Developing a Climate Change, Agriculture and Food security Research Agenda for East Africa: Identifying Research Needs and Priorities

Emerging Issues from Regional Engagements and Studies in East Africa

Background

Climate change is threatening food production systems, livelihoods and food security of hundreds of millions of people who depend on agriculture for their livelihoods in developing countries. In many parts of Eastern Africa, the impacts of climate change on agriculture are expected to be negative. Consequently, urgent and concerted efforts are needed to adapt to and mitigate the adverse impacts of climate change.

CCAFS is initially focusing on three regions — East Africa (EA), West Africa (WA) and the South Asia — to carry out its research. The CCAFS East Africa regional program has commissioned various studies on climate risk management, adaptation and mitigation in agriculture in the region. In addition, the regional program hosted national and regional workshops with partners from agricultural research, agricultural extension, climate services and products, food security, and early warning systems. It has established six learning sites in Kenya (Nyando and Wote), Uganda (Hoima and Rakai), Tanzania (Lushoto) and Ethiopia (Borana). The learning sites were strategically chosen to represent areas that are becoming both drier and wetter, and are focal locations that will generate results that can be applied and adapted to other regions worldwide. This report summarizes past and on-going research activities, and stakeholder engagements in the region identifying research needs and priorities.

Adaptation to progressive climate change

While the potential impacts of climate change are becoming increasingly well known, great uncertainty remains about how climate change effects will play out in specific locations and sectors. Research is needed to improve farmers’ and scientists understanding of climate projections and potential adaptation pathways. In addition, there is need to examine human behaviour, and the cultural and institutional vehicles or barriers to adaptive change. To address this gap, General Circulation Models (GCM), are largely used to understand and illustrate the potential impacts of climate change on agriculture in Africa. In 2010, ASARECA commissioned country studies to examine agricultural vulnerability to climate change in East Africa. The outcome of the studies will help policymakers and researchers better understand and anticipate the likely impacts of climate change on agriculture and on vulnerable households in the region, and inform the development of appropriate response strategies.

Adaptation will benefit from integrated research that includes analysis of current farming systems and how these are likely to change, identification of appropriate technologies and practices, and understanding processes of institutional learning and adaptation. Research on adaptation in East Africa should also focus on developing and testing technologies that address climate change related stresses across different cropping systems and farming communities. This will require, for example, developing breeding strategies informed by examining potential improvement scenarios and incorporating them into crop models. CCAFS in collaboration with other CGIAR partners has developed an information portal that provides access to a database on the performance of...
agricultural technologies at various sites across the developing world for climate change analysis (http://www.agtrials.org:8080/). The AgTrials builds on decades of evaluation trials, mostly of varieties, but includes any agricultural technology for developing world farmers. In order to support modelled policy recommendations with on-the-ground empirical testing, CCAFS in collaboration with the Walker Institute for Climate System Research (University of Reading, UK) have developed the analogues approach. The analogues tool connects sites with statistically similar climates, across space (i.e. between locations) and/or time (i.e. with past and future climates). It is anticipated that once the analogue sites have been identified, information gathered from local field studies or databases can be used and compared to provide data for further studies, propose high potential adaptation pathways, facilitate farmer-to-farmer exchange of knowledge, validate computational models, test new technologies and/or techniques, or enable learning from history. Under the ‘Farms of the Future’ project, CCAFS is testing the climate analogue tool to connect farmers to their potential climate futures through farmer–to–farmer exchanges in its learning site in Tanzania (Lushoto). There is an opportunity for other partners to use the analogues tool in their research to inform the development of adaptation strategies across East Africa.

