PROCEEDINGS OF WORKSHOP

ON

SUSTAINABLE LAND MANAGEMENT

ENVIRONMENTAL ECONOMICS POLICY FORUM FOR ETHIOPIA/
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Executive Summary

Land degradation has been a serious problem in Ethiopia, and it is believed that it results in a substantial welfare loss of society. Although a number of complex and interrelated factors contribute to land degradation, poor land and livestock management are the primary causes. The objective of this workshop was to present and discuss three papers: (i) the Stakeholder Analysis for SLM in Ethiopia: Assessment of Opportunities, Strategic Constraints, Information Needs, and Knowledge Gaps, (ii) Cost of Land Degradation in Ethiopia: A Critical Review of Past Studies and (iii)A Cost Benefit Framework for pro-SLM Decision-making in Ethiopia.

The main objectives of the stakeholder analysis were: to show opportunities and strategic constraints affecting the quality of intervention and up-scaling of successful SLM practices; to identify key information needed by stakeholders for the above-mentioned purpose; to identify knowledge gaps related to SLM practices and outline a future researchable agenda that could help fill identified gaps and further improve intervention on SLM. To address the mentioned objectives, consultation of key stakeholders involved in the implementation of SLM practices at all levels, group discussions, surveys with questioners and review of relevant documents were undertaken including a visit of high and low potential areas.

Discussants of the presentation noted the importance of establishing a centralized database on soil and land degradation, incorporating the community and creating awareness including the bad consequences of LD and ways of combating it. A number of other comments were given from participants including the importance of incorporating watershed and water and land management in the school system of the country, harmonization of the different SLM efforts and practices initiated and executed by different institutions, provision of well-studied and efficient incentive mechanisms for farmers to implement successful SLM practices, shifting from the top-down to the bottom up approach in communicating with farmers and the community, a fair allocation of resources to combat LD in-between the high and low potential areas from the side of the

government, and undertaking a well-designed study on the impact of food aid on LD. In addition, emphasis was made by some participants on the existing massive LD in some other areas of the country such as the pastoral and forest covered areas, which are exposed to serious LD due to ongoing settlement and clearing for private agribusiness.

The paper that assessed past studies on the costs of LD had objectives of reviewing the major methodological and conceptual issues involved in estimating the costs of land degradation, critically reviewing the methods, assumptions and drawbacks of past estimates of the cost of LD in Ethiopia, and comparing the estimates across the available studies and compare those with other estimates for Sub-Saharan Africa and other developing countries. In doing so, the paper made a critical assessment of the six major studies prepared by different institutions and individuals, and the reviewers noted that the previous approaches need to be developed further into a full cost-benefit approach that takes into account different components of LD, including offsite costs, and under different alternative conservation measures. Doing so will help to design appropriate strategies and programs to tackle the problem of LD that are both privately and socially desirable and improve the well being of the poor.

The major observations coming out of the discussions were: the importance of considering the impacts and social costs of deforestation, soil erosion and water resource depletion and wastage in discussing the problem of LD. In addition, a number of other constructive comments were raised by participants such as the need to clearly identify which soils have what kinds of nutrient losses and the importance of incorporating other impacts like the migration and health impacts of LD as part of the social costs, although it is difficult to quantify them.

The cost-benefit framework (CBF) is one of the pilots/tools proposed under the TerrAfrica imitative with a main objective of developing an approach to come up with appropriate measures of costs of land degradation and the associated benefits of sustainable land management program. The CBF is seen as a tool to promote policy dialogue. The World Bank believes that to inform/influence key policy-makers (e.g. Ministry of Finance) the CBF can be a useful tool. The main idea in the CBF for SLM is

thus to test it/implement it in two pilot countries (Ethiopia and Ghana), to possibly replicate the results and methodology in other African countries later. The framework consists of an approach for quantifying the biophysical process of LD and an economic framework that attaches economic values to both on-site and off-site effects of soil erosion and efforts of soil conservation.

The discussants of the presentation noted the importance of making a distinction between private and social costs and benefits and the costs and benefits at both micro and macro levels for policy makers, presenting the clear linkages of the SLM with other policies and programs of the government such as the PRSP, the need of addressing LD and SLM in both high and low potential areas, and incorporating other ongoing serious environmental problems such as soil acidity. The existence of a huge stock of data in the ESSP lab of IFPRI, which needs some effort and resources to make it fit in to the CBF, has also been a major point noted by the discussants. In addition, participants raised comments and questions and responses were made by the presenters. Some of the comments made on the CBF include: the need for the CBF to accomodate differences in household characteristics such as human and livestock populations and a note on the difficulty of scaling up SLM practices due to high degree of heterogeneity in the Ethiopian highlands, the need to incorporate degradation in pastoral areas by basing some ongoing studies such as the master plan prepared for pastoral areas by ADB, and the importance of considering not only biophysical aspects but also chemical aspects of soil erosion.

Land degradation is a serious problem and there is a very urgent need to combat it and apply SLM practices in large parts of Ethiopia. The World Bank therefore sees a continuous need for SLM interventions and that this is a major component of the development efforts of the country. Finally, there was a consensus on the importance of incorporating the constructive comments and ideas raised during the workshop to come up with a more complete and practical cost-benefit framework for sustainable land management.

OPENING SESSION

Introduction and Welcome Remarks

Dr. Gunnar Köhlin (EEPFE)

In his opening remarks, Dr. Gunnar Köhlin, representing the organizing institution, the Environmental Economic Policy Forum for Ethiopia (EEPFE) of the Ethiopian Development Research Institute (EDRI), welcomed all the participants and briefly presented the seriousness of the problem of Land Degradation (LD) in Ethiopia and the main objectives of the workshop.

Dr. Köhlin specifically mentioned that the land is the backbone of the Ethiopian economy and the core of the livelihood for the rural poor. He argued that in his mind, there is no other issue as important for the sustainable development of Ethiopia as how we treat her soils. This was also the underpinning for a series of workshops in Addis less than a year ago. He recalled that at that time the objectives were to:

- Review the status, trends and impacts of land degradation in Ethiopia;
- Share information about on-going activities, particularly best practices; and
- Explore options to support sustainable land management in Ethiopia in a more coordinated way.

The major message that came out of the Operational workshop on SLM on the 30th of May last year was also the need for a more coordinated effort from all stakeholders to enhance and scale up implementation of SLM throughout the country as the speaker stated.

According to Dr. Köhlin, last year, a first deliverable was also presented from the WB Economic Sector Work on Poverty and Land degradation in Ethiopia. That was a literature review of the past economic research on Determinants and Impacts of Land Management Technologies in the Ethiopian Highlands, carried out by Dr. Mahmud Yesuf and Dr. John Pender.

That workshop was then followed by a more technical workshop that discussed the need for an applied research agenda on SLM in Ethiopia. One of the major conclusions of that workshop was the need to start from the users point of view with a Stakeholder Analysis, that would focus not only on what kind of information the farmers and extension staff would need from research, but also in which form.

Dr. Köhlin noted that this workshop is a major step towards the implementation of the recommendations of last year's workshop and it fully builds on the previous work. The objective of this workshop was to present and discuss three papers that have come out of this process. This includes the second and third deliverables from the World Bank sponsored Economic Sector Work on Poverty and Land Degradation, namely a critical review of past cost of land degradation assessments in Ethiopia and the Stakeholder Analysis.

Dr. Köhlin said that his team has also been anxious to find practical ways to make use of all this knowledge in a way that would actually improve the situation for the land and the people. He was therefore proud to have brought on-board a TerrAfrica initiative at the World Bank that attempts to develop A Cost Benefit Framework for pro-SLM decision making in SSA, to be discussed on the second day of the workshop. The speaker argued that the framework had the potential to do exactly what was called for during last year's workshop, namely to bring all the major stakeholders together in a concerted and coordinated effort to deal with SLM. The proposed work would identify promising land management treatments, conduct carefully designed field research to analyze these treatments, and then feed the information back to policy makers and the extension service for successful up-scaling.

Dr. Köhlin also presented the other very promising development over the last year, which was the preparation of the Ethiopian Country Program on Sustainable Land Management. He believed that the implementation of such a program would provide the ideal conditions to apply the proposed cost-benefit framework.

Finally, as organizer of the workshop, Dr. Köhlin said that EDRI and the Environmental Economics Policy Forum for Ethiopia are very proud that the World Bank and the major government stakeholders have vested their confidence on them for organizing this workshop. He noted that the Forum, which, he added, receives core support from Swedish Sida, will continue to focus on issues related to land management and poverty. During the past year the Forum continued to recruit high-powered staff, and it has now a unique concentration of PhDs in environmental economics at the Forum working in this area, and he promised that others would be returning from Sweden, re-joining the Forum.

With these words of introduction, Dr. Köhlin welcomed all the participants again to the workshop and left the floor to the chairman for the morning session - His Excellency Professor Mesfin Abebe.

The chairperson of the morning session, **Prof. Mesfin Abebe**, welcomed all the participants and emphasized the seriousness of the problem of land degradation in Ethiopia. He noted that the outcomes of the workshop are expected to play significant roles in combating the problem of land degradation and implementing sustainable land management practices. Prof. Mesfin then invited all the participants to actively participate in the workshop and he welcomed other speakers to make their opening remarks.

