

## **Dramatic Changes in Agriculture Needed as World Warms and Grows**

ScienceDaily (Feb. 11, 2010) — Yields from some of the most important crops begin to decline sharply when average temperatures exceed about 30 degrees Celsius, or 86 Fahrenheit. Projections are that by the end of this century much of the tropics and subtropics will regularly see growing season temperatures above that level, hotter than the hottest summers now on record.

An international panel of scientists writing in the Feb. 12 edition of the journal *Science* is urging world leaders to dramatically alter their notions about sustainable agriculture to prevent a major starvation catastrophe by the end of this century among the more than 3 billion people who live relatively close to the equator.

Specifically they urge world leaders to "get beyond popular biases against the use of agricultural biotechnology," particularly crops genetically modified to produce greater yields in harsher conditions, and to base the regulations of such crops on the best available science.

"You're looking at a 20 percent to 30 percent decline in production yields in the next 50 years for major crops between the latitudes of southern California or southern Europe to South Africa," said David Battisti, a University of Washington atmospheric sciences professor.

He is a coauthor of a Perspectives article in *Science* that urges food production experts, scientists and world leaders to begin thinking in dramatically different ways to meet food needs in a significantly warmer world. Lead author is Nina Federoff, science and technology adviser to Secretary of State Hillary Rodham Clinton.

"I grow increasingly concerned that we have not yet understood what it will take to feed a growing population on a warming planet," said Federoff, who also is a biology professor at Pennsylvania State University.

The challenge is becoming more difficult, the scientists said, because the world's population is likely to have increased more than 30 percent, to 9 billion people, by 2050.

Even without climate change, feeding all of these people will require doubling the grain production in the tropics, Battisti said, but a warmer climate will reduce yields because the temperature will be too high to achieve the most efficient photosynthesis. That factor, combined with less rainfall in major food-producing regions and increasing pressure from pests and pathogens, is likely to cut major food crop yields a minimum of 20 percent to 30 percent.

The authors advocate developing systems that have the potential to decrease the land, energy and fresh water needed for agriculture and at the same time reducing the pollution associated with agricultural chemicals and animal waste.

Battisti noted that the so-called green revolution in agriculture produced a 2 percent increase in yields per year for 20 years, primarily through development of new grain varieties and use of fertilizer and irrigation. But there is little, if any, new land available for farming, and such yield increases cannot be sustained without further innovation. In addition, there already are 1 billion people, mostly in the tropics, who do not have

enough food for a healthy life.

"We're really asking for yield gains comparable to those at the peak of the green revolution, but sustained for an unprecedented length of time, 40 years, and at a time when climate change is acting against us," he said.

A major obstacle is that many of the institutions involved do not work together closely enough to succeed and, despite years of safe production and consumption, there is continued resistance to crops such as corn and soybeans that have been genetically modified to be insect resistant and tolerant of herbicides.

"There has to be a lot of creative thinking, a greater blending of biotechnology and agriculture and better coordination between private and public research efforts throughout the world for us to keep pace with the increasing demand for food," Battisti said. "We need to be thinking about the long-term demands for food and the environmental and social ramifications of how we will produce it."

The *Science* article represents the views of the authors and stems from a workshop they presented for the State Department last September in Washington, D.C.

Other authors are Roger Beachy of the U.S. Agriculture Department; Peter Cooper of the India-based International Crops Research Institute for the Semi-Arid Tropics; David Fischhoff of Monsanto Co.; Carl Hodges of The Seawater Foundation; Vic Knauf of Arcadia Biosciences; David Lobell of Stanford University; Barbara Mazur of the DuPont Experimental Station; David Molden of the Sri Lanka-based [International Water Management Institute](#); Matthew Reynolds of the Mexico City-based International Maize and Wheat Improvement Center; Pamela Ronald of the University of California, Davis, and the Joint Bioenergy Institute; Mark Rosegrant of the International Food Policy Research Institute; Pedro Sanchez of Columbia University; Avigad Vonshak of Ben-Gurion University in Israel; and Jian-Kang Zhu of the King Abdullah University of Science and Technology in Saudi Arabia and the University of California, Riverside.

*Email or share this story:*

| [More](#)

---

### Story Source:

Adapted from materials provided by [University of Washington](#).

---

### Journal Reference:

1. N. V. Fedoroff, D. S. Battisti, R. N. Beachy, P. J. M. Cooper, D. A. Fischhoff, C. N. Hodges, V. C. Knauf, D. Lobell, B. J. Mazur, D. Molden, M. P. Reynolds, P. C. Ronald, M. W. Rosegrant, P. A. Sanchez, A. Vonshak, J.-K. Zhu. **Radically Rethinking Agriculture for the 21st Century**. *Science*, 12 February 2010: Vol. 327. no. 5967, pp. 833 - 834 DOI: [10.1126/science.1186834](https://doi.org/10.1126/science.1186834)

Need to cite this story in your essay, paper, or report? Use one of the following formats:

APA

MLA

University of Washington (2010, February 11). Dramatic changes in agriculture needed as world warms and grows. *ScienceDaily*. Retrieved February 12, 2010, from <http://www.sciencedaily.com/releases/2010/02/100211141140.htm>

*Note: If no author is given, the source is cited instead.*