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Perception of Local Community towards Soil and Water Conservation in the Case of Damote Boloso Kebele, Damote Gale Woreda, Wolaita zone.

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Abstract
The adoption of improved soil and water conservation technologies in developing countries has attracted much attention from scientists and policy makers mainly because land degradation is a key problem for agricultural production. The study was conducted in Damote Boloso Kebele, Damote Gale Woreda with the main objective to identify existing soil and water conservation measures while assessing local community perception towards soil and water conservation measures. During the study simple random sampling technique was used to select sample respondents and hence a total of 33 sample size was considered. Primary data was collected using a household survey, interviews, focus group discussions and field observations. The data was analyzed using SPSS version 16. The result indicates that almost all respondents have perceived well about problem of soil erosion and showed preference to adopt newly introduced soil and water conservation measures while maintaining existing practices. The most common physical soil and water conservation measures practiced in the study area are soil bund and Fanya juu and dip trench even though it is newly introduced practice. The study have shown that 46%, 21% and 33% of respondents insured that training and extension service was provided by Developmental agents, Non Governmental Organization and both Developmental agents and Non Governmental Organization respectively, even though it is inconsistent. Nevertheless, there has been factors like shortage of land, soil and water conservation measures are source of rodents, labor shortage, lack of consistent extension service and regularity are affecting the farmer's to fully practice the technologies. The study emphasizes that many of these problems were related to a lack of farmer's involvement in the conservation efforts and suggests that future soil and water conservation interventions should follow a real farmer participatory approach in the areas. In addition, farmer's should have a greater awareness of the economic significance of soil erosion on their cultivated fields; they need training on the impacts of erosion and the conservation technologies available to control soil loss; and farmer's with labor shortages need to be provided with support that enables them to retain their conservation technologies.

Introduction

Soil erosion is the main form of land degradation, caused by the interacting effects of factors, such as biophysical characteristics and socio-economic aspects. Degradation resulting from soil erosion and nutrient depletion is one of the most challenging environmental problems in Ethiopia. The Ethiopian highlands have been experiencing declining soil fertility and severe soil erosion due to intensive farming on steep and fragile land (Amsalu and de Graaff, 2006).

Land degradation in the form of soil erosion, sedimentation, depletion of nutrients, deforestation, and overgrazing - is one of the basic problems facing farmers in the Ethiopian highlands, and this limits their ability to increase agricultural production and reduce poverty and food insecurity. The integrated process of land degradation and increased poverty has been referred to as the "downhill spiral of un-sustainability" leading to the "poverty trap" (Greenland et al., 1994). The immediate consequence of land degradation is reduced crop yield followed by economic decline and social stress. In Ethiopia, where agriculture is the main stay of the economy (approximately 50% of GDP, 90% of foreign exchange earnings (EEA, 2002) an estimated half of the Ethiopian highlands' arable lands are moderately to severely degraded and nutritionally depleted due to over cultivation, over grazing, primitive production techniques, and over dependence on rainfall (Hugo et al., 2002). Hence, over four percent of the country's arable land has completely lost its ability to produce food (Teketay et al., 2003), and much more area is in a state of active degradation that makes restoration difficult and/or requires a considerable investment for mitigation (Lu et al., 2007).

In Ethiopia soil erosion is one form of environmental degradation with enormous negative consequence on the performance of the agricultural sector and the national economy in general. The annual soil loss of the country is estimated to be about 13 t ha-1 yr-1, of which 45% is removed from cropland (Hurni, 1993). Long-term land sustainability and soil degradation prevention are essential for Ethiopia to feed the growing population of the country (Awdenegest and Holden, 2007).

According to De Graaff *et al.* (2008), the adoption of improved soil and water conservation technologies in developing countries has attracted much attention from scientists and policy makers mainly

because land degradation is a key problem for agricultural production. There are three phases in the adoption process: the acceptance phase, the actual adoption phase and the final adoption phase. The acceptance phase generally includes the awareness, evaluation and the trial stages and eventually leads to starting investment in certain measures. The actual adoption phase is the stage whereby efforts or investments are made to implement soil and water conservation measures on more than a trial basis. The third phase, final adoption, is the stage in which the existing soil and water conservation measures are maintained over many years and new ones are introduced on other fields used by the same farmer.

Result from (Million and Kassa, 2004) has supported that natural resource degradation is the main environmental problem in Ethiopia. The degradation mainly manifests itself in terms of lands where the soil has either been eroded away and/or whose nutrients have been taken out to exhaustion without any replenishment.

