

Info Note

Potential for climate change adaptation and mitigation in crop production in East Africa

Findings from a scoping study on opportunities and barriers to adaptation and mitigation in crop value chains of Kenya, Tanzania and Uganda.

Joab Osumba, John Recha, Teferi Demissie, Helena Shilomboleni, Maren Radeny, Dawit Solomon, Catherine Mungai

OCTOBER 2020

Key messages

- Rainfed farming systems in East Africa face challenges associated with increased climate change and variability.
- Despite extensive mainstreaming efforts, climate change and agriculture are still not well integrated in East Africa's policy documents, with climate-smart agriculture (CSA) being addressed separately from mainstream agriculture.
- Whereas national governments in East Africa have made progress on adaptation and resilience policies with mitigation co-benefits, the potential to implement them is hampered by inaccessible and unaffordable inputs, limited knowledge and skills and low agricultural production and productivity.
- Critical success factors for enhancing adaptation and resilience with mitigation co-benefits include knowledge, information, services, appropriate technologies, capacity building, a blend of financial instruments, and enabling policy environments and institutions.
- Climate Resilient Agribusiness for Tomorrow (CRAFT) has been testing and providing actionable evidence on these factors to enhance adoption and scaling.

Background information

Agricultural production in East Africa is mainly rain-fed, making it highly sensitive and vulnerable to increased

climate variability arising from climate change (EAC 2017a). Climate vulnerability is also exacerbated by reduced produce quality, land degradation, declining soil fertility and imperfect insurance and credit markets. Smallholder farming systems in the region are characterized by low productivity and commercialization (EAC 2017b).

Farming systems in the region also face climate risks that include increases in heat stress, prolonged dry spells, droughts, excessive rains, floods, climate-induced pest and disease incidences, invasive weeds, frost and tropical storms.

Study approach

Data for this study was collected through a literature review; key informant interviews with government officials, private sector, NGOs; focus group discussions with two groups in Nyando Climate-Smart Village (CSV); and semi-structured "fill-and-return" questionnaires administered to key informants.

A perception-based multi-criteria analysis (MCA)¹ was applied to determine priority adaptation strategies with mitigation co-benefits as a proxy for the potential of CRAFT intervention strategies, according to current priority levels for each country. The MCA was based on a set of attributes or indicators provided to the respondents in a Likert scale scoring matrix of 1 (low priority), 2 (medium priority) and 3 (high priority). The study focused mostly on the productivity and resilience/adaptation pillars of CSA, in line with the priorities of the governments of the target countries.

¹ MCA is a decision-making tool that is particularly applicable to cases where a single-criterion approach (such as cost-benefit analysis) falls short, especially

where significant environmental and social impacts cannot be assigned monetary values. It is a simple and intuitive way to explain why a solution has been chosen.

Adaptation and mitigation gaps in East African agriculture

Critical gaps have been identified from reviewed policy documents, key informant interviews and deliberations in climate risk assessment workshops in Kenya, Tanzania and Uganda. These include:

- Substantial gaps in yield and productivity (actual vs potential; and local vs world averages). For instance, average maize yield in East Africa is ≈ 1.6 tons/ha/year against the global average of 4.9 tons/ha/year (EAC 2017b). This gap is projected to widen further under climate change.
- Inadequate institutional arrangements for implementing climate-resilient strategies. This includes inadequate linkages for research, extension and farmer-market, in addition to inadequate climate information, agro-weather advisories and agricultural extension services.
- Limited knowledge, skills and relevant information to implement climate change adaptation and mitigation actions.
- Deficiencies in the production (quality) and supply (quantity) of climate resilient inputs.

Adaptation actions in East African agriculture – a policy perspective

Adaptation actions are documented in various climate change policy and strategy documents of the three East African countries (e.g. National Adaptation Programmes of Action (NAPAs), National Adaptation Plans (NAPs), Nationally Determined Contributions (NDCs)). The actions proposed in the reviewed policy documents are summarized as follows:

- Support and expand research and implementation on CSA, climate information services (CIS), water harvesting/storage/conservation, access to markets and finance, and agricultural mechanization.
- Improve crop productivity through adoption of climate resilient technologies such as improved crop varieties and/or animal breeds, index-based insurance and credit.
- Strengthen soil and water conservation initiatives, integrated soil fertility management, residue and manure management, and irrigation.
- Enhance training for sustainable land management (SLM), community-based natural resource management (NRM) and agroforestry.
- Implement agro-weather advisory policies and increase access to climate information services (CIS).

