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EAST AFRICAN AGRICULTURE AND CLIMATE CHANGE

A Comprehensive Analysis

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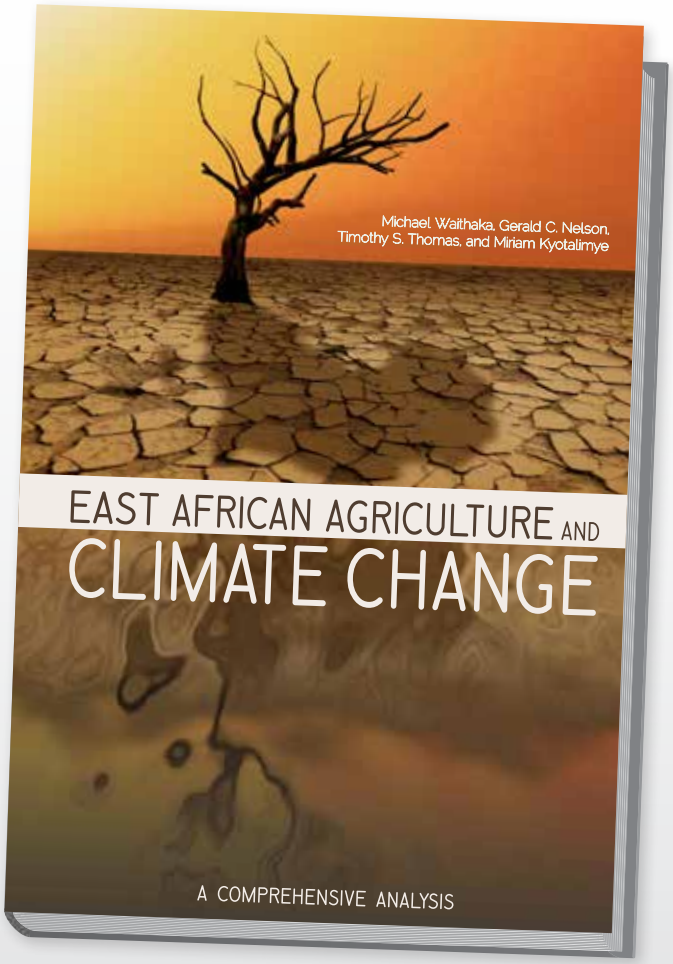
Agriculture is essential to the economies of East African countries. Climate change, with its effects on temperature and precipitation, threatens this important economic activity. How to foster agricultural development and food security in East Africa as the effects of climate change become more serious is the subject of the study *East African Agriculture*



and Climate Change: A Comprehensive Analysis. The authors develop several weather-based scenarios for how climate change might affect countries in the region between now and 2050. National contributors from Burundi, the Democratic Republic of Congo (DRC), Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania, and Uganda review the scenario results for their countries and propose a variety of policies to counter the effects of climate change on agriculture and food security.[1] These policies include greater investment in agricultural research and extension, equitable access to land and inputs such as seeds and fertilizer, expanded irrigation, and improved infrastructure.

PRESENT AND FUTURE CONDITIONS IN EAST AFRICA

Agriculture accounts for 43 percent of the surveyed nations' annual gross domestic product (GDP), on average, although the precise proportions vary considerably from country to country. For example, agriculture in Burundi, DRC, Ethiopia, Sudan, and Tanzania accounts for more than 50 percent of GDP while in Eritrea, Kenya, and Madagascar it accounts for less than 30 percent. Kenya's low percentage is due to structural transformation toward a less agriculture-based economy.

Despite these differences, farming in all the surveyed nations is dominated by smallholders reliant on rainfall. These farmers face the challenges of land degradation, poor soil fertility management, and continuous cropping. Sluggish growth in agricultural productivity translates into slow overall growth and generally low per capita income levels. Meanwhile, population growth in these 10 East African countries is among the highest in the world, which threatens to worsen already severe food insecurity.

High levels of agricultural imports—particularly of staples—appear to fill only partially the consumption needs of a population lacking purchasing power, resulting in extensive adult and child malnutrition and high child mortality rates. The poorest consumers have been overwhelmed by sharp increases since 2008 in the prices of staple foods, as well as high price volatility. These consumers spend a large proportion of their income on food and have limited capacity to adjust quickly to rapid price increases. Because the finite amount of agricultural land makes it impossible to increase the area under production in the higher-potential areas, which tend to have high population densities and a dependency on agriculture, increasing farm productivity and enhancing sustainability in these areas are essential.

Projections for East African countries show that the temperature will increase between 1.3°C and 2.1°C (with greater or lesser local variation depending on the model) by 2050. Precipitation either will increase or remain the

[1] The analysis for this book occurred before the new republic of South Sudan separated from Sudan on July 9, 2011.

same, on average, across the region. Local precipitation may diverge from this average, however. One model predicts an increase of over 100 millimeters of rainfall per year over half of East Africa and a rainfall decrease in small areas of western DRC and southern Madagascar. Another model predicts significant rainfall decreases for large parts of DRC, Ethiopia, and Madagascar. Moreover, some analysts suggest that even these models' projections of average rainfall increase or stability are too optimistic. Instead, they argue East Africa will be much drier overall in the future, particularly during the "long rains" period of March to June.

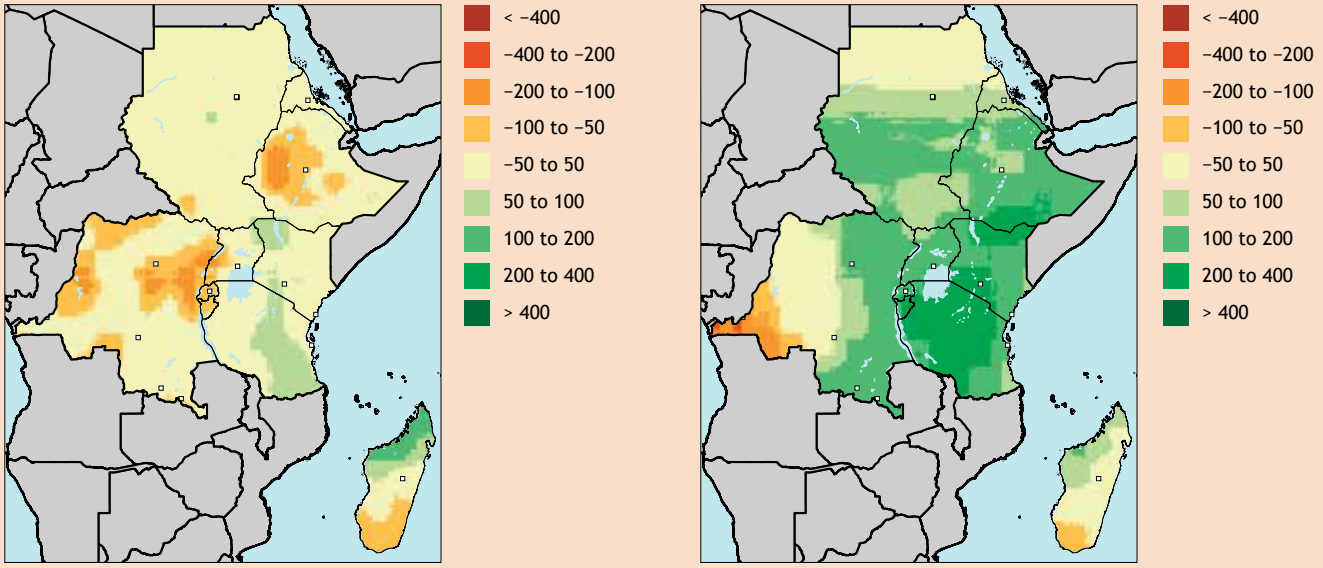
Crop modeling assessments of the potential effects of climate change suggest a general increase in maize yields in most parts of East Africa but yield losses in large parts of DRC, Ethiopia, Tanzania, and northern Uganda. They also show that climate change will likely reduce sorghum yields across East Africa, but increase yields in the western DRC, the highlands of Ethiopia, Kenya, Sudan, and Tanzania. When technological change (including increased fertilizer use) is factored in, however, food production is projected to rise overall, despite climate change effects, because of acreage expansion in some cases but more generally because of increases in productivity.

