NATURAL RESOURCE MANAGEMENT IN ETHIOPIA: MAKING GOOD USE OF INDIGENOUS KNOWLEDGE

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Abstract: *Natural resource degradation is a major environmental, socio-economic and policy challenge in Ethiopia. In particular, land degradation due to soil erosion and nutrient depletion has put a perilous stress on rainfed agriculture on which the country's economy and livelihood of its people largely depend. Conservation projects have been designed and extensively carried out during the past three decades under various packages by governmental and non-governmental organizations. However, it is widely recognized that the projects have little succeeded in meeting their objectives. Among others, the top-down nature of conservation approaches in the development and transfer of technologies considerably contributed to the ineffectiveness of the strategies and failure of the projects. This paper argues that making good use of and building upon indigenous knowledge and practices of the land users in the development and implementation of conservation technologies could bring about effective technological transfer and sustainable land use.*

INTRODUCTION

Sustainable natural resources use and management is a key component of sustainable development. Specifically, attaining economic objectives of food and fiber production while maintaining the environment is central to the sustainable use of natural resources. To this end, there must be a dynamic equilibrium attained between the natural resource base and the human population depending on it for survival. Nonetheless, in most

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developing countries, the trend thus far shows the opposite. Natural resources are being depleted at rates beyond the rates of natural recovery. The situation is critical specifically in Sub-Saharan Africa (SSA), which results in lower levels of production and deterioration in the standards of living of the population.

Ethiopia is a country with diverse climate and natural resources endowment. Smallholder peasant agriculture is the main sector of the country's economy. It accounts, in some areas including forestry, for about 45 percent of the GDP, 85 percent of exports and 80 percent of total employment (FDRE, 1997). However, the country is facing severe problems of agricultural stagnation and decline, high population growth, and degradation of the natural resource base (Shiferaw, 1997). In particular, land degradation due to soil erosion and nutrient depletion is a principal environmental and socio-economic problem. Over the past many decades, the problem has remained a predicament to agricultural production. As a result, the country is precariously affected by recurrent food shortages, which claimed the lives of thousands of its population and caused millions underfed. Effective and efficient conservation strategies are thus urgently needed to prevent further degradation and destruction of the natural resource base. This paper is aimed at providing an overview of the land degradation problem in the country, past responses to it, and highlights the potential of using indigenous knowledge in the sustainable management of land.

THEORETICAL CONTEXT

There is a multi-faceted and complex interrelationship between people, agriculture and the environment. As a result, there has been a growing debate on population-environment relationships for more than half a century. And in many parts of the world, however, this relationship is becoming a detriment to the environment thereby leading to the conclusion that environmental degradation is to a large extent human-induced.

Of the various forms of environmental degradation, the degradation of agricultural land has been a major global issue during the 20^{th} century and

LAND DEGRADATION AND REHABILITATION IN ETHIOPIA: *A Synopsis*

The land degradation problem

Land degradation due to soil erosion and nutrient depletion constitutes a major constraint to increasing agricultural production in Ethiopia. Although data on the extent of the problem are quite thin (Hoben, 1995) and patchy, it is learned from exiting information that land degradation is a serious environmental and economic problem in the country. For instance, the Ethiopian Soil Science Society (ESSS, 1998) indicated a total of 1.5 billion tons of soil loss per year in the country. The same source further stated that it is only around 20 percent of the highlands which is free from the hazards of soil erosion at present. According to FAO (1993), about half of the highlands (270,000 km2) are already significantly eroded; of this, 140,000 km2 are seriously eroded and have been left with relatively shallow soils. Estimates from plot level studies have also shown that the rate of soil loss is high from currently unproductive (70 t/ha) and cultivated areas (42 t/ha) (Hurni, 1987).

Table: Soil loss from different land category

Land category	Soil loss (t/ha/yr)
Crop land	42
Perennial crops	8
Grazing and browsing	5
Currently unproductive	70
Currently uncultivable	5
Forest	1
Wood land	5

Source: Hurni (1987).