Several estimates tried to measure the economic impacts of soil erosion in Ethiopia. Suticliffe (1993) estimated that erosion costs Ethiopia 2% of its GDP between 1985 and 1990. Similarly, Woldeamlak and Sterk (2002) and Sonneveld (2002) predicted that soil erosion would reduce per capita incomes of the highlands' population by about 30% by the year 2010. Daniel (2001) reported that an average soil loss of 42 t ha-1 yr-1 on cultivated lands and the maximum of 300-400 t ha-1 yr-1 in highly erodible and intensively cereal cultivated fields. The cost of soil erosion to the national economy is around US$ 1.0 billion/ year (Sonneveld, 2002).

Soil erosion can reduce crop yields by reducing organic matter content, plant nutrients, rooting depth, and water retention capacity of the soil (Schertz *et al.,* 1989; Awdenegest and Holden, 2007). Many studies in Ethiopia attributed the recurrent famines, prevalent food insecurity and the widespread poverty partly to the environmental degradation problem in general and soil degradation in particular. According to (Chizana *et al*, 2006), investigating farmers' perception of soil erosion and its impact is important in promoting soil and water conservation technologies. Soil erosion is an insidious and slow process therefore farmers need to perceive its severity and the associated yield loss before they can consider implementing soil and water conservation practices.

To minimize the severity of the problem, soil and water conservation interventions with some new technologies were implemented in many parts of the country during the 1970s and 1980s. They were introduced in some degraded and food deficit areas mainly through food-for-work programs. The major types of conservation methods were structural type, and of these the most common were the *fanya juu* and soil (or stone) bunds (Belay, 1992; Herweg and Ludi, 1999). Hundreds of thousands of kilometers of *fanyajuu* and soil (stone) bunds were constructed on croplands in Ethiopia (Belay, 1992). However, reports indicated that many of these conservation structures have either not been adopted or not been sustainably used by the farmers (Fitsum *et al.,* 2002). Farmers that seemed to be adopting soil and water conservation technologies due to incentives or coercive pressures often dismantled the structures partially or completely from their cultivated land. The failure to achieve the objective of adopting soil and water conservation technologies is attributed to both technical problems, as well as intricate socio-economic factors (Kessler, 2006).

The most important reason for limited use of soil and water conservation technologies is farmers' low adoption behavior1. Kessler (2006) considers soil and water conservation measures fully adopted only when their execution is sustained and fully integrated in the household's farming system. Adoption of soil and water conservation measures does not automatically guarantee long-term use. For example, when soil and water conservation measures have been established with considerable project assistance, not all farmers may continue using the measures. Therefore, introduction of soil and water conservation technologies may not lead to sustained land rehabilitation unless the farmers proceed to final adoption. The objective of the study is to identify existing soil and water conservation measure and investigate perception of farmers' towaards soil and water conservation technologies in Damote Boloso Kebele, Damote Gale Woreda, Wolaita Zone.

Materials and Methods

Site description

The study was conducted in Damote Boloso Kebele, Damote Gale Woreda, , which is situated 364 km away to south of Addis Ababa and nearly 25 Km away from Wolaita Sodo town. It is geographically located at 6º57'20.035" N Latitude and 37º46'31.279"E Longitudes. Damote Boloso Kebele was selected for the research because of the widespread implementation of soil and water conservation structures to control soil erosion.

Sampling technique, Data sources and analysis

Farm household survey was used to collect data in order to have quantitative data about perception of local community towards soil and water conservation activities. During the study simple random sampling technique was used to select sample respondents with some stratification based on watershed position either upper stream or downstream and hence a total of 33 sample sizes were considered. Informal discussion with individual farmers while they were constructing soil and water conservation structures, developmental agents and experts were made. This informal dialogue provided a forum where farmers openly expressed their opinions and views with a feeling of being at an equal standing with the interviewer. The data generated during the study was

statistically analyzed using frequencies and descriptive using the Statistical Package for Social Science for Windows 16 (SPSS, 2007). The qualitative data generated by the informal discussions were used to substantiate and augment the quantitative results from the structured questionnaires.

Result and Discussion

In the study area the physical soil and water conservation structures were under implementation. The commonly structures constructed are soil bund, *fanya juu* bunds and Dip trench in areas with high erosion risk. Among these practices, local communities are more willing to participate in soil bund and *fanya juu* bunds because of familiarity with the technology.

Background characteristics of respondents

Table 1: Descriptive Statistics on Perception, Age and Education

Item	N	Minimum	Maximum	Mean	Std. Deviation
Perception	33	1	1	1.00*	.000
Education	33	0	3	1.21	.927
Age	33	25	60	39.45	9.308
Valid N (listwise)	33				

1 refers to perception is positive*

The above table indicates that all respondents (100%) have perceived to adopt improved soil and water conservation measure. This is attributed to the level of education, training and access to extension services (Million and Kassa 2004).

