

HORIZON

The EU Research & Innovation Magazine

Environment

Harvesting water in Ethiopia

07 October 2015

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In Ethiopia, researchers identified three major challenges related to water and land use: rainfall variability, poor soil fertility and a shortage of land. Image: Shutterstock/John Wollwerth

Land-based dams and clever use of bacteria and yeast are enabling Ethiopian smallholders to increase production by 10, and the techniques could be replicated across east Africa.

So-called water harvesting on small-scale farms over the past four years has helped annual crop yields rise from 500 to 5 000 kilogrammes per hectare, when combined with other soil management measures, according to Dr Kifle Woldemariam, coordinator of the Ethiopian study site for the WAHARA research project.

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On average, the Ethiopian smallholders involved in the project have around half a hectare of land that they use to raise crops and livestock to feed their families and make a living.

'With this much land, if they can get enough water and improve their soil through different management practices, they are able to support their families,' Dr Woldemariam said. 'Otherwise they could remain food insecure, as they

are all small-scale farmers who are very poor and very sensitive to various rainfall and climate related challenges.'

The aim of the EU-supported WAHARA project is to develop innovative and appropriate water harvesting technologies that can be applied to different geographical regions in Africa. The project is running trials in four countries: Burkina Faso, Tunisia, Zambia and Ethiopia.

At the Ethiopian study site, which covers one water catchment area in the north of the country, the researchers identified three major challenges related to water and land use: rainfall variability, poor soil fertility and a shortage of land.

Although northern Ethiopia's annual rainfall is quite similar to countries in northern Europe – 500 to 800 millimetres per year – it all falls over just a few months and is unreliable.

'The rainfall doesn't come at the same time every year, it stops early or it comes late and this makes rainfall-based farming really challenging,' Dr Woldemariam said.

The poor soil fertility is also linked to rainfall. In Ethiopia it is not unusual to have very high levels of rain over just a few days. This leads to flash floods, which strip the land of its topsoil, reducing its fertility.

To tackle the unreliable rainfall and poor soil fertility, researchers have been investigating the effectiveness of so-called check dams and soil improvement techniques, such as mulching with effective micro-organisms, which involves laying organic matter that has been treated with a yeast and bacteria solution on the ground.

Check dams

Rather than stopping water completely, check dams are barriers designed to interrupt flow and reduce water velocity, which helps tackle erosion and flash flooding. They also allow farmers to divert and store water for irrigation and, by slowing it down, increase the infiltration of water into the surrounding land.

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Dr Kifle Woldemariam, the
WAHARA research project

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'It's amazing, even in wells that were dry, new groundwater has started to come up,' Dr Woldemariam said. 'The sedimentation has stopped running off almost completely in some areas and the floods have stopped in parts of the watershed.'

The researchers have also been looking at the introduction of bench terraces on steep ground to create more usable land. The ultimate aim of the project is to produce designs for check dams and bench terraces that can be adapted and used across Ethiopia and east Africa.

'The idea is that we will come up with a design, with options and guidelines for different conditions, that NGOs (non-governmental organisations), communities and individuals can take and implement on their own land,' Dr Woldemariam explained. 'This is starting already. Individuals are trying to build the check dams and bench terraces on their own farmland, especially if they are near rivers.'

If Ethiopia is able to manage its water resources well, then it may actually be able to increase its food production levels as the climate changes, according to Prof. Riccardo Valentini from the Euro-Mediterranean Centre for Climate Change in Viterbo, Italy.

He coordinated the EU-funded CLIMAFRICA project, which constructed a map of how climate change will affect the food security of different countries and regions in sub-Saharan Africa.

'One of the results of the project which is quite interesting is exactly that the climate effects are different in different parts of Africa,' he said.

'We found that west Africa and south Africa will be most affected by climate change, while, quite surprisingly, there will be some marginally positive effects on the east Africa horn.'

This is because rainfall amounts are expected to increase in this last region, potentially enabling an increase in crop yields.

Medium range

Africa as a whole is particularly vulnerable to climate change, both because of the physical impacts and because the ability to respond is limited. CLIMAFRICA researchers looked at the likely effects of climate change in different parts of Africa over a medium-term range to 2030.

The idea was to give governments, international institutions and citizens useful information to help decide where best to invest resources.

'Usually everybody is predicting climate scenarios at the end of the century,' said Prof. Valentini. 'The end of the century is too far for this type of thing. And at the same time the weather forecasts are too short to take appropriate measures.'

'So the intermediate scale is very important for managing investments and to make more robust the African system to stop climate change.'

The CLIMAFRICA researchers estimate that Africa needs a total investment in irrigation systems of around EUR 1.95 billion to cope with the effects of climate change. 'This is not really a huge amount when you consider the African continent,' said Prof. Valentini.

Expo Milano

The WAHARA and CLIMAFRICA projects form part of a presentation by the EU at the Expo Milano 2015 world fair.

Expo Milano runs from 1 May to 31 October and focuses on feeding the planet sustainably.

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