

Researchers propose new framework for regulating engineered crops

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Safety testing would be recommended for products with new characteristics that have the potential for health or environmental effects, or for products with differences that cannot be interpreted, Most new varieties would not trigger a need for regulation. Credit: NC State University

A Policy Forum article published today in *Science* calls for a new approach to regulating genetically engineered (GE) crops, arguing that current approaches for triggering safety testing vary dramatically among

countries and generally lack scientific merit—particularly as advances in crop breeding have blurred the lines between conventional breeding and genetic engineering.

Rather than focusing on the methods and processes behind the creation of a GE crop to determine if testing is needed, a more effective framework would examine the specific new characteristics of the crop itself by using so-called "-omics" approaches, the article asserts. In the same way that [biomedical sciences](#) can use genomic approaches to scan human genomes for problematic mutations, genomics can be used to scan new crop varieties for unexpected DNA changes.

Additional "-omics" methods such as transcriptomics, proteomics, epigenomics and metabolomics test for other changes to the molecular composition of plants. These measurements of thousands of molecular traits can be used like a fingerprint to determine whether the product from a new variety is "substantially equivalent" to products already being produced by existing varieties—whether, for example, a new peach variety has molecular characteristics that are already found in one or more existing commercial peach varieties.

If the new product has either no differences or understood differences with no expected health or [environmental effects](#) when compared with products of existing varieties, no [safety testing](#) would be recommended, the article suggests. If, however, the product has new characteristics that have the potential for health or environmental effects, or if the product has differences that cannot be interpreted, safety testing would be recommended.

"The approaches used right now—which differ among governments—lack scientific rigor," said Fred Gould, University Distinguished Professor at North Carolina State University, co-director of NC State's Genetic Engineering and Society Center and the

corresponding author of the article. "The size of the change made to a product and the origin of the DNA have little relationship with the results of that change; changing one base pair of DNA in a crop with 2.5 billion base pairs, like corn, can make a substantial difference."

When dealing with varieties made using the powerful gene editing system known as CRISPR, for example, the European Union regulates all varieties while other governments base decisions on the size of the genetic change and the source of inserted genetic material. Meanwhile, in 2020 the U.S. Department of Agriculture established a rule that exempts from regulation conventionally bred crop varieties and GE crop varieties that could have been developed by methods other than [genetic engineering](#).

The "-omics" approaches, if used appropriately, would not increase the cost of regulation, Gould said, adding that most new varieties would not trigger a need for regulation.

"The most important question is, 'Does the new variety have unfamiliar characteristics,'" Gould said. The paper estimates that technological advances could make the laboratory cost for a set of "-omics" tests decrease to about \$5,000 within five to 10 years.

Establishing an international committee composed of crop breeders, chemists and molecular biologists to establish the options and costs of "-omics" approaches for a variety of crops would start the process of developing this new regulatory framework. Workshops with these experts as well as sociologists, policymakers, regulators and representatives of the general public would enable trustworthy deliberations that could avoid some of the problems encountered when GE rolled out in the 1990s. National and international governing bodies should sponsor these committees and workshops as well as [innovative research](#) to get the ball rolling and ensure that assessments are accessible

and accurate, Gould said.

In 2016, Gould headed a 20-member National Academy of Sciences committee responsible for a report, *Genetically Engineered Crops: Experiences and Prospects*, which aimed to "assess the evidence for purported negative effects of GE crops and their accompanying technologies" and to "assess the evidence for purported benefits of GE [crops](#) and their accompanying technologies." Most of that committee co-authored the policy article published this week.

More information: Fred Gould, *Toward product-based regulation of crops*, *Science* (2022). [DOI: 10.1126/science.abo3034](https://doi.org/10.1126/science.abo3034).
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