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# Soil and Water Conservation Perceptions and Practices among Small Scale Farming House Holds: The Case of Borena Woreda, South Wollo (2011 G.c).

Eshetu Shifaw
Bule Hora university, department of Geography and Environmental studies , p.o.box- 144

**Abstract**
Ethiopia has been severed with land degradation problems. Among others, Soil erosion is a serious threat for environmental degradation. Poor soil and water conservation (SWC) practices and lack of effective planning and implementation of approaches for conservation are responsible for accelerating degradation on agricultural lands. These problems are among the factors to the outbreak of famines in the country which initiated the Government of Ethiopia and its foreign partners to emphasize on SWC. The purpose of this study is to identify SWC related awareness and practice of farmers as well as interface of farmers' SWC practices with local schools. Both qualitative and quantitative approaches were employed. Data was collected from primary and secondary sources through review of related document, questionnaire survey, formal and informal interview and field visit. The overall findings show that majority of the farmers recognized and have good awareness about the existence, major causes, indicators and impact of soil erosion. The majority of respondents perceived most of indigenous technologies from useful to very useful but not in a position to accept and act most of modern(introduced) technologies on their own private initiatives. Farmers' SWC investment was influenced positively and significantly with farmer's perception about severity of soil erosion, farm experience, labor force availability, farms' slope, farmer's access to credit and tenure security while negatively and significantly influenced with off farm activity, fertility level and fragmentation of farmers' plot. The networking of farmers with local school was found to be very weak. Generally, Farmers were not quite committed to SWC measures. Since reducing soil erosion is likely to be a less important objective for the farmers than securing immediate food needs, conservation measures should be followed by other inputs such as improved seeds to address immediate problems of the farmers.
**Keywords:** Indigenous and introduced soil and water conservation practices, farmers' awareness, farmers' attitude, networking of farmers with local school.

## 1. Introduction

Our world has been suffered and will suffer from different environmental problems. Some of them are global warming, land degradation, soil erosion, and problem of solid and liquid waste, war and terrorism. The extent and intensity of accelerated soil erosion is generally high and the big environmental problem in the world. Erosion by water and wind affects about 1643Million hectare of the surface area of the world, that is, about 11 per cent of the land area, and is by far the most widespread form of soil degradation (wild, 2003). He added that the economic implication of soil erosion in developing countries is very series because of lack of capacity to cope up with the problem which lead to population-poverty- degradation cycle. The rate of soil erosion is higher in Asia, Africa and South America averaging 30 to 40 tons per year and lower in United States and Europe averaging about 17 tons per hectare per year (Barrett, 1991). Dregne and Chou (1992) estimated that nearly 47 % of global crop land was just to be degraded with a percentage vary from 61 in Africa and 16 in North America.

Responses to growing resource constraints in Africa typically focus on two key limiting natural resources – soil fertility and water. This is because soil erosion and water loss are a great threat for realizing their development. Productivity decline of land due to soil erosion and desertification have reached to 50%. In addition, yield decline in African due to past soil erosion was estimated to range from 2% to 40% with a mean loss of 8.2% (Eswaran et al, 2001). Another alarming estimation made by Barbier and Bishope (1995 ) is that cost of land degrading in developing countries vary from less than1% to more than 9% of their respective GNP with estimate of Ethiopia being 6% to 9% GNP.

Historically in Ethiopia, land degradation which is mostly in the form of soil erosion is not a problem long years ago when the people are fewer in number and living without depleting natural resources as well as erosion was checked naturally (Zewdie, 1999). But, this history is changed at the time of emperor Menelik. Since then, Land degradation is common but little has been done to minimize their impact on productivity (Zewdie, 1999). There are several reasons such as shortage of rainfall, pest, soil erosion and week institutional support for low level of agricultural productivity. However, Aklilu and Degraaff (2006) explained that degradation of land due to soil erosion and nutrient depletion is the most challenging problems in Ethiopia. The present government adopted agricultural led industrialization(ADLI) by taking agriculture as a stepping stone to industrialization. But, soil and water which have determinant role for agricultural production are degraded quickly and so that it

could be difficult to achieve ADLI policy (Dubale, 2001). Land degradation has gone contrary to land conservation which results farm productivity reduction to 1 to 3 % per year (Mitiku, et al, 2006).

