

Enhancing adaptation to climate change in semi-arid Kenya

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What is the issue?

Like the rest of sub-Saharan Africa, Kenya's agriculture is mainly rain-fed and therefore highly vulnerable to climate change. If left unmanaged, climate change will exacerbate the already precarious food situation in the country, cause severe shortage of other essential basic commodities and lead to long-term food insecurity. However, most vulnerable areas, such as semi-arid eastern Kenya, lack locally-specific information on the exact nature and consequences of climate change that can be used in local adaptation planning. Data that is available is based on global and regional estimates.

In response, the IDRC-funded project *Enhancing Climate Change Adaptation in Agriculture and Water Resources in the Greater Horn of Africa* has generated precise estimates of the impacts of climate change on some key food crops under a variety of adaptation strategies. The work has focussed on Kitui, Machakos and Makueni counties of semi-arid eastern Kenya, supporting the three county governments in developing appropriate adaptation strategies and programs that can assist farmers to adapt better to climate change.

What did we do?

Simulation models were used to predict the impacts of climate change on some major food crops in the three counties, namely maize, pigeonpea, sorghum and beans. This was done using two climate scenarios, CNRM and

Key messages

- Climate change will have serious consequences on major crops in semi-arid eastern Kenya such as pigeonpea, maize and sorghum.
- Pigeonpea yields in eastern Kenya are expected to decline by over 60% by 2050.
- Irrigated maize and in situ water conservation measures are the most feasible adaptation strategies for lower eastern Kenya. According to simulation modelling work, these measures have the potential to reduce poverty levels by 3% in Machakos, by 1.5% in Makindu and by 2% in Mutomo.
- County governments should develop programs to provide affordable credit to farmers to enable them to invest in irrigation of maize and sorghum.
- Kenya's national agricultural research system should develop pigeonpea varieties that are adapted to increasingly wet conditions.

CSIRO, focussing on the near (2050) and far (2100) future. The costs and benefits of possible adaptation options were also assessed using economic models to identify the most viable ones. The viable options were validated using field experiments conducted in the three sites.



Without access to localised climate information, farmers are highly vulnerable to crop loss

What did we learn?

- Like the rest of semi-arid eastern Kenya, Kitui, Machakos and Makueni counties are projected to be warmer by 2°C by 2050.
- The three counties are expected to receive slightly higher rainfall (11%) by the end of the century (2100).



Farmers in Makueni discuss the agro-advisory before the start of the cropping season

- Pigeonpea in the three counties is projected to be affected negatively by these changes in climate. Yields are expected to decline by over 60% by 2050.
- Maize yields are expected to increase substantially even if farmers do not adopt soil and water conservation measures, provided they follow other recommended agronomic practices, such as use of certified seed, fertilizer application and early planting. If irrigation were used, the three locations could register yield increases of over 300% (from 500kg/ha to 2000 kg/ha) by 2050.
- Sorghum yields are also expected to increase tremendously with the adoption of soil and water conservation measures. Under irrigation, yield increases of up to 500% (from 500kg/ha to 3014kg/ha) are predicted by 2050.
- Irrigation of maize and in situ water conservation measures such as tied ridging and bench terracing are the most feasible adaptation strategies in lower eastern Kenya. These have the potential to reduce poverty levels among adopters by 3% in Machakos, by 1.5% in Makindu (Makueni county) and by 2% in Mutomo (Kitui county).



With climate information, farmers are achieving good yields even in poor seasons

Stories of change

- A significant achievement of the project has been the active involvement of project team members in national climate change adaptation planning initiatives. Thanks to the expertise they developed through the project, the team was invited to join national fora that culminated in the development of Kenya's National Climate Change Action Plan (NCCAP).
- Farmers in the project sites now use climate information to plan farm operations and are able to realize good yields even in poor seasons. The majority (over 70% of the 400 households involved in the project) are now achieving good harvests and over 80% are willing to pay for climate information.

- Mr. Joseph Maingi of Machakos said, "I cannot start any farm activities without the weather forecast. I use it to plan my farm operations and I have no regrets since I have been able to harvest a crop even when the season is bad."

What are the policy implications?

- The Ministry of Agriculture, the secretariat responsible for implementing the National Climate Change Action Plan (NCCAP) in the Ministry of Environment, and the county governments of Machakos, Makueni and Kitui should enhance their on-going campaigns to promote enterprise diversification, including more promising crops such as sorghum and maize.



In Makeni, a farmer admires his highly productive maize crop

- Provision of climate information to farmers in a timely manner and in a format they can understand has proved to be very productive. County governments of Machakos, Makeni and Kitui should liaise with the Kenya Meteorological Department towards developing a sustainable mechanism for delivering this information to farmers.
- It is clear that investing in irrigation and soil and conservation measures will help farmers in these arid areas to cope better with climate change. However, given their prohibitive costs, many farmers may not afford such strategies, especially irrigation. Counties are therefore encouraged to develop programs

that will provide affordable credit to farmers, to enable them to set-up small-scale irrigation systems such as drip irrigation.

What next?

- Kenya is the fourth largest producer of pigeonpea in the world after India, Myanmar and Malawi. Most of it is produced by smallholder farmers in eastern Kenya who consume it and export the surplus to India and the Middle East. There is need to invest in developing water-logging-tolerant pigeonpea varieties to safeguard these markets, given the projected decline in pigeonpea yields.
- Based on their success in the three counties, agro-advisories need to be up-scaled to other dry areas in the country to establish if these approaches can work elsewhere.

Need more information?

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