Managing risks to current climate variability

Managing risks associated with climate variability is essential for a comprehensive strategy for adapting to a changing climate. Across East Africa, the variable nature of rain-fed agriculture and the smallholder subsistence production base increases vulnerability to climate risks — primarily drought. The frequency and severity of climate shocks such as drought, heat and cold stress as well as floods, are likely to lead to major food crises in the region. CCAFS has initiated participatory action research (PAR) in some learning sites in East Africa, evaluating a portfolio of promising climate change adaptation, mitigation and risk management options to enhance resilience to climate variability and promote food security, in collaboration with a wide range of partners. In this regard, actions that build community capacity and strengthen community institutions to ensure long term presence of skilled and knowledgeable personnel within the local communities are important. In Nyando, for example, CCAFS is working with farmers and community-based organization to identify suitable crop and livestock response strategies. At the same time, CCAFS has engaged PICO Eastern Africa to help develop community level capacity for PAR that addresses impacts of climate change across selected learning sites in East Africa. PICO will also identify priority constraints and potential interventions that respond to climate change adaptation, risk management and mitigation at these learning sites.

The importance of identifying and documenting traditional or indigenous risk management strategies in the region has been raised and emphasized. Findings from a study carried out by Sokoine University of Agriculture – Soil Water Management Research Programme (SWMRP) showed that seasonal forecast for March-April-May (MAM) season in 2012; using Indigenous Knowledge (IK) and the Tanzania Meteorological Agency (TMA) for Lushoto were nearly identical, with both predicting normal rains. However, IK forecasts are often location specific in comparison with scientific forecasts that apply to larger areas. Consequently, for IK and scientific forecasts to complement each other, there is need to improve and downscale scientific seasonal forecasts and climate predictions to smaller areas such as Lushoto. Expanding spatial coverage of meteorological stations for climate data collection, and enhancing the institutional capacity for better seasonal forecast and climate predictions are actions that have great potential for improving climate risk management among farming communities in the region.
In addition to generating climate data, dissemination is critical to ensure that the users are able to access information that is timely, reliable and user friendly for seasonal forecasts that effectively address their demands. Findings from the CCAFS household baseline surveys showed that radio is one of the most effective ways of accessing information across the learning sites in East Africa, while at the same time providing a platform for farmers to share their knowledge and experiences. In 2012, the regional program initiated a local radio dialogue programme in partnership with Mbaitu FM, profiling risks in dryland agricultural systems in Eastern Kenya. Feedback from listeners indicates that farmers are demanding for credible information from agricultural experts, which they can use to enhance their farming activities to improve food security and incomes.

Sustainable food security in a world of growing population and changing diets is a major challenge under climate change (Hazell & Wood, 2008). The recent events in the Horn of Africa underscore the vulnerability of millions of livelihoods to extreme weather shocks with implications for food security. National and regional trade, marketing, increasing agricultural production, understanding changing consumption habits all important for reducing vulnerability and adaptability of the agricultural system. CCAFS East Africa is currently undertaking a regional food security stakeholder consultation to inform and build a partnership strategy for key regional and national institutions working at the level of food systems. This study seeks to build a greater understanding of the constraints and barriers to the effective incorporation of advanced climate information into policy and practice for food system decision making in the face of climate variability at national and regional levels. Particular attention will be paid to the information sources used for make food security decisions.

**Mitigation through intensification of low carbon pathways**

Agriculture possesses huge untapped potential to mitigate future greenhouse gas (GHG) emissions while helping those most vulnerable to adapt to its impacts and reduce pressure on natural resources. To realize this goal, long-term investment in “climate-smart” agriculture is essential. Sustainable agricultural intensification strategies through sustainable land management and agro-forestry are options for controlling land degradation, enhancing ecosystem resilience. In addition, land use policies should take into account options for reducing climate change impacts. Lack of data to inform development nationally appropriate mitigation actions on agriculture and Reducing Emissions from Deforestation and Forest Degradation (REDD) has been identified as a major gap in East Africa.