- Diversify sources of livelihoods among smallholder farmers.
- Adopt Climate-Resilient Farmer Field School (CR-FFS) approaches.

Potential for adaptation and mitigation actions in East African agriculture

Figure 1 illustrates the ranking of potential actions for adaptation and mitigation of climate change in East Africa. Water management can be done by conserving available water, river basin planning and coordination, construction of dams and controlling water pollution. Another action is increasing crop production and productivity through developing new crop varieties and enhancing seed banks, increasing efficiency of irrigation and promoting drought management technologies. Provision of climate information is also important as it enables proper planning of agricultural activities. Other critical options to be considered are enhancing and/or developing agricultural financial markets, agroforestry and soil and landscape management.

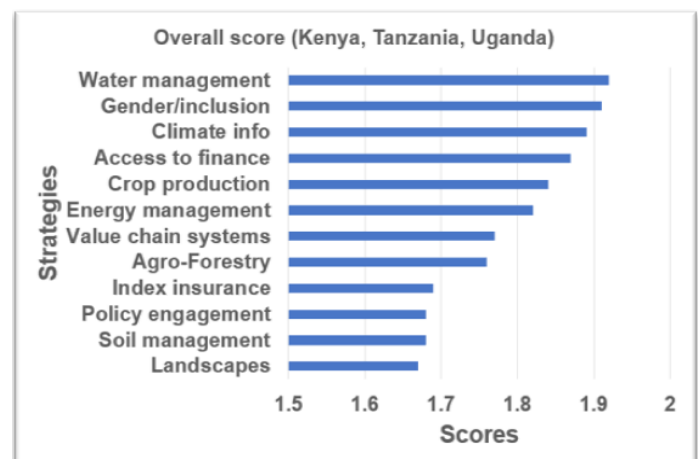


Figure 1: Priority ranking of potential for adaptation and mitigation strategies in East Africa.

Opportunities for scaling adaptation and mitigation in East African agriculture

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) in East Africa, working with other partners, is using the CSV approach to address the impacts of climate change in an integrated manner rather than apply a solo style approach. Efforts in the CSV model identify best transformative innovations for adaptation and mitigation in agriculture, which can help achieve food security under a changing climate while also delivering benefits for environmental sustainability, nutrition and livelihoods. The interventions vary depending on local agro-ecology, level of development in the area, local capacity, and the interests of producers and local partners. Table 1 summarizes the portfolio of adaptation and mitigation options that have been explored by CCAFS and its partners in East Africa's CSVs.

Table 1: Portfolio of CSA technologies and practices tested for adaptation and mitigation in CCAFS CSVs

<p>1. Climate information services</p> <ul style="list-style-type: none"> Seasonal weather forecasts Climate analogues Agro-weather advisories Blended scientific and indigenous mix of climate information services Climate-informed farm planning 	<p>4. Crop management</p> <ul style="list-style-type: none"> Testing and selection of more resilient, adapted crop varieties, supported by seed banks Crop diversification Intensification (intercropping) Crop rotations Improved storage and processing technologies
<p>2. Soil management</p> <ul style="list-style-type: none"> Site-specific nutrient management (supply soil nutrients to actual needs of crops) Applications of indigenous practices and knowledge to soil and land management Contour farming, terracing contour earth bunds planted with grass 	<p>5. Agroforestry</p> <ul style="list-style-type: none"> Multi-purpose trees to deliver multiple benefits Natural regeneration based on indigenous knowledge
<p>3. Water management</p> <ul style="list-style-type: none"> Improved techniques for rain-water harvesting and storage Improved, low cost, supplemental irrigation including solar More efficient use of agricultural (on-farm) water 	<p>6. Energy management</p> <ul style="list-style-type: none"> Access to modern, renewable energy services e.g. the use of solar powered irrigation
	<p>7. Institutional arrangements</p> <ul style="list-style-type: none"> Use of community based organizations (local institutions) Access to financial services and markets through private sector linkages

