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Climate Change and Food Security in Kenya

Does Climate Change Affect Food Insecurity in Kenya?

BY JANE KABUBO-MARIARA, EFD KENYA, DRB 15-05, DECEMBER 2015

The research analyzes the impact of climate change (including increased variability and less predictability of temperature and rainfall) on food security in Kenya. The study is based on county-level data, collected over time, for yields of four major crops (maize, beans, sorghum and millet), four climate variables (precipitation, temperature, runoff and total cloud cover), population, soil and agro-ecological zones data spanning over three decades. The paper estimates models of main food crop yields and also of the probability of a county being food insecure. A county is defined as food insecure if yields fell short of the 25th, 40th and 60th percentile of the yields in any one period. The results show that climate variability and change will increase food insecurity and that food security responds positively to favourable agro-ecological zones, soil drainage and depth, and high population density. The paper recommends strengthening policies on mitigation against climate change.

The research

Climate change threatens to significantly increase the number of people at risk of food insecurity all over the world. According to the Inter-governmental Panel on Climate Change, climate change has led to, and will continue to lead to, increases in the frequency and intensity of natural disasters and extreme weather events, such as droughts, floods and hurricanes; rising sea levels; salinization of water supplies and agricultural lands; changes in rainfall patterns; and decline in water quality and availability in arid and semi-arid regions, with expected reduction in agricultural productivity, especially in sub-Saharan Africa. Predictions suggest that yields from rain-fed agriculture in parts of sub-Saharan Africa could fall by 50 percent by the year 2020.

Kenya is characterized by low and declining crop productivity, and, like many other developing countries, is particularly susceptible to climate change due to its over-reliance on rain-fed agriculture, aridity, inadequate water supply and degradation of many of its natural

Key Points

- Climate change affects food security due to over-reliance on rain-fed agriculture, high levels of poverty, low levels of education, inadequate access to financial capital and poor infrastructure, especially in sub-Saharan Africa.
- The results show that climate variability and change will increase food insecurity and that different food crops respond differently to climate change variables in Kenya.
- The results further indicate that food security responds positively to favourable agro-ecological zones, soil drainage and depth, and high population density.
- These results point at the need for policies that safeguard agriculture against the adverse effects of climate change in order to alleviate food insecurity in Kenya.

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resources. The agro-ecological zones differ in terms of moisture index, rainfall, vegetation and farming systems, where the arid and semi-arid zones (characterized by high temperatures and less suitable for arable agriculture) account for about 80 percent of the total land area. Given this agro-ecological setting, agricultural production is undermined by unpredictable weather and climate variation, especially in the arid and semi-arid or less arable zones.

Most previous studies on Kenya have concentrated on the impact of climate change on crop and livestock productivity, and on adaptation to climate change. There is, however, a gap in knowledge on the relationship between climate change and food security in Kenya. Despite this gap, there are no country-wide policies to address the effects of climate change. To design policy measures which counter the negative effects of climate change, there is a need for research on the impact of climate change on food security. This study addresses this gap and assesses the impact of climate change on food security for four major food crops (maize, beans, sorghum and millet) and suggests policy options for mitigating the effect of climate change in Kenya. The study is based on county-level data for yields of four major crops (maize, beans, sorghum and millet) and daily climate data spanning over three decades (1975 to 2012). The study is based on the United Nations Food and Agriculture Organization (2008) framework on climate change and food security and estimates the direct effects of climate variables on crop yields.

The results suggest that high rainfall is crucial for increased crop productivity and thus food security, but that excessive rainfall is harmful. The results further suggest differential impacts of temperature – high temperatures during the planting period slow down or destroy crop growth, while moderately high winter temperatures are crucial for crop maturity. Population density and favourable agro-ecological zones are associated with lower food insecurity. Good soil drainage is associated with lower millet and bean crop insecurity. High river runoff is associated with lower bean crop insecurity.

Simulations of the effects of different climate change scenarios on food insecurity were also carried out. The results suggest that adverse climate change is likely to increase food insecurity in Kenya, with the greatest effect on maize insecurity, which is predicted to increase by 8.56% to 21% by the year 2100, other factors constant. The results further suggest that sorghum may improve (in terms of less food insecurity by the year 2050), followed by modest increases in insecurity by the year 2100. There is also a likelihood of modest increases in beans and millet insecurity.

Conclusions

Different food crops respond differently to climate change variables in Kenya. This calls for the need to put in place policies which safeguard agriculture from the adverse effects of climate change in order to alleviate food insecurity in Kenya. The government should implement policies to reduce emissions of greenhouse gases and increase carbon storage through reforestation. Farmers should also be encouraged to practice reforestation, especially in the arid and semi-arid areas, where drought-resistant trees and crops could be introduced. Moreover, the government should also support policy-driven adaptation to climate change as well as continuous climate change monitoring, intensified early warning systems and dissemination of relevant information to farmers in order to ensure that farmers adopt the appropriate adaptation strategies.

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ABOUT THIS BRIEF

This brief is based on 'Climate Change and Food Security in Kenya', by Jane Kabubo-Mariara and Millicent Kabara, 2015, EFD Discussion Paper 15-05. The DRB series of research briefs is associated with the EFD Discussion Paper series.

FURTHER READING

Deschenes, O., and Greenstone, M. (2007) 'The Economic Impacts of Climate Change: Evidence from Agricultural Output and Random Fluctuations in Weather'. *The American Economic Review* 97(1): 354-385.

FAO (2008). Climate Change and Food Security: A Framework Document. Rome, Italy.

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