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CROPS AND CLIMATE

Agriculture threatened by climate change

by **Bill Schlesinger**

Mon Mar 7th, 2016

The threat to agriculture is seldom mentioned among the impacts of global climate change. Few other economic activities depend so much on climate. Year-to-year variations in climate, including rainfall and the length of the growing season, remain the greatest determinant of agricultural productivity and the cost of food.

You might think it would be easy to test for the effect of higher temperatures on the growth of crop plants. Just put a few of them in greenhouses at different temperatures and wait to measure the yield later in the year. We might also compare crop yields during past cool and warm periods. In the Southeast, the warm, dry period extending from the 1930s into the 1950s had lower agricultural yields than seen during the relatively benign period of the 1980s and 1990s.

We know from past periods of climate, that hot dry conditions take a big toll on crop production. In temperate regions, high temperatures allow pests to persist through the winter, when pest numbers are otherwise held in check by cold or frozen soils. It is often the coldest night of winter that determines the survival of these pests for the next growing season. Following warm winters, we can apply pesticides to make up the difference, but costs are higher and yields are lower in periods of warm climate.

High temperatures are often associated with drought, since they increase the rate of water loss from soils (evaporation) and crops (transpiration). Agricultural yields have fallen in the Central Valley of California during the recent years of extreme drought. Many farms went broke during the Dust Bowl of the 1930s.

Fortunately, field agriculture includes a lot of innovations that influence yield; for instance, what variety to plant—including new GMO varieties—how to fertilize, when to irrigate, and what pesticides and herbicides to use. Agricultural practices have changed during the past few decades and the concentration of carbon dioxide, which helps many plants grow, is now higher than it was before. Farmers have out-paced climate change during the past few decades of warmer temperatures, and agricultural yields have risen.

Those hoping to predict the effect of climate change on agriculture must factor out the effects of various agricultural practices that influence crop growth, so that the impacts of warmer temperatures alone can be seen. Globally corn and wheat yields declined 5.8 and 5.5% due to rising temperatures since 1980, compared to what would have been seen without human intervention. In many areas, we have masked these impacts on yield by increasing applications of new crop varieties, fertilizer, and irrigation.

Food and water are the central commodities for human survival. As we head into a period of substantially warmer temperatures—from whatever cause—corn yields are destined to drop, food prices will surely rise, and human strife is likely to increase. As is so often the case, the greatest impacts will be seen in the undeveloped world. As the climate warms, we will again respond with new varieties adapted to the new conditions and supplements of water and nutrients delivered to fields by the use of fossil fuels. How we can provide low-cost nutrition to 10 billion fellow citizens that occupy our planet should motivate immediate steps to curtail the extent of global climate change and its effects on agriculture.

References:

Burke, M., S.M. Hsiang, and E. Miguel. 2015. Global non-linear effect of temperature on economic production. Nature 527: 235-239.

Cammarano, D., D. Zierden, L. Stefanova, S. Asseng, J.J. O'Brien and J.W. Jones. 2016. Using historical climate observations to understand future climate change crop yield impacts in the southeastern U.S. Climate Change 134: 311-326.

Diffenbaugh, N.S., C.H. Krupke, M.A. White, and C.E. Alexander. 2008. Global warming presents new challenges for maize pest management. Environmental Research Letters 3: doi: 10.1088/1748-9326/3/4/044007

Lobell, D.B. and C.B. Field. 2007. Global scale climate-crop yield relationships and the impacts of recent warming. Environmental Research Letters 2: doi: 10.1088/1748-9326/2/1/014002

Lobell, D.B., W. Schlenker, and J. Costa-Roberts. 2011. Climate trends and global crop production since 1980. Science 333: 616-620.

Miranda, M.L., D.A. Hastings, J.E. Aldy and W.H. Schlesinger. 2011. The environmental justice dimensions of climate change. Environmental Justice 4: 17-25.

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