It is critical to understand mitigation strategies appropriate for different groups of the poor (including men and women). To avoid exploitation, there should be guidelines for carbon financing and disbursement of funds to beneficiaries. CCAFS has initiated studies to investigate institutional arrangements and incentives that enable small holder farmers and common pool resource users to reduce GHG emissions and improve livelihoods. The purpose is to enable national planners, developers and managers of agricultural carbon projects in Africa to develop cost-effective payment for ecosystem services (PES) projects that support local sustainable development priorities. Moreover, by involving active agricultural carbon project institutions in design, data collection and analysis, the project also aims to build their capacity for institutional analysis and design for agricultural carbon projects. If successful, such studies and trainings have potential for up-scaling in other parts of Africa and the developing world.
CCAFS is also developing and validating methods for quantifying GHG emissions at the farm and landscape level to inform mitigation interventions. In Western Kenya, for example, CCAFS in partnership with ICRAF and CIFOR are comparing GHG fluxes of different land use practices, including conventional cropping, improved fallow and agroforestry practices with N2-fixing species and identify their drivers. Analyses of agricultural GHG emission and potential for decreases in emissions/ increases in sequestration across countries in East and West Africa have also been carried out. This information will be useful in identifying agricultural development pathways that lead to better decisions for mitigation, poverty alleviation, food security and environmental health in the region.

Policy frameworks to support adaptation and mitigation in agriculture

Consultations with policy makers and other stakeholders in the region reveal that there is an urgent need to harmonize policies and strategies from various sectors which address climate change. There is also need for better coordination and collaboration among various ministries, sectors and departments whose mandates require the implementation of climate change adaptation and mitigation strategies. National governments need to collaborate at the regional and international levels to make policies which complement each other. To achieve this, it is essential to identify the institutions and actors involved in the formulation and implementation of policies. This will assist researchers, practitioners and even farmers to identify entry points to influence policy making and implementation in the region. At the international policy making level, it is critical to identify key scientific and technological aspects that will enhance agricultural adaptation, productivity, livelihoods and food security in Africa’s diverse agricultural systems. There is also need to identify areas of actual and potential conflict between African interests and those of other partners.

At the regional level, CCAFS has undertaken household, village and organisational baseline studies across the six East African learning sites. The household baselines focused on basic indicators of welfare, current risk management, mitigation and adaptation practices, resource management strategies and sources, needs and uses of climate and agricultural-related information. This information is useful for informing the research agenda for the region and also provides a benchmark for monitoring changes over a given period of time. In 2011, CCAFS commissioned a study to examine policies, institutions and actors in climate change adaptation, food security, food systems and agricultural development in East Africa. Preliminary findings from the study shows that various institutions — state and non-state actors — are involved in climate change issues, but efforts are largely uncoordinated. In addition, while a number of climate change policies already exist, majority are biased towards environmental management.

Preliminary research has shown that scenarios can help inform decision making under uncertainty. By developing a structured range of plausible futures, analyses of different policy and technical interventions can be undertaken. Such research will provide a suitable framework to identify the trade-offs and synergies of different options for climate change, agriculture and food security goals, and consider the viability of potential adaptation options.
Gender and capacity strengthening for research and engagement in EA

Stakeholders’ observations continue to emphasize that research should benefit women and other vulnerable groups, as well as socially differentiated groups in the region. It is widely acknowledged that climate change affects social groups (men and women, age groups) differently thus there is need to take into account gender differentiated impacts as well as the different adaptation and mitigation needs and potentials for men and women\textsuperscript{12}. On-going dialogues and research initiatives at the regional level reveal the need for evidence-based research which shows the benefit of mainstreaming gender in the planning and implementation of adaptation and mitigation projects.

CCAFS and the Food and Agricultural Organization of the United Nations (FAO) are collaborating to develop and test capacity building tools and methods on gender analysis in climate risk management, adaptation and mitigation, among resource-poor smallholders\textsuperscript{33}. Results from this study will inform the integration of gender in adaptation and mitigation planning.

Other initiatives

Under the Integrative Graduate Education and Research Traineeship (IGERT), fellows have developed an inventory of the existing and potential climate change adaptation and local mitigation (CCAM) activities among pastoralist and agro-pastoralist communities in the Borana zone of southern Ethiopia. They have also highlighted the potential conflicts and complementarities that may be associated with the implementation of index-based Livestock Insurance in the region.

To undertake effective research in the region, training and capacity building is critical to equip researchers to effectively carry out research in the region.

Conclusion

While the CCAFS East Africa regional program initiated research activities at regional, national and local levels, there are still research gaps to be addressed. It will host a three-day workshop to engage with partners from agricultural research, agricultural extension, climate services and products, food security, and early warning systems in East Africa to plan and develop thematic research to support climate risk management, adaptation and mitigation options in East Africa. The workshop will build on the research gap identified above and the regional research needs and priorities identified from the national and regional workshops in 2011. A major outcome of the workshop will be about five project concepts that can be supported as seed participatory action research (PAR) activities that will be used to build longer term projects from those with the greatest potential to deliver CCAFS outcomes and impact.
References

1. www.ccafs.org
2. ASARECA Country papers on agricultural vulnerability to climate change in East Africa, 2010
3. Case study on identifying the power brokers in climate change adaptation policy decision making for Uganda; 2011 http://ccafs.cgiar.org/our-work/research-themes/progressive-adaptation/mapping-power-brokers
4. Addressing climate change through building in farmer’s functional coping strategies in Uganda, CIAT-PABRA study (on-going)
6. Compiling and making available performance data for plantain and banana from multi-locational trials in East, Great Lakes Central and West Africa and Latin America for climate change analysis, Bioversity International, 2011
7. www.agtrials.org
10. Enhancing food security through managing climate risks in agricultural systems in lower Nyando, Kisumu, Kenya, (on-going)
11. Developing Community Level Capacity for Participatory Action Research in East Africa, PICO Eastern Africa (on-going)
12. Promoting integration of indigenous knowledge and scientific weather and climate forecasting for risk management under a changing climate in Lushoto District, Tanga Region by Sokoine University of Agriculture (SUA), 2011-2012
14. Social Innovation and Rangeland Enclosure to Adapt to a Changing Climate in Borana by Managing Risk for Improved Livelihoods, (MARIL), 2012
15. Improved Daily Rainfall and Temperature Time Series over Ethiopia by Ethiopia National meteorological Agency (NMA), 2010
17. Enhancing Learning and Dialogue in Communities to Communicate Climate Related Risks in Eastern Kenya: Use of Local Kamba Language, Eastern Broadcasting Co-operation (EBC), 2012
18. CCAFS East Africa: Regional Stakeholder Food Security Consultation (on-going)
19. Consultative Workshop on Climate Change, Agriculture and Food Security, 2011 at ILRI Addis Ababa, Ethiopia


26. Case study on identifying the power brokers in climate change adaptation policy and decision making for Uganda (http://ccafs.cgiar.org/our-work/research-themes/progressive-adaptation/mapping-power-brokers)

27. Mapping policies, institutions and actors related to climate change adaptation, food security, food systems and agricultural development in East Africa (on-going)

28. National Priority Setting Workshops and Agricultural Adaptation and Mitigation Professional Group meetings

29. Review of submissions on issues related to agriculture for SBTA consideration at its 36th Session as submitted by Parties, Intergovernmental organizations and non-governmental organizations


31. East Africa Scenarios Quantification Exercise (on-going)

32. Enhancing the Adaptive Capacity of Men and Women Crop - Livestock Farmers to the Effects of Climate Change in Uganda, NaLIRRI (on-going)


34. Enhancing Climate-Related Information Access for Improved Food System Planning and Coordination in East Africa Workshop, 2011

35. Ethiopia National Planning Workshop on Climate Smart Agriculture: Research Needs and Priorities, 2011
