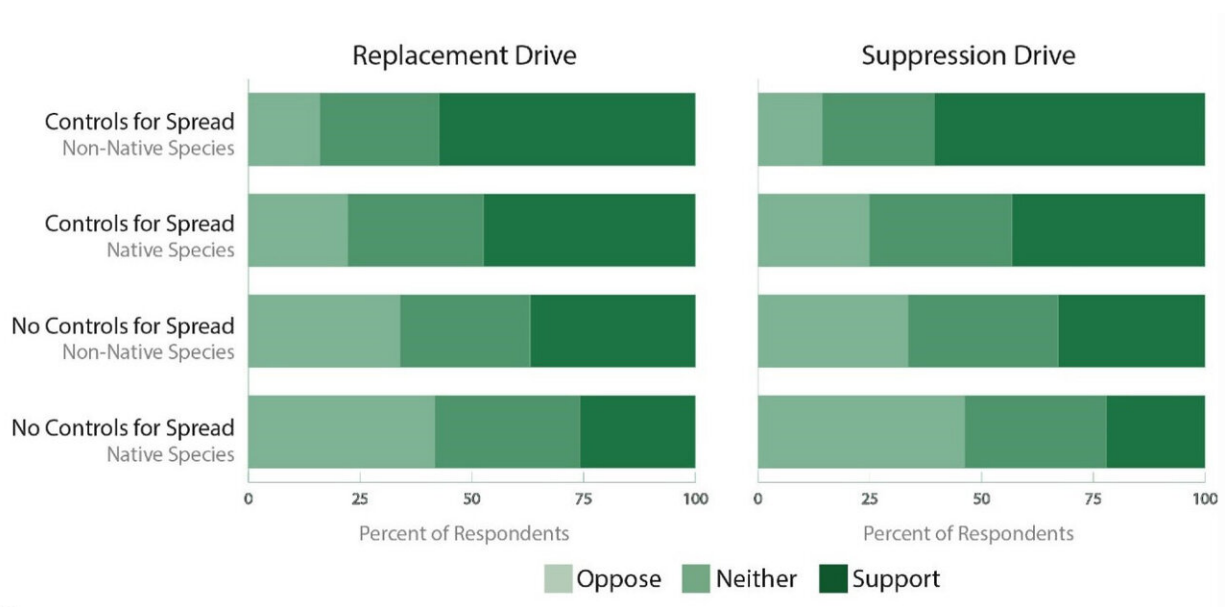


Public support for gene drives in agriculture tied to limits

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Respondents were asked whether they support or oppose the use of gene drives to control agricultural insect pests in each of eight applications, with condensed Likert response frequencies varying 1) whether controls are in place to limit the extent of drive spread, 2) whether the target species was native to an area, and 3) whether the design is a 'replacement' or 'suppression' drive. A 'replacement' drive may alter an organism to block it from carrying a crop disease and this modified version remains in the environment. A 'suppression' drive may alter an organism, for example, to prevent female offspring from developing normally and thus crash the population over time, and is generally intended to locally or broadly eradicate the species. Credit: Mike Jones, NC State University

The first national survey inquiring about American attitudes toward agricultural gene drives—genetic modification techniques that can be used to "drive" a genetic trait or characteristic through a given insect pest population to help commercial crop production by squelching harmful pest effects—shows more support for systems that are limited in scope and aimed at non-native insects.

The survey of more than 1,000 American adults, conducted by researchers at North Carolina State University and the University of Wisconsin-Madison, can help inform further development of these gene drive systems in agriculture, an important consideration as the speed of technological development outpaces public understanding of the issues surrounding the technology.

Zack Brown, assistant professor of agricultural and resource economics at NC State and the corresponding author of a paper describing the research, said that people were more apt to support gene drive systems that controlled the spread of the drive. He added that respondents also more strongly favored gene drives targeting non-[native species](#); they had a harder time supporting genetic changes to native insects. More than 50% of respondents supported controlled gene drive systems targeting non-native species.

Respondents also showed greater levels of support for gene drive systems that genetically alter an insect but leave it in the environment—taking away its ability to carry a pathogen causing a crop disease, for example—than systems meant to suppress or eradicate insect populations, although those differences were not large.

Nearly 50% of respondents opposed uncontrolled gene drive systems that would eliminate native species, with another 25% showing neither opposition nor support.

"This is valuable information for scientists because controllability is difficult to design in gene drive systems," Brown said.

Other survey findings included increased opposition to gene drive systems among people who seek out food labeled non-genetically modified. Interestingly, though, their support exceeded opposition for limited gene drive systems targeting non-native species.

The research arose from a 2016 National Academies report that recommended gene drive research continue in parallel with ecological risk assessment and engagement with stakeholders and the public. Brown, lead author Michael Jones and coauthors realized that there was little to no published research on public perceptions of gene drive technology in an agricultural context.

"This is the right time—while the technology is still under development and before any release decisions have been made—to gain insights into what the public thinks, what types of information they prioritize from researchers, and who is trusted to carry out this sensitive research," said Jones, an NC State Ph.D. candidate in agricultural and resource economics. "Proactively incorporating this feedback into technology design and risk assessment helps align the science with public values and the needs of diverse economic ecosystems."

The process began with in-person, open-ended discussions about gene drive technologies and their possible uses and drawbacks with groups of consumers recruited from grocery stores. This method of conducting focus group discussions helped identify and distill the most important questions to be asked in the Web survey questionnaire.

Jason Delborne, associate professor of science, policy and society at NC State and co-author of the study, contributed to the design of the focus groups. "The focus groups provided a space for real conversations,

where regular consumers learned about the potential for applying gene drives in agriculture and explored together their hopes and concerns. Inclusive deliberation about emerging technologies is a key foundation for responsible innovation," he said.

The researchers used a Web-based questionnaire that allowed glimpses into how respondents interacted with information presented on gene drive systems and available FAQs. Jones said respondents spent a great deal of time looking through information when compared with other surveys.

"Maybe the fact that respondents went through a lot of research on our Web-based survey gave them a more nuanced perspective," Brown says. "That seems to be reflected in the survey responses."

The study also showed public perceptions on which organizations to trust with research into gene drive systems. Universities and the U.S. Department of Agriculture were the most trusted, with more than 60% calling those organizations very or somewhat trustworthy. Respondents were less trusting of foreign universities and the U.S. Dept. of Defense; small and large private companies were least trusted.

"The public wants a trusted body to be a leader here," Brown said. "In this case, it's American universities and the USDA."

More information: "Does the U.S. public support using gene drives in agriculture? And what do they want to know?" *Science Advances*, [DOI: 10.1126/sciadv.aau8462](https://doi.org/10.1126/sciadv.aau8462) , advances.sciencemag.org/content/5/9/eaau8462

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