

Note to readers: This interview script was used when interviewing sustainable food systems scientists, civil society researchers, and activists with a noted history of critical engagement in crop biotechnologies.

Introduction

CRISPR-Cas9 is one of a handful of so-called new biotechnologies that stand to radically change prospects for human intervention in agriculture. Said to have unprecedented precision, speed, and cost-efficiency, CRISPR has become ubiquitous in biotech labs worldwide, won numerous “breakthrough” prizes, and is amassing roughly 5,000 new research papers each year.

Although human therapeutic applications of CRISPR have garnered more limelight, CRISPR’s uptake in agriculture has been no less significant. Gene-edited versions of mushroom and waxy corn have already been greenlighted by the USDA, and the R&D pipeline is rapidly filling with CRISPR’d tomatoes, potatoes, wheat, rice, cassava, cacao, cattle, chickens, and pigs. Burgeoning start-up finance, research initiatives, patent applications, and new regulations and trade policies attest to this technology’s power and potential.

Yet with CRISPR, as with any “disruptive innovation,” comes a spectrum of possibilities, the trajectories of which my project is designed to trace. Will CRISPR tend to reinforce the lock-ins characteristic of industrial systems? Could it, by contrast, foster transitions to sustainable food systems by decentralizing science, diversifying crop development, and re-distributing centers of ownership and control? Who owns this technology, who has access to it, and who is making decisions about its development and use?

Combining participant observation, semi-structured interviews, literature review, and intellectual property studies, my project asks questions about CRISPR in three key areas:

(1) Democratizing biotechnology - Who participates in developing, accessing, and making decisions about gene editing and its applications? How is “democracy” understood and applied in different aspects of CRISPR research, agriculture development, and governance?

(2) Diversifying crop development for sustainability - Can gene editing support breeding of locally adapted varieties and reduce crop genetic erosion? What is being diversified and for whose benefits?

(3) De-concentrating ownership and control - What are the prospects for smaller companies in the CRISPR biotech space to interrupt seed market concentration? How affected by intellectual property rights?

In our interview today, the focus will be only on part 1 (democratizing).

Who is involved

I am seeking the perspectives of CRISPR scientists and experts in CRISPR-related fields of policy/regulation, communications, ethics, and intellectual property issues. In parallel, I am gathering contrasting perspectives from academic sustainable food systems scientists and

researchers in civil society organizations with a record of critical engagement with genetic technologies.

I. “Democratizing” biotechnologies

Several scientists and media observers suggest gene editing could decentralize and democratize biotechnology. Because CRISPR-Cas9 is relatively cheap and easy to develop and use, it could enable many more scientists, smaller companies, and even [DIY tinkerers](#) to become involved in crop development. As a result, increasingly many researchers, analysts, and journalists are calling CRISPR a tool that has been democratized.

- What does “democratization” of a technology mean for you?

- We can think about different elements of democratization with CRISPR-Cas9. I’d like to run through a few of those to see what you think:

A. “Making” and producing

In 2018 an article in National Geographic suggested “CRISPR has been democratized.” As evidence, the article gave the following:

“Crispr has been democratized,” says Barrangou, who is editor in chief of the newly-established *Crispr Journal* and also oversees a multidisciplinary [Crispr lab at NC State](#). “With 100,000 labs and 10 people per lab, we now may have over a million geneticists working with this technology.”

- In what way does this sound, or not sound, like democratization to you?

- Do you see potential for (or a benefit in) a more-diverse range of people to become involved in shaping the development of biotechnology like CRISPR? What about participation by:

- Scientists (breeders, agronomists, ecologists, biotechnicians in a range of fields)?
- Farmers? Small-scale and large-scale?
- Citizens in their backyards with DIY CRISPR kits to make their own crops? What do you think of informal, popular use of CRISPR?

- Are these things happening already? If not, what would it take from your perspective? What opportunities or risks would more-numerous and more-diverse users bring?

B. Access

- To whom do you see CRISPR primarily being made accessible currently? Would you like this to change? If so, how?

- I’d like to ask you about a few different facets of access:

- Knowledge access. How do you think specialized knowledge/expertise might factor into access to CRISPR among different constituencies: eg. researchers/academics, farmers in developed and developing countries, plant breeders in formal and informal systems. (Do

you think when people speak of democratizing there is the real expectation that farmers will be using CRISPR?)

- Economic access. CRISPR is said to be much cheaper than conventional forms of biotechnology (GMOs). How do you think affordability factors into democratization of use?
- Regulatory access. A correlate to this argument is that regulation can make biotechnology more expensive for smaller-scale companies/breeders, thus giving big companies and edge. In other words, greater regulation of gene editing would be counter to democratization of access. What do you make of this argument? How would you describe the relationship between regulation and democratization of technologies like CRISPR?
- Resource-mediated access. One level of access is to the tools or technologies themselves - eg. in the Green Revolution, high-yielding varieties were said to be scale neutral and accessible to small and large-scale farmers alike. On another level, access may be mediated by *resources* that users have at their disposal to make the tools work. How do you think resource disparities may shape the ability of different actors to use the tools/technologies to which they have “open access”?

- Even if non-scientists (citizens, consumers, farmers, etc) might not be able to be directly involved in making or using CRISPR, should they still have a role in helping to decide whether and which crops or traits would be developed with the technology? Why or why not?

- What types of processes or systems could enable a wider group of people to contribute to making decisions about CRISPR development and use?

C. Intellectual property

I am interested to learn how the intellectual property context affects your thinking about the prospects of CRISPR in agriculture.

- Were you previously aware that CRISPR-Cas9 is freely available to universities and non-profit organizations for academic research? Does this change your perspective on the technology at all?

- How does the commercial licensing landscape affect your thinking about CRISPR-Cas9 as a tool in shaping agro-food systems? In terms of reinforcing aspects of industrial systems, or by contrast, working to foster transitions to sustainability, what do you see as the role and influence of CRISPR IP?

- Do you see intellectual property in general (over genes, traits, crops) as a boon to innovation in agriculture, or as an impediment to fostering transitions to sustainability?

- What would you like to see in terms of property rights – or lack thereof – over CRISPR in agriculture? Would you distinguish between developed/developing country regions?

Biotechnology in the Long View

- Given your experience as a researcher in sustainable food systems and/or practitioner or academic with a record of critical engagement in biotechnology, what can you tell me about CRISPR relative to GM crops of the past 25 years?

- What aspects of CRISPR technology feel “new” or different from previous GM technology? What aspects feel the same?

Thank you!