of soil erosion because all of sampled households confirmed that increasing of yield and reducing of soil erosion are changes that observed as the result of the programme. The reducing of soil erosion contributed to the improvement of soil fertility and 89 (91.7%) opted that increasing of soil fertility is another changes that occurred due to rehabilitation practices. In addition, about 43 (44.3%) and 53 (54.6%) of interviewed households confirmed that decreasing of inputs and increasing of biodiversity are some changes that are seeing as the results of restoration efforts and that are taken by the joint efforts of different stakeholders.

5. Conclusions

This study has attempted to assess the restoration efforts of degraded land, challenges and prospects in Soro wereda. The main source of income of farmers in the study area relies on farming. The source of income of households in study area has a positive impact for the restoration process because those farmers who engaged in on–farm activities spent much time on their farmland and are more involved in soil and water conservation measures, afforestation, and reforestation and in protecting of restored land than that of farmers that engaged in off- farm activities.

The findings show that there is a land degradation problem and its extent is mainly found moderate to severe in the study area and the same is true about degree of soil erosion problem. The indicators of land degradation are gully formation, stoniness of land, absence of grasses and

vegetation cover, declining of crop productivity, change in soil color, drying up of streams and springs, presence of bare land, climate change, land itself requires high fertilizer, drought and famine.

In order to avert land degradation in the study area there has been undertaken a number of restoration efforts by the joint efforts of rural communities, government and non-governmental organizations. The major activities that are undertaking to restore degraded land are physical (structural) soil and water conservation measures and area closure. In addition, in order to speed up the restoration process the biological soil and water conservation measures, agroforestry and agronomic measures have been practicing.

The main goals of the restoration efforts are increasing of the production and productivity of agricultural land, achieve the food security of the rural community by fighting against poverty and to change the stoniness of land to soil or grass coverage of land.

Regarding extension services to restore degraded land, development agents are the major source of information. Besides of that the neighboring farmers, mass media, field training, and NGOs are also served as additional sources of information.

The crucial issues to run the restoration efforts in sustainable ways are developing the awareness of rural community as well as other stakeholders, running and adopting of the participatory approach, initiates the farmers to support the structural soil and water conservation measures with biological measures and managing the rehabilitated land by a local association and benefits the rural community through the income generating activities.

6. Recommendations

Based on the finding of the study, the following practical suggestions are forwarded to the restoration efforts of degraded land in the study area.

1) The researcher recommends that strengthening of community participation and capacity building of the community play an important role to increase the participation of community in the restoration process. Therefore, in order to reclaim the degraded land, the rural communities should involve in the programme and expected to play their roles.
2) The wereda agricultural and rural development office has great duties to facilitate the conditions for non-governmental organizations should involve in the restoration process.
3) Showing the ways how to the rural community to benefit from the programme that should have a positive impact for restoration efforts of degraded land and currently integrated watershed management is focused up on the conservation and development.
4) The government is one of the major actors to run the restoration process like farmers, has a great role should prepare policy regarding to how to manage the restored land and implement and check success of the policy at the country level.
5) The wereda agricultural and rural development has roles to achieve and ensure sustainability of the programme and one of the big issues about the restoration process is its sustainability.
6) In order to fill the skill gap of experts regarding soil and water conservation engineering works the government should give especial attention to capacity building.
7) Fast population growth is a challenge for the restoration efforts. Therefore, creating of income generating activities, facilitating resettlement program with their interest, encouraging the rural community to use family planning and opening employment access to rural community should play an important role to the sustainability of the restoration process.
8) Encourage kebele agricultural office head, kebele administrative leaders, developments agents and farmers should draw laws that govern them protect restored land and to punish criminals and to use resources wisely.
9) Providing incentives for those who showed great efforts and progresses in restoring of degraded land at wereda level and then scale up the best practices among the kebeles through the sharing of experience.

Acknowledgements

The authors would like to thank Soro Wereda Finance and Economic Development Office and Agricultural and Rural Development office experts for their numerous supports during data collection.

References

[1] Amare. B, Hagos. G/S & Temesgen. G. (2014). Land Degradation in Ethiopia: Causes, Impacts and Rehabilitation Techniques. *Journal of Environment and Earth Science Vol. 4, No. 9, 2014.*

[2] Anteneh. G. (2010). Farmers Awareness about Land Degradation and their Attitude towards Land Management Practices (M. A Thesis). Addis Ababa University, Addis Ababa, Ethiopia.

[3] Badeg. B and Abdu. A K. (2003). Agroforestry and Community Forestry for Rehabilitation of Degraded Watersheds on the Ethiopia Highlands, International Symposium on Contemporary Development Issues in Ethiopia, July 11-12, 2003 Addis Ababa, Ethiopia.

[4] Bekele. S, H. A. Freeman & S. M. Swinton. (Eds). (2005). Natural Resource Management in Agriculture Methods for Assessing Economic and Environmental Impacts, Andhra Pradesh, India: ICRISAT.

[5] Central Statistics Authority and the World Bank. (2013). Ethiopia Rural Socioeconomic Survey. Addis Ababa, Ethiopia.

[6] Fikru. A. (2009). Assessment of Adoption Behavior of Soil and Water Conservation Practices in the Koga Watershed, Highlands of Ethiopia. Cornell University.

[7] Getachew. A. (2005). Determinants of Land Degradation in the Lake Tana Basin and its Implications for Sustainable Land Management: The Case of Angereb and Gish Abbay Watersheds. (M.Sc Thesis), Ethiopia.

[8] Habtamu. E. (2006). Adoption of Physical Soil and Water Conservation Structures in Anna Watershed, Hadiya Zone (MA Thesis). Addis Ababa University, Addis Ababa, Ethiopia.

[9] Hagos. F, Pender. J & Nega. G/S. (1999). Land Degradation in the Highlands of Tigray and Strategies for Sustainable Land Management, Addis Ababa. Ethiopia.

[10] Israel. D. G. (2012). Determining Sample Size, University of Florida, USA. Pd006. http://edis.Uf/.edu/ Accessed on September 2, 2012.

[11] Kebede. W (2015). Evaluating Watershed Management activities of campaign work in Southern nations and peoples regional state of Ethiopia, *Wolancho Environmental System Research (2015) 4: 6.*

[12] Kibemo. D. (2011). Farmers Perception on Soil Erosion and Their use of Structural Soil Conservation Measures in Soro District, Southern Ethiopia (MA Thesis), Addis Ababa University, Addis Ababa, Ethiopia.

[13] Kiflemariam. (2008). Farmers Perspectives of land degradation and (padets) contribution to Sustainable Management. The case of Gozamen Woreda, Amhara Regional State (MA Thesis). Addis Ababa University, Addis Ababa.

[14] Lakew Desta, Carucci, V., Asrat Wendem-Agenehu and Yitayew Abebe (eds). 2005. Community Based Participatory Watershed Development: A Guideline. Ministry of Agriculture and Rural Development, Addis Ababa, Ethiopia.

[15] Meaza. H. (2015). The Role of Community Based Watershed Management for Climate Change and Adaptation in Adwa, Central Tigray Zone. *International Journal of Weather, Climate Change and Conservation Research Vol. 1, No. 1, pp. 11-35, March 2015.*

[16] Mesfin. D. (2010). Challenges and Prospects of Land Rehabilitation Practices: A Case of Angacha Woreda, Kambata Tambaro Zone, SNNPR, (MA. Thesis). Addis Ababa University, Addis Ababa.

[17] Mulugeta. L. (2004). Effects of land use change on soil quality and native flora degradation and restoration in the highlands of Ethiopia. Implication for sustainable land management. (Ph.D Thesis). Swedish University of Agriculture Science, Uppsala, Sweden.

[18] Shibru. T (2010). Land Degradation and Farmers perception: The Case of Limo Woreda, Hadiya Zone of SNNPR, Ethiopia. (MSc Thesis), Addis Ababa University, Addis Ababa.

[19] Soro Wereda Finance and Economic Development Office. (2015). Total Household sizes in each Kebele Administration of Soro Wereada.

[20] Temesgen. G. (2015). The implications of watershed management for reversing land degradation in Ethiopia. *Research Journal of Agriculture and Environmental Management. Vol. 4 (1), pp. 005-012.*

[21] Tesfa. W and S. K. Tripathi. (2015). An Evaluation of Watershed Management Practice in Ethiopia: A preliminary Review. *International Journal of Environmental Sciences Vol. 4 No. 1. 2015. pp. 24-30.*

[22] Tesfaye. G and Debebe. W|M. (2013). Farmers' Perception' and Participation on Mechanical Soil and Water conservation techniques in Kembata Tembaro Zone: the case of Kachabirra Woreda, Ethiopia. *International Journal of Advanced Structure and Geotechnical Engineering ISSN 2319-5347, VO 1.02, No. 04*.

[23] Tolera. M. (2011). Assessing the role of Traditional Land Management Practices in improving cropland Productivity: the case of Diga Woreda, Oromia. MS. Thesis, Ambo University, Ambo.

[24] United Nations Environment Program. (2006). don't desert dry lands! Facts about deserts and desertification. http://www.unep.org.

[25] Woldeamlak. B. (2003). Towards Integrated Watershed Management in Highland Ethiopia the Chemoga Watershed case Study. Tropical Resource Management. Paper, No 44|2003.

[26] Yeraswork. A. (2000). Twenty years to Nowhere; Property Rights, Land Management and conservation in Ethiopia, The Red Sea Press, Inc, Asmara.

[27] Yohannes. G. (1999). The Use, Maintenance and Development of Soil and Water Conservation Measures by small-scale Farming Household in Different Agro-Climatic Zones of Northern Shewa and Southern Wello, Center for Development and Environment, University of Berne, Switzerland in Association with the Ministry of Agriculture, Ethiopia Research.