Greening Kenya's drylands through climate-smart agriculture

By Rodolfo Quevenco

Climate-smart agricultural practices can help turn marginal lands into productive fields.
(Photo: D. Calma/IAEA)

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— Isaya Sijali, Kenya Agricultural and Livestock Research Organization

Arid and semi-arid lands account for almost 80 per cent of Kenya's land area, and climate change is threatening this fragile ecosystem.

In a country where suboptimal agricultural practices already result in poor crop growth, low vegetative cover, low crop yields and serious land degradation, weather conditions resulting from climate change and variability have made drought and water scarcity common.

Using nuclear techniques, the IAEA is helping Kenya improve soil fertility and water management technologies, as part of the introduction of Integrated Soil Fertility Management (see box), which can help maintain the right water, nutrient and carbon balance and maximize climate change adaptation in agricultural systems.

Finding the right balance

Under an ongoing five-year project, the IAEA is working with local laboratories and scientists to determine the extent of carbon loss from the soil and the effects of drought on plants and water resources in the arid and semi-arid regions of Kenya. It is also helping to measure fertilizer intake and water use, as well as the rate of evaporation. Data from field tests will be fed into various models to generate recommendations for the appropriate farming systems to introduce in the affected regions.

For example, more than 300 farmers were trained in terracing techniques that are used to conserve soil and water and improve productivity. Most of them have been able to adopt the techniques and have since obtained good yields, said Isaya Sijali, a principal research scientist and coordinator of irrigation, drainage and problem soils management at the Kenya Agricultural and Livestock Research Organization. Many are now able to harvest over 10 tonnes of fodder per hectare from land that lay barren before the project's inception.

The IAEA is also providing equipment and experts to support the project. To facilitate the transfer of knowledge to local counterparts, it has provided several fellowships and scientific visits, as well as fellowship training.

A key goal is to combat land degradation caused by overgrazing and poor soil

management practices. The project also aims to boost agricultural production, Sijali said.

"The use of nuclear techniques to validate water and nutrient management technologies is essential for Kenya to realize its vision of developing a modern and productive farm and livestock sector," Sijali said.

"The technologies will help us to maximize the use of high- and medium-potential lands and to further develop arid and semi-arid areas for both crops and livestock production," Sijali added. "Nuclear techniques will also help us to quickly adapt our use of these lands to better cope with the effects of climate change."

Almost 80 per cent of Kenya's land area is composed of arid and semi-arid lands.
(Photo: R. Quevenco/IAEA)

Multi-agency collaboration

The International Institute for Applied Systems Analysis (IIASA) in Vienna, Austria, has also collaborated on the project. Experts from IIASA are working with counterparts in Kenya and the IAEA, assessing the water footprint of crops in the Central, Eastern and Rift Valley counties. This is expected to yield valuable data on how much water consumption is related to rainfall and how much to the availability of surface or groundwater.

The water availability assessments — concerning abundance, need and/or scarcity — will in turn lead to a better understanding of the impact of drought on existing resources and on the communities in these areas.

A notable extension to the project is the planned development of mobile-based technology for sharing information with farmers. Once in place, practical information, such as how much fertilizer to use and when and how often to irrigate, can be sent to farmers straight from a mobile phone.

Climate-smart agriculture

The catchphrase most often used to describe this integrated, adaptive agricultural model is 'climate-smart agriculture'.

"We may not be able to totally stop the ravaging effects of drought but we could minimize them through employing farming methods that adapt to changing climatic conditions and boost productivity while maintaining the sustainability of natural resources," Sijali said.

"By supporting farmers and empowering them to use sustainable land management practices, we are helping them contribute to a positive ecosystem and maintain the right water, nutrient and carbon balance and therefore a better quality of life for all."

THE SCIENCE

Integrated Soil Fertility Management

Field trials have been established in different parts of Kenya to identify integrated best practices, combining the principles of Integrated Soil Fertility Management (ISFM), conservation agriculture and water management. The results have shown that in the arid and semi-arid eastern part of Kenya, technology packages, which include the use of tiered-ridging for water conservation, improved crop varieties, use of manure and micro-dosing, among other ISFM technologies, were able to increase maize yields from less than 500 kilograms per hectare to an average of 1.2 tonnes per hectare.