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Perception of the Farmers' on the Existence of Soil Erosion in the Case of Sekela District, Amhara State, Ethiopia

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Abstract
Soil erosion is one of the major ecological problems challenging rural agricultural production in many parts of Ethiopia. Even though a number of Soil and Water Conservation (SWC) methods (both indigenous and introduced) are practiced, however soil erosion is still a serious problem. Therefore, the objective of this research was was carried out to identify the perception of the farmers' on the existence of soil erosion in the case of Sekela District, Amhara State, Ethiopia. Structured questionnaire survey and focus group discussion methods were applied to collect the necessary information from farm households. A total of 90 households were asked in the survey and several fields were visited during observation. The primary data were also obtained from group discussion with household heads; and interview with the District experts and Kebele Administration workers. The qualitative data obtained through interviews, observation and focus group discussions were analyzed and interpreted through content analysis (after the collection of all the necessary data, analysis was followed). The survey result shows that in the study area there is high soil erosion. The cause of this is associated with anthropogenic (human) and natural factors. Farmers are awarded about the existence of soil erosion in various forms that taking place on their farms as well as in the surrounding areas. The major soil erosion indicators identified by the farmers were land slide, bare land, falling of trees, formation of gullies, decreasing of spring water, stony land and red soil. The following set of recommendations were forwarded base on the findings. Action based sustainable soil management systems, area closure and tree plantation methods, applying crop residues to left on soil surface should be practiced. Training and providing information should be given to the farmers.
Keywords: Farmers' knowledge, Soil Erosion, Soil erosion indicators, Ethiopia

1. INTRODUCTION

Soil erosion has had both positive and negative effects throughout the history of human civilization. For example, erosion has positively contributed to the early civilization that lives in the basin of Tigris, Euphrates, Nile, Indus, and the rivers of China (Wild, 1996). Today, 98% of Egypt totally dependent upon the Nile Rivers and Nile is literally the life-artery of the country (Oestigaard, 2010). In contrast to this, other countries like the highland parts of Ethiopia, Greece and Italy are suffered by erosion due to deforestation, cultivation of the cleared land and overgrazing (wild, 1996).

Ethiopia is one of the most well endowed countries in sub-Saharan Africa in terms of natural resources (Gete *et al*., 2006). However, it faces different problems in the country. Natural resources such as soil, water and vegetation are degraded in its quality and quantity. From this, soil erosion is one of the most serious environmental problems (Million and Kassa, 2004).

The major types of soil erosion in Ethiopia are water and wind erosion. It was possible to understand that the major and prominent soil erosion type the Ethiopian highlands is water erosion (sheet erosion, rill erosion, gullies or gully). In the Ethiopian highlands, soil erosion is caused by combination of rainfall erosivty which is determined by energy; intensity and duration of rainfall; absence of structures such as terraces, grass strips, field bunds etc.; slope gradient and length, which is determined by topography and cover and density of vegetation; and steepness of the land and human impacts such as deforestation (Fitsum *et al*, 2002).

In Ethiopia, the cause of soil erosion is also associated with surface run-off draining to neighboring countries by transboundary rivers (EPA, 1998); lack of technology, low adoption and/adaptation SWC technology, topographical factor, the increasing of population and institutions and policy issues (Gete *et al*., 2006; Gizachew, 1994; Gizaw *et al*., 2009); land cover change (Woldeamlak, 2002); civilization expansion into new areas for better soil (Hurni, 1998); Land degradation was largely neglected by policymakers until the 1970s (Genanew and Alemu,2010) and through the components of climate (Bezuayehu *et al*., 2002).

Due to the above factors, soil erosion results one third of the world agricultural soil or roughly two billion hectares of land were being affected by soil degradation in the world (Hurni, 2002); milk yields decline about one to fourth of the average for all developing countries in each year due to decline in grazing land (Pender *et al*., 2002) and in Ethiopia results crop yield per year is expected to decline by one to three percent (Mitiku *et al*., 2006).

