

## POSITION PAPER

### KORONIVIA JOINT WORK ON AGRICULTURE

# Socio-economics and Food Security Dimensions under a Changing Climate in the Agriculture Sector in ECA: Lessons, Challenges and Future Prospects



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## Summary

**This paper sets out the position of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) on the Koronivia Joint Work on Agriculture (JKWA) under the United Nations Framework Convention on Climate Change (UNFCCC). The paper focuses on the appropriate solutions to improving food security and building climate-resilient agriculture systems in Eastern and Central Africa (ECA).**

This position paper follows discussions held with stakeholders drawn from Government Ministries, National Agricultural Research Institutions (NARIs), Non-Governmental Organizations (NGOs), Academia and Community Based Organizations (CBOs) in ASARECA member states. The member states are Burundi, Cameroon, Central African Republic, Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Republic of the Congo, Rwanda, South Sudan, Sudan, Tanzania, and Uganda.

The stakeholders agreed that food security and socio-economic sustainability in the ECA is at stake under the changing climate. Additionally, in the current COVID-19 situation, food insecurity will increase unless measures are undertaken to address emerging risks within the food systems.

ASARECA thus recommends that:

- The complexity of challenges of enhancing food security and improving socio-economic status under a changing climate need **integrated actions taken by all stakeholders** (public and private actors) at local, national and regional levels. These include:
  - a) farmers, livestock keepers and fishermen; Input industry, advisory services;
  - b) Food industry, processors;
  - c) research, innovation and knowledge providers;
  - d) finance and credit providers; and
  - e) citizens, NGOs, CBOs, educators, local, sub-national and national authorities.
- **Mainstreaming of climate change priorities into national agricultural and food security policies, plans and programmes.** While ECA countries have developed national development agendas, the agriculture sector can begin by mainstreaming climate change adaptation and mitigation measures into National Agriculture Investment Plans (NAIPs), policies, programmes and projects. Furthermore, a suite of adaptation measures needs to be developed that are socially and culturally relevant, suitable for different climatic zones and, which are short-, medium- and long-term. There should be deliberate efforts put in place these adaptation measures in the agriculture sector while considering projections of climate change and its associated impacts.
- **Assessment of vulnerability and impacts of climate change on socio-economic and agricultural sub-sectors** (crops, livestock and fisheries). A few studies have provided possible changes of hazard frequency and magnitude, and predictions for likely future scenarios. Yet, this research does not consider subsequent impacts on livelihoods. Thus, the social, economic and environmental risks and vulnerabilities associated with these hazards are not clearly known and understood across various agricultural production systems in ECA and the NARIs can play a critical role in assessing such risks and vulnerabilities.
- **Strengthening of climate and weather information services** (data collection, monitoring and forecasting). Climate information products and services should be developed to promote decision-making in the agriculture sector. Additionally, there are significant gaps in data collection and data availability for adaptation planning in ECA. The establishment of the User Interface Platform (UIP) and capacity development for interpretation of climate information is crucial for end-users such as farmers
- **Strengthening indigenous food systems to ensure food security.** This will entail increasing a) the production and productivity of indigenous crops and livestock and b) post-harvest processing techniques to preserve these foods for food security.



**Kenya: Ms. Veronica Musyoki and her son show-off the benefits of drip irrigation. She planted cabbages to diversify her efforts to adapt to effects of climate change.**

## Introduction

The agricultural sector in Eastern and Central Africa (ECA) accomplishes many functions including food security<sup>iii</sup>, socio-economic wellbeing, jobs and income, cultural values and agro-biodiversity conservation while supporting more than 60 per cent of the population (Mbow et al. 2019; Gabriel, 2017; FAO, 2015; Kahane et al. 2013). However, this sector is particularly vulnerable to the impacts of climate change in ECA sub-region (Table 1). This is resulting in increased food insecurity and deteriorating socio-economic conditions of its population. Droughts and floods are becoming frequent, and the land area affected is increasing (Nicholson et al., 2018; Haile et al. 2019). Droughts and floods, especially in rural areas are leading to increased rural-urban migrations of men and male and female youth, which leave women, children, elderly at home to provide agricultural labour (Nzengya and Maguta, 2021; Chindarkar, 2012). More recently, COVID-19 pandemic and locust infestations are exacerbating the food security situation(Kassegn and Endris, 2021; Erinle et al. 2021; Xu et al. 2021). It is for these reasons that it is essential to transform the agricultural sector to simultaneously increase production, build resilience

to climate change and reduce emissions, in line with the Paris Agreement's preamble that recognizes the fundamental priority of safeguarding food security, ending hunger and poverty.

The agricultural systems in ECA are also under pressure from non-climate stressors such as gender inequalities, social exclusions, population and income growth; poor infrastructure (Mbow et al. 2019; UN, 2017). Population growth in Eastern Africa is expected to increase rapidly and the outcomes of this growth will include an increased number of hungry and malnourished people, increased human diseases due to poor nutrition, increased domestic violence, increased conflicts, increased food prices, weakened capacity of communities to adapt to climate change, increased stunting and wasting of children because of changes in food consumption, and a significant increase in the mismanagement of natural resources (Dury et al. 2019; FAO et al. 2019; Swinburn et al. 2019; Raleigh et al. 2015; WHO 2013).

In ECA countries, due to restrictive social and cultural norms, women, youth, People Living With Disabilities (PLWD), the elderly and indigenous/marginalized people continue to experience inequitable access to land, soil

amendment and fertility technologies, improved seed technologies, credit facilities and weather and agro-advisory information (Meinzen-Dick et al. 2019; Nyasimi and Huyer, 2017; Kristjanson et al. 2017). National governments in ECA have recognized the importance of gender equality and social inclusion. These countries have also signed international commitments to reduce gender inequities such as the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), SDGs, the Paris Agreement, and the Sendai Framework for Disaster Risk Reduction. The degree to which women, youth, PLWD, the elderly and indigenous/marginalized people's capabilities, opportunities and participation are enhanced within the agricultural sector remains low. This equally affects food security and the ability of these groups to adapt to the changing climate.

