



## SOIL AND WATER CONSERVATION ON THE SLOPES OF KILIMANJARO



Location: Moshi, Hai, and Rombo districts, Tanzania

*Himo Environmental Management Trust Fund has worked to improve the livelihoods of small-scale farmers facing low productivity and soil erosion on the slopes of Mt. Kilimanjaro. Farmers have been trained in soil and water conservation techniques and built small rural infrastructures.<sup>1</sup>*

### CHALLENGE

At over 5,000 meters, Mount Kilimanjaro's rounded, snow-capped peak is an iconic African symbol. The National Park's forested slopes rise up to the peak, above the plains of northern Tanzania. Slightly lower down, at altitudes between 1,000 and 1,500 meters, farmers grow crops in the fertile soil: coffee, bananas, fodder trees, and grasses. Further down, at altitudes of 750-1,100 meters, where the slopes merge into the drier plains, farmers grow maize and beans and keep goats and dairy cattle. The soil is fertile, and the rainfall is relatively good for Tanzania—around 1,800 mm a year in the coffee-growing area and about 800 mm in the area planted with maize and beans. The area also has some of the highest population density in the country: 650 people/sq km in the coffee-growing area and 350 people/sq km in the maize and beans zone.<sup>2</sup>

Maize and bean farmers face increasing soil erosion and low productivity challenges. The majority keep cattle—normally one or two cows—for milk, manure, and to be sold for cash. Farmers also keep goats as a meat source and for sale. These animals are traditionally confined in a shed and fed with cut grass, banana leaves, and other vegetation. Finding enough fodder is a problem.

After the maize and bean harvests, all crop residues are removed and used to feed the animals; hence gullies form on the bare soil during heavy rainfall. This prevents water from seeping into the soil, and impedes sufficient moisture from reaching the crops during dry spells. Instead, the water runs off, carrying valuable topsoil. The result is declining yields that leave farm families hungry and poorer.

### RESPONSE

Since the 1990s, Himo Environmental Management Trust Fund (HEM), a local NGO, has worked to improve the livelihoods of family farmers in the three districts around Mt. Kilimanjaro: Moshi, Hai, and Rombo. It manages and protects the area's natural resources—land, water, and vegetation; introduces ways to improve small-scale farms; and promotes income-generating activities such as beekeeping, fish farming, poultry, dairy cows, tree nurseries, and biogas production.

**More specifically, HEM has undertaken the following activities:**

- Helping individuals, groups of farmers and institutions such as schools and churches start tree nurseries. Participants grow fruit trees and fodder species seedlings to plant or sell.
- Promoting the use of energy-saving wood stoves among the farmers to reduce the number of trees cut for fuel and the amount of time women spend fetching firewood.
- Supporting furrow rehabilitation so farmers do not have to transport river water to irrigate vegetables and other crops. Cement-lined canals reduce water loss, allowing farmers to produce up to three crops, compared to just one without irrigation.
- Promoting various soil and water conservation technologies to reduce erosion and conserve and improve soil fertility.

The conservation farming techniques promoted include contour farming, which consists in plowing and growing crops along lines of consistent elevation (contours) rather than up and down the slope. This conserves rainwater and reduces soil losses, especially when coupled with planting of grass strips to break the water flow down the slope and reduce surface erosion.

Other practices help maintain soil structure and fertility, such as: planting a mix of crops to protect the soil from heavy rain, using crop residues as mulch to conserve soil moisture, rotating crops of maize, tomatoes, and nitrogen-fixing legumes (groundnuts and beans) to maintain fertility and prevent build-up of pests, diseases and weeds. Water and irrigation are managed through digging trenches along gentle to moderate slope contours with up to eight percent gradients. In this practice, soil is piled into a ridge upslope to control water flow, prevent erosion, and encourage the natural formation of terraces (or *fanya juu*). The ridges are planted with stabilizing grass and trees. The farmers also moved large amounts of soil to form a series of flat terraces suited for irrigation. Terraces are appropriate for steeper slopes, with up to 13 percent gradient. Finally, building barriers across gullies or streams helps to slow water flow, thereby preventing further erosion.

These activities are promoted through training and demonstrations on farmers' fields. HEM has a regular training program offering short courses to farmers on the aforementioned topics and on appropriate technologies. While HEM teaches farmers how to use the various soil and water conservation techniques, the farmers perform all the work themselves.

Starting in 2000, the village governments passed by-laws requiring all the farmers to implement soil and water conservation practices.



Women walk for several hours to collect firewood.  
© Michael Farrelly

Zero-grazing is an approach to animal management in which families contain livestock in an enclosed, shaded area. Farmers carry fodder and water to them and provide them with daily exercise instead of letting them wander in the open where they are more likely to catch diseases or damage the environment.

Productivity has risen: on average, maize yields have doubled, from six to twelve bags an acre.

The program began in 1996. A chairman and secretary from eight of the nineteen villages closest to Himo attended two to three-day soil and water conservation trainings at the HEM centre. The Ward Secretary and Divisional Secretary (representing the next two higher layers of local government) were also in attendance. The trainings covered various methods to control erosion and restore soil fertility, combining classroom discussions with visits to the 2.5-acre experiment farm, which is used for banana cultivation, contour farming, fodder production, and various conservation structures. After the trainings, village representatives invited HEM technicians from various fields—agriculture, natural resources, livestock, water, and community development—to advise local people on how to implement these approaches on their land.

HEM next conducted a detailed participatory rural appraisal for each village. It was clear that soil erosion was creating poor yields and low productivity. Each village established a soil and water conservation committee responsible to the village government. Committees were tasked with raising local awareness about erosion; persuading farmers to adopt soil and water conservation measures; facilitating trainings, planning sessions; and monitoring/implementing village-wide conservation works. Each village also nominated one farmer as a village-level extension worker to receive a month-long training at the HEM center on tree nurseries, agro forestry, irrigation furrow rehabilitation, soil and water conservation, zero-grazing,<sup>3</sup> improved stoves, and training methodologies. Extension workers were provided with a bicycle and were excused from *kazi jumua*—compulsory community work (according to local by-laws, all villagers are required to work one day a week on community activities such as road maintenance or school building).

HEM also organized a study visit so village leaders and extension workers could see areas where farmers were already practicing soil and water conservation. Farmers chose from a variety of trainings: marking out contours using a spirit level, constructing *fanya juu* contour bunds to accommodate steeper slopes, determining the best types of fodder grasses and trees, or planting and maintaining fruit trees.

Next, extension workers trained the farmers interested in further education. HEM maintained regular contact with the extension workers and obtained and disseminated information on improved technologies and new crop varieties

from local research institutes and other NGOs. In 2006, HEM began providing the extension workers with information on market prices for commodities such as bananas, tomatoes, and other vegetables sold in the Himo and Moshi markets.

In some villages, farmers formed groups to build *fanya juu* on individual fields. For issues affecting several farmers or the whole village—repairing an irrigation canal or building check dams on a stream—the village leadership organizes a *kazi jumua* to do the work. The village extension worker plays an advisory role, and village leaders supervise the work.

## RESULTS

- Of the initial 1,140 farmers who were trained in 1996, 760 (67 percent) adopted at least some of the technologies. Their success encouraged the others to follow suit. By 2005, some 6,500 farmers in the eight villages had applied conservation techniques on more than 4,200 hectares (ha) of land.
- Farmers who implemented the conservation techniques have reaped many benefits. Productivity has risen: on average, maize yields have doubled, from six to twelve bags an acre (from 1.3 to 2.6 t/ha) and bean yields have risen from three to five bags per acre (0.7 to 1.2 t/ha).
- As part of soil and water conservation techniques farmers planted trees such as *leucaena*, *calliandra*, and *croton*, as well as grasses—*Napier*, *desmodium*, *setaria*, and *Pallida*—on the bunds. Cut grass and tree pruning are fed to animals, resulting in increased milk yields. Goats once yielding an average of 0.5 liters of milk a day now produce averages of 2.5 liters. Cows now produce seven liters a day, compared to the previous four liters. The farmers sell much of their milk—and even some fodder—in Himo.
- Starting in 2000, the village governments passed by-laws requiring all the farmers to implement soil and water conservation practices. Non-compliant farmers are fined in various ways; they may, for example, have to double their portion of *kazi jumua*. Before the by-laws were passed, half of the farmers were implementing conservation measures. Since their passage, all farmers implement soil and water conservation techniques.
- The “Uhuru Torch,” a government program to highlight successful development interventions, has visited HEM several times, generating significant media coverage

in newspapers, radio, and TV. Local and regional politicians, officials, civil servants, and the Minister of the Environment have also visited HEM.

- These visits were partly responsible for the government's 2004 decision to establish environment committees in every village throughout the country. The committees are responsible for the conservation of natural resources.

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## ENDNOTES

- 1 Adapted from *Sustainable agriculture: A pathway out of poverty for East Africa's rural poor. Examples from Kenya and Tanzania*. GTZ and Sustainet (Sustainable Agriculture Information Network), 2006. <http://www2.gtz.de/dokumente/bib/06-0712.pdf> (accessed October 31, 2014).
- 2 Farmers here generally own between 0.5 and 2.5 acres (0.2–1 ha) of land.
- 3 See: Heifer International. *Answering Today's Global Challenges*. "Zero-Grazing, Eco-friendly Animal Management." <http://www.heifer.org/ending-hunger/global-challenges/the-environment/zero-grazing.html> (accessed October 31, 2014).

### FRONT PAGE PHOTO:

Mt Kilimanjaro. © Michael Farrelly



Farmers building contour ridges (fanya juu) to retain rainwater and reduce soil erosion. © Samwel Zongolo



Fanya juu is a form of contour ridging to retain rainwater and reduce soil erosion. © Samwel Zongolo

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