Land degradation in the Amhara state has not focused on the economic, social or institutional factors that affect how farmers manage their land. The biophysical dimension of the problem has been favored (Lakew

et al., 2002). Though Gojjam is naturally endowed with beautiful landscapes and soils with good potential, it has been continuously exploited for centuries and its present condition is very alarming (Gete and Hurni, 2001). In terms of the extent of impacts, Gojjam, Awi and surrounding areas of Lake Tana are most critical areas where the erosion hazard is very sever. Therefore, the occurrence of soil erosion makes the issue of soil conservation not only necessary but also a vital concern if the country wants to achieve sustainable development on its agricultural sector and its economy at large (Abera, 2003).

Therefore, this study was intended to study the perception of the farmers' on the existence of soil erosion by exploring major indicators of soil erosion.

OBJECTIVES OF THE STUDY

Main objective of the study

The main objective of this study is to look over the perception of the farmers' on the existence of soil erosion in the case of Sekela District, Amhara State, Ethiopia

2. SITE DESCRIPTION (LOCATION)

The study area is located in Amhara state; north western Ethiopia within the geographical grid coordinates of $10^0$55'00" to $11^0$05'00" North latitude and $37^0$05'00" to $37^0$15'00" East longitude.

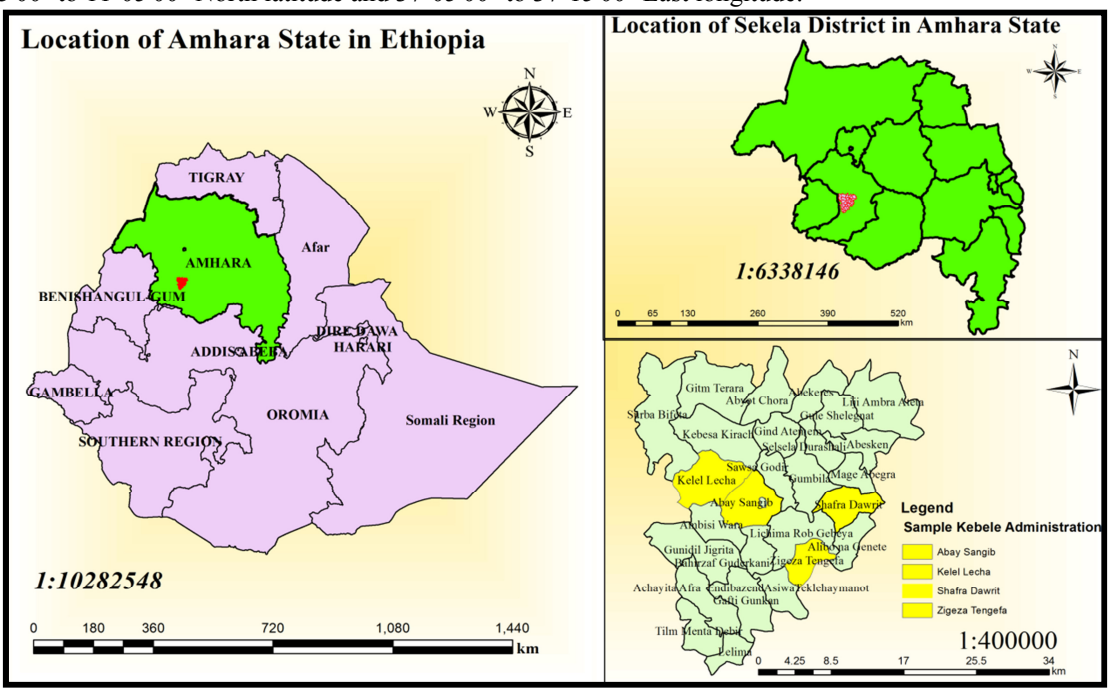


Figure 1: Location Map of the Study Area

Topography, Agro ecology, climate and water resources

Steep slope and undulated topography is a typical characteristic of the study area. The majority (75%) of the study area is mountainous and consists of dissected terrain with steep slopes, and the remaining (25%) has an undulated topography with gentle slopes. The study area is located in altitude ranges from 2000-3400m a.s.l (fig. 2). According to the traditional agro-climatic classification, the study area lies within *dega* (cool to cold humid) and *woinadega* (warm to cool semi humid). The climate is humid with an average annual rainfall of more than 1600 mm.