Poorly developed rural infrastructure (transport, electricity, communication and irrigation systems) are severely limiting economic activities in the agricultural sector. For example, lack of investment in electricity and roads has hindered the development of climate adaptation practices for post-harvest management, irrigation systems, value addition and agro-processing (Badiane and McMillan, 2015; Borgstein et al. 2020).

With that background information, this position paper serves three purposes namely;

- a. To highlight and raise awareness amongst stakeholders that climate change is already impacting the food security and nutrition and socio-economic status of the most vulnerable populations, and that if action is not very quickly taken, climate change will increasingly threaten the achievement of sustainable development goals, specifically goals 1, 2, 5 and 13. Therefore, it is critical for ECA governments to take ambitious action to tackle climate change in the agriculture sector.

- b. To highlight the range of climate-resilient agricultural actions available in ECA that can simultaneously enhance food security, improve socio-economic status, and address climate change as well as lessons learned in addressing socio-economic and food security dimensions under a changing climate.
- c. To stimulate discussions on how ASARECA member countries can engage in Koronivia Joint Work on Agriculture (KJWA) discussion and highlight future prospects on food security under a changing climate.

### Climate change impacts on crop, livestock and fisheries in ECA

In ECA, the changing climate is likely to affect the frequency and intensity of extreme events. In the agriculture sector, climate change generates considerable uncertainty about future precipitation, in intensity and seasonal distribution.

In ECA, the magnitude of impacts of extreme events on agriculture is already high. It is estimated that 25 per cent of all economic losses and damages inflicted by droughts, floods and storms in ECA affect the agriculture sector (Molua et al. 2020; Gladys, 2017; Omoyo et al. 2015; Edame et al. 2011). In Arid and Semi-Arid Lands (ASALs) of ECA, specifically South Sudan, Sudan, Eritrea, Uganda, Kenya and Ethiopia, increased water scarcity under climate change will present a major challenge for pastoral systems.

The coastal areas of Madagascar, Kenya and Tanzania will experience sea-level rise, thus affecting the salinity of surface and groundwater. It is clear that climate change is and will continue to modify the circumstances under which agricultural activities are undertaken in ECA.

## Conservation Agriculture in Tanzania

Conservation agriculture (CA) is among the climate-smart practices recommended in Tanzania to curb the impacts caused by climate change. CA is practiced by smallholder farmers to solve the problems of poor agricultural yields, low incomes, soil degradation and unreliable rainfall patterns. CA is critical because it;

- involves the use of organic soil management practices such as reduced tillage, mulching and leguminous crops.
- reduces soil and land degradation
- helps farmers to adapt to climate variability and change
- is more water-, nutrient-, and energy-use-efficient
- improves the productivity of current farming systems under current climatic conditions



## Impacts of Climate Change on status of Food Security and Socio-economics

The extent to which climate change will impact food security and socio-economic conditions not only depends on the magnitude of the climate change effects themselves, and on the underlying vulnerabilities of food systems. In ECA, the communities that are most at risk to the changing climate, are those that are dependent on agriculture and natural resources (Tumushabe, 2018). These are communities that are poor, and have very limited capacity to respond and recover from droughts and floods (Pereira, 2017).

Gender inequalities and social exclusions discriminate women's, the disabled, elderly and marginalized people's access to climate-resilient agricultural actions. For these groups, climate change is contributing to reduction in income levels through reduction in crop, livestock and fisheries productivity and increased production costs of critical inputs (Godde, 2021; Wiebe, et al. 2019Ghahramani, and Bowran, 2018).

Continued exposure to climatic risks lowers individual incentives to invest in production systems. This has become pronounced amongst the youth who are migrating from rural areas to urban areas to engage in non-agricultural livelihood strategies (Kassie et al. 2017; Mueller and Thurlow, 2019). Households that are not meeting their food security needs are also engaging in early girl child marriages, spend less on education and health and have high rates of malnutrition amongst children aged below five years (Fox and Timmer, 2020; Macharia et al. 2018; Rao, N. 2019; Otto et al, 2017). At national and regional levels, climate change leads to market disruptions, increases in agricultural commodity prices (food and feed), and negatively affects supply chains (Scheffran, 2020; Pais et al. 2020; Bongase, 2017).

## Lessons Learned while ensuring Food Security and Improving Socio-Economics in the Context of Climate Change

The uncertainties of climate change remain strong with negative consequences to the food security in ECA region. Some of the lessons learned across ECA countries include;

- Profound change in the food security (e.g., low yields, increase in pests and diseases)
- The most affected populations are women, youth, PLWD, elderly, indigenous/marginalized people and the poor.
- There is rapid social change such as migration of populations to areas more favorable to the survival of agricultural activity.
- Incidences of domestic violence and community conflicts are on the rise.
- Destruction of infrastructure which is affecting transportation and leading to increased food prices.
- Massive loss of soil and land as a result of flooding, erosion and landslides.

Countries in ECA are all aiming to build resilience of agricultural systems, by implementing measures that are location specific (see examples on Table 2). In addressing the impact of climate change, integration of scientific and indigenous measures are of critical importance. And all stakeholders involved along agricultural value chains need to adopt a suite of adaptation measures such as;

- Climate resilient agricultural policies, projects and programs (e.g Kenya's Climate Smart Agriculture Strategy, Ethiopia's Productive Safety Net program, Republic of Congo's National Agricultural Development Plan; and Cameroon's Agricultural Value Chains Development Project).