According to the estimate of FAO (1986), some 50% of land of Ethiopia were already eroded significantly in the mid 1980's and causing productivity decline by 2.2% per year. It was also predicted that by 2010, erosion could reduce per capita income of highland population by about 30%. Davide (1993) also pointed out that 88% of human population, 60% of live stock and 90% of agriculturally suitable area is found in highland of Ethiopia where annual soil loss is 42 tons per hectare per year from cropland which will remove total of top soil within 100 to 150 years with loss of production is between 1% to 2%. 75% of highlands are estimated to need soil conservation measures if they are to support sustained cultivation (wood, 1990). According to Gedion (2003), cost of soil erosion in Ethiopia from 1985 to 2010 was estimated to 1.9 billion US$ which shows the need for interventions based on the existed local socio economic potentials for the continuation of Ethiopia as a nation.

Unfortunately, the importance of conservation technologies to combat soil erosion were largely neglected prior to 1974.The attention of policy makers was attracted only after devastating famine in 1973(4) (Bekele and Holden 1998).To respond the problem of soil erosion through application of conservation technologies, massive conservation programs were initiated following 1975 by the governments through mobilizing farmers and by assigning local responsibilities (USAID, 2000). However, past efforts do not bring significant result mainly due to tope down approach persuaded and therefore soil erosion mainly by water continues to be a threat particularly to rural poor(Woldamlake and Sterk, 2002). Regardless of the achievement, the government has continued intervention project and as a result many area has been covered with terrace, soil bunds, closed by area closure and planted with millions of seedlings (Teklu and Gezhegn, 2003). To be effective, soil and water conservation technologies should be carefully designed and constructed by taking ground realities rather than top down approach. Participation of farmers has to come from their conviction and believe of technologies' effectiveness and efficiency. Farmers knowledge should be integrated since experience has shown that conservation measures which were not built on farmer's knowledge and without their acceptance lead nowhere (Woldamlake and Srerk, 2002).

Land degradation can be understood from both social and environmental context. These contexts are so diverse from place to place and time to time that only a real local understanding can provide insights into this issues. There is a general understanding that land degradation in the Ethiopian highlands is related to individual land use and management practices(Gizaw, 2010).Therefore, the key issue in reversing land degradation in the form of soil erosion and water loss is to understand farmers' practices and the factors that have driven them to choose such practices. This highlights the need to conduct study at locally specific issue of soil and water conservation.

Some studies were conducted in part regarding problems of maintenance of conservation measures, attitude of farmers and the impact of food or cash for work scheme (Lakew et al, 2005). However, Ethiopia is a home of diversity in both physical and social environment and therefore, complexities can arise from location specific nature of problems and diversity of farmers' circumstance that make it difficult to draw generalizeable findings to wider area. Large scale SWC programme to Ethiopia have been introduced before giving great attention to the area specific soil erosion process based conservation measures (Woldamlake, 2003).This could indicate that local problem identification was missing which resulted in much lower impacts of SWC measures than expected. Therefore, the missing of local problem identification, difficulties to generalize previous studies to the wider area and so to the study area and absence of SWC related studies in the study district are among the gaps which are the motivational factors behind this study.

The overall objective of the study is to assess soil and water conservation practices and Perceptions among small scale farming households. Specific objectives are:

I .To assess farmers' awareness of soil erosion and associated problems.
II. To assess farmer's perception regarding usefulness of the different conservation measures
III. To identify and describe farmers' soil and water conservation practices.
IV. To examine the relationship of physical, socio economic and demographic factors of households with soil and water conservation practices.
V. To examine the networking of farmers' SWC practice with the local school.

