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Gut Check

Warmer Planet, Fewer Crops?

By Ezra Klein

Wednesday, October 14, 2009

This column has focused on the effects of food production on climate change. But what about the effects of climate change on food production? After all, few things are as sensitive to changes in weather as agriculture. Farmers wait for warmer seasons to grow some crops and colder seasons to plant others. They pray for rain and, at times, hope the rain eases up. The relationship between a good yield and the weather that produces it is rather delicate.

Climate change, however, is going to be rudely indelicate. The basic story is simple: Greenhouse gases warm the atmosphere. More heat causes more evaporation. That water has to come down somewhere. Where it comes down depends on atmospheric conditions, weather patterns and much else. It is, frankly, quite complicated.

But it's also quite important. Where it comes down also decides growing patterns and land suitability. That's why the number crunchers over at the [International Food Policy Research Institute](#) have built a complex model to estimate such things.

The results of the model, which compares a world with climate change to a world without it, are not comforting, particularly in the developing world. By 2050, wheat yields in developing nations would drop by about 30 percent and irrigated rice yields would drop by 15 percent. That would have an outsize impact on cost: Wheat prices are projected to increase by about 180 percent, and irrigated rice prices would jump by about 115 percent. The overall result? Twenty-five million more children would be malnourished.

We can, to some degree, buy our way out of this. IFPRI estimates that counteracting the effects of climate change on children will cost \$7 billion annually. If we begin spending that sum next year, that will be \$280 billion in increased aid.

Sound bad?

"We've underestimated it," says Gerald Nelson, one of the lead researchers on the study. "We don't take into account variability, melting glaciers or sea level rise. We don't take into account droughts and floods."

It is, in other words, a conservative prediction.

It's also a limited one: The report looks forward only to 2050. But left unchecked, global warming doesn't just keep going. It accelerates. The greenhouse gases continue accumulating, trapping ever more heat. The glaciers melt, further warming the Earth. What damage is done in the next 40 years pales in comparison with the 40 years after that, and the 40 years after that.

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"A plant has a natural range in which it does okay," Nelson says. "It does better at some temperatures and worse at others. But corn plants in the Midwest, for instance, quit after 80 or 90 degrees. As you get out to 2050 and beyond, you run into events where existing varieties of plants can't keep up."

At that point, you're not talking about decreased yields. You're talking about the extinction of foodstuffs, unless scientists can breed plants that endure totally different climates.

A study by Wolfram Schlenker, an assistant professor of economics at Columbia University, and Michael Roberts, a professor of agricultural economics at North Carolina State University, attempted to calculate the long-term impact of climate change on U.S. production of corn, soybeans and cotton. Climate change might hit the developing world hardest and first, but as Schlenker and Roberts show, over time it hits the developed world pretty hard, too. Their study proceeds from the finding that moments of "extreme heat" are critical to crop outcomes. They defined "extreme heat" as 84 degrees, which is the threshold at which corn deteriorates. They found that nationwide average yields on corn, soybeans and cotton drop by 30 to 46 percent under the slowest warming scenario, which is considerably more mild than most scientists think is likely. Under the fastest warming scenario, yields dropped by 63 to 82 percent.

Their study also contained bad news for techno-optimists. The data comparing yield and extreme temperatures was sorted both across time and across countries. Presumably, those two sets of data would be very different, as farmers in warmer climates would have done a better job developing heat-resistant seeds.

"This finding strongly suggests farmers in warmer southern climates haven't been able to adjust their management practices to offset the damaging effects of extreme heat," Roberts wrote on his [Greed, Green and Grains](#) blog. That doesn't mean technology won't ever be able to catch up to global warming. But it won't be easy, and it won't be cheap.

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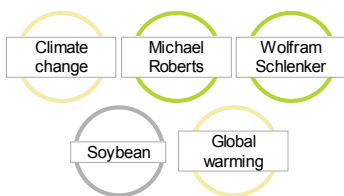
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