Welcome remarks were made by his Excellency **Ato Neway Gebre-ab**, economic advisor to the Prime Minister, with the rank of a minister and Executive Director of EDRI, his Excellency **Ato Ahmed Nassir,** Vice Minister of the MoARD, and Dr**. Herbert Acquay** of the World Bank.

Ato Neway started by recalling the previous year's workshop, which paved the way for this one and discussed the emergency of undertaking sustainable land management practices in Ethiopia, a country where a significant part of the top soil is being lost every year due to the prevailing land degradation. He mentioned that according to the latest publication of the Central Statistical Authority (CSA) only about 20% of the total

agricultural produce is being marketed, which implies the presence of production for self consumption mainly due to poor land productivity. The poor productivity is mainly associated with declining soil quality as a result of land degradation such as soil erosion and loss of soil fertility. The speaker stated that this fact implies the seriousness of the problem of land degradation and the urgent need to implement sustainable land management practices. Ato Neway concluded by appreciating the organization of the workshop and the issues to be discussed.

Ato Ahmed started by mentioning empirical evidences that showed the presence of alarming land and natural resources degradation in Ethiopia. He briefly discussed the state of land degradation and the underlying causes by mentioning specific case studies. He then expressed his hope that the outcome of the workshop will be useful for the government and society at large in fighting land degradation and exercising appropriate remedial actions.

Dr. Herbert of the World Bank expressed his pleasure at welcoming the participants to the workshop, which the World Bank had co-sponsored with EDRI. He clearly stated the issue of land degradation and the associated problem of coming up with good measures of the economic costs of such land degradations and the benefits of sustainable land management practices. He pointed out that it is this problem of measurement that paved the way for the continued partnership of the World Bank and EDRI in addressing the issue of land degradation in Ethiopia. Dr. Acquay then concluded his welcome remarks by inviting all participants to participate actively in the workshop.

WORKSHOP OPENING

H.E. Dr. Abera Deressa, Vice Minister of MoRAD welcomed all the participants.
In his opening remarks, **Dr. Abera** stated that Ethiopia is faced with multiple challenges. Some of these are captured in the commitment to fulfill the Millennium Development Goals by 2015. These are all important challenges – to eradicate extreme poverty, to give schooling to all children, to reduce child mortality. But if we don't take the 7th goal seriously, to ensure environmental sustainability, there is a risk that our children and grandchildren, healthy and educated as they might be, will not have enough productive land to cultivate. Because the great majority of Ethiopians live on a depleting resource, where land degradation not only reduces the productivity of their agricultural lands, but also gives rise to further costs as the soil pours into lakes, dams and reservoirs. The speaker noted that one of the papers during the workshop will deal with exactly this - what are the costs to land degradation, now and in the future?

Dr. Abera said that the situation is far from only gloomy and there are ample experiences of successful interventions where degraded lands have been successfully treated, erosion halted and productivity increased. The question is how one in the best possible way could make use of these experiences; bring them into the agricultural extension system in order to scale them up, but only where they are likely to be successful. This link between applied research and experimentation on SLM and its implementation were the themes of the first paper presented on the day. The speaker stated that he was happy to see that the starting point for the paper is our need, in the extension service, and not the other way around.

In the final analysis, we need to bring these costs and benefits together as Dr. Abera argued. He claimed that everybody agree that land degradation is a serious problem for Ethiopia, and that it is worthy of more attention. In one of the reports EPA is quoted to state that during the 1990's only 3% of the government budget went to agriculture and natural resource management. The Development Assistance Group reports that in recent years only 7% of overseas development assistance goes to agriculture. As part of the

SDPRP the allocation to agriculture from government funds has increased substantially. But, given the pressing needs in almost all other sectors, how much is enough? And how should we best use these resources? This was the focus on the third paper, the proposal for a Cost Benefit Framework to facilitate decisions regarding how much to allocate to sustainable land management and where to spend it. The speaker stated his anticipation and the deliberate objective of the TerrAfrica initiative at the World Bank, was that it will help generate substantial increases in the funding of sustainable land management initiatives.

Dr. Abera finally expressed his thanks to the World Bank for their consistent support to the important analytical work that his team needed to address the vagaries of land degradation in Ethiopia. In particular, he acknowledged the support they have given to produce the three reports that were discussed during the workshop time. He also thanked EDRI and the Environmental Economics Policy Forum for Ethiopia for the administrative arrangements that have facilitated the workshop; and also for their commitment to carry out the work to be presented.

Dr. Abera then declared the opening of the workshop. He invited all participants to participate actively and contribute for the successful completion of the workshop.

PRESENTATION I

Stakeholder Analysis for SLM in Ethiopia: Assessment of Opportunities, Strategic Constraints, Information Needs, and Knowledge Gaps

Gete Zeleke, EEPFE

Objectives

The main objectives of the stakeholder analysis were: to show opportunities and strategic constraints affecting the quality of intervention and up scaling of successful SLM practices, to identify key information needed by stakeholders for the above mentioned purpose, to identify knowledge gaps related to SLM practices, identify a future research agenda that could help fill identified gaps and further improve intervention on SLM. To

address the mentioned objectives, consultation of key stakeholders involved in the implementation of SLM practices at all levels, group discussions, surveys with questioners and review of relevant documents were undertaken including a visit of high and low potential areas. The key stakeholders that were identified in the analysis were Government organizations such as MoARD, BoARD, ZOoARD, WOoARD, DAs NARS, EIAR, RARIS, RCs, EDRI, HLIs, Research Projects, EPA, REPLAUA, WOoLA HILs, TVTs, Land Users (both farmers and from private sector), Donors and NGOs.

SLM Definition

SLM is defined as the use of renewable land resources, for agricultural and other purposes to meet community needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions through systematic use of indigenous and scientific knowledge/technologies, proper participation of communities in the decision making process (planning, implementation and management), and appropriate policy environments to ensure the successful implementation of the above processes.

Key Components of SLM

- Technology: Use of different technologies/practices and integration among them to solve ecological and socio-economic constraints;

- Approach: Participatory planning, flexibility & integration to meet community needs and use of the renewable natural resources sustainably without compromising their current/future environmental functions;

- Policy: To meet community needs and use of the renewable natural resources sustainably without compromising their current/future environmental functions. This implies the need for an appropriate policy environment to undertake the above major tasks on an equitable basis.

Land Degradation

The term Land encompasses: Soil, Plants, Water resources and living organisms and within a given location land productivity is the result of interactions and balance among these components. Human activity also affects this relation or nature of each component

negatively or positively. Land degradation is, therefore, the destruction/negative disturbance of all or one of these components and their interrelationships.

Overview of Land Degradation and Immediate Causes

Land degradation is a serious problem through out Ethiopia and dealing with it here exhaustively may be a difficult task. However the following are major consequences that are common to most parts of the country.

1**.** Relentless Removal of Vegetation Cover from the Landscape which results in the existence of Barren landscapes unprotected in many parts of the country, especially in the north and Encroachment of virgin forest areas for cultivation without protection (South and South west)

2. Unabated Soil Erosion Mainly by Water that results in huge gully erosion eating away cultivated lands**,** which is a process still common in most parts of Ethiopia

3. Loss of Soil Fertility: The Invisible Threat (Biological and Chemical). This is visualized in terms of loss of soil productivity and Reduction of soil productivity by soil erosion is about 2% and biological 1%. In addition, all soils in the country (except pastoralist areas) suffer from soil nutrient mining i.e. open nutrient cycle. Due to Use of cow dung and crop residue as a source of energy in the country an equivalent of about 500,000 tons of grain/year is lost.

4. Degradation of Water Resources: Wells and rivers are drying up, and wetlands are shrinking or have dried up, e.g. Lake Adele in Afar and Alemaya in Oromia regions. There is a hydrological drought coupled with high flooding. It is estimated that each year about 81 billion m3 of water leaves the country with soil and nutrients. Surface water bodies are being seriously polluted with chemicals and sediments.

Some Causes of Land Degradation

A number of interrelated factors contribute to the existing land degradation in Ethiopia. But the following are the most important ones.

Poor Land Management**:** Undertaking an Exploitative trend of the farming system, which includes steep land cultivation without protection, soil fertility mining (Such as extensive use of artificial fertilizers without proper land management and removal of soil organic

matter) and shortened fallow periods. In addition, absence of sufficient alternative energy sources contributes significantly to LD through burning of crop residue, cow dung and clearing of vegetation.

Poor Livestock Management: Free grazing, which deteriorates soil physical properties, destroys soil conservation measures, removes crop residue from the soil and detaches soil particles and unbalanced carrying capacity resulting in overgrazing including very weak grassland/rangeland management.

Country Experiences on SLM

The situation of LD is not a totally hopeless situation. By making the existing environmental policies and strategies more enforceable and by working through the organizational setup of extension, research and agricultural and natural resource management educational institutions, it will be possible to fight LD. Moreover, the country has rich ecological diversity to test a wide array of SLM options with the highland-lowland, tropical-temperate, and the rift valley systems and there is a rich experience on participatory watershed management. The availability of both indigenous and scientific knowledge and successful SLM practices and experiences such as SWC, Agro-forestry, Area closure, Gully rehabilitation, water harvesting etc. are also other options that give the hope of controlling LD in Ethiopia in combination with existing global conventions, initiatives and supports.

Barriers – Strategic Constraints

Why LD is not controlled or why SLM is not widely disseminated or adopted? What are strategic constraints from stakeholders' perspective? The following are some of the reasons.

1. Lack of proper awareness on extent and impacts of LD & benefits of SLM;
2. Limited knowledge about nature and technical requirements of SLM;
3. Top-down planning approach, which doesn’t ensure the active participation of the society;

4. Old Dichotomies & emphasis on SLM: Broad dichotomization of the country into "high and low potential" which lead to serious neglect of the conservation of "high potential areas" and creates unbalanced situation including resource allocation for SLM;
5. Policies and strategies, which are very weak in implementation and Focus on short-term solutions. Issue of sustainability is often neglected! (NRs are the first victims) and Lack of donor harmonization;
6. Weak linkages among different institutions during technology generation and dissemination;
7. Limited capacity to plan and implement SLM practices say due to Lack of focused in-service training and often poor quality of training, Staff turnover, especially at Woreda and RC level, Very weak technical backstopping to lower hierarchies, Lack and/or poor availability of appropriate guidelines and additional reference materials etc.;
8. Socio-economic and bio-physical causes such as increasing population pressure and poverty, which force people to clear vegetation for daily home use and failure to invest on land;
9. Unstable Institutional Set-up: Frequent restructuring of administrative and ministry organizations, which led to staff turnover and loss of confidence among staff and loss of important documents;
10. Shortage of resources for a comprehensive SLM practice: Available resources are highly scattered, un-harmonized, and mostly addressing only pieces of the puzzle, and most resources are attached with rigid fund utilization procedures.

Key Information Needs

What key information do stakeholders at different levels need to make decisions on appropriate SLM practices? Reliable information is needed on the following issues.

- The extent and impacts of land degradation in understandable form and status of the resource base.
- Technical requirements and specifications of SLM; costs and benefits of applying SLM practices and success stories – what works where and why?
- Required approaches and methodology for planning, implementation and management of SLM practices; and policy and institutional requirements.

Key knowledge gaps in promoting SLM practices

What are the knowledge gaps that should be acquired, learned, developed, etc to effectively plan, implement and manage SLM in the country and control land degradation and poverty?

- On land degradation processes (what it is), factors affecting LD, costs and impacts of LD
- On categorization of recommendation domains from SLM perspective for successful intervention and scaling-up of SLM practices;
- Characteristics of SLM practices or technologies (indigenous and introduced) including their requirements and what works where in what combination, cost and benefits of SLM;
- Knowledge of successful SLM practices (whereabouts, in what combination, under what circumstances, etc) and effective information and communication system,
- On effective ways of integrating SLM practices with income and asset development;
- Effective ways of agricultural water management;
- On Impacts of climate change on sustainability of SLM and levels of climatic variability in the country;
- Impacts of frequent institutional restructuring on SLM;
- On the natural resource base in general
- On tools and methods:
  - Easy to follow framework to promote SLM technologies including research methodology
  - Simple and effective quality control, regulation and capacity building mechanisms;
- On impacts of un-harmonized donor support on SLM;

The way forward

- Make the existing systems more responsive and efficient to undertake SLM.

- Improve institutional linkages:
- Improve capacity:
- Redefine recommendation domains for SLM ➔ let us free ourselves from the 'prison' of "low potential" – "high potential" dichotomy
- Characterize SLM practices – indigenous & introduced
- Develop Cost Benefit Framework and apply the results for decision making purpose for planning and implementing SLM practices
- Develop scaling-up mechanism for SLM
- Make SLM practices economically attractive: Link them with income enhancement and productivity
- Develop incentive system for SLM – different forms for different actors – direct and indirect.

Reflections by discussants

- It is extremely important to establish a centralized database on soil and land degradation
- Due attention should be paid to incorporate the community and create awareness including the bad consequences of LD and ways of combating it
- It is important to create awareness in the specialists and professionals on the issues of LD
- LD is a more serious environmental problem than other environmental problems such as pollution in Ethiopia
- There is a high demand of scientific research outputs by the World Bank on the costs of LD and benefits of SLM to make policy influences on governments
- Directing research systems to the problem of LD is crucial

Comments: the participants made a number of comments and suggestions. The following is the list of the comments made on the stakeholder analysis presented and the issues of land degradation and sustainable land management practices.

- Watershed, water and land management issues need to be incorporated in the educational curriculum of the country
- It is important for institutions to open doors for on the job trainings of students coming from educational institutions that incorporated the issues of land degradation and resource management
- Strengthened capacity in terms of equipments and manpower resources is needed for a successful SLM practice
- Harmonization of the different SLM efforts and practices initiated and undertaken by different institutions is important
- The list showing the different stakeholders in the stakeholder analysis is not exhaustive and needs to add institutions like ministry of water resources and education
- Taking the opportunities of trainings undertaken by universities on SLM is helpful
- The costs of degradation in communal land management (grazing) need to be considered in the stakeholder analysis
- Most farmers do not practice SLM not due to lack of awareness but due to poverty and lack of incentive to invest on their land, which implies the importance of creating incentives for farmers in SLM implementation
- Massive land degradation is going on in forgotten areas such as pastoral areas, and forest covered areas, which are exposed to serious degradation due to ongoing settlements and clearings for private agricultural business. The stakeholder analysis needs to consider these
- Providing indirect supports such as opening schools and clinics for farmers is a preferred incentive method for farmers exercising SLM instead of direct monetary support. In addition, correcting the existing market constraints and distortions is important to make the SLM effort successful
- Shifting from the top down to the bottom up approach is important in communicating with farmers because experience shows that a lot can be learnt from farmers about LD and effective SLM practices

- The government should make an equitable allocation of its SLM practice budget between high and low potential areas
- Instead of using Woredas, which are overburdened and understaffed for channeling resources, other effective channels are needed
- Encouraging private firms to engage in SLM through planting of valuable trees is helpful
- A well-designed study is needed on the impact of food aid on LD and SLM
- A focus on vegetative measures instead of construction measures
- One needs to clearly classify areas to prioritize for SLM practices
- One major problem in implementing SLM is that farmers do not trust extension agents. Efforts are needed to improve the credibility of the agents and introduce them to major methodological issues instead of a heavy dose of technical concepts
- Commitment of stakeholders is a vital point for a successful implementation of SLM practices
- There are substantial opportunities to scale up successful SLM practices in Ethiopia. However, it is important to focus on developing new effective SLM practices in line with utilizing the existing ones
- A well designed coordination and cooperation needs to be there between federal level and regional level institutions to combat LD

Question: Why is the stakeholder analysis focused only on SLM, while ignoring water resource management especially on farm and small watershed levels related with land?

Responses by Dr. Gete: The stakeholder analysis focused mainly on cropland areas of the Ethiopian Highlands due to the reasons of data availability and the fact that the vast majority of the country is living in these areas. It was difficult to address all parts of the country in the study. Implementation problems of government policy and lack of capacity in the research, educational and regulatory systems are major problem areas addressed in the stakeholder analysis. The importance of linking institutions is also well acknowledged.

A summary by Dr. Herbert: Clear messages have emerged from the discussion on the stakeholder analysis, among which are: the presence of a noticeable paradigm shift to a whole rounded approach on addressing SLM, the importance of incorporating farmers in the whole implementation of the SLM practice and the urgent need of incorporating SLM issues in the schooling systems of the country.

PRESENTATION II

Cost of Land Degradation in Ethiopia:
A Critical Review of Past Studies
By
Mahmud Y., Alemu M., Menale K., (EEPFE) and J. Pender (IFPRI)

Objectives

Land degradation is a serious problem in Ethiopia and there are widely varying conclusions concerning the nature, extent and economic cost of the land degradation problem due to diversity in assumptions and methodologies. The results of the different studies were non-comparable due to differences in the mode of reporting the results, which limited the ability to draw clear policy and program conclusions related to SLM. The main objectives of the paper hence were:

- To review the major methodological and conceptual issues involved in estimating the costs of land degradation;
- To critically review the methods, assumptions and drawbacks of past estimates of the cost of land degradation in Ethiopia; and
- To compare the estimates across the available studies and compare those with other estimates for sub-Saharan Africa and other developing countries.

Methodological and Conceptual Issues

1. **Definitional problems/confusions**

What are we measuring?

- Land: “the terrestrial bio-productive system that comprises soil, vegetation, other biota, and the ecological and hydrological processes that operate within the system”
- Land degradation: “reduction or loss of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from processes such as (i) soil erosion caused by wind and/or water; (ii) deterioration of the physical, biological or economic properties of the soil; and (iii) long-term loss of natural vegetation”
- Soil erosion: a particular physical process that causes land and soil degradation, and refers to the wearing away of the land surface by water and/or wind as well as to the reduction in soil productivity due to physical loss of topsoil, reduction in rooting depth, removal of plant nutrients, and loss of water
- Other forms of soil degradation include other types of physical degradation, such as compaction, surface sealing and crusting, water logging and aridification; chemical degradation, including depletion of soil nutrients, acidification, salinization, and pollution; and biological degradation, including loss of soil organic matter (which also affects physical and chemical properties of the soil), flora and fauna populations or species in the soil (e.g., earthworms, termites and micro-organisms).

The problem, however, is that most cost estimates of land degradation do not distinguish between soil erosion, soil degradation and land degradation in their analyses. The fact that different studies estimate different components of land degradation makes comparison of cost estimates across studies a difficult task.

2. Methodologies on estimating soil erosion rates

Different studies use different methodologies such as expert’s judgment, USLE or other sophisticated models to estimate physical soil erosion rates depending on data availability. However these methodologies were not free of problems. For instance: (i) they were designed to measure only a specific type of LD (e.g. USLE for Sheet erosion

but not gully or other forms), and specific land uses (e.g. USLE for crop lands but not forest land, range land, etc), and (ii) They were originally designed to fit soils and conditions in some other countries (e.g. USLE for the US) and may results in errors if applied in the tropics, thus making comparing estimates using different methods a difficult task.

3. Economic approaches to translate soil loss into income loss

There are two commonly applied approaches to translate soil loss into income losses, which are Change of Productivity approach (CPA) and Replacement Cost Approach (RCA). Other methods include the Contingent Valuation Method (CVM) and Hedonic Pricing (HP) methods.

4. The problem of aggregating costs of LD: Theoretically, RCA and CPA can applied at any scale, but practically it is not possible to estimate the costs at household level and aggregate them at national level. Hence, the standard practice is to identify landscape units with expected similar impacts of LD and aggregate those results at national level or make forecasts over time. The problems related with this practice however are (i) adding up soil losses (measured through USLE on smaller units) means soil deposition in downstream areas are ignored- this will over estimate cost of LD at national level, (ii) Socio-economic elements (crop prices, credit, off-farm opportunities, etc) affecting cost of production, and erosion rates are neglected when aggregation is not based on household level (iii) Change in crop choice over time ignored, i.e., in response to declining productivity, farmers may change to less nutrient demanding or less erosive crops, (iv) the choice of discount rate and time horizon are controversial in computing future stream of costs of LD in a CBA, and (v) Off-site costs such as sedimentation effects, degradation of potable water, siltation etc. are often ignored and estimates of LD at national level are underestimated.

Review of Past Estimates in Ethiopia

There are a number of studies that tried to estimate the cost of LD in Ethiopia at different times and with different methodologies resulting in different results. Among the most important ones are The Ethiopian Highlands Reclamation Study (EHRS) (FAO 1986a,

1986b); The Soil Conservation Research Project (SCRP) (Hurni, 1988); The National Conservation Strategy Secretariat (NCSS) (Sutcliffe 1993); The World Bank's reassessment (Bojö and Cassells 1995); Estimates by Sonneveld, 2002 (a PhD thesis); and The Woody Biomass Inventory and Strategic Planning Project (WBISPP) (WBISPP 2001a, 2001b, 2001c, 2002, 2003a, 2003b, 2004a, 2004b). Most of these studies had national or regional coverage and most of them focused on the Ethiopian highlands (>1500 mts. above sea level), which covers 44% of land, 90% of population, and croplands, and 2/3rd of livestock population. A brief review of each of these studies is made as follows.

Ethiopian Highland Reclamation Study

The Ethiopian highland reclamation study is a study that was conducted jointly by FAO and MoA in the 1980s and it is the most comprehensive and detailed study that adressed the issue of land degradation in Ethiopia. The study mainly estimtaed soil erosion for three AEZs which are HPC, HPP, LPC for about 25 years (1985-2010). The study mainly used soil depth and geomorhological maps and data compiled by the land use planning and regulatory department of the MoA at 1:2,000,000 scale and the USLE model developed by FAO. In addition to these, the study used international estimates (mainly from temperate zone where slope<10%) to covert soil loss into production loss. However, no formal model was used to estimate annual yield reductions, and the study assumed a constant soil erosion rate. The study also used prices paid by the then Agricultural Marketing Corporation (AMC), which were 20-30% lower that the existing market prices and a discount rate of 9%.

As per the findings of the study, about 130 tons of soil per ha is lost from cropland and an average of about 35 tons of soil per ha is lost from all land. Furthermore, the study concluded that 50% of the highlands were significantly eroded and some 25% seriously eroded and 4% of the highland reached a point of no return. In terms of cereal production loss, in the 1980s about 120,000 tons of cereal output is lost every year, which is equivalent with a 2% loss per annum.

Although the EHRS was the first and most comprehensive study made on land degradation, it is not free from drawbacks. FAO itself admitted that the poor quality of the data might have led to overestimation of erosion rates and even these estimations of erosion erosions were guesses made without any formal model, which imply the possible underestimation of the erosion rates. Moreover, the study is criticized because it assumed constant soil erosion rate and ignored redeposition.

Soil Conservation Research Project (SCRP)

The SCRP was a project jointly run by the MoA and Bern University of Switzerland with an objective of conducting research on the problem of LD in Ethiopia. The SCRP research was undertaken on 8 research stations with catchment and plot level collection of soil conservation data since the mid-1980s. In the research, soil losses in different land uses were estimated using USLE. The study implicitly assumed constant soil erosion rates, and it estimated only immediate losses and hence avoided the use of discount rates.

The resports of the SCRP showed that cropland covered only 13% of the total land area but produced 45% of the soil loss in the country. It also showed that the decrease in agricultural production due to LD was about 2% per year.

One, however, can criticise the SCRP outcomes on the grounds that off-site costs were ignored, a constant soil erosion rate used, which underestimates the existing erosion, and the impact of redeposited soils was also ignored.

The National Conservation Strategy Secretariat (NCSS)

The national conservation strategy secretariat (NCSS) was a project with a mandate to design regional and national conservation stragegies in Ethiopia. As part of the strategy work, Sutcliff re-estimated the cost of land degradation using information of previous studies. The value added in this study was imputing values to loss of nutrients through the use of dung and crop residues, which were ignored in the previous studies.

The study essentially used data from SCRP and EHRS and estimates made by the Ethiopian Energy Commission on actual use of dung and crop residues as energy to run a

soil life model of Stocking and Pain (1983) which is an analytical framework used to convert soil loss into production loss.

The NCSS study showed that the total loss due to soil erosion and nutrient depletion was about 934 million ETB in the year 1994. This result implied that the cost of land degradation due to erosion was much less than suggested by previous studies. On the other hand, the cost of nutrient losses was estimated to be very large.

The NCSS had, however, a number of drawbacks like the previous studies including ignoring off-site impacts and redeposition and the assumption of constant soil erosion rate. In adition, the study assumed that soil nutrients are readily available for plant growth which is a doubtful assumption since nutrients in dung or crop residue depend on how they are managed.

The World Bank Reassessment (Bojo and Cassells, 1995)

Bojo and Cassels (1995) from the World Bank also tried to assess the cost of land degradation based on previous studies such as the Sutcliffe's estimates of soil erosion and nutrient depletion. The major addition that was made in this study was accounting of redeposition, avoiding double counting of crop residue and classifying LD costs as immediate, future and cumulative losses. In doing so, the study used data generated by Sutcliffe but assumed a critical depth of 100cm for all crops, which implies imputing production loss for only 30% of the crop land having a soil depth of less than 100cm. The study used the same methodology as Sutcliffe and assumed a uniform redepostion rate. In addition, an infinite time horizon and a 10% discount rate were assumed including a 2.5% growth in the consumption of dung and residue.

Using the methodology and assumptions stated above, the World Bank assessment estimated a 0.4% average annual productivity loss due to soil erosion. The study, however, is not free from the criticisms made against the Sutcliffe and SCRP studies which includes a failure to make an appropriate examination of the impact of redeposition and the assumption of a critical soil depth of 100cm for all crops including failure to incorporate offsite impacts.

Estimate by B. Sonneveld (2002)

Sonneveld in his PhD thesis (2000) used a spatial optimization model to estimate the impact of water erosion on food production for a 10-year period (2000-2010) under different alternative scenarios, which are: without soil conservation/fertilizer application (stationary scenario), with soil conservation/fertilizer application (control scenario), with restricted or free migration, with access to technology and different assumptions on population growth. He used two approaches to estimate the yield impact of SD: empirical and engineering approaches. In adressing its objectives, the study used geo-referenced data on rainfall, slope, altitude, temperature and crop yield and assumed that SD and soil fertility to increase and decline at a rate of 2.5% respectively.

Sonneveld's study found out that crop yield were projected to increase by about 22% over 10 years time with no control scenario and by 20% with conservation but not fertilizer and by 6% with fertilizer use but no conservation.

The noticeable limitations of the study, however, are that it considered only water erosion and ignored off-site and redepostion impacts. Aggregating SD into four groups as nil, moderate, severe and very severe could reduce variability in SD and reduce robustness of the results. In addition, the assumption of 2.5% growth in SD (and decline in soil fertility) and assumption in yield reduction of 1, 2 and 7% per cm top soil loss on least, moderate and susceptible soil types need to be justified.

Estimates by Woody Biomass Inventory and Strategic Planning Project (WBISPP)

The WBISPP mainly dealt with issues concerning woody biomass production and consumptions for the periods of 1990-2004 in Ethiopia. In the meantime, it also made efforts to estimate the cost of LD coming mainly through soil erosion and nutrient depletion using similar methodologies with Suttcliffe. Cost of LD was computed for different regions for the period of 2000-2025. The study used data collected through remote sensing from different sources and field surveys at Woreda levels and applied USLE to estimate soil erosion and the impact of redepostion. But since the methodologies used in the study are quite similar to that of NCSS, the major drawbacks discussed under NCSS above also hold for the WBISPP estimates.

General Conclusions and Drawbacks

After undertaking an exhaustive revision of the above-mentioned studies of the cost of LD in Ethiopia the following general conclusions can be made and common drawbacks identified.

- Cost of LD was estimated between 2 - 3% of the Agricultural GDP, with one study estimating it at 6.75%.
- Except NCSS, WB, and WBISPP all imputed value only to soil erosion (nutrient loss was not accounted with in on-site costs).
- Others that considered nutrient loss assumed that plant nutrients available in these organic materials (dung and crop residues) would be readily available to crops and would lead to immediate productivity impacts, which is doubtful in many circumstances
- All studies admitted the poor quality of the data. Furthermore, they applied different techniques to compute soil erosion. Also, the USLE was originally designed for applications in US croplands, hence needs to be adopted to local conditions. It also doesn't account for redeposition.
- Except WB and WBISPP, none had accounted for redeposition. An arbitrary 50% (and uniform) assumption of redeposition by WB is doubtful.
- In translating erosion into yield loss, different studies use different assumptions on the min-max soil depth requirements for plant growth, which will have considerable implications for cost estimation.
- With the exception of WB, none has distinguished between immediate, future and cumulative losses. They also used different time horizons and discount rates.
- In all of the studies, the benchmark level of soil erosion and nutrient balances were not clearly specified
- With the exception of Sonneveld (who assumed 2.5% growth rate in soil erosion), all assumed constant soil erosion, which is a doubtful proposition.

- Almost all studies did not indicate how they aggregated their estimates to national or regional levels. There is a feeling that the relationship between LD and productivity is nonlinear
- All studies ignored off-site impacts
- Almost all studies did not attempt to estimate soil erosion under different conservation measures (A CBA approach to LD/SLM)
- Despite the dire predictions of some of the studies, FAO data doesn't indicate decline in croplands, and crop production over the last 20 years. This could partly be explained by expansion of farming to marginal lands, and more use of fertilizers. Increased use of fertilizers might suggest that soil fertility depletion is a major form of land degradation as indicated by some of the studies.

Conclusions

- Based on earlier studies, LD in Ethiopia is in the order of 2-3% of Agricultural GDP with one exception.
- But earlier works need to be developed further under a full CB approach that takes into account different components of LD, including offsite costs, and under different alternative conservation measures. Doing so will help design appropriate strategies and programs to tackle the problem of LD that are both privately and socially desirable and improve the well being of the poor.

Reflections by discussants:

- It is important to see the impacts and social costs of deforestation, and soil erosion in talking about costs of land degradation
- The issue of water management needs to be included in analyzing the problem of land degradation

Comments: A number of comments were made by the participants on the issue of measurement of cost of land degradation and the paper presented. The major ones can be listed down as follows.

- It is important to properly study which soils have what kinds of loss since productivity of soil differs between soils
- The importance of redeposited soils is not that much important for a country like Ethiopia, where all major rivers cross the boarders of the country with no physical barriers to deposit the eroded soil
- The paper can be more complete if it can incorporate most recent studies on cost of LD such as Gray's study
- It can be a good idea to include other impacts such as the migration and health impacts of LD as part of the social cost although it is difficult to quantify them
- One needs to consider not only current and future economic values of loss of biodiversity but also option, existence and bequest values
- The nutrients lost in the soil are not only nitrogen and phosphorus as most of the studies considered but also other nutrients

Responses by Dr. Mahmud: He stated that the paper is by no means exhaustive since the issues related with LD are complex and his team focused on six major studies that addressed costs of LD. He also added that the costs of land degradation in Ethiopia is not only between 2 -3 % but at least 3% which needs to be investigated including redeposition rates using more appropriate methods. As the presenter argued, his analysis focused on croplands because almost all previous studies were done on these areas and there is a relatively better stock of knowledge on them. Finally, Dr. Mahmud discussed that knowing the costs of LD by itself is not an end but the starting point for the implementation of SLM practices.

Responses by Dr. Pender: The most important thing to believe now is that the cost of LD is very substantial in Ethiopia although the estimates of its magnitude differ from one study to another as Dr. Pender argued. He also added that according to a number of studies made, farmers are quite aware of the impact of LD but they can't combat it due to the issues of profitability and risk associated with investment on SLM practices. In addition, in line with SLM, we need to focus on provision of access to credit, labor,

biomass etc. to farmers and the importance of applying different SLM technologies on different areas and agro ecological zones.

PRESENTATION III

Background to the Cost-Benefit Framework: TerrAfrica and mainstreaming SLM through analytical work

By

Matteo Marchisio, (World Bank)

Despite the magnitude and severity of land degradation in SSA, and despite the potential of SLM practices to solve the problem, past efforts have been inadequate to the scale of the problem, and the scale and scope of the land management interventions have remained limited due to a number of barriers. First many institutions regarded land degradation and SLM as either agricultural or environmental issues and rarely as cross cutting issues. Second, political commitments were inadequate and policy frameworks were lacking provision of adequate incentives. The third reason is insufficient or inadequately targeted funding. On top of these, there has been weak analytical underpinnings that support decision-making processes.

It is due to the above mentioned reasons that the World Bank felt it was important to promote the scale-up of SLM so that key policy makers be provided with some analytical tools that could help their choices and guide their investment decisions through analytical tools, this with the main objective of supporting the mainstreaming of SLM into the policy agenda of the country. Among these tools the World Bank proposes the development of a CBF to assess the costs of land degradation and the benefits of SLM.

The cost benefit framework (CBF) is one of the pilots/tools proposed under the TerrAfrica imitative with a main objective of developing an approach to come up with appropriate measures of costs of land degradation and the associated benefits of sustainable land management. TerrAfrica is a recently built partnership/multi-partner

platform (which involves African countries, Regional organizations such as NEPAD, bilaterals and multilaterals, NGOs, etc.) which seeks to create enabling conditions to scale-up sustainable land management (SLM) in Sub-Saharan Africa (SSA). TerrAfrica is the result of the understanding that no single action/institution can address the problem of land degradation alone. On the contrary, by acting together through a common set of objectives, outcomes, indicators, etc. partners can maximize their comparative advantage and enhance their impact.

The CBF is seen as a tool to promote policy dialogue. The World Bank believes that to inform/influence key policy-makers (e.g. Ministry of Finance) the CBF can be a useful tool to help rationalize choices. The main idea here is now to test/implement it in two pilot countries (Ethiopia and Ghana) and to possibly replicate the results and methodology in other African countries later. The technicalities of the framework are discussed in the continuing presentations. Two important aspects of the CBF exercise are worth mentioning here. First, the framework by itself is not an "end product" and it won't be a quick study developed for the sake of having nice models. Second, the process by itself is as important as the product and therefore it is the belief of the World Bank to see this exercise as a way to promote policy dialogue.

The continuing discussions are expected to focus on two important aspects of the framework, which are the conceptual soundness of the framework and very operational and pragmatic questions such as: What do we need to implement the framework? i.e what data do we need, availability of the data, what capacity is needed to implement the framework, is this capacity available or not? etc.

PRESENTATION IV

A Cost-Benefit Framework to Support Pro-SLM decision-Making in Sub-Saharan Africa

Gunilla Bjorklund (GeWa Consultancy, Sweden) and Gunnar Kohlin (EEPFE)

Land degradation, including soil and soil fertility degradation, is a major factor for the low agricultural productivity of Sub-Saharan Africa and is estimated to cause 2 to 5% loss in the agricultural GDP of countries. Althouth LD is recognized as a major development issue, SLM has not recieved the desired attention in the development agenda of countries due to the existence of a number of barriers inspite of the availability of many promising SLM practices. Past strategies have concentrated on short-term technical solutions instead of creating enabling socio-economic environments, adopted a top-down appraoch without proper considerations to local conditions and needs, and emphasised surface erosion control over other aspects of LD and measures for productivity improvements.

The adoption of TerrAfrica as a multi-donor initiative offers opportunites to enhance the capacity and to scale up investments in SLM programs as a way to improve the contribution of natural resource management to economic growth and poverty reduction. A prerequisite for the adoption of SLM programs is that policy makers are provided with reliable estimates of the magnitude of the land degradation problem and that there are convincing evidences showing that the benefits from implementing instruments and SLM initiatives such as TerrAfrica, are greater than the costs. Under the activity line 2 – knowledge generation and management - TerrAfrica is developing a set of analytical tools to strengthen the knowledge of LD and its effects with the objective of mainstreaming SLM into the development agenda of SSA countries.

In this context, the World Bank initiated an activity under the Africa project line on ”Costs and Benefits of SLM in African countries” to develop a pilot initiatve on mainstreaming and partnership building in SLM and providing analytical contributions to the mobilization of additional financial resources for SLM. The initiative was to

contribute towards analytical work on the costs of LD and the barriers to mainstraming of SLM.

The objective of the GEF Medium-Sized Project (MSP), expected to result from that initiative was ”to increase in-country awareness on the true costs to livelihoods, growth and environment, of land degradation.” It should further ”clarify the potential benefits associated with increasing the scale and scope of SLM investments and related activities.” The SLM project should complement existing systems in that it will strengthern the analytical assessment in dealing with not only economic costs but also environmental costs of first and second order as well as related benefits within a system of Natural Resources Accounting.” These would also be the main objectives for the current phase of the project.

The initiative, that was undertaken as a project by a Swedish team, aimed at producing the basis of an MSP, resulted among others in reports on ”methods for Assesing the Impasts and Costs of Land Degradation and the Net Benefits of Prevention and Mitigation Measures”, ”Strategies to overcome barriers for sustainable land managemt in Africa”, a concept paper entitled ”A decision framework for accounting costs and benefits of LD and SLM, and a draft MSP Project Brief ”Costs and Benefits of SLM in African Countries.”

The Cost Benefit Framework (CBF) therefore should: identify ”hot-spots” of serious on- and off-site costs of land degradation, indicate benefits from various SLM treatments, support policy makers and donors to allocate sufficient resources for SLM and help resource planners to prioritize areas and treatments. The main characterstics of the CBF are: it makes use of past data collection and research in an efficient and consistent manner, it is inter-disciplinary, drawing mainly on soil science research and applied economics, with heavy use of GIS, and it is an open framework that can evolve with advancements in data collection and research.

Main Steps of the CBF

- Identification of recommendation domains that share the same conditions for applications of treatments.

- Estimation the soil erosion & nutrient depletion rates for each recommendation domain based on explanatory factors proposed in the USLE.
- Estimation of production responses to erosion and treatments for each recommendation domain.
- Translation of soil erosion and nutrient depletion into income losses using different economic valuation techniques.
- Computing the net present value (NPV) of each treatment for each development domain (mapping unit)
- Mapping on- and off-site returns from treatment.
- Prioritizing areas with highest return according to budget constraint.
- Dissemination of this information to the relevant users, particularly land use planners and extension staff at regional level and below

Major Functions of the CBF

- Compile and utilize the existing relevant data and research on land degradation and various SLM treatments in Ethiopia and elsewhere.
- Provide information on the areas facing largest short- and long-term costs from land degradation.
- Show how SLM treatments could prevent losses in productivity in hydro- and irrigation dams as well as fisheries in affected lakes.
- Indicate the relevant size of investments in SLM.
- Prioritize areas and treatments in order to maximize the returns to society from these investments.
- Act as a unifying framework for the design and dissemination of applied research on SLM practices.
- Support the up scaling of promising SLM practices.

Planning Process

- TerrAfrica at the WB is ready to propose the piloting of the CBF in Ethiopia and Ghana as a Medium-Sized Project.

- It needs to meet GEF Land degradation project requirements.
- It needs to be approved by the two governments.
- It needs to be processed through WB and GEF project cycle.

GEF 'Land Degradation Focal Area' Requirements

- Demonstrate "global environmental benefits"
- Be replicable
- Demonstrate environmental, socio-economic and financial sustainability
- Through its activities support capacity to address barriers towards introducing SLM investments.

Implementation Modalities

- The inter-agency Technical Committee for SLM should oversee/guide the implementation.
- There is also a need for an executive body that is responsible for the implementation and accountable to the governing board.

Major Tasks to be Performed

- Basic data collection (soil, soil depth, vegetation, erosion, redeposition, sedimentation etc)
- Applied research on treatments in various localities (inputs, design, returns)
- Applied research on downstream impacts of land degradation.
- Analytical work to bring the data together, estimate erosion and economic coefficients for further simulations.
- Serious GIS work both as a basis for the analysis and for the presentation of the results.
- Dissemination of results.
- Planning and implementation of the SLM practices.

Major Stakeholders

- **Users**: Extension Program and Natural Resource Development Program of MoARD; Regional Bureaus of Agriculture; Federal and Regional EPAs, major donors, farmers.
- **Contributors**: EDRI, EIAR, RARI and universities, CGIAR-centres.
- **Disseminators**: WB, UNCCD, GEF/UNEP

Capacity, Needs & Training

- Much available capacity which needs to be used properly
- Academic network and workshops!
- Greatest training needs at the regional level
- MSc program to combine physical and economic perspectives on SLM?

Proposed WB/GEF Program on SLM - Objectives

The objectives of the proposed program on Sustainable Land Management are to:

(a) facilitate investment in sustainable land management through strengthened land tenure security;

(b) increase and sustain agricultural productivity through improved integrated land and water management practices; and

(c) protect or restore ecosystem functions in agricultural landscapes.

Components of Proposed SLM Program

Project component 1: Land Certification and Administration

Project component 2: Knowledge and Innovation. This component would comprise the following three sub-components:

(a) ***Capacity building for integrated land and water management***.
(b) ***Developing a knowledge base on good practice in land and water management.***.
(c) ***Dissemination of best land and water management practices***. .

Project component 3: Land monitoring system.

Project component 4: Program coordination and management.

Links to the SLM Program

- The proposed CBF work would be synergetic to the proposed program:
  - Support land use planning.
  - Support scaling up of best management practices.
  - Great overlap with the proposed land monitoring system.
- Proposal:
  - Start the application of the CBF in the same geographical areas as the SLM program.

The CBF has great potential to address the objectives of justifying the implementation of SLM practices but it requires: involvement and commitment from many stakeholders, a core group of highly committed professionals who can bridge the physical and economic aspects, and activities to keep the unifying framework alive and improving.

PRESENTATION V

Cost Benefit Framework for Pro-SLM Decision Making Process: Ethiopian Case Study

Gete Zeleke and Mahmud Yesuf (EEPFE)

Frameworks for Quantifying the Biophysical Processes of LD

Gete Zeleke, (EEPFE)

Previous attempts to quantify land degradation process in Ethiopia were highly constrained by lack of relevant reliable data sets. Most of them used USLE and ranges of parameters that were developed for the conditions of USA. In this study an attempt is made to use the data sets of the Soil Conservation Research Project's (SCRP) gauged stations and extrapolate their results to homogenous land units represented by each station. It is not however claimed that this approach is free from errors but at least it will be tried to minimize these errors by extrapolating the results of each station to areas that have similar agro-climatic conditions to that of the stations. This classification will be used to predict both the on-site and off-site processes of LD. Attempts will be made to

calibrate both empirical and process-based erosion models using gauged data sets of SCRP and extrapolate the result to the identified recommendation domains. It is, however, found important to characterize stations and find domain areas that can be represented by each station. Given the data is only available for six stations; the whole country will unfortunately not be covered with the existing data.

Quantifying Major On-Site Impacts of LD

Although it is possible to apply other soil loss models, which are more precise in modeling soil erosion processes, the applicability is always a question. Therefore, in this study, the use of the Universal Soil Loss Equation (USLE) is proposed, but with proper model calibration and identification of model parameters based on actual measurements at SCRP stations.

The USLE is an empirical overland flow or sheet-rill erosion equation. It is a regression equation developed based on information from large data sets and lumps inter-rill and rill erosion together in order to estimate average soil loss over an extended period, e.g. average annual soil loss. The limitations of the model are: i) it is not designed to estimate soil loss from single storm events; ii) it is an erosion equation and consequently does not estimate deposition; iii) it does not estimate gully or channel erosion. In spite of these limitations, however, the model gives fair estimates, provided that its model is carefully generated based on local information. Since the interest is not in estimating gully and channel erosion, the limitations may not affect the intended framework very much except for the lack of a deposition element.

The application of the USLE and model parameters will not, however, represent the whole country, but only the areas that can be represented by research stations as discussed above.

Quantifying Major Off-site Impacts of LD

Offsite impacts of land degradation have been neglected in previous studies in Ethiopia. This is not due to its lack of awareness but it is mainly related to lack of appropriate tools to quantify these impacts of LD and the complexity to capture major features. This is,

however, an important component of LD in Ethiopia and we foresee possible work to quantify at least three major offsite impacts on selected parts of the country, i.e. siltation of dams and reservoirs that reduces storage capacity for power generation and irrigation (Koka, Sendafa, Angereb and Awa dams), siltation of lakes that affects biodiversity (Lake Tana and Zewai) and deposition on downstream agricultural lands that reduces or improves cultivated land and grasslands (Ambassel area, Wollo). The focus is, therefore, on presenting the methodology and tools to quantify the offsite impacts that are proposed for the CBF.

To quantify siltation and related problems on reservoirs and lakes, the Soil and Water Assessment Tool (SWAT) basin/watershed model is chosen. SWAT is a river basin, or watershed-scale model developed by the USDA Agricultural Research Service. It is a continuous time, physically based and distributed watershed model. It was originally developed to predict the impact of land management practices on water, sediment and agricultural chemical movements in large complex watersheds with varying soils, and use management conditions over long periods of time. To satisfy this objective, the model is physically based. This means, rather than incorporating regression equations to describe the relationship between input and output variables, SWAT require specific information on weather, soil properties, topography, vegetation, and land management practices occurring in the watershed.

SWAT allows a number of different physical processes to be simulated in watershed, i.e. hydrology, crop growth, soil erosion, nutrient and pesticide movement within the soil. The other potential of SWAT is its capability to take point source pollutants as input and simulate their downstream impact. It also shows the impact of different management options on soil, water and nutrient flow balances. This means that one can apply the recommended SLM practices on major land use units and then see their downstream impacts. The only limitation of SWAT model is its data requirements, i.e. the need of some data readjustment to fit the model's data structure.

What is Required to Undertake the Above Tasks

1. Data Collection or Extrapolation

- Map Scale: 1:250,000
- Data
  - Land use – available but needs revision (southern part), can also be generated from satellite images
    - Cropping areas available at Woreda level – need further reclassification
  - Climate – available
  - Topography – can be generated using GIS from satellite images
  - Soil – available at 1:1,000,000 and 250,000 scales. Very coarse; needs to be refined using different techniques

SLM scenarios

- Develop generic values based on some observation
- If needed, establish learning sites

2. Capacity

- Team set-up at federal level
  - Modeler (physical science)
  - GIS specialist
  - Soil specialist
  - Agronomist
  - Forester/climatologist

b. Training

- In-service training
- MSc and PhD studies

Conclusion

- It should be noted that it is not attempted to capture all processes and impacts of LD
- It is, however, possible to quantify more as experiences develop

- CBF should not be taken only to show costs and benefits but to create awareness, show options, set priorities, learn more about SLM and LD, build capacity, build systematic database, etc.

PRESENTATION VI

Economic Approaches to Assess Land Degradation and SLM Practices

By

Mahmud Yesuf (EEPFE)

This section of the CBF discusses the economic framework that attaches economic values to the effects of soil erosion and efforts of soil conservation. Following the biophysical description of land management practices, in the previous section, in this economic framework, four management practices would be considered. Scenario one is the baseline scenario of no conservation measure. Scenario two represents physical conservation measures such as soil and stone bunds and *fanya juu.* The third scenario represents physical conservation measures with moisture management conservation measures such as mulching, application of green manure and other cover crop for soil fertility improvement. The last scenario represents progressive conservation measures combined with soil management, plantation of fruits, grasses and other trees on, above or below the bunds, including agro forestry between the bunds.

The stream of net benefits/losses of the second, the third and the fourth conservation scenarios will be computed in reference to the baseline scenario of no conservation measure for each of the recommendation domains described in the previous section.

Furthermore, only three forms of on-site damage of soil erosion would be considered, i.e. crop production loss due to movements of top soil, crop production loss due to nutrient cycle breaches (removal of dung and crop residues), and livestock production loss due to the burning of crop residues. However, at a later stage, efforts will be made to quantify impacts of unwise deforestation, mainly outside the carrying capacity and overgrazing. The onsite costs would be assessed only in reference to the dominant crop in each

domain. Of the different off-site damages, only damages caused by sediment leads to water storages (both hydroelectric dams and irrigation water storages), and sediment loads to lakes mainly used for fish production and loss of downstream productive lands as a result of gravel deposition will be assessed. However, the methodology that is proposed is so general so that with increased information (data and research) more treatments and offsite impacts can be incorporated.

The whole exercise of attaching economic values to both on- and offsite costs of soil erosion, and subsequently conducting the full cost benefit analysis of SLM practices involve the following steps:

- Estimating the soil erosion rates for each recommendation domain.
- Estimating production responses to erosion and treatments for each recommendation domain.
- Translating soil erosion into income losses using different economic valuation techniques such as the change of productivity approach (CPA), replacement cost approach (RCA) and other approaches including the contingent valuation method (CVM) and the hedonic pricing method (HP).
- Computing the net present value (NPV) of each treatment for each development domain.
- Computing the net present value (NPV) of a whole package of integrated treatment for selected micro-watersheds in each development domain.

Reflections by Discussants

- It is important to consider the profitability of different SLM practices
- The main objective of the CBF for SLM is not to redo everything but to fill gaps in the existing knowledge
- A clear distinction between private and social costs and benefits and the costs at both micro and macro level are important for policy makers
- Many aspects of the SLM are difficult to model but at least one need to incorporate them qualitatively

- It will be a good approach to present the clear linkage of the SLM with other polices of the government such as the PRSP
- Any study on the problem of LD should incorporate both erosion and nutrient loss and the problem needs to be addressed for both high and low potential areas
- The most important aspect of SLM is the soil conservation and management area
- There are serious current soil issues in Ethiopia such as soil acidity which need to be addressed in the CBF
- There is already a huge stock of data that can be used for the CBF in places like the ESSP lab of IFPRI. The issue is how to modify and make use of the data
- How is the cost benefit approach compared with cost effectiveness? That needs a clear answer in the CBF
- It is good to incorporate other dimensions of LD such as reduced absorption of carbon sinking although the issue of carbon sinking is not significant in the Ethiopian context
- The CBF considers only croplands of the country, hence, either the team needs to incorporate other lands of the country like the pastoral areas or modify the title showing that it focuses on croplands
- The biophysical aspect of the CBF needs to incorporate loss of biodiversity due to soil erosion
- LD may have benefits sometimes. For example. grabbles and stones of the eroded land can be used and have economic values. In addition, the sediments carried in rivers help in purifying the rivers. One needs to incorporate these possible benefits in the CBF
- The biophysical aspect of the CBF does not have a room to accommodate differences in household characteristics such as human and livestock population
- The SCRP data to be used in the framework has a number of limitations such as absence of important parameters such as fertilizers and labor inputs
- The Ethiopian highland is characterized by a high degree of heterogeneity which makes scaling up difficult
- It is a very good experience to see biophysical and economic scientists working together in addressing the problems of LD and SLM
- The distinction between private and social costs and benefits need to be clearly put in the economic analysis part of the CBF

- There are already completed master plans on the Ethiopian pastoral areas by ADB focusing on environmental and land use issues. There is also an ongoing livestock master plan. They can be used in the CBF.
- Most of the past studies on LD focused on the biophysical aspect. The chemical aspects are however very important and need to be incorporated.

  The stakeholder analysis needs to be consistent with the government's priority issues, e.g. currently soil acidity is a priority issue from the side of the government.

Questions:

There are different versions of the USLE model. Which version of it is to be used in modeling soil erosion? What is the time frame of the CBF? Is it a one shot approach? Why is it focusing only on two basins? Which institution takes the lead to undertake the CBF for SLM? Why is the contingent valuation method (CVM) ignored in the economic valuation aspect of the CBF? There is an ongoing erosion and land degradation in Oromia region, and why is it not incorporated in the CBF? What is the clear definition of the SLM?

Responses by Dr. Gunnar: The main reason that the CBF focuses on cropland is due to the fact that the vast majority of the rural population is living on them and a significant portion of soil lost every year is from these areas. In addition, there is a relatively accumulated stock of knowledge and data on these areas.

Responses by Dr. Mahmud: The CBF is by no means exhaustive and there are wider ways of incorporating some additional components. The economic value of resources coming from eroded areas such as stones is not significant in the Ethiopian context. The main reason for using the replacement cost approach in the economic analysis part of the CBF is due to data limitation. Cost effectiveness approaches are used mainly to attain certain targets and here the objective is to undertake a cost benefit analysis.

Responses by Dr. Gete: Soil nutrients other than nitrogen and phosphorus are not significant in Ethiopian soils. But it is possible to consider potassium. The major reason that the CBF focus on SCRP data set is that it is rich in terms of biophysical data, and it is representative of the different agro ecological zones of the country. It is possible to

incorporate gully erosion, acidity, and salination problems in the CBF and possible precautions have been taken in choosing soil loss models. In addition, the hydrology models model only hydrological aspects, but the SWAT model incorporates hydrology, soil and other biophysical aspects. Tana basin in the Amhara region is the focus due to its international nature and the presence of very serious land degradation in the region. In addition, resources are scarce to incorporate all regions. The SLM definition refers to not only physical technologies but also ideas and methods of conserving land.

Responses by Mr. Matteo: Ethiopia is going to get at least half a million dollars from the World Bank for the whole pilot project of the CBF for SLM, and the issue of which institution takes the lead for the implementation is something to be decided during next day's workshop.

CLOSING REMARKS

Dr. Ernst Lutz of the World Bank stated that the Bank sees the issue of sustainable land management program as one major component of the development efforts of the country. He also added that it is hoped that the studies discussed during the first workshop would in turn inform the Operational workshop on the next day and also the planned WB/GEF program on SLM.

Mr. Matteo Marchisio from the World Bank said that the major comments made during the discussions would be incorporated and used as inputs to come up with a more complete CBF. He also added that the Swedish team would combine the Ethiopian and Ghanaian CBFs and come up a standard CBF proposal. Mr. Matteo finally thanked all the different presenters, participants and the organizing institutions for their lively presentations, discussions and for organizing such a productive workshop.

Stakeholder Workshop on Sustainable Land Management (SLM):

Cost of Land Degradation, Stakeholder Analysis and Cost-Benefit Framework for pro-SLM decision-making

Time	**Topic**	**Presenter**	**Affiliation**	**Chair person**
08:30	Registration		EEPFE	
09:00	Introduction and welcome	Dr. Gunnar Köhlin	EEPFE/GU	H.E. Prof. Mesfin Abebe
09:10	Welcome remarks	H.E. Ato Neway Gebreab H.E. Ato Ahmed Nasser Dr. Herbert Acquay	EDRI MoARD WB	
09:50	Workshop opening	H.E. Dr. Abera Deressa	MoARD	
10:00	Stakeholders Analysis for SLM	Dr. Gete Zeleke	EEPFE	
10:30	Coffee			
11:00	Reflections by discussants: Research Agricultural education Extension and TVT on SLM	Discussants: (Dr. Tsedeke Abate) (Prof. Belay Kassa) Ato Lakew Desta	 EIAR Alemaya University MoARD	
	Summary of morning discussion			
12:30	Lunch			
14:00	Continued discussions: Donor perspectives	Discussants: Dr. Winfried Zargeb Mr. Volli Carucci Dr. Ernst Lutz	 GTZ WFP World Bank	Dr. Herbert Acquay, World Bank
	Summary and conclusion of the SA session			
15:00	Coffee			
15:30	Assessment of cost of land degradation in Ethiopia	Mahmud Yesuf	EEPFE	Dr. Alemayehu Seyoum, ESSP
16:30	Reflections by discussants:	Discussants: Dr. Peter Sutcliffe Dr. Yihenew Zewdie	 Nile Basin Initiative WFP	
17:30	First day workshop closing.			H.E. Ato Neway Gebre-Ab EDRI
18:00	Reception	ILRI		

May 3, 2006				
Time	**Topic**	**Presenter**	**Affiliation**	**Chair person**
09:00	Background to the Cost-Benefit Framework: TerrAfrica and Mainstreaming SLM through analytical work	Mr. Matteo Marchisio	WB/TerrAfrica	Dr. Eleni G/Medhin, ESSP
09:20	Overview of a Cost Benefit Framework for pro-SLM decision making in SSA	Dr. Gunilla Björklund	WB/Consultant	
09:45	Proposal for a CBF for Ethiopia	Dr. Gunnar Köhlin Dr. Gete Zeleke Dr. Mahmud Yesuf	EEPFE EEPFE EEPFE	
10:30	Coffee			
11:00	Continued CBF proposal	Dr. Gunnar Köhlin Dr. Gete Zeleke Dr. Mahmud Yesuf	EEPFE EEPFE EEPFE	
11:30	Questions and Reflection by participants			
12:00	Lunch			
13:30	<u>Reflections by discussant on:</u> Design and approach (Internat'l perspective) Design and approach (National erspective) Data requirements (General) Data requirements (Soil) Capacity needs Institutional setting Policy Implication	<u>Discussants:</u> Dr. John Pender Dr. Solomon Assefa Mr. Jordan Chamberlin Dr. Abayneh Issayas Ato Zenebe Abreha Ato Belete Geday Ato Daniel Denanew	 IFPRI EIAR IFPRI National Soil Laboratory Mekelle University EPA MoARD	Dr. Assefa Admassie, EEPRI
15:00	Coffee			
15:30	Panel discussion on the way forward for the CBF.	Dr. Gunilla Björklund Dr. Gunnar Köhlin Dr. Gete Zeleke Dr. Mahmud Yesuf Mr. Matteo Marchisio	WB/Consultant EEPFE/GU EEPFE EEPFE World Bank	
16:20	Discussions on an applied research agenda in support of SLM operations	Dr. Gete Zeleke	EEPFE	
16:30	General Discussion			
17:00	Words of Thanks	Dr. Herbert Acquay	World Bank	
17:30	Workshop closing			

List of participants in Stakeholder Workshop on Sustainable Land Management

NO.	Full Name	Gender	Organization	Region/Country
1	Abayneh Esayas	M	National Soil Laboratory	
2	Abera Deressa	M	Ministry of Agriculture and Rural Development	A.A./Ethiopia
3	Ahemed Nasser	M	Ministry of Agriculture and Rural Development	A.A./Ethiopia
4	Aklog Laike	M	Sida	
5	Alemayehu Semunigus	M	EC-Delegation	AA/Ethiopia
6	Alemayehu Seyoum	M	Intrenational Food Policy Research Institute	A.A./Ethiopia
7	Aliye Hussen	M	Oromia Regional Agricultural Research Institute	A.A./ Ethiopia
8	Amare Belay	M	Tigray Agricultural Research Institute	Tigray/Ethiopia
9	Amare Worku	M	Ministry of Agriculture and Rural Development	A.A./Ethiopia
10	Anna Nordén	F	Environmental Economics Policy Forum for Ethiopia	A.A./Ethiopia
11	Asgelil Dibabe	M	Ethiopian Institute for Agricultural Research	A.A./Ethiopia
12	Assaye Legesse	M	WB	AA/Ethiopia
13	Assefa Admassie	M	Ethiopian Economic Policy Research Institute	A.A./ Ethiopia
14	Assefa Tofu	M	World Vision	AA/Ethiopia
15	Azage Tegegne	M	International Livestock Research Institute	AA/Ethiopia
16	Belete Geda	M	Ethiopian Protection Authority	A.A./Ethiopia
17	Berhanu G/Medhin	M	International Livestock Research Institute	AA/Ethiopia
18	Birhanu Adenew	M	Ethiopian Economic Policy Research Institute	A.A./Ethiopia
19	Charles Michael Akol	M	UNECA/SDD	A.A./Ethiopia
20	Chilot Yirga	M	Ethiopian Institute for Agricultural Research	A.A./Ethiopia
21	Daniel Danano	M	Ministry of Agriculture and Rural Development	A.A./Ethiopia
22	Daniel Kassahun	M	Forum For Social Studies	A.A./Ethiopia
23	Derek Byerlee	M	World Bank	A.A./Ethiopia
24	Deribe Gurmu	M	Ethiopian Institute for Agricultural Research	
25	Eleni Gebremedhin	F	Ethiopian Strategy Support Program/IFPRI	A.A./Ethiopia
26	Ernst Lutz	M	World Bank	Washington D.C
27	Getachew Alemayehu	M	Amahara Regional Agricultural Research Institute	BahirDar/Ethiopia
28	Gete Zeleke	M	Environmental Economics Policy Forum for Ethiopia	A.A./Ethiopia
29	Girma Hailu	M	UNDP	A.A./Ethiopia
30	Girma Tadesse	M	International Livestock Research Institute	AA/Ethiopia
31	Gunilla Björklund	F	GeWa Consulting	Sweden
32	Gunnar Köhlin	M	Environmental Economics Policy Forum for Ethiopia/GU	Sweden
33	H/Mariam H/Meskel	M	African Development Bank	A.A./Ethiopia

NO.	Full Name	Gender	Organization	Region/Country
34	H/Mariam T/Wold	M	Ethiopian Institute for Agricultural Research	DebreZeit/Ethiopia
35	H/Maiam Kassa	M	CIFOR	
36	Hamdou Raby Wane	M	UNECA	A.A./Ethiopia
37	Herbert Acquay	M	World Bank	A.A/Ethiopia
38	Isatou Gaye	F	UNECA/SDD	A.A./Ethiopia
39	John Pender	M	International Food Policy Research Institute	Washington D.C.
40	Jordan Chamberlin	M	International Food Policy Research Institute	A.A./Ethiopia
41	Kelsa Kena	M	South Agricultural Research Institute	Awassa
42	Kwadwo Tutu	M	UNECA	A.A./Ethiopia
43	Lakew Desta	M	Ministry of Agriculture and Rural Development	A.A./Ethiopia
44	Mahmud Yesuf	M	Environmental Economics Policy Forum for Ethiopia/AAU	Sweden
45	Margaaretha Sundgren	F	Sida	
46	Marta Bergfors	F	Environmental Economics Policy Forum for Ethiopia	A.A./Ethiopia
47	Matteo Marchisio	M	World Bank	Washington D.C.
48	Menale Kassie	M	Environmental Economics Policy Forum for Ethiopia	A.A./Ethiopia
49	Menberu Alebachew	M	Nile Basin Initiative	A.A./Ethiopia
50	Mesfin Abebe	M	PM's office	A.A./Ethiopia
51	Million Alemayehu	M	ORDA	A.A./Ethiopia
52	Paul Mulder	M	Private Consultant on watershed Mgt.	France
53	Peter Sutcliffe	M	ENTRO	A.A./Ethiopia
54	Ramio Mayor-Mora	M	CIDA/SWHISA	AA/Ethiopia
55	Sara T/Birhan	F	Mekele University	Mekele/Ethiopia
56	Sara Yirga W/Girma	F	World Bank	Addis Ababa
57	Seleshi Bekele	M	IWMI at ILRI	AA/Ethiopia
58	Seme Debele	M	EAAP/Private Consultant	A.A./Ethiopia
59	Shirley Tarwari	F	International Livestock Research Institute	AA/Ethiopia
60	Solomon Abate	M	ENTRO	A.A./Ethiopia
61	Solomon Assefa	M	Ethiopian Institute for Agricultural Research	A.A./Ethiopia
62	Susanna Olai	F	Environmental Economics Policy Forum for Ethiopia	A.A./Ethiopia
63	Tamene Tiruneh	M	CIDA	AA/Ethiopia
64	Tamirat H/Meskel	M	Sustainable Land Use Forum	A.A./Ethiopia
65	Tekie Alemu	M	Environmental Economics Policy Forum for Ethiopia/AAU	A.A./Ethiopia
66	Tena Gashaw	M	Alemaya University	Alemaya/Ethiopia
67	Tesfai Mebratu	M	GTZ	A.A./Ethiopia
68	Tseday Ayalew	F	Environmental Economics Policy Forum for Ethiopia	A.A./Ethiopia

NO.	Full Name	Gender	Organization	Region/Country
69	Tsedeke Abate	M	Ethiopian Institute for Agricultural Research	A.A./Ethiopia
70	Tsegaye Debebe	M	Ministry of Water Resource	A.A./Ethiopia
71	Tsege Genet	M	Bahir Dar University	Bahir Dar/Ethiopia
72	Volli Carucci	M	WFP	A.A./Ethiopia
73	Winfried Zarges	M	GTZ	A.A./Ethiopia
74	Workneh Ayalew	M	International Livestock Research Institute	AA/Ethiopia
75	Yehenew Zewdie	M	WFP	A.A./Ethiopia
76	Yonas Alem	M	Environmental Economics Policy Forum for Ethiopia	A.A./Ethiopia
77	Zenebe Abreha	M	Mekele University	Mekele/Ethiopia
78	Zerihun Alemayehu	M	ENDA-Ethiopia	A.A./Ethiopia