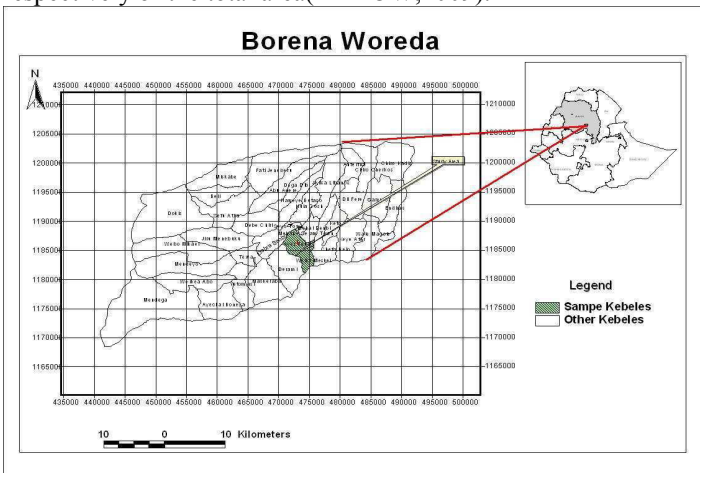
## 2. Material and methods

### 2.1. Description of the Study Area

Borena Woreda is situated between 38°28'E to 38°54'E Latitude and 10°34'N to 10°53'N Longitude. It is characterized by rugged topography with mountains, deeply dissected valleys, escarpment and plateau. Elevation of the woreda is found between 500 to 3200 a.m.s.l. The rainfall distribution is bimodal with the total annual rainfall varies from 889 to 1500 mm. The mean annual temperature of the region varies from $14^0$c to $19^0$c ( Meteorological records of the woreda from 2008-2010). According to agriculture and rural development office

of the woreda (ARDOW, 2009), total populations of the woreda is 164,302 of which 153991and 4995 were rural and urban settlers respectively. Regarding land use; Cultivated land, Shrub or bush land, Grass land and Settlement area covered 41421.26ha(42.42%), 18329ha(18.8%), 8356.14ha(8.6%) and 5486.83(5.6%) respectively of the total area(ARDOW,2009).




Source: Ethio-GIS and CSA, 2007.
Figure 1: Map of the study area

**2.2. Research design, Data Source, data gathering tools**

Descriptive survey research design is employed. Both qualitative and quantitative approaches are also used. Because, each approach has its own limitation and therefore, Creswell (2003) advised that researchers can be benefited much if they used mixed approach as one fills the gap of the other.

Among 40 peasant associations (PAs), Workemeskele and Ayer Tena were taken as the sample PAs. Given 79% of the woreda's area is found in tropical and subtropical agro climatic zone and two sample PAs are found in the mentioned agro climatic zone, so that large and diverse enough to accommodate various socio economic characteristics of farmers and could effectively represent the woreda. After sample frame of house hold heads was divided into different strata on the basis of gender, wealth group and agro climatic zone, Lottery method was employed to take 73 samples respondents(38 from Workemeskele and 35 from Ayertena). To see the interface of local schools with farmers' SWC practices, interview was conducted with two school principals, eight teachers and eight students taken from two primary schools in the sample PAs. Data Gathering Tools are questionnaires, key informant interview, field observation and informal interview and review of related document. During dissemination of questionnaires, interviewees were encouraged by interviewer for some explanation when respondents' responses did not match with the questionnaires. In practice, therefore, questionnaires are also a guideline around which discussion is built. To enhance Validity and reliability of the instruments, a pilot test was carried out on 15 households who were not included in the sample of the main study and modification was made accordingly. Data gathered through different tools was triangulated to verify the data. A draft instrument was also judged by experts. In addition, the researcher helped interviewer to understand questionnaires as well as the objective of the study.

**2.3. Variable of the Study**

Dependent variable considered in this study is soil and water conservation investment. Explanatory variables are farm experience, education, family size, Perception of soil erosion, Labor availability, fragmentation and slope of farm plots, soil fertility, and severity of soil erosion, off farm activities, farm size, Security of land tenure, households contact with development agents (DA) and access to credit.

**2.4. Method of data Analysis**

Data generated through secondary sources, key informants interview, formal and informal discussion and field observation was analyzed qualitatively throughout the analysis. Quantitative data was analyzed using descriptive statistics and spearman correlation.

**3. Results and Discussion**

**3.1. Farmers Perception on Soil Erosion**

**3.1.1. Causes of soil erosion**

Knowing the cause of a given problems is an important, possibly the first step, to find solution for a given problem or to take remedial action. All respondents have aware the existence of soil erosion and perceived

different causes. Some causes were presented to see respondents' perceived rank of them. As indicated in Table 1, high intensify of rainfall and deforestation were the most vital factors as their mean rank shows the majority were ranking these causes from first to third. Contrary to this, data from some key informant interview showed that rainfall was not the primary causes and they reasoned it has been showing a decreasing trend from the past to the present.

Table 1. perceptions on causes of soil erosion (percentage)

| Causes | Workemeskele | | | | | | | Ayertena | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rank | | | | | | Mean Rank | Rank | | | | | | Mean Rank |
| | 1st | 2nd | 3rd | 4th | 5th | 6th | | 1st | 2nd | 3rd | 4th | 5th | 6th | |
| A | 21.2 | 7.9 | 7.9 | 15.8 | 13.2 | 34 | 3.9 | 20 | 2.8 | 2.8 | 5.0 | 11.4 | 58 | 4.6 |
| B | 31.6 | 23.7 | 15.8 | 13.1 | 5.3 | 10.5 | 2.6 | 28.6 | 34.3 | 8.6 | 8.5 | 20 | - | 2.6 |
| C | 16.7 | 35.8 | 29 | 5.3 | 7.9 | 5.3 | 2.7 | 25.7 | 31.4 | 25.7 | 11.4 | 5.8 | - | 2.5 |
| D | 8.6 | 7.9 | 7.9 | 42 | 23.1 | 10.5 | 3.9 | - | 5.7 | 11.4 | 54.3 | 20 | 8.6 | 3.1 |
| E | 7.9 | 13.2 | 31.5 | 13.2 | 23.7 | 10.5 | 3.6 | 22.9 | 17.1 | 40 | 2.8 | 11.4 | 5.8 | 2.8 |
| F | 15.8 | 18.5 | 10.5 | 10.5 | 18.4 | 26.3 | 5.2 | 5.7 | 11.4 | 8.6 | 8.6 | 40 | 25.7 | 4.4 |

Key: A- Poor agricultural practice; B- High intensify of rainfall; C- Deforestation; D- Overgrazing; E -Cultivation of steep slope; F-Continuous cultivation.

Source: own survey

Data from focus group discussion (FGD), also revealed some crops mainly maize and sorgum were viewed as the causes to slow down erosion due to their cultivation during small rainy seasons and cover soil before the arrival of heavy summer rain. Generally, farmers aware and perceived a number of but interrelated causes of soil erosion even though variation were aroused from their priorities.

### 3.1.2. Indicator of Soil Erosion

Regardless of wealth group and agro climate, majority of the respondents perceived different indicators with decrease in production was the most commonly observed indicator of soil erosion by the majority in both PAs. However, increasing agricultural inputs was not perceived by the majority in topical climatic zone (Worke meskele) contrary to Ayer tena. Transect walk also addressed gullies and rills are frequent in both farm lands and pasture land, exposure of rocks and plant roots are also a common phenomena. Most of the rills and gullies on farmlands were developed mostly from poorly constructed traditional ditch and water way due to lack of maintenance from the owner.

Table 2. Perception on indicator of soil erosion (%)

| Indicators | Workemeskele | Ayertena |
|---|---|---|
| Decrease in soil depth | 71 | 80 |
| Decrease in production | 92.2 | 91.4 |
| Change in crop color | 84.2 | 71.4 |
| Increase agricultural inputs | 47.4 | 97 |
| Increase gullies and rills | 76.3 | 94.3 |
| Exposure of rocks or plant root | 78.9 | 82.8 |

Source: own survey data

### 3.1.3. Problems and Priorities of Crop Production Decline

The study area is generally food insecure due to various factors. To see the perceived rank of soil erosion among others in contributing crops production decline, some factors were presented to the respondents as indicated in table 3. Shortage or over rain is the first prioritized factor by the majority for crop production decline in both workemeskele and Ayertena with mean rank of 1.7 and 1.8 respectively followed by soil erosion and fertility decline with mean rank of 2.8 and 2 in respective study districts. Key informants interview also showed that soil erosion and fertility decline are the responsible deterioration of crop production and the limited capability of degraded soil was further hampered with over rain during June and July and shortage of rain during September and October when it is highly needed.

**Table 3. Problems of crop production (%)**

| problems | Workemeskele | | | | | | | Ayertena | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rank | | | | | | Mean rank | Rank | | | | | | Mean rank |
| | 1st | 2nd | 3rd | 4th | 5th | 6th | | 1st | 2nd | 3rd | 4th | 5th | 6th | |
| A | 15.7 | 2.6 | 5.3 | 13.2 | 15.8 | 47.4 | 4.5 | 2.8 | 2.8 | 5.7 | 8.6 | 37.2 | 42.9 | 5 |
| B | 21.1 | 10.5 | 5.3 | 5.3 | 39.4 | 18.4 | 3.9 | 11.4 | 11.4 | 8.6 | 11.4 | 22.9 | 34.3 | 4.2 |
| C | 26.3 | 29 | 18.4 | 21 | 5.3 | - | 1.7 | 45.7 | 40 | 8.6 | 5.7 | - | - | 1.8 |
| D | 13.4 | 26.3 | 34 | 21 | - | 5.3 | 2.8 | 28.6 | 37.1 | 25.7 | 8.6 | - | - | 2 |
| E | 10.6 | 15.8 | 18.4 | 21 | 23.7 | 10.5 | 3.8 | 3 | 2. 7 | 14.3 | 40 | 31.4 | 8.6 | 4.2 |
| F | 15.8 | 15.8 | 18.4 | 18.4 | 13.2 | 18.4 | 3.7 | 8.6 | 5.7 | 34.3 | 31.4 | 11.4 | 8.6 | 4.3 |

Key: A- Fragmentation of farmland; B- Lack of draught oxen; C- Shortage or over rain;
D- Soil erosion and fertility decline; E - Poor agricultural practice like nutrient mining; F- Weed.
Source: own survey

## 4. Farmers Perception and practices of soil and water conservation (SWC) Technologies

Different indigenous and modern SWC practices were evident in the study areas. But, it was found reasonable to minimize them to relatively a manageable number for analysis. Therefore, field observation, discussion with both development agents(DA) and some farmers was held at the early stage of data gathering and their by '7' indigenous and '5' introduced technologies were selected based on their relative employment by the farmers. Perception to usefulness of SWC technologies and their perceived capabilities in arresting soil erosion affects farmers' decision to use them. In this regard, Woldeamlak (2008) found that the major cause of disinterest by most of the farmers towards SWC activities is farmers' perceived ineffectiveness of SWC technologies. Therefore, an attempt was made to investigate perceived usefulness of SWC measures.

### 4.1. Farmers' Perception to Indigenous SWC Measures

As presented in table 4 below, the majority (around 80%) of respondents in both PAs rated indigenous technologies from useful to very useful in arresting soil erosion and increase productivity of farms. The perceived orders of technologies based on total mean rank of their usefulness are crop residue, traditional cut of drain (*tras boyi*),traditional water way (*Bahlawi boyi*), contour ploughing,(*Agidim mares*), traditional check dam (*Bahlawi keter*), grass strip (*yesarshenter*) and traditional ditch (*fesses*) respectively. According to data gathered through discussion with some farmers while field visit and key informants, indigenous measures were perceive positively by the majority due to: they have multiple benefits beyond protecting soil from erosion, are flexible and hence easy to adapt to different environmental conditions, have been developed and repaired during farming and so integrated with prevailing farming systems as well as they are not dependent on managerial skill of outsiders like development agents.

Table 4: Farmers perception to usefulness of indigenous SWC measures (%)

| Indigenous SWC measures | Workemeskele (N= 38) Scale (1-4) | | | | Ayertena (N=35) Scale (1-4) | | | | Total mean score | Rank by mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | | |
| Traditional ditch | 15.8 | 5.3 | 57.9 | 21.1 | 22.8 | 8.6 | 40 | 28.6 | 2.5 | 7 |
| Grass strip | 10.5 | - | 57.9 | 31.6 | 5.7 | - | 54.3 | 40 | 3.14 | 6 |
| Traditional cut of drain | 13.1 | 2 | 37.5 | 47.4 | - | - | 37.1 | 62.9 | 3.4 | 2 |
| Traditional water way | 7.9 | - | 50 | 42.1 | 8.6 | 2.8 | 40 | 48.6 | 3.3 | 3 |
| Contour ploughing | 10.6 | - | 52.6 | 36.8 | 11.5 | - | 51.4 | 37.1 | 3.15 | 4 |
| Crop residue | 13.1 | 7.9 | 21.1 | 57.9 | - | 2.8 | 8.6 | 88.6 | 3.53 | 1 |
| Traditional check dam | - | - | 52.6 | 47.4 | 11.4 | - | 62.9 | 25.7 | 3.26 | 5 |

Scale: 1= not useful, 2= uncertain, 3 = useful, 4 = very useful
Source: own survey data, 2011

### 4.2. Farmers' Perception to Modern SWC technologies

There are some introduced soil and water conservation measure which have been practiced in the study area. As indicated in table 5, cut off drain and check dam are the two highest rated technologies by their usefulness with the highest mean score of 3.28 and 2.66 respectively which are approaching the highest scale (4) relatively than others. Regardless of agro climate, the order of introduced technologies based on their perceived usefulness score are cut off drain, check dam, stone terraces, planting trees, and water way with the mean score of 3.28,

2.66, 2.36, 2.15 and 1.87 respectively. Unlike most of indigenous technologies, there is considerable proportion of respondents in both districts who perceived most of modern conservation measures as not useful. Information from key informants and most of respondents had complains regarding limitations of introduced technologies mainly related to stone terraces. These includes stone terraces are space taking, obstacle to turn yoked pair of oxen, easily damaged by freely moving animals, harboring rodents, causing water logging at upper side of the structure, removal of stone from the farm surface which aggravate soil erosion as well as labor consuming. This finding support the literature (Woldeamlak and Sterk.G,2002) that reported introduce technologies were not sensitive to micro scale biophysical and socio economic realities as long as they are based on the guideline of manuals prepared in reference to slope inclination and agro ecology.

Table 5. Farmers perceptions to usefulness of modern SWC technologies (%).

| Introduced SWC measures | Workemeskele (N= 38) Scale (1-4) | | | | Ayertena (N=35) Scale (1-4) | | | | Total mean score | Rank by mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | | |
| Stone terraces | 42.1 | 7.9 | 44.7 | 5.3 | 31.4 | 5.6 | 37.1 | 25.7 | 2.36 | 3 |
| Cut of drain | 10.7 | 5.3 | 50 | 34 | 5.6 | - | 28.6 | 65.7 | 3.28 | 1 |
| Water way | 52.6 | 23.7 | 13.2 | 10.5 | 37.1 | 34.3 | 25.7 | 2.8 | 1.87 | 5 |
| Planting trees | 23.7 | 52.6 | 18.4 | 5.3 | 48.6 | 22.9 | 8.6 | 20 | 2.15 | 4 |
| Check dams | 13.1 | 23.7 | 44.7 | 18.4 | 15.8 | 15.6 | 48.6 | 20 | 2.66 | 2 |

Scale: 1= not useful, 2= uncertain, 3 = useful, 4 = very useful
Source: own survey

### 4.3. Soil and Water Conservation Practices

#### 4.3.1. Indigenous Soil and Water Conservation Practices

Interview result with elder farmers and field observation addressed that farmers have been practicing a combination of biological and structural measures. Among different measures, contour ploughing and traditional water way were the most common indigenous practices in both PAs. Opposed to this, information from key informants' interview revealed that there were many indigenous practices like fallowing that the farmers are abandoning in response to environmental change such as population pressure, land scarcity and deterioration of economic conditions.

Table 6. Farmers practice of indigenous SWC technologies (%)

| Indigenous SWC Practice | Workemeskele | Ayertena |
|---|---|---|
| Traditional ditch | 81 | 85.7 |
| Grass strip | 36.8 | 51.4 |
| Traditional cut of drain | 63.2 | 88.6 |
| Traditional water way | 89.5 | 85.7 |
| Contour ploughing | 100 | 100 |
| Crop residue | 36.8 | 17.7 |
| Traditional check dam | 55.3 | 54.3 |

Source: own survey

#### 4.3.2 Introduced Soil and Water Conservation Practice

In light of overwhelming land degradation due to water erosion, experts and policy makers were convinced that indigenous technologies alone were not sufficient to conserve the land resource. Therefore, the state has launched large scale environmental protection programs in 1980s which focused on food deficit region of North, Central and Eastern part of the Ethiopia (Osman et al, 2000). Likewise, it was observed that there are different SWC technologies introduced to the study districts. As indicated in Table 7, all respondents practiced Stone terraces. Cut off drain in Workemeskele and both Check-dam and Cut off drain in Ayertena were practiced by the majority. It was learned from interview with development agents that stone terraces have been built by mobilization of farmers through productive safetnet program. However, most farmers were not participating voluntarily but for the purpose of getting food or money. To alleviate this problems some key informants were forwarding some recommendation such as mobilization of their force by village administrators or development agents to participate in conserving their own land than being forced to participate in others village, highlight the need to have good design of the structures like stone terraces before structures were constructed on their farm land and integrating the issue of soil and water conservation in the main local institution (locally called "kire").

