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IN THE FIELD

Farmers' views of soil erosion problems and their conservation knowledge at Beressa watershed, central highlands of Ethiopia

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Abstract. Farmers' decisions to conserve natural resources generally and soil and water particularly are largely determined by their knowledge of the problems and perceived benefits of conservation. In Ethiopia, however, farmer perceptions of erosion problems and farmer conservation practices have received little analysis or use in conservation planning. This research examines farmers' views of erosion problems and their conservation knowledge and practices in the Beressa watershed in the central highlands of Ethiopia. Data were obtained from a survey of 147 farm households managing 713 fields during the 2002/2003 cropping season. In-depth interviews and group discussions were also held with the farmers to obtain additional information. The results show that 72% of the farmers reported erosion problems, and they recognized that conservation was necessary. However, they considered erosion to be severe mostly when visible signs – rills and gullies – appeared on their fields. The majority of the farmers believe that erosion could be halted, and they use a range of practices for erosion control and fertility improvement. These include contour plowing (83%), drainage ditches (82%), and stone terraces/bunds (73%). Nevertheless, despite decades of conservation intervention in the area, it appears that most farmers have developed negative attitudes towards externally recommended measures. The research concludes that under the conditions present in the Ethiopian central highlands, soil and water conservation interventions should consider farmers' conservation knowledge and practices to improve acceptance and adoption of the recommendations.

Key words: Drainage ditches, Ethiopian highlands, Farmer perceptions, Indigenous knowledge, Natural resource management, Soil and water conservation, Soil erosion, Stone terraces

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Introduction

The degradation of agricultural land poses a serious threat to current and potential food production in the highlands of Ethiopia (Hurni, 1988; Azene, 2001; Sonneveld and Keyzer, 2002). With fertile soils and good rainfall, these highlands (>1500 m asl) hold the highest agricultural potential in the country (Hurni, 1993; Shiferaw and Holden, 2001). Constituting less than half of the national territory (43%), the highlands host large concentrations of people (over 85% of the total population) and livestock (75% of the total population), making the area the most intensively cultivated part of the country. Agriculture is the main economic activity for the majority of the population, and its contribution to the national economy is significant. It accounts for about 45% of the GDP, 85% of exports, and 80% of total employment (FDRE, 1997). However, in the absence of sound land use policies, this pressure coupled with many other physical, socio-economic, and political factors has led to serious land degradation (Bewket and Sterk, 2002).

Several studies have shown that extensive areas of the highlands are in the grip of accelerated erosion. An estimate in the mid-1980s showed that 3.7% of the highlands (2 million ha) had been so seriously eroded that they could not support cultivation, while a further 52% had suffered moderate or serious degradation (Wood, 1990; Kruger et al., 1996). On arable land, soil erosion averages about 42 tons per hectare per year and causes an average annual reduction in soil depth of 4 mm (Hurni, 1988). Even though this loss will often reappear as fresh sediments deposited downstream, the areas that benefit from the transported soil are relatively small compared to those from which it is removed (Sonneveld and Keyzer, 2002). Water shortage and the loss of soil fertility are associated problems constraining productivity. Despite the fact that erosion undermines productivity in the highlands, data on erosion (productivity relations in particular) are quite scanty in the country. The deterioration of soil fertility is also related to the sale of manure for fuel in the urban areas.

Recognizing land degradation as a major environmental and socio-economic problem, the government of Ethiopia has made several interventions. Large-scale conservation schemes were initiated particularly after the famines of the 1970s. Since then, huge areas have been covered with terraces, and millions of trees have been planted (Herweg, 1993; Yeraswork, 2000). These projects have made use of farmer labor under the "food-for-work" project funded by the World Food Program. Farmers were provided with grain and edible oil in payment for their participation in the funded conservation works. Obviously, food aid has helped to fight hunger in famine-stricken areas, but, in the long run, the program has not been successful for improving soil and water conservation (SWC).

Decisions on which types of SWC measures to use and where to place them were not made by the farmers concerned, and only rarely was an attempt made to include indigenous experience and knowledge (Wood, 1990; Herweg and Ludi, 1999). Instead, donor and government officials told rural community residents what they should do to obtain relief food, and they provided little opportunity for discussion and local participation in conservation planning (Wood, 1990). Eventually, when the supply of food-for-work was discontinued, most of the participating farmers became unwilling to participate in the new conservation projects or maintain those already established. Some farmers even removed the structures from their fields (Yeraswork, 2000; Girma, 2001). In the end, the effort realized little success in combating erosion problems.

The assumption that farmers have a poor perception of erosion problems and limited conservation knowledge has contributed to the external development of conservation technologies. Nonetheless, little confirmation exists in the literature that farmers' decisions are any more or less rational than recommendations based on professional advice (Kiome and Stocking, 1995). Thus, erosion and conservation cannot be understood without studying how people use the land and the reasoning that guides their decisions about land use (Stocking, 1993; Mazzucato and Niemeijer, 2000; Mbaga-Semgalawe and Folmer, 2000). The present research explores what farmers in the Beressa watershed of the Ethiopian central highlands think of erosion and its control. The specific research objectives were (1) to investigate farmer perceptions of the soil erosion problem and its magnitude, and (2) to document farmer conservation knowledge and practices.

The research site

The Beressa watershed is located in the central highlands of Ethiopia (9°40′ N, 39°37′ E) approximately 140 km to the northeast of Addis Ababa, the capital city (Figure 1). In administrative terms, the watershed lies within the North Shewa Zone of the Amhara National Regional State and is comprised of three villages – Debele, Wushawushign, and Faji. The area is situated on the edge of the western escarpment of the Rift Valley, and is characterized by a rugged topography. Elevation ranges between 2740 and 3600 m asl. The watershed covers an area of about 215 km^2 and forms part of the headwater of the Blue Nile basin. Both the Inter Tropical Convergence Zone (ITCZ) and sub-tropical pressure cells influence the area's climate. Hence, it experiences a temperate climate with an average annual temperature of 19.7 °C and a mean annual rainfall of 887 mm (1984–2002). About 83% of the total rain falls between May and September. Frost is common particularly between October and December when temperatures fall far below average. Soil types found in the area are predominantly volcanic in origin and belong to the Trappean series (Figure 2).

The area lies within the high potential cereal crop and livestock zone of the country's central highlands (Westphal, 1975; Mesfin, 1991), and agriculture is characterized by integrated subsistence crop–livestock production. The integration of crop and livestock production has long sustained the area. Crop residues constitute the main source of feed for livestock, and, in turn, provide the traction power and manure for fertilizing cultivated fields. The main crops grown include barley, wheat, beans, field peas, and lentils. Barley is the dominant crop cultivated in Debele and sometimes is rotated with wheat and beans. In Wushawushign and Faji, however, farmers often rotate barley with other crops. Cattle, sheep, donkeys, horses, mules, and poultry are among the common types of livestock raised in the area. Farming is almost entirely rain-fed, and is dependent on weather conditions. Hence, farmers worry about rainfall – its intensity, irregularity, or complete failure (Markos, 1997) – as agriculture is primarily subsistence-based. Occasionally farmers sell a portion of their produce (crops and livestock) to earn cash income for covering expenses such as taxes, school fees, and household items.

Methods

Data were obtained from a survey undertaken in the three villages of the Beressa watershed (Debele, Wushawushign,

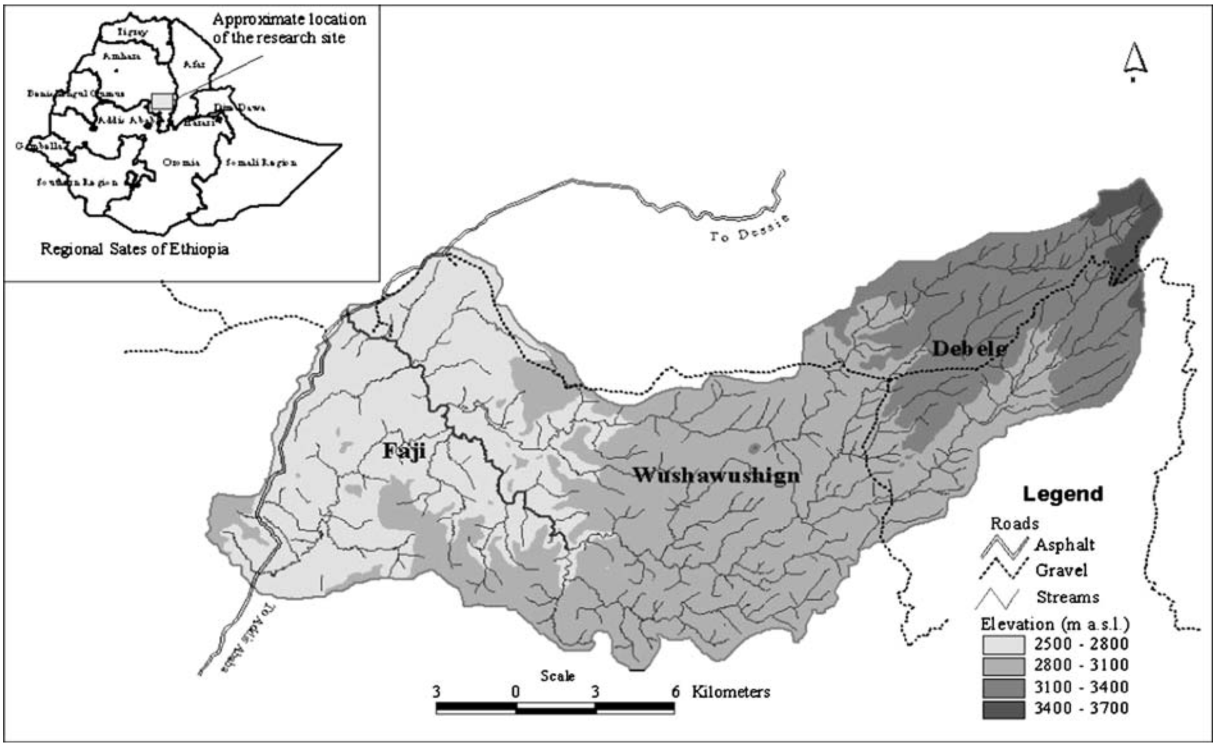

Figure 1. Location of the Beressa watershed, central highland Ethiopia.

Figure 2. Partial view of the Beressa watershed (*Photo by Aklilu Amsalu, March 2003*).

and Faji). Table 1 presents characteristics of the sample households by village.

An agro-economic survey was conducted from February to April of 2003 using a structured survey questionnaire to obtain farmers' views of erosion problems and their conservation knowledge. The questionnaire was comprised of both open-ended questions and questions with codified answers, and was administered after pre-testing. The questions pertained to four main topics: (1) household and farm characteristics, (2) perceptions of erosion problems and fertility changes, (3) causes of erosion and productivity decline, and (4) knowledge and use of conservation measures.

A systematic random sample of 147 farm households was selected from the three villages for personal interviews. The sampling was done using a list obtained from the respective village administrations. Every twentieth household on the list was included in the sample. A household in this case consists of a cohort of one family – a husband, a wife, and children with other dependents if any – living in the same house and depending on the same farmland and farm resources. The head of the

Table 1. Characteristics of sample households in the Beressa watershed.

Characteristics	Villages		
	Debele	Wushawushign	Faji
Total number of households	1322	1656	819
Sample households	54	59	34
Area (ha)	6427	8393	6688
Mean elevation (m)	3220	2940	2770
Mean slope (%)	17.6	11.6	6.1
Agro-climate	Alpine	Temperate	Temperate
Main crops*	BR, BN	BR, BN, WT, P	BR, WT, LT
Main SWC measures**	ST/B, WW, CP	ST/B, DD, WW, CP	DD, GS, CP

*BR = barley, BN = beans, WT = wheat, P = peas, LT = lentils.
**ST/B = stone terraces/bunds, WW = waterways, DD = drainage ditches, GS = grass strips, CP = contour plowing.

household was considered to be the unit of analysis because s/he was the ultimate decision-maker with respect to farming activities. Well-trained interviewers who could understand the local language administered the questionnaire, and the head of the household was interviewed. When the head of a selected sample household was unavailable (after repeated visits), interviewers went to the next household on the list.

Additional information was obtained through in-depth interviews and community group discussions. In each village, discussion groups were comprised of eight people, both males and females of differing ages. SPSS (Statistical Package for Social Scientists, version 10) was used to analyze the data on which case summaries were written and cross tabulations were performed.

Results and discussion

In this section, the paper presents and discusses the results of the survey conducted in the Beressa watershed. Subsequent to the description of household and farm characteristics, farmers' perceptions of erosion problems are presented. This is followed by data on farmers' perceptions of the causes of erosion and productivity decline as well as on aspects of soil fertility change. Finally, farmers' knowledge and use of conservation measures are discussed.

Household and farm characteristics

Table 2 presents the characteristics of the sample households included in the survey. Farmers ranged in age between 20 and 76 years, with an average of 45 years. Of the total respondents, 22% were female, mainly divorcees, widows, and unmarried women. The literacy rate in the area, as elsewhere in rural Ethiopia, was very low. Over half of the respondents (59%) were illiterate while only 22% could read and write. Only 19.7% of the total had any formal education, either at elementary or secondary level. Differences in literacy rates among the surveyed villages may be due to their proximity to Debre Berhan town, an urban center, where there may be a more positive attitude towards and exposure to formal education.

All of the interviewed farmers owned land (in fact, land has been under public ownership since the 1975 land reform, and farmers have only insecure use rights). Overall, 713 farm plots were managed by the participating farmers. The mean holding size was 1.7 ha, which is higher than the national average of 1.29 ha. However, almost one-third of the households owned less than 1 ha and it should be noted that the per capita holding size has been declining over time due to population increase. Considerable difference in holding size was observed across villages within the watershed. In the upper villages, where there is a greater proportion of steep slopes and limited non-farm opportunities, per household holding size was smaller. Land holdings were not all in one piece, and the number of farm plots ranged from 1 to 11 (with one exception of 25 plots). The mean was five plots per household. Farmers expressed differing views regarding the advantages of fragmented plots.

As indicated in the sections above, livestock constitutes an important component of the farming system and livelihoods in the area. All of the interviewed farmers owned livestock of some sort. The average livestock holding was 5.9 Tropical Livestock Units (TLU). Overall there is a declining trend in livestock numbers per household due to shrinking per capita land area. Over the last ten years, for instance, per household land area decreased from 2.4 to 1.7 ha, and livestock numbers decreased from 7.7 to 5.9 TLU. Nevertheless, differences were observed across villages (Table 2). It appears that livestock numbers increase with decreasing elevation, increasing farm size, and proximity to the urban center of Debre Berhan town.

Table 2. Characteristics of the respondents in the Beressa watershed.

Characteristics	Debele ($n = 54$)	Wushawushign ($n = 59$)	Faji ($n = 34$)	Average ($n = 147$)
Age (year)				
Mean	46	42	47	45
Standard deviation	11	12	14	12
Sex (%)				
Male	74	81	79	78
Female	26	19	21	22
Education (%)				
Illiterate	59	62	52	58
Write and read	26	18	21	22
Elementary	11	17	18	15
Secondary and above	4	2	9	5
Average family size	6	5	5	5
Land holding (ha)				
Mean	1.3	1.8	2.1	1.7
Standard deviation	2.3	2.9	5.3	3.5
Number of farm plots				
Mean		6	5	5
Standard deviation	2	2	3	2
Average number of livestock (TLU)*	5.1	5.3	7.3	5.9
Number of oxen				
Mean	1.3	1.5	1.6	1.5
Standard deviation	0.9	0.8	0.8	0.8

*TLU refers to Tropical Livestock Unit, equivalent to 250 kg live animal weight.

Perceptions of erosion problems

Soil erosion was perceived by the farmers of the Beressa watershed as a problem constraining crop production. Seventy-two percent of the interviewed farmers reported erosion problems on their farmland – 72% in Debele, 76% in Wushawushign, and 67% in Faji (Table 3). Most of these respondents observed the prevalence of erosion damage during the first rain showers when the soil is bare (before vegetative growth) and loose due to tillage. The farmers also reported damage due to wind erosion particularly when the aggregate stability of the soil was disturbed through tillage. Farmers expressed the opinion that the loss of soil from cultivated fields reduced the depth of the topsoil and lead to a reduced production potential.

Table 3. Farmers' views of soil erosion problems, types, and ratings of seriousness (% of respondents).

Farmers' responses to:	Debele ($n = 54$)	Wushawushign ($n = 59$)	Faji ($n = 34$)	Total ($n = 147$)
Prevalence of soil erosion				
Yes	72	76	67	72
No	28	24	33	28
Prevailing form of erosion				
Sheet erosion	68	60	55	61
Rill erosion	21	32	36	30
Gully erosion	12	8	9	10
Extent of soil erosion				
Severe	13	16	18	16
Moderate	55	43	45	48
Minor	32	41	36	36
The rate over time				
Increasing	68	47	28	48
Same	20	23	41	28
Decreasing	12	30	31	24

Erosion in the form of sheet wash and rills was the dominant form of erosion mentioned by the majority of the farmers (Table 3). Of the farmers who reported erosion problems, 91% mentioned the prevalence of sheet and rill erosion on their farmland. Although not widespread, gully erosion was also reported by farmers along farm boundaries and waterways used to expel excess water. However, the majority (84%) of the farmers rated the extent of the problem as moderate and/or minor. Further discussions revealed that farmers considered erosion to be severe when the visible signs – rills and gullies – appeared on their fields. This shows that although farmers were aware of erosion problems, their understanding of the severity was confined mostly to visual evidence. However, it was clear from field observation that both sheet and rill erosion caused considerable damage to cropland and that farmers' limited understating of the severity of sheet erosion could influence their conservation decisions negatively. This suggests that farmers would benefit from education that would better explain erosion processes and impacts.

Farmers were asked to indicate the rate of erosion over time. Forty-eight percent of the interviewees rated erosion as increasing; 28% felt there was no change, and 24% felt it was decreasing. Those who indicated that the rate was increasing were mainly from Debele, an area where most of the farm plots lie on steep slopes.

Causes of soil erosion and productivity decline

The major causes of soil erosion mentioned by farmers included erosive rains, steep slope, damaged conservation structures, and tillage, which makes the soil loose and bare (Table 4). Rainfall leads to significant soil loss mainly at times of seedbed preparation. Over half of the farm plots managed by the total respondents were located on slopes having more than a 10% gradient. Given higher rainfall conditions, farm plots on steep slopes will exhibit a higher erosion potential (Nyssen et al., 2004). Farmers also recognized the effects of slope on soil erosion. Yet, few respondents indicated that damaged conservation structures escalated the problem. Farmers' did not refer to crop types when mentioning the causes of soil erosion.

Productivity decline was reported by almost all of the interviewed farmers, and they attributed the decline to rainfall shortage, fertility decline, and continuous cultivation (Table 4). As the farmers indicated, the rainfall pattern in recent times had become more unreliable and incompatible with their usual farming calendar. This observation agrees with those of Bewket and Sterk (2002) in the western Ethiopian highlands, Dejene et al. (1997) in Tanzania, and Visser et al. (2002) in Burkina Faso, and reflects the recent drought in many parts of sub-Saharan Africa. However, although soil erosion can cause a reduction in infiltration and the water holding capacity of the soil as well as a loss of plant nutrients, few farmers attributed productivity decline to erosion.

Soil fertility changes

Next to water shortage, soil fertility was the most important production concern mentioned by the farmers of the Beressa watershed. When the quality of land was mentioned, farmers often associated it with soil fertility. A similar view was held among the farmers of Wolayta in Southern Ethiopia (Elias and Scoones, 1999).

Over 70% of the farmers reported a decline in soil fertility in their farm plots over the years. The reasons given included continuous cultivation (46%), soil erosion (24%), insufficient use of artificial fertilizers (21%), and moisture stress (5%). The remaining 6% gave no reasons. Population increases have limited the use of fallowing, and continuous cultivation has become an

Table 4. Perceptions of the causes of soil erosion and productivity decline (% of respondents).

Farmers' responses to:	Debele (n = 54)	Wushawushign (n = 59)	Faji (n = 34)	Total (n = 147)
Causes of soil erosion				
Erosive rains	44	40	40	41
Slope steepness	33	26	44	34
Damaged conservation structures	16	10	8	11
Tillage/lack of vegetation cover	nr	4	4	4
Causes of productivity decline				
Rainfall shortage/drought	67	73	45	62
Fertility decline	8	13	23	15
Continuous cultivation	14	7	19	13
Soil erosion	8	4	nr	6
Frost	2	nr	13	8
Others	2	4	nr	3

*nr indicates "no response." Averages are taken only of those who responded.

inevitable practice in the area. The absence of adequate inputs often results in deteriorating soil fertility and disturbs the soil structure thereby accelerating erosion. Thus, the farmers noted that resting the land for some time helps reduce erosion quite apart from its role in nutrient maintenance. Moreover, since erosion reduces the depth of the topsoil and its moisture-holding capacity, the loss of organic-rich topsoil is a constraint to improved production. Nevertheless, the effects of erosion on the loss of soil fertility were given little attention by the majority of farmers. Further, it became clear from the interviews and discussions that the farmers' understanding of soil fertility change largely influenced their management practices.

Farmers undertook a range of practices for soil fertility maintenance: crop rotation; application of organic matter (animal manure, household trash, and crop residues); use of chemical fertilizers; and erosion control. While crop rotation and erosion control were widespread practices in the area, spatial differences in the intensity of use of organic matter and chemical fertilizers were observed. The farmers in Debele depend heavily on organic matter, while those in Wushawushign and Faji use both organic matter and chemical fertilizers. Overall, farmers were well aware of the positive effects of organic matter in improving soil fertility. Apart from fertility maintenance, they indicated that organic matter improved soil structure and reduced runoff. Regarding the effects of organic matter on soil biology, farmers mentioned the proliferation of earthworms as being good indicators of soil fertility. However, the lack of fuelwood and the use of crop residues and dung for fuel limited the use of organic matter and resulted in the deterioration of biological processes in the soil (see Hurni, 1993). Most farmers were involved in selling manure in the urban market where it was in high demand as fuel. This appeared to be a "normal" practice for resource-poor farmers who used manure for cash income rather than for fertilizer. At the same time, chemical fertilizers were unaffordable to resource-poor farmers, and poorly developed credit facilities, lack of subsidies, and unreliable rainfall conditions often prohibited the use of fertilizers. The combined effect of all of these socio-economic and institutional problems has resulted in deteriorating soil fertility.

Knowledge and use of conservation techniques

When asked whether erosion could be stopped, all respondents indicated that it could be controlled. They enthusiastically expressed the belief that they could control erosion on their farm plots. Such a view agrees with the results of Belay (1992) in the southwestern highlands and Bewket and Sterk (2002) in the northwestern highlands of Ethiopia. Indeed, the idea of soil conservation is not new to Ethiopian farmers as the many traditionally implemented techniques in various parts of the country would indicate (Herweg, 1993). Yet, little is known about this pool of local expertise of farmers, and the technical and socio-economic appropriateness of their technologies has rarely been analyzed.

Almost all of the farmers reported using SWC measures for erosion control. The measures mentioned include stone terraces/bunds, drainage ditches, soil bunds, waterways, grass strips, contour plowing, and tree planting (Table 5). Contour plowing, drainage ditches, and stone terraces/bunds constituted the most important local conservation measures, knowledge of which was acquired by farmers through years of farming experience.

Contour plowing was widely used in the area. The practice was primarily intended for SWC, though it also helped to reduce the need for traction power. Farmers used contour plowing irrespective of slope steepness. When asked when the practice began, the farmers explained that they inherited it from their ancestors. Contour plowing demands no more labor than plowing and, hence, is an efficient technique for reducing runoff mainly in moderately and gently sloping areas. On steep slopes, as farmers noted, contour plowing needed to be used together with terraces and bunds to effectively control erosion.

Drainage ditches, also known as traditional ditches, were indigenous practices widely used by almost all farmers of the area for erosion control. These are

Table 5. Type and use of SWC measures (% of respondents).

Type of SWC measure	Debele (n = 54)	Wushawushign (n = 59)	Faji (n = 34)	Total (n = 147)
Contour plowing	84	88	78	83
Drainage ditches	83	88	75	82
Stone terraces/bunds	84	72	63	73
Waterways	28	16	25	23
Tree planting	13	33	22	23
Grass strips	33	16	16	22
Soil bunds	27	11	6	15
Other	11	5	–	5

Note: Totals over 100% are due to multiple responses.

micro-channels constructed on cultivated fields to drain off excess water. Construction involves pressing the plow deep into the ground and running it diagonally across the farm plot. Ditches are different from normal plow furrows (in dimension and orientation), and their construction is executed in every cropping season (see Million, 1996). Farmers connect the ditches to waterways constructed alongside the farm plots for the safe disposal of excess water. They explained their importance as follows: "*kezera gebere yaboyew yibeltal*," a saying which literally means "a farmer who constructs drainage ditches is better by far than one who sows without." Ditches were one of the most favored conservation techniques for at least two reasons: (1) they demanded less labor for construction, and (2) they were effective in protecting the farm plot from upslope runoff and associated soil loss.

The use of stone terraces is an age-old conservation tradition in the area, although stone terraces also have been introduced by the Ministry of Agriculture over the past few decades. The introduced terraces do not currently retain their original design as the farmers have modified and adapted them to fit local conditions. According to most farmers, terracing is effective in erosion control, although it is labor-intensive, hosts rodents, and returns investment only gradually. Two different types of stone terraces were identified on cultivated fields – those at field boundaries and those within the farm plot. Stone terraces at field boundaries are more stable and farmers let grasses grow on the risers. These structures develop over time into stone bunds. Besides helping with soil and water conservation, the structures serve as boundaries between the adjoining farm plots of different owners. On the other hand, terraces within a farm plot are periodically destroyed and reconstructed when farmers think too much soil has become entrapped. This was an indigenous practice, which they called locally *erken meshar*, and which literally means terrace destruction. According to the farmers, *erken meshar* is practiced to redistribute the entrapped soil and help reduce rodent breeding. In addition, it helps to enhance soil fertility and improve the infiltration capacity of the soil. A new stone terrace is then constructed slightly downhill from the previous (i.e., the destroyed) terrace. Such practices illustrate the dynamics of adoption and adaptation of SWC technologies to fit local conditions.

Although not widespread, the use of soil bunds was also mentioned by farmers. This practice was promoted by past conservation projects carried out in the area. Adoption of the measure, however, was limited to less steep slopes and to areas where stone availability was limited. Farmers indicated the inappropriateness of the soil bunds on steep slopes where runoff is high.

Waterways are permanent structures constructed alongside the cultivated fields. These structures are wider and deeper than the ditches and normally require maintenance and the dredging of sediments, chores taken care of by farmers of adjacent plots.

Although farmers mentioned the use of tree planting for SWC, it was observed that the trees were planted for firewood and construction purposes. Eucalyptus was the dominant species and was more often planted in home compounds than on farmland, indicating that agroforestry practices for erosion control were limited.

In discussions, farmers indicated that they had been using stone terraces/bunds, drainage ditches, and contour plowing since time immemorial. Many of them indicated that they inherited most of these techniques from their fathers and forefathers, though preferences largely depended on perceived effectiveness and workability. They further said that "we are well aware of how and where to install conservation measures (and where not to) as opposed to government-dictated measures, which often don't consider appropriateness." Since farmer preferences largely depended on perceived effectiveness and workability, spatial differences in the intensity of conservation strategies used were observed. For instance, stone terraces/bunds were predominantly used in Debele, while a wider use of drainage ditches was observed in Wushawushign and Faji (Table 5), perhaps due to differences in slope and the availability of stones for construction. This illustrates that the farmers of the Beressa watershed were well aware of conservation techniques.

Conclusions

Farmers' decisions pertaining to SWC are largely determined by their knowledge of the problem and the perceived benefits from conservation. The results of this research show that over 70% of the farmers in the Beressa watershed in the central highlands of Ethiopia recognized soil erosion problems, and were of the opinion that conservation was necessary. Sheet and rill erosion were the dominant forms mentioned by 91% of the farmers. However, the farmers consider erosion to be severe mostly when the visible signs – rills and gullies – appeared in their fields. This shows that although farmers are aware of erosion problems, their understanding of its severity is confined mostly to visible evidence.

Farmers use a range of techniques for erosion control. Among them, contour plowing, stone terraces/bunds, and drainage ditches constitute the most widely used techniques, although spatial differences in the intensity of use were observed within the watershed. Further, farmers have been changing and adapting techniques to fit local requirements. *Erken meshar* is an indigenous practice which farmers use to improve the effectiveness of stone terraces. It is used to redistribute entrapped soil at the edge of the terraces and to reduce rodent breeding. In addition, drainage ditches are the preferred and most widely practiced conservation measures because they are less labor demanding and more effective in expelling excess water after heavy rain showers. Apart from erosion control, farmers use a mix of fertility enhancing practices such as crop rotation and the application of animal manure. Farmers are aware of the multiple benefits of organic matter. However, the intensity of application is limited by the opportunity to market manure in urban centers and by distant farm locations that impose labor constraints.

Overall, farmers accept and use conservation technologies that enhance productivity and offer short-term benefits rather than technologies requiring long-term investments. Perhaps this is related to the subsistence nature of the farm economy and immediate demands for improved yield. This research, therefore, demonstrates the wealth of conservation knowledge available among farmers. It suggests that conservation interventions should take into account farmer perceptions of problems, understand farmer priorities and the conditions that influence their decisions, and make good use of their indigenous knowledge.

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