

Saving Ethiopia's soils

About one-third of all agricultural land worldwide is degraded, presenting a significant threat to current and future food security. The picture is worse in Ethiopia: there, two-thirds of the population is affected by soil degradation, which usually starts when forests are converted into agricultural land. To remedy this situation, ESAPP's main focus in Ethiopia was on developing integrative approaches to sustainable soil and water management.

Sustainable development challenge

Worldwide, nearly 2 billion hectares of land are affected by human-induced soil degradation, putting the livelihoods of nearly 1.5 billion people at risk (UNCCD 2012). Reduced production capacity of the land is a major cause of food insecurity in many parts of Eastern Africa; in Ethiopia, about two-thirds of the population is directly affected by soil degradation, an age-old phenomenon which started with the spread of agriculture millennia ago, but was greatly accelerated in the past century.

According to a recent study by Hurni et al. (2015), the overall rain-fed agricultural area of Ethiopia covers 600,000 square kilometres, or 54 per cent of the country. In this predominantly highland and mountain area, yearly net erosion (i.e. soil erosion minus soil deposition) is estimated at about 940 million tonnes, or an average of 18 tonnes per hectare. On cropland, which covers more than one-third of the rain-fed agricultural area, both erosion and deposition rates can be much higher than average. Since the 1970s, much effort has been invested in soil and water conservation, not only on cropland but also in reforestation and area closure. To date, about 18 per cent of the cropland can be considered as treated, while another 23 per cent requires no treatment. Over the next five to ten years, sustainable land management measures must be taken on the remaining 59 per cent of cropland.

ESAPP's response

ESAPP took an integrative approach towards soil and water management, combining a number of strategies. First, researchers together with other stakeholders worked to generate relevant knowledge on sustainable land management issues. Next, they made this knowledge accessible through various channels and tools, and helped develop human and institutional capacity to maximize its use. Finally, they tested innovative solutions and made them available at a larger scale.

ESAPP worked in Ethiopia for 15 years, always focusing on sustainable soil and water management. During this period (1999–2014), over 25 interrelated projects were carried out. A first set of projects emphasized knowledge generation, supporting monitoring activities in research catchments varying in size from one to ten square kilometres, as well as in larger watersheds. A second set of projects focused on enhancing and developing the knowledge base for sustainable soil management. Here, work focused on further analysing databases established by a prior project, and establishing information and knowledge systems. In a third set of projects, key needs in capacity development were identified at the level of universities and ministries, and addressed through training courses and course material development at the universities. Finally, a fourth set of projects focused on implementing pilot projects for testing innovation and best practices.



Main messages

- In Ethiopia achievements in soil and water management since the 1970s are impressive. However, there is still a need to scale up projects to achieve broader coverage, to regions as a whole and to all croplands showing signs of soil degradation.
- Long-term observatories collecting all relevant socioecological and biophysical parameters have proved essential for the success of activities and programmes in sustainable land management. Whenever possible, such observatories should take advantage of and build on the experience of previous projects, while supporting new activities.
- Knowledge and capacity development at all levels remains a key requirement for sustainable land management, but must be based on local experience and joint generation of new knowledge on technologies and approaches.



Farmers in Anjeni, Gojam, built these conservation structures in 1985 and have maintained them well ever since. They retained traditional measures, such as drainage ditches across the terraces. (Photo: Hans Hurni)



Top and middle: A research assistant monitors suspended sediment yields in Anjeni, a Soil Conservation Research Programme (SCRP) study site in Gojam. Regular sediment sampling and processing throughout the rainy season makes it possible to assess total sediment loss from the catchment. (Photos: Hans Hurni)

Bottom: Traditional ploughing for *teff*, a major cash crop, but also for subsistence extends well into the rainy season. For this reason, traditional *teff* farming is a major contributor to soil erosion on cultivated land. (Photo: Hans Hurni)

The project story

Knowledge generation: The University of Bern conducted research work from 1981 to 1998 under the Soil Conservation Research Programme (SCRP), funded by the Swiss Agency for Development and Cooperation. Results from this programme provided the basis for later research and implementation in ESAPP projects from 1999 to 2014. ESAPP partners assessed the impact of sustainable soil and water management on reducing soil erosion and maintaining agricultural productivity, and they developed indicators for improving, scaling up, and phasing out various management approaches (see Gete 2011). The benefit of having long-term rural observatories became clear, as on-farm data and impact assessments of past activities and experiences are vital to current projects.

Knowledge base: A number of ESAPP projects focused on building up databases on climate, soil erosion, sedimentation, and agricultural production in research catchments before and after conservation (e.g. Amare et al. 2011). In addition to these local-level knowledge platforms, ESAPP supported EthioCAT, a knowledge and information base that serves to test applicability of local solutions in wider areas of Ethiopia. Other ESAPP projects supported EthioGIS, a geoinformation system that brings together national layers of information into a common and open-access information source (see Highlight 18). A major follow-up programme to the SCRP and these ESAPP projects is now the Water and Land Resource Centre in Addis Abeba, which makes all previous and current information available via its interactive website.

Capacity development: ESAPP strongly emphasized the training of trainers in view of achieving a wider educational impact. One strategy was to support university-level courses for Master's students through curriculum development and training of lecturers (see Highlight 15). The other approach taken was to help local academics develop locally relevant textbooks on soil and water conservation and on indigenous technologies in soil and water management.

Testing innovation: Finally, ESAPP supported pilot implementation projects in sustainable land management at four different sites in Ethiopia. Innovative aspects of these pilot projects included the way in which local communities were integrated in project activities, methods used for identifying degradation processes, design of the measures developed to reduce land degradation, and implementation and monitoring procedures of the projects.



Innovation and relevance

ESAPP's main support to Ethiopia was on sustainable soil and water management. Two main innovations were (a) the multi-scale approaches, and (b) enhancing process-based understanding of land degradation and rehabilitation.

Multi-scale approaches: This first innovation started with on-farm testing, in cooperation with farmers, of concrete solutions against excessive overland flow, soil erosion, soil accumulation, and gullying. At that scale, participants monitored the effectiveness of measures and their impacts on reducing problems and enhancing agricultural productivity. They also studied, documented, and made available to stakeholders the potential of maintaining ecosystem services. At an intermediate scale, projects addressed soil and water conservation issues in small catchments or larger watersheds, by monitoring the interactions between plots of land, particularly overland flow, soil movement or gullying, and the reactions of farmers in these catchments' communities. At a macro scale, overviews were developed for district and regional staff and up to the country level, again with a focus on river flow, sedimentation, or agricultural productivity, thus contributing to policymaking for sustainable soil and water management.

Enhancing process-based understanding of rural systems: This second innovation contributes to a comprehensive understanding of larger systems. It was carried out by carefully monitoring climatic, hydrologic, sedimentological, and agricultural parameters at selected sites, usually small to medium catchments, and by using models for extrapolation to wider areas. The innovation involves combining process-based knowledge with information layers of biophysical resources, socio-economic settings, and land use systems, enabling analyses such as the Economics of Land Degradation (ELD) case study on Ethiopia (Hurni et al. 2015).

At a regional scale, in Eastern Africa, sustainable soil and water management is a core problem and key focus of national governments. Here, ESAPP furthered South–South exchange through meetings on methodology and approach.



Top: Even very steep slopes are cultivated in about one-third of Ethiopia's highlands. These farming activities in very steep terrain threaten the country's soil resources more than anything else. (Photo: Hans Hurni)

Bottom: Farmers today are convinced that sustainable land management is a major component of their on-farm activities. Their willingness to invest time is apparent almost throughout the highlands. Here, farmers in the area of Abagerima, south Gonder, are working to conserve their soil and water resources. (Photo: Hans Hurni)



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Highlight profile

This highlight is based on the achievements of 25 ESAPP priority action projects.

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1999–2015

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This highlight

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What is ESAPP?

The Eastern and Southern Africa Partnership Programme (ESAPP) is a research implementation programme funded by the Swiss Agency for Development and Cooperation (SDC), coordinated by the Centre for Development and Environment (CDE) of the University of Bern, Switzerland, and implemented jointly by CDE and a network of partner institutions in Eastern and Southern Africa. Launched in 1999 and completed in 2015, ESAPP implemented over 300 priority action projects in the programme region, which included Eritrea, Ethiopia, Kenya, Tanzania, Mozambique, and Madagascar.

What are ESAPP Highlights?

ESAPP Highlights are a series of 24 project descriptions providing insights into ESAPP's research and implementation partnerships. Each Highlight describes a succession of demand-driven priority action projects addressing local and regional sustainability issues. The 24 Highlights are collected in a publication that includes additional background information on ESAPP (see citation above). The individual Highlights and the entire publication are also available for download on CDE's website: www.cde.unibe.ch (keyword search: "ESAPP").

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