Table 2: Education level of respondents

Education level	Frequency	Percent	Valid Percent	Cumulative Percent
Illiterate	9	27.3	27.3	27.3
Grade 1-4	10	30.3	30.3	57.6
Grade 5-8	12	36.4	36.4	93.9
Grade 9-12	2	6.1	6.1	100.0
Total	33	100.0	100.0	

Table 2 has indicated that 36.4% of the total sample respondents have attended Grade 5-8 where as 27.3% are illiterate. This again clearly indicates that the need for further training and extension services on newly introduced technologies to make adoption of soil and water conservation practices more effective as it was again evidenced by (Woldeamlak, 2005).

Table 3: Watershed Strata of respondents

Strata	Frequency	Percent	Valid Percent	Cumulative Percent
Upper stream	21	63.6	63.6	63.6
Down stream	12	36.4	36.4	100.0
Total	33	100.0	100.0	

Survey on perception of local community towards soil and water conservation measure was done by considering the upper stream community as well as downstream community. The result was based on 64% respondents from upper stream community while 36 % downstream community.

Table 4: Slope category and respondents response

Slope category	Frequency	Percent	Valid Percent	Cumulative Percent
Flat Slope (0-6%)	4	12.1	12.1	12.1
Gentle Slope (6-15%)	21	63.6	63.6	75.8
Steep Slope	4	12.1	12.1	87.9
Mountainous	4	12.1	12.1	100.0
Total	33	100.0	100.0	

Agricultural farming system (Table 4) is practiced mainly on gentle slope areas while because of the nature topography still there are respondents who are depending on mountainous and steep areas for the purpose of cultivation. This is another opportunity to adopt soil and water conservation practices in order to sustain

agricultural productivity by retaining soil moisture and fertility status. Majority of respondents (63.6%) are from upper stream, in addition considering the downstream respondents does have paramount contribution to perceive on soil erosion problem and to the success of soil and water conservation practice.

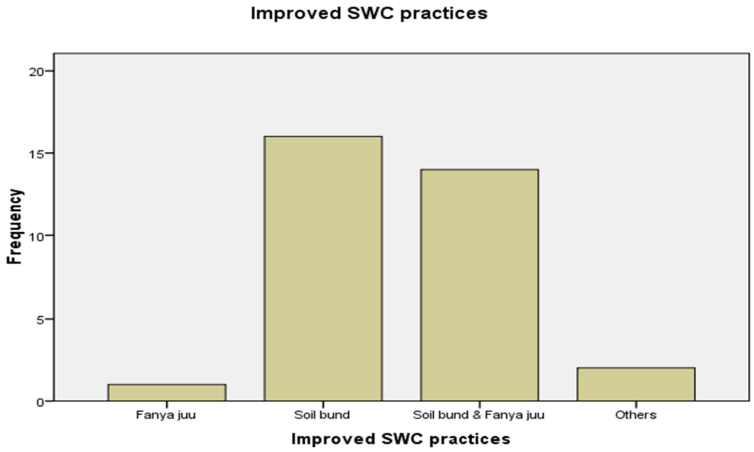
As far as perception on soil erosion is concerned all respondents from both upper stream and downstream respondents have appreciated the problem of soil erosion and its consequence on land degradation. It is pointed out that soil erosion is the most serious problem which was affecting livelihood of the local community to a greater extent as well as deterioration of environmental quality and/or soil quality in particular (UNEP, 2002).

Soil erosion problem

According to Table 5, it is understood that level of soil erosion and its severity is medium 73% with somehow high 27% but not at all low. This was attributed to the perception of local people and their engagement in soil and water conservation measures on their farm land and the entire watershed as it was supported by (Woldeamlak and Sterk, 2002). But, because of disparity and inconsistent follow up and guidance (Table 10) the result is indicating that local peoples are not fully engaged with all technical knowledge and expectations.

Table 5. Erosion problem

Level of erosion	Frequency	Percent	Valid Percent	Cumulative Percent
High	9	27.3	27.3	27.3
Medium	24	72.7	72.7	100.0
Total	33	100.0	100.0	



Graph 1: Improved soil and water conservation measures

According to graph 1, Soil bund and a combination of soil bund and Fanyaa juu are common practices with very limited practice like dip trench which is practiced on erosion risk and moisture deficient areas.