## Trends in factors affecting the level of food security in ECA

- Increasing frequency of droughts and flooding and increasing land areas affected by droughts and floods
- Increasing land, water and environmental degradation as landslides and erosion removes topsoil
- Increasing outbreaks of crop and livestock pests and diseases (e.g., locusts and armyworm)
- Seasonal shifts on rainfall patterns that is creating a challenge in land preparation, sowing and weeding
- Diminishing agricultural labour as youth (female and male) and men migrate to urban centers leaving behind women, elderly and people living with disabilities
- Uncontrolled grazing habit by pastoral communities
- Increased conflicts as resources become scarce

- Long term sustainable land management programs that engage community mobilization and participation.
- Development and adoption of adapted crop varieties or breeds, with different climatic optima and/or broader tolerances, including currently neglected crops.
- Adaptive changes in crop management such as planting dates and cultivar choice.
- Agricultural mechanization.
- Establishment of agricultural insurance system for crops and livestock.
- Promotion of climate smart agricultural and agro-ecological techniques.
- Improved and efficient small, medium and large-scale irrigation and value addition for water harvesting, storage and management, increased productivity, incomes and improved nutrition. These will also include agronomic practices that enhance soil water retention such as minimum tillage, and increase in soil carbon and organic matter.
- Breeding livestock that is tolerant to climate changes including the fodder crops and forages.
- Targeting of vulnerable populations with safety nets and social protection programs that can break the vicious cycle of poverty and food insecurities and strengthen income-generating abilities and opportunities for the poor and vulnerable. Safety nets and social protection programs will be beneficial to women, PLWD, elderly, youth and marginalized people.
- Post-harvest management practices including agri-based post-harvest processing units for grain and fodder drying and storage and for reducing food loss and waste.
- Changes to fishing and fish-farming practices and management such as species composition that is adaptable to different locations (fresh and saline water).
- Enhancing the capacity of actors and farmers in agriculture business (e.g., youth engagement, farmers cooperatives and women groups).
- Implementation of land consolidation program.

## Challenges

The African Union (AU), through its various initiatives such as the Comprehensive Africa Agriculture Development Program (CAADP) and African Union Development Agency-NEPAD (AUDA-NEPAD) as well as respective national governments and regional organizations, and the international community, have in recent decades launched a multitude of agricultural initiatives (policy, project and programs) aimed at addressing and tackling ECA's food insecurity challenges.

Despite those efforts and commitments by the various stakeholders, much remains to be done. Below are some of the food security challenges facing ECA (for more see table 3);

- Low funding for agricultural development, agricultural research, appropriate and suitable technology development and innovation transfer
- Limited knowledge on extent of climate change impacts on food security and socio-economic status
- Lack of food security early warning systems
- Increasing gender inequities coupled with a lack of addressing the contribution of women to food security
- Low participation of youth in agriculture
- Outdated agricultural technologies that cannot withstand climate change
- Low investments by private sector in adaptive agricultural technologies and innovations
- Low rate of adoption of climate-resilient technologies and innovations generated by research
- Low development of mechanization technologies
- Increasing magnitudes and impacts of floods and droughts
- Increasing population growth that leads to increased food demands

## Status of Food insecurity in Eastern and Central Africa

- About 65% of the population in ECA work and derive their livelihoods from agriculture
- Climate change, Covid-19 pandemic, conflicts and economic woes are reversing years of progress made in the agriculture sector. This means a decline in income opportunities, lost livelihoods, diminished purchasing power, and limited access to basic food and services.
- 85 million people are at risk of starvation
- 55 million face acute food insecurity.
- About 15.2 million children are acutely malnourished in the ECA region.

**Sources:** FEWSNET, 2021; WFP, 2020; Future Directions International, 2021; IFPRI, 2020



- Increasing food prices
- Disappearance of the variety of food species
- Low investment in research for traditional foods
- Erratic or unpredictable weather patterns
- Lack of value addition on foods
- Poor post harvest handling and marketing of agricultural products
- Poorly organised agricultural producers and distributors

It is important to note that ECA countries have recorded economic growth in the last decade (Adeleye and Eboagu, 2019; Bekere and Bersisa, 2018; Sala and Trivin, 2014). However, despite this stellar economic growth, it faces the above mentioned challenges as well as rapid population growth, persistent economic inequality, youth unemployment and undernourishment.

Therefore, understanding the state of food security and socio economics under a changing climate in ECA, and addressing the above-mentioned challenges, should be the highest priority for national governments, NARIs and other relevant stakeholders. Not doing so will continually ensure that ECA fails to achieve an inclusive, sustainable and resilient economic development and prosperity for its people.

## Future Prospects

Eastern and Central Africa is one of the most exposed regions to the adverse effects of climate change despite contributing the least to global warming. The region is already disproportionately feeling the impacts related to a changing climate. Devastating cyclones affected 3 million people in Madagascar, heavy rainfalls that leads to flooding and landslides affects Uganda, Kenya, Ethiopia and Cameroon.

Droughts are affecting the ASALs of Sudan, South Sudan, Kenya and Uganda. Adapting to climate

change will require ambitious actions such as scaling up resilient and sustainable food and land use systems as well as targeting investment to resilient irrigation infrastructure.

However, if ECA countries fail to step up climate action in the agriculture sector, continuing on the current climate trajectory could force millions of people, especially women, PLWD and the elderly into extreme poverty by 2030 (Okonjo-Iweala, 2019).

Future prospects for ECA over the next decade should aim to address the deteriorating food security situation due to climate change and compounded by rapid population, gender inequalities and social exclusion, and urbanization growth. Already ECA member states are committed to ending hunger by 2025 under the Comprehensive Africa Agriculture Development Program (CAADP) and by 2030 under the SDG 2.

Some of the ECA countries have made substantive progress towards achieving food security, though the progress is slow. These prospects depend, however, on a lot of factors working in favour of implementation of Climate Smart Agricultural (CSA) practices. Implementation of CSA can spur the kind of development that is envisaged in most of the ECA agricultural policies, climate change and national development policies and agendas (such as Vision 2025, 2040, 2030 and 2050 of Tanzania, Uganda, Kenya and Rwanda respectively; Climate-Resilient Green Economy of Ethiopia).

Furthermore, in addition to funds from domestic sources, external finance is needed to support ECA's adaptation and mitigation in agriculture through low carbon development programmes (For example, Uganda has a Costed Implementation Strategy under the Green Growth Development Strategy of US\$2.9 billion covering the next 15 years).

## Managing soil erosion and increasing food security in Rwanda

Parts of Rwanda are experiencing drought, soil erosion and land degradation. A project called, Water Harvesting, and Hillside Irrigation project is implementing climate-smart agriculture to control erosion and increase yields for maize, beans, wheat and potatoes.

The project has built stronger farmer institutions and provided extension education, rural finance, and marketing support alongside physical investments. 280,000 farmers (50% were women) are observing increased food security and resilience. A total of 1,356 hectares of land has been irrigated (Source World Bank, 2018).

Going forward, some of the future prospects to address the dimensions of socio-economic and food security under a changing climate include:

- a. ***Harnessing digital technologies for improved agricultural knowledge management, access to weather and agro-advisory information, access to markets and financial services:*** The current systems of information sharing to farmers and other food security value chains are often inadequate and may not always respond to the changing climatic conditions as well as farmers' changing needs. Therefore, digital technologies for monitoring climate risks can identify the onset of climatic shocks before they happen and facilitate responses for building resilience amongst farmers. Digital tools can also enhance food availability and accessibility, as well as improve food utilization and safety through effective monitoring of food hazards.
- b. ***Supporting youth to actively participate in agriculture:*** The mass exodus of youth towards non-agricultural livelihoods can be halted by providing them with access to land and other resources and ICT technologies. For Example, the ENABLE youth program implemented by the African Development Bank is an innovative program that trains youth along agricultural value chains and trains them in business development skills. This program is currently in DRC, Sudan Cameroon, Tanzania, Uganda and Kenya.
- c. ***Leveraging science and indigenous knowledge to adapt agriculture to the changing climate:*** Climate change is already affecting agricultural production in ECA and thus negatively affecting food security. Petr et al. (2015) estimates that Africa (which includes the ECA region) could face a near double-digit reduction in crop and livestock yields over the next decade, as well as rising food prices. Co-generation of adaptation actions between researchers and farmers offers enormous potential to provide sustainable solutions for food security that are demand-driven and knowledge-intensive. It will require the translation of scientific solutions into packages that can be disseminated and adopted by farmers and other stakeholders. Increased investment into research and development to generate context relevant climate information, agricultural technologies, varieties and breeds and also needed.
- d. ***Investments into agricultural infrastructure development including irrigation, electricity***

***access and other technologies.*** For example, in Ethiopia, import of over 100 agricultural technologies was made tax exempt and in 2020, the Ministry of Agriculture received one of the highest budgets from the government.

- e. ***Establishing social protection policies and strategies such as crop and livestock insurance to enhance food security and protect livelihoods.*** Social protection programs can play a fundamental role in mitigating the impacts of climate change in ECA. Social protection policies and strategies can address the environmental, cultural, economic, and social vulnerabilities to food insecurity by protecting and promoting climate-resilient sustainable livelihoods.
- f. ***Documentation of best practices on food security within the ECA region:*** A great number of best practices are carried out at local level to support and enhance the food security and improve the livelihoods of vulnerable households, under the changing climate. Yet these best practices are rarely documented, leading to a lack of awareness of successful interventions. Therefore, documentation and dissemination of best practices and lessons learned is critical to facilitate exchange of climate-resilient agriculture technologies and knowledge within ECA region.
- g. ***Appropriate adaptation planning and implementation frameworks:*** These are required to facilitate and diffuse science and technology and to put policy into action. In ECA this will require diversification through creation of employment in other economic sectors, more efficient transportation infrastructure and the removal of obstacles that impede adoption of climate-resilient agricultural practices and efficient market mechanisms. Additionally, income and employment opportunities should be promoted within the agricultural sector itself, in areas such as processing and marketing to enhance food security.
- h. ***Supporting women farmers to produce more food:*** under the changing climate, raising agricultural productivity and output and improving household food security demands a greater emphasis on women farmers by national governments. This can be done through policy reforms to improve women's access to land and credit, their ability to contract labour and their willingness to access and adopt technology and utilise weather and agro-advisory services.



## Future topics that ECA countries would like addressed in the KJWA processes

In ECA countries, socio-economic, food security, and climate change often go hand in hand. Therefore, adopting an integrated, inclusive, diversified resilient and sustainable agricultural system represents the best way forward. At the same time, understanding and addressing the challenges that food security faces under the changing climate could increase production by two to three times what it is today.

The goal of ASARECA is to inform and promote national and regional dialogues about what the impacts of climate change are likely to be and what options exist for reducing vulnerability, and to provide local communities with site-specific adaptation solutions.

The KJWA decision requests parties to submit future topics to be carried out in close collaboration with the

Constituted Bodies (CB) under the UNFCCC. With that, below are three topics that ECA countries would like to be addressed in upcoming KJWA workshops.

- a. Harnessing digital technologies (ICT) for climate-resilient agricultural systems and improved food security,
- b. Local and commercial food processing,
- c. Context specific approaches and interventions to address food security for:(i) women, (ii) youth, (iii) people living with disability, (iv) indigenous people and (v) marginalized people, and,
- d. Strategic frameworks for enhancing food security and improving socio-economic status under a changing climate.



*These farmers in Tanzania have adopted climate smart innovations for feeding livestock.*

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**Table 1: Impacts of climate change on food security and social-economics status of people in ECA**

Sector	Impacts
Agriculture (crop, livestock and fisheries)	<ul style="list-style-type: none"> <li>Shift in the calendar of agricultural activities such as sowing and weeding dates</li> <li>Changes in maturity dates and high abortion rates for fruit trees, crop and livestock due to the lengthening or shortening of the rainy season with high intra-seasonal variability during the rainy season.</li> <li>Changes in quality of crops e.g., mycotoxins in cereals and fruits have more water, which results in change in taste.</li> <li>Appearance of crop and livestock pests at unexpected times that leads to loss in production and additional work.</li> <li>Desert locust infestation in Ethiopia and Kenya</li> <li>Rising food prices especially for urban dwellers</li> <li>Crop, fisheries and livestock disease outbreaks such as fall Armyworm in maize and cotton</li> <li>Weed proliferation affecting crops and livestock</li> <li>High evapotranspiration accentuates the water deficit of certain annual crops with weak rooting such as peanuts.</li> <li>Increased costs of production and marketing</li> </ul>
Weather	<ul style="list-style-type: none"> <li>Changes in rainfall patterns. For example, increased rainfall with abundance at unwanted periods such as beans drying period in Cameroon and Ethiopia</li> <li>Increased flooding</li> <li>Increasing temperatures) and changes in rainfall distribution.</li> <li>Disappearance of second growing season in Ethiopia</li> </ul>
Soil and land	<ul style="list-style-type: none"> <li>Increased soil erosion and land degradation</li> <li>Reduced soil fertility levels</li> <li>Waterlogging</li> <li>Degradation of natural resources such increased landslides, soil and water pollution</li> </ul>
Socio-economics	<ul style="list-style-type: none"> <li>Increased malnutrition and stunting of children</li> <li>Social strife, perennial insecurity and conflicts arising from diminishing food resources (e.g. cattle rustling)</li> <li>Food shortages especially for expectant/lactating mothers, children, elderly, PLWD and indigenous people</li> <li>Reduced/lost rural incomes from crop and hence increased rural poverty</li> <li>Increased water borne related diseases – impacts of swamps</li> <li>Conflict between nomadic and sedentary communities due to limited grazing land for livestock</li> <li>Increased domestic gender violence</li> <li>Massive displacement of the population</li> </ul>



**Table 2: Examples of climate-resilient agricultural actions available that can simultaneously enhance food security, improve the socio-economic status, and address climate change in ECA**

Climate resilient agricultural actions for ECA countries
<b>1. Improved crop varieties and management act</b>
1.1 Seed varieties that are adaptable to drought, flooding and high temperatures
1.2 Agroforestry systems
1.3 Integrated pest and disease management
1.4 Adjustments to crop seasonal calendars
1.5 Efficient and renewable Irrigation systems
1.6 Use of organic and inorganic fertilizers
1.7 Improved water management systems e.g., Conversation agriculture, minimal tillage, mulching
1.8 Increasing soil organic matter
1.9 Crop insurance
1.10 Post-harvest storage facilities
<b>2. Improved livestock and feed management</b>
2.1 Shift to drought tolerant/resistant livestock
2.2 Shift to small ruminants
2.3 Shift to fish farming
2.4 Improved livestock feeding regimes
2.5 Improved fodder production
2.6 Improved animal health and disease control
2.7 Livestock insurance
2.8 Animal storage facilities
<b>3. Weather and climate services</b>
2.1 Early warning systems for crops and livestock
2.2 Monthly/Seasonal weather forecast
2.3 Shift to fish farming
2.4 Improved livestock feeding regimes
2.5 Improved fodder production

**Table 3: Impacts of climate change on Food security and social-economics on ECA countries, lesson learned, challenges and future prospects**

Impacts of climate change on Food security and social-economics	Lessons learned	Challenges	Key Entry points	Examples of Best practices available	Future Research Topics
<b>Cameroon</b>	<ul style="list-style-type: none"> <li>Shift in the calendar of agricultural activities (sowing dates, etc.)</li> <li>Maturity date for citrus fruits has changed and the abortion rate is high</li> <li>The taste of fruits has changed</li> <li>Increased rainfall with abundance at unwanted periods</li> <li>Increased Flooding</li> <li>Appearance of crop pests at unexpected times with corollaries such as production losses and additional work.</li> </ul>	<ul style="list-style-type: none"> <li>Profound change in the food paradigm</li> <li>Social change (migration of populations to areas more favorable to the survival of agricultural activity)</li> </ul>	<ul style="list-style-type: none"> <li>Lack of knowledge on extent of climate change amongst stakeholders in the agricultural sector</li> <li>Difficulty in building resilience in relation to the diversification</li> <li>Difficulty in changing behavior and cultural values to address climate change</li> </ul>	<ul style="list-style-type: none"> <li>Agricultural Insurance</li> <li>Use of ICT as warning and management tools (pest attacks, disturbed rainfall), etc.)</li> <li>Building capacity of stakeholders in the agricultural sector on aspects of climate change</li> </ul>	<ul style="list-style-type: none"> <li>PDCVA (<a href="https://pdcvacameroun.com">https://pdcvacameroun.com</a>) and PDCVEP projects that cover the value chain (creation of communication channels, transformation, financing of peasant initiatives, awareness, etc.) financed by the AfDB and the State of Cameroon</li> </ul>
<b>Ethiopia</b>	<ul style="list-style-type: none"> <li>The Belg season production (second growing season) is disappearing</li> <li>Increased drought, flood, desert locust invasion, soil erosion and land degradation</li> <li>Negative effects on food security and socioeconomics in all its dimensions- availability, access, utilization- women and children are particularly affected by food shortages,</li> <li>Reduced or lost rural incomes and hence increased rural poverty</li> <li>Food insecurity of both rural and urban due to rising food prices</li> </ul>	<ul style="list-style-type: none"> <li>Ethiopia's agricultural GDP and rainfall amount co-fluctuate; food security and rural incomes are strongly related to rainfall.</li> <li>Ethiopia's drought early warning and response system is good</li> <li>Flood early warning and response is poor</li> <li>National policies and strategies exist; e.g., NAP, mitigation strategies, DRM policy and strategy</li> </ul>	<ul style="list-style-type: none"> <li>Limited institutional capacity to effectively implement policies and programs</li> <li>Financial constraints</li> <li>Technological constraint</li> <li>Human capacity limitations particularly at the local and community levels</li> </ul>	<ul style="list-style-type: none"> <li>ICT for agricultural information management – thousands of tablets distributed to woreda/ district agric offices</li> <li>ICT for climate services – ATA (agric transformation agency) initiative with the met agency</li> <li>Weather-index based crop and livestock piloted</li> </ul>	<ul style="list-style-type: none"> <li>Vulnerability analysis, and impact measurement along value chains, agro-ecologies, at different scales, etc</li> <li>Research and development on technologies</li> <li>Adaptation tracking along the potentially progressive climate change</li> <li>Tracking mitigation co-benefits of adaptation actions (Agriculture and forestry sector mitigation strategy available)</li> <li>Cross-scale biophysical and socioeconomic barriers and ecological limits to adaptation in agriculture</li> </ul>



