

Farmers' Attitude to Improved Soil and Water Conservation Practices in the Environs of Simen Mountain National Park, Ethiopia

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Abstract

In the past, many soil and water conservation practices were introduced in Ethiopia. However, those technologies failed to win acceptance of the land users because of their limitations and constraints. Thus, identification of constraints in relation to the adoption of soil and water conservation practices is of paramount importance. A study was undertaken in the environs of Simen Mountain National Park area of Amhara state to assess farmers' attitude on the existing soil erosion and soil and water conservation and to identify alternative approaches and strategies to promote improved soil and water conservation technologies. The results of the study show that farmers' level of perception on soil erosion and soil and water conservation is significantly related to adoption of soil and water conservation practices by the farmers. Incorporating farmers' views in the design of physical works undertaken in soil and water conservation should be practiced as an alternative policy and strategy to promote improved soil and water conservation practices.

1. Introduction

1.1. Background

Ethiopia is a country endowed with a favorable natural environment for production of various crops and livestock. The agricultural sector accounts for nearly 45 percent of the GDP and provides employment for more than 80 percent of the population. (EEA, 2004).

Though land provides a means of livelihood for the majority of the population of the country, land resources are facing increasing degradation mainly due to water erosion in the form of sheet and rill erosion (Hurni, 1993).

The environs of Simen Mountains National Park is also under similar threat because of using the typical agricultural practices in the north. Degradation of

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natural resources, particularly vegetation and soils, is wide spread and leads to a chronic food deficit under present standards of mountain agriculture (Hurni and Ludi, 2000).

Soil erosion is very pronounced in the entire study area, particularly on cultivated land. Without protective measures, the maintenance of the livelihood system of the people in the area would not be guaranteed because of the depletion of the natural resources (Ibid.).

Therefore, understanding farmers' land management behavior in the environs of the Simen Mountain National Park is of paramount importance and hence the study was taken up.

1.2. Objectives of the Study

The objectives of the study were:

1. To assess farmers' attitude to soil erosion and soil and water conservation (SWC) technologies; and
2. To identify alternative approaches and strategies to promote improved soil and water conservation technologies.

2. Literature Review

2.1 Adoption pattern and Sociological factors affecting Adoption of Technologies

Rogers and Shoemaker (1971) define adoption as a decision to make full use of a new idea as the best course of action available. Similarly, Feder *et al.* (1985) define final adoption at the level of the individual farmer, as the degree of use of a new technology is sustainable when the farmer has full information about the new technology and its potential.

Sociological factors such as attitude towards soil erosion, household knowledge about soil erosion and attitude towards soil conservation that influence farmers' decisions are considered. Households' attitude towards soil erosion determines his concern about soil loss and prevention of the soil erosion problem by using appropriate soil conservation measures. A farmer who knows that he has soil erosion on his farm is likely to seek information about its occurrence. Farmers' awareness and perception of decreasing productivity over time and his perception of soil quality of his fields located on the slopes also influence his perception and understanding of soil erosion problems. Farmers who feel that productivity and soil quality of his farms located on the slopes have

been declining over time are likely to associate this with the soil erosion problem and will look for preventive measures (Mbaga, 1998).

Farmers' perception of soil erosion and their subsequent conservation behavior have mixed results (Tesfaye, 2003). In some studies, there was no substantial relationship between soil erosion perception and farmers' conservation behavior, whereas in others, there were direct links. For instance, the perception of erosion was found to be important to the adoption behavior of SWC in the Philippines and at Andit Tid, Ethiopia. Farmers' decisions to retain conservation structures are positively and significantly related to soil erosion perceptions, attitude towards new technology and exposure to new practices. Such was not the case in Tanzania where farmers' perception of the soil erosion problems fails to explain household behavior towards adoption of improved SWC practices.

3. Methodology

The study was conducted in Amhara state of Ethiopia. A mixture of different methods was used for data collection. These include documentation, interviews, observation, and group discussion. Interviews were carried out with governmental and non-governmental organizations. Semi structured interview involved farmers, development agents, district experts, Keble Administration (KA), etc. Kebele Administration is similar to "villages" or "Rural community". Key informant interview at farmers home developed self-confidence in him for more accurate information. Group discussion gave the opportunity to see the dynamics of the discussion, whether or not different individuals had similar opinion on the same topic. Expert interview served as a cross check to look at the data from many angles. Among the different tools, direct observation helped to check the quality of SWC physical structures like stone bund, soil bund and cutoff drain. Data pertains to the year 2005.

Multi stage sampling procedure was used to select the respondent farmers. In the first stage, two districts were purposely selected out of three, based on accessibility. In the second stage, four Keble Administrations (KAs) out of 17 in the two districts were randomly selected. The four KAs included a total of 3983 households. Among them, 2483 households (62 percent) were participants in food for work or mass mobilization and the remaining 1500 households (38 percent) were either the technology users or non users. These 1500 households formed the sampling frame for the study. From this, 120 households were randomly selected using Probability Proportional to Size sampling technique.

Descriptive statistics were used. Descriptive statistics were important to have a clear picture of the characteristics of sample units. Applying descriptive statistics such as mean, standard deviation, frequency of appearance, etc., one can compare and contrast different categories of sampled units (in this case farm households) with respect to the desired characters so as to draw some important preliminary conclusions.

Summated rating scale was used to measure farmers' attitude towards soil erosion and soil and water conservation using the guidelines suggested by Likert (1932) with necessary modifications. The attitude was measured as evaluative perceptions of the respondents on soil erosion and soil and water conservation. This was done with the assumption that evaluative perception reflected their liking or disliking to a great extent and moreover it reflected their judgments on the phenomenon of soil erosion as well as the soil and water conservation measures. The measurement was done in this manner purposely to yield better inferences, which would be more useful to make strategic recommendations. Evaluative perception measurement was also assumed to help to reflect the attitude of the respondents along with sufficiently indicating their awareness on the constructs studied.

To have the most appropriate item included in the attitude scale, items analysis was done with a pool of 30 items and the items with the highest *t* values were selected for inclusion on the scale. The highest *t* values indicated the ability of the items to discriminate between individuals having favorableness and unfavorableness towards the given object. The scale containing items were administered after establishing its reliability and validity. The scale was then incorporated into the interview schedule to get responses of agreement towards each item. For the responses on each item, scores were assigned and total score of the responses constituted the attitude score of the individual.

4. Results and Discussion

4.1 Adoption of Soil and Water Conservation Practices

Sociological factors that are expected to play a role in the adoption process in this study are related to households' perception of the impact of soil erosion and land productivity, and attitude towards benefits from using improved soil and water conservation technologies.

Farmers' knowledge and perception of their environment provide essential information for understanding their land management practices. There is no clear-cut association between knowledge, action, attitude and perception, (Tesfaye, 2003).

4.1.1 Farmers' Attitude towards Soil Erosion

Farmers' attitude towards soil erosion was assessed in terms of their evaluative perceptions on soil erosion, using a scale developed for the purpose of this study. The value of the scale for the positive statements of evaluative perception on soil erosion were assigned 3, 2, 1 for agree, not clear, and disagree; respectively, whereas the negative statements were assigned to the reverse values. Post administration reliability test for the 6 items considered to assess attitude on soil erosion resulted in the standardized alpha of 0.8015, which is in the acceptable range to discriminate respondents.

All farmers in the sample agree that soil erosion is bad. This means that they have generally developed a negative attitude to soil erosion.

Technology users have a better perception than non-technology users on decrease of soil depth because of soil erosion. In this respect, the difference in mean is significant at 5 percent level. Technology users have also better knowledge than non-technology users that soil erosion affects farmland in the future. The difference in mean is significant at 5 percent level.

Technology users better explained farmers' perception on the prevalence of soil erosion in their farms. The same group tends to know that steep lands are prone to soil erosion unlike the non-technology users. The difference in mean between technology users and non-technology users is significant at 5 percent for the above two items (Table 1).

Table 1. Farmers' attitude towards soil erosion in terms of their evaluative perception N = 120

Statement	Means		t-value
	TU (77)	NTU (43)	
Soil erosion is bad	3.00	3.00	-
Soil erosion decreases land productivity	3.00	2.81	3.098**
Prevalence of soil erosion is very common	2.64	2.02	3.448**
Steep land is prone to soil erosion	2.64	2.02	3.448**
Soil erosion decreases soil depth	3.00	2.81	3.098**
Soil erosion will affect farmland in the future	3.00	2.81	3.098**

** Significant at five percent level

TU: Technology users

NTU: Non Technology Users

a. Perception on Causes of Soil Erosion

There are different factors responsible for soil erosion in the environs of Simen Mountains National Park (Table 2).

Table 2. Respondents' perception of major causes of Soil Erosion

Soil erosion problems	Technology users		Non-technology users		Total	
	N	%	N	%	N	%
Deforestation, repeated plowing, very steep slope, and high amount of rainfall	28	36	11	26	39	33
Repeated plowing, very steep slope, and high amount of rainfall	9	12	8	19	17	14
Repeated plowing	9	12	6	14	15	13
Repeated plowing and very steep slope	8	10	5	12	13	11
Miscellaneous	23	30	13	30	36	30
Total	77	100	43	100	120	100

Deforestation, repeated plowing, steepness of the land, and high amount of rainfall as major causes of soil erosion was identified by 33 per cent of the households. Another 14 per cent of the households reported all the major causes of soil erosion mentioned earlier, except deforestation. Farmers who identified a single factor, viz., repeated plowing as major causes of soil erosion problem were 13 per cent. Repeated plowing is a serious problem especially for the populated highland areas. In the highlands, deforestation is a less serious problem to majority of the farmers.

b. Farmers' Perception of Soil Erosion

Farmers have different levels of perception on soil erosion. They associate the exposed bedrocks and gullies with soil erosion over time. Farmers' perception of the level of soil erosion was assessed (Table 3). Accordingly, 83 percent of the technology users and 51 percent of the non-technology users reported soil erosion as "moderate" to "severe". Moreover, the difference in means between the technology users and non-technology users was statistically significant. So it implies that farmers' perception on severity of soil erosion promotes the decision on practicing soil and water conservation.

Table 3. Farmers' level of perception of soil erosion

Perception of soil erosion	Technology users		Non technology users		Sample households	
	N	%	n	%	N	%
Moderate to Severe	64	83	22	51	86	72
Otherwise	13	17	21	49	34	28
Total	77	100	43	100	120	100

4.1.2. Households' Attitude to Soil and Water Conservation

Similar to the preceding section (4.1.1), farmers' attitude on soil and water conservation was assessed using another scale developed for this study. In addition, a similar procedure was followed in assigning positive and negative statements (items) on this issue (soil and water conservation) also.

According to group discussion with farmers on the importance of soil and water conservation practices, the differences between treated and untreated areas of soil and water conservation is not only on the amount of crop produced but also at the growing stage where crops and grasses show better performance on the treated areas. A consistent observation was found from the scale on selected items (table 4), which are summarized below.

All the technology users agree that the fertility of soil is important in crop production. The difference in means between technology users and non-technology users is significant. Thus, attitude on fertility of soil in crop production promotes the decision on the practices of soil and water conservation.

All farmers agreed to the use of indigenous soil and water conservation. A similar score was given to the statement on the need to maintain soil fertility for the current generation. They also agreed to use manure in homestead areas but fertilizer and physical soil and water conservation measures on slope lands. Indigenous knowledge is an acquired learning from experience and ancestors. Then, the subsequent generation will carry out his/her responsibility to pass on to the next generation. Many years ago, farmers used to collect stones in one spot of their field in order to clear the fields and plow the land easily. Fortunately, they saw good performance on the amount of produce as well as good growing appearance of crops and grasses.

Farmers could not explain how they learned about contour plowing, but they plough across their field to decrease soil erosion. Some of them reported that the practice was passed down from their parents. Farmers use contour plowing, crop rotation, grass strips, and tree planting as appropriate indigenous soil and water conservation measures.

Trees have a paramount importance as an indigenous vegetative conservation practice. However, now a days, farmers do not grow trees around their farmland because; trees are feared because of the birds harboring in them and the water droplets from leaves which are believed to adversely affect their crops.

It was expected that farmers among the technology users would disagree and those from non-technology users would agree with the item "feeding the current generation instead of thinking for the future." As expected, there was a significant difference between the two groups of farmers at 5 percent. However, the mean difference was not that large, even though it was statistically significant. Apart from this item, small mean difference was found between the two groups on another item, viz., "farmers should be paid for soil and water conservation practices in their farmland." The difference in this respect was also significant at five percent level.

Table 4. Farmers' Attitude towards Soil and Water Conservation in terms of their evaluative perception (N = 120)

Statement	Means		t-value
	TU (77)	NTU (43)	
The fertility of soil is important in crop production	3.00	2.81	3.098**
Use of indigenous soil and water conservation measures is preferable	3.00	3.00	—
We have to use manure in homestead areas but fertilizer and physical soil and water conservation measures on slope lands	3.00	3.00	—
We have to maintain soil fertility for the current generation	3.00	3.00	—
We have to feed the present generation instead of thinking for the future	1.34	1.09	2.271**
Farmers should be paid for soil and water conservation practices in their own farm lands	1.55	1.00	5.339**

** Significant at five percent level

TU: Technology users

NTU: Non Technology Users

4.2. Alternative Policies and Strategies to Improve Soil and Water Conservation Practices

4.2.1. Current Practices in Soil and Water Conservation

Discussion on this was drawn mainly from the qualitative design research of this study, which involved different farmers' groups and experts working at various levels.

Typical approaches of implementing soil and water conservation in the study area was through Food for Work (FFW) and Employment Generation Schemes (EGS). FFW began in northern Ethiopia in connection with the 1973/74 famine (Berhe, 1997). EGS is rather a recent development, which emerged partly as an alternative to FFW. Participants in EGS are poor households who cannot produce enough food to sustain themselves the whole year. According to the experts in the region, these people should have been involved in what was expected to be productive work for the community instead of being a passive recipient of the food aid, which is also shared by the donor community. Food was and still is the main form of incentive to involve the rural people in public works.

EGS participants are involved in different public works such as labor-based rural road construction, terracing, building check-dams, hillside plantations, water development, etc., The motive of the participants was to secure "employment" rather than ensuring the quality of works desired to fulfill the public services. These works are often assigned to a group of people in the form of quota to be audited by an expert. It should also be noted that the targeted households reap the benefits of the community that was targeted for public service. However, farmers complained about anomalies in targeting of the beneficiaries.

According to some group participants, work sites are selected in consultation of the village and village leader, while others disagree with this practice. The difference observed reveals that there was inconsistency in the practices, which seriously affects the outcome. When farmers are not involved in the site selection, Development Agents and Kebele Leaders decide on the site and the work to be done. When such works include individual lands, owners of the land simply let the EGS participants carry out the works for the time being, while they knew that the owners would destroy or modify it or leave it without maintenance. Works on the communal lands were reported to have been damaged often without trace of who would do it. This practice has perpetuated a dependency syndrome in the community that is imported through food-aid. The syndrome is now-a-days widely condemned, even though how to do away with it is not properly worked out.

The other limitation of the current soil and water conservation works is its adherence to the technical design of the conservation structure, which was disliked by farmers based on practical observation of their farm realities; more specifically, lack of compatibility of the specification of the structures with ox-plowing. In addition, the physical structures occupy considerable piece of land in spite of the growing land scarcity in the highland areas (Meier, 2002).

It was learnt that farmers were practicing soil and water conservation they inherited from their ancestors to survive on the mountains. In addition, thanks to their understanding of the side-effects of soil erosion, considerable numbers of them have implemented the stone bunds introduced by the extension system on their own will. Those who accepted the stone bunds introduced in the area carried out some evaluation on its characteristics. For instance, its widely known side-effect of harboring rodents and hosting weeds were tolerated in view of the benefits they have obtained from the minimized soil erosion.

Experts in the field suggest the need to modify the physical conservation measures and orient it towards, what they call it, bio-physical soil and water conservation (BSWC). They argue that BSWC minimizes many of the side-effects of the physical conservation measures that have been pushed for the last three decades or so, but with little contribution. The advantages include less rodent infestation, minimum space competition, low investment requirements and maintenance. In addition, it provides fodder, wind-break and green manure, among others.

4.2.2. Alternative Approaches to Promote Soil and Water Conservation

Soil and water conservation practices that dominated the FFW and the recent EGS approaches revealed a mixture of approaches. In some respects it has populist elements, while on the other it promoted the classical approach of technical intervention approaches (Yavan *et al.*, 1995).

A brief account of three decades phenomena in the country and three years experience in the study area force us to break away from the riddle of the old approaches in search of alternatives in view of the growing land degradation in the study area and the country at large. Possible alternatives can be categorized as follows:

1. Participatory approaches: there is a direct need to involve all relevant and potential stakeholders in the entire planning process and based on a new culture of evaluation of the past activities for learning. These actors may

include, farmers, young and old, men and women; religious leaders, political leaders at various levels and technical experts. Such approaches are by no means equated with the rhetoric of mass-mobilization that is often seen in the study area.

2. Awareness raising education: poor awareness of the environmental consequences of today's land management practices to both the present and future generation should be addressed through a continuous educational process. For this, use should be made of all public venues such as religious centers, public schools, markets and others as deemed appropriate. This approach helps to overcome the top-down approach that dominated the scene of soil and water conservation practices in the country, where the study area is no exception.
3. Using a mix of incentives rather than adhering to the traditional food distribution. An immediate one could be cash for individual incentives. At the community level incentives such as provision of health facilities, animal clinic, schools, irrigation facilities, roads, tax exemption and others can be introduced for any successful conservation works.
4. Incorporating farmers' views in the design of physical works undertaken in soil and water conservation and others. Broad-based people's participation mentioned above is one mechanism of incorporating indigenous knowledge that has been tested through the life experience of the people.
5. Promoting a mix of soil and water conservation methods instead of a fixed-menu, which is the physical conservation measure. The recent experience, though limited, of bio-physical soil and water conservation needs to be promoted.

5. Conclusion and Recommendations

This study emphasized that understanding of socio economic, institutional, and bio-physical attributes of technologies that influence farmers' decision on practicing soil and water conservation is a necessary and first step to formulate sustainable land management programs. Among these, the following are salient issues that emanated from the study.

Extension services that enhance farmers' understanding on land degradation process play a crucial rule in the promotion of technologies related to SWC. This was indicated by significant differences between technology users and

non-technology users compared in this study. Therefore, the extension system should intensify its endeavors in promoting sustainable agriculture with a due recognition of differences among farmers in their understanding of the soil degradation symptoms and access to extension contacts.

Even though farmers are exposed to the same bio-physical environment their understanding of the process and subsequent action may vary. In this study, it was found that farmers who perceived seriousness of soil fertility decline over years positively responded to the extension campaign to conserve soil and water in mountain agriculture, unlike those who felt otherwise. Therefore, the extension system on land management should make consistent efforts to improve farmers' understanding of the state and consequences of bio-physical environment on their livelihoods, including, the future generation.

It was found that the soil and water conservation strategies applied in the study area followed a blanket recommendation, which is highly technical without considering farmers land operation practices and indigenous knowledge. In addition, the technologies promoted lack a mix of methods. The main component is the physical conservation measures of which farmers complain with respect to its compatibility with their age-old farm operations. Farmers are not actually against soil conservation, but they were left out of the decisions in the choices to be made. In this respect, it was found that farmers are readily accepting biological conservation measures. Hence, concerned authorities should take necessary measures to redress the past mistakes in this respect.

Based on the focus group interviews with the community and discussions held with experts, food for work and employment generation schemes often raise concerns of mis-targeting of beneficiaries and inappropriate work norms, which are likely to distort the very purpose of using the approaches for food security and natural resources management. In view of this, each stakeholder should review its activities such as follow up of the working norms and appropriate targeting of the beneficiaries in using these approaches for SWC.

6. References

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