Assessment of Impact of Climate Change and Adaptation Strategies on Maize Production in Uganda

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Abstract
Globally, various climatic studies have estimated a reduction of crop yields due to changes in surface temperature and precipitation especially for the developing countries which is heavily dependent on agriculture and lacks resources to counter the negative effects of climate change. Uganda's economy and the wellbeing of its populace depend on rain-fed agriculture which is susceptible to climate change. This study quantified the impacts of climate change and variability in Uganda and how coping strategies can enhance crop production against climate change and/or variability.
The study used statistical methods to establish various climate change and variability indicators across the country, and uses the FAO AquaCrop model to simulate yields under possible future climate scenarios with and without adaptation strategies. Maize, the most widely grown crop was used for the study. Meteorological, soil and crop data were collected for various districts representing the maize growing ecological zones in the country.
Based on this study, it was found that temperatures have increased by up to 1 °C across much of Uganda since the 1970s, with rates of warming around 0.3 °C per decade across the country. High altitude, low rainfall regions experience the highest level of warming, with over 0.5 °C/decade recorded in Kasese. Rainfall is variable and does not follow a specific significant increasing or decreasing trend. For both future climate scenarios, Maize yields will reduce in excess of 4.7% for the fast warming-low rainfall climates but increase on average by 3.5% for slow warming-high rainfall regions, by 2050. Improved soil fertility can improve yields by over 50% while mulching and use of surface water management practices improve yields by single digit percentages. The use of fertilizer application needs to go hand in hand with other water management strategies since more yields as a result of the improved soil fertility leads to increased water stress, especially for the dry climates.

Keywords
Warming;
Crop yield modeling;
AquaCrop