Impacts of climate change on Food security and social-economics	Lessons learned	Challenges	Key Entry points	Examples of Best practices available	Future Research Topics
<p>Kenya</p> <ul style="list-style-type: none"> <li>Increased malnutrition and stunting of children</li> <li>Increased poverty occasioned by decreasing household income from agricultural activities</li> <li>Migration of people from the affected areas - land degradation, urbanization, resource use conflicts, loss of lives, unemployment</li> <li>Social strife and perennial insecurity arising from diminishing food resources (e.g. cattle rustling)</li> <li>Disease outbreaks</li> <li>Degradation of natural resources – landslides, soil erosion, soil and water pollution</li> <li>Increased water borne related diseases – impacts of swamps</li> <li>Increased costs of production and marketing</li> <li>Decreased crop and livestock yield</li> <li>Poor quality of crops – deteriorating water quality; mycotoxins</li> <li>Increasing frequency of droughts and flooding</li> <li>Increasing land and environmental degradation</li> <li>Outbreaks of pests and diseases (recent outbreak of locusts and FAW armyworm and MLND)</li> <li>Seasonal shifts on rainfall patterns – challenges in agricultural planning</li> <li>Diminishing agricultural labour</li> </ul>	<ul style="list-style-type: none"> <li>Food Availability “supply side” improving food availability dimension is strengthened by improving the level of food production through adoption of climate smart technologies and innovation, support for value chain development through improved financing system stock levels and net trade.</li> <li>Food access: insufficient food access has resulted in a greater policy focus on incomes (especially social safety nets), improved expenditure on agriculture (Malabo declaration on 10% expenditure in agriculture), improved markets &amp; supply chains and prices (reduction of price volatility) in achieving food security objectives.</li> <li>Food utilisation: Entails improvement in the way the body makes the most of various nutrients in the food for achievement of sufficient energy and nutrients.</li> </ul>	<ul style="list-style-type: none"> <li>Limited budgets for agricultural development crowded by recurrent expenditure – low funding for agricultural development low funding for agricultural research, low funding for technology and innovation transfer</li> <li>Indebtedness of countries limiting access to international low interest funding for development</li> <li>Poor participation of youth in agriculture</li> <li>Incoherent policy development and implementation</li> <li>Outdated agricultural technologies</li> <li>Challenges of research extension linkages – challenges in technology transfer national to County to farmer level</li> </ul>	<ul style="list-style-type: none"> <li>Mainstreaming ICT in agriculture for improved knowledge management, access to markets and financial services</li> <li>Supporting youth to participate in agriculture – access to land, ICT programs e.g. Enable Youth Program (capacity building, access to resources)</li> <li>Adoption of insurance to mitigate climate change risks (Index Based Livestock Insurance for Arid and Semi-Arid areas in Kenya to mitigate loss of livestock during severe drought and crop insurance for semi-arid areas all supported by government)</li> <li>Availability of financial and credit facilities to support women and youth to access finance – VijaBiz, Mbeleni Biz – County initiatives targeting youth in agriculture</li> <li>Increased funding for agricultural research and information dissemination – various aspects of agriculture e.g., solar energy in agriculture</li> </ul>	<ul style="list-style-type: none"> <li>Understanding the dynamics of socio economic factors for improving adoption of agricultural technologies and innovations e.g. mechanization, ICT in agriculture, climate information, insurance information, insurance</li> <li>Understanding underlying factors affecting mainstreaming of financials and insurance services in smallholder agricultural production</li> <li>Uncovering social and economic factors driving the potential for reducing post-harvest losses through adoption of requisite technologies</li> <li>Extent and factors affecting women and youth access to productive resources</li> </ul>	<ul style="list-style-type: none"> <li>Implementing large scale programmers to improve climate change resilience KCSAP (World Bank supported Kenya Climate Smart Project – productivity, capacity building, upscaling, climate information services, post-harvest markets</li> <li>Gok – Livestock and Crop insurance projects – insurance, compensation, climate information services</li> <li>The National Agricultural and Rural Inclusive Project (NARIGP) aimed at increasing agricultural productivity and profitability of targeted rural communities based on the Vulnerable and Marginalized Groups Framework (VMGF) and by targeted Agricultural Value Development and support for Common Interest Farmer Groups (CIGs) – productivity, vulnerable groups, markets</li> <li>Kenya Cereals Enhancement Project – Climate Resilience Agricultural Livelihoods project (KCCEP – CRAL) – productivity, post-harvest, marketing, insurance, credit schemes.</li> </ul>

Impacts of climate change on Food security and social-economics	Lessons learned	Challenges	Key Entry points	Examples of Best practices available	Future Research Topics
	<ul style="list-style-type: none"> <li>Achieving utilization requires improved care and feeding practices (investing in food nutritionists), food preparation Investing in food technologists), diversity of the diet (By supporting growing of indigenous crops with drought resistance traits) and intra-household distribution of food (Support for community development).</li> <li>Food stability:</li> </ul> <p>Dimension for ensuring stability of the other dimensions: This is achieved by minimization of adverse weather conditions, political instability, or economic factors (rising food prices; unemployment)</p> <ul style="list-style-type: none"> <li>During heavy rains and floods – increased production – food waste, loss of lives and livelihoods</li> </ul>			<ul style="list-style-type: none"> <li>Promote intra-Africa trade by eliminating tariff and non-tariff barriers to improve farmer incomes and ensure food security.</li> <li>Promote free movement of people/labour to facilitate sharing of skills e.g., Rwanda allowed Kenyan experts in agriculture to transfer knowledge, today they are way ahead in technology</li> <li>Promote free movement of technologies and knowledge e.g., free movement of improved seed (crop, livestock and fishery)</li> <li>Support cross country Agriculture value chain development (production and productivity, value addition and marketing)</li> <li>Capacity building – youth, women – access to productive resources, finances</li> </ul>	<ul style="list-style-type: none"> <li>Research of short-cycle varieties, resistant to drought, more resilient to climate change</li> </ul>
Madagascar				<ul style="list-style-type: none"> <li>Agricultural sector dominated by small family farms with low monetary income and more concerned with their subsistence through self-consumption.</li> <li>Shortage of food products resulting in excessive price increases on the market</li> </ul>	<ul style="list-style-type: none"> <li>Establishment an agricultural insurance system</li> <li>Promotion of agro-ecological techniques</li> </ul>



Impacts of climate change on Food security and social-economics	Lessons learned	Challenges	Key Entry points	Future Research Topics
<ul style="list-style-type: none"> <li>Intensification of extreme weather events (cyclones, flooding, hailstorms)</li> <li>Weed proliferation, increased disease and pest attacks</li> <li>All this has an impact on the level of productivity resulting in a drop in available production and therefore food insecurity.</li> </ul>	<ul style="list-style-type: none"> <li>Unexpected immigration, settling in areas with better production potential</li> <li>Sometimes threat of invasion of protected areas by clearing which can lead to land and social conflicts</li> </ul>	<ul style="list-style-type: none"> <li>Low investments by private sector in the agricultural sector.</li> <li>There is a low rate of adoption of technical innovations generated by research, considered the engine of rural development.</li> <li>Research also lacks resources of any kind for its operation, not being a priority sector for the State.</li> <li>Land tenure insecurity, rural insecurity, isolation of areas with high production potential</li> </ul>	<ul style="list-style-type: none"> <li>Political will for the effective transformation of Agriculture through the implementation of a good agricultural policy.</li> <li>More importance should also be given to agricultural research and the dissemination / appropriation of its results to support the modernization of Agriculture</li> <li>Promotion of agro-ecological techniques (conservation agriculture, climate smart agriculture), more respectful of the environment and means of adaptation to climate change</li> </ul>	<ul style="list-style-type: none"> <li>Development of curriculum on Environmental, agriculture and climate change education</li> <li>Food fortification in vitamins, trace elements</li> <li>Reduction of post-harvest losses: conservation and agro-food processing techniques</li> </ul>
				<p><b>Republic of Congo</b></p> <ul style="list-style-type: none"> <li>Modification of the crop calendar mainly due to the lengthening or shortening of the rainy season with high intra-seasonal variability during the rainy season.</li> <li>80% of food products intended for urban areas are imported</li> </ul> <ul style="list-style-type: none"> <li>The uncertainties of climate models remain strong and even that the disparities between different territories remain strong</li> <li>Increase in temperatures, lengthening of dry episodes lead to a decrease in plant cover</li> <li>Biodiversity to a change in the composition of forest species</li> <li>Increased risk of flooding from soil erosion and massive displacement of the population. With possible risks of conflicts between populations</li> </ul> <ul style="list-style-type: none"> <li>Development of an action strategy that will take into account the agricultural law, the law setting the rules of occupation of land and land in the process of adoption and the National Agricultural Development Plan (PNDA)</li> <li>Development of strategy and simple plans for the sustainable management of coastal forest ecosystems, as well as bushmeat</li> <li>National policy development on food and nutrition security</li> <li>Promotion of agricultural insurance</li> <li>Improving climate services in the agricultural sector</li> </ul>

Impacts of climate change on Food security and social-economics	Lessons learned	Challenges	Key Entry points	Future Research Topics
<b>Rwanda</b> <ul style="list-style-type: none"> <li>Environment deterioration (soil erosion, flooding issues, landslides, siltation, drought, etc..)</li> <li>Emergency of pests and diseases</li> <li>Low productivity (yield gaps)</li> <li>Malnutrition and stunting of children in poor families/households</li> </ul>	<ul style="list-style-type: none"> <li>Soil loss due much rain</li> <li>Destruction of agricultural infrastructures and farms due to a lot of rain</li> <li>Disasters affecting human inhabitants</li> <li>Low crop yields due to much rain or drought</li> </ul>	<ul style="list-style-type: none"> <li>Unpredictable weather conditions</li> <li>Insufficient knowledge in agricultural technologies</li> <li>Low development of mechanization</li> <li>Limited research infrastructures and capacity of scientists</li> <li>Low involvement of the private sector in the agriculture sector</li> </ul>	<ul style="list-style-type: none"> <li>Developed clear policies and strategies to address socio-economic and food security dimensions of climate change</li> <li>Implementation of land consolidation program</li> <li>Development and upscale of technologies (e.g., land husbandry technologies, irrigation infrastructures, post-harvest infrastructures, livestock nutrition program, etc.)</li> <li>Development of technology transfer approach</li> <li>Increased capacity of actors and farmers in agriculture business (e.g., youth engagement, farmers cooperatives,</li> <li>Development of agri-based post-harvest processing units</li> </ul>	<ul style="list-style-type: none"> <li>Research focus on natural resources management and biotechnology</li> <li>Soil fertility improvement with focus organic matter options sources (conservation agriculture)</li> <li>Develop integration of ICT and digital technologies in agriculture</li> <li>Development of prediction modeling tools</li> <li>Facilitate exchange of technologies and knowledge</li> </ul>



Impacts of climate change on Food security and social-economics	Lessons learned	Challenges	Key Entry points	Examples of Best practices available	Future Research Topics
<b>South Sudan</b>	<ul style="list-style-type: none"> <li>Low production in Agricultural sector (products)</li> <li>Increase in price of commodities in the market due to high demand</li> <li>Conflict between nomadic due to limited grazing land for livestock</li> <li>Drought and flooding</li> <li>Uncontrolled grazing habit by Nomadic Communities in the Country</li> <li>Insecurity in some parts of the Country</li> </ul>	<ul style="list-style-type: none"> <li>Change in temperature and delay in rain</li> <li>Failure of crop due to flooding</li> <li>Few commodities in the market</li> </ul>	<ul style="list-style-type: none"> <li>Lack of favorable and legal environmental framework policy</li> <li>Limited resource (funding)</li> <li>Increase in magnitude of floods and droughts</li> </ul>	<ul style="list-style-type: none"> <li>The government and other stakeholders to ensure focus on production where there is enough rain</li> <li>Use of varieties that are resistant/tolerant to drought</li> <li>Increase production through use of different varieties tolerant to drought</li> <li>Government to avail supplementary budget to Ministry of Agriculture</li> </ul>	<ul style="list-style-type: none"> <li>Research on drought resistant crops</li> </ul>
<b>Sudan</b>	<ul style="list-style-type: none"> <li>Increase in widespread and severe droughts, famines, storms and flooding</li> <li>Disease spread</li> <li>Species die-offs.</li> <li>Increased Immigration</li> <li>Decreased wheat and maize yields</li> <li>Increased conflicts</li> </ul>	<ul style="list-style-type: none"> <li>Increasing population growth,</li> <li>Increasing demand for food</li> <li>Increaseig food price</li> <li>Disappearance of the variety of agricultural plant species</li> </ul>	<ul style="list-style-type: none"> <li>Better soil management</li> <li>Using of indigenous knowledge in solving food shortage</li> <li>Technology transfer</li> <li>Awareness rising</li> <li>Training of stockholders</li> <li>Extension activities</li> </ul>	<ul style="list-style-type: none"> <li>Studies on food security improvement involving local communities (good practices and successful stories)</li> <li>Rehabilitation of degraded areas (reforestation and a forestation) using agroforestry system practices</li> </ul>	

Impacts of climate change on Food security and social-economics	Lessons learned	Challenges	Key Entry points	Examples of Best practices available	Future Research Topics
<b>Tanzania</b> <ul style="list-style-type: none"> <li>Increasing temperature (For example, for the months of October to December in the years of 1967 to 1975, 1976 to 1944 and 1994 to 2011 the mean minimum temperatures were increasing at 17.98, 17.92 and 18.41 degrees Centigrade respectively).</li> <li>Extreme weather events (floods, droughts, storms), melting of glaciers, sea-level rise. For example some regions which were receiving the Uninadal rains the months have increased and the variation is different from year to year.</li> <li>Shift of Agro-ecological zones and displacement of optimal growing regions (study under Lake Victoria). This has changed for example 1975 to 2011 the cultivated land and settlement increased by 37.7% and 21% respectively</li> <li>There was decrease of water bodies by 13.9% grass land, 13.1%, closed forest by 9%, vegetated wetland 4% and shrubs by 1.6%</li> <li>Changes in pest exposition, invading species and genetic losses. For example, Fall Armyworm in maize and cotton has become a serious issue, insects like Jassid in cotton where the same variety which was resistant are being attacked and diseases and insect outbreaks (eg Water hyacinth, Locust)</li> <li>All these challenges have resulted to unsecure cropping conditions, crop failures thus overall yield losses but with considerable regional differences</li> </ul>	<ul style="list-style-type: none"> <li>It is important to practice conservation agriculture because it reduces soil and land degradation, adapts production to climate variability and improved productivity.</li> <li>Many communities are not knowledgeable about climate change issues thus capacity building is needed.</li> <li>Some regions of the country have not adopted strategies for combating climate change.</li> </ul>	<ul style="list-style-type: none"> <li>Limited awareness of climate change in communities</li> <li>Limited funding for research, technology and innovation development</li> <li>Knowledge gap and perception amongst farmers</li> </ul>	<ul style="list-style-type: none"> <li>To promote the further use of sustainable practices relating to agriculture, crops and forestry to improve food and nutrition security while ensuring the sustainable management of natural resources.</li> <li>To enhance the resilience of agriculture to the adverse impacts of climate change.</li> <li>To maintain natural ecological processes that support sustainable food production systems along the value chain. There are potentials to fix (sequester) GHGs in soils and vegetation (sinks).</li> <li>ICT technologies are now used to support farmers in identifying pests, predicting changes and fertilizer rates. The programme started with cassava farmers</li> </ul>	<ul style="list-style-type: none"> <li>Conservation Agriculture (CA) is the best practice! CA improves the productivity of current farming systems</li> <li>Traditional irrigation system commonly practiced in some parts of Tanzania (e.g. Nduva commonly practiced by Pare communities in Kilimanjaro Region).</li> <li>Improvement of indigenous <i>in situ</i> rainwater harvesting technologies such as Cholo pits commonly practiced in Cholo village, Dodoma City.</li> </ul>	<ul style="list-style-type: none"> <li>Mitigation measures on climate change issues along the value chain including sustainable land management practices to enhance adaptation to climate change</li> <li>modellings and predictions on climate change effects and impact</li> <li>Research on climate change resilience for resistant varieties to drought and insects in different crops</li> </ul>



Impacts of climate change on Food security and social-economics	Lessons learned	Challenges	Key Entry points Future Research Topics
Uganda	<ul style="list-style-type: none"> <li>• Reduced crop yields</li> <li>• Increasing emergence of new and/or virulent plant pests (insects) and pathogens. This increases costs of crop management / production. In addition, it increases exposure of farmers and consumers to health hazards</li> <li>• Increased food prices due to high cost of production           <ul style="list-style-type: none"> <li>• Difficulty in distribution of food across the country due to breakdown of transport infrastructure</li> <li>• Increased land conflicts due to competition for scarce productive land due to climate change impacts</li> <li>• Migration from less productive areas due to climate change and its associated ills</li> <li>• Droughts</li> <li>• Unemployment especially for the youth</li> <li>• Gender violence</li> <li>• Climate change is in one way or another responsible for the unreliable agricultural production and this has increased unstructured urban growth thus increasing urban poverty levels</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Agricultural loans and insurance safeguards against climate change</li> <li>• Formation of cooperatives</li> <li>• Small agroprocessing industries in rural areas</li> </ul> <ul style="list-style-type: none"> <li>• Lack of domestic markets</li> <li>• Lack of value addition that has affected the prices for the semi processed agricultural produce</li> <li>• Erratic or unpredictable weather patterns. I.e. the fact that the seasons are no longer regular affects timing of planting and hence yields</li> <li>• Prolonged dry spells in some areas, as well as the too much flooding in other places affects food security due to reduced productivity</li> <li>• Poorly organised agricultural producers and distributors experience more impacts</li> <li>• Poor post handling and marketing of agricultural products</li> </ul>	<ul style="list-style-type: none"> <li>• More research on drought resistant crops</li> <li>• Research on indigenous food crops</li> <li>• Sustainable land management practices to enhance adaptation to climate change</li> <li>• Research on storage and distribution of food</li> <li>• Nexus between Agro-biodiversity food security</li> <li>• Mitigation potential of agricultural fields</li> </ul>



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