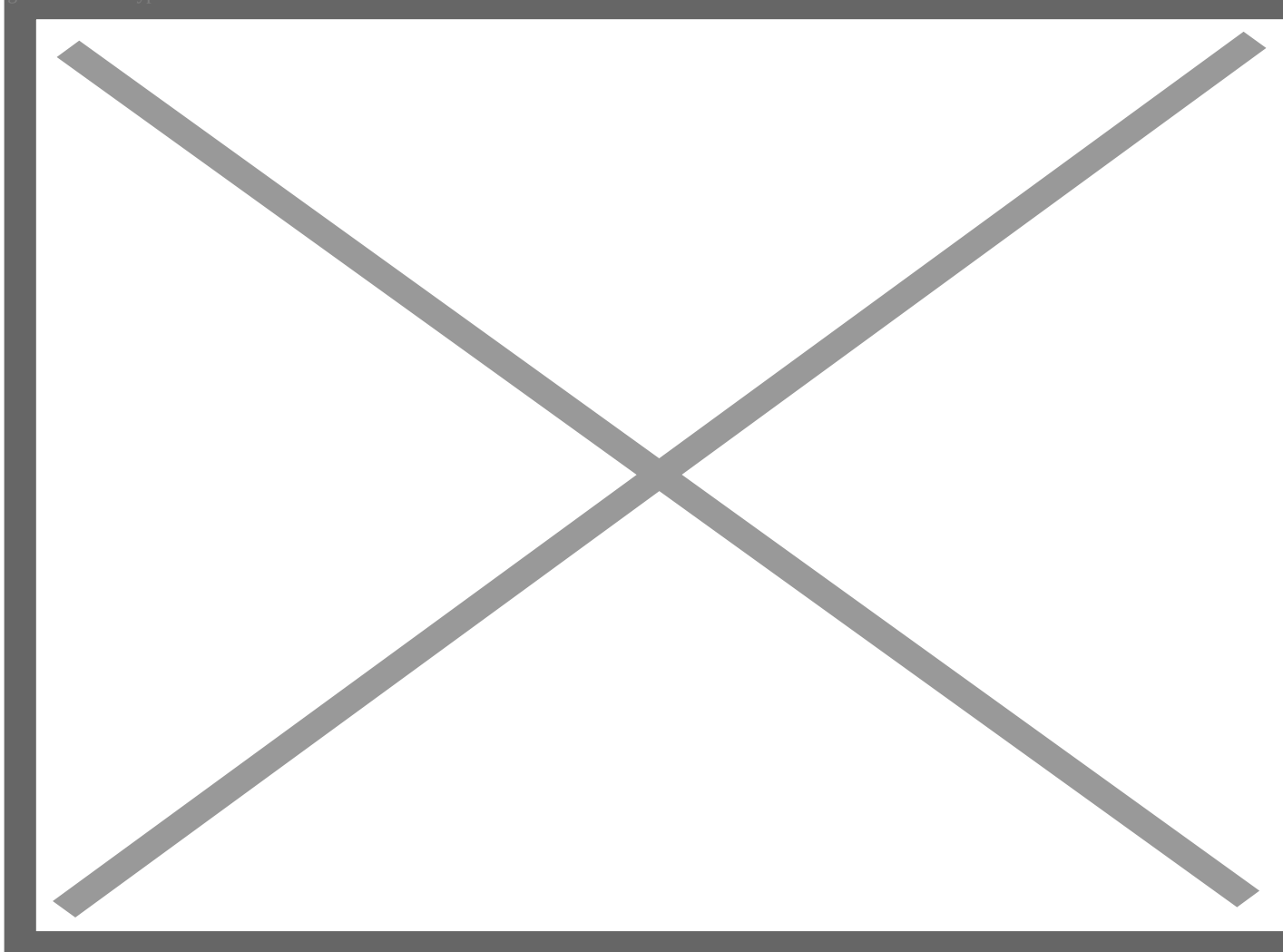


Viewpoint: 'Underrated and underfunded': It's time for Congress to increase support for biotechnology tools in next farm bill

B iotechnology and breeding are important ways to improve agriculture: they make the plants we grow and animals we raise for food healthier, better tasting, able to thrive under changing weather conditions due to climate change, create less food waste and pollution, and emit fewer greenhouse gasses.

But we can't get the most out of biotechnology and breeding if we continue to underfund their development. And the Farm Bill is key to getting that funding. The Farm Bill, an omnibus bill negotiated about every five years and slated for development in 2023, shapes a wide variety of agricultural and food programs. To enhance the environmental benefits of agricultural biotechnology, the Farm Bill should increase support for trade programs that bridge differences in regulations between countries, and research programs that build knowledge about important crop traits and the technology to improve them.

