SECOND DRAFT

Stakeholder Analysis for Sustainable Land Management (SLM) in Ethiopia: Assessment of Opportunities, Strategic Constraints, Information Needs, and Knowledge Gaps

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Acronyms

ADC	**Austrian Development Cooperation**
AEZ	**Agro Ecology Zone**
BBM	**Broad Bed Maker**
BoARD	**Bureau of Agriculture and Rural Development**
CBPWD	**Community Based Participatory Watershed Development**
CDD	**Community Driven Development**
CDM	**Clean Development Mechanism**
CEP	**Community Empowerment Programme**
CGIAR	**Consulting Group for International Agricultural Research**
CIDA	**Canada International Development Agency**
CT	**Conservation Tillage**
DA	**Development Agent**
EARO	**Ethiopian Agricultural Research Organization**
EPE	**environmental Policy of Ethiopia**
EPA	**Environmental Protection Authority**
EPLAUA	**Environmental Protection, Land Use, Administration and Use Authority**
FAO	**Food and Agriculture Organization of the United Nations**
FFW	**Food for Work**
GEF	**Global Environmental Facility**
GIS	**Geographical Information System**
GTZ	**Gesellschaft für Technische Zusammenarbit**
HLI	**Higher Learning Institutes**
ICRAF	**International Centre of Research for Agro-Forestry**
IFPRI	**International Food Policy Research Institute**
IGA	**Income Generating Activities**
IT	**Information Technology**
LLPPA	**Local Level Participatory Planning Approach**
LUPRD	**Land Use Planning and Regulatory Department**
MoARD	**Ministry of Agriculture and Rural Development**
ME	**Monitoring and Evaluation**

MERET	**Managing Environmental Resources to Enable Transition to more Sustainable Livelihoods**
NGO	**Non-Governmental Organization**
NRM	**Natural Resources Management**
PADETS	**Participatory Demonstration Extension Training System**
PLUP	**Participatory Land Use Planning**
RARI	**Regional Agricultural Research Institutes**
REFAC	**Research Extension Farmers Advisory Council**
SCRP	**Soil Conservation Research Project**
SIDA	**Swedish International Development Agency**
SLM	**Sustainable Land Management**
SNNP	**Southern Nations & Nationalities People**
SWC	**Soil and Water Conservation**
TVT	**Technical and Vocational Training**
WB	**World Bank**
WFP	**World Food Parogramme of the United Nations**
WOoARD	**Woreda Office of Agriculture and Rural Development**
WOCAT	**World Overview of Conservation Approaches and Technologies**
UNDP	**United Nations Development Programme**
USAID	**United States Agency for International Development**

1 Introduction

1.1 The natural resource base and land degradation: an overview

Ethiopia is one of the most well endowed countries in sub-Saharan Africa in terms of natural resources and valuable diversity in the production environment. Its location in the tropics combined with impressive altitudinal variations within short ranges allows the country to enjoy both temperate and tropical climates and this gives a wealth of biophysical resources including rich biodiversity, relatively fertile soils, and huge fresh water resources. For millennia, this rich natural resource base has been serving as the foundation for agricultural development and for meeting the basic needs of millions of rural people in the country

Although the country is endowed with enormous biophysical potential, it has been affected by the interlinked and reinforcing problems of land degradation and extreme poverty. This is further aggravated by high population pressure (currently about 72 million with annual growth rate of 2.5%), climatic variability, top-down planning systems, lack of appropriate and/or poor implementation of polices and strategies, limited use of sustainable land management practices, limited capacity of planners, researchers and land users as well as frequent organizational restructuring.

It is estimated by LUPRD/UNDP/FAO, (1984) and FAO/UNDP (1986), that close to 1.9 billion tons of top soil has been washed from the landscape (mainly from the highlands) every year, and a major part of this is believed to leave the country. The on-site effects of land degradation, mainly in reducing agricultural production, is quite high, with estimated costs ranging from 2 to 6.75% of AGDP per annum (Mahmud, et al. 2005, citing estimates by FAO (1986), Hurni (1988), Sutcliffe (1993), Bojo and Cassells (1995), and Sonneveld (2002)). The Environmental Protection Authority (EPA) (1997) also estimated that approximately 17% of the potential annual agricultural GDP of the country was permanently lost because of physical and biological soil degradation. Despite differences in the above estimates due to various reasons (Mahmud et al, 2005), they all show the seriousness of the problem of land degradation caused by only soil erosion and loss of soil nutrients. Moreover, the

country also suffers from off-site effects of land degradation of various forms, although no detailed study has been done on this issue (Mahmud et al, 2005). These effects include siltation of dams, reservoirs, wetlands (Lake Alemaya, Adele, etc), lakes rich in biodiversity (Lake Tana, Lake Zeway and other Rift valley Lakes), and productive farm lands at foot slope areas (such as the Ambasel plain areas of Wollo). Moreoever, downstream countries of the Nile Basin (Sudan, Egypt) also feel the negative offsite effects of land degradation in Ethiopia.

As a result of combined on-site and off-site effects of land degradation, which in turn are caused by various intermingled factors, soil productivity has been negatively affected and agricultural production has not been able to meet the basic food requirements of the growing population. This significantly contributed to the food insecurity and hunger faced by some 5 to 7 million people in the country, thereby requiring external assistance every year for their survival and more than 45% of the total population to toil below the absolute poverty line.

The causes of land degradation are complex and have diverse nature and dimensions, depending on peculiarities of different countries. Although it is influenced by natural and socio-economic factors, in Ethiopia, the heavy reliance of some 85 percent of Ethiopia's growing population on an exploitative kind of subsistence agriculture has greater contribution to the current state of land degradation. This is partly explained by the fact that agriculture in the country is characterised by a subsistence rain-fed production system with simple traditional methods of production and has prevailed for thousands of years with little or no modification. In addition, the farming system, particularly in the highlands, is dominated by cereal crop production, which accounts for about 73% of the total cultivable area (Markos Ezra, 1997). Most of these cereals, particularly *teff* and wheat, need fine seedbed preparation and provide little groundcover during the most erosive storms of June, July and early part of August. This situation, combined with poor land management practices and the consistent push of cultivation towards increasingly marginal areas, contributes to the current level of land degradation and to significant decreases in agricultural production.

Moreover, the exploitative nature of the farming system also contributed to the high rate of deforestation and left the landscape devoid of vegetative biomass, exposing it to high soil erosion. Deforestation results principally from: (i) the conversion of forests and woodland to cropland, and (ii) the harvesting of forests for fuel wood to meet the energy needs of a rapidly growing population. As a result, currently the high forest cover of the country is said to be reduced to about 2.4% of the total area as compared to the estimated 40% initial coverage (Shibru Tedla and Kifle Lemma, 1998). Even then, the remaining forest is being depleted at an alarming rate. This is partly due to the fact that nearly 95% of the total energy consumption originates from biomass fuels such as fuel wood, cow dung and crop residue. Burning of cow dung as a source of fuel instead of using it as a soil conditioner, which was pushed by shortage and or lack of fuel wood and alternative energy sources, is considered to cause a reduction in grain production by some 550 thousand tones annually (EPA, 1997).

Similarly, like that of human population, livestock pressure and their poor management, which mainly depend on the free grazing system, is a major cause of land degradation. Ethiopia has a high livestock population, including 35.3 million cattle (Ethiopia is 1st in Africa in cattle population, although the productivity is very low). Only 25% of the livestock population grazes in the rangelands (lowland areas of Afar, Somali and Borena), which cover about 57.7 million sq km of Ethiopia's land area. Areas outside the rangelands are infected with tsetse fly and malaria, and growing moisture deficiency that limit livestock health and survival. The remaining 75% of the cattle graze in the highlands, (above 1,500 m.a.s.l), creating serious over-grazing problems in areas already under huge agrarian human pressure (EPA, 2005). In these areas, expansion of grazing beyond the carrying capacity of the land takes place at the expense of the remnant natural vegetation and this leads to serious land degradation. Furthermore, the growing livestock grazing pressure, and lack of protection for communal grasslands from the extended free grazing system are increasingly accelerating the land degradation problem in the country.

In many parts of the highlands use of degraded land units as a communal grazing land becomes a normal practice. Groups of livestock are forced to stay on these land

units, especially during the cropping season, although there is little for them to eat. This is one of the practices adopted by farmers when the population grows; land gets scarce, the farming system follows exploitative trend while most of the grasslands are converted to cultivated lands. In this case, not only cultivation, as stated above, but also the livestock are pushed towards marginal lands, which eventually results in even more severe land degradation.

Moreover, scarcity of grazing land and shortage of livestock feed has forced widespread use of crop residues as a source of livestock feed. The removal of crop residue for livestock feed and use of cow dung as a source of fuel results in subsequent loss of humus and soil nutrients from the soil that would otherwise have found their way back into the soil. This makes the nutrient cycle almost open and leads to a serious loss of soil quality, increased soil erosion and ultimatly reduction in soil productivity.

In general, a close look into the process of land degradation--which is a result of long history of agricultural activity combined with high level of population pressure and exploitative trends of agricultural practices--has led to the existing depletion of natural vegetative cover and over-utilisation of land resources in many parts of the country, and ultimately serious land degradation problems and intensified poverty.

Considering the above complex and interwoven problems of land degradation and poverty, it is, therefore, evident that for Ethiopia, characterized by subsistence agriculture, extensive land degradation and chronic food insecurity, agricultural development with the application of sustainable land management (SLM) practices cannot be an option, but rather is an indispensable element of all development efforts. Although it was not in organized form, the massive soil and water conservation and afforestation activities initiated in the 1980s had this element in mind. In most places, implemented SLM practices were either totally or partially destroyed by farmers. For instance, of the total conservation measures implemented between 1976 and 1990, only 30% of soil bunds, 25% of stone bunds, 60% of hillside terraces, 22% of the planted trees, and 7% of the reserve areas survived (TGE, 1994; Nurhussen, 1995). A recent survey in the Amhara region also showed that only 30% of the implemented soil and water conservation structures of the past two

and half decades of conservation work has survived (EPLUA, 2005). The above two survey results, however, should be seen in time context. In the 80's probably more than the above mentioned percentage has been destroyed due to many factors including lack of experience and the planning approach (V. Carucci, 2006 personal communication). At the later stage this figures might be on the high side because many improvements, particularly in project supported areas. However, this could be the case in high potential areas and in areas supported by EGS and mass mobilization. Therefore, studies of this kind need to be disaggregated in time frame, intervention strategies and area differentiations.

Although many scholars raised different factors affecting the sustainability of conservation measures, the problems with past conservation efforts are largely rooted in a lack of understanding of the important interface between resource conservation and agriculture, and of the factors that motivate farmers to invest in SLM over the long run.

Despite the above negative trends, there are some pockets of success in different parts of the country. Some have a deep-rooted history of indigenous experience such as Konso and Ankober areas, but others are related to innovative interventions by some donor supported projects. However, up-scaling of these successful SLM practices has been rather limited.

This study will attempt to show opportunities, strategic constraints and possible solutions for improving the quality of interventions and up-scaling of successful SLM practices in the country, information needs of different stakeholders to make decisions, knowledge gaps that hinder further expansion of SLM practices and a possible applied research agenda to support informed decision making processes and improvements in the promotion of SLM in the country.

1.2 Objectives

The major objectives of this paper are, therefore, threefold: i) to show opportunities and strategic constraints affecting the quality of intervention and up scaling of successful SLM practices, ii) identify key information needed by stakeholders for the purpose mentioned above and iii) to identify knowledge gaps related to SLM practices, and identification of a future researchable agenda that could help fill identified gaps and further improve intervention on SLM.

1.3 Methodology

It was attempted to visit "high potential" and "low potential" woredas in different parts of the country, mainly in the highlands. Interviews were conducted with key stakeholders involved in the implementation of SLM practices in the country at different levels and modes of intervention. These included farmers (53 in four woredas), development agents (6 in four woredas), WOoARD (30 in four woredas), ZOoARD (19 in three zone administrations) BoARD (13 in two regional states), MoARD (5), EPLUA (4 in one region), EPA (2), Regional Research Institute (4 in one region), Research Center (6 in one research center), University (17 in two universities), Donors (3 in two donor organizations) and NGO (6 in one organization).

As the details can be seen on Appendix 4, the group consulted comprised of farmers (with wealth category, gender and age taken into consideration), DAs from potential and non potential woredas with gender balance, Official's, department heads, and experts at all levels, i.e., MoARD, BoARD, ZOoARD and WOoARD, officials and experts at EPLUA and EPA, organization heads and professionals of selected donors and NGO, and agricultural scientists at universities, selected research institute and research centre. The selection criteria were different for various categories. For instance, in terms of site selection (i.e., woredas, and zone) we focus on representativeness of high potential and low potential areas1, from communities we use nearness to universities and research centers as one criterion to see the

[1] Planned survey in the south was not condcuted because of time shortage. The plan was to inclued one zone and woreda in the *Inset* belt areas and addistional woreda and zone in highvalue fruit and vegetable producing areas.

influence on SLM technology generation and dissemination. Moreover severities of rates of land degradation and involvement as well as successful results in donor supported projects were taken criteria for other communities.

In terms of government organization we consider high involvement in planning and implementing SLM practices at different levels, responsibility in setting and implementing policies and strategies, conducting agricultural education, technology generation and dissemination. Accordingly within HLIs we selected Alemaya University representing the prime agricultural universities and collages and Mekele University representing those established recently and within research we took one representative research center in high potential areas and one research institute in a rather challenging environment in terms of land degradation. Within donors, we selected two organizations that have ample experience on SLM in the country (methodological, technical, resource mobilization, area coverage and length of commitment) and from NGOs we took one sample NGO who is pushing innovative approaches in the country.

Open ended questions were prepared for each group addressing issues suitable to their mandate and level, i.e., one questioner for each category. Except with farmers and high government officials, brief explanations were given about the objective and the contents of the questionnaires and were distributed. The stakeholders were allowed to fill it in group and later on they discuss their view with investigators in group discussion. With the farmers we directly raise the issue and discuss in group. We choose the kind of method where the investigators only trigger discussions but the major interaction was among farmers themselves. Care was taken not to influence the discussion at all levels. We choose very flexible approach with those government officials and donor representatives as most of them have limited time. For some we directly raise the issue and initiate discussion, for others we brief them and gave them the questioner (for those who have been heavily involved on SLM issues).

Moreover, numerous documents, including strategies, policies, evaluation reports, research outputs, and guidelines etc., developed by different actors were reviewed.

The analysis part involved filtering issues from questionnaires filled by stakeholders, summarising issues from direct group or individual discussions and from review documents. We avoided quantified results form our questionnaires because this requires extensive area and group coverage. We rather focus more on qualitative interpretations of survey results.

2 Sustainable land management: definition and study perspectives

The concept and definition of sustainability is broad and varies depending on the problems to be addressed. There is a need to give clear working definition of sustainability in the context of our problem. According to Hurni et al, (1996), sustainable land management is defined as "a system of technologies and/or planning that aims to integrate ecological with socio-economic and political principles in the management of land for agriculture and other purposes to achieve intra- and intergenerational equity

WOCAT, (2005), define SLM in more specific term as "the use of renewable land resources, including soils, water, animals and plants, for agricultural and other purposes to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions".

According to these definitions, SLM is thus composed of the three development components, i) use of different technologies/practices and integration among them to solve ecological and socio-economic constraints, ii) the need for participatory land management planning to meet community needs and use of the renewable natural resources sustainably without compromising their environmental functions, iii) and the need for an appropriate policy environment to undertake the above major tasks on an equitable basis.

Therefore, SLM in the Ethiopian context could be 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 on the decision making process (planning, implementation and management), and appropriate policy environments to ensure the successful implementation of the above processes

In this regard, SLM is not only the use of physical soil conservation measures, which is a common mistake made by almost all actors in the country, but also includes the use of appropriate soil fertility management practices, agricultural water management, forestry and agroforestry, forage and range land management, and application of these measures in a more integrated way to satisfy community needs while solving ecological problems

We foresee that to improve the quality of intervention and up-scale successful SLM practices it requires intra- and interdisciplinary linkages, effective integration of practices/technologies, flexibility in addressing community needs and priorities, participation of communities in the decision making process, existence of appropriate capacity and resources, appropriate policy environments and most important of all efficient utilization of available manpower and resources. . Blanket recommendations and approaches cannot address specific local situations and hence cannot insure SLM in general. WOCAT, (2005), shares a similar idea and defines SLM as an approach based on the socio-cultural, institutional, economic, and ecological dimensions of sustainability. Therefore, implementation of SLM should be seen within the specific local context. Moreover, SLM also aims to harmonize the complementary but often conflicting goals of production and environmental protection. Hence, the need for balancing between economic feasibility and ecological soundness of SLM practices has paramount importance. It was with this understanding the survey was conducted and we would like to see the findings in line with these principles.

3 Stakeholders involved in promoting SLM practices

The stakeholders that play an active role in the promotion of SLM practices in Ethiopia can be grouped into six broad categories, i.e., government development agencies, research institutes, agricultural/environmental education institutes, farmers, regulatory agencies, donors and NGOs. These are the major groups that play their own role, either in groups or individually, and have significantly influenced promotion of SLM practices and approaches in the country. The function of each stakeholder group and the roles they play in the entire system are briefly discussed below (for details see Appendix 1).

Government development agencies: Under this group we see the federal Ministry of Agriculture and Rural Development (MoARD), the regional, zonal, and woreda bureaus (BoARD, ZoARD, WoARD), and the community level development agents (DA) as major players. This group plays decisive roles in the promotion of SLM practices/technologies in the country. The group determines the approach, types of SLM technologies to be promoted, amount and mechanisms of implementation. Despite some intervention by local administration in different forms, the planning, implementation, and monitoring and evaluation (ME) processes are largely carried out by these agencies.

These agencies indeed have applied commendable effort in initiating the massive land rehabilitation programmes starting from the 1980s with the aim of arresting land degradation and improving rural livelihoods in the country. Despite this massive undertaking, however, there has been limited success in controlling land degradation and associated problems as compared to the efforts applied, the organizational structure and the resources mobilized (Gete Zeleke, 2000, Shiferaw and Holden, 1998). Although this has to be seen in timeframe perspective, this is mainly related to the top down planning approach, (except in some donor assisted projects), lack of experience and capacity and lack of awareness. Most of the constraints presented in section 5 that affect promotion of SLM practices have direct relation to the function of this group.

Research institutes: This includes the national and regional research organizations (EARO, regional agricultural research institutes (RARIs), federal and regional agricultural research centres, higher learning institutes (HLIs)) and the international research centres mainly composed of CGIAR centres and some commissioned research forums and groups. The roles of these organizations with regard to SLM are to generate and or adapt SLM technologies that are suitable to the different AEZs of the country, undertake systematic studies to help successful implementation of SLM practices, help policy makers to make informed decisions, assist the extension agencies to be well equipped with required information and mechanisms of promotion, assess impacts and suggest possible areas of improvement. Moreover, this group has also responsibility to bring international experiences and also technologies that are proved effective and fit local conditions. Accordingly the group produced some notable research outputs on SLM that have national and some site-specific implications. For instance, various soil fertility management research results, Vertisol improvement works and the works of SCRP which focussed in understanding land degradation processes and controlling mechanisms in the country are some of the outputs of the group to mention few.

However, the research institutes in general, particularly the national system, have been constrained by lack of capacity and experience on SLM, particularly on physical soil and water conservation, agricultural water engineering, soil pedology, assessing macro-level land degradation and agro-ecosystem studies. Many stakeholders stated that the research system could have done more than what it did so far in rendering required outputs (e.g. economics of SLM and mechanisms of up-scaling SLM practices) and services to check the land degradation problem in the country and effectively promote SLM practices. Apart form problems related to capacity, many of the stakeholders regarded that lack of integration within the research system (among disciplines, among the regional, HLIs and federal systems as well as between the national and international institutes) and with the extension group as a major problem. Details are discussed in section 5 and Appendix 1.

Regulatory agencies: This group includes the EPA, and Environmental Protection and Land Administration Authorities at different levels. These institutes lack

experience and are understaffed since they are relatively newly formed institutes and partly lack of appropriate graduates in the field. There is no university or college that gives courses on land administration and environmental protection in the country. Despite these constraints, the EPA was able to formulate a number of environmental policies and strategies. Recently, most of the regional authorities (Amhara, Tigray, Oromya and SNNP) have formulated regional land administration and use policies and implementation has been started in these regions. Right now land registration and certification are underway in these regions. It is hoped that this will increase land tenure security and improve investment in land management. However, according to some stakeholders concern, the effort towards developing appropriate land management systems and making available different development options that the communities can choose seem far from being realized. Moreover, many stakeholders recommended that implementation of the main environmental policy and related sectoral policies (see Appendix 3) and reinforcement of the different polices formulated by this group at federal and regional level in general requires careful consideration.

Agricultural and Environmental Education institutes: The HLIs (Agricultural universities, and colleges) and Technical and Vocational Training (TVT) colleges are responsible for providing training in agriculture and natural resources management specialists of different qualifications. Recently the numbers of institutes and graduates have been substantially increased. However, the quality of education at all levels seems not to the required standard except in few cases. Many stakeholders complain that the graduates are neither rich in theoretical knowledge or practical experience to promote sustainable land management practices. Improvements in the quality of education and the curriculum itself require serious consideration at all levels. Moreover, there is a need to redefine or develop new curriculum to address sustainable land management issues in the country. This should also be done with serious consideration of the demand for such changes and in consultation with major stakeholders.

Donors: Although the support for SLM has been relatively limited as compared to other humanitarian assistances, several donors, including GTZ, the World Food

Programme (WFP), USAID, the World Bank, and others, have been strongly supporting the promotion of SLM practices in different parts of the country. Some of these donors give project support but are not heavily involved in the implementation process. Others provide both resources and hands-on technical support with strong attachment with implementing institutes. A good example of this kind of arrangement is the MERET project, where the donor (WFP) is working closely with MOARD and other implementing agencies and provides resources and hands-on technical backstopping (Gete Zeleke, 2005). It was through the latter kind of arrangement that many of the successful SLM practices in different parts of the country were promoted.

However, as also stressed by stakeholders at regional and woreda level, most donors have their own financial procedures that create problems for efficient utilization of their support (see also Gete Zeleke, 2003). Moreover, most donor-supported projects on SLM are highly concentrated in degraded parts of the country. In principle this is not a problem but, according to most stakeholders view, it could have been possible to also address less degraded areas to prevent further degradation using different form of support such as training, field, and office equipment, running costs, etc, and this is cheaper than rehabilitation.

NGOs: This includes international and local NGOs. Often, environmental rehabilitation is the major component for NGOs involved in agricultural development. This group is also highly efficient in applying or using some innovative methods and approaches to promote SLM such as integration of land management with income generation, credit, value adding and marketing. As a result there are some examples of success here and there. However, one of the limitations of this group, as mentioned by stakeholders, is that they often address very small areas, and continuity of similar or better activities after phase out of these projects is not assured. This is partly related to their relatively capital intensive approach, such as building cement check dams, high cost gabions, etc; but also related to sometimes unfulfilled promises that raise expectations of communities, lack of strong institutional linkage, and relatively high overhead costs (many consulted stakeholders within the

government claim this). Moreover, like that of the donor assisted projects, except very few, most NGOs work only in already highly degraded areas.

Land managers (farmers and communities): In principle this is the group who should decide whether to take certain SLM practices or not. In the past, when indigenous knowledge was the only means of land management, this has been the case. However, according to consulted farmers, with the development of the extension system, which is often top-down in nature, population growth, changes in policy and ever reducing farm sizes, farm households' decision making role on SLM reduced[2]. As a result of this, in many instances, land management measures have been introduced or implemented without getting farmers' willingness and consent. This greatly contributed for the poor sustainability of introduced land management practices in many places. This combined with poor quality work negatively affected farmland and that in turn resulted in the development of a negative attitude towards certain soil conservation measures (e.g. most interviewed farmers, especially those in "high potential areas" confirmed that poor quality of work done on their plot without their agreement (lack of proper consultation) as well as poor integration of land management practices (for instance, graded SWC structures without waterways, and level SWC structures without cut-off drains to divert excess runoff above the capacity of structures, etc.) indeed negatively affect their land). However, in some areas where donor-assisted projects have introduced participatory approaches and managed to link soil conservation with NRM-based income generating practices, farmers have been extensively adopting SLM practices (e.g., farmers in Chencha and Omo Sheleko woreda in SNNP show greater interest after WFP assisted MERET project introduced improved apple and other NRM based income generating activities (personal observation and consultation, 2005).

[2] There are, however, some exceptional areas that are successful with lots of experience on the use of indigenous SLM practices. To mention a few examples: Farmers in Konso and Ankober (Million Alemayehu, 2003) have very rich experience with stone terracing, soil fertility management and below bund plantation of high value crops. Farmers in Hararge highlands have excellent experience on inter cropping, moisture harvesting using tie-ridges, and zero grazing; farmers in Raya valley (Kobo and Alamata) have very good experience in runoff farming (based on personal observations; see also Reij and Waters-Bayer, (2001) and Reij, et al., (1996))

4 SLM practices and approaches: An overview

4.1 SLM Practices or Technologies

The SLM practices/technologies that have been applied in Ethiopia can be grouped into two broad categories (indigenous and introduced), with different degrees of acceptability, area coverage and benefits. Each category includes the following practices: physical soil and water conservation measures (dominant in the country), biological soil conservation measures, soil fertility improvement measures, agricultural water management measures, grassland management measures and forestry and agroforestry measures. Each of the above mentioned two broad categories have one or more elements of activities in these groups of activities (for details see appendix 2).

Indigenous SLM practices: For generations farmers in different parts of the country used to apply their own indigenous SLM practices to halt land degradation, improve soil productivity and woody biomass production. Some of their indigenous practices were effective, despite some limitations as mentioned on Appendix 2. As population increased with an ever-accelerated rate, some of the indigenous practices such as fallowing, manuring, crop residue management, and leaving trees on farm declined due to high demand for fuel wood, feed and house construction. On the other hand tree planting around homesteads, farm boundaries and smaller woodlots, mainly eucalyptus, has increased.

The other major problem associated with indigenous SLM practices, as also mentioned by many stakeholders, is lack of appropriate and well defined standards, design criteria, and integration requirements. As a result, sometimes they are over done or left below standards. However, in both cases, failure to have clear standards has its own negative consequences.

Despite some of the limitations in the use of indigenous SLM practices, there are very successful sites where one could draw lessons (See also footnote 1). However, these are generally not properly documented, with some exceptions (see Million

Alemayehu, (2003 and 1992), Reij and Waters-Bayer, (2001), Reij et al, (1996), and Berhanu Fantaw et al, (1992)).

Introduced SLM practices: The introduction of SLM practices in the country has dated back many hundred years. However, the most recent attempts, which are more focussed and extensive, started after the 1973-74 drought in parts of the country. Application of artificial fertilizer, SWC measures of various types, and afforestation/reforestation, enclosure of degraded hills are the four major components of SLM that have been pushed extensively since then. There are very good examples of success stories of these measures (e.g. in many of MERET project sites, i.e., Ambasel, Kalu, Wukro, Omo Sheleko, Chencha, Gorogutu, Dessie Zuria, Adet Nadear, etc) and many donor assisted project sites such as GTZ, and others. However the scale of these efforts, while important and often impressive at the location specific level, they cover only a fraction of what needs to be treated as degraded land nation-wide.

Particularly in areas that are not covered by donor supported projects in general and in few of project supported communities, compared to the length of intervention or initiation period and applied efforts, the impacts of introduced measures (with the exception of artificial fertilizer) are not that significant (Gete Zeleke, 2000 and 2005). See also section 5 and Appendix 2 for detailed description of associated problems. Often single SLM practices are considered to give solutions for controlling land degradation and improving land productivity. However, apart from its correct application, it is an integration of different measures that could give desired results. Many studies revealed this fact (Kassie and Holden, 2005), Shiferaw and Holden (2004)).

There are a number of SLM practices, such as hillside rehabilitation through distribution among community members[3] (Gebremedhin, Pender and Tesfay (2003); Jagger, Pender and Gebremedhin (2005)), tie-ridging, conservation tillage, etc, that

[3] Degraded hillside distribution has been taken as one important intervention area for rehabilitation of degraded hillsides after some farmers got high income (up to 200,000 ETH Birr) from selling eucalyptus poles grown on previously distributed degraded hills in some woredas (Head of NRM Sector of BoARD in Tigray Region, personal communication).

have positive impact on reducing land degradation and increasing household income. For instance, the conservation tillage experiments and demonstrations in different parts of the country supported by SG-2000 on Wheat, Maize, Teff, and lowland beans, showed better net income as compared to conventional tillage without incorporating the costs of land degradation (SG-2000, 2001, 2003 and 2004)[4]. However, according to some stakeholders in Ambasel woreda and SG-2000 (group discussion) and our personal observations, these technologies have not been sufficiently well promoted by the responsible organizations, for reasons that are not clear to the survey team. The attempts made by different stakeholders to restore soil fertility and control land degradation using other SLM practices have been impressive. However, what technologies could do better and in what condition; or for what purpose what technology or combination of technologies are required seems not clear to most stakeholders, and needs special attention.

4.2 Approaches used to promote SLM

A number of approaches to promote SLM have been tested or applied by different actors and this is mainly related to the fact that most donor-supported programmes are often attached to different approaches. Despite internal differences, almost all of them have one goal in common; the need for improving participation of communities in the decision making processes. The most notable ones are: Community Empowerment Programme (CEP) used by SIDA-Wollo programme, Community Driven Development (CDD), used by the World Bank to implement its food security project, Participatory Land Use Planning (PLUP), used by GTZ to implement its food security project, Local Level Participatory Planning Approach (LLPPA), used by WFP to implement its MERET project, and Community Based Participatory Watershed Development (CBPWD), which is a recently developed approach by MoARD combining the different experiences in the country. These approaches have been implemented, some of them for a fairly long time, (e.g., LLPPA starting form 1992 on

4 Plenty of experimental results on different types of conservation tillage are available in these documents. Although the response varies on crop type, location and treatment type, the general trend shows that conservation tillage in the Ethiopian condition is more profitable without adding the net benefit from controlling land degradation. Moreover the results showed that the use of herbicides can be significantly reduced after the second year of CT in some areas.

pilot basis and gradually scaled up) in the country (with the exception of CEP which was replaced by LLPPA somewhere around 1997, and CBPWD which was recently developed by MoARD) and have accumulated ample experiences.

Some of these approaches have attempted to instil a pure grass roots level kind of approach where expert knowledge and opinion have very little room to provide support. Others tried the reverse of this where despite the word participatory; the farmers have not much say in the whole process. Although both approaches have their own merits and demerits, the long experience in Ethiopia shows that neither approach does a good job alone. So, one should try to find the optimum balance between these two extremes. In line with this, some projects tried a number of options and came up with a mix of the above two, with still more room for further improvement. The latest approach, i.e., CBPWD, which is a hybrid of some successful approaches in the country, is a good example of an approach that tried to accommodate both technical and participatory elements.[5] Although a lot more has to be done along this line, the development of this approach is one step ahead towards promoting sustainable land management in the country.

The above few paragraphs tried to discuss attempts made towards the development of participatory planning and implementation approaches for SLM in the country. As part and parcel of these approaches, there have been some innovative actions taken in the past that have positive impact on the whole SLM initiative. These are briefly discussed as follows:

Hillside and gulley distribution among communities: In some parts of the country degraded hillsides and gullies were distributed to community members based on agreed community bylaws. For example, in Tigray, degraded hillsides have been distributed to households for private tree planting, subject to regulation by the community to ensure sustainable use (Gebremedhin, et al. 2003; Jagger, et al. 2005). Although not in all areas, this approach has shown quite remarkable results in

[5] In a review of watershed development projects in India, Kerr (2002) found that projects that combined technocratic approaches with participatory approaches were more effective than either purely technocratic or purely participatory ones.

successfully rehabilitating degraded hills and changing highly rugged gullies into productive lands. Most of these successful results are observed in areas where there has been some project support. Despite this remarkable result, the expansion of this approach is still limited. At least during our survey we did not find any satisfactory reason that blocks the promotion of this approach. The results are clearly visible and stunning but why this has not been promoted more widely seems a case to be closely investigated. Otherwise, probably this is the kind of very cost effective and systematic approach to rehabilitate the degraded hillsides in the different parts of the country.

Integrated homestead development: After having worked for many years on the core part of land management practices, some projects realized the need for value adding and natural resources management (NRM)-based income generation at household level. Homesteads and plots proximate to homesteads are found appropriate for this kind of approach. This is because the tenure of these plots tends to be more secure than that of other plots further from the homestead, easy to manage including protection from damages caused by livestock, and also more convenient for applying soil fertility improving practices such as compost and manure. It is also easier to integrate high value agricultural activities like small-scale fattening, dairy, apiculture, and horticulture on such plots. The MERET project is pioneering this initiative with a systematic approach focussing at household level. This approach was very effective in improving household income and it increases the interest of many farmers to apply more SLM practices on their remaining plots. This approach shows the need to link any land management activity with income enhancing practices both at household and community level. However, focussed and integrated professional support, regular monitoring and resource are required until the farmer get the benefit of the various interventions which is a key element in expanding this approach (Gete Zeleke, 2005)

Seedling pricing: In the past (up to 1997) farmers were provided seedlings of various kinds to plant within their own plots free of charge. Although very few farmers managed to exploit this opportunity, the result was not comparable to the amount of seedlings produced and distributed (EPLAUA, 2004). Even though there is no

empirical evidence, the survival rate of seedlings increased, as stated by Tigray BoARD during our discussion, after some regions reportedly introduced a simple seedling pricing system (this may show how high the value of money in rural areas is). This could be one of the NRM-based income generating activities that could engage some rural households effectively.

5 Opportunities and Constraints to improve quality of intervention and scale-up successful SLM practices

5.1 Opportunities to promote and scale-up SLM practices in the country

Previous attempts by the government and non-governmental actors in halting land degradation have left some valuable experiences and many opportunities behind. We believe that making good use of these opportunities should be the starting point to promote successful SLM initiatives in the country. The focus of many studies so far, however, was pinpointing problems or constraints rather than capitalizing on opportunities. In this section we try to see key opportunities that will help improve the quality of intervention and up-scale successful SLM practices.

Existence of environmental policies and strategies: Although the implementation leaves much to be desired, Ethiopia has made commendable efforts in terms of policy and strategy response to address environmental degradation (Gedion Asfaw, 2003). One of the most important umbrella polices is the Environmental Policy of Ethiopia (EPE). This policy was approved by the Council of Ministers in 1997 and addresses a wide variety of sectoral and cross-sectoral environmental concerns in a comprehensive manner. The major aim was to ensure sustainable use and management of natural, human made and cultural resources and the environment (Ibid). Following this a number of sectoral polices and strategies have been approved to translate the above umbrella policy into specific actions (see Appendix 3 for details). Moreover, land use and land administration policies and strategies have been developed by different regions and an autonomous organization has been established to implement them. Very recently, the federal government also approved

the national land use and land administration policy. Many global environment conventions have been approved by the government.

Policy making is not a simple task; it requires time and resources. In the case of Ethiopia much of the hard work is done. However, implementation, efforts applied to make the public aware of policies and strategies, internal consistency and inter-linkages of sectoral policies and strategies are the major shortcomings. Formulating sound environmental policies is an achievement but it is not an end by itself. Therefore, the need is to solve major constraints mentioned above to implement the policy instead of looking for another new policy and strategy to promote SLM.

Rich experience on participatory watershed management: The need for genuine participation of communities at all levels of the decision making process is one of the key requirements of successful SLM undertakings. Although there are many issues for different approaches which need careful scrutiny, there are very good experiences in the country as mentioned in section 4.2. The government has recognised for the need for participatory watershed management and recently MoARD developed a national guideline known as Community Based Participatory Watershed Development, (Lakew Desta, et. al., 2005) by taking the potential procedures from selected approaches in the country. This is one of the most important steps taken by the government for effecting SLM in the country.

Organizational setup of MoARD and National Research System: The organizational set-up of MoARD, regional and local bureaus of agriculture extending down to the kebele level (with three DAs in each kebele), the national agricultural research system, which is composed of federal, regional institutes and research centres that almost covers major agro ecological zones, and the system of higher learning institutes (HLI) offer key opportunities that could be exploited to successfully implement SLM in the country. The existence of international research organizations (CGIAR) in the country is another opportunity to bring in international experience. However, lack of appropriate integration within and among these systems and limited capacity are the two major constraints for the proper functioning of these huge set-ups (see also Section 5.2).

Therefore, the immediate focus could be establishing a functional system within each organization to allow intra- and interdisciplinary linkages, and for all to follow demand driven, consolidated, and integrated approaches, for proper implementation of SLM in the country. Effective capacity building in each organization using various means, including focused on-job training, is the other immediate task to potentially exploit the opportunities offered by the existing institutional set-up.

Ecological diversity to test a wide array of SLM options: Ethiopia has a highly diverse agro-ecological environment that originates from its location in the tropics and geological processes of landscape formation. This ecological diversity has a great potential to allow testing of a wide variety of SLM technologies and practices in different combinations. The planner or researcher will not be constrained by limited ecological conditions to introduce SLM technologies and practices that have proved successful elsewhere in the world and in Ethiopia. In this regard, the only requirement could be systematic adaptation of selected SLM technologies to the local biophysical and socio-economic settings.

Availability of both indigenous and scientific knowledge: Although some environmentally friendly indigenous land management practices have been abandoned due to various factors, mainly population growth and scarcity of farm lands, there are rich indigenous knowledge and practices that can be further exploited (see also Section 4.1 and Appendix 2). Moreover, over the last four decades, many SLM technologies have been introduced or generated by research in the country (see Section 4.2 and Appendix 2). For instance, an entirely new range of soil and water conservation measures have been introduced to accommodate arid and semi-arid conditions, previously largely neglected areas from extension and research. The MERET project with MOARD introduced over 20 new set of measures for these areas concomitant to improved technical standards and work norms for all new and existing measures altogether. The GTZ project introduced a set of very effective vegetative measures that are very instrumental in gulley and highly degraded land rehabilitation. Moreover, some of introduced SLM measures have been modified to fit specific local conditions and are successful in many parts of the

country (for instance, increasing vertical intervals between physical conservation measures compensated by increment in standards of structures is a widely accepted modification in many of MERET project sites). There are also technologies of great potential but not properly exploited due to adoption problems or lack of proper technology dissemination mechanisms, such as conservation tillage, tie-ridging, the broad-bed maker (BBM), etc, mainly related to the weak linkages between research and extension. Though the latter problem needs careful intervention, most of the introduced and scientifically generated technologies will not be alien to the communities. The task ahead in this regard is to take inventory of the different indigenous and introduced SLM technologies and practices in the country, as well as those generated by the national research system, and characterise them including possible integration within and across different technologies. Disseminating this information and devising systematic technology introduction approaches could be regarded as the immediate tasks along this line.

Availability of successful SLM practices and experiences: It is not only the availability of SLM technologies and knowledge as mentioned above but also the fact that there are areas in different parts of the country where pockets of successful SLM practices are visible. Some of them are indigenous and others are introduced. The key issue in this case is, however, that these areas are like islands. Replication of these successful practices remains a challenge. Moreover, despite some isolated efforts here and there, lack of appropriate inventory of these stories at national and regional level is another constraint. Therefore, the immediate task in this regard could be rearrangement of the available information, gathering additional information, and devising up-scaling mechanisms in the country.

Existence of donor support: Although the support to SLM is limited, there are several donors interested to assist interventions on SLM. The key issues here are not only the limited availability of the resources but effective utilization of the resources at hand. This is related to the high level of bureaucracy in using resources (most of this emanates from donor procedures and requirements) and lack of donor resource harmonization. The latter issue will be discussed in depth in Section 5.2.9, but this is one area that requires serious attention. Beyond this, additional resources are

needed; without increased resources it would be a futile exercise to try arrest land degradation and implement SLM practices. However, one should focus as a priority of intervention to devise a simple and less bureaucratic system for the proper utilization of the available resources.

Carbon sequestration projects: In recent years, many developed countries have been trying to reduce their carbon emissions through investment in afforestation and reforestation projects (or agroforestry) in developing countries. The developing countries will be able to sell their sequestrated carbon to developed countries as a pollution offset. Since Ethiopia has huge degraded mountains and hills, it could substantially benefit from carbon trading. This could lead to a win-win situation: more income (carbon and timber revenue) and sustainable environment. This can be used as new opportunity to up-scale SLM practices. The landless members of communities could also benefit from this practice if the benefits are distributed among all community members. Project funds can be secured from the World Bank and the Global Environment Facility (GEF). Recently, the World Bank has carried out a pre-feasibility assessment of the Humbo (Wolayita Sodo) reforestation carbon project

5.2 Strategic constraints hindering the quality of intervention and up-scaling of successful SLM practices[6]

Probably this is the most debated issue by different authors and presented in various reports. However, constraints affecting single components of SLM are often discussed and sometimes the problems arising from the lack of integration among the different components are neglected. This kind of approach leads to erroneous conclusions and sometimes can be a source of misunderstanding. We tried our best to present SLM in its holistic nature and find out the key constraints from stakeholders' perspectives at different levels. The following are key constraints that

[6] This sectrion, though critical, should not be taken as disregarding the various positive efforts and results of the government in general, communities, donors, NGOs and others in the country. However, it is try to reflect on areas that needs further improvement or better consideration and ation to combat the serious land degradtion problem that is previaling in the country. It also tried to pinpoint some overlooked issues that have determinental role in the fight against land degradtion in the country as mentioned by many stakeholdrs.

negatively affect the quality of intervention and up-scaling of successful SLM practices in the country, based on our discussions with stakeholders:

5.2.1. Lack of proper awareness among policy makers of the extent and impacts of land degradation

Land degradation is a long-term and subtle process where its effect and steady expansion is hardly noticed until it manifests itself with disastrous drought and famine. That is why the attention to the problem was very little in the country until the 1973-74 drought, although it has still not received appropriate attention commensurate to the high risk it poses to current and future livelihood security (Gete Zeleke, 2005, forthcoming). This is partly explained by the fact that often land degradation is only associated with the tons of soil lost per hectare per annum or depletion of hectares of forest coverage, and this does not seem to impress policy makers in many cases. It is in fact the loss of productivity, and consequent impacts on people, which is more salient as erosion removes the most fertile top soil, along with readily available soil nutrients, organic matter, and reduces soil depth and soil moisture holding capacity. These effects lead to reduced productivity and increased vulnerability to famine. However, use of some improved agricultural inputs, even without proper land management practices in place, can mask the effect of land degradation, especially in areas with relatively better and deeper soils. Because of this many stakeholders have regarded land degradation as a problem of highly degraded areas only.

This misunderstanding, according to many stakeholders, is created because very little has been done to show costs of land degradation and benefits of applying SLM practices in a holistic and comprehensive way. Even though there have been some attempts to estimate costs of land degradation in Ethiopia, these only considered on-site effects without addressing externalities of land degradation (Mahmud et al, 2005). Moreover, there have been very few attempts to develop easy-to-apply diagnostic tools such as easily applicable models to help decision makers and planners to make informed decisions about land degradation.

5.2.2. Lack of awareness of the nature and technical requirements of SLM practices

Another very important misunderstanding, not only among policy makers but also among many scholars, is that construction of soil and water conservation (SWC) measures is considered as the main solution in halting land degradation. In almost all cases SWC measures are unjustly evaluated and criticised against their purpose. The issue of integration among the different SLM practices/technologies to make soil and water conservation measures more effective and enhance soil productivity are seldom considered. Moreover, the technical requirements of these measures are often forgotten.

Although it is highly associated to the ambitious desire in solving the problems food security and land degradation as fast as possible, mostly, attention is given to the number of achievements but not to the quality, standard, and sustainability, and integration with each other and other impacts. That is why some technologies are being pushed beyond their margins (e.g., blanket recommendations such as fertilizer application in highly moisture stressed areas, construction of water harvesting ponds in highly permeable soils, level soil bunds in high runoff areas, etc.) and technical requirements. According to almost all consulted stakeholders, this has not only created resentment of some technologies among farmers and communities, but also resulted in wastage of the meagre resources in the country. In most cases it negatively affects the economic status of individual farmers and further aggravates land degradation problems. This misunderstanding, particularly at higher levels, persists and has very strong negative effect on proper application of SLM practices. Because of this, a frightening trend of neglecting professional opinion develops at lower levels, particularly at woreda level. This is one of the major issues we observed during our stakeholder survey and many of the consulted stakeholders are highly concerned about it.

5.2.3. Top-down planning approach to technical assistance

Although the current level of poverty in the country is pressing, technology dissemination requires time and a careful approach to address community needs,

build capacity and trust, and to demonstrate flexibility and share risks. According to Ashworth (2005), sustainable development can only be achieved when actual beneficiaries of the technical assistance feel they are equal partners and that they, rather than the government, are the owners and drivers of the process. Long-term sustainability is more likely to be achieved if development is driven from the bottom-up and if it addresses farmers' and communities' immediate needs and constraints. It seems, however, that from our findings, the extension approaches exercised in Ethiopia have very few elements of the above mentioned processes; particularly with regard to promoting SLM practices. Quick solutions rather than sustainability, quantity rather than quality, area coverage rather than impacts, seemingly command and control system rather than participation, are the dominant approaches that have been followed by the extension system, according to many stakeholders. The problem in general is presented in the following two broad categories:

Looking the constraint in its broader sense: Apart from its top-down nature, the extension system has never been consistent in the country. Often, new approaches are introduced without adequately evaluating past experiences and investigating the suitability of the new approach. For instance, the Training and Visit (T & V) system was changed to the Participatory Demonstration Extension Training System (PADETS) with the vision of increasing participation of communities, but the participation element was largely confined to demonstration plots being implemented cooperatively with farmers on their own land (Ashworth, 2005) and had limited success with enhancing the decision-making capacity of individual households and communities. Even those involved in the demonstration plots are not taking part in the decision making process (**Box 1**). Currently, the PADETS approach appears inconsistent, with continual addition or reduction of pieces and bits by the different regions. Accordingly one would face difficulty to precisely define the current extension approach, but Box1 clearly describes the shortcomings of the current approach.

Box 1:
PADETS places great emphasis on demonstration plots, on farmer training in improved technology use, and on offering complete technology packages to farmers, including credit. The participatory aspects are largely confined to demonstration plots being implemented cooperatively with farmers on their own fields. PADETS has achieved remarkable success with expanding the use of improved technologies, especially fertilizer and improved seed varieties. This success, however, has come at a cost. Farmers found they could not sell the marketed output at economic prices. This starkly revealed the structural weaknesses in the Ethiopian grain marketing system and, as a consequence, undermined the sustainability of the gains made.

The chief limitation of PADETS, however, is the weakness in enhancing the decision-making capacity of individual farm families and of their communities. Moreover, the narrow focus on expanding land productivity and technology transfer has limitations for those who live in remote poorly integrated areas, and those situated in the poorer, mainly drought prone agro-ecological zones.

For the most part, the extension service remains largely under centralized direction. The hierarchical 'culture' does little to encourage and exploit the inherent resourcefulness of those who work closely with farmers and rural communities. Farming communities do not participate in extension planning. Rather than being active facilitators of community capacity building and conveyors of relevant information, extension agents remain largely conveyors of technical messages. The content of these is decided by external decision-makers who, due to the lack of adequate local adaptation, do not, in too many cases, have the information necessary to make informed decisions on local contexts.

Adapted from Ashworth, 2005

Looking the constraint in a chronological order and specific to SLM: When the campaign on SWC was started initially it was in the 1973-74 famine stricken areas of the country using relief food. Shortly after that, modest expansion of the campaign for SWC and afforestation to the rest of the country occurred following the same top-down approach. At that time, however, neither the professionals nor the communities had much experience in modern SWC and afforestation activities. The only introduced SWC structures that were heavily promoted across the country were level soil and stone bunds, even in areas where the rainfall is high and excess runoff diversion is a major concern of local communities.

Incompatibility of the technology with local conditions, combined with the poor technical design (because of lack of skill and experience) and lack of participation and awareness at all levels resulted in devastating negative consequences. These poorly designed and constructed level structures were immediately filled by excess run-off (often during the first shower), broke and resulted in destruction of many farmlands which otherwise could have been in better condition. Most of the high rainfall areas of the country such as Shewa, Gojam, Gonder and Wollo and eastern and central Oromia, and some parts in the South were dissected by large gullies, and according to some stakeholders (and also personal observation), several of them originated from poorly designed SWC structures.

In the late 1980s, the government and some donors assisting the initial effort realized that the massive conservation effort was not having the desired results and tried to improve the capacity of technical experts, introduce participatory approaches, and introduce a variety of technologies suitable for the different AEZ, mainly in project assisted areas. This adjustment almost took a decade until it matured. The MERET project is a perfect example, and has passed through this process (Sonali, 2000, FAO/WFP, 2004, Barry et al 2005, Gete Zeleke, 2005). There have been marked improvements along this line since the early 1990s. However, these remained as pocket areas, concentrated in drought prone and highly degraded parts of the highlands, while much of the country remains with the same kind of approach up to now. The only difference from the 1980's campaign on SWC in high rainfall parts of the highlands where there are no donor supported projects is that the technology diversity and the technical capacity of experts, in relative terms as compared to the 1980s, is improved. However, the top-down approach largely remains the same, although it has acquired different names over the years.

During our survey we found that, in most of these areas (i.e., "high potential areas") the local decision makers at regional level are formulating the annual agricultural plans without much participation of key stakeholders, including key professionals in the field. Such planning seems done with very minimal consideration, or neglecting the local knowledge, clients' (farmers') interest and resources, the capacity of agricultural offices in terms of manpower, technical knowledge, and available

resources. A system of prescriptive targets, often locally understood as "quota" is used for implementing SLM practices in each woreda. Subsequently the woreda channels this quota to development agents (DAs) at kebele level, with little consideration for workloads, level of DAs technical know how and material availability to accomplish the tasks Most importantly, the targets do not consider aspects of suitability of the technologies to local conditions and farmers' interest in adopting them.

Consistent with this, we found that experts and DAS do not have sufficient space to exert their professional abilities and are often unable to express their technical views and concerns about planning and implementation aspects of SLM activities (i.e., little empowerment). Moreover, emphasis on application of physical SWC measures and artificial fertilizer highly dominates the interventions, and a holistic approach to SLM is not applied in these areas. This planning approach is (as mentioned above) focused more on quantity (number) than on quality, sustainability, and acceptance of implemented SLM practices. As a result many farmers are dismantling the SWC structures immediately after implementation. According to interviewed farmers, they often destroy structures because they had bad experiences in the past from poorly designed and constructed physical measures.

Although there are accepted and successful participatory planning approaches in most project assisted areas (such as LLPPA), we found that the quota system also applies in these areas. In spite of successful endeavours and significant improvements in planning and implementation aspects, the experts have difficulty to reconcile the quota with the actual planning, which is largely based on the needs and priorities of local communities. Unless the current quota system approach is stopped, the successful participatory planning process exercised by frontline experts in most project assisted areas, such as MERET, will be a futile exercise.

In most cases what has been planned in the previous year is the basis to set the new plan. By definition, the quota in the new plan must be higher than the immediate previous year's plan, irrespective of whether the previous year's plan was properly implemented or successful. Except in some donor assisted project areas the new

plan is set without closely evaluating the previous year's achievements. In general, we found that the monitoring and evaluation process for SLM is very weak, misleading and seems totally focused on reporting of numbers and disregards sustainability, acceptance and impacts of implemented measures.

In general, in a country where the vast majority of the population (over 85%) depends on subsistence agriculture, decades of top-down planning approaches and an extension system that is largely based on a numerical quota system for promoting adoption of pre-selected technologies has contributed to weak dissemination of proper land management practices and very poor sustainability of conservation measures, ultimately aggravating land degradation problems in the country.

Although targets are essential in any planning process, the planning process on SLM should consider participatory approaches and local specific technology dissemination as a central element for success. This has been demonstrated by many projects in the country and the lessons would be drawn from this to apply it at national level.

5.2.4. Weak linkage during technology generation and dissemination (inter- and intra-discipline)

This is another crucial constraint that affects proper implementation of SLM and up scaling of successful SLM practices in the country. Although the government invests huge public money in setting the institutional framework for the national agricultural research, education, and extension systems, there seems to be no strong functional linkages among them. Researchers working along with extensionists can make an important contribution by researching and developing demand driven conservation technologies and practices, analysing the factors that motivate farmers to invest more in SLM practices in their plots and formulating policy recommendations that will increase investment in SLM practices. Extensionists could serve as a bridge between researchers and farmers by providing feedback from the farmers to the researchers and vice versa, and also by being involved in on-farm research undertakings. The higher learning institutes could produce graduates that fulfil the demands of research and extension. They can also be involved in demand driven research agendas and

have great potential to do so, particularly using MSc and PhD students, which is possibly among the most neglected potentials in the country. Despite this function and potential of each actor, the current research-extension-education linkage is characterised by poor coordination, which affects the development and transfer of technologies from research to farmers.

In fact this is not a new finding; it has been identified in almost every document which reviewed the agricultural development process in Ethiopia within the last three decades. However, it still remains as one of the major problems hindering the agricultural development in the country. Opportunities for potentially useful intra- and inter-institutional linkages among these institutes should have been better exploited to speed up the development and transfer of demand driven technologies.

All of the above mentioned systems have expanded in their organizational set-up and service coverage. For instance, the single institute research system has been transformed into a multi-institutional system with the opening of the regional agricultural research institutes (RARIS). They are closer to the problem and they were able to open research centres to address the different problems or opportunities of major agro-ecological zones. The same is true of the higher education system, where several new agricultural universities and colleges have recently become functional. The extension set-up is not different either, where relentless effort has been applied to increase the number of DAs at the kebele level to three. Despite all of these undertakings, their impacts, particularly in halting land degradation and improve the well being of the rural community, seems not yet comparable to the applied effort.

It is not only the institutional linkages but also inter-disciplinary linkages within each institute that are also very weak. For instance, forage and agronomy experts hardly work together with NRM experts and vice versa. The whole system is a piecemeal approach, which has a negative impact on developing effective conservation technologies, information flow and resource allocation. It also has impact on the prospects of developing a holistic agricultural planning strategy. For instance, when conservation activity is planned, the influence of livestock on the sustainability of

implemented conservation measures is not considered. Similarly when irrigation micro-dams are constructed other support activities are not jointly planned and executed, particularly those related to treatment of the catchment area of dams.

In general, why this is happening seems a logical question to ask and we tried to analyze some of the underlying reasons based on our stakeholder interviews:

i) ***Systems for mutual accountability:*** Although the research system has applied some effort to involve representatives of the other two groups (agricultural extension and education) during the research review and advisory council meetings, all of them appear to walk little distance to fill the gap in between. It seems that there is a problem of moving out of existing organizational norms and culture to share experiences or to learn from others, to make joint efforts, to adjust internal system in accordance to the requirements or needs of the other group, above all to bring better impact through joint efforts. Moreover, there seems to be no strong system within each organization that makes each of the organizations accountable either to each other or to the farmer they are serving. One could fairly conclude that this lack of accountability in each organization somehow encourages all of them to perform their own task irrespective of the need for joint action.

ii) ***The mandate of the researchers (including from HLIs):*** According to our findings the mandate of the researchers seems limited to technology generation but doesn't extend beyond that. There is not a functional system in the research to communicate finished technologies to the extension and other systems, for instance the private sector. The only technology release mechanism available in the country is for improved crop, forage, and tree seeds. Once the research is completed, the researcher is not mandated to undertake any dissemination activities other than publishing a scientific paper. As a result, many important technologies generated by research, particularly on NRM, are not able to reach the end users.

iii) ***Emphasis on SLM:*** According to our findings, in all of the three separate systems, the emphasis given to SLM in its holistic nature is very weak compared to other sectors. Both the research and the extension system are highly crop biased and the emphasis given to research and education on SLM in the education sector is also limited. Although SLM is the basis for agricultural development in Ethiopia, it has been the least considered sector in all of the above systems. This could be mainly because of the misunderstanding mentioned on Section 5.2.1 and the complex nature of dealing with SLM as compared with other sectors.

iv) ***Incentives for integration:*** We looked further into the reasons for not having proper integration, both institutional and inter-disciplinary integration within each institute, and we found that there is not sufficient incentive for integration. For instance, in the national research system it is mandatory for individual researchers to prepare research proposals. During the evaluation of proposals the focus is on whether the proposal is technically sound and has not been addressed in the past elsewhere in the country. Whether the research proposal has an integrated element or not is not evaluated. However, we saw a small initiative by Mekele University, where jointly presented research proposals by different disciplines have better chance of success for their small research grant. Other than this small initiative, we didn't come across any kind of incentive that encourages institutes, groups or individuals to work in an integrated way. All of them are financed by the government for their annual work and there is not any requirement, precondition or additional incentive to use this resource for integration. Although the end result is rewarding, integration is highly demanding task. So, it is no wonder that institutes and individuals avoid this if there is no additional incentive for taking this initiative.

v) ***The mandate of extensionists:*** The way the extension system is functioning has contributed greatly to the lack of intra- and interdisciplinary linkages. Often, technology packages are developed at federal or regional level and transferred down to the woreda and DA level with their prescriptions. The packages are mostly sectoral. Often, the woreda experts and the DA asked to apply these

technology packages as they are sent to them. These frontline extensionists are mandated neither to modify these packages depending on their local specific conditions, nor to integrate the packages with other disciplines for better results. Moreover, they are also not mandated to consult other institutions laterally and have no incentive for doing this. Although the capacity of frontline extensionists to undertake the above tasks is questionable, they could have been trained and encouraged to do so through different mechanisms. The placement of 3 DAs in one PA might improve this in the future but need to be systematized and properly nurtured from the very beginning.

vi) ***Capacity to undertake SLM research:*** It has been said time and again that the national research system is highly crop biased and the experience is not far from that. Although some similarity can be accepted, the research design for SLM in general should be different from the crop research design. However, because of the rich experience in crop research, most SLM research designs tend to follow the same approach. Land degradation problems are complex and are resulted from interactions complex biophysical and socio-economic processes. Any research design to address this problem should be able to capture these complex processes unless there is a need for addressing single processes or issues. To do this both the available capacity and the experience are highly limiting and this is one of the limiting factors affecting institutional integration.

vii) ***Decentralization and linkage between federal and regional offices:*** In addition to the above constraints, following the decentralization process, there seems to be unclear institutional linkage between federal and regional agencies, mainly in research and extension. This is the other dimension of the problem which seriously affects dissemination of SLM technologies in the country. We found that there is no formal and inbuilt information exchange system between the federal and regional systems. In contrast to the extension system, there is an annual national research review where the regional research institutes also take part. However, this is also very weak and has no efficient feedback mechanisms. Some regions are still in need of capacity

building and guidance from the federal MoARD and EARO. Moreover, the regional systems in general need to have more information about methodologies, technologies, approaches and progress on SLM in other regions for experience sharing. On the other hand, the federal system also needs information about what is happening on SLM in each region, both in research and development. However, this doesn't seem to be the case, according to our findings, and seriously affects the proper functioning of the system at all levels.

5.2.5. Limited capacity to plan and implement SLM practices at all levels (including communities)

Within extension system: The extensionist at all levels, particularly at woreda and DA level, lacks adequate capacity on both methodological issues (e.g., on participatory planning techniques, as a facilitator and knowledge broker in introducing technologies to the farmers and addressing their needs, constraints and priorities to the research system, etc.) and technical issues related to SLM (actual knowledge of SLM practices/technologies on their standard, requirements, design, layout, what works where and how, support practices to make them more productive and sustainable, etc.). There is, however, a marked difference in capacity between extensionists working in "high potential" and "low potential" areas. The latter usually have access to some additional training and resource support by different projects, and have better exposure to methodological and technical issues. But this does not mean that capacity problems are not an issue in "low potential" areas as well. The causes of poor capacity, according to many stakeholders are: i) lack of focused in-service training and often poor quality of training, ii) staff turnover, especially at woreda level, mainly due to lack of an appropriate working environment, including current trends of neglecting professional knowledge or opinion during the planning and implementation process (see also Section 5.2.2) and assignment of experts to areas outside their original profession, iii) very weak technical backstopping to the woredas and DAs by the federal, regional and research system, iv) lack and/or poor availability of appropriate guidelines and additional reference materials to help

professionals improve quality of their intervention and guide communities in better directions, and v) incompatibility of the DA curriculum with the current level of land degradation in the country and the holistic nature of SLM.

Although the capacity limitation of experts at different levels is important, the DAs weak capacity is the most important limitation, as he/she is the one responsible for promoting SLM practices at community level. Most development agents do not understand adequately the concept of SLM practices with all their requirements. In some places there seems no knowledge difference between DAs and the farmers, or the DAs are less knowledgeable and experienced than farmers[7]. This results from a lack of focused in-service training after DAs graduate from college and inadequate practical training while they were in agricultural colleges and training centres. Despite the initial proposal by MoARD to make the training more practical and less oriented on theory, we actually found that the training emphasis in most of these institutes was nearly the opposite. Beyond the level of emphasis on theory, as mentioned by consulted DAs and experts, the theory itself seems not based on local conditions, but rather the experiences of other countries due to lack of materials produced on Ethiopian conditions. Apart from these problems, DAs do not have sufficient incentives that motivate them to properly transfer extension messages. Their salary seems not in line with their workload and it is lower than other public employees working in similar areas (e.g. teachers).

Despite the presence of three DAs at the kebele level with different professional training (crop, animal science and natural resources), which is an action that requires appreciation, we found that each of them usually do all the jobs. This means the purpose of having three disciplines together to deal with the different disciplinary tasks as per the required standard but with proper integration among them is forgotten. For instance, the animal science graduate DA is often obliged to implement SWC measures and crop specific tasks whenever he/she goes into a kebele. This could result in poor implementation of most SLM activities that require engineering knowledge and often create serious land degradation problems on farmers' plots.

[7] Some consulted framers express their serious concern abut this issue in almost all places.

Moreover, the accountability of DAs seems not clear since the woreda decision makers can give an assignment to any DA without consulting the woreda office of Agriculture and Rural Development, irrespective of whatever work plan or workload the DA has. The DAs are forced to be involved in many other activities outside their line of duties such as collection of repayment of loans, distribution of inputs, etc. (Ashworth, 2005). Apart from negatively affecting their major duties this condition often puts the DAs in a difficult and undefined position with the communities. This is one of the problems that jeopardises the whole extension system in the country.

Within the research system: As briefly mentioned in Section 5.2.4 above, the capacity of the national research system in undertaking problem solving research on SLM to address the complex nature of land degradation in the country has been limiting. Apart from capacity limitation, there seems lack of desired emphasis on SLM research as compared to the extent of land degradation in the country. Most of the research undertakings are more of a piecemeal approach and lack integration to address SLM in its holistic nature. Moreover, in addition to generating technologies, research is supposed to give general overviews of the costs of land degradation and benefits of applying SLM practices, the status of the natural resource base, methodological requirements for successful implementation of SLM practices, policy advice in shaping the extension system and approach, etc. But due to lack of capacity and weak experience in the past, these needs haven't been adequately addressed. Most researchers working on SLM issues are junior, especially in research centres in the regions, and have neither enough reference material nor appropriate technical backstopping. They can do very little to solve the serious land degradation problem with their current knowledge status.

Moreover, within the natural resources wing of the research system, there are critical knowledge gaps on land degradation, SWC and agricultural water management engineering as compared to soil fertility and forestry. In these areas the research is not better equipped than the extension system and the effort applied to improve these sectors seems not encouraging.

Land users (communities): The effort applied to empower communities in all aspects of SLM is very weak. Although this is partly related to the limited capacity at woreda and kebele level, the top down planning approach plays a greater role. This approach doesn't require knowledge of community needs and priorities, and above all it neglects participation of communities in the decision making process on the choice of land management options. Moreover, different interventions require different capacity from the land user. But in this approach, SLM technologies are directly injected without building necessary capacity at community level. Because of this, proper management, sustainability and continuity or replication of SLM practices are not observed as desired. According to our findings, even though there are some training attempts by woreda experts or researchers in some areas, farmers express their concern that the training is too short, theoretical and often designed for literate farmers only. From this one could deduce the need for establishing appropriate demonstration sites (learning sites) representing different AEZs where both the experts and farmers can see and also practice appropriate SLM practices, which is currently lacking in the country.

5.2.6. Limited availability and poor networking of information on SLM

Appropriate information on the resource base, extent of land degradation, the costs and benefits of applying SLM as well as information on the nature of the different SLM practices is required to make decisions at different levels. However, none of the above is available in an organized way befitting the requirements of different stakeholders. Although there are some efforts here and there, either they are poorly organized, do not address the full picture, or they are too old to be able to represent current situations. Most studies address only a piece of the puzzle, and even then are not properly formulated to help policy makers and beneficiaries make informed decisions (Mahmud et al, 2005).

When it comes to individual households, the decision to invest in a particular technology ultimately depends on the economic contribution of the technology to the household. For risk-averse farmers, the risk characteristics as well as the expected profitability of technologies are important. From society's point of view, the off-site

and longer term impacts of a technology are also important. However, almost all stakeholders at different levels do not have detailed empirical information on the on-site and off-site economic costs and benefits as well as risk impact of SLM practices that have been introduced to farmers. Moreover, impacts of SLM practices on biophysical conditions is also lacking in its broader sense, although the Soil Conservation Research Project (SCRP) and some other projects in the country tried to quantify impacts of some conservation measures in reducing soil loss and runoff. Most of the studies conducted along this line have incomplete information (Mahmud et al, 2005).

Although there have been several studies assessing determinants and impacts of land management practices in particular regions (e.g., Gebremedhin (1998); Gebremedhin and Swinton (2002); Gebremedhin, Pender and Ehui (2003); Benin and Pender (2001, 2006); Benin (2006); Pender, et al. (2001); Pender and Gebremedhin (2004, 2006)); and particular sites (Herweg (1993); Shiferaw and Holden (1998, 1999, 2000, 2001); Holden, Benin, Shiferaw and Pender (2003); Holden and Shiferaw (2004); Holden, Shiferaw and Pender (2005)) (see Mahmud and Pender (2005) for a review) and some small studies by the national research team, economic assessment of the impacts of SLM practices in its holistic nature at national level is lacking. Often the farmers are informed about the benefits of SLM practices only in qualitative terms. This is mainly due to: i) the limited empirical studies on the economic costs and benefits of physical and biological conservation measures (Kassie and Holden, 2005, Shiferaw and Holden, 2004); ii) lack of information from available studies in a form that can be understood by key stakeholders; and iii) unlike other technologies (e.g. fertilizer, improved seeds, improved livestock breed, etc) there are no learning and model sites representing at least major AEZs to demonstrate the performance of SLM practices and mechanisms of implementing them, though some earlier attempts in this regard were made by the Soil Conservation Research Project (SCRP).

The farmers residing in different parts of the country have their own indigenous SLM practices that are both economically and biophysically important. Some of them are still exercised but some are abandoned in many places because of population

pressure and scarcity of land. The application of these practices, however, has its own limitations. As a result the farmers often didn't have comparable results to the applied effort. Moreover, some of the introduced SLM practices are often exposed to blue print application without being adapted to local specific conditions. Not only this but also integration requirements as well as necessary standards are not also met. The two conditions show the need for proper characterization of both indigenous and selected introduced technologies for better impact. This needs to be done systematically by taking into consideration past efforts and should be properly communicated at all levels with appropriate guidelines understandable by key stakeholders.

Although there are many successful SLM practices in different parts of the country, both indigenous (in Konso, Ankober, Alamata, Harargea, *Enset* belt areas in the SNNP, etc) and project assisted (MERET, GTZ, SG-2000 (mainly Conservation Tillage), etc), either they are not properly recognized at higher level (with some exceptions), or they are poorly documented and the available information is poorly communicated. In addition to lack of proper information and poor communication, the absence of clear up-scaling mechanisms hinders up-scaling of successful SLM practices in the country.

Even if it is in scattered form and sometimes scanty, there are many information sources (study results, research outputs, survey data sets, etc), reference materials, guidelines, etc, that with proper documentation and networking could provide valuable information to stakeholders. However, most often they are poorly documented, lost, not easily accessible by users, or they are not properly communicated among the different stakeholders. In some cases they are not designed or organized to be used by different stakeholders. This is another serious constraint hindering successful application of SLM in the country. Along with this, most stakeholders mentioned their concern about lack of an appropriate forum to share information and access to modern information communication systems.

5.2.7. Policy and strategy related constraints

As mentioned on Section 5.1, Ethiopia had set a number of important policies and strategies related to the environment. However, setting sound policies and strategies is not an end by itself. The goals stated in the different policies could only be achieved if and only if that policy is properly implemented. Although poor implementation of policies and strategies remains a major constraint, we found that some policies and strategies are hindering proper implementation and sustainability of SLM practices, and there is still a need for more policies and strategies to be developed or some to be modified.

One of the most important strategies that has been and is negatively affecting the implementation of SLM practices is the old dichotomy of the country into two broad categories, i.e., "high potential" and "low potential"[8] areas and the associated biased actions in implementing SLM practices. This categorization is believed to originate from rainfall amount and rain-fed crop production perspectives and has been instrumental in determining approaches towards addressing land degradation problems. The availability of food-aid in most drought prone areas, which has been used to promote land management practices mainly through food for work (FFW) and recently also cash aid for cash-for-work (CFW) based safety net activities in most drought prone areas, is likely part of the reason for greater emphasis on promoting SLM in such areas. Apart from this, many also thinks that land degradation is not a problem in the so called "high potential" areas. Because of this perception and some of the reasons mentioned above, the focus of the government and other non-state actors in halting land degradation in high potential areas of the country, which are currently suffering under high rates of land degradation, has been very insignificant. This could be partly explained by the fact that use of fertilizers and improved seeds (which is the focus of the extension system in these areas), even if without proper land management practices, can mask the effect of land degradation, especially in areas with relatively deep soil, and could make hard for decision makers to notice the impact of land degradation before it is late. Such misunderstanding and associated

[8] High potential areas also referred as food secure, non-moisture stressed and surplus producing areas. Similarly low potential areas are also called food insecure, moisture stressed and non-surplus producing areas.

actions explained below have resulted in the degradation of many high potential areas, which could otherwise have been avoided, with the use of proper land management practices (Gete, Zeleke, 2000). Therefore, it is critical to perceive land degradation as a problem across borders, i.e. it is not a problem in the so called “low potential” areas alone but a problem common to all areas, including the “high potential”.

Although the approaches and technologies for SLM should in principle be different for different domain areas or AEZs, the current categorization, according to interviewed stakeholders, is overly broad and has many flaws for the following reasons. Firstly, the categorization only focused on rain fed crop production, ignoring other comparative advantages (economic opportunities) of a given rural area. For example, “low” potential areas can be easily changed to “high potential” areas if irrigation can be developed in those areas (Volli Carucci, 2006). “Low” as well as “high” potential areas may have other comparative advantages such as livestock production, afforestation and eco-tourism that can be exploited while sustaining the natural resources. Secondly, the parameter (mainly rainfall) used to categorize woredas and zones is not adequate as it ignores other important parameters such as the current land degradation rate, soil types, population density, biodiversity, surface and ground water availability, market access, and cultural and historical heritages. Thirdly, the categorization uses woredas as the smallest unit but in practice there is a lot of variability within woredas. For instance, within “high” potential woredas there are often food insecure and low productive kebeles, and most of these woredas are degenerating to low potential areas (e.g., Sekela, Quarit, Banja, Goncha, etc Woredas in Gojam are perfect examples to cite) due to unchecked and active land degradation processes of various forms.

Despite all the above arguments, we found that, by taking this broad and contentious category as a basis, for the last nearly four decades a huge amount of resources, mainly donor supported, have been invested on “low potential” areas for environmental rehabilitation purposes. The impact was significant although not comparable to the applied effort and resources. This showed the possibility of

change, even if the area is highly degraded, if proper land management practices are implemented and proper support is granted. However, it would have been also possible to prevent further degradation of areas that have better agriculture potential, which have been almost neglected from any form of assistance for natural resources management. For instance, apart from support materials such as office and field equipment, transport facilities, food items, and some farm tools for farmers, additional budget on the order of twenty million Birr is being allocated to low potential woredas through food security, safety net and other donor or NGO assistance while the high potential areas are deprived of this major investment and attention. Moreover, experts in low potential woredas have better opportunities for in-service training, study tours and access to reference materials on natural resources management as compared to those in high potential areas, and this has also created capacity differences between experts. This in turn has impact on the quality and quantity of work to be done and experts' level of motivation to work.

In general, this old and broad dichotomy, although not well understood by almost any stakeholders, has played and continues to play a significant role in influencing development strategies and underestimating the land degradation-poverty nexus in Ethiopia. According to Volli Carucci (2006), this is the most misplaced and largely wrong differentiation made in Ethiopia with respect to SLM.

All stakeholders argued that such a classification strategy is wrong and it should be revised and researched carefully, as it has a major impact on natural resource management and up-scaling of SLM practices. The slogan for the health sector, 'prevention is much better than curing', should be applied to NRM in high potential areas, as the cost of preventing is lower than the cost of curing degraded lands. Balance in attention, by taking into consideration comparative advantages of every part of the country, proper categorization instead of overly broad categories, and always taking SLM in the centre of development efforts, is a key for economic development and SLM.

Tenure insecurity is another policy issue that stakeholders perceive has been seriously affecting investments in land management, although Mahmud and Pender

(2005) show mixed impacts in their review of available studies. After the 1975 land reform land was claimed as a property of the state and farmers were granted the right to free use of land. However, the frequent redistribution of land, shortly following the proclamation, which was also extended up to 1997 (the last redistribution in Amhara Region), negatively affects the implementation and sustainability of SLM in the country. Although getting confidence and trust of farmers will take time and require a high level systematic approach, the different regions have recently set land use and administrative policies. These policies generally prohibit frequent redistribution of land but do not fully deny its possibility depending on sets of pre-conditions. Most of the regions have started certifying land, which is one step forward in increasing tenure security, but a series of consultations with farmers, awareness creation, capacity building, demonstration sites, making sufficient resource available and other actions towards enhancing SLM practices are some of the required actions that are still needed. However, the capacity and experience of these authorities are very limited, as is the action taken so far. Moreover, lack of a fully mandated organization for land at the federal level is the other major policy gap and many stakeholders believe that this has resulted in lack of direction on proper utilization and management of land.

The other major constraint that seriously affects the implementation, effectiveness, and sustainability of SLM practices is lack of an appropriate strategy in harmonizing donor resources and approaches. Although the support for environment from different donors is limited, the different donors have their own procedures, approaches, and want to have their own isolated sites. In most cases the confusion this creates outweighs the benefits (Gete Zeleke, 2003). Most donors have their own comparative advantages[9], but few are willing to share experiences or to join their resources for better impact. It is not surprising to find more than two donor assisted projects who share a common objective in one woreda but having their own target area, planning, implementation and financial procedures. What is often surprising is that none of them have a complete solution for the farmer (Gete Zeleke, 2003).

[9] In terms of resources some have cash, others food aid or a combination. In terms of experience, some donors are experienced in supporting watershed management, others in marketing, agriculture production, water harvesting, humanitarian assistance etc.

5.2.8. Socio-economic and bio-physical constraints

There are many socio-economic and physical constraints that hinder decisions to invest and sustain SLM practices in the country, but this paper will briefly discuss only the major constraints raised by stakeholders. A thorough overview of socio-economic factors can be found in Mahmud and Pender (2005).

Poverty is one of the fundamental problems affecting SLM, which most of the Ethiopian population continues to face. It is not only a chronic problem made worse by a range of shocks including recurrent drought, famine, civil war, and mass displacement, but also causes enormous environmental damage as the poor are forced to mine the rapidly deteriorating natural resource in their surroundings (Ermias B., 2003). Thus, there is a strong nexus between land degradation and worsening poverty in the country (Grepperud, 1996; Holden et al. 1998; Shiferaw and Holden 1998). Rural poverty is typically linked to loss of soil productivity and forces the poor to depend more on scavenging the remaining natural resources, inducing more degradation and damage to the ecology.

The majority of the poor are concentrated in rural areas, where their livelihoods depend on smallholder crop-livestock production activities and rural labour markets. Moreover, they often supplement their daily subsistence by charcoal making and fuel wood collection from the remnant communal bush or shrub lands. This leaves the poor with very limited time, options, capacity and resources to apply sustainable land management practices, including external inputs and improved technologies. Hence, the parcel of land that the poor owns is exposed to land degradation and the productivity of land decreases over time. The poor do not only lack the ability to invest but also lack access to innovations to improve productivity and/or cope with the impacts of climatic and other shocks. However, according to Mahmud and Pender, (2005) the evidence on impacts of different dimensions of poverty on land management is mixed; and depend on the type of land management technology considered and the nature of poverty considered.

The unchecked population growth is the other major socioeconomic challenge facing Ethiopia that stakeholders see as contributing not only to the worsening of poverty

but also to land degradation as it hinders proper land management practices in the different parts of the country. The steadily increasing population, with persistent need for food, firewood and building material, over the centuries, led to the clearing of vegetation cover from the landscape and exerted more pressure on an already fragile environment. As the country's population continues to grow, ecologically sensitive landscapes are converted into farmlands without any protection measures. The traditional practice of fallowing is abandoned and land is ploughed frequently without any rest. Shortage of land pushes farmers to the very last remaining marginal areas. This results in the deterioration of the soil and intensified land degradation, with ultimate impacts of serious decline in agricultural productivity. As a result, considerable damages have been done to the ecology in many parts of the country, some beyond recovery.

Consistent with these stakeholder views, many empirical findings show the negative impacts of population growth on SLM in Ethiopia. For instance, using community level data from Tigray and Amhara, Pender, et al, (2001) found that population growth was associated with more decline in use of fallowing and manuring, and with perceived declines in several indicators of natural resource conditions and human welfare, including declining cropland quality, soil fertility, availability and quality of grazing land, average household wealth, food availability, and ability to cope with drought. Grepperud (1996) also found both human and livestock population pressure to be associated with predicted land degradation. The negative impact of population pressure on fallowing is consistent with Boserup's (1965) theory of agricultural intensification, while the declining use of manuring found by Pender, et al. (2001) is possibly related to fuel wood constraints resulting from population growth and associated deforestation which forces communities to use dung as a source of fuel. It could also be related to the reduction of livestock holding per head that results in less quantity of manure to apply on farmers' plots. Despite these findings, the impact of population growth on land management depends on the context, as mentioned by many studies (Mahmud and Pender, (2005), Pender et al, (2001), Kruseman (2003), Ermias B. (2003), Tiffen, et al. 1994). In the Ethiopian context, however, where significant non-farm alternative means of livelihood are absent, approaches towards SLM are top down, nearly 85% of the population is dependant on subsistence

agriculture often applying highly traditional but unfit farming practices to the current level of population growth, the high level of illiteracy, many cultural barriers, very weak organization at community level, limited accesses to market and other infrastructures, etc, population growth indeed negatively affects sustainability and up scaling of land management practices in general.

Of the biophysical constraints that affect successful implementation of SLM practices, climate variability is becoming a significant factor. The drylands (arid, semi-arid, and dry sub-humid areas) of Ethiopia, which cover some 70% of the total area of the country, are particularly vulnerable to climate change, desertification and drought. Climatic variability causes recurrent droughts and this is associated with high rainfall variability (both in space and time), which have long been a feature in Ethiopia, and contributed to the decline in vegetation cover, loss of biodiversity and ultimately worsening of land degradation. Climatic variability worsened by human induced environmental degradation in turn negatively affects the sustainability of SLM practices in some parts of the country. This is one major challenge that has developed over the years and deserves careful assessment so that SLM practices could be adapted to the changing conditions.

5.2.9. Institutional instability

Even though tackling land degradation and rehabilitation of degraded lands have been priority areas in the country, institutions dealing with natural resources management have been under continuous restructuring, and this undermines a sense of ownership by program staff, results in high staff turnover, wastes institutional capacity, and causes discontinuity of activities and initiatives and loss of institutional memory. Like that of land degradation, the cost of institutional instability in the country is immeasurable. Ethiopian policy makers have been busy revising institutional set-ups for nearly three decades and appear not to consider the damage this inflicts on the country's economic development.

Establishing a stable working environment is one important function for staff development, progress in activities, intra and interdisciplinary integration, innovation, proper communication with communities and dissemination of SLM practices. The

frequent restructuring not only erodes all the above functions but the stage has been reached where non-professionals are assigned to undertake natural resources management activities, particularly at woreda level. Whenever new restructuring is planned, it is often done without serious consideration of consequences, and as a result, many important documents, established linkages and joint activities, site specific information of high value, skills that took years of investment, methodological approaches resulting from years of experimentation etc, have been lost in many parts of the country.

The country's farmers and natural resources have been the victims of such institutional instability with associated internal changes. The current level of land degradation and the low level of dissemination of SLM practices and technologies are strongly associated with it.

5.2.10. Shortage of resources and incentives

The current level of land degradation in many parts of the country requires huge investment in different forms if it is to be reversed. It needs systematic integration of public investment with donor supported resources. It requires departing from the piecemeal approach of many small projects each with their own territory and rules. Above all it requires efficient utilization of the available resources (human, financial and non monetary resources) for better impact. However, this has not been the case in Ethiopia and as a result efforts on SLM have not been commensurate with the level of requirement because of the following reasons: i) the resources allocated to fight degradation are relatively meagre as compared to the level of the problem, ii) the available resources are highly scattered, un-harmonized, and mostly addressing only pieces of the puzzle, iii) they are attached with rigid fund utilization procedures, iv) a lack of integration between public investment (mainly on fertilizer) and donor support (mainly cash, food and non-food items for environmental rehabilitation), with the former focused on high potential areas and the latter concentrated in highly degraded areas of the country, v) resources are often not available on time, vi) often the capacity building component of many donor supported environmental rehabilitation projects is very insignificant and results in poor implementation of the project and lack of continuity after the project phase-out, and vii) except in some

donor assisted projects, such as MERET and GTZ to mention a few, most have no inbuilt monitoring and evaluation mechanisms.

The other problem that reduces efficiency of the available donor supported funds for environmental rehabilitation is the artificial differentiation of beneficiaries into poor, very poor and better-off farmers. It is clear that financial resources are always limited and has never been enough. However, putting communities into different categories will not lead to the rational use of any resource because it is simply dividing the same group into superficial classes. For instance, often those farmers having one ox or cow are considered better-off and denied any form of support that will help them to invest in land management. This principle of addressing the poorest of the poor led to the liquidation of the remnant assets of many households to get the benefit entitlement, which is often more valuable than the meagre assets they own. One could have followed area targeting with a set of criteria and present different development options to allow the different categories to benefit from the assistance. Despite the negative impacts of such categorization in the past, many new initiatives, such as the Safety Net Program, are still following the same approach, i.e., addressing the poorest of the poor – a purely artificial categorization dictated by legitimate considerations for the most affected households but largely inadequate to address the root causes of the problem and insufficient to provide a cohesive and coherent developmental platform to graduate the poor out of food insecurity.

We also learned that the cost of rehabilitating degraded areas is quite high and requires huge resources over a longer period of time. Only very few donors and organizations were able to grant this kind of support, such as WFP, GTZ, and some others. However, despite the length of their assistance their projects were not expanded to adjacent areas as desired because much needs to be done within the project areas themselves. This tells what it means and what it requires to rehabilitate degraded areas on one hand and the need for prevention of further degradation of high potential areas on the other hand.

5.2.11. Incomplete technology packages

One of the problems that contributed to the limited dissemination of SLM practices is the misunderstanding of the effects of the different SLM components. Often SWC measures, mainly physical, are confused with SLM and many think the problem is solved simply by constructing these structures. The truth is that the function of SWC structures is mainly to reduce soil loss and runoff and create an enabling environment for further improvements of the soil. At a minimum they have to be integrated with soil fertility and moisture management practices to give positive responses in crop production. Further integration with forage production (bee and livestock), high value crop and fruit plantation (below and above bund), and leguminous plants for soil fertility improvement will help to increase their benefit in improving household income. There are good experiences in South Wello (Ambassel woreda) where farmers are growing pigeon pea on, above and below bunds. Similarly in Omo-Sheleko District (which is one of the MERET project sites) farmers grow sugar cane, cassava and pigeon pea on, below and above bunds. This contributes to "win-win-win" outcomes since it increases soil fertility, provides high quality feed and food and hence increases household income. For instance, Kassie and Holden (2005) found that yields from conserved plots[10] with physical conservation measures (*fanya juu*) are lower than yields from non-conserved plots in a community in the northwestern Ethiopian highlands (Anjeni, in Dembecha district of the Amhara region). However, the same study indicated that conserved plots could provide higher returns than the non-conserved plots by growing fodder grass on the bunds. Shiferaw and Holden (2004) also found similar results. Different from the above two studies, FAO/WFP (2004) show positive impacts of properly maintained and developed SWC measures in MERET project sites. In general this indicates that proper implementation of SLM practices with appropriate quality and standard as well as developing SLM practices that are more compatible with agricultural income earning opportunities is increasingly important for acceptance and sustainability of SLM practices and improvements of livelihood in rural areas where population pressure and land scarcity becomes increasingly challenging.

10 This result should be carefully interpreted because the SWC measures are not also mentained and developed to the required standard (personal observation).

However, in most of the cases SLM practices have been applied piecemeal, without the required integration and often without the required standard and quality. This misunderstanding by planners, researchers and policy makers was a major reason for the lack of wide dissemination of SLM practices in the country. This is also partly due to the free grazing system that is widely practiced in the country and destroys many biological measures planted on SWC structures. Free grazing is also one of the major factors that inhibit the integration of physical measures with biological measures for better impact.

Moreover, lack of proper integration of introduced SLM practices with indigenous knowledge and practices, incompleteness of available technologies to address the requirements of the diverse agro-ecological conditions of the country, and lack of proper consideration of the socio-economic setting of the different communities during introduction of SLM practices were some of the other factors reported by stakeholders as negatively affecting the success of SLM practices.

5.2. Key information needs to make decisions at different levels

During our survey we tried to identify the key information requirements of the different stakeholders to make decisions on SLM at different levels. We found that three groups of information are required:

Extent and impacts of land degradation: As mentioned in Sections 1.1 and 5.2.1 the extent of land degradation and the damage it is causing on the natural resources of the country as well as its economic development seems not properly understood, particularly by policy makers and some development partners. For some, land degradation is an issue to be addressed only when the land is completely degraded. Other than this, for the other areas that have relatively better soil and vegetative conditions, land degradation is not an issue to worry about, according to this perspective. The heavily sediment laden sluggish flow of rivers and streams during the rainy season seems considered as a normal seasonal process. Remnant vegetations are steadily removed from the landscape (with the exception of Tigray

region where there are strictly enforced rules and regulations on cutting of remnant vegetation), even from marginal areas, and this seems also accepted as a normal process. Initially the impacts are slow and could also be masked by use of different inputs. The impacts are only clearly visible, even to the common man, after it is late.

The reasons for this misunderstanding are straightforward; the extent and rates of land degradation and its impacts in the different parts of the country are not clearly known. Often, billions of tons of top soil loss and annual deforestation of thousands of hectares of natural forest are reported without site specific data or information about the economic losses resulting. The scientific community believes it is important to inform decision makers at all levels about the possible economic loss that is happening as a result of land degradation. The few attempts to measure these costs made in the past, although signals of the danger, are neither inclusive of all land degradation processes, nor free of methodological flaws (Mahmud et al, 2005). The policy makers and the farmers need to understand the impacts of land degradation in economic terms. Not only immediate loss but also the cumulative losses are important to understand, since the impacts of land degradation accumulate and reinforce themselves over time. Decision makers need to be shown these impacts in a form that is easily understandable. Although there have been some site specific case studies, in general they were not properly addressed to the policy makers and communities nor translated into preventive measures and practical actions. Often the policy makers and communities are told about the ultimate impacts of land degradation, including drought, famine, and desertification, but not about the immediate impacts. These are sometimes seen as situations too remote to internalize and lead to the development of attitudes towards land degradation as a less urgent phenomenon not necessary to worry about much. Therefore, i) information, aggregated and disaggregated, on the impacts of land degradation translated into monetary basis including possible cumulative impacts showing what could happen if actions are not taken today; ii) in a form easily understandable at different levels; iii) mechanisms of translating this information into the policy making process and; iv) a very systematic awareness creation strategy; are required.

Costs and benefits of applying SLM practices in different contexts, and the nature of such practices: Often most SLM practices, particularly SWC measures, are introduced to the communities as measures to reduce soil loss and runoff. The economic impacts of this and the need for integration among technologies for better impacts are often not communicated. In some cases, however, they are communicated as if they give all solutions related to land degradation problems, which is not the case. Moreover, the costs of applying SLM practices and the benefit farmers could get out of this, under different scenarios and converted into monetary basis, is almost neglected (Mahmud and Pender (2005)). Apart from the shortcomings of the communication style, which is strongly linked to the top-down planning approach, information on these issues is lacking. Even though there are some attempts to develop some generic values, for instance the work norms and technical standards developed by MoARD and WFP (2000), they are often used to calculate project costs but not to communicate this information to communities to help guide their decisions. In principle the farmer must be told what it costs to apply a specific practice or sets of SLM practices and what benefits and risks he can expect in return. This, however, is not done in Ethiopia, even in environmental projects that are relatively successful such as MERET.

The other very important information required is complete information on the characteristics of SLM practices, including design, standards, integration and management requirements, and suitability to the diverse AEZs of the country. There were some particular encouraging attempts to address this issue by Hurni (1986), and recently by ICRAF (2005) as a follow-up from Hurni's work. However, these efforts were too narrow, only addressing technical requirements but giving less consideration to possible needs of communities. Moreover, they were not linked with focused in-service training programmes for planners, decision makers, and land users on the use of these materials. In addition, the availability of these training materials for distribution to different sites is often limited. In general, there are no simplified versions of such materials suited to the level of farmers.

Even though there are some pockets of successful SLM practices distributed throughout the country (both indigenous and introduced), they are often poorly

documented, and specific information to learn from them is unavailable or poorly networked.

Required approaches and methodology for SLM: Both the assessment of land degradation processes (including its cost at different levels) and applying SLM practices (how, where, in what combination, costs and benefits) requires certain approaches and methods, starting from the planning process. Often the research methodology is piecemeal, not comprehensive, poorly integrated, and non-participatory in nature. Moreover, dissemination of research outputs to end users is usually not a part of the methodology. On top of this, the approach followed by extension for SLM is largely top-down, except in very few donor assisted projects such as MERET (by WFP) and PLUP (by GTZ). Land degradation is a complex process which is a result of interactions among many complex natural and socio-economic processes. Understanding and properly documenting land degradation impacts and responses requires a rigorous methodology and is not a simple process. Similarly, controlling mechanisms are also not simple. Apart from technical correctness, they require careful approaches, understanding, and acceptance by direct beneficiaries. Often information along this line is lacking or very scanty. The current attempt by MoARD in developing a common community based participatory watershed guideline (Lakew Desta., et al, 2005) by taking into consideration past experiences in the country is one step forward. This needs to be further strengthened with periodic revision based on experiences, training, other support materials, and translated into systematic action.

More specifically the following types of information are required for improving the quality of intervention and to up-scale successful SLM practices:

i) Proper planning, implementation and ME approach for successful promotion of SLM practices;
ii) Technical standards and specification of SLM practices applied in the different parts of country (characterization of SLM practices both indigenous and introduced) to understand specific requirements for each SLM practice to gain maximum benefit (social and biophysical requirements) including integration

requirements between different SLM practices) supported by appropriate guidelines, maps, software, etc.;

iii) Basic information on successful SLM practices, including what works where and under what conditions to up-scale to:
   a) Wider areas within the same locality and similar AEZs outside the locality
   b) Different types of beneficiaries such as individual households, groups of farmers, and communities

iv) Clear information on the extent, impact and costs of land degradation at different levels in forms understandable by policy makers and community members;

v) Costs, benefits and risks of applying different SLM practices in different combination and under different agro-ecological settings;

vi) Understanding contextual factors that determine adoption of SLM technologies and their sustainability;

vii) Requirements and modalities for effective linkage and integration between research, extension and education for efficient promotion of SLM practices across the country;

viii) Availability of technology or research outputs (in country and international) and mechanisms to disseminate available information or research results ➔communication and networking mechanisms;

ix) Technological gaps for new SLM practices to be introduced (what SLM practices are needed where and to fill what gap?);

x) Research design requirements or methodology for assessing land degradation processes and promoting SLM practices in different forms to address the diverse AEZs in the country;

xi) Experiences of other countries on SLM research and development including linkage modalities and approaches to scaling up successes in SLM; and

xii) Proper documentation at all levels and accessibility of spatial data.

5.3. Key knowledge gaps in promoting SLM practices

Although this is partly linked to the information requirements, this section focuses mainly on the knowledge gaps that play decisive (direct and indirect) roles for the promotion of SLM practices in the country. Knowledge of key processes and their interaction that affect land degradation is essential to devise controlling mechanisms. Some factors affect not only land degradation but also sustainability and impacts of SLM practices. It is also essential to know more about the different SLM practices including their nature, technical requirements, impacts, etc, to come up with the best possible choice of technologies suitable for a particular situation. We found that there is a clear knowledge gap in understanding the processes of land degradation, its extent and costs in the different parts of the country. Knowledge about factors affecting land degradation is also limited. What is more important along this line is the serious misunderstanding about what SLM practices could do, under what condition, with what level of integration and technical requirements. Because of these and other knowledge gaps, often land degradation didn't have enough attention and the approach to deal with it has many limitations. More specifically the following are some of the key knowledge gaps that need to be carefully addressed to come up with better solutions for arresting land degradation and expanding SLM practices:

i). Very crude and old information on rate and extent of land degradation and its impacts. There is a need for updated version (focusing mainly on major physical and biological forms of degradation) and its costs, including off-site impacts;

ii). Unclear categorization of recommendation domains from SLM perspective for successful intervention and scaling-up of SLM practices;

iii). Weak characterization of SLM practices or technologies (indigenous and introduced) including their requirements and what works where in what combination;

iv). Lack of proper inventory of successful SLM practices (whereabouts, in what combination, under what circumstances, etc) and effective information and communication system, including identification of technology gaps to

address the diverse AEZ of the country and effective ways of agricultural water management;

v). Lack of easy to follow framework to promote SLM technologies including simple and effective quality control and regulation mechanisms;

vi). Effective ways of integrating SLM practices with income and asset development (through NRM-based income generating activities);

vii). Impacts of climate change on sustainability of SLM practices and levels of climatic variability in the country;

viii). Impacts of un-harmonized donor support on SLM;

ix). Impacts of frequent institutional restructuring on SLM;

x). Varied and non exhaustive studies on costs of land degradation and benefits of applying SLM practices (lack of quantified information on on-site and off-site economic as well as risk impact of SLM practices);

xi). Unclear information on the natural resource base at all levels; and

xii). Very limited use of IT and GIS technologies for proper information management and decision making (particularly at federal and regional level) to promote SLM.

5.4. Possible future applied research agenda

To be able to effectively promote SLM practices and reduce the current rates of land degradation and thereby address the extreme poverty facing rural Ethiopia, some of the knowledge gaps and information needs of the different stakeholders at various levels could be provided with very focused and participatory applied research programmes. During our survey, we found very critical issues that have an important role in affecting the success of SLM interventions. Some of them are linked to lack of awareness at different levels but some are due to lack of appropriate knowledge or information. Even though research work has been done in the country to address these issues, mostly they were incomplete; often lacked integration and results were not sufficiently addressed to actual stakeholders such as policy makers and farmers. Some of the information needs continuous updating with an inbuilt applied research component to monitor progress, impacts and changes over time. This also will help policy makers to make informed decisions and set clear a direction towards

sustainable development in the country. It will help to make corrections, adjust strategies, set new policies, devise appropriate approaches and also introduce new more efficient but locally adaptable SLM technologies. It will help to build necessary capacity, mobilize resources and devise appropriate mechanisms for efficient utilization of available resources. In line with this, we propose the following applied research agenda that we hope will fill the gaps identified during the survey:

i) Re-examine recommendation domains classifications for SLM in rural Ethiopia: and the implications for SLM and rural development;
ii) Assess or design appropriate mechanisms of up-scaling successful SLM practices within the Ethiopia context;
iii) Characterize major SLM practices/technologies (indigenous and introduced) and develop easy to use guidelines with geo-referencing (including focused case studies to investigate reasons for success and failure in selected SLM projects and areas with rich indigenous experiences);
iv) Assess the planning, implementation and monitoring and evaluation (ME) systems and required capacity for successful implementation of SLM programs in Ethiopia, including re-examining of the roles of different actors on the different stages of SLM (a. technology generation or introduction, testing, and demonstration, b) planning, c) implementation, and d) ME);
v) Assess alternative approaches to promote SLM; identify approaches that work effectively in different contexts and means of up scaling them (including an assessment of impacts of hillside distribution as compared to communal area closure) and suggest better ways to up-scale impacts;
vi) Analyze gaps in SLM technologies/practices to address the diverse agro-ecological settings of Ethiopia;
vii) Re-examine the existing linkages among research, extension and education for SLM and suggest alternatives to improve these linkages;

viii) Assess the resource base, status of land degradation and extent of its impacts and establish appropriate databases using state-of-the-art technologies;

ix) Design and apply a simple cost benefit framework for assessing impacts of land degradation and SLM practices; and

x) Assess impacts of frequent institutional restructuring, mandate and decision making flows on SLM and suggest solutions.

6. Conclusion and Recommendations

In this study, based on consultations of different stakeholders, we have attempted to explore existing opportunities that could help to control land degradation problems and promote potentially profitable SLM practices in Ethiopia. We have also identified major constraints, information and knowledge gaps that hinder promotion of SLM practices at all levels. Based on the major findings of our stakeholder analysis, future researchable agendas were also identified. Up-scaling of SLM practices is a huge undertaking and all can not be done at once. One needs to set clear directions, set priorities and find entry points. Setting clear directions and designing a workable system will allow better use of existing opportunities and solve key constraints. If this is done in a more systematic and interactive way, with appropriate strategies in place and followed, the solution for the current inter-woven problems of land degradation and poverty will be at the reach of the Ethiopian people. Therefore, this part of the document focuses on actions that need to be taken immediately as a way forward to control land degradation problem and pave the foundation for further actions. Based on our consultation of stakeholders, we recommend the following:

i. ***Make the existing systems more responsive and efficient:*** The extension, agricultural research, and education systems in the country have a relatively favorable set-up that can be shaped to make it more responsive and efficient to address the problems associated with land degradation. The system needs to be critically revisited and be functional with a desired set of actions. One of the major actions that could be easily incorporated in each system is the adjustment of the planning system from the existing top-down to a participatory or demand-based

approach. This will not require designing a new strategy or methodology. It is a matter of adding a few elements in each of the systems' planning frameworks that could make them function more responsively and effectively. The following immediate course of actions are recommended for each system:

a) ***For the extension system***: It needs to follow the recent guidelines developed by MoARD (i.e., CBPWD) at different levels during the planning and implementation stages of SLM. This would substantially improve the efficiency of the system, and the quality, quantity, and sustainability of SLM measures. Training on how to use the guidelines and making the guidelines available at all levels, hands-on technical backstopping for field staff and provision of the minimum required resources are essential actions for this to happen. Once this is done, follow-up actions towards improving the approach can be done iteratively based on field observations and feedback.

b) ***For the research system:*** Apart from the capacity limitations, one of the key problems within the research system is the gap associated with definition of the mandate of the researchers. If the mandate of researchers is redesigned to include technology dissemination to end users, it will improve technology promotion, accountability, and quality of research (more need-based and participatory) and intra- and interdisciplinary integration. Moreover, SLM technology dissemination mechanisms, involving approval or recommendations from land users, should also be designed and made functional at all levels. This will be an incentive for researchers and motivate them to do more problem solving kinds of research.

c) ***For the agricultural education system:*** One key area that needs an immediate intervention is the revision of the curriculum of students in order to make it more responsive to the demands of the extension and research systems. The balance between theory and practical training need to be revised.

ii. ***Improve institutional linkages:*** This is one of the critical issues that need immediate intervention. All of the above three important systems should try to

develop vertical and horizontal accountability system at different levels. Again this action doesn't require major adjustments. It only needs to systematically modify the planning, implementation, ME and reporting system and create an indirect incentive mechanism to improve accountability with particular importance given to downward accountability.

iii. ***Improve capacity:*** This is one of the areas where there is a big gap between what is available and what needs to be achieved. Lack of capacity on SLM is the biggest challenge in the country. This can be manifested in two forms: a) when the institutions are not able to use the available capacity, and b) when there is little or no capacity at all. The first situation is mainly related to lack of proper functioning of institutional systems. In this case professional knowledge is neglected and decisions are made at higher level without considering actual conditions. In general, in such cases professionals have very little chance to apply their knowledge and hence could easily become frustrated or lose interest and ultimately leave the organization. The second situation is common at woreda and kebele level and is mainly caused by high staff turnover, lack of additional incentives for remote areas, lack of proper on-job training, and lack of graduates in the market to fill the gap. In general, the capacity problem could be solved by addressing the above two major challenges through a focused and step-wise approach in each organization.

iv. ***Redefining recommendation domains for SLM:*** In our stakeholder analysis, we have observed an arbitrary division of the entire country into two broad categories, i.e., "high potential" and "low potential". This broad categorization has been misleading the decision process on promotion of SLM in the country. An urgent redefinition of appropriate recommendation domains for SLM is required and areas of intervention should be selected for each domain area based on its comparative advantage. This will reduce wastage of resources due to blanket recommendations and help to organize intervention areas based on comparative advantages of each domain area.

v. ***Characterization of SLM practices:*** We found that information is lacking about the requirements of each SLM practice (indigenous and introduced), including an

in-depth economic and risk impact assessment of different SLM practices in different agro-ecological settings to allow decision makers and land users make informed decisions on SLM. Therefore, this is one key area where concerted effort is needed to characterize both indigenous and introduced SLM practices in the country by building on available information. Given the fact that knowledge is not an end by itself, the information should be communicated to the different levels through easily understandable formats and tools.

vi. ***Develop cost benefit framework:*** The cost of land degradation and costs and benefits of using SLM practices in different domain areas need to be known to make informed decisions at all levels. Development of a practical low cost assessment framework and its implementations are other essential actions that should be undertaken immediately.

vii. ***Develop scaling-up mechanisms for SLM as means to -built on success:*** It has been mentioned that there are pockets of successful SLM practices in different parts of the country. However, there is no clear scaling-up mechanism that can be followed by the different stakeholders. Therefore, it is recommended that a scaling-up mechanism or framework need to be developed and systematically applied. This involves devising a mechanism to identify what is required (i.e., resources, organization, time, linkages, integration, type of technical support, type of vegetative materials, etc,) to scale-up certain successful SLM practices to the nearby areas or other similar areas far from the site, identify what is successful and where, reasons for success, etc.

viii. ***Develop an improved incentive system for SLM:*** We have seen that lack of incentive, particularly at woreda, kebele and community level (including institutional incentive for integration and collaboration) seriously affects promotion of SLM. We recommend the development of low cost incentive mechanisms to promote more responsive and integrated approaches (e.g., including consideration of integration and demand responsiveness in evaluation of research proposals; providing merit based promotions and awards of recognition to DAs and others who demonstrate

superior performance in learning from farmers and transferring knowledge across communities and to higher levels of the extension and research system).

ix. ***Link SLM practices to improvements in productivity and make them economically attractive:*** One of the sources of failure in the past with regard to the promotion of SLM practices is the fact that they were often not linked to enhancing soil productivity and were economically attractive for the farmers. Ecological benefits of SLM practices used to outweigh other benefits. Apart from signifying ecological benefits during communication actions to make SLM measure more productive and economically beneficial to the farmer was very limited. As a result, in many areas, farmers' present different reasons for not keeping SLM measures on their plot. However, this was different for farmers who get economic benefits from applying SLM practices as a result of enhanced soil productivity and other NRM based benefits. Therefore, it is recommended that SLM practices need to be attached to income both at household and community levels.

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8. Appendices

Appendix 1: Map of decision making process, information needs, and sources of information and knowledge gaps

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Development	MoARD	1. Type of extension system or approach to be followed for SLM	1.1. Strength and weakness of available system and need assessment	1.1.a. Field evaluation, feedbacks from regions and woredas	1.1.a.i. Often there is lack of exhaustive evaluation and assessment of the existing system 1.1.a.ii. Usually there is a tendency to start most of the things afresh and loosely consider past experiences
			1.2. Strength of the new system	1.2.a. System documentation or review reports and Professional consultation	1.2.a.i. Often weak review of the new system and limited consultation of professionals
			1.3. Available capacity to handle the new system	1.3.a. From reports and available documents	1.3.a.i. Very loose report exchange and weak reporting system often focused on number not on quality 1.3.a.ii. Lack of proper documentation of available information
		2. Types of SLM technologies to be promoted across the country	2.1. Detail requirements of the technology, including costs and benefits	2.1.a. Research outputs or explanatory notes/guidelines about the technology	2.1.a.i. Often no full information available (e.g. lack of quantified empirical evidence on physical & economic benefits and risk (on and off-site) SLM practices, information & knowledge gap on alternative SLM practices, limited knowledge on integration of technologies on a farm (e.g. physical vs biological or agronomic conservation and consider only single technology which may not be profitable), poor characterization of both indigenous & introduced SLM practices, lack of integration of livestock into land management systems and limited knowledge on what SLM includes and means, etc. 2.1.a.ii. In some cases lack of proper consideration of available SLM information and technologies
				2.1.b. Professional advice	2.1.b.i. Limited professional capacity 2.1.b.ii. Often lack proper professional consultation
			2.2. Detail biophysical and socio-economic set-up of domain areas	2.2.a. Study results, reports, maps	2.2.a.i. Lack appropriate study results, poor documentation or too old to depend on 2.2.a.ii. In some cases limited use of available information
				2.2.b. Detail investigation	2.2.b.i. Lack capacity (technical and resource to undertake) 2.2.b.ii. Lack of insight about its importance
		3. Development of Policies and Strategies	3.1. Policy or strategy gaps (needs)	3.1.a. Survey reports and feedbacks on gaps	3.1.a.ii. Often limited survey and feedback or need assessment
			3.2. Weakness and strengths of current policies and strategies	3.1.b. Professional consultation	3.1.b.i. In most cases very limited professional consultation
				3.2.a. Survey of weaknesses and strengths of existing policies and strategies	3.2.a.i. Often weak or no survey 3.2.a.ii. In most cases poor review of available information

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
	MoARD	4. Establish institutional linkage mechanisms	4.1. Linkage needs 4.2. Consultation with stakeholders	4.1.a. Need assessment reports 4.2.a. Evaluation reports and consultations	4.1.a.i. Lack of appropriate survey or need assessment and limited information exchange due to loose reporting linkages 4.1.a.ii. Sometimes poor reports or lack of reports 4.2.a.ii. In some cases feedbacks are not properly incorporated and lack of proper follow-up
		5. Capacity building	5.1. Need for better capacity 5.2. Requests for capacity building from regions	5.1.a. Survey documents, reports, need assessment 5.2.a. Reports and requests for capacity building	5.1.a.i. Lack of proper survey or need assessment 5.1.a.ii. Often no focused capacity building or quality is not to the required standard due to lack of capacity within MoARD 5.2.a.i. Lack of appropriate request due to lack of capacity in the regions 5.2.a.ii. Sometimes neglect request for capacity building
		6. Lead Federal Research, Extension and Farmers Advisory Council (FREFAC)	6.1. Documents, previous meeting decisions	6.1.a. Initial strategic documents about the function of the council 6.1.b. Previous meeting decisions 6.1.c. Agendas and issues raised by stakeholders	6.1.a.i. Initial strategic document poorly prepared (too general and not updated in line to the changing situation) 6.1.b.i. Lack of regular meetings, weak implementation and follow-up of council decisions, and unclear accountability (both research and extension) for the council 6.1.c.i. Agendas not properly addressed, often formal kind of discussion not engaged on the real challenge
		7. Designing Organizational Structure	7.1. Need for new organizational structure	7.1.a. Need assessment documents, reports, etc 7.1.b. International experiences 7.1.c. Professional consultation	7.1.a.i. Often very weak needs assessment and sometimes based on some officials interest 7.1.a.ii. In some cases need assessment documents and reports are not properly reviewed and incorporated in the design 7.1.b.i. Limited review of international experiences and sometimes blue print approach is followed 7.1.c.i. Limited professional consultation
		8. Resource mobilization	8.1. Resource requirements to undertake SLM in full capacity	8.1.a. Plans and reports 8.1.b. Needs assessment	8.1.a.i. Often plans and resources do not match – often plans are too ambitious and lack serious consideration of available resource 8.1.a.ii. In some cases plans or reports undermine the need for resources 8.1.b.i. Very limited or weak need assessment 8.1.b.ii. Lack of clear strategy for resource mobilization

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Development	BoARD	1. Type of extension system or approach to be followed for SLM in the region	1.1. The National extension system	1.1.a. Extension manual or guideline from the federal	1.1.a.i. Often too general and may not address region specific conditions
				1.1.b. Directives by MoARD	1.1.b.i. Directives are often blanket and neglect regional specificity
			1.2. Regional Situation	1.2.a. From regional analysis	1.2.a.i. Lack of proper regional information and documentation 1.2.a.ii. Tendency to neglect regional situation because it is the directive from the federal and lack flexibility 1.2.a.iii. In some cases poor capacity to adapt to regional situation
		2. Types of SLM technologies to be promoted in the region	2.1. Detail requirements of the technology, including costs and benefits	2.1.a. Research outputs or explanatory notes about the technology, guidelines sent by federal MoARD	2.1.a.i. Often no full information available (e.g. lack of quantified empirical evidence on physical & economic benefits and risk (on and off-site) SLM practices, information & knowledge gap on alternative SLM practices, limited knowledge on integration of technologies on a farm (e.g. physical vs biological or agronomic conservation and consider only single technology which may not be profitable), poor characterization of both indigenous & introduced SLM practices, lack of integration of livestock into land management systems and limited knowledge on what SLM includes and means, etc. 2.1.a.ii. Poor consideration of the available information & Knowledge
				2.1.b. Professional advice	2.1.b.i. Top down planning, often decided by cabinets and often lack or limited professional consultation on SLM 2.1.b.ii. Limited professional capacity to give appropriate advice
			2.2. Detail biophysical and socio-economic set-up of recommendation areas	2.2.a. Study results, reports, maps	2.2.a.i. Lack appropriate study results, poor documentation or too old to depend on (e.g. lack of quantified information on the extent & impact of land degradation 2.2.a.ii. Limited or no review of available reports, in most cases focus on given quota although situation may not be suitable for that SLM
				2.2.b. Detail investigation	2.2.b.i. Lack capacity (technical and resource to undertake) 2.2.b.ii. Lack of will or lack insight about its importance
		3. Development of SLM Related Regional Policies and Strategies	3.1. Policy or strategy gaps (needs)	3.1.a. Survey reports and feedbacks on gaps	3.1.a.i. Often lack of complete survey and feedback or need assessment and sometimes follows federal policies and strategies without being adapted to regional situations
				3.1.b. Federal policies and strategies	3.1.b.i. Often too general and lacks regional specificity
				3.1.c Professional consultation	3.1.c.i. Very limited professional consultation
			3.2. Weakness and strengths of current policies and strategies for SLM	3.2.a. Survey of weaknesses and strengths of existing policies and strategies	3.2.a.i. Very weak assessment or no survey 3.2.a.ii. Often very poor review of available information

Category of actors	Actors involved in the decision making process on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
	BoARD	4. Establish institutional linkage mechanisms	4.1. Linkage needs	4.1.a. Need assessment	4.1.a.i. Lack of appropriate survey or need assessment and limited information exchange due to strong horizontal or vertical accountability
			4.2. Consultation with stakeholders	4.2.a. Evaluation reports and consultations	4.2.a.i. In some cases feedbacks are not properly incorporated and lack of proper follow-up 4.2.a.ii. Sometimes very weak stakeholder consultation
		5. Capacity building	5.1. More capacity needs	5.1.a. Survey documents, reports, need assessment	5.1.a.i. Lack of proper survey or need assessment 5.1.a.ii. Often no focused capacity building or quality is not to the required standard due to lack of capacity within BoARD
			5.2. Requests for capacity building from woredas	5.2.a. Reports and requests for capacity building	5.2.a.1. Lack of appropriate request due to lack of capacity in woredas (not considering timing, resource and capacity) 5.2.a.ii. Sometimes neglect request for capacity building
		6. Lead Regional Research, Extension and Farmers Advisory Council (RREFAC)	6.1. Documents, previous meeting decisions	6.1.a. Initial strategic documents about the function of the council 6.1.b. Previous meeting decisions	6.1.a.i. Initial strategic document poorly prepared (too general and not updated in line to the changing situation) 6.1.b.i. Lack of regular meetings , weak implementation and follow-up of council decisions, and unclear accountability (both research and extension) for the council
				6.1.c. Agendas and issues raised by stakeholders	6.1.c.i. Agendas not properly addressed, often formal kind of discussion not engaged on the real challenge
		7. Designing Regional Organizational Structure	7.1. Need for new organizational structure	7.1.a. Need assessment documents, reports, etc	7.1.a.i. Often very weak needs assessment and in some cases depend on some officials interest and pushed by the federal decisions 7.1.a.ii. Need assessment documents and reports are not properly reviewed and sometimes the recommended structure is above the available capacity
				7.1.b. International and National experiences	7.1.b.i. Limited international or national experience reviewed or often blue print is applied
				7.1.c. Professional consultation	7.1.c.i. Limited professional consultation, often it is done in rash and lacks internal consistency
		8. Resource mobilization	8.1. Resource requirements to undertake SLM in full capacity	8.1.a. Plans and reports	8.1.a.i. Often plans and resources do not match – plans are too ambitious and lack proper consideration of available resource 8.1.a.ii. In some cases plans or reports undermine the need for resources
				8.1.b. Needs assessment	8.1.b.i. Very limited or weak need assessment 8.1.b.ii. Lack of clear strategy for resource mobilization

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Development	WOoARD	1. Types of SLM technologies to be promoted in the woreda ➔ plan, implement and follow-up	1.1. Detail requirements of the technology, including costs and benefits	1.1.a. Research outputs or explanatory notes about the technology, guidelines, directives and plan and/or quota sent by regional BoARD	1.1.a.i. Often no full information available (e.g. lack of quantified empirical evidence on physical & economic benefits and risk (on and off-site) SLM practices, information & knowledge gap on alternative SLM practices, limited knowledge on integration of technologies and consider only single technology which may not be profitable, poor characterization of both indigenous & introduced SLM practices, lack of integration of livestock into land management systems and limited knowledge on what SLM includes and means, etc. 1.1.a.ii. Limited consideration of the available information & knowledge, often related to lack of capacity and too much workload 1.1.a.iii. Top down planning, often sent from region and decided by woreda cabinets, and weak follow-up
				1.1.b. Professional advice	1.1.b.i. Very weak professional capacity at woreda level 1.1.b.ii. Often lack professional consultation and there is tendency of neglecting professional advice. The experts at woreda level are often asked to implement what is decided by the cabinet. 1.1.b.iii. Some experts assigned to implement SLM practices lack the required professional background or qualification
			1.2. Detail biophysical and socio-economic set-up of recommendation areas within the woreda	1.2.a. Study results, reports, maps	1.2.a.i. Lack appropriate study results, poor documentation or too old to be used 1.2.a.ii. Lack of critical review of available data, depend on directives and quota 1.2.b.i. Lack capacity (technical and resource) to undertake such studies 1.2.b.ii. Lack of insight about its importance
			2.1. More capacity needs	1.2.b. Detail studies of the woreda biophysical and socio-economic condition	2.1.a.i. Lack of proper survey or need assessment 2.1.a.ii. Often no focused capacity building or quality is not to the required standard due to lack of capacity within WOoARD
		2. Capacity building	2.2. Requests for capacity building from DAs and communities	2.1.a. Survey documents, reports, need assessment	2.2.a.i. Lack of appropriate request due to lack of capacity at DA/community level (not considering timing, resource and capacity in the woreda) 2.2.a.ii. Sometimes neglect request for capacity building– often messages forwarded as orders
				2.2.a. Reports and requests for capacity building	3.1.a.i. Often plans and resources do not; resources are channeled from the region and in most cases it is not according to the woreda plan
		3. Resource mobilization	3.1. Resource requirements to undertake SLM in full capacity	3.1.a. Plans and reports or quota given by the region	3.1.a.ii. Often lack of flexibility on the use of available resources (tied by many donor specific and government procedures) 3.1.a.ii. In most woredas plans undermine the need for resources for SLM
				3.1.b. Needs assessment	3.1.b.i. No proper need assessment 3.1.b.ii. No clear strategy for resource mobilization only take what is available

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Development	DA	1. Types of SLM technologies to be promoted in the Kebele – plan, implement and follow-up	1.1. Detail information about the technology (design, integration, and other requirements)	1.1.a. Guidelines, directives and plan and/or quota sent by the Woreda OoARD	1.1.a.i. Often the DA don not get appropriate guidelines, no full information available about SLM technologies that the DA is asked to implement (e.g. integration, impact, requirements and standards of both indigenous & introduced SLM practices, most DAs have very limited capacity to extract knowledge and experience from communities, lack of appropriate knowledge and guidance on integration of livestock into land management systems and limited knowledge on what SLM includes and means, etc. 1.1.a.ii. Poor consideration of the available information & Knowledge mainly due to lack of experience and capacity 1.1.a.iii. Very weak participatory planning and follow-up mainly due to very weak capacity and too much workload 1.1.a.iv. Often top down planning, sent from Woreda OoARD, decided by woreda cabinets
				1.1.b. Professional backstopping/support (from Woreda and regional or projects)	1.1.b.i. Very limited or weak professional support mainly due to weak professional capacity at woreda level 1.1.b.ii. Some experts assigned to implement or coordinate SLM lack the required professional background or qualification and are not able to give proper hands-on support for the DA
			1.2. Detail biophysical and socio-economic set-up of the Kebele	1.2.a. Study results, reports, maps 1.2.b. Detail studies by the DA	1.2.a.i. Lack appropriate study results in easy-to-use form for the DA standard and poor documentation of available information 1.2.b.i. Lack capacity (technical and resource) to undertake such studies 1.2.b.ii. Lack of insight about its importance➔ follow directives
		2. Capacity building	2.1. More capacity needs for communities as per the proposed plan	2.1.a. Need assessment	2.1.a.i. Often no proper need assessment done by the DA mainly because of limited capacity 2.1.a.ii. No focused capacity building or poor quality often planned by woreda and attached to quotas 2.1.a.iii. Most DAs has no capacity (is not capacitated) to build capacity of communities 2.1.a.iv. Weak follow-up
			2.2. Requests from communities	2.2.a. Requests for capacity building by communities	2.2.a.1. Often no resource, capacity and time to fulfill requests by communities 2.2.a.ii. Often, neglect request for capacity building – the DA has no much option at hand

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Development	Donors	1. Project approval for support	1.1. Detail information about type of SLM activities to be implemented and approach (design, integration, and other requirements)	1.1.a. Project document	1.1.a.i. In some cases project documents are highly generalized and lacks specificity 1.1.a.ii. In most cases project documents prepared with standard format and do not catch actual needs and requirements of communities 1.1.a.iii. Sometimes, project documents miss the meaning of SLM and the way it has to be done 1.1.a.iv. Often, the integration aspect of SLM is mentioned but do not show how it should be done
				1.1.b. Professional consultation in the form of appraisal	1.1.b.i. Usually very poor consultation of actual stakeholders (mainly communities and woreda experts), often depend on information from heads of offices and bureaus 1.1.b.ii. Some consultants put their view neglecting the real situation 1.1.b.iii. Some consultants have very poor capacity unable to give appropriate information and guidance
			1.2. Detail biophysical and socio-economic set-up of project sites	1.2.a. Project document or commissioned study	1.2.a.i.Often project documents lack specific information on biophysical and socio-economic condition of project areas, mainly due to lack of time or use of national or regional average values 1.2.a.ii. Sometimes projects are prepared in hasty condition due to lack of time, or too long procedures, or lack of resources 1.2.a.iii. Sometimes, poor capacity of consultants or companies commissioned to undertake such studies and lack of critical review of studies
		2. Capacity building	2.1. Capacity needs for communities and implementing agency	2.1.a. Need assessment within the project proposal	2.1.a.i. Sometimes lack proper need assessment 2.1.a.ii. In most cases, no focused capacity building or poor quality often donor driven 2.1.a.iii. Often, the region or woreda lack capacity to implement the capacity building component 2.1.a.iv. Often, the capacity building resources are not flexible and tied-up with many procedures and weak follow-up
			2.2. Requests from stakeholders	2.2.a. Evaluation reports	2.2.a.i. In some cases poor evaluation reports mainly related to biased consultants 2.2.a.ii. Often many donors neglect request for capacity building requested by stakeholders
		3.Technical backstopping	3.1. The need for technical support	3.1.a. Project document 3.1.b. Need assessment	3.1.a.i. In most cases poor quality technical advisors attached to many projects 3.1.a.ii. Often, most important areas that need technical support not considered 3.1.b.i. Sometimes very weak need assessment
		4. ME	4.1. Project agreement	4.1.a. Project document	4.1.a.i.In some cases project documents lack inbuilt ME and impact monitoring system 4.1.a.ii. Mostly poorly done do not reflect actual reality 4.1.a.iii. Often, lack of timely corrective action based on ME findings

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Development	NGOs	1. Project preparation/ approval for support	1.1. Detail information about the type of SLM activity to be implemented and approach (design, integration, and other requirements)	1.1.a. Project document	1.1.a.i. In some cases project documents are highly generalized and lacks specificity 1.1.a.ii. In most cases project documents prepared with standard format and do not catch actual needs and requirements of communities 1.1.a.iii. Sometimes, project documents miss the meaning of SLM and the way it has to be done 1.1.a.iv. Often, the integration aspect of SLM is mentioned but do not show how it should be done
				1.1.b. Professional consultation in the form of appraisal	1.1.b.i. Usually neglect locally applied approaches and tend to introduce new approaches instead of building on what is available 1.1.b.ii. Often some consultants put their view neglecting the real situation 1.1.b.iii. In most of the cases some consultants have very poor capacity unable to give appropriate information and guidance
			1.2. Detail biophysical and socio-economic set-up of project sites	1.2.a. Project document or commissioned study	1.2.a.i.Often project documents lack specific information on biophysical and socio-economic condition of project areas, mainly due to lack of time or use of national or regional average values 1.2.a.ii. Sometimes projects are prepared in hasty condition due to lack of time, or too long government and donor procedures, or lack of resources 1.2.a.iii. Sometimes, poor capacity of consultants or companies commissioned to undertake such studies and lack of critical review of studies
			2.1. Capacity needs for communities and implementing agency	2.1.a. Need assessment component within the project proposal	2.1.a.i. Often, lack of proper need assessment for capacity building 2.1.a.ii. Often lack of focused capacity building or poor quality 2.1.a.iii. Sometimes, the NGOs have limited capacity to implement the capacity building component 2.1.a.iv. The capacity building resource is often not be flexible or some heads of organization are not willing to fulfill requirements and weak follow-up
		2. Capacity building	2.2. Requests from stakeholders	2.2.a. Evaluation reports	2.2.a.i. Sometimes poor evaluation and do not reflect actual situation 2.2.a.ii. Sometimes neglect request for capacity building and use resource for other purpose
			3.1. The need for technical support	3.1.a. Project document	3.1.a.i. In most cases poor quality technical advisors attached to many projects 3.1.a.ii. Often, most important areas that need technical support not considered 3.1.b.i. Sometimes very weak need assessment
		3.Technical backstopping/implementation	3.2. Their mandate to implement	3.1.b. Need assessment	3.2.a.i. Often weak capacity and set-up of NGOs to implement approved project 3.2.a.ii. Poor institutional linkage especially with WOoARD and BoARD
			4.1. Project agreement	3.2.a. Project document	4.1.a.i. In some cases projects lack inbuilt ME and impact monitoring system 4.1.a.ii. Mostly poorly done do not reflect actual reality 4.1.a.iii. Often, lack of timely corrective action based on ME findings
		4. ME		4.1.a. Project document	

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Research	EARO	1. National Research Strategy	1.1. Detailed assessment of technology and Knowledge gaps, opportunities and constraints	1.1.a. Field evaluation, feedbacks from MoARD, BoARD, and other agencies and study documents	1.1.a.i. In some cases lack of exhaustive evaluation mainly related to SLM and is often related to lack of capacity 1.1.a.ii. Lack of proper consultation of stakeholders 1.1.a.iii. In some cases tend to follow classical approaches 1.1.a.iv. Often lack the big picture in its approach
		2. Coordinating the National Research System including networking	2.1. Types of research proposed across the nation and by different institutes	2.1.a. Research review and reports	2.1.a.i. Often very weak review mainly due to shortage of time and lack of high professionals on the field (SLM) 2.1.a.ii. Weak system to counter check the incorporation of feedbacks during the review
				2.1.b. Review reports	2.1.b.i. Often review reports lack details and sometimes incomplete
				2.1.b. Research Directory	2.1.a.i. Lack details in the research directory
				2.1.c. Research progress reports	2.1.c.i Often no or very poor progress report from the different organizations involved on research 2.1.c.ii. Very weak evaluation and lack of releasing system of finished SLM research results
		3. Establish institutional linkage mechanisms	3.1. Linkage needs	3.1.a. Survey reports, needs assessment	3.1.a.i. Lack of comprehensive survey or need assessment 3.1.a.ii Lack of efficient system and incentive for linkage and integration (for both horizontal and vertical)
			3.2. Consultation with stakeholders	3.2.a. Evaluation reports and consultations	3.2.a.i. In most cases evaluations or consultations with stakeholders are weak or not often done 3.2.a.ii. Sometimes feedback not incorporated 3.2.a.iii. Lack of follow-up and sometimes lack of will to address stakeholder concerns
		4. Coordinate Federal Research, Extension and Farmers Advisory Council (FREFAC)	4.1. Documents, previous meeting decisions	4. 1.a. Initial strategic documents about the function of the council	4.1.a.i. Initial strategic document was not rich and not revised
				4.1.b. Previous meeting decisions	4.1.b.i. Often no regular meeting and poor implementation and follow-up of council decisions, and unclear accountability of both research and extension for the council
				4.1.c. Agendas and issues raised by stakeholders	4.1.c.i. Agendas not properly addressed 4.1.c.ii. Often very formal kind of discussion not engaged on the real challenge

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Research	EARO	5. Capacity building	5.1. There is a need for better capacity	5.1.a. Survey documents, reports, need assessment	5.1.a.i. Often no proper survey or need assessment 5.1.a.ii. No focused capacity building often supply driven
			5.2. Reports and requests by regions and research centers	5.2.a. Reports and requests for capacity building	5.2.a.1. Often no appropriate request from stakeholders 5.2.a.ii. Neglect request for capacity building often due to unclear relation within the research system 5.2.a.iii. Limited capacity within EARO to meet stakeholder requests (knowledge and resource)
		6. Designing Organizational Structure	6.1. Need for new organizational structure	6.1.a. Need assessment documents, reports, etc	6.1.a.i. Often very weak need assessment and tend to follow classical approaches and systems 6.1.a.ii. Sometimes, need assessment documents and reports are not properly reviewed
				6.1.b. International experiences	6.1.b.i. Limited review of international experience or tend to follow blue print
				6.1.c. Professional consultation	6.1.c.i. Lack of addressing professional concerns
		7. Resource mobilization	7.1. Resource requirements to undertake SLM research in full capacity	7.1.a. Research plans and reports	7.1.a.i. In most cases plans and resources do not match and depends on government direct support 7.1.a.ii. Plans are often piecemeal and undermines the need for more resources
				7.1.b. Needs assessment	7.1.b.i. Lack of proper need assessment mainly due to the research approach or system 7.1.b.ii. Lack clear strategy for resource mobilization
		8. ME and technical backstopping	8.1. Requirements for ME and technical backstopping (National mandate)	8.1.a. Research Proposals	8.1.a.i. Lack capacity and efficient system to undertake effective ME and backstopping 8.1.a.ii. In most cases, research proposals lack clarity on ME
				8.1.b. Need assessment and /or request by stakeholders	8.1.b.i. Often weak need assessment; often it focused on federal system but not on the national research system 8.1.b.ii. Lack of resource and capacity to undertake extensive ME and backstopping 8.1.b.iii. Lack of focus outside the research system such as dissemination or following technologies in the hands of farmers or extension system mainly due to lack of incentive and limitations in the system

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Research	RARIs	1. Design Regional Research Strategy	1.1. Detailed assessment of technology and Knowledge gaps, opportunities and constraints	1.1.a. Field evaluation, feedbacks from BoARD, and other agencies and study documents	1.1.a.i. In some cases lack of exhaustive evaluation mainly related to SLM and is often related to lack of capacity 1.1.a.ii. Lack of proper consultation of stakeholders 1.1.a.iii. In some cases tend to follow classical approaches 1.1.a.iv. Often lack the big picture in its approach on SLM
		2. Coordinating the Regional Research System including networking	2.1. Types of research proposed across the region by different centers and institutes	2.1.a. Research review reports	2.1.a.i. Often very weak review mainly due to shortage of time and lack of high professionals on the field (SLM) 2.1.a.ii. Weak system to counter check the incorporation of feedbacks during the review 2.1.a.iii. Often review reports lack details and sometimes incomplete
				2.1.b. Research Directory	2.1.b.i. Lack details in the research directory
				2.1.c. Research progress reports	2.1.c.i Often no or very poor progress report from the different organizations involved on research 2.1.c.ii. Very weak evaluation and lack of releasing system of finished SLM research results
		3. Establish institutional linkage mechanisms	3.1. Linkage needs	3.1.a. Survey reports, needs assessment	3.1.a.i. Lack of comprehensive survey or need assessment 3.1.a.ii Lack of efficient system and incentive for linkage and integration (for both horizontal and vertical)
			3.2. Consultation with stakeholders	3.2.a. Evaluation reports and consultations	3.2.a.i. In most cases evaluations or consultations with stakeholders are weak or not often done 3.2.a.ii. Sometimes feedback not incorporated 3.2.a.iii. Lack of follow-up
		4. Coordinate Regional Research, Extension and Farmers Advisory Council (RREFAC)	4.1. Documents, previous meeting decisions	4.1.a. Initial strategic documents about the function of the council	4.1.a.i. Initial strategic document poorly prepared not addressing changing situations in each region
				4.1.b. Previous meeting decisions	4.1.b.i. In some regions no regular meeting and poor implementation and follow-up of council decisions, no clear accountability of both research and extension for the council
				4.1.c. Agendas and issues raised by stakeholders	4.1.c.i. Agendas not properly addressed 4.1.c.ii. Often very formal kind of discussion not engaged on the real challenge

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Research	RARIs	5. Capacity building	5.1. The need for better capacity	5.1.a. Survey documents, reports, need assessment (strategy)	5.1.a.i. Often no proper survey or need assessment for capacity building 5.1.a.ii. No focused capacity building and strategy, often supply driven
			5.2. Reports and requests by centers	5.2.a. Reports and requests for capacity building (also during annual review)	5.2.a.1. Often requests do not fit to available resource and capacity within RARIs 5.2.a.ii. In most cases requests do not fulfilled due to lack of capacity and resources
		6. Designing Organizational Structure	6.1. Need for new organizational structure	6.1.a. Need assessment documents, reports, etc	6.1.a.i. In some cases very weak needs assessment 6.1.a.ii. Sometimes, need assessment documents and reports are not properly reviewed
				6.1.b. National experiences	6.1.b.i. Often weak national experience review or often blue print is applied
				6.1.c. Professional consultation	6.1.c.i. Sometimes lack of addressing professional concerns
		7. Resource mobilization	7.1. Resource requirements to undertake SLM research in full capacity	7.1.a. Research plans and reports	7.1.a.i. In most cases plans and resources do not match and depends on government direct support 7.1.a.ii. Plans are often piecemeal and undermines the need for more resources
				7.1.b. Needs assessment	7.1.b.i. Lack of proper need assessment mainly due to the research approach or system 7.1.b.ii. Lack clear strategy for resource mobilization
		8. ME and technical backstopping	8.1. Requirements for ME and technical backstopping (Regional mandate)	8.1.a. Research Proposals	8.1.a.i. Lack capacity and efficient system to undertake effective ME and backstopping 8.1.a.ii. In most cases, research proposals lack clarity on ME
				8.1.b. Need assessment and /or request by stakeholders	8.1.b.i. Often weak need assessment; often it focused on federal system but not on the national research system 8.1.b.ii. Lack of resource and capacity to undertake extensive ME and backstopping 8.1.b.iii. Lack of focus outside the research system such as dissemination or following technologies in the hands of farmers or extension system mainly due to lack of incentive and limitations in the system

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Research	Research Centers	1. Plan for SLM research	1.1. The need to undertake the proposed research based on surveys in the domain areas of the centers	1.1.a. Survey findings (farming system constraints, opportunities and demands from stakeholder)	1.1.a.i. Often research proposals are very weak and follow piecemeal approach 1.1.a.ii. Most proposals do not address holistic nature of SLM and lack necessary depth on SLM 1.1.a.iii. Often proposals do not address major constraints of farming communities on SLM due to limited capacity and system 1.1.a.iv. Quality of most research proposals on SLM questionable due to lack of capacity and experience and weak technical backstopping 1.1.a.v. Poor integration because of the system and lack of incentive
				1.1.b. Research review	1.1.b.i. Often very weak review attached to shortage of time and lack of highly qualified professionals on the field 1.1.b.ii. Very weak system to counter check the incorporation of feedbacks during the review
		2. Implement Research and generate SLM technologies including demonstration	2.1. Research design and requirements	2.1.a. Research proposal	2.1.a.i. Often poorly designed research mainly due to limitations in capacity and lack of appropriate backstopping 2.1.a.ii. Poor follow-up of the research work by the researcher 2.1.a.iii. Very weak evaluation and releasing system of finished SLM research results 2.1.a.iv. Lack of incentive for integration and for problem solving but non-publishable research results on SLM
				2.1.b. Recommendation during the Review	2.1.b.i. Review recommendations not addressed due to lack of efficient counter checking system 2.1.b.ii. Often no or very poor progress report from researcher 2.1.b.iii. Very weak demonstration of finished SLM technologies
		3. Establish institutional linkage mechanisms	3.1. Linkage needs	3.1.a. Survey reports, needs assessment	3.1.a.i. Lack of appropriate survey or need assessment 3.1.a.ii Lack of efficient system and incentive for linkage and integration
			3.2. Consultation with stakeholders	3.2.a. Evaluation reports and consultations	3.2.a.i. Sometimes feedbacks not incorporated in evaluation reports 3.2.a.ii. In most cases lack of follow-up and lack of accountability
		4. Coordinate Center Led- REFAC	4.1. Documents, previous meeting decisions	4.1.a. Initial strategic documents about the function of the council	4.1.a.i. Initial strategic document poorly prepared not addressing changing situations in each domain area and accountability
				4.1.b. Previous meeting decisions	4.1.b.i. Minutes are not properly documented or checked 4.1.b.ii. Stakeholders are not attending the meeting seriously 4.1.b.iii. Poor implementation and follow-up of council decisions, no accountability both by research and extension
				4.1.c. Agendas and issues raised by stakeholders	4.1.c.i. Agendas not properly addressed 4.1.c.ii. Shortage of time and lacks innovation in its approach

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Research	International Research Centers	1. Plan for SLM research projects	1.1. The need to undertake the proposed research based on survey results (national and international)	1.1.a. Survey findings	1.1.a.i. Often very little research on SLM in the country 1.1.a.ii. Proposals didn't address holistic nature of SLM 1.1.a.iii. Proposals didn't address major constraints of farming communities, deal only on very few specific issues 1.1.a.iv. Often participation of stakeholders, mainly the national research system, during research design limited
		2. Implement Research project and generate SLM technologies including demonstration	2.1. Research design and requirements	2.1.a. Research proposal	2.1.a.i. Weak information communication and releasing system of finished SLM research results to stakeholders 2.1.a.ii. Lack of proper integration with the national system
		3. Introduce improved SLM technologies	3.1. Technology gaps and demands	3.1.a. Need assessment	3.1.a.i. Sometimes lack of detail needs assessment and in some cases based on request 3.1.a.ii. Often shortage of resource to introduce finished technologies
				3.1.b. Request by organizations	3.1.b.i. Too much expectations form stakeholders above the capacity of the centers
Regulatory	EPA and Regional EPLAUA	1. Environment Policy and strategy design and implementation	1.1. Needs for policy and strategy	1.1.a. Need assessment- study documents	1.1.a.i. Gaps during need assessment 1.1.a.ii. Often weak consultation of stakeholders and lack of incorporating stakeholder concerns 1.1.a.iii. Lack of capacity and experience 1.1.a.iv. Weak awareness creation about policies and strategies 1.1.a.iv. Weak reinforcement and poor implementation of policies and strategies, and lack of appropriate follow-up 1.1.a.vi. Weak linkage with extension and research system
				1.1.b. Field evaluation reports	1.1.b.i. Lack of experience in implementing new policies and strategies (e.g. Land Administration) 1.1.b.ii. Lack of graduates on the field trained within the country

Category of actors	Major actors on SLM	Types of decisions they made or role they play	Information needs to make decisions	Sources of information	Key information/knowledge gaps
Agricultural Education	Universities and collages	1. Graduating more professionals on SLM	1.1. The need for trained manpower	1.1.a. Survey findings and requests	1.1.a.i. Often weak need assessment and curriculum not comprehensive 1.1.a.ii. In some cases too theoretical and graduates lack practical experience 1.1.a.iii. Some issues of SLM such as land administration, SLM, etc not properly addressed in their curriculum 1.1.a.iv. In some cases trends of quality deterioration 1.1.a.v. University capacity and student quota not matched 1.1.a.vi. Weak capacity (human resource, facility, etc)
		2. Design and Implement Research project and generate SLM technologies including demonstration	2.1. Research design and requirements	2.1.a. Survey results	2.1.a.i. Often piecemeal lacks holistic nature of SLM 2.1.a.ii. In most cases lack of appropriate attention by the university for SLM research 2.1.a.iii. Poor linkage both with extension and national research system 2.1.a.iv. Limited capacity and resource to undertake holistic research 2.1.a.v. Lack of incentive to involve on research and linkages as well as on dissemination
	TVT Collages	1. Education of DAs	1.1. Request by MoARD	1.1.a. Gap presented or decided by Regions and woredas	1.1.a.i. Very weak curriculum not addressing the real problem 1.1.a.ii. Poor capacity (human and material resources) 1.1.a.iii. Lack experience 1.1.a.iii. Lack proper linkage with universities and collages
Land Users/ Farmers	Farmers	1. Decide or select what SLM practices to implement	1.1. Design, standard, benefit and cost	1.1.a. DAs or woreda experts	1.1.a.i. Often very poor capacity of DAs and woreda experts to communicate message to farmers (about benefits, costs, integration, design, standards, negative effects, etc) 1.1.a.ii. Often quota system and farmers have no chance to choose 1.1.a.iii. Poorly designed SLM measures negatively affect farmers livelihood 1.1.a.iv. Lack of incentive for applying and properly managing SLM practices
				1.1.b. Demonstration	1.1.b.i. Very weak or lack of demonstration 1.1.b.ii. Lack of full package information on cost, benefit and risk, often top-down
		2. Manage SLM practices	2.1. Benefits of SLM practices	2.1. Communication and demonstration	2.1.a..i. Lack of involvement on the planning process and poor demonstration resulted in very poor ownership feeling and poor management 2.1.a.ii. Destruction because fear of negative impacts 2.1.a.iii. Lack of knowledge and experience for better management

Appendix 2: Currently applied SLM practices, common mistakes and constraints affecting their sustainability and possible actions[11]

Group Name	Major SLM practices	Common mistakes and constraints during application	Possible actions for improvement
I. Indigenous SLM practices			
1. **Physical conservation measures**	• Stone terracing (mainly in Ankober area including surrounding and Konso), • *Dinber (Deb)* (initially made to mark plot boundaries but developed to terrace overtime), • *Boy or Fesses* (in farm ditch to divert or drain excess runoff*),* • *Gulenta (traditional ditch used to collect runoff from smaller ditches and act as waterway),* • Simple check dams (stone and brush), • *Tekebkebo* (diversion ditches to cut-off the excess runoff from upland areas*)*	• Lack of proper design and standards; often initiates soil erosion or water logging • Poorly integrated with other land management practices • Seriously affected by free grazing system • Poorly managed • Often poor collaboration among farmers (sometimes it is source of serious conflict)	• Proper characterization (set design, standard and integration requirements) • Control free grazing • Proper follow-up and management • Joint planning and collaboration
2. Biological Conservation Measures	• Below terrace plantation (mainly in Ankober area (*Prunus*) and Konso (*Shefere*); • Live fence around homesteads and farm lands; • Plantation along traditional waterways and diversion ditches • Scattered trees on farmlands (mainly acacia and croton), • Traditional agroforestry, • Small-Scale woodlots • Traditional nurseries	• Lack of appropriate design (including layout, combination and management) • Poor moisture management affects survival rate of seedlings • In appropriate tree and bush species for the purpose, often highly competitive trees like Eucalyptus • Poor management and follow-up • Poorly integrated with other land management practices • Lack of experience on nursery management • Seriously affected by free grazing	• Proper characterization (set design, standard and integration requirements) • Proper species selection (high value agro-forestry trees) • Proper moisture management • Control free grazing • Proper follow-up and management • Introduce proper nursery management

[11] A more detailed assessment of SLM practices is done by Gete et al (2005), forthcoming.

Group Name	Major SLM practices	Common mistakes and constraints during application	Possible actions for improvement
3. Soil Fertility Improving Measures	• Farmyard manuring, • Fallowing, • Use of special crops such as Lupine (mainly practices in Gojam area), • Inter-cropping, • Crop rotation, • Relay cropping	• Lack of clear standard and guideline for the farmer • Lack of awareness and support on alternative ways of using manure e.g. composting. • Poor combination with other soil management and conservation measures • Lack of proper awareness on the best rotation schedule, relay techniques and inter-cropping • Problem in combination of crop species • Problem in timing • Affected by free-grazing	• Set appropriate and site specific design and standard with all possible means of flexibility and/or options • Create awareness, provide guideline and training • Introduce proper management system • Control free grazing
4. Agriculture water management	• Runoff diversion for flooding (mainly in Raya valley, around Dredawa and other highly moisture stressed lowland areas), • Moisture conservation using crop residue, • Mulching, • Small scale irrigation, • Drainage ditch (Smaller Fesses),	• Lack of proper design, layout and standard • High time demand • High wastage due to inappropriate design and usage • Poor management and follow-up • Lack of back-up strategy • Less economic value crops • Affected by free grazing • In some cases poor collaboration among farmers	• Proper characterization, (design, standard and requirements, etc) • Proper management • Introduce high value crops and link with markets • Control free grazing
5. Grassland Management	• Zero grazing (mainly in Harargea highlands) • Hey making, • Temporary blocking of grasslands	• No standard • No quality control system • Lack of improved forage species • Poor management • Affected by free grazing	• Set improved standard and quality control system • Introduce proper management systems and improved forage species • Create awareness and capacity • Control free grazing

Group Name	Major SLM practices	Common mistakes and constraints during application	Possible actions for improvement
II. Introduced SLM practices			
1. Physical Conservation Measures	• Stone and stone-faced terracing, • *Fanyajuu,* • Soil bund, • Cut-off drains, • Waterways, • Check dams (stone, concrete, gabion, brush, etc)	• Lack of proper introduction through consultation and demonstration • Improper engineering design and layout (problem in keeping required standards) • Poor integration among measures and with other soil management practices • Very poor action to make measures productive • Seriously affected by free grazing • Poor follow-up, maintenance and management	• Follow proper participatory planning approach and demonstration • Respect proper layout, design and standard • Integrate among them and with other land management practices (as a minimum standard with soil fertility and moisture management) • Make practices productive • Proper follow-up and management • Control free-grazing
2. Biological Conservation Measures	• Bund stabilization (on, below and above bund plantation), • Hedge rows, • Grass strips, • Live fence around homesteads and farm lands, • Gulley stabilization or re-vegetation, • Area enclosure and enrichment plantation • Nursery development, • Agro forestry including trees on farmlands • Small woodlots (communal and individual),	• Often not properly introduced and implemented • Lack of respecting design and standard as well as requirements • Problem in species selection and combination • Lack or very little use of moisture conservation and management measures (moisture stress is often major problem) • Poor area closure management • Shortage of high value agroforestry species • High dominance of Eucalyptus woodlots • Poor management and follow-up • Highly affected by free grazing	• Follow proper participatory planning approach and demonstration • Respect proper layout, design and standard • Properly select species (grasses, bushes, trees, etc) and maintain appropriate combination • Integrate among them and with other land management practices • Apply appropriate water harvesting and moisture management structures • Introduce high value plant species • Make nurseries economically productive • Improve woodlots and increase diversity • Proper follow-up and management • Control free-grazing
3. Soil Fertility Improving Practices	• Compost making and application, • Crop rotation, • Inter-cropping,	• Often poor introduction and lack of following recommended design and standard	• Follow proper participatory approach, respect standards and requirements • Intoroduce high biomass vegetative

	• Alley cropping, • Conservation tillage, • Green manuring, • Improved agronomic practices, • Fertilizer application	• Shortage of biomass for compost making • Lack of awareness at different levels • Lack of capacity and know how to properly apply the measures • High cost • Lack of integrating with other land management practices mainly with physical and soil moisture management practices • Often blanket recommendation	materials • Create awarness, upgrade skill and demonstrate practices • Integrate with other land management practices • Introduces efficient credit system or low cost soil fertility management practices • Improve fertilizer use efficiency • Design site-specific recommendation
4. Agricultural Water Management Practices	• Moisture harvesting using different structures (Trenches, Micro-basin, Eyebrow Basin, Tie-ridging), • Runoff harvesting (Farm Ponds, SS-Dams, infiltration dams), • Rain water harvesting (roof catchment, rock catchment), • Mulching, • Small scale irrigation with all modern techniques, • Drainage using BBM,	• Poor application, design and standard • Blanket recommendation and lack of proper participation • Poor maintenance and management • Lack of appropriate capacity and experience • Lack of awareness • Poor design of farm tools such as BBM • Very poor follow-up and technical back-stopping • High cost to apply some measures	• Follow proper participatory approach during introduction • Respect appropriate design and standard • Avoid blanket recommendation and quota • Create awareness • Build capacity • Properly design farm tools to suit farming conditions and properly demonstrate • Introduce low cost technologies • Introduce efficient credit system • Make measures productive and economically attractive
5. Grassland Management	• Improved forage plantation (grass, shrubs and legumes), • Improved zero grazing (stall feeding), • Improved hey making, • Temporary blocking (padocking), • Silage making	• Poor introduction (poor design and standard) • Poor management • Create high expectations but lack standard design and management • Poor follow-up • Lack of capacity • Very big awareness problem • Affected by free grazing	• Follow proper participatory approach during introduction • Respect appropriate design and standard • Avoid blanket recommendation and quota • Create awareness • Introduce proper management system • Link with livestock productivity and soil fertility management • Control free grazing

Appendix 3: List of some of sectoral policies produced following Environmental Policy of Ethiopia[12]

No	Policy title	Year	Remark
1	The National Population Policy of Ethiopia	1993	
2	The National Fertilizer Policy	1999	
3	The National Science and Technology Policy	1998	
4	National Policy on Disaster Prevention and Management	1997	
5	National Policy on Biodiversity Conservation and Research	1998	
6	The Ethiopian Water Resources Management Policy	1999	
7	The National Health Policy	1993	
8	The National Energy Policy	1993	
9	The National Agricultural Research Strategy	1993	
10	The National Drug Policy	1994	
11	The National Health Science and Technology Policy	1994	
12	The National Land Use and Land Administration Policy	2005	

[12] This is modified after Gidion Asfaw, (2003) but the list is not exhaustive.

Appendix 4: List of stakeholders consulted (interviewed or involved in group/individual discussions)

Organization		Status of individuals consulted	Number	Remark
MoARD		State minister	2	On information basis and a sort of briefing about the study
		Department heads	2	
		Team leader	1	
EPA		Deputy Manager	1	
		Team leader	1	
BoARD	Amhara Region	Bureau Head	1	
		Department heads, team leaders and experts	7	
	Tigray Region	Deputy Bureau Head	1	
		Department heads, team leaders and experts	4	
EPLAUA	Amhara region	Bureau Head	1	
		Department heads and team leaders	3	
ZDoARD	Eastern Harargea	Team Leaders	2	
	Eastern Gojam	Team leaders and experts	7	
	West Gojam	Team leaders and experts	10	
Woreda OoARD	Alemaya	Tried but not successful		Representing partly high potential areas in the eastern highlands
	Gozamin	Team leaders and experts	7	Representing high potential woredas
	Adet	Team leaders and experts	6	Representing high potential woredas
	Ambasel	Team leaders and experts	4	Representing low potential wordas with some project support

	Wukro	Team leaders and experts	3	Representing low potential wordas with some project support
DAs	Alemaya		1	
	Adet		3	
	Ambasel		1	
	Wukro		1	
Farmers	Alemaya		12	
	Adet		20	
	Ambasel		6	
	Wukro		11	
Research[13]	Tigrai RARI	Directors	4	
	Adet ARC	Researchers and Division Heads	6	
Universities	Alemaya University	Academic Vice president, Department heads and Lecturers	8	
	Mekele University	Academic Vice president, Department heads and Lecturers	9	
Donor	WFP		1	Long years of experience in assisting SLM projects
	GTZ		2	
NGO	SG2000	Project Coordinator and 5 senior professionals	6	Innovative practices (conservation tillage)
		Total	**154**	

[13] The author is familiar with the research system

Appendix 5: TOR the study

In order to assist in up-scaling of sustainable land management (SLM) programs in Ethiopia, a stakeholder analysis will be conducted to identify how applied science and social science research can support the development of SLM related policies and make future targeting and implementation of SLM programs more efficient. This study is one of several near-term activities suggested by participants in a technical workshop on poverty and land degradation held at EARO on June 1-2, 2005, based upon stakeholder input from a national stakeholder workshop on this topic held at the U.N. Conference Center on May 31, 2005 (see workshop summary report).

Past experience and the recent consultations have indicated that although there have been many research initiatives and SLM projects implemented in the past, there has not been sufficient coordination between these related activities. It is widely agreed that applied research could be valuable in analyzing past experiences and supporting the design of SLM policies and programs. At the mentioned technical workshop it was therefore given highest priority to develop a **demand-driven applied research agenda** to enhance up-scaling of SLM practices. However, to make this agenda really demand-driven and to overcome some of the past problems in disseminating research results and avoiding unnecessary duplication of efforts, it was agreed to propose as a first step in this process a stakeholder analysis.

The main focus of this stakeholder analysis will be to assess key knowledge gaps and identify entry points and relevant modes of dissemination for research outputs into key agencies and organizations. The stakeholder analysis will analyze information/applied research demand to enable profitable and sustainable land management, indicating: (a) who (farmers, kebele and woreda administrations, regional governments, federal government, NGOs, international organizations) needs what type of information in order to improve the quality of interventions and to expand coverage; (b) what part of the needed information can be supplied/disseminated, and if so, how this can best be done; (c) what are the existing knowledge gaps, and (d) how can the missing information be generated by applied research and best be provided to stakeholders in the future?

The basis for the stakeholder analysis will be an initial identification of the main stakeholders (relevant government, NGO and international organizations active at the federal, regional and local levels). Particular emphasis should be given to the stakeholders involved in planning general nation-wide initiatives, and special attention should be given to stakeholders expected to be involved in the implementation of the Country Partnership Program on Sustainable Land Management. These stakeholders will be contacted for interviews and collection of plans and other documents. Based on this information a report will be written that specifies for each main stakeholder its key knowledge gaps where applied research can be expected to improve success in implementation and up-scaling of SLM initiatives. In addition, entry points and relevant modes of dissemination for such research results will be identified. A summary that focuses on key research themes will also be made. This summary is intended as an input into the process of developing a demand-driven applied research agenda.

To ensure its appropriateness the study will be staged. The already established advisory committee for the Poverty and Land Degradation project will be convened to identify the most relevant stakeholders. Interviews will be conducted with the stakeholders and will be used as the basis for preparing a report on key knowledge gaps and priority applied research issues.

The report of the study will be shared with stakeholders in a national workshop, and the study will be revised, considering the feedback received, and disseminated to stakeholders and relevant research organizations.

Expected outputs:

1. Identification of key stakeholders on SLM research.
2. Identification of key knowledge gaps and modes of disseminating results as well as entry points for applied SLM research.
3. A summary of future research themes and recommendations for a demand driven applied research agenda.
4. Stakeholder workshop conducted.
5. Final report prepared and results disseminated