

The *ngolo* farming technology

In Eastern Africa, soil degradation is a major problem in the densely populated hilly regions cultivated by subsistence farmers. A farming technology known as *ngolo* promises to enhance soil fertility, reduce crop erosion, and increase crop yields. ESAPP and its Tanzanian project partner, the Mikocheni Agricultural Research Institute, worked to introduce the *ngolo* technology to more communities.

Sustainable development challenge

Soil degradation is a major problem in Eastern Africa. It reduces the capacity of ecosystems to regenerate and sustain human use, and impacts negatively on local communities' food security and resilience against short- and long-term climatic variability. Soil conservation measures proposed by development projects and rural advisory services are often not, or insufficiently, taken up by local communities. Thus, a broad effect of these technologies is only rarely achieved.

In Eastern Africa, these problems mostly occur in the densely populated mountainous and hilly regions. Facing rapid land cover change, decreasing land productivity, and ever smaller land parcels, subsistence farmers in these regions cultivate steep slopes using farming practices that are poorly adapted to the rugged terrain. Areas such as the Uluguru and Usambara mountains in Tanzania and the heavily degraded hills of Mutonguni and Nzauni villages in Kitui County, Kenya, have become so unproductive that the affected communities have but two options. Either they shift to lower, flatter, relatively fertile areas – resulting in serious conflicts among the farmers – or they resign themselves to becoming perpetual food-relief recipients.

ESAPP's response

Maintaining the productive capacity of land in the long run was one of ESAPP's major concerns, and consequently a focus of its research and implementation activities. ESAPP adopted an integrative approach towards achieving this goal, the last step of this approach being dedicated to the dissemination of successful sustainable land management practices. Particular emphasis was put on the participatory dissemination of traditional or locally developed innovative technologies and practices in the regions concerned.

Ngolo is a traditional farming technology that was known to scientists and extension officers for its ability to enhance soil fertility, reduce soil erosion, and increase crop yields. The purpose of the *ngolo* project was to scale out this technology, selected because of its good performance in its area of origin and because it was unknown to farming communities in other parts of the country. Awareness creation, test plots, exchange visits, and information material thus became the main tools for the project partner, the Mikocheni Agricultural Research Institute (MARI), Tanzania, to enhance the visibility of *ngolo* and to make it attractive to other farming communities.



Main messages

- Smallholder communities in Eastern Africa have developed a number of local solutions for the conservation of land resources. These solutions can be scaled out to other communities within and outside the region, provided they are adapted to the context into which they are being transferred.
- Exchanges between farmers, even across country boundaries, have a high awareness creation impact. They greatly encourage the visiting community to replicate, back home, the practices learned; they also help to enhance self-confidence of the host community and its willingness to maintain the practice in question.
- Successful scaling-out of local innovations requires consistent mid- to long-term intervention by visionary scientists and extension officers who have the resources and experience to design and facilitate the implementation of a participatory technology transfer and exit strategy.



Having returned from Tanzania, Kenyan farmers pass on their knowledge on how to prepare *ngolo* fields. The project's success hinged on farmer-to-farmer learning, with only limited external facilitation and guidance. This strongly enhanced credibility of the technique to farmers for whom it was still new. (Photo: CETRAD photo gallery)



The project story

The *ngolo* farming technology combines erosion control and soil fertility maintenance using pits and ridges on steep slopes. It has been practised by the Matengo community in southern Tanzania for more than a century, but was never disseminated to other parts of the country, despite its confirmed ability – when correctly implemented – to control erosion, maintain soil fertility, and increase productivity. Under the *ngolo* system, farm residues from the previous cropping season are arranged into square grids of around 1.5 metres edge length and subsequently covered with soil dug up from the pits in the centre of the grids. The residues increase soil fertility while the pits retain rain water, thus considerably increasing soil moisture.

In 2003, project partner MARI, of the Tanzanian Ministry of Agriculture and Food Security, proposed to scale out the *ngolo* farming technology to heavily degraded agricultural areas in the Uluguru and Usambara mountains. MARI created a capacity development and dissemination concept that involved building awareness, devising training modules, producing posters and leaflets, establishing demonstration plots, and organizing farmer field days and exchange visits. The successful dissemination of the *ngolo* technology in the Uluguru and Usambara mountains from 2003 to 2005 encouraged the MARI team to extend it to other affected regions of Tanzania. Two equally successful additional transfer phases took place: one in 2005, in selected north-eastern and coastal areas of Tanzania, and the other in 2012, in the Uмба river basin in the East Usambara Mountains.

Eventually, the *ngolo* success story was carried across the border to the heavily degraded hillsides of Mutonguni and Nzauni in Kitui, Kenya. Nanyuki-based CETRAD (Centre for Training and Integrated Research in ASAL Development) developed a cross-border collaborative concept to facilitate technology migration. A team of researchers and extension officers from MARI and CETRAD designed an implementation strategy, identified suitable sites in the selected areas, and effected a first cycle of two seasons. Meanwhile, CETRAD organized an exchange visit of Kenyan farmers to southern Tanzania to facilitate farmer-to-farmer interaction, promote social learning, and allow Kenyan farmers to convince themselves of the benefits *ngolo* has to offer. The CETRAD team included extension workers from the Department of Agriculture in Kitui, to whom the project was eventually handed over to ensure long-term and widespread adoption.



Top: Kenyan farmers walking towards *ngolo* fields in southern Tanzania, where this farming technique has been used for several generations. (Photo: CETRAD photo gallery)

Bottom: Beans and other crops, such as maize and wheat, can be planted using the *ngolo* technique. (Photo: CETRAD photo gallery)

Innovation and relevance

The series of projects on the dissemination of the *ngolo* farming system was based on an approach revolving around the transfer and adaptation of knowledge and experience from one community or region to another. With this approach, farmers learn from other farmers who speak the same language and share the same pre-occupations and needs. The researchers from MARI and CETRAD purposely limited their role to facilitating and guiding the dissemination and awareness creation processes along the different stages of the project. This facilitation and guidance was done using the tools mentioned above (e.g. exchange visits, leaflets, farmer field days, demonstration plots).

Between 2010 and 2012, the *ngolo* dissemination projects were upgraded to a transnational South–South exchange between Tanzania and Kenya. According to the implementing institutions, the Tanzanian farmers' self-confidence was greatly strengthened by the fact that farmers from another country came to learn about their farming practices. Inversely, Kenyan farmers who visited Tanzania became highly motivated ambassadors of the *ngolo* farming system back in their own communities, which substantially helped to enhance ownership of the targeted dissemination process.

The *ngolo* projects are of great relevance in terms of food security, both in the short and in the long term. In the short term, the *ngolo* farming technology can substantially improve the quantity and stability of yields, even in areas with climate variability. In the long term, the improvement of soil fertility leads to an overall improvement of the project regions' carrying capacity and ability to withstand high farming pressure. As food security and land degradation are two major problems in Eastern Africa, the experiences gained in the *ngolo* projects are also highly relevant at the regional scale.



Top: A Tanzanian farmer shows his Kenyan counterparts how to prepare *ngolo* fields. The interaction between farmers of both countries was crucial to successfully scaling out the *ngolo* farming technique. It instilled a sense of pride in Tanzanian farmers, and reassured Kenyan farmers that the technology is already in use and has yielded good results. (Photo: CETRAD photo gallery)

Bottom: A farmer in Kitui demonstrates how crop residues from the previous season are arranged on the ground and then covered with soil around a central pit. Integrating these residues enhances the soil's fertility and water permeability. These are crucial advantages in an ecologically marginal farming area such as Kitui, where rainfall is erratic and soils are often poor in nutrients. (Photo: CETRAD photo gallery)



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Further reading

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Highlight profile

This highlight is based on the achievements of 4 ESAPP priority action projects.

Implemented during:
 2006–2014

Total funds contributed by ESAPP:
 CHF 141,000

Implemented by:
 Mikochei Agricultural Research Institute (MARI), Dar es Salaam, Tanzania

In collaboration with:
 Centre for Training and Integrated Research in ASAL Development (CETRAD), Nanyuki, Kenya

Main beneficiaries:
 Farming communities in the Uluguru and Usambara mountains in Tanzania, as well as in Makeni County in Kenya

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").