In Sekela District, there are 5 major rivers that flow permanitilly, 38 small tributaries, 105 springs and one lake are found. The major rivers are Abbay, Guder, Lahie and Jemma. Despite the widely held view that the Blue Nile originates from Lake Tana, the local people and District level officials strongly believe that the Gish Mountain is the true source of Blue Nile.

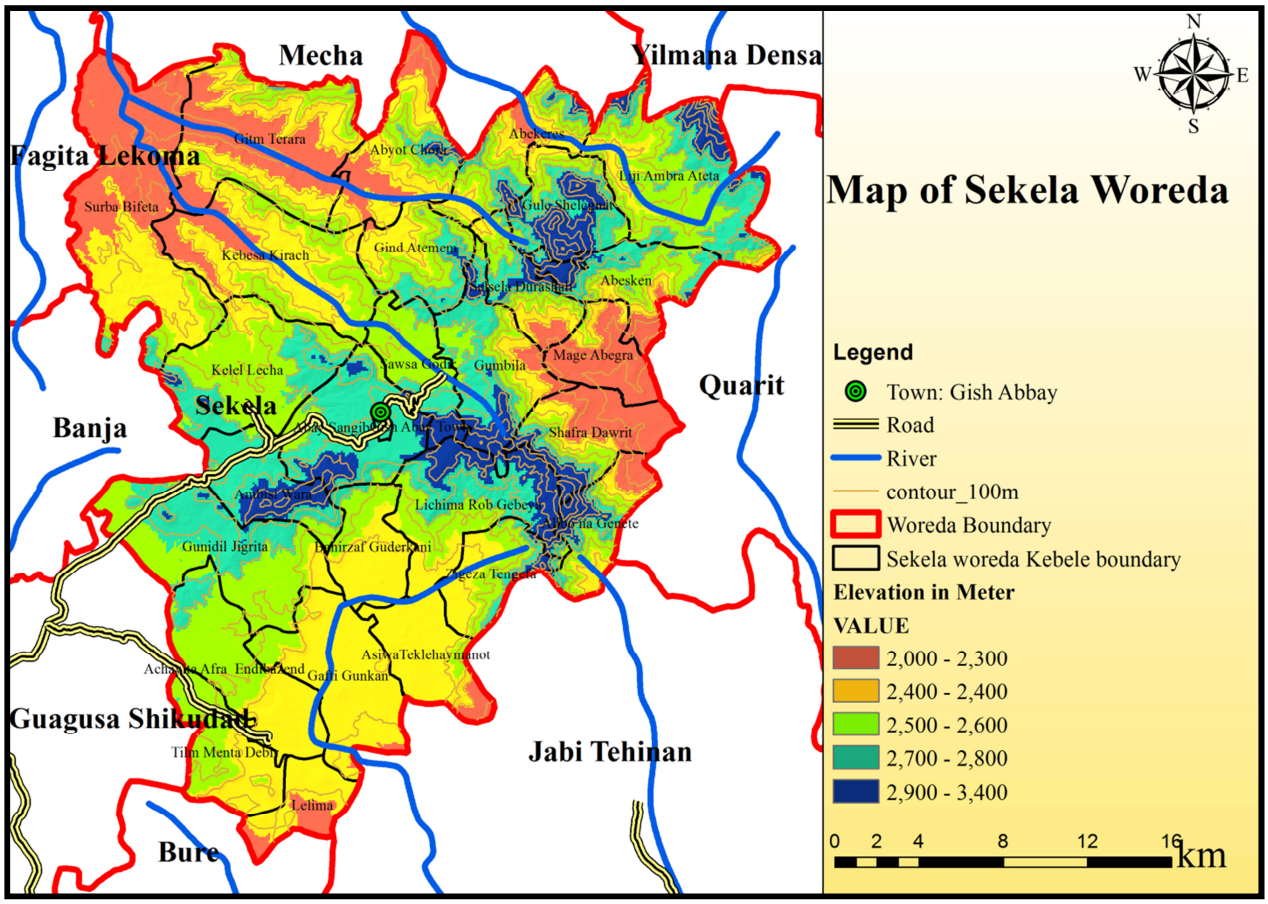


Figure 2: Elevation, Contour, Road and River map of Sekela district

3. MATERIALS AND METHODS

3.1. Sampling techniques and designs

The study was conducted in Sekela District, West Gojjam zone of Amhara National Regional State (ANRS) in 2010/11. The District was selected due to the fact that there was serious soil erosion problem and to some extents there was the practices of some coping mechanism have been undertaken today. From the District, four Kebele Administrations (KAs) were selected purposefully. The selected KAs were according to the degree of land degradation; relatively degraded areas (Kolelie- Lecha and Zegeza-Tenigefa) and relatively less degraded areas (AbaySangib and Shafra-Dawurit).

Based on their total population of each Kebele Administrations, proportional sampling method was used for household survey study. Following the selected four Kebele Administrations, 90 farm households were selected using systematic sampling method from the list of all farm households available in the selected Kebele Administrations. Even though the sample sizes of the households are small, it represents the whole population. Because, the study area is characterized by similarities, in terms of: (a) agroclimatic type (*dega* and *woina-dega*), (b) relief structure, (c) economic activities and (d) vegetative parameters.

3.2. Methods of data collection

Both primary and secondary sources of data were used in this study. Secondary sources of data were obtained from various published and unpublished sources of the governmental and nongovernmental organizations. Internet sources and research reports were employed for acquiring the necessary information. Information was also obtained from reports of District agricultural and rural development office and finance and economic development office about the socioeconomic, demography, educational, and other information related to the District.

Schedule Household Questionnaire

Structured questionnaires with close-ended and open-ended questions were used to collect the primary data from the sampled households. Before distributing the questionnaires to the households, an orientation was given to the households about the purpose of the study. Questionnaire includes questions like, the causes and indicators of soil erosion, and the socio-economic conditions and demographic characteristics of the households.

Field Observation

An observation was made together with Developmental Agents and Chairpersons of each Kebele Administration (*Likemeniber*) through walking in each Kebele villages before and after the questionnaire are carried out because the questionnaire includes those questions which are guiding during field observation of the areas. The observation was supported by adequate on-farm discussions and participatory observation.

Plat 1: Observation with Developmental Agents and farmers on the framers farm land

Focus Group Discussion

The greater part of the data for the study was collected through focus group discussion session with members of the communities selected for the study. In all, four focus group sessions were held. A minimum of seven persons and the maximum of 12 which include (men, women, elders and youths) were selected in the local communities to participate in the focus group sessions. For each Kebele, one group discussion was held. The advantages of this method (focus group discussion) were: the informal group situation, the open-ended nature of the questions, and the interaction among participants who encouraged and stimulated in-depth discussions.

Interview Questions

Semi-structured interviews were conducted with few farmers, chairpersons of each Kebele Administrations (*Likemenibers*) and Developmental Agents in respective Kebeles and experts from the District.

Plat 2: Interview with developmental agents in field works in Abay-Sangib Kebele

4. RESULTS AND DISCUSSION

4.1. Soil Erosion in the Study Area from the Farmers Point of View

Farmers' decisions to conserve natural resource in general and soil and water conservation in particular are largely determined by their knowledge of the problems and perceived benefits of conservation (Aklilu and Graaff, 2006).