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Farm subsidies generally ebb and flow. Is this how we should treat funding for agricultural technology?
Credit: Rizqi Rachmat

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How can the 2023 Farm Bill support trade of products of agricultural biotechnology?

Restrictions on imports of products of agricultural biotechnology in other countries matter because they reduce the ability of the United States to trade these products internationally, reduce the scale of global benefits of biotechnology, and increase the cost of meeting technical and regulatory requirements for trade. Trade restrictions vary significantly based on the specific technology used to make the product, whether the product involves seeds that can potentially reproduce, and whether it is for human food, animal feed, or fiber and other non-food uses. Currently, the global landscape of agricultural biotechnology and associated regulatory systems and trade restrictions is changing frequently and thus requires continuing negotiations.

The United States Department of Agriculture's (USDA) Foreign Agricultural Service (FAS) works to advance US agricultural exports around the world. Several FAS programs work to bridge trade across differences in regulations between countries, which is particularly relevant to biotechnology because many countries have different regulatory systems with different technical requirements.

Biotechnology and Agricultural Trade Program (BATP)

The FAS program with the greatest focus on biotechnology is the Biotechnology and Agricultural Trade Program (BATP), which was originally authorized in the 1990 Farm Bill to assist with the removal of non-tariff and other trade barriers to U.S. agricultural products produced with biotechnology. BATP was authorized for \$6 million in yearly appropriations from 2002–2007 in the 2002 Farm Bill, then lapsed. The Growing American Food Exports Act in the 2018 Farm Bill reauthorized BATP for a lower \$2 million in yearly appropriations for 2018–2023, and expanded the program's authority to advocate for all new agricultural technologies, not just biotechnologies.

The 2023 Farm Bill should reauthorize funding for the Biotechnology and Agricultural Trade Program at a higher level considering the fast pace of developments in crop and animal biotechnologies over the last five years, the program's new mandate to advocate for new agricultural technologies in addition to biotechnology, and the number of countries with recent changes in biotechnology regulation, especially regarding CRISPR gene editing. As the USDA [states](#): "Most of the corn and soybeans we export are biotechnology-derived, and this means that working with our trading partners is critical to help them understand the technical aspects of new products and how we have determined that they meet our high safety standards, to open up new markets, and to ensure that our products are treated fairly in the global marketplace."



The field of biotech is overcrowded and underfunded say critics. Credit: Black Hills State University via AP Photo

Other Farm Bill Market Development Programs

The 2023 Farm Bill should also increase export support for new crop products of biotechnology and advanced breeding techniques through USDA FAS' other market development and export programs: the Market Access Program, Emerging Markets Program, Foreign Market Development (Cooperator) Program, Technical Assistance for Specialty Crops, and Priority Trade Fund. Together, these programs provide assistance for marketing and consumer education in importing countries, market research to identify new markets for crop products, and activities to address technical barriers to trade for new crop products and crop products in new markets. Support from these market development and export programs is important not just for products of biotechnology but for new crop products, including specialty crops that can be made more productive using advanced breeding technologies and therefore may become available for export, and crops with new traits like nitrogen fixation that may be unfamiliar to importing countries.

These five programs were consolidated in the 2018 Farm Bill to form the Agricultural Trade Promotion and Facilitation Program (ATPFP), and provided with \$255 million in mandatory annual funding, but each program maintains its existing functions. The Priority Trade Fund was most recently established in the 2018 Farm Bill to provide additional funding to be allocated among the other programs as needed. The

2023 Farm Bill should increase the level of mandatory annual funding for these programs to address barriers to the trade of new crop products of biotechnology and other new breeding technologies.

How can the 2023 Farm Bill support agricultural biotechnology research and development?

The Farm Bill also authorizes funding for many federal agricultural research and development (R&D) programs. To support the development of genetically engineered crops and animals with greater environmental benefits, the next Farm Bill should also expand funding for initiatives of increasing importance that are either currently underfunded or will need additional funding to keep up with increasing demand: the Agricultural Genome to Phenome Initiative (AG2PI), Agriculture Advanced Research and Development Authority (AgARDA), Agriculture and Food Research Initiative (AFRI), Foundation for Food and Agriculture Research (FFAR), and Specialty Crop Research Initiative (SCRI).

Agricultural Genome to Phenome Initiative (AG2PI)

The Genome to Phenome Initiative is a grant program that supports foundational research on predicting phenotypes from genomic sequencing, which helps speed the pace and improve the efficiency and accuracy of agricultural plant and animal improvement via breeding and biotechnology, including genetic engineering and gene editing.

The Genome to Phenome Initiative has successfully provided 30 seed grants to different projects so far. One example is a machine learning competition to use a massive dataset, including genetic data, growing conditions, and plant measurements of bioenergy sorghum crops, to predict end-of-season phenotypes. Improving crop productivity and resource efficiency has environmental benefits because it reduces the amount of land needed to grow crops and the amount of inputs such as fertilizer and water required.