Table 6: Status of SWC practice

Status of SWC practices	Frequency	Percent	Valid Percent	Cumulative Percent
Partially removed	8	24.2	24.2	24.2
Not removed	7	21.2	21.2	45.5
Modified/adapted	18	54.5	54.5	100.0
Total	33	100.0	100.0	

As shown above in Table 4, more than half of the respondents have already perceived that soil erosion is not a severe problem now a day. Because, effective watershed management is now becoming a day to day activity allowing local people to participate and learn more lesson to solve soil and water related problems. However, still some respondents have assured that once introduced soil and water conservation measures have been partially removed because of knowledge and experience gap, while the disadvantage of soil and water

conservation measure as they take crop land and may pose difficulty for oxen turning during plowing. Other respondents indicated that soil and water conservation measures are source of rodents.

Soil and water conservation and soil fertility status

Table 7: Overall Statistics

		Improved SWC practices	Trend of Soil Erosion	Local People Perception	Extension Service regularity	Availability of Extension Service	Extension Service Provider
N	Valid	33	33	33	33	33	33
	Missing	0	0	0	0	0	0
Mean		3.00	1.94	1.00	2.64	1.00	1.88
Median		2.00	2.00	1.00	3.00	1.00	2.00
Std. Deviation		1.146	.242	.000	1.617	.000	.893
Variance		1.312	.059	.000	2.614	.000	.797

Table 8. Fertility status

Level	Frequency	Percent	Valid Percent	Cumulative Percent
High	1	3.0	3.0	3.0
Medium	28	84.8	84.8	87.9
Low	4	12.1	12.1	100.0
Total	33	100.0	100.0	

Result of this study confirmed that soil and water conservation measure has contributed to enhancement of soil fertility status and moisture improvement. Around 85% of respondents supported that soil fertility status is getting increasing and increasing from season to season and the yield too.

Soil and Water Conservation Training and Extension services

The success story on soil and water conservation practice in a given watershed is a function of training facility and access to extension service (Woldeamlak and Sterk, 2002). The study clearly indicated that Developmental agents took a lion of share in providing training and remains committed on the task of extension services. Moreover, there is a chance where training and follow up on soil and water conservation measure from Non Governmental Organization even though inconsistent.

Table 9. Extension Service Provider

Responsible Institution/expert	Frequency	Percent	Valid Percent	Cumulative Percent
DAs	15	45.5	45.5	45.5
NGOs	7	21.2	21.2	66.7
Both	11	33.3	33.3	100.0
Total	33	100.0	100.0	

Table 10. Extension Service regularity

Follow up/Service regularity	Frequency	Percent	Valid Percent	Cumulative Percent
Once per month	14	42.4	42.4	42.4
Two times per month	1	3.0	3.0	45.5
Three times per month	8	24.2	24.2	69.7
Once per four month	3	9.1	9.1	78.8
Others	7	21.2	21.2	100.0
Total	33	100.0	100.0	

Soil and water conservation as a practice has to be thought and demonstrated on the catchment level as well as field level. The demonstration is ultimately done when local people are directly informed, consulted and involved (Chizana et'al., 2006). The current study has investigated that almost 50% of respondents' agreed that there is inconsistent follow up and guidance from experts. Developmental agents and NGOs are responsible for the extension service. The extension service is mostly 46% delivered by Developmental agents, 21% by NGOs

and 33% both Developmental agents and NGOs. Table 8 and 9 have evidenced that farmers are visited nearly once per month and once per four month. It was also substantiated that farmers are visited by NGOs which very less regular as compared to Developmental agents.

Conclusions and Recommendation

The intension of soil and water conservation is obvious and there is plenty of optimistic experience from the field, capacity building and extension service does significant role, but if not technically guided implementation is poor. Effective soil and water conservation measures have substantial benefit for attaining and sustaining food security in smallholder farming, through the successful rehabilitation and management of natural resources. The dominant physical soil and water conservation measure in the study area are soil bund and Fanya juu and dip trench even though newly introduced practice. In this context, farmers' perceptions on the practice of soil and water conservation measures remain critical. Therefore, there is a need for awareness creation, and for monitoring the proper management of the existing structures, to ensure that they function as intended, and to improve their efficiency. In addition, suitable conservation structures, adapted to climatic conditions and slope gradient, need to be implemented. This study has generally concluded that farmer's perception can positive and/or negative depending on the level and continuity of awareness creation and availability of extension services. Presence of extension service alone will not warrant for awareness creation and to substantiate local people perception. The most important finding from this research is there is no problem with extension services center. However, the regularity of service provision, follow up and guidance is not consistent that people may lack confidence and trust on the practice.

Therefore, this research has recommended that for newly introduced soil and water conservation measure awareness creation in line with training and guidance must be given. This awareness should not be something to tell or order local people but simply to demonstrate and let them participate so that they can experience and share more. In addition, there must be continuity and consistent consultation, advice and guidance on the practice of soil and water conservation measures.

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