The CSV approach provides a good model for mainstreaming climate-resilient technologies while localizing practices and innovations to adopt the technologies. The CR-FFS methodology, which CRAFT has adopted, has many elements in common with CSVs (e.g. technology testing and local observations). The common features between CR-FFS and CSVs will become entry points for contextualizing the CSV model in the CRAFT CR-FFS methodology.

Conclusions and recommendations for policy action

The governments of Kenya, Tanzania and Uganda have made good progress in integrating adaptation/resilience and mitigation into national agricultural policies. The potential for adoption of resilience building practices, and for climate change adaptation and mitigation, is high but often hampered by several factors, which manifest themselves as gaps and barriers. These include low yield and productivity, inadequate institutional environments, limited knowledge and skills and unaffordable and inaccessible climate resilient inputs.

Some of the recommendations to address the gaps are:

- Knowledge and information, especially on climate events or climate-induced occurrences, such as pests and diseases
- Technology and innovation (e.g. improved seeds and service delivery models)
- Capacity development (e.g. skills, physical assets and institutional arrangements)
- Finance (e.g. a blend of financial instruments that fit case-by-case interventions)

Further reading

- EAC (East African Community). 2010. East African Community Industrialisation Policy 2012 – 2032. EAC IRC Repository.
- EAC (East African Community). 2011. East African Community Industrialisation Policy 2012 – 2032. EAC IRC Repository.
- EAC (East African Community). 2017a. Vulnerability, Impacts and Adaptation Assessment in the East Africa Region. Chapter 2: Agriculture and Food Security – Baseline for East Africa. East African Community/USAID. EAC IRC Repository.
- EAC (East African Community). 2017b. Vulnerability, Impacts and Adaptation Assessment in the East Africa Region. Chapter 8: Agriculture and Food Security – Future Impacts from Climate Change. East African Community/USAID. EAC IRC Repository.
- EAC (East African Community). 2017c. Vulnerability, Impacts and Adaptation Assessment in the East Africa Region. Chapter 7: Climate Change Scenarios: Projected Rainfall and Temperature. East African Community/USAID. EAC IRC Repository.
- Management Convention. 2012. Whitesands Hotel, Mombasa, Kenya.

This Info Note is part of a series of briefs to summarize the findings of a scoping study for the Climate Resilient Agribusiness for Tomorrow (CRAFT) project undertaken by researchers from the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) East Africa. This brief focuses on the potential for adaptation and mitigation in the three project focus countries.

Joab Osumba (J.Osumba@cgiar.org) is a Climate Smart Agriculture Policy Specialist of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) East Africa

John Recha (J.Recha@cgiar.org) is a Climate Smart Agriculture Policy Scientist, and the CRAFT Coordinator of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) East Africa

Teferi Demissie (T.Demissie@cgiar.org) is a Climate Scientist and Climate Modeler for the CRAFT Project of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) East Africa

Helena Shilomboleni (H.Shilomboleni@cgiar.org) is a Climate Smart Agriculture Scaling Scientist of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) East Africa

Maren Radeny (M.Radeny@cgiar.org) is the Science Officer of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) East Africa

Dawit Solomon (D.Solomon@cgiar.org) is the Regional Program Leader of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) East Africa

Catherine Mungai (C.Mungai@cgiar.org) is the Partnerships and Policy Specialist of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) East Africa

About CCAFS Info Notes

CCAFS Info Notes are brief reports on interim research results. They are not necessarily peer reviewed. Please contact the authors for additional information on their research. Info Notes are licensed under a Creative Commons Attribution – NonCommercial 4.0 International License.

The CGIAR Research Program on Climate Change, Agriculture and Food Security (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. Visit us online at <https://ccafs.cgiar.org>.

CCAFS is led by the International Center for Tropical Agriculture (CIAT) and supported by:

