

Diversification: a safety net for Kenya's dryland farmers in the face of climate change

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What is the issue?

Climate change threatens livelihoods in the arid and semi-arid lands (ASALs) of Kenya, where frequent drought and erratic rainfall limits the ability of the predominantly pastoral communities to expand their livelihood options. Currently, it is estimated that about 50% of households in the ASALs are food insecure, with crop failures happening around once every four years. Maize production is only 0.5 tons/ha, compared to 1.5-2.4 tons/ha under favorable climatic conditions (Boko et al., 2007). Given the pressures from climate change, food security will worsen unless changes in food production are made.

In adapting to climate change, some households have adopted an agro-pastoral way of life, combining traditional livestock rearing with crop production and other economic activities (Gordon et al., 2010). While this shift represents an innovation by these communities, it has also exposed them to new risks and a different set of challenges in securing their livelihoods. The IDRC-funded *Agricultural Productivity and Climate Change in Arid and Semi-Arid Kenya* project set out to identify suitable crops for local conditions that would be readily acceptable to farmers, and to investigate water efficient farming systems that would be more productive under projected climatic changes.

What did we do?

Localised rainfall information for the region was used to indicate current and future rainfall scenarios, which are used to forecast the onset of

Key messages

- **Downscaled projections revealed sharply declining yields for many dryland food crops in Transmara district. Maize production is predicted to fall by up to 50% by 2030 if nothing is done.**
- **Organic fertilizers increased household maize yields by 50% in a normal season. Fertilizer use reduced losses by up to 10% during severe drought and 30% during mild drought.**
- **Use of zai planting pits to grow maize, beans, sorghum and sweet potatoes reduced yield losses during extreme dry weather by up to 40%.**
- **Short season crops such as cowpea and pigeonpea cope better with climate change. Improved varieties of sweet potato and cassava should also be adopted.**
- **Crop diversification supports income, food and nutrition security under climate change. By allocating 10% more of their arable land to food crop production, households improved their food security by 18%. Supplementing animal feeds with crops and crop residues increased feed supplies by 8%.**
- **County governments must invest in farmer field schools and demonstration centers to support farmer learning.**

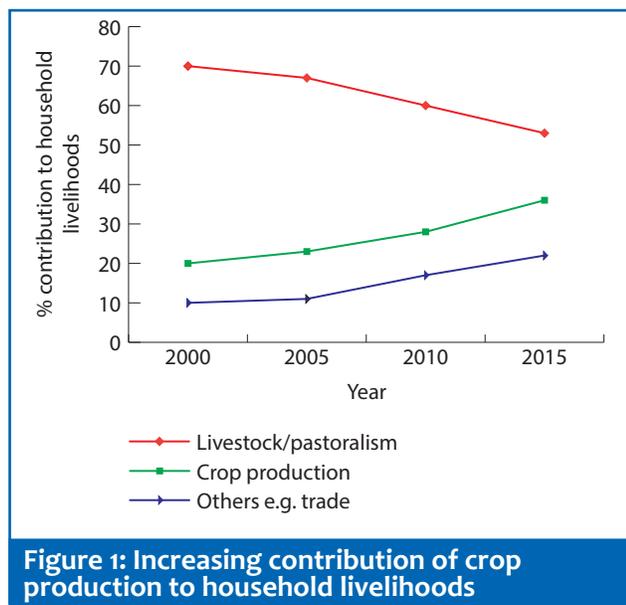
the planting season and to identify suitable areas for different adaptation strategies.

Working with 240 households in 4 divisions of Transmara district in south-west Kenya, the project established demonstration centers and farmer field schools to introduce appropriate climate adaptation strategies. These included: planting of alternative crops (e.g. sweet potatoes, pigeonpea, sorghum, lab lab and indigenous vegetables); use of organic and inorganic fertilizer; and new production systems (e.g. zai planting pits and strip cropping with food and fodder crops). Crops were evaluated in randomized control trials, which farmers attended to learn about crop establishment and to score crops based on characteristics such as plant vigor and yield. Crop acceptability was assessed through participatory group discussion.

Planting materials for those crops that performed well and that were favorably evaluated by farmers were then distributed to all participating farmers.

What did we learn?

Following the promotion of alternative crops and production practices, households started to allocate about 10% more of their arable land to food crop production, improving their household food security by 18%. Having boosted crop production, 20% of the households started to supplement their animal feeds with crops and crop residues, increasing their feed supplies



by 8%. Although households acknowledged a decline in the size of their livestock herds as they adopted cropping practices, increases in crop production compensated for the reduction in livestock-based earnings.

Farmers who used zai planting pits to produce maize, beans, sorghum and sweet potatoes reduced yield losses during extreme dry weather by up to 40%. Crop production increased with the depth of the pits, which prolonged the period before crops dried up under extreme weather.

By using organic fertilizers, households were able to increase maize yields by 50% in a normal season. Use of fertilizers reduced losses by up to 10% during severe drought and up to 30% during mild drought. By cultivating crops in former livestock pens (rich in organic fertilizer), farmers were consistently able to produce up to three times more than they achieved in unfertilized fields during periods of good or bad rains. This emphasized the importance of organic fertiliser, as a way to reduce the impacts of climate variability and change.

Cost and benefit projections found that crop diversification yielded over 40 times the investment cost within the first ten years, with the potential of further significant increases in subsequent years, if strategies are promoted and adopted by virtually all households. However, despite these strong benefits, introducing such strategies depends on public support for research, farmer training, technology adaptation and supply of fertilizers and seed.

Stories of change

Prior to the project, households had reported a reduction in their crop yields over the previous ten years by between 10% and 50%. Households that planted the alternative, drought-tolerant and high yielding crop varieties obtained up to 40% increase in yields, compared to their counterparts who did not. During seasons with moisture stress, the improved sweet potato and maize varieties demonstrated valuable resilience to climate variability. Although 240 households were targeted, each of these influenced between 3-5 other households, significantly increasing the uptake of adaptation strategies.



Farmers using zai planting pits reduced losses by up to 40% in extreme dry weather

Demonstration of climate-resilient crops and practices encouraged farmers to expand the area devoted to crop production. Sixty one percent (61%) of households planted an increased number of crops in their farms in semi-intensive systems, increasing food and nutritional security, and raising average monthly household incomes by 36%. Some households created kitchen gardens in former cow pens and in areas located close to water supply points. Thanks to surplus production, traded volumes increased by 20%, with three-quarters of the households able to trade products, predominantly with their neighbors. Households with the highest diversity of crops traded in the market more frequently than those with fewer crops. Market surveys showed that nearly all the farmers started to consciously seek information from agro-chemical shops and extension officers on appropriate crop varieties to plant. On average, 40% of the farmers sought climate information in order to make decisions on food production.

Involvement of county government staff in the project helped to demonstrate the role that different institutions can play in improving

food security. As a result of this partnership, the county government of Narok mobilized more resources and established mechanisms to work with agricultural researchers from the Kisii research station in order to supply greater quantities of improved crop varieties such as sweet potatoes and maize to the farmers.

What are the policy implications?

Given the need for farmers to adopt new crop varieties and farming practices in response to climate variability and change, county governments must support seed multiplication and distribution of improved, drought-tolerant varieties. Because of the high diversity of crops required to cope with climate change in the ASALs, new support mechanisms are needed to ensure that households can embrace the new systems in ways that maximize benefits. To this end, county governments should invest in competent extension services, farmer field schools and demonstration centers. These must be designed to support households in building wealth, growing income and ensuring food and



Climate-resilient crop demonstrations encouraged farmers to allocate more land to cropping

nutrition security through the growing of crops and varieties that are drought-tolerant, early maturing and high yielding.

What next?

The project has proven that adoption of new crops and varieties in the drylands has great potential to maintain livelihoods in a changing climate. However, the challenge remains of how to optimize the scarce water resources to produce food all year round and maintain dryland ecosystem services. There is need to investigate and improve water use through refinement of existing water conservation technologies. This will include developing policies and institutions for improving water access, water use efficiency and water conservation to ensure that optimal output is gained from the available water, thereby building food and nutrition security and alleviating poverty.

Need more information?

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