Climate change and crop yields

One degree over

Data from crop trials underline the threat climate change poses to farmers

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As high as an elephant's eye?

FOR a scientist, there are few happier accidents than finding a trove of data that were gathered for other purposes, but which apply to your pet problem. That happened to David Lobell, a researcher at Stanford University, when he started talking to Marianne Bänziger of the International Maize and Wheat Improvement Centre, in Mexico, about how climate change would affect crops in Africa.

Dr Bänziger and her colleagues had been running an ambitious set of field trials designed to look at what sorts of maize (corn, to Americans) grow best in various parts of southern and eastern Africa, paying special attention to drought resistance. They were struggling, though, to find the money to pull the results from 123 separate research stations together into one big, tractable database. Dr Lobell realised that if he helped them he could also use the result to correlate yields with meteorological conditions other than drought, and thus reveal any harm done by hotter-than-usual weather. His conclusions, published this week in *Nature Climate Change*, confirm for the tropics the findings for temperate climes of a recent American study. This is that peak, rather than average, temperatures are what matter most to maize.

Days above 30°C are particularly damaging. In otherwise normal conditions, every day the temperature is over this threshold diminishes yields by at least 1%. Moreover, days where the temperature exceeds 32°C do twice the harm of those at 31°C. And during a drought, things are worse still. Then, yields take a hit of 1.7% per day over 30°C.

This matters because increasing the average temperature only a bit can multiply the number of the hottest days a lot. The research predicts that a 1°C rise in average temperature will reduce yields across two-thirds of the maize-growing region of Africa, even in the absence of drought. Add drought and that effect spreads over the entire area.

There is one caveat. Using data from crop trials risks exaggerating the problem, because the plants in such trials are usually well fertilised—unlike most normal maize planted in Africa. Underfertilised crops have lower average yields to start with (which is why encouraging appropriate fertiliser use is important in Africa), but they tend not to be as badly hit by heat and drought as well-fertilised ones. However, the new results accord with one of Dr Lobell's previous studies, which was based on actual harvest data rather than crop trials and suggested yield losses of 20% or more for African maize by the middle of the century.

Perhaps more important than the specific results, though, is the insight that data from crop trials could be used to look at the effects of warming on other farms in other places. Dr Bänziger says she is now planning to move on to wheat, which is widely seen as even more climate-sensitive than maize. There are nowhere near enough data available on climate and farming in the poor world. To find a previously untapped supply is worth celebrating, even when the news is bad.

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