The Genome to Phenome Initiative was authorized in the 2018 Farm Bill for up to \$40 million in funding every year from 2019–2023. However, it received only \$1 million in fiscal years 2020 and 2021, and \$2 million in 2022. The 2023 Farm Bill should reauthorize the program and authorize permanent mandatory funding or otherwise provide sustained, reliable funding for efforts to predict crop and livestock traits.

Agriculture Advanced Research and Development Authority (AgARDA)

Standing up and expanding the Agriculture Advanced Research and Development Authority (AgARDA) would fill a critical research niche for the development of innovative biotechnology tools and agricultural products. AgARDA, authorized by the 2018 Farm Bill and modeled after successful “ARPA” programs within the Department of Defense and Energy, can support multi-year, high-risk and high-reward projects that are too risky for private investors and do not fit well into the research models of existing federal research agencies. The program was mandated to focus on the development and deployment of technologies that address challenges in agricultural production, processing and distribution, managing plant pests, and managing biological threats to livestock — challenges that biotechnologies are well-suited to address.

One example of a research project that AgARDA would be better suited to support than existing funders is the development of additional crops that fix nitrogen — either through symbiosis with soil microorganisms as legumes do, or on their own. There are scattered existing research efforts to develop nitrogen-fixing crops, and funding is similarly erratic from organizations including NIFA and NSF; however, this goal is long-term enough that research funding must be consistent and reliable. Developing additional nitrogen-fixing crops will ameliorate the environmental impacts from nutrient runoff, since they require less fertilizer application than crops that cannot fix any of their own nitrogen.

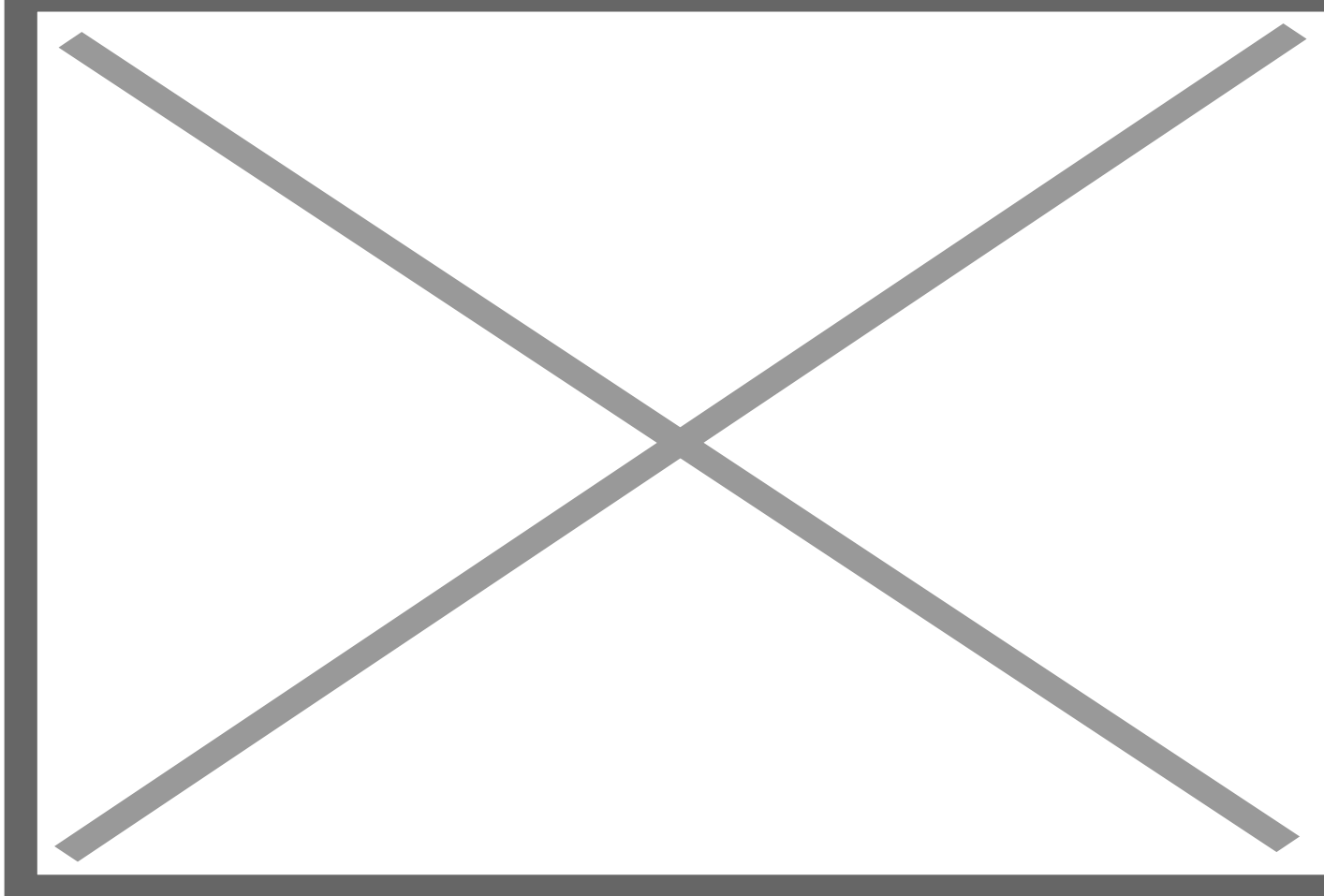
Though AgARDA was authorized for up to \$40 million in annual funding, it only received its first funding in 2022 for [\\$1 million](#). The 2023 Farm Bill should reauthorize AgARDA and provide it with reliable mandatory funding, ramping up funding over time so that program managers and directors can pilot and then scale up different approaches to grant-making.

Agriculture and Food Research Initiative (AFRI)

The [Agriculture and Food Research Initiative \(AFRI\)](#) is the USDA's flagship competitive grant-making program for the agricultural sciences. AFRI explicitly supports many components of agriculture, including biotechnology.

Some funded projects utilizing biotechnology within the sub-program titled [Plant Breeding for Agricultural Production](#) include an initiative that uses gene editing to make lettuce more [resistant to disease](#), and another that [improves](#) the use of gene editing in peanuts. Improving disease resistance is important because it means that less food will be lost to disease damage, thereby reducing greenhouse gas emissions from food waste itself as well as from producing excess food to compensate for waste.

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Previous agricultural budgets have seen a fraction of available resources devoted to government research. Credit: CRO

AFRI was established in the 2008 Farm Bill with authorized appropriations up to \$700 million — which has stayed the same in the years since — but has never received nearly that in appropriations. The most funding AFRI has received through appropriations was \$445 million in FY22. The 2023 Farm Bill should reauthorize AFRI, and ideally authorize permanent mandatory funding.

Foundation for Food and Agriculture Research (FFAR)

The 2014 Farm Bill authorized \$200 million in mandatory funding to establish the nonprofit [Foundation for Food and Agriculture Research \(FFAR\)](#), which leverages federal investments in agricultural research with private funding.

One important biotechnology-related project that FFAR has helped fund is the Realizing Increased Photosynthetic Efficiency (RIPE) project, which has used genetic engineering to increase the efficiency with which plants turn sunlight into food; the project is now at a stage of working to apply those improvements to a range of food crops. Increasing photosynthetic efficiency is one important way to [reduce agricultural greenhouse gas emissions](#)

, because growing more food on less land can help decrease deforestation motivated by agricultural land expansion.

The 2018 Farm Bill reauthorized FFAR and added an additional \$185 million in mandatory funding. The 2023 Farm Bill should increase mandatory funding for FFAR to support continued growth, or at least maintain current funding.

Specialty Crop Research Initiative (SCRI)

The Specialty Crop Research Initiative (SCRI) provides grants to support research and extension to address challenges in agriculture for specialty crops, which includes fruits and vegetables, tree nuts, and flowers.

SCRI includes five focus areas of research, one of which is plant breeding technologies, including biotechnology. One project that has been awarded SCRI funding uses biotechnology tools to [create](#) a disease-resistant and seedless variety of muscadine grape, but without adding genes from another species. Improving disease resistance is important because it means that less food will be lost to disease damage, thereby reducing greenhouse gas emissions from food waste. Another SCRI-funded project aims to improve breeding technologies (not including biotechnology) that can be used to make [cranberry and huckleberry](#) produce more and higher-quality fruits.

The 2018 Farm Bill extended SCRI's \$80 million in mandatory funding from the 2014 Farm Bill, but effectively increased funding for all its research areas besides Citrus Greening by creating a separate funding stream for this subject. Specialty crops include most fruits and vegetables, which are central to nutritious diets and are in growing demand; however, most crop research focuses on improving corn, soybean, wheat, cotton, and others that are consumed or used in larger quantities than fruits and vegetables. Since a small minority of crop research focuses on fruits and vegetables, these crops have undergone much less improvement than others like grain crops, and as demand for fruits and vegetables grows, it will be crucial to improve the productivity of these crops — using biotechnology and other advanced breeding methods — to enable increased production without massive increases in the land area required. The 2023 Farm Bill should further increase mandatory funding for SCRI, given increasing demand for healthy fruits and vegetables and intensifying challenges to production due to climate change.

Emma Kovak is a Food and Agriculture Analyst at Breakthrough. Find Emma on Twitter [@EmmaKovak](#)

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