Agricultural areas are also suffering higher rates of soil fertility decline. Assessment of soil nutrient depletion in SSA indicated that Ethiopia is among the countries with the highest rates of nutrient depletion (Stoorvogel et al., 1993). The assessment estimated a negative balance of the major nutrients (NPK) for arable soils in the country; that is, – 41 kg N, – 6kg P and –26 kg K ha^{-1} yr^{-1}. Fertility decline has caused annual loss in grain will remain high on the international agenda in the 21st century (Eswaran et al., 2001; Lal, 2001). This is because of its adverse impacts on agronomic productivity, the environment, and its effects on food security and the quality of life. Soil erosion is one of the most common forms of land degradation. During the last 40 years nearly one-third of the world's arable land has been lost by erosion and continues to be lost at a rate of more than 10 million hectares per year (Pimentel et al., 1995). The problem is critical in the developing world resulting in substantial productivity decline on approximately 16 percent of the agricultural land, especially on cropland in Africa and Central America, pasture in Africa, and forests in Central America (Scherr, 1999). The trend indicates that the problem is likely to cause severe decline in agricultural income in the future by reducing yield and raising the cost for inputs, if it is left unchecked.

On the other hand, there were considerable efforts put in place on degraded areas of the world to counter the problem and its effect on agriculture and the environment. In many cases, however, these efforts have largely failed to reverse the situation. Several theories and assumptions are posited to explain the failure. Among others, the approaches followed in the design and extension of conservation technologies, the nature (technical aspect) of and the way the technologies are developed, and the socio-economic and policy environment within which the land users operate have been subjects of criticism and debate. As a result, different perspectives that explain the failure to redress the land degradation problem emerged out. Biot et al. (1995) summarize three sets of assumptions on which issues of land degradation and conservation in many developing countries rest.

1. The extent of and solutions to the problems of land degradation are well known, but the problem is to get people to implement them.

2. The nature and extent of land degradation are imperfectly understood, that local peoples often reject conservation technologies for good reasons and, in fact, adopt their own individual and collective approaches that have in the past resulted in sustainable livelihood practices.

3. Suitable technologies presently exist or can readily come into existence; the problem is to understand the present structure of incentives that prevent land users from adopting them, and to design incentives that will induce adoption.

Common to these assumptions is unwillingness of the land users to adopt technologies extended to them. Hence, understanding the question - Why do land users become unwilling to implement and invest in recommended conservation technologies? – could be relevant for undertaking effective and acceptable conservation strategies.

For close to a century, rural development policies and practice have taken the view that farmers are mismanagers of soil and water (Pretty and Shah, 1997). Accordingly, they are seen as either 'adopters' or 'rejecters' of technologies, but not as originators of either technical knowledge or improved practice (Scoones and Thompson, 1994). This assumption has since been leading to the external development of technologies and transfer in a top-down approach. For instance, when the seriousness of the erosion problem was realized in the 1950s in developing countries, governments (initially colonial powers) took the initiative and for a long time they followed a top-down approach in the design and implementation of soil conservation projects or programs (de Graaff, 1996). And Ethiopia is not an exception to this trend. There is a strong tradition of blanket acceptance of imported technology and a blind rejection of the experience and know-how of the land user (Dessalegn, 2001).

Nonetheless, today a growing number of African governments and international development agencies are recognizing that local-level knowledge and organizations provide the foundation for participatory approaches to development that are both cost-effective and sustainable (Warren, 1992; Dejene, 2000). This paradigm shift seriously questions the commonly held belief that local land users are ignorant, and that their knowledge should be replaced by a technical transfer from scientists (Biot et al., 1995). Consequently, a lot of debate emerged about the importance of what has come to be known as 'indigenous knowledge' in recent years (Warren, 1991; Dejene, 2000).

production of 40,000 tons (Azene, 2001). To compensate the losses, there has been a substantial increase in the use of chemical fertilizers, mainly DAP and urea. Hence, total fertilizer (DAP) consumption increased from 80,000 tons in 1991 to 200,251 tons in 1996 (Croppenstedt, 1999). The purchase of such inputs, on the other hand, raised the country's foreign expenditure, which has a negative implication on the current economic situation of the country.

One way or the other, the destruction of natural vegetation cover contributed to the declining trend of soil fertility. Forests have been cleared mainly for firewood and house construction, which could be for own consumption and/or market. In general, deforestation in the country has been quite high. Though not based on reliable evidence (Dessalegn, 2001), it is believed that about 40 percent of the country's total area was covered with forests at the beginning of the 20th century. Then after, the extent of deforestation has been so severe and, therefore, the area of land under forest cover is estimated to have been reduced to 16 percent in 1950, 3 percent in 1980 and only to 2.7 percent in 1990 (Krauer, 1988). Estimates of deforestation, which is mainly for expansion of rainfed agriculture, vary from 80,000 to 200,000 hectares per annum (FDRE, 1997). Deterioration of the forest resources caused shortage of fuelwood, which is the main source of energy in rural Ethiopia. The use of animal dung and crop residues largely replaced fuelwood to counterbalance the deficit. The burning of these sources of soil humus and fertility has led to a progressive deterioration in soil structure, infiltration capacity, moisture storage, and fertility (Wood, 1990). Eventually, the land looses its productive capacity or degrades.

Evidently, the estimates on the extent of soil erosion and fertility depletion show the seriousness of the land degradation problem in the country, albeit there remains a lot to be researched to gain a better understanding of local variations in the rate and magnitude of degradation and the causative factors.

Conservation activities: Success stories?

The government of Ethiopia recognizes land degradation as a major problem constraining agricultural production and food security in the country. In effect, over the past few decades there has been massive rehabilitation work, mainly soil conservation and afforestation, to correct the situation. In particular, conservation strategies have been embarked on after famine episodes of the 1970s and 1980s. Farmers were mobilized to participate in the conservation projects through either campaign works or the incentive of food-for-work (FFW). Achievements in the construction of conservation measures were quite remarkable in quantitative terms. For instance, between 1976 and 1985 it is estimated that a total of some 600,000 kms of soil and stone bunds and about 470,000 kms of hillside terraces were constructed, and 80,000 hectares of steep slopes were closed for regeneration (Hoben, 1995; Yeraswork, 2000). Moreover, check dams were constructed along gullies over tens of thousands of kms and about 500 million tree seedlings were planted over 180,000 ha of land in the course of the decade.

Despite all this, the outcome has not been encouraging (Azene, 1997) and land degradation continues to be a major constraint to agricultural production. Evidences show that pre-designed (introduced) soil and water conservation technologies did not work as foreseen. Nor do the land users willingly accept them. It is reported that between 5 and 25 percent of the conservation structures accomplished were damaged in just a year after construction. Partly the farmers themselves were involved since the late 1980s in the destruction of the structures when the FFW incentive stopped and coercion was relaxed (Shiferaw, 1997). On many occasions, farmers uprooted seedlings and destroyed functional terraces in order to get paid with grain and edible oil (for participation in FFW) by doing them again (Azene, 1997). Consequently, many of the conservation measures are found neither effective nor accepted and widely adopted by local farmers. Several reasons could be put forward as an explanation to this. First, the introduction of the measures did not consider local practices and were not compatible with the 'traditional' ones. Second, since interventions normally include such activities as reforestation, terrace construction, etc., they are generally characterized by high initial costs and by the benefits that only become apparent in the long run (de Graaff, 1996). Third, the extensive and uniform application of similar soil and water conservation measures disregarded local agroecological and socio-economic variations.

Apparently, there is a mismatch between the perspectives of scientists, technology developers and local professionals, and the views of the land users who are expected to implement the recommendations (Stocking & Murnaghan, 2001). This illustrates the need to revise the conservation approaches and strategies that have been pursued so far.

MAKING GOOD USE OF INDIGENOUS KNOWLEDGE: *A Potential for Success*

Several studies have shown the importance of indigenous knowledge in natural resources management (Reij, 1991; Warren, 1991; Scoones and Thompson, 1994; Critchley, 1999; Dejene, 2000). The conventional 'transfer of technology' process whereby recommended technologies are taken from research institutions through advisory services or extension agencies and onto farmers has proved largely tired and ineffective (Critchley, 1999). Because the mere designing and installing of conservation measures do not necessarily change the hazard [land degradation], but maintenance and the involvement of the farmers are firm requisites of effectiveness (Dudal, 1981). Consequently, in national and international agricultural research centers, universities, government agencies and NGOs, there is a growing acceptance of the need to involve local people as active partners in all aspects of the research and development process (Scoones and Thompson, 1994). In particular, there is increased awareness of the need to move away from a narrow technical focus on soil conservation measures *per se* to more flexible approaches supporting farmers' responses to a changing resource base and other external and internal environmental, social and economic pressures (McDonald and Brown, 2000).

Nevertheless, experiences in Ethiopia reveal that indigenous knowledge of the land users and their involvement in the decision making process has not been considered relevant. Instead, solutions were sought solely through the introduction of externally developed conservation technologies, which seem to be grounded on the 'one-size-fits-all' principle. Implementation was thus executed uniformly irrespective of local agroclimatic and socio-economic variations. At the beginning when the land users resisted implementing the technologies, they were "encouraged" using incentives, mainly food-for-work, and coerced lately when failed to do so. Even so, it is largely learned that the interventions did not bear fruits as envisaged. Rather, it appears to have promoted the extensively condemned 'top-down' approach, emasculated inventiveness of the land users in generating effective technologies fit to local conditions, and eroded the foundation of trust between the land users and the various stakeholders involved in natural resources management.

Recently, however, there is a growing consensus that the poor record of soil and water conservation in Ethiopia can be attributed in part to the lack of appreciation of indigenous practices by soil conservation experts and policy-makers (Kruger et al., 1996). It should also be noted that the idea of soil conservation is not new to Ethiopian peasants as many traditionally implemented techniques in various parts of the country state (Herweg, 1993). A new approach that takes indigenous knowledge into account is therefore necessary to successfully deal with the problem. In fact, the Environmental Policy of Ethiopia (FDRE, 1997) explicitly indicated the need to improve land husbandry practices with an appreciation of existing husbandry systems, technologies and knowledge as a policy objective. However, little is known about this body of knowledge thus far. A closer look at the way resources are conserved and managed locally provides the starting point on which interventions should be designed and integrated with the already existing ones. This suggests the need to reorient conservation approaches in such a way that indigenous knowledge is put to good use, and interventions are built on and/or integrated with it. This is not to romanticize indigenous knowledge but to use the knowledge readily available in the hands of the land users. On the other hand, local practices may not be perfect and complete in all respects. Hence, making good use of indigenous knowledge should involve uncovering and appreciating locally available conservation technologies, evaluating their suitability, and assessing the potential for integration and wider dissemination. To this effect, participation of the land users is vital.

CONCLUSION

Natural resource degradation is a predicament to sustainable development. And it has become clear that natural resource degradation is to a large extent human-induced. In Ethiopia, degradation of agricultural land significantly hampered the performance of the agricultural sector. To remedy the situation, measures have been undertaken during the past three decades. However, the efforts did not bear success stories. Among others, the failure to recognize indigenous knowledge and skills of the land users in the design and implementation of conservation technologies is often cited as a cause. Instead, technologies were externally developed and transferred to the land users in a top-down process. Such a strategy was finally found out to be neither effective nor willingly accepted by the farmers. This suggests the need to reconsider the approaches that have been pursued. In this regard, making good use of locally available knowledge, on participatory grounds, could be a potential for the development of effective and acceptable conservation technologies.

REFERENCES

Azene Bekele-Tessema, 2001, "Status and dynamics of natural resources in Ethiopia". In Taye Assefa (ed.), *Food security through sustainable land use: Policy on institutional, land tenure and extension issues in Ethiopia*, pp. 133–164, NOVIB partners Forum on Sustainable Land use, Addis Ababa.

Azene Bekele-Tessema, 1997, *A Participatory Agroforestry Approach for Soil and Water Conservation in Ethiopia,* Tropical Resources Management Papers, 17.

Biot, Y. P. Blaikie, C. Jackson, and R. Palmer-Jones, 1995, *Rethinking research on land degradation in developing countries,* World Bank Discussion Papers No.289, Washington, D.C.

Critchley, W., 1999, *Harnessing traditional knowledge for better land husbandry in Kabele District, Uganda*, "Mountain Research and Development," 19: 261-272.

Croppenstedt, A., Mulat Demeke, and Meshi, M., 1999,. *An empirical analysis of demand for fertilizer in Ethiopia*, "Ethiopian Journal of Agricultural Economics" 3,1, : 1-39.

Dejene Aredo, 2000, Indigenous Knowledge Systems in Ethiopia: A background paper. National workshop of OSSREA, Ethiopian Chapter, Addis Ababa.

Dessalegn Rahmato, 2001,. "The landscape of development: A complex reality. Keynote address". In Taye Assefa (ed.), *Food security through sustainable land use, Policy on institutional, land tenure and extension issues in Ethiopia*, pp. 7-17, NOVIB partners Forum on sustainable land use, Addis Ababa.

Dudal, R., 1981, "An evaluation of conservation needs". In R.P.C. Morgan (ed.), *Soil Conservation: Problems and Prospects*, Wiley, UK.

ESSS (Ethiopian Soil Science Society), 1998, *Over 15 million Birr needed to restore 1.5 billion tons of Ethiopian soil.* Addis Tribune, 06-03-98. Addis Ababa.

Eswaran, H. R. R. Lal, and. P.F. Reich, 2001, Land degradation: an overview. In E.M. Bridges, I.D. Hannam, L.R. Oldeman, F.W.T. Pening de Vries, S.J.Scherr, and S. Sompatpanit (eds.), *Responses to Land Degradation.* Proceedings of the 2nd International Conference on Land Degradation and Desertification, Khon Kaen, Thailand, New Delhi, India: Oxford Press.

FAO, 1993,. "Natural resource degradation." In *The State of Food and Agriculture*, pp. 96–98, Rome.

FDRE (Federal Democratic Republic of Ethiopia), 1997, *Environmental Policy of Ethiopia.* Environmental Protection Authority in collaboration with Ministry of Economic Development and Cooperation, Addis Ababa.

Graaff, J. de, 1996, *The price of soil erosion; an economic evaluation of soil conservation and watershed development.* Tropical Resource Management Papers 14, Wageningen.

Herweg, K., 1993, *Problems of acceptance and adaption of soil conservation in Ethiopia*, *Topics in Applied Resource Management*, 3 : 391-411.

Hoben, A., 1995, *Paradigms and Politics: The cultural construction of environmental policy in Ethiopia, World Development*, 23, 6 : 1007-1021.

Hurni, H., 1987, *Erosion–productivity– conservation systems in Ethiopia*. In Proceedings of the fourth international conference on soil conservation, pp. 2–20, Maracy, Venezuela.

Krauer, J., 1988, *Rainfall, Erosivity and Isoerodent Map of Ethiopia*. SCRP, Institute of Geography, University of Berne, Switzerland.

Kruger, H-J., Fantaw, B., Gebremichael, Y., and Kejela, K., 1996, "Creating an inventory of indigenous soil and water conservation measures in Ethiopia". In *Sustaining the Soil – Indigenous soil and water conservation in Africa*, Chris Reij, Ian Scoons and Camilla Toulmin (eds.), London: Earthscan publications.

Lal, R., 2001, *Soil Degradation by Erosion, Land Degradation and Development*, 12:519-539.

McDonald, M. and K. Brown, 2000., *Soil and water conservation projects and rural livelihoods: Options for design and research to enhance adoption and adaptation, Land Degradation & Development*, 11:323-361.

Pimentel, D., Harvey, C., Resosudarmo, P., Sinclair, K., Kurz, D., McNair, M., Crist, S., Shpritz, L., Fitton, L., Saffouri, R. & Blair, R. 1995, *Environmental and economic costs of soil erosion and conservation benefits*. Science, 267 (February): 1117-1121.

Pretty, J. N. and P. Shah, 1997, *Making Soil and Water Conservation Sustainable: From Coercion and Control to Partnerships and Participation, Land Degradation & Development*, 8:39-58.

Reij, C., 1991,. *Indigenous soil and water conservation in Africa*. Gatekeeper series No. 27

Scherr, S., 1999,. *Soil degradation: a threat to developing-country food security by 2020?* Food Agriculture and the Environment Discussion Paper 27, IFPRI.

Scoones, I. and J.Thompson, 1994, *Beyond farmer first: Rural people's knowledge, agricultural research and extension practice*. IIED, UK. Intermediate Technology Publications.

Shiferaw Bekele, 1997, *Peasant Agriculture and Sustainable Land Use in Ethiopia: Economic Analysis of Constraints and Incentives to Soil Conservation*. Ph.D. Dissertation, Department of Economics and Social Sciences, Agricultural University of Norway, Norway.

Stocking, M.A. & N. Murnaghan, 2001, *Handbook for the field assessment of land degradation*. London: Earthscan.

Stoorvogel, J. J., E.M.A. Smaling, and B.H. Janssen, 1993,. *Calculating soil nutrient balances in Africa at different scales. I Supra-national scale, Fertilizer research*, 35: 227 – 235.

Warren, D.M., 1991, *Using Indigenous Knowledge in Agricultural Development*. Discussion Paper 127, World Bank, Washington, DC.

__________1992, Indigenous Knowledge, Biodiversity Conservation and Development. Keynote address at the International Conference on Conservation of Biodiversity in Africa: Local Initiatives and Institutional Roles, 30 August-3 September 1992, Nairobi, Kenya.

Wood, 1990, "Natural Resource Management and Rural Development in Ethiopia". In S Pausewang, F Cheru, S Bruene, E Chole (eds), *Ethiopia: Rural Development Options*. pp. 187-198, London: Zed Books.

Yeraswork Admassie, 2000, *Twenty Years to Nowhere: Property Rights, Land Management and Conservation in Ethiopia.* Asmara: Red Sea Press.