

# Info Note

## Building adaptive capacity and improving food security in semi-arid Eastern Kenya

*Preliminary results from climate change adaptation and mitigation initiatives in Wote climate-smart villages*

*John Recha, Maren Radeny, Philip Kimeli, Vivian Atakos, Rachel Kisilu, Julius Kinywee*

**DECEMBER 2016**

### Key messages

- Collective action has led to increased agricultural investments, and provided an avenue for dissemination of climate-smart technologies.
- Cereal–legume intercrop innovations offer farmers multiple benefits that contribute to increased farm resilience, greater food security and better incomes.
- Farmers are taking up soil and water management practices to address the risk of declining rainfall amounts and variability.

Wote in semi-arid zone of eastern Kenya, is characterized by highly weathered soils. Soil erosion is rampant due to lack of adequate vegetation cover at the beginning of the rainy seasons, and also due to the sparse shrubs. Land degradation and limited soil fertility replenishment have contributed to reduction in agricultural productivity, reducing potential crop yields due to soil nutrient depletion. The population density is estimated at 110 persons per square kilometre.

Crop and livestock production are the main sources of livelihood in the mixed farming system. Major crops grown include cereals (maize and sorghum) and legumes (beans, cowpeas, and pigeon peas). Fruits trees—mangoes and citrus fruits—are also an important source of income. Use of improved seeds is low. Nearly 95% of farmers rely on informal seed systems and planting material for most crops. Farmers often plant local landraces conserved on their own farms, purchased from the market, or exchanged with neighbours to cut down on costs of purchasing seeds. Crop yields are low as a result of poor quality seeds, lack of crop variety diversity, increased incidence of pests and diseases, and lack of adequate knowledge of appropriate agronomic practices. Cattle, goats and chicken are the main livestock species households keep. In the year 2012, when a household

baseline survey was done, only 2% of the people were 'food secure' all year long. About 1% had enough food for their families for at least 10 months of the year, and 97% of these households struggled to get enough food to feed their family for more than 2 months out of a year. Therefore, acute malnutrition rates are experienced by over 15% of children below five years of age.

### Climate related risks

Recurrent and more intense droughts are the major climate risks in Wote. Droughts occur annually, with variable rainfall patterns. Mean annual rainfall is about 500 mm with an average of 70 rainy days. Long term daily rainfall data from 1961 to 2012 from Kenya Meteorological Department (KMD) shows a decreasing trend (see Figure 1). The length of growing period (LGP) is in the range of 75–180 days.



*Climate change has led to increased frequency of droughts in the last 50 years in eastern Kenya. Photo: J. Recha (CAAFS)*

In the 1970s, long and short season rains were reliable, with two cropping seasons a year. However, from the

1980s, the rainfall has been unreliable, with only one dependable cropping season a year. The first rainfall season is in March–May (long rains), while the second rainfall season occurs in October–December (short rains). The area experienced four successive rain failures in the recent past: the long and short rains of 2010 and 2011, resulting in 50-60% crop failure in the less dry zones and 80-90% crop failure in the drier zones. Planting dates are variable. In 18% of the seasons (8 out of 45), planting dates identified are followed by a 12-day dry spell necessitating replanting. Increasing temperatures, and low and variable rainfall, coupled with poor soil fertility have negative impacts on crop productivity.

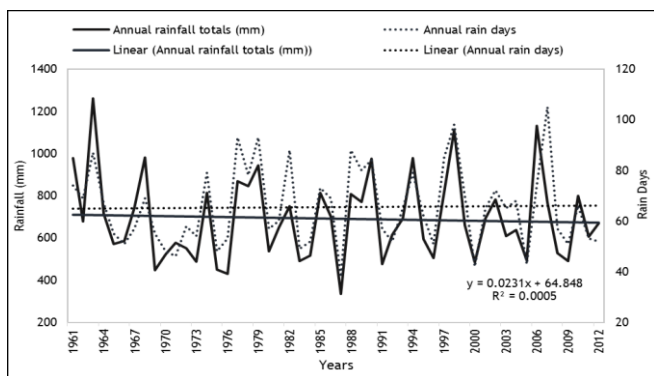


Figure 1: Katumani long term annual rainfall trend and annual rain days

## Partnership for science-led interventions and collective action

To address the climate related risks, a partnership facilitated by the CGIAR Research Program on Climate Change Agriculture and Food Security (CCAFS) was initiated in 2012 in seven villages. The approach is based on climate-smart villages (CSVs) Research for Development (R4D) approach to test, through participatory methods, technological and institutional options for dealing with climate change in agriculture, with the aim of scaling-up and -out the appropriate options and drawing out lessons for policy makers.



CCAFS is promoting effective adaptation options. Photo: V. Atakos (CCAFS)

The aim is to create awareness about local climate risks to inform farming decisions, and contribute towards efforts to reduce the hunger and malnutrition and improve household incomes and food security. Through participatory action research, farmers can identify improved technologies that are more adapted to the changing climate.



Drought-tolerant green grams. Photo: C. Schubert (CCAFS)

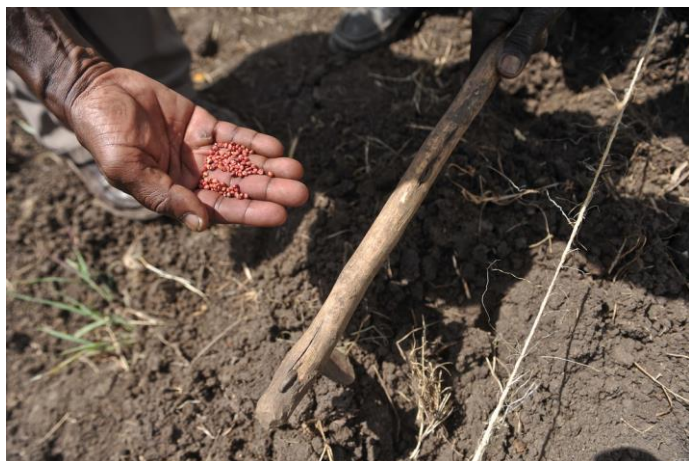
Farmers in Wote have organized themselves into self-help groups affiliated to two community based organizations (CBOs), to empower the farmers through collective action to pool financial resources, labor for farm operations and agro-advisory services. The two CBOs—Kikumini-Muvao and Sinai-Kikeneani—were formed in 2014, initially covering seven villages. By August 2016 (two and a half years later) their membership increased from 140 to 620 households, out of which 70% are women. During that period, the CBOs pooled financial resources amounting to USD 44,000 into an innovation fund. Members can borrow from the fund at relatively affordable interest rates of 5%, which is mostly used for agricultural activities targeting high value horticultural crops and poultry farming for managing the climate related risks. The CBOs are avenues for disseminating information on climate-smart agriculture technologies such as cereal-legume intercroops, and soil-water conservation on-farm. The CBOs have influenced members to diversify crop choices and plant new crop varieties. By end of 2015, about 85% of the households had introduced one or two new crops or varieties up from 4% in 2012. The International Crops Research Institute for Semi-Arid Tropics (ICRISAT) in partnership with the Kenya Agricultural and Livestock Research Organization (KALRO), and Makueni County Department of Agriculture and Livestock train members of the CBOs on use of improved agronomic practices.

## Downscaled climate information services for better farm decisions

Climate information is important in helping farmers make decisions such as choice of crop type and variety, and planting date. A partnership between KMD, ICRISAT, KALRO, and Makueni County Department of Agriculture and Livestock facilitates provision of downscaled seasonal weather forecast information to the farmers. Provision of climate information in Wote has been improved through a multi-stakeholder approach of discussing and analysing forecasts released by KMD. Upon release of the weather forecast by KMD, the stakeholders convene meetings with the CBOs to discuss the forecast and provide appropriate agro-advisories. Members of the CBOs subsequently pass on the information to their neighbours. Led by the Makueni County government, the partners are exploring ways of establishing a county-wide information dissemination network that can downscale weather forecast information to all farmers. This will be achieved by exploring options for disseminating climate information within the local communities; through the local schools, self-help groups, religious groups, partnership with non-governmental organisations, agricultural input dealers and service providers. Similarly, integration of weather forecasting into the County Integrated Development Plans (CIDPs) is ongoing. To improve understanding and use of the forecasts by the farmers, the consensus weather forecast is translated into the local Kamba language.

## Resilient crop varieties address food and nutrition challenges

Early maturing, disease resistant, pest tolerant and high yielding varieties of sorghum (e.g. KARI Mtama I, Seredo, and Gadam), millet, green grams, cow peas, pigeon pea and chick pea have been developed by ICRISAT and KALRO for semi-arid lands. These crops have high water use efficiency and tolerant to limited soil moisture during crop growing period compared to maize. The CBOs have been instrumental in the promotion of cereal-legume intercrop innovations that involve these crops.



Early maturing sorghum being planted. Photo: K. Trautmann

The CBOs exchange knowledge within the local communities through farmer learning events to showcase new farm practices and value addition options. These include i) making various sorghum dishes like porridge, cakes, doughnuts and blended rice-sorghum, ii) use of sorghum and legume residues for preparing livestock feed, iii) use of sorghum and legume residues as mulch and compost for soil fertility improvement, iv) benefits of using improved crop varieties compared to low quality local varieties and improved agronomic practices for higher yield, and v) improved post-harvest processing and storage practices to reduce losses and maintain high quality.



Rain-water harvesting through water retention ditches. Photo: C. Schubert (CCAFS)

## Soil and water management practices

In order to address the risk of declining rainfall amounts and variability, farmers in Wote are taking up soil and water management practices. These include water management practices for soil moisture replenishment, and water harvesting using storage structures. Land management practices for replenishing soil moisture include cut-off drains or diversion ditches, artificial waterways, retention ditches, bench terraces, reverse slope bench terraces, terraces where excavated soil is deposited uphill to form embankments (*Fanya juu*), grass strips, trash lines, road runoff, planting pits, and irrigation. Additionally, farmers practice agroforestry, and have established woodlots and trees on boundary. Water management practices mainly focus on water harvesting and include surface tanks that collect roof catchment, communal water pans, and earth dams. The seasonal rainfall provides an opportunity for investment in appropriate and affordable rainwater harvesting technologies that can be scaled up in similar areas to address crop and livestock production constraints. The CBOs in partnership with the Makueni County government are facilitating increased investments in water harvesting, with the County enacting by-laws for increased water use efficiency.

## Further Reading

- Mwangangi M, Mutie M, Mango J. 2012. Summary of Baseline Household Survey Results: Makueni, Kenya. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: [www.ccafs.cgiar.org](http://www.ccafs.cgiar.org).
- Rao KPC, Okwach GE. 2005. Enhancing Productivity of Water Under Variable Climate, pp 1-7. Proceedings of the East Africa Integrated River Basin Management Conference. Sokoine University of Agriculture, Morogoro, Tanzania.
- Recha JW, Bancy M, Nyasimi M, Philip K, Kinyangi J, Radeny M. 2016. Changing rainfall patterns and farmers' adaptation through soil water management practices in semi-arid eastern Kenya. *Arid Land Research and Management*. 30:3, 229-238
- Recha J, Kinyangi J, Omondi H. 2012. Climate related risk and opportunities for agricultural adaption and mitigation in semi-arid eastern Kenya

**Correct Citation:** Recha J, Radeny M, Kimeli P, Atakos V, Kisilu R, Kinywee J. 2016. Building adaptive capacity and improving food security in semi-arid eastern Kenya. CCAFS Info Note. Copenhagen, Denmark. Available online at: [www.ccafs.cgiar.org](http://www.ccafs.cgiar.org)

This Note presents preliminary results from participatory action research activities conducted by CCAFS and partners in the Wote climate-smart villages in Eastern Kenya.

The titles of the INFO NOTE series seek to disseminate research findings on climate change, agriculture and food security, as well as stimulate feedback from the science community. This INFO NOTE was prepared by the following authors

**John Recha** ([j.recha@cgiar.org](mailto:j.recha@cgiar.org)) *Participatory Action Research Specialist, CGIAR Research Program on climate change, Agriculture and Food Security (CCAFS)*

**Maren Radeny** ([m.radeny@cgiar.org](mailto:m.radeny@cgiar.org)) *CCAFS Program Coordinator, CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)*

**Phillip Kimeli** ([p.kimeli@cgiar.org](mailto:p.kimeli@cgiar.org)) *Research Assistant, CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)*

**Vivian Atakos** ([v.atakos@cgiar.org](mailto:v.atakos@cgiar.org)) *Communication Specialist, CGIAR Research program on Climate Change, Agriculture and Food Security (CCAFS)*

**Rachel Kisilu** ([rkkisilu@gmail.com](mailto:rkkisilu@gmail.com)) *Research Officer, Kenya Agricultural and Livestock Research Organization*

**Julius Kinywee** ([kinyweejulius@gmail.com](mailto:kinyweejulius@gmail.com)) *Agricultural Extension Officer, Makueni County Department of Agriculture, Livestock and Fisheries*



## CCAFS and Info Notes

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic partnership of CGIAR and Future Earth, led by the International Center for Tropical Agriculture (CIAT). CCAFS brings together some of the world's best researchers in agricultural science, development research, climate science and Earth System science, to identify and address the most important interactions, synergies and tradeoffs between climate change, agriculture and food security.

CCAFS Info Notes are brief reports on interim research results. They are not necessarily peer reviewed. Please contact the author for additional information on their research.

[www.ccafs.cgiar.org](http://www.ccafs.cgiar.org)

CCAFS is supported by:

