

The impact of agricultural development in East Africa on the resilience of maize production to climate change

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To date, projections of future climate impacts on food security have not thoroughly considered the influence of development activities associated with the African Green Revolution on future food production. There is good reason to believe that the development interventions taking place in sub-Saharan agriculture (improved seed, improved management, and increased fertilizer use) may prove to function as an adaptation to future climate change and current climate variability. Here we are leveraging existing research on trace gas emissions from soils in western Kenya to collect data for calibration of a widely adopted improved maize variety, Western Seed 505, in the Decisions Support System for Agrotechnology Transfer crop modeling system (DSSAT).

In order to understand how the adoption of an improved maize variety, increased fertilizer use, and improved management may affect western Kenyan cropping systems' resiliency to climate change, we will use the coupled HadCM3/DSSAT models to conduct a series of sensitivity analyses of crop yield for local and improved maize varieties under different farm-level adaptive management practices (changes in planting date, plant density, fertilizer management, fertilizer quantity, and crop variety). The adaptations representative of the Millennium Village practices establish an alternative "development" baseline for understanding sub-Saharan Africa's vulnerability to climate change, in comparison to the more dire "business as usual" approach taken for the IPCC fourth assessment report. We will simulate future climate using the delta method, in which long-term climate changes from the general circulation model are mapped onto daily weather station data. We will run DSSAT using outputs from HadCM3 runs for the 2020s, 2050s, and 2080s using a baseline of 1970 to 1999 daily weather data from weather stations in Kisumu and Kakamega, Kenya. The detailed set of agricultural scenarios used in these modeling efforts will provide a new window into understanding the role development can play in ameliorating the impacts of climate change on agriculture in sub-Saharan Africa.