Table 7. Farmers practices of introduced SWC technologies (%)

| Introduced SWC Practice | Workemeskele | Ayertena |
|---|---|---|
| Stone terraces | 100 | 100 |
| Cut of drain | 52.6 | 65.7 |
| Water way | 31.6 | 17.1 |
| Planting trees | 42.11 | 28.6 |
| Check dams | 44.7 | 85.7 |

Source: own survey

### 4.4. Factors Affecting Farmers' soil and water conservation (SWC) Investment

It is obvious that households' SWC investment is influenced by a wide range of socio economic, institutional and physical factors. Statistical significance was tested at 0.01 and 0.05 significance level as observed from table 8 below. Farmers' SWC investment was influenced positively and significantly with perception of farmer's about severity of soil erosion, farm experience, availability of labor force, slop class of farms, farmers' access to credit and tenure security while negatively and significantly influenced with off farm activity, fertility level and fragmentation of farmers' plot.

Table 8. Relationship of socio-economic, farm land and institutional variables with farmers' SWC investment

| Explanatory variables | Farmers' SWC investment | | |
|---|---|---|---|
| | Pearson Correlation | Sig. (2-tailed) | N |
| *personal factors:* Farm experience of house holds | *.238(*)* | *.043* | *73* |
| Educational level of households | *-.109* | *.358* | *73* |
| Availability of farmer's labor force | *.256(*)* | *.029* | *73* |
| Family size of house holds | *.028* | *.816* | *73* |
| Perception of farmer's about soil erosion | *.304(**)* | *.009* | *73* |
| *Economic factors:* Off arm activity of house holds | *-.244(*)* | *.037* | *73* |
| Farm size of households | *.092* | *.439* | *73* |
| *Farm land characteristics* Fertility level of farmer's plot | *-.293(*)* | *.012* | *73* |
| Slop class of farmer's plot | *.344(**)* | *.003* | *73* |
| Fragmentation of farmer's plot | *-.237(*)* | *.043* | *73* |
| *Institutional factors*: Households' contact with AD | *-.073* | *.540* | *73* |
| Farmer's access to credit | *.248(*)* | *.035* | *73* |
| Tenure security of households | *.256(*)* | *.029* | *73* |

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

### 4.5. Networking of farmers SWC practice with local school

The result of interview with school principals, some teachers and some students shows that there is no connection between the schools and the surrounding SWC measures. Interview with teachers addressed that there is no enough time allocated to teach and cover students' text book and hence teaching learning process was limited to the classroom. Even though environmental issues around the school such as soil erosion, prevalence of fauna and flora as well as water are some examples of the local context in which teachers can contextualize and make abstract concepts more real, it was found that teaching learning process was conducted in the classroom through lecture method. Therefore, lack of time was seen as the major reason for students not to use some of best practices of farmers as demonstration site and their weak involvement which ultimately create poor school linkage with farmers' practices. School principals also said that there is inter-linkage between schools and sounding farmers on different issues like calling students' parent to generate income for school and to discuss about students' behavior other than soil and water conservation practices.

## 5. Conclusion

**Food insecurity as a root causes for soil erosion:** Majority of the farmers are well aware of the causes of soil erosion and its coping mechanisms. Yet, different factors like shortage of land and its productivity decline ultimately lead to food insecurity which forced farmers to cultivate marginal areas and destroy trees. Hence, addressing the root causes of poverty will be an entry point to good land husbandry.

**Deep rooted indigenous SWC practices:** There are ranges of physical and biological soil and water

conservation measures. Majority of the respondents perceived most of indigenous SWC practices from useful to very usefully than introduced technologies. Therefore, indigenous practices need o be harmonized with modern technologies for better conservation out come and better acceptance of modem conservation practices.

**Top down approach:** some introduced SWC technologies used are technically biased and not to the interest of farmers. Farmers view need to be integrated to get better acceptance of new technologies and for sustainable land resource management. In addition, adequate consideration of different factors affecting farmers practice may greatly contribute to increase the SWC investment.

**Interface of SWC practices with local schools:** Even though there are wide range of indigenous conservation practices and extension services in the study area, these practices were not strongly linked with local schools. Environment related clubs of the schools were also not able to create students' interest to different soil and water conservation efforts.

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