

# US farmers dodge the impacts of global warming -- at least for now

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A combine harvester reaps, threshes and winnows its way through a field of corn at harvest time. Yields in the US, Canada and northern Mexico have yet to feel the impact of global warming. Credit: UDSA

Global warming is likely already taking a toll on world wheat and corn production, according to a new study led by Stanford University researchers. But the United States, Canada and northern Mexico have largely escaped the trend.

"It appears as if farmers in North America got a pass on the first round of [global warming](#)," said David Lobell, an assistant professor of environmental Earth system science at Stanford University. "That was surprising, given how fast we see weather has been changing in agricultural areas around the world as a whole."

Lobell and his colleagues examined temperature and precipitation records since 1980 for major crop-growing countries in the places and times of year when crops are grown. They then used crop models to estimate what worldwide [crop yields](#) would have been had temperature and precipitation had typical fluctuations around 1980 levels.

The researchers found that global wheat production was 5.5 percent lower than it would have been had the climate remained stable, and global [corn production](#) was lower by almost 4 percent. Global rice and [soybean](#) production were not significantly affected.

The United States, which is the world's largest producer of soybeans and corn, accounting for roughly 40 percent of global production, experienced a very slight cooling trend and no significant production impacts.

Outside of North America, most major producing countries were found to have experienced some decline in wheat and corn (or maize) yields related to the rise in global temperature. "Yields in most countries are still going up, but not as fast as we estimate they would be without [climate trends](#)," Lobell said.

Lobell is the lead author of a paper about the research to be published May 5 online in [Science Express](#).

Russia, India and France suffered the greatest drops in wheat production relative to what might have been with no global warming. The largest comparative losses in corn production were seen in China and Brazil.

Total worldwide relative losses of the two crops equal the annual production of corn in Mexico and wheat in France. Together, the four crops in the study constitute approximately 75 percent of the calories that humans worldwide consume, directly or indirectly through livestock,

according to research cited in the study.

"Given the relatively small temperature trends in the U.S. Corn Belt, it shouldn't be surprising if complacency or even skepticism about global warming has set in, but this study suggests that would be misguided," Lobell said.

Since 1950, the average global temperature has increased at a rate of roughly 0.13 degrees Celsius per decade. But over the next two to three decades average [global temperature](#) is expected to rise approximately 50 percent faster than that, according to the report of the Intergovernmental Panel on Climate Change. With that rate of temperature change, it is unlikely that the crop-growing regions of the United States will continue to escape the rising temperatures, Lobell said.

"The climate science is still unclear about why summers in the Corn Belt haven't been warming. But most explanations suggest that warming in the future is just as likely there as elsewhere in the world," Lobell said.

"In other words, farmers in the Corn Belt seem to have been lucky so far."

This is the first study to come up with a global estimate for the past 30 years of what has been happening, Lobell said.

To develop their estimates, the researchers used publicly available global data sets from the United Nations Food and Agriculture Organization and from the University of Delaware, University of Wisconsin, and McGill University.

The researchers also estimated the economic effects of the changes in crop yield using models of commodity markets.

"We found that since 1980, the effects of climate change on crop yields have caused an increase of approximately 20 percent in global market prices," said Wolfram Schlenker, an economist at Columbia University and a coauthor of the paper in Science.

He said if the beneficial effects of higher carbon dioxide levels on crop growth are factored into the calculation, the increase drops down to 5 percent.

"Five percent sounds small until you realize that at current prices world production of these four crops are together worth nearly \$1 trillion per year," Schlenker said. "So a price increase of 5 percent implies roughly \$50 billion per year more spent on food."

Rising commodity prices have so far benefited American farmers, Lobell and Schlenker said, because they haven't suffered the relative declines in crop yield that the rest of the world has been experiencing.

"It will be interesting to see what happens over the next decade in North America," Lobell said. "But to me the key message is not necessarily the specifics of each country. I think the real take-home message is that climate change is not just about the future, but that it is affecting agriculture now. Accordingly, efforts to adapt agriculture such as by developing more heat- and drought-tolerant crops will have big payoffs, even today. "

Provided by Stanford University

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