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Contact: Anne Stark

stark8@llnl.gov

925-422-9799

[DOE/Lawrence Livermore National Laboratory](#)

Crops feeling the heat

LIVERMORE, Calif. -- Warming temperatures since 1981 have caused annual losses of roughly \$5 billion for the major cereal crops, a study has found.

From 1981-2002, fields of wheat, corn and barley throughout the world have produced a combined 40 million metric tons less per year because of increasing temperatures caused by human activities.

"There is clearly a negative response of global yields to increased temperatures," said David Lobell, a Lawrence Livermore National Laboratory researcher and lead author of the study that appears online March 16 in Environmental Research Letters. "Though the impacts are relatively small compared to the technological yield gains over the same period, the results demonstrate that negative impacts of climate trends on crop yields at the global scale are already occurring."

This is the first study to estimate how much global food production already has been affected by climate change. Annual global temperatures increased by about 0.7 degrees Fahrenheit between 1980 and 2002, with even larger changes observed in several regions.

"Most people tend to think of climate change as something that will impact the future, but this study shows that warming over the past two decades already has had real effects on global food supply," said Christopher Field, co-author on the study and director of Carnegie Institution's Department of Global Ecology.

Lobell and Field studied climate effects on the six most widely grown crops in the world – wheat, rice, maize (corn), soybeans, barley and sorghum (a genus of about 30 species of grasses raised for grain). Production of these crops accounts for more than 40 percent of global cropland area, 55 percent of non-meat calories and more than 70 percent of animal feed.

Using global yield figures for 1961-2002 from the Food and Agriculture Organization, Lobell and Field compared yields with average temperatures and precipitation over the major growing regions.

They found that, on average, global crop yields respond negatively to warmer temperatures for several of the crops. Lobell and Field then used these relationships to estimate the effect of observed warming trends.

"To do this, we assumed that farmers have not yet adapted to climate change, for example by selecting new crop varieties to deal with climate change," Lobell said. "If they have been adapting – something that is very difficult to measure – then the effects of warming may have been lower."

Most experts believe that adaptation would lag several years behind climate trends, because of the difficulty of distinguishing climate

The importance of this study, the authors said, was that it demonstrates a clear and simple relationship at the global scale, with yields dropping by approximately 3-5 percent for a 1 degree Fahrenheit increase. "A key moving forward is how well cropping systems can adapt to a warmer world," Lobell said. "Investments in this area could potentially save billions of dollars and millions of lives."

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