The Washington Post

This Terrifying Chart Shows We're Not Growing Enough Food to Feed the World

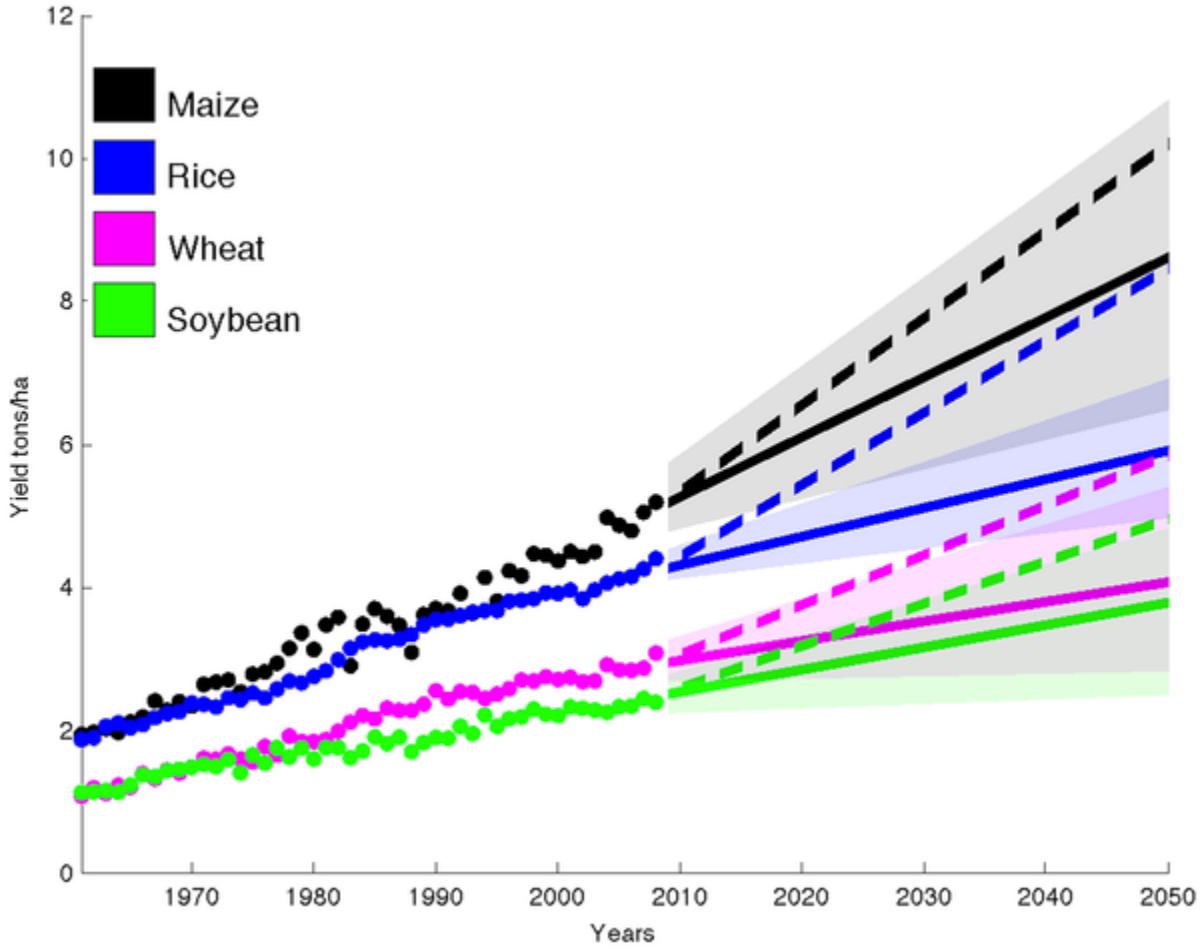
By Brad Plumer, Updated: July 1, 2013

It's a question that keeps crop scientists up at night: How are we possibly going to feed the world over the next few decades?

After all, consider what we're up against: The global population is expected to swell from 7 billion today to 9.6 billion by 2050. The rising middle class in China and India is eating more meat than ever. And this is all happening at a time when we're setting aside a greater slice of farmland for biofuels *and* trying not to cut down any more forests (which exacerbates climate change). Doing this in a sustainable manner is tricky.

In theory, there's a simple solution here: The world's farmers will just need to get better at squeezing more productivity out of existing farmland. Crop yields have been steadily improving since the advent of synthetic fertilizer and modern agricultural techniques. So those yields will just need to keep improving in the years to come.

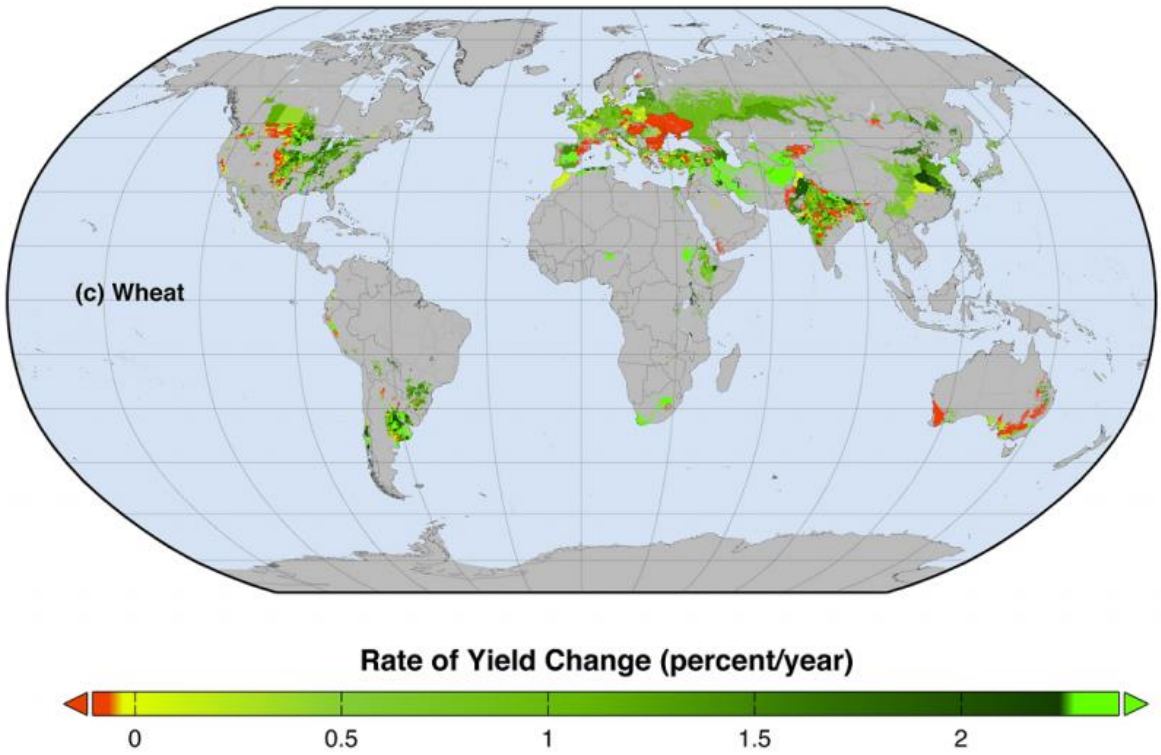
But there's a big problem: This isn't happening. Or at least, it's not happening fast enough. A recent peer-reviewed study in the journal PLOS ONE found that crop yields haven't been rising at a sufficient pace to meet projected demand by 2050. Here's the key graph:



The study takes a careful look at historical improvements in crop yields for corn, rice, wheat and soybeans. As you can see, yields per acre have been growing fairly constantly in all four areas. The solid lines show what would happen if this growth continued.

And it's not enough. The dashed lines above show how productivity would need to grow even *more* rapidly for the world to satisfy expected demand and double global food production by 2050 in a sustainable manner, without razing more forests for farmland. "Current rates," the authors note, "are not achieving this goal."

The paper, by Deepak Ray, Nathaniel Mueller, Paul West and Jonathan Foley, also finds that crop productivity growth isn't uniform around the world. In some places, crop yields are actually stagnating. Here's the map for global wheat production:



In the U.S. Midwest, wheat yields per acre have been rising at a decent 2 percent per year. But in parts of India or Eastern Europe, they've basically flat-lined. The same holds true for other crops: "China, India and Indonesia are witnessing rice yield increases of only 0.7%, 1.0%, and 0.4% improvement per year," the paper notes.

There are two big reasons why yield gains could be stagnating, explained Jonathan Foley, an agricultural expert at the University of Minnesota, in an interview we did a few months back. "In many parts of the world, we haven't seen enough investment in agriculture because of economics or policies or institutions," he said. Many former Soviet states, say, could improve their yields through better fertilizer use. They just aren't doing it.

But in some parts of the world, there's a more worrisome prospect — farmers are doing everything they can to squeeze more productivity out of their farmland, but they're starting to hit a biological "wall," a limit on how much yields can keep rising.

"We can sometimes bust through these walls with technology, genetics, better seeds," Foley says. Indeed, this is a place where people hope that genetically modified crops might be able to boost yields. "But at a certain point," Foley says, "we run up against fundamental physiological limits for plants. If a billion of years of evolution can't figure it out, are we going to be able to? That I don't know."

And this is all a worry even before we start talking about global warming, which creates its own set of issues. Scientists like David Lobell have found evidence that extreme heat waves could hurt crop yields in the decades ahead, outweighing the benefits of warmer temperatures. And if climate change brings

more frequent droughts — as some researchers expect — that would make a further dent. Australia's wheat yields, for one, have stagnated in recent years thanks to an extended dry period.

So what can the world actually do? If crop yields don't improve quickly enough, then something will have to give. Food prices could start spiking further in the years ahead. Or humans might just start clearing away bigger swaths of forest for new farmland, which could exacerbate climate change. Neither seems ideal.

But there are other options, too. In a 2009 essay for Scientific American, Foley argued that the world should focus on five big things: **1)** Stop razing forests and savannahs for farmland — by, for instance, shifting away from crop-based biofuels. **2)** Focus on boosting yields where it's technologically doable, especially in Africa. **3)** Figure out how to use water and fertilizer more efficiently everywhere. **4)** Pare back the amount of meat in our diets. **5)** Cut down on the enormous amount of food waste worldwide.

"Feeding nine billion people in a truly sustainable way," Foley concludes, "will be one of the greatest challenges our civilization has ever faced." That essay doesn't have all the answers, but it's one place to start on the topic.