

Can organic crops compete with industrial agriculture?

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The yields of organic farms, particularly those with multiple crops, compare well to those of chemically intensive agriculture, according to a new UC Berkeley analysis. Credit: Kristin Stringfield

A systematic overview of more than 100 studies comparing organic and conventional farming finds that the crop yields of organic agriculture are higher than previously thought. The study, conducted by researchers at the University of California, Berkeley, also found that certain practices could further shrink the productivity gap between organic crops and conventional farming.

The study, to be published online Wednesday, Dec. 10, in the *Proceedings of the Royal Society B*, tackles the lingering perception that [organic farming](#), while offering an environmentally sustainable alternative to chemically intensive agriculture, cannot produce enough food to satisfy the world's appetite.

"In terms of comparing productivity among the two techniques, this paper sets the record straight on the comparison between organic and conventional agriculture," said the study's senior author, Claire Kremen, professor of environmental science, policy and management and co-director of the Berkeley Food Institute. "With global food needs predicted to greatly increase in the next 50 years, it's critical to look more closely at organic farming because, aside from the environmental impacts of industrial agriculture, the ability of synthetic fertilizers to increase [crop yields](#) has been declining."

The researchers conducted a meta-analysis of 115 studies - a dataset three times greater than previously published work - comparing organic and conventional agriculture. They found that organic yields are about 19.2 percent lower than conventional ones, a smaller difference than in previous estimates.

The researchers pointed out that the available studies comparing farming methods were often biased in favor of [conventional agriculture](#), so this estimate of the yield gap is likely overestimated. They also found that taking into account methods that optimize the productivity of [organic agriculture](#) could minimize the yield gap. They specifically highlighted two agricultural practices - multi-cropping (growing several crops together on the same field) and crop rotation - that would substantially reduce the organic-to-conventional yield gap to 9 percent and 8 percent, respectively.

The yields also depended upon the type of crop grown, the researchers

found. There were no significant differences in organic and conventional yields for leguminous crops, such as beans, peas and lentils.

"Our study suggests that through appropriate investment in agroecological research to improve organic management and in breeding cultivars for organic farming systems, the yield gap could be reduced or even eliminated for some crops or regions," said the study's lead author, Lauren Ponisio, a graduate student in [environmental science](#), policy and management. "This is especially true if we mimic nature by creating ecologically diverse farms that harness important ecological interactions like the nitrogen-fixing benefits of intercropping or cover-cropping with legumes."

The researchers suggest that organic farming can be a very competitive alternative to industrial agriculture when it comes to food production.

"It's important to remember that our current agricultural system produces far more food than is needed to provide for everyone on the planet," said Kremen. "Eradicating world hunger requires increasing the access to food, not simply the production. Also, increasing the proportion of [agriculture](#) that uses sustainable, organic methods of farming is not a choice, it's a necessity. We simply can't continue to produce [food](#) far into the future without taking care of our soils, water and biodiversity."

More information: Diversification practices reduce organic to conventional yield gap: [rspb.royalsocietypublishing.org1098/rspb.2014.1396](http://rspb.royalsocietypublishing.org/doi/10.1098/rspb.2014.1396)

Provided by University of California - Berkeley

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