**Unintended Effects of Genetic Manipulation**
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# Impact of Genetic Engineering on Crop Yields Not Obvious, NAS Panel Concludes

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A major new review of the research on genetically engineered crops concludes that there is no significant evidence that genetic engineering technology by itself has increased the rate of yields for the three most frequently planted genetically engineered crops in the U.S. – maize, soybeans, and cotton. Such yields have been increasing, but it's not possible to determine how much the increases are due to GE technology, versus other factors, despite the review's effort to tease out such a positive effect. The report, *Genetically Engineered Crops: Experiences and Prospects*, was produced by a committee of the prestigious U.S. National Academies of Sciences, Engineering, and Medicine.

The committee added: "There is disagreement among researchers about how much GE traits can increase yields compared with conventional breeding. In addition to assessing detailed surveys and experiments comparing GE with non-GE crop yields, the committee examined changes over time in overall yield per hectare of maize, soybean, and cotton reported by the U.S. Department of Agriculture (USDA) before, during, and after the switch from conventional to GE varieties of these crops. No significant change in the rate at which crop yields increase could be discerned from the data. Although the sum of experimental evidence indicates that GE traits are contributing to actual yield increases, there is no evidence from USDA data that they have substantially increased the rate at which U.S. agriculture is increasing yields."

Fred Gould, the committee's chair, wrote in the report's preface that comparing "the merits of technology-intensive agriculture compared with more agroecological approaches" was beyond the scope of his committee's work. He added, however, that such a comparison would be an "important" one to conduct.

The committee called for research to "isolate effects of the diverse environmental and genetic factors that contribute to yield." GE crops already on the market "do not have greater potential yield than non-GE counterparts," the report states, and genetic engineering technologies alone cannot be expected to increase food security, because of the "wide variety of complex challenges" facing small farmers. Whether growing GE crops will benefit farmers depends on the particular social and economic context in which genetic engineering technology is developed and distributed, it adds.

But the committee also stated that it had "found no substantiated evidence that foods from GE crops were less safe than foods from non-GE crops."

The report noted that earlier national committees have called since 2000 for U.S. data to be collected to make it possible to trace the impact of GE crops on measures of environmental sustainability, including biodiversity. But it concluded that such databases remained "inadequate" in 2015, when this committee was conducting its own review. So the lack of data limits "the ability to assess effects on abundance of monarchs and many other species."

As for how genetically engineering plants to be herbicide resistant (HR) has affected pesticide use, the committee concluded: "The use of HR crops sometimes initially correlated with decreases in total amount of herbicide applied per hectare of crop per year, but the decreases have not generally been sustained." It added, however, that merely measuring in kilograms how much total herbicide use per hectare per year has risen or fallen "is not useful for assessing changes in human or environmental risks," as the mix and relative hazards per kilogram of different herbicides also matters. The report noted that weed resistance to glyphosate "is a problem," and that in areas where GE crops have led to a heavy reliance on that herbicide, such resistance is now "a major agronomic problem."

To slow evolution of weed resistance to it and other herbicides, the report calls for "integrated weed-management practices beyond simply spraying mixtures of herbicides" for HR crops engineered to resist multiple herbicides.

In addition to its wide-ranging examination of the effects of genetic engineering, the report provides a wealth of data and a very readable account of the history, the technical aspects, and the current status of GMOs. As of 2015, it states, 12 percent of the world's croplands were planted in GMOs. That includes nine food

crops, three non-food crops (cotton, alfalfa, and poplar), and two types of flowers (carnations and roses). GE maize and soybean were the most widely grown GE crops. GE varieties now account for about 80 per cent of all the soybeans grown worldwide, and GE maize accounts for a third of all the maize planted. The other GE food crops are: apple, canola, sugar beet, papaya, potato, squash, and eggplant. But many other GE food crops are now in development. About 39 per cent of all GE crops in 2015 were grown in the U.S. About half of all cropland in the U.S. was planted in GE crops in 2014 – mainly maize, soybeans, and cotton.

The report also calls for research on such possible unintended effects of genetic engineering technologies as:

- Whether they are contributing to "farmer de-skilling," and if so, to what extent.
- Whether varieties engineered with more than one new trait are leading to more expensive seeds than farmers need.
- Whether seed market concentration is affecting the price of GE seeds and if so, is that helping or harming farmers.

Download a chart showing the studies discussed in the report, including their funding sources where that was available, at http://nas-sites.org/ge-crops/files/2016/05/Reference-Table-Chapter-4.pdf. Read or download a copy of the full report, *Genetically Engineered Crops: Experiences and Prospects*, at http://dx.doi.org/10.17226/23395.

## Source

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