POLICY RECOMMENDATIONS FOR EAST AFRICA

Policymakers and others concerned with adapting East African agriculture to climate change can take the following steps (some of which are already underway):

- Invest in crop breeding and livestock research to develop new agricultural technologies suitable for smallholders.
- Expand irrigation where economically feasible. This is critical in the countries with large arid and semiarid zones: Eritrea, Ethiopia, and Kenya.

FIGURE 1 Change in mean annual precipitation in East Africa, 2000–2050, A1B scenario (millimeters)



Source: Authors' calculations based on Jones, Thornton, and Heinke (2009).

Notes: A1B = greenhouse gas emissions scenario that assumes fast economic growth, a population that peaks midcentury, and the development of new and efficient technologies, along with a balanced use of energy sources; CSIRO = climate model developed at the Australia Commonwealth Scientific and Industrial Research Organisation; MIROC = Model for Interdisciplinary Research on Climate, developed at the University of Tokyo Center for Climate System Research.

- Improve transport and market infrastructure. Among other benefits, this can increase rural producers' access to markets and offset food shortages through regional trade.
- Provide access to financial and extension services and insurance to farmers.
- Stem high population growth through family planning access and education. This is particularly important in Ethiopia and Madagascar, the countries with the fastest population growth.
- Ensure proper land management. Farmers need equitable access to land and its use. Further, land-use tenure needs to be extended to give farmers a sense of ownership or guardianship over the land. A number of environment-related policies have already been drafted, yet require support through coherent laws and regulations.
- Improve smallholder access to inputs such as seeds and fertilizer.
- Promote research on the relationship between climate change and agriculture. Research programs in this area already exist in the DRC, Kenya, Madagascar, Rwanda, Sudan, Tanzania, and Uganda; more research programs and development projects in different disciplines should be undertaken.
- Build human and institutional capacity, particularly in the areas of climate change modeling, remote sensing, and developing climatic early warning systems.
- Improve the coordination and implementation of climate change policies. National agricultural adaptation strategies show weaknesses resulting from poor coordination, poor implementation of objectives, or both. Correcting these weaknesses requires harmonizing the different policies and institutions that affect climate change adaptation.

To date, East African nations have taken some steps to address climate issues. All the nations surveyed for this study have ratified the United Nations Framework Convention on Climate Change (UNFCC) and submitted National Adaptation Programmes of Action (NAPAs). Strategies common to all 10 nations' NAPAs include the development and promotion of drought-tolerant and early-maturing crop species and the exploitation of new and renewable energy sources. At the regional level, the East African Community recently published a policy guide for the region on taking action on climate change; establishing a climate change fund to support adaptation and mitigation activities; creating research institutions to develop climate change adaptation technologies; and mainstreaming climate change in national development processes.

CONCLUSION

As policymakers and others in East African nations anticipate their countries' economic prospects, they must consider climate change and how to adapt agriculture to its challenges. A range of positive responses, from providing farmers with seeds, fertilizer, and financial and extension services to developing new agricultural technologies to investigating the relationship between climate change and agriculture, is possible. Those concerned with growth and food security in East Africa should identify and pursue responses best adapted to each region and country.

Reference: Jones, P. G., P. K. Thornton, and J. Heinke. 2009. *Generating Characteristic Daily Weather Data Using Downscaled Climate Model Data from the IPCC's Fourth Assessment*. Project report. Nairobi: International Livestock Research Institute.

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