

# Half of world's population could face climate-induced food crisis by 2100

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Rapidly warming climate is likely to seriously alter crop yields in the tropics and subtropics by the end of this century and, without adaptation, will leave half the world's population facing serious food shortages, new research shows.

To compound matters, the population of this equatorial belt - from about 35 degrees north latitude to 35 degrees south latitude - is among the poorest on Earth and is growing faster than anywhere else.

"The stresses on global food production from temperature alone are going to be huge, and that doesn't take into account water supplies stressed by the higher temperatures," said David Battisti, a University of Washington atmospheric sciences professor.

Battisti is lead author of the study in the Jan. 9 edition of *Science*. He collaborated with Rosamond Naylor, director of Stanford University's Program on Food Security and the Environment, to examine the impact of climate change on the world's food security.

"This is a compelling reason for us to invest in adaptation, because it is clear that this is the direction we are going in terms of temperature and it will take decades to develop new food crop varieties that can better withstand a warmer climate," Naylor said.

"We are taking the worst of what we've seen historically and saying that in the future it is going to be a lot worse unless there is some kind of adaptation."

By combining direct observations with data from 23 global climate models that contributed to Nobel prize-winning research in 2007, Battisti and Naylor determined there is greater than a 90 percent probability that by 2100 the lowest growing-season temperatures in the tropics and subtropics will be

higher than any temperatures recorded there to date.

They used the data as a filter to view historic instances of severe food insecurity, and concluded such instances are likely to become more commonplace. Those include severe episodes in France in 2003 and the Ukraine in 1972. In the case of the Ukraine, a near-record heat wave reduced wheat yields and contributed to disruptions in the global cereal market that lasted two years.

"I think what startled me the most is that when we looked at our historic examples there were ways to address the problem within a given year. People could always turn somewhere else to find food," Naylor said. "But in the future there's not going to be any place to turn unless we rethink our food supplies."

The serious climate issues won't be limited to the tropics, the scientists conclude. As an example, they cite record temperatures that struck Western Europe in June, July and August of 2003, killing an estimated 52,000 people. The summer-long heat wave in France and Italy cut wheat yields and fodder production by one-third. In France alone, temperatures were nearly 6.5 degrees Fahrenheit above the long-term mean, and the scientists say such temperatures could be normal for France by 2100.

In the tropics, the higher temperatures can be expected to cut yields of the primary food crops, maize and rice, by 20 to 40 percent, the researchers said. But rising temperatures also are likely to play havoc with soil moisture, cutting yields even further.

"We have to be rethinking agriculture systems as a whole, not only thinking about new varieties but also recognizing that many people will just move out of agriculture, and even move from the lands where they live now," Naylor said.

Currently 3 billion people live in the tropics and subtropics, and their number is expected to nearly double by the end of the century. The area stretches from the southern United States to northern Argentina and southern Brazil, from northern India and southern China to southern Australia and all of Africa.

The scientists said that many who now live in these areas subsist on less than \$2 a day and depend largely on agriculture for their livelihoods.

"When all the signs point in the same direction, and in this case it's a bad direction, you pretty much know what's going to happen," Battisti said. "You are talking about hundreds of millions of additional people looking for food because they won't be able to find it where they find it now."

He said wheat makes up one-quarter of the calories consumed in India, but growth in wheat yields there have been stagnant for the last decade.

Temperature increases from climate change are expected to be less in equatorial regions than at higher latitudes, but because average temperatures in the tropics today are much higher than at midlatitudes, rising temperature will have a greater impact on crop yields in the tropics.

Recent UW research has shown that even with much smaller temperature increases in the tropics, the impacts of warmer climate will be greater there because life in the tropics does not encounter much temperature variation and so is less adaptable. That makes an even stronger case to begin now searching for ways to deal with substantially warmer conditions, Battisti said.

"You can let it happen and painfully adapt, or you can plan for it," he said. "You also could mitigate it and not let it happen in the first place, but we're not doing a very good job of that."

Source: University of Washington

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