FORUM

Land Degradation Problems and Their Implications for Food Shortage in South Wello, Ethiopia

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ABSTRACT / Understanding the problems of land degradation and seeking long-lasting solutions to these problems should be one of the central concerns of countries such as Ethiopia where agriculture is the mainstay of no less than 85% of the population. To this end, the collaboration of policy makers, researchers, donor agencies, and the local people is indispensable. In this paper an attempt is made to discuss the causes of land degradation and the reasons for the failure in the endeavors made to solve the problems. Possible solutions, which may help to ameliorate the situation, are also suggested. The study deals with South Wello (a region in northern Ethiopia), but the assessment is, by and large, a reflection of most of the highlands in the country.

In countries such as Ethiopia, where a major part of the population depends on agriculture for its livelihood, the problem of land degradation requires urgent consideration. Although famine is more dependent on socioeconomic and political factors than on local physical circumstances (Mesfin 1984), the consequences of land degradation that lead to food shortages can sometimes be very serious. The problem of land degradation is exacerbated when it is associated with rapid population growth, which implies further clearing of vegetation and cultivation of marginal areas to feed the increasing population. The long-term repercussion of such activities is, therefore, indisputable.

This paper focuses on South Wello because, as part of the Ethiopian highlands that are facing a serious problem of land degradation, it cannot be free from the consequences mentioned above. It has already suffered much from previous famines. It is also a region with high risks of soil erosion and, in view of the low food production vis-à-vis the rapid population growth, it will soon be unable to feed more than a small part of its population. In a discussion of these problems, one might ask questions such as: What attempts have been made to rehabilitate the degraded areas and how did the people respond? What are the priorities of the people regarding land use? What should be expected from the people, government, and donor agencies?

The problem of land degradation is much more complex than one would imagine because it incorporates both ecological and socioeconomic aspects. Thus, implementing the conventional conservation methods to solve the problem may not take us far. Recently, donor agencies such as the Swedish International Development Authority (SIDA) have started activities in the region related to community empowerment, rehabilitation, and extension-based farm, forestry, and soil conservation (SIDA 1995). They may have a share in solving the problem. However, if fruitful land rehabilitation programs are to be carried out, the role that can be played by the local people should be given due consideration.

KEY WORDS: Agroforestry; Donor agencies; Food for work; Hillside closures; Land rehabilitation; Local participation; Population growth; Reforestation

The Setting

With an area of 21,200 km^2 (MPED 1993), South Wello (Figure 1) is one of those regions of northern Ethiopia that were severely hit by drought and famine in 1973 and 1984. Except for Mesozoic sandstone and limestone in the Abbay gorge, South Wello is covered by volcanic deposits of Trappean series dating from the Tertiary period (Mohr 1961). Drained by many small and some large rivers that belong to the Abbay and Awash river basins, South Wello is characterized by deep gorges, dissected plateaus, and rugged massifs. Around 80% of the region is found within a range of altitude of 1500–3500 masl (MPED 1993). By and large, South Wello lies in the summer rainfall area (June–August) but some areas also get spring rainfall (March–May). However, the majority of the farmers depend on the summer rains. Rainfall and temperature are highly influenced by altitude. Depending on the altitude differences, the mean annual rainfall in South Wello ranges between 400 and 1600 mm and mean annual temperature between 10 and 25°C (Anon. 1988).

The major soil types covering large parts of the region are phaezoms, cambisols, lithosols, and vertisols (Anon. 1988). Most phaezoms, cambisols, and lithosols occur on steep slopes and are often shallow with many

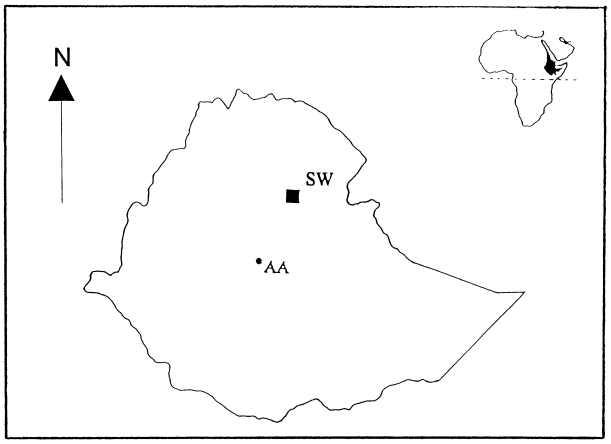

Figure 1. Map of Ethiopia showing the approximate location of South Wello (SW). AA = Addis Ababa

stones and rock outcrops. Their agricultural use is, therefore, limited. Vertisols cover relatively small areas; they are potentially good for agriculture except that they shrink and form deep cracks during the dry season and are waterlogged in the rainy season. In some of the river plains, there are also fluvisols (alluvial deposits), which are generally good for agriculture.

A considerable part of South Wello is characterized by shallow soils. By taking 60 cm as a mean soil depth for croplands in the Ethiopian highlands and a mean annual loss of 4 mm of soil depth, Hurni (1993) estimated an annual reduction of soil productivity of 1%–2%; without incurring any inputs, the rate of degradation and subsequent cropland expansion can rise by up to 4%/yr after 50 years (ca. 2040). For particular cases such as South Wello, where about 75% of the soils have a depth of only ca. 10 cm (Henrickson and others 1983), an even more adverse situation can be expected. Together with slope, which has a strong influence on the process of erosion in this region (Bhan 1988), the clearing of vegetation has contributed to the classification of South Wello as a severe erosion risk zone.

The large majority of people in South Wello are ''mixed'' farmers engaged in crop production and sedentary livestock grazing. Crop production is mostly rainfed and the major crop types grown in the region include cereals [such as barley, wheat, 'teff' (*Eragrostis tef*), maize, sorghum], pulses (such as peas, lentils, chick peas), and oil seeds. As in most parts of rural Ethiopia, farming in South Wello is subsistence, where production does not go beyond home consumption. Off-farm employment or other sources of income are negligible. Before the Land Reform Proclamation of 1975, which nationalized all rural lands and brought an end to the landowner–tenant relationships, most of the

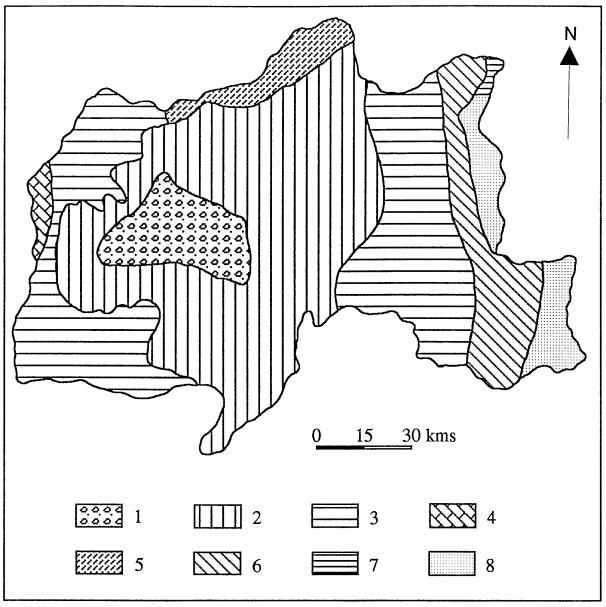

Figure 2. South Wello potential natural vegetation types: 1, Afroalpine and sub-Afroalpine; 2, *Juniperus* forest; 3, *Podocarpus* forest; 4, *Arundinaria* (bamboo) forest; 5, *Juniperus* woodland; 6, *Acacia* woodland; 7, steppe; 8, halophytic vegetation. Source: generalized from MOA (1983a).

farmers in the study area were either landowners who worked on their own plots of land or landless peasants who worked as tenants (by paying a portion of what they produced to the landowner).

Vegetation and Land Use in South Wello

As can be seen from Figure 2, the potential natural vegetation in the study area consists of Afroalpine and sub-Afroalpine vegetation, *Juniperus* forests, *Podocarpus* forests, *Arundinaria* (bamboo) forests, *Juniperus* and *Acacia* woodlands, steppe, and halophytic vegetation (MOA 1983a). At present, however, large parts of South Wello are under intensive or moderate cultivation and grazing (MOA 1983b) and only in very few places can one see small patches of original or secondary forests (see Figure 3).

Land Degradation: Causes and Consequences

In South Wello, the main processes of land degradation are soil erosion and deterioration of soil structure due to heavy grazing, clearing of vegetation, and cultivation on steep slopes. Coupled with the removal of protective vegetation cover, heavy grazing leads to soil crusting and compaction due to livestock trampling, surface sealing, increased runoff, and excessive loss of

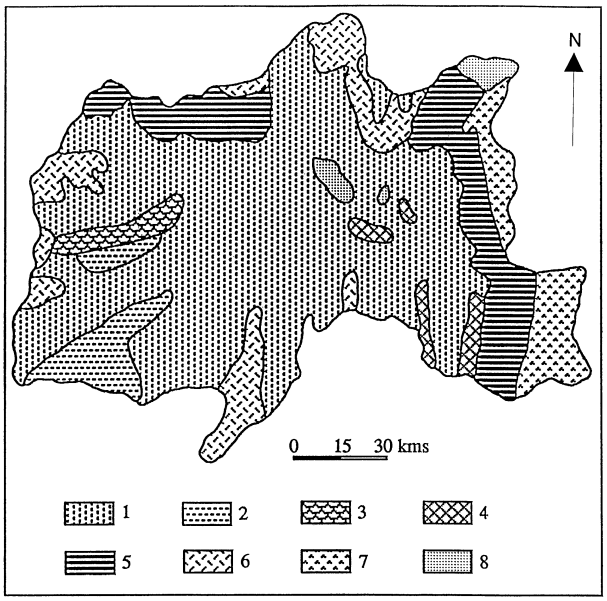

Figure 3. South Wello land use and land cover: 1, intensively cultivated; 2, moderately cultivated; 3, Afroalpine and sub-Afroalpine; 4, woodland; 5, bushland; 6, moderately cultivated land interspersed with bushland; 7, wooded grassland; 8, exposed rock or sand surface. Source: generalized from MOA (1983b).

topsoil. This loss of topsoil is also influenced by intensity of rainfall, soil texture, slope, and amount of organic matter.

Exploitation of wood resources in the area under study has a long history. Carbon dating of charcoal samples in Wello shows that forest burning started ca. 2450 years before present (Hurni 1987). Because of the favorable conditions for agriculture, the Ethiopian highlands were settled more than 5000 years ago (Hurni 1982). Thus, the strain on the highlands of Wello, which are now left with few centimeters of topsoil, is not a recent problem. In the mid-nineteenth century, the situation was particularly aggravated by the Ethiopian monarchs' political struggle for supremacy. This led to a change of the kings' headquarters, which involved movement of thousands of people, high demand for wood (for house construction and fuel), and thus heavy deforestation (Asnake 1983, Mesfin 1991). The destruction of hillside closures (areas free of human and animal intervention) during the transition period of change in government in 1991 is also worth mentioning. Moreover, the rapid population growth claimed large forest areas. Side by side with the clearing of vegetation or deforestation activities, little was done to maintain the vegetation cover. There were no effective reforestation programs. Thus the use of the land as a mine rather than as a source of renewable resources has led to severe degradation problems (Tewolde 1989).

Table 1. Estimates of area under land use in South Wello (1991/92)[a]

Land use	Area	
	Hectares	%
Crop	250,440	85.72
Grazing	33,360	11.42
Fallow	8,360	2.86
Total	292,160	100.00

[a]Source: CSA (1995a).

Cropping is one of the main factors of degradation, not only because it replaces vegetation, but also because crops are mostly grown on slopes and seed beds have to be ploughed several times, resulting in the breaking up of soil aggregates that are easily eroded (Constable and Belshaw 1989). Because intercropping is not a common practice, erosion increases since the soil is bare at the time of the most erosive rainfall. Of the estimated 1493 million tons of annual soil loss from the slopes of Ethiopian highlands, 672 million tons, or 45%, is accounted for by croplands that constitute about 13% of the land use (Hurni 1993). This implies a relatively huge proportion of soil loss in South Wello, where croplands make up 85% of the land use (CSA 1995a) (Table 1).

Although grazing may not be comparable to cropping in accelerating soil erosion, its role should not be underestimated. As in most parts of Ethiopian highlands, not only does it demand more clearing of vegetation, but it also affects areas under temporary crop cultivation because uncontrolled grazing for crop residues commences immediately after harvesting. This results in soil crusting, which reduces rain infiltration and the ability of the soil to absorb moisture (Alemneh 1990).

In a society where animals are considered a sign of wealth and prestige and also as insurance for bad years, peasants wish to have as many animals as possible even if they mean low or no economic return. In 1994/95, South Wello had about 3.1 million head of livestock (CSA 1995b), and this has an enormous impact on the available grazing land. A recent study of peasants in northern Shewa and southern Wello and the perceptions they have of their environment (Mesfin 1991) showed that there is a real shortage of grazing land. In view of the already high demand for areas of cultivation, keeping many animals would definitely be beyond the carrying capacity of the area, resulting in intensive grazing on small plots, more crusting, and so more degradation.

According to the 1994 census (CSA 1995c), South Wello has a population of 2,123,803 (66% of the Wello population) living in 21,200 km^2 (27% of Wello). With a high population density of about 100 persons/km^2, South Wello has a low mean crop area of 0.57 ha/household as compared to 0.93 ha/household for the rest of the country (CSA 1995a).

In the 25-year period (1970–1994), the population of South Wello grew from 1,174,600 to 2,123,803 (CSO 1974, CSA 1995c)—an increase of ca. 81%. On the other hand, the traditional farming technology did not change much, and thus crop production could not cope with the population increase. South Wello is thus suffering from low crop production because land fallowing to regain soil fertility does not occur, artificial fertilizers are not affordable, and animal dung is used for fuel rather than fertilizing the soil. Hence, the increase in population leads to still more clearing of remaining vegetation and cultivation of marginal areas.

Constable and Belshaw (1989) reported that in 1984/85 about half of the Ethiopian highlands were heavily eroded and even if erosion rates stay at the current level, about 18% of the highlands will have a soil cover less than 10 cm deep, making them incapable of sustaining cropping by the year 2010. With about 1493 million tons of soil being eroded annually from the Ethiopian highlands (Hurni 1993) and cropped areas losing an average of about 100 tons of soil/ha/yr (Constable and Belshaw 1989), the situation is becoming critical, especially in areas such as South Wello, which are classified as low potential cereal crop (LPC)[1] zones.

It is worth noting that uncontrolled denudation of mountain zones can also threaten the adjacent lowlands. The inundation of the food-producing Kyele lowlands by the annual floods from the Mbeya highlands (Mashalla 1990) and sedimentation in the surface-water reservoir in the Dodoma region, Tanzania (Christiansson 1981), can be cited as examples. Similarly, the future of many potentially productive intermontane valleys and basins of South Wello (such as Borkena, Mille, Beshilo), several of which are intensively cultivated, are at risk for major effects from highland degradation.

The agricultural costs of degradation for a period of 25 years (1990–2014) are estimated to be about $2500 million, and this would mean a substantial decrease of per capita income (by a mean of 30%) in the Ethiopian highlands, with the LPC zone as one of the most seriously affected areas (Constable and Belshaw 1989). This will also mean destruction of farmlands of some 10 million highlanders, 60% of them in the LPC zone (Constable and Belshaw 1989). In this connection, Hurni (1993) points out that degradation results in a high rate of expansion of croplands. He estimated that in the coming 50 years (until 2040) this rate of expansion of croplands will decrease (or fall to zero) and sustainability of all croplands will be attained only by incurring high inputs costing about $200 million per year.

What Has Been Done to Ameliorate the Situation?

Wello is one of the regions in Ethiopia that gained the attention of some of the early land rehabilitation programs in the country. This was partly due to the fact that the 1973 famine was associated with activities such as deforestation and clearing areas for cultivation (Yeraswork 1995). Moreover, the famine in Wello had political implications in that it was taken as the fault of the regime under the last emperor and also as one of the immediate causes for its downfall. Therefore, the succeeding socialist government had to show concern. To start with, hillside closures and reforestation activities began on the basis of a food-for-work (FFW) program where peasants were given grain for participating in planting seedlings, making terraces, etc. The major initiatives in the land rehabilitation programs of the study area are shown on Table 2.

Since 1978, the World Food Programme (WFP), the European Economic Community (EEC), the Australian government, and SIDA played a major role in running the FFW program (Hurni 1987). The FFW activities in Ethiopia, 73% of which involved soil conservation and afforestation programs, were carried out by the Ministry of Agriculture (MOA) and various nongovernmental organizations (NGOs) (Hareide 1986). Some problems associated with FFW included delays in food supply (or payment), bad monitoring and evaluation, corruption-related problems with screening, which may benefit those better off, and possible disincentives to local food production (Hareide 1986, Holt 1986, Yeraswork 1995). Moreover the FFW could not reach its expectations of land rehabilitation because it was associated with programs such as hillside closure about which people were not consulted. Thus, most farmers took part in the FFW programs either because they needed the grain or because they were forced to participate.

[1]According to the classification made by the Ethiopian Highlands Reclamation Study (Constable and Belshaw 1989), the low potential cereal crop (LPC) zone is one of the three agroecological zones in the highlands of Ethiopia. It is characterized by the longest history of population settlement, devegetation, and erosive cropping; shorter plant growing periods; thin vegetation; and slow rates of natural soil formation.

Table 2. Major land rehabilitation activities in South Wello conducted by various governmental and nongovernmental organizations

Organization / ministry	Activity
World Food Programme (WFP)	Running the food-for-work (FFW) program
European Economic Community (EEC)	Running the food-for-work (FFW) program
Australian Government	Running the food-for-work (FFW) program
Swedish International Development Authority (SIDA)	Material contribution (vehicles, stores, hand tools) used in afforestation programs
Swedish Agency for Research Cooperation with Developing Countries (SAREC)	Funding research on vegetation ecology
Ministry of Agriculture (MOA)	Planting tree seedlings (afforestation) and coordinating activities of governmental and nongovernmental organizations
Ethiopian Red Cross Society (ERCS)	Implementing various hillside closures and afforestation programs; introduction of agroforestry
Ethio-German Reforestation Project	Conducting reforestation programs on Mt. Yegof
Swiss Government (through University of Berne)	Soil conservation research
Finnish International Development Authority (FINNIDA)	Fuel wood plantation

Considering that vegetation regeneration leads to decreased runoff and soil erosion, hillside closure started on a trial basis in several parts of the region. According to the Upper Mille Cheleka Catchments Disaster Prevention Programme (UMCC-DPP) report (ERCS 1989), it was estimated that after 8–12 years of enclosure, careful removal of biomass (grass, fuel wood) to support human life would be possible. In some places, for example, on Mt. Yegof, hillside closures supplemented by plantation of seedlings started as early as 1973 (Bendz 1988). Since it was not possible to know for certain the time it takes to recover, large-scale hillside closures were postponed. However, the few enclosed pilot areas showed good signs of recovery. Before the encroaching bushes were cleared in 1991, the Kontoro and Kakaua hillsides were, for example, closed for 11 and 15 years, respectively. The positive achievements in these hillside closures could be long lasting and even be used as models in other parts of the country if they were carried out in cooperation with the local people.

Supplementing hillside closures with reforestation can be effective in rehabilitating degraded areas. This was demonstrated on Mt. Yegof, where forested areas are found between altitudes of 2000 and 3000 m. In the early part of the century, when there was no permanent human settlement, Mt. Yegof was covered with dense natural forest dominated by *Juniperus procera* (FWCD 1989). After two major forest fires in 1923 and 1971, which depleted the dense forests, planting with species such as *Cupressus lusitanica*, *Eucalyptus camaldulensis*, *Pinus radiata*, *Pinus patula*, *Juniperus procera*, etc., started in 1973 in cooperation with the Ethio-German Reforestation Project. As a result, Mt. Yegof now has an area of 1526 ha covered by forests (FWCD 1989). Besides the plantation activities on Mt. Yegof, reports from the MOA zonal office show that in 1986 alone over 30 million seedlings, mainly *Eucalyptus globulus*, *Juniperus procera*, *Olea europaea*, and *Acacia abyssinica*, were planted in Wello, of which 73% were in South Wello (MOA 1986). However, as will be discussed later, the planting of so many seedlings never meant success in the land rehabilitation program.

In connection with conservation measures attempted in the region, the UMCC-DPP, launched in 1986 by the Ethiopian Red Cross Society (ERCS) and implemented by MOA, needs to be mentioned. The UMCC-DPP, which was financially supported by the Swedish, German, and Japanese Red Cross (Polluha 1990) had its origins in the initiative taken by the Swedish Red Cross Youth Association to support ERCS in the plantation of one million tree seedlings (Yeraswork 1995). As an attempt to solve some of the possible causes for the large-scale food deficit, the UMCC-DPP aimed to overcome the lack of vegetative cover and poor natural water storage capacity (Alemneh 1990). To this end, besides starting reforestation programs and the introduction of agroforestry, it incorporated community water resource development, improved crop production and livestock development, improved food storage, land-use management, and preventive community health (ERCS 1986).

In addition to hillside closures and reforestation programs, soil and stone bunds were also constructed in some parts of South Wello in an attempt to prevent soil from being washed away. Immediate positive results cannot be achieved because the formation of bench terraces from the construction of these bunds is a gradual process that takes 5–20 years (Hurni 1988). In spite of some associated problems, such as sheltering of rodents, reduction of cultivable surface, and close spacing of bunds (Yeraswork 1995), the contribution of these bunds to soil conservation cannot be underestimated.

Problems Related to Land Rehabilitation Programs

In spite of the attempts made to alleviate the problems of land degradation, the end results were not impressive, especially when one considers the labor and money spent in the whole program compared to what was achieved. Little attention was given to the attitude of local people toward conservation programs and what their priorities were. In most conservation programs the local people were not consulted nor included in the planning. Thus, once the land rehabilitation projects run by the donor agencies complete their terms, it was not possible for the local people to shoulder the responsibility of implementing and continuing the objectives of these projects. As Ståhl (1990) put it, the rehabilitation policy was not consultative and supportive of local initiatives, but rather was prescriptive and commandist, emphasizing the number of seedlings planted rather than survival, management, and utilization of planted trees and the number of hectares of hillsides closed off rather than on how to manipulate revegetation. Under such circumstances, it was difficult for donor agencies and government organizations to hand the responsibility to the local people and proceed to the less accessible and more degraded areas of the region (Yeraswork 1995). The Ministry of Agriculture and Environmental Protection and Development (MOAEPD previously known as MOA) was thus stuck with the original project areas and could not expand its activities to other parts of the region where conservation programs were desperately needed.

Some of the hillside closures included areas that could be cultivated or grazed, and this led to local resistance to the programs from the outset. In many instances, farmers were not allowed to graze their animals or cut the grass, and this created bitter feelings about hillside closures. As a result, many hillside closures were destroyed during the transition period in the change of government in 1991. There were even incidents when farmers would not allow fencing of small (20×20 m) experimental plots because of fear of reintroduction of the program. Because of the negative impression they had about hillside closures and reforestation programs, the farmers did their best to do away with any future threat to land access.

One of the most important reasons for the destruction of hillside closures witnessed in 1991 was the ambiguous and uncertain land ownership system (Yeraswork 1995). The nationalization of land, which was one aspect of the agrarian reform of the mid-1970s in Ethiopia, could contribute a lot to the success of various conservation programs. However, the opportunity was misused because the local people, without whom little can be achieved, were not given due consideration and were, on the contrary, left with little or no feeling of belonging to the land under hillside closures or to the reforestation programs. Moreover, there was no coherent national forest policy or guidelines on utilization of trees in the community forests (Alemneh 1990). Thus, even if farmers planted tree seedlings they were not sure what would happen to their trees or who was going to use them. There was no follow-up on the planted seedlings and no regular reports after the year of planting. It is difficult to come up with reliable figures on the survival rates of planted tree seedlings in the FFW programs. However, they were generally low. This can be partly attributed to the indifference of the farmers whose aim, at times, could have been only the grain.

The tenure system of an area has an effect on the management practices of the land and hence determines the trend in the conservation of resources. That clearly defined property rights can contribute a lot to reversing degradation problems is shown by Kenya's example, where areas in which soil conservation measures have been most readily adopted roughly coincide with land registration and obtaining land titles (Ståhl 1993). In line with this, Marcos and Kassahun (1988) report that the uncertainty of ownership and right of use of tree plantations contributed to the low performance of the community forestry program in Ethiopia.

MOAEPD, besides being engaged in the regular tasks of an agricultural agency, was deeply involved in the unpopular programs of villagization (creating new villages), forming farmers' cooperatives, forced resettlement of farmers from South Wello to other parts of Ethiopia, and even the forced conscription of peasant children into the army (Yeraswork 1995). It was unfortunate that the farmers could not separate the land rehabilitation programs and the people from MOAEPD who were involved in these schemes. It is not surprising, therefore, that in addition to the reasons discussed earlier, these negative associations created ill will that could lead to people destroying hillside closures and forests.

Is There Hope for the Future?

Multidimensional and complex as the problems of land degradation are, they deserve carefully designed solutions that integrate conservation measures and agricultural development activities. This can be a major step in enabling the community to use the mountain resources on a sustainable basis and minimize the problems of land degradation in the long run. To this

end, much is expected from policy makers, researchers, relevant government bodies (like MOA), and the community at large. In most countries with problems of land degradation, the issue is often of low political priority because the people affected have little influence (Blaikie 1985). The solution, therefore, partly depends on carefully explaining the research findings to policy makers and convincing them that the situation is critical and that land degradation is a national problem threatening agricultural production.

With regard to problems of land degradation in Ethiopia, many studies have been made on peasants' attitude to conservation and on agrarian reforms and property rights vis-à-vis land management. Furthermore, soil conservation studies sponsored by the Swiss government and conducted by the Soil Conservation Research Project (SCRP), rehabilitation of degraded and degrading areas in Tigray sponsored by the EEC, studies on vegetation ecology sponsored by the Swedish Agency for Research Cooperation with developing countries (SAREC) and SIDA, and various studies by MOA and ERCS are among many conducted on land degradation problems. There is also an ongoing SAREC-sponsored project on natural regeneration of degraded and heavily grazed areas in southern Wello. Phytosociological inventories of the actual vegetation, knowledge of potential natural vegetation, and planting of proper combinations of native species (because they are cheaper, more stable and require less maintenance than exotic species) have shown successful regeneration in many parts of Japan in less than two decades (Miyawaki and others 1987). An attempt to incorporate the findings of the various studies mentioned earlier and encouragement of further research may, therefore, help to bring about long-lasting solutions.

Without taking the local conditions and basic problems of the people into consideration, it might be futile to think of conducting successful land rehabilitation programs because, in the final analysis, the community's role in implementing the integrated plan is decisive. Thus, involving the people in land rehabilitation programs and helping them improve traditional farm techniques becomes extremely vital when one relates the farmers' desperation in clearing the vegetation to have more cultivation area and increase crop production. In connection with the significance of local participation of a community, Pretty and others (1995) noted that in some parts of Kenya, strengthening the local organization has helped in lessening degradation and enhancing water resource and growth in agricultural production by 10%–30% per year.

As for the degraded areas not currently used for agriculture, hillside closure can be introduced with local participation. Destocking of the Irangi hills in the Kondoa Eroded Area (KEA) in Tanzania has not only helped the landscape of bare ground to be covered by different types of plants but has also reduced surface runoff and helped in the formation of river banks that can be used for cultivation and in the creation of a permanent water supply in wells that used to dry up during the dry season (Christiansson 1988). However, the successes gained by destocking have started experiencing negative trends (grazing, cutting, etc.) due to lack of local participation ever since the program was initiated. As was mentioned earlier, this is what happened in the study area in 1991, and it is likely to happen any time if the local people are not involved in the rehabilitation programs. Chokor (1993) argues that lack of public enlightenment and mobilization of the people may have contributed to the low level of achievement in the goals set towards reforestation, erosion control, and land conservation in Nigeria. In line with gaining the confidence of the people to increase their participation, the government should formulate unambiguous land ownership policies and coherent forest policies (Alemneh 1990, Yeraswork 1995). Besides the possibility of increasing crop production, the people need some kind of assurance for a planned use of the grass and wood products.

Not only does agroforestry increase organic matter content in the soil and reduce soil erosion, but it can also be a good source of income for the farmers. Thus it should be encouraged. In some parts of South Wello, such as Kalu and Ambassel districts, some farmers practice agroforestry by integrating cereal production with fruit crops such as oranges and bananas and cash crops such as coffee (CSA 1995a). However, in spite of agroforestry's possible contribution to diversification and intensification of agriculture, it is not yet practiced on a large scale. At present there are only 850 ha under coffee (CSA 1995a), only 0.34% of the area under all crops (Table 3). The introduction of exotic tree species such as *Robinia pseudoacacia* and *Morus alba*, which are fast-growing and suited to high-altitude/low-temperature regions (Barber 1984), can be a short-term solution. In the long run, however, with the planting native species such as *Acacia abyssinica* and *Millettia ferruginea*, which are also useful in fixing nitrogen (Legesse 1995, Fassil 1993), agroforestry's contribution can be valuable.

The dramatic population growth is going to affect the country at large and South Wello in particular because more food will be required, which will mean clearing of remaining vegetation cover, leading to more soil erosion and low production. As can be seen from Table 4, the majority of households in South Wello have

Table 3. Areas in south Wello under temporary and permanent crops (1991/92)[a]

Crops	Area	
	Hectares	%
Temporary crops	247,990	99.02
Coffee	850	0.34
Chat[b]	460	0.18
Enset[c]	240	0.10
Other permanent crops	900	0.36
Total	250,440	100.00

[a]Source: CSA (1995a).

[b]Chat is a stimulant crop.

[c]Enset is false banana (*Ensete ventricosum*).

Table 4. Size of land holding (per number of household) in South Wello (1991/92)[a]

Size of holding (hectares)	Number of households	%
<0.10	34,510	7.84
0.10–0.50	176,510	40.09
0.51–1.00	154,580	35.11
1.01–2.00	67,540	15.33
2.01–5.00	7,160	1.63
Total	440,300	100.00

[a]Source: CSA (1995a).

a low mean crop area per household (CSA 1995a) that is below the minimum (1 ha) required to sustain peasant farming in most highlands of Ethiopia (Alemneh 1990). This is partly due to the increasing population. In addition to religious reasons, children are seen as assets for the parents in old age and it can be a real challenge to implement family planning programs. Still, serious efforts should be made to extend these programs to the rural areas. Otherwise, the nation's population growth of 2.9% will remain a major problem for land degradation.

To make ends meet, the people need different types of technical assistance or material help from the government and donor agencies. Wello, with about 16% of donor agencies/NGO activities, gets the largest share of all regions in the country (Alemneh 1990, Tegegne 1994). Among the many donor agencies/NGOs in the region, those directly or indirectly involved in land rehabilitation programs include: the ERCS in tree planting and soil conservation activities; SIDA in material contribution such as vehicles, stores, and hand tools; Finnish International Development Authority (FINNIDA) in fuel wood plantation schemes, and the Swiss government (through University of Berne) in soil conservation research (Yeraswork 1995). In view of the large sums of money spent in the region to arrest the problem of land degradation, the results are poor. The donor agencies/NGOs will play a significant role in reversing the problem only if they can work in close cooperation with each other to achieve a common goal.

With all the problems at hand, a developing country such as Ethiopia may not be able to carry out a successful land rehabilitation program by itself. It is no wonder, therefore, that much is expected from donor agencies, at least in the initial stages, but without the commitment of policy makers to involve the local people and without cooperation of the donor agencies among themselves and with concerned government bodies, the problem will remain unsolved.

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