A Worldwide Analysis of Extreme Climate Events on Crop Output

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Introduction

Rosenzweig et al. predict that the world is expected to become warmer, and that the incidence and intensity of extreme weather events will increase, as well\(^1\). We want to determine if these extreme climate events will have an adverse effect on agricultural output, and if so, to what extent. If climate events do have an adverse effect on agricultural output, this is a troubling implication about the availability of future food resources, as the United Nations predicts food production must double by 2050 to meet the demands of the world’s growing population\(^2\).

Methodology

Our analysis of crop output and climate consisted of merging spatially-explicit global climate, cropland, and cropland output data for the years 1971 to 2000. Using the climate data, we determined when and where unusual weather events occurred during growing seasons. We defined these unusual weather events as precipitation or climate data that were two standard deviations above the 30-year average for a region. We then used econometric techniques to calculate the effect these extreme weather events had on past crop output, which allows us to predict the effect future climate change might have on future crop output.

Initial Results

Analysis done earlier in the summer for 13 countries (Israel, France, Ecuador, Costa Rica, Bangladesh, Austria, Tanzania, Senegal, South Korea, Papua New Guinea, New Zealand, Kenya) suggests that almost all extreme climate events have a fairly negative effect on crop production, unsurprisingly. However, unusually high nighttime temperatures had a positive effect on crop production. This makes sense as crops are less likely to be susceptible to frost, for example. Droughts had the largest negative impact on crops, followed by frosts, and heat waves. While the same analysis has not been completed yet for the entire globe, it is expected to follow the same trend displayed by the 13 countries.

The insights gained by this climate analysis are important as they might allow for future policy measures that would help areas better adapt their crops to climate changes and extreme climate events.


Faculty Mentor: Professor Erik Nelson

Funded by the Mathematics and Climate Research Network Faculty Research Grant