From the survey and interview results, soil erosion in the study area is associated with continuous agricultural activities. The major economic activity of the study area is agriculture in general and farming in particular. More than 95% of the population is engaged on farming. This continuous farming system contributes a lot for soil erosion. Almost all farmers in the study area have awareness about the prevalence of soil erosion on their Kebele in general and on their land in particular. In other words, farmers have awareness about the prevalence of soil erosion in various forms on their lands as well as the surrounding areas.

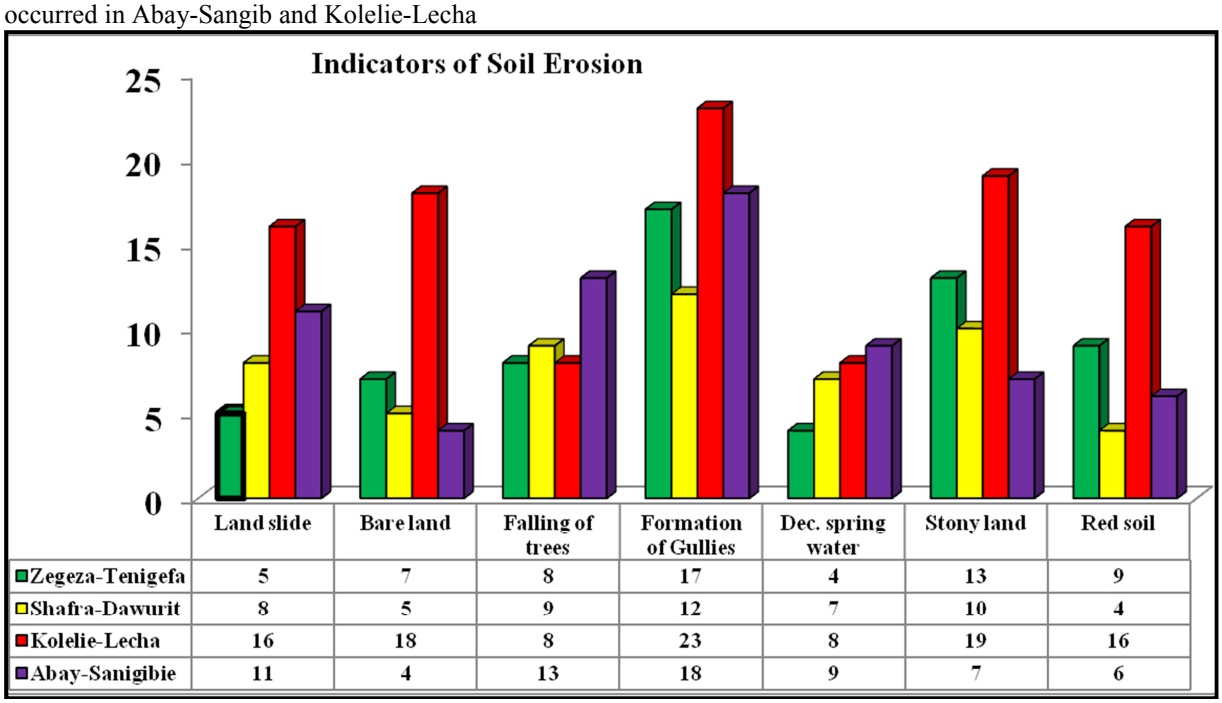
Table 1: Farmers' awareness of the existence of soil erosion on their land

Kebele Administration	Yes (%)	No (%)	Total (%)
Abay-Sanigibie (n=28)	20 (71.4)	8 (28.6)	28 (100)
Kolelie-Lecha (n=27)	18 (66.7)	9 (33.3)	27 (100)
Shafra-Dawurit (n=19)	15 (78.94)	4 (20.06)	19 (100)
Zegeza-Tenigefa (n=16)	7 (43.75)	9 (56.25)	16 (100)

Source: survey results

Figure 3, illustrates the major indicators of soil erosion based on the farmers survey result, personal interview with Developmental Agents and District experts, focus group discussions and field observation. The

households responded on the indicators that are common in their lands and in their villages. From the interview results with DAs and field observation it was possible to understand that most of soil erosion commonly occurred in Abay-Sangib and Kolelie-Lecha



	Land slide	Bare land	Falling of trees	Formation of Gullies	Dec. spring water	Stony land	Red soil
Zegeza-Tenigefa	5	7	8	17	4	13	9
Shafra-Dawurit	8	5	9	12	7	10	4
Kolelie-Lecha	16	18	8	23	8	19	16
Abay-Sanigibie	11	4	13	18	9	7	6

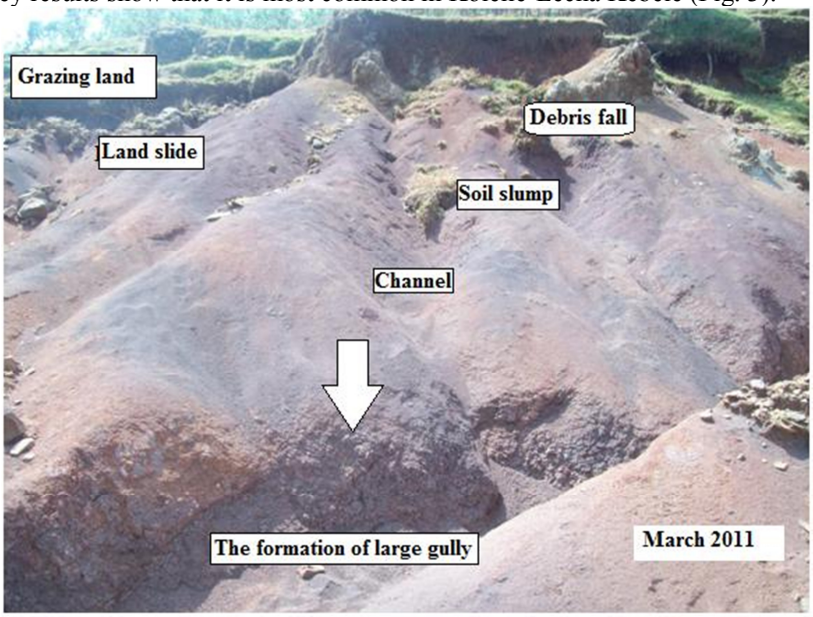
Figure 3: The major indicators of soil erosion in the study area

4.1.1. Common erosion indicators in the study area

Some soil erosion is easily identifiable. Gullies cutting across the land and landslides moving down the hill are easy to observe. But there are many indicators of soil erosion which are less observable. For this study, the following soil erosion indicators are easily outlines and understandable by the local peoples.

A. Land slide

Soil erosion by water increases as the steepness of the slope increases. Soil erosion by water also increases when the slope length increases due to the greater runoff that drains from the upper part of the area. This is most common in summer or rainy seasons. Farmers associated this problem due to high rainfall and hail. According to the explanations of farmers in the group discussion, it was possible to understand that the problem is commonly occurred on steep slope which is used for agriculture and grazing purpose. During field observation, it was observed that the major landslide types of the study area are earth and soil slump, and debris falls (Plat 3). The questionnaire survey results show that it is most common in Kolelie-Lecha Kebele (Fig. 3).



Plat 3: The change of grazing land to bare land in Kolelie-Lecha Kebele

B. Bare land

Bare land is a type of land use which does not used for agricultural purpose. From the reports of District (2011), this land is estimated to cover 13,748.80 hectares of the District total area. Bare land is caused by over grazing of the communal land by livestock. The explanation of farmers in the group discussion implied that it is caused by grazing of cattle in the same common grazing lands (*Shaha or Amaga*) throughout the year without rotation. Hence, overgrazing of communal lands changed in to a bare land. Bare land is common in Kolelie-Lecha Kebele than other three Kebeles (Fig. 3).

C. The formation of gullies

This is locally called *Gedel* meaning big or large channels. This is the formation of small channels and big gullies associated with natural and human activities. Naturally, gullies are formed due to high rainfall and run-off. From interview results, the formation of gullies is caused by poor land management practices, deforestation and lack of integrated watershed management practices. The formation of gullies is common along the footpaths (aligned along the slope direction), in areas without SWC measures and in areas adjacent to roads or around homestead. The respondents pointed out that the formation of gullies resulted in blocking of foot paths, and decreasing the land size due to expansion of gullies. It is the major feature in the area especially in Abay-Sanigibe and Kolelie-Lecha Kebele Administration.

Plat 4: Active gully damage in Abay-Sangib Kebele

D. Decreasing amount of spring water

From the reports of District (2011), there are around 105 springs. The main sources of drinking and other purpose are using spring water. Farmers associate the decreasing amount of spring water with the clearance of forests around the spring. From the focus group with farmers and interview with Developmental Agents, it was possible to understand that plantation of *Eucalyptus* near by the springs is the major factors for not only for decreasing of the amount of spring water flow but also dry out of the springs. A study conducted by Woldeamlak (2003), in Chemoga watershed concluded that there was a significant decreasing of water availability in the watershed due to plantation of *eucalyptus*, which led to decreasing groundwater recharge.

Spring water is most commonly found around areas covered by forest especially *Arundinaria alpine* (Kerkha), *Fiscus sur* (Sholla) and *Erythrina abissinica* (Korich). Farmers also associated the cause for decreasing the amount of spring water is the entrance of high run-off and sedimentation in to the spring. Farmers interview results also shows that while the steep slope areas and mountains were covered by vegetation, clean water could be obtained from streams during the rainy seasons and good quality of water in the springs during the dry seasons. During winter (*bega*) season some springs dry out and others reduced the volume of water significantly as a result of clearing of forests around the spring.

E. The existence of stony land and red soil

The cause of the existence of stony land is the removal of top soil by water erosion. This means small stones lying on the soil surface at different concentration. The stoniness is exposed on soil surface after the dark top-soil and the red sub-soil layers have been eroded. Stony land and red soil are most common in steep or mountain areas and resulted in low agricultural production and difficult for ploughing. It is most common in Kolelie-Lecha Kebele. During field observation it was possible to observe stony areas in Kolelie-Lecha Kebele.

Red soil is commonly caused by continuous cultivation of farmlands without fallowing. This indicator describes the colour of remaining soil. However, farmers associated that the existence of red soil is not always an

indicator of soil erosion because there is parent materials are red soil by nature. They associated the changing of the colour of the soil from dark to red- white as a result of the removal of top soil is an indicator of the prevalence of soil erosion. From the questionnaire survey result this indicator is most common in Kolelie-Lecha Kebele Administration.

F. Root exposure and falling of trees

This occurs when soil under tree is eroded by high rainfall and run-off causing the trees in to fall.

However, during the focus group discussion with farmers, they explained that it may not be a good indicator of soil erosion because trees may easily fall in their nature without any external factors. Besides to this, erosion may aggravate the root exposure and falling of trees. Some trees, for example locally known as *Yeferenge tid* are easily fall after 5 or 6 years of its life span. Longer effects of erosion process results in the exposure of deep root system of the trees that is quite a good indicator of soil erosion.

Plat 5: Soil erosion on eucalyptus trees in Abay-Sangib Kebele

5. CONCLUSION

In the area soil erosion is common on farm plots and communal lands. High rainfall, over cultivation, deforestation and steep slope has the major causes of soil erosion. So far, farmers hardly carry out action to reduce erosion. Only few soil conservation structures come to practices at household level. If more work is not done, the consequences of erosion become high. Therefore, sustainable soil management (structural and agronomic) methods should be developed. Farmers should practice area closure and tree plantations on sloppy lands. In this regard:

- Experts should also encouraging farmers to protect the existing vegetation and planting of new trees (afforestation) on sloppy areas which is served as protecting soil erosion.
- Agricultural extension experts are expected to do more on creating awareness and motivating farmers to practice conservation methods.

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