

Biotechnology to Secure America's Fertilizer Supply

Reducing U.S. dependence on vulnerable fertilizer supply chains by advancing biofertilizers and biostimulants.

American farmers and growers rely on a secure, affordable supply of chemical fertilizer for their farms. As prices rise and availability shrinks, chemical fertilizer is also fast becoming a strategic vulnerability. For example, Russia's war against Ukraine disrupted fertilizer production and trade, contributing to sharp price increases and exposing the vulnerability of fertilizer supply chains.¹ 30% of fertilizer trade moved through the Strait of Hormuz as of 2024, and conflict in the region has further constrained supply.²

New biotechnologies provide a solution. Biofertilizers and plant biostimulants, hereafter 'biologicals', can enhance the soil and provide key nutrients for crops. Depending on the product, crop, and field conditions, these technologies can supplement or reduce reliance on conventional fertilizer inputs, reducing U.S. dependence on vulnerable supply chains and bolstering American food security.³

While America leads in the research and development of agricultural biologicals, it is not positioned to capitalize on this advantage. Adoption remains uneven, with farmers citing the lack of existing field data across a variety of crop and growing conditions and regulatory uncertainty as barriers to broader use. In June 2026, the National Security Commission on Emerging Biotechnology (NSCEB) and the American Alliance for Biomanufacturing (AAB)

convened stakeholders across industry, academia, and the federal government to identify how the NSCEB's recommendations and policy options could support the domestic agricultural biologicals ecosystem to reduce American dependency on foreign supplies. This paper discusses the findings of that convening and offers next steps for policymakers to secure U.S. agricultural leadership.



Barriers to U.S. Biofertilizer and Biostimulant Commercialization and Adoption

Limited field adoption

Agricultural biologicals' effectiveness depends on field conditions and soil content. Convening participants noted that American farmers are hesitant to adopt new products without proven effectiveness under their own local conditions. Localized field data are necessary to determine the appropriate product, yet these data are slow and costly to generate. For certain regulated products, generating these data may itself require regulatory authorization for field trials, which is often not possible without the data that is prohibitively expensive to obtain before the product is on the market. This traps developers in a vicious cycle—no adoption without field data, no field data without revenue, and no revenue without adoption.

Definitional and regulatory ambiguity

Agricultural biologicals lack consistent definitions and regulatory pathways across federal and state regimes. Regulatory treatment can depend on a product's composition, intended use and claims, the characteristics of the microorganism, and whether it has been genetically modified. Based on those factors, microbial products may implicate Environmental Protection Agency (EPA) authorities under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) or Toxic Substances Control Act (TSCA), United States Department of Agriculture (USDA)-Animal and Plant Health Inspection Service (APHIS) authorities under the Plant Protection Act (PPA), state fertilizer or soil-amendment laws, or a combination thereof. This complexity can create uncertainty for developers seeking to determine the appropriate pathway to field testing and commercialization. Fall 2026 Farm Bill drafts in both the Senate and the House would address this issue; provisions included would define plant biostimulants, based on definitions in other draft legislation, the Plant Biostimulant Act of 2025 (S.1907, H.R. 3783).⁴

Fragmented, duplicative regulation of microbial products

In addition to definitional ambiguity, microbial products can face overlapping federal and state regulatory

requirements, with pathways that vary based on the organism, intended use, modification, and potential risks. For new and genetically engineered microbes, developers may need to navigate multiple regulatory authorities without clear or coordinated pathways for review. Developers expressed that an increase in staff turnover and fewer experts dedicated to agricultural biologicals contribute to six-to-ten-year regulatory timelines that disincentivize innovation and investment. Existing frameworks can also require substantially similar products or strains to undergo repeated review rather than leveraging information from prior assessments. Together with differing state and federal requirements, this fragmentation can increase the time and cost of bringing microbial products to market and create uncertainty for developers and investors.

Scientific bottlenecks

Convening participants noted that there can be a gap between lab results and performance in field trials. Product developers lack access to field data on soil composition, microbial content, weather, crop genotype, and longitudinal field outcomes. This leads to mismatches between crops and the microbes meant to help them. Performance can also vary significantly depending on how the product is used, making locally relevant field data particularly important. More data would help developers to accurately predict what works where, cut duplicative trials, and build the evidence regulators need for ensuring safety and efficacy of these innovations.

Challenges to domestic manufacturing and investment

While the United States has significant fermentation and biomanufacturing capabilities—dedicated largely to ethanol production—it lacks sufficient, accessible, cost-competitive scale-up biomanufacturing capacity for sectors outside of biofuels. Emerging agricultural biological companies often struggle to access the specialized infrastructure and capital necessary to move from laboratory production to commercial scale.

Next Steps for Policymakers

Policymakers should take concrete steps to overcome the abovementioned challenges and ensure U.S. farmers can take advantage of these new technologies to improve plant nutrients and growth while reducing the need for expensive chemical fertilizers. The following recommendations and policy options are primarily derived from the Commission's April 2025 report, [Charting the Future of Biotechnology](#), and its January 2026 discussion paper series on [The Future of Biotechnology Regulation](#).⁵

April 2025 Report Recommendations

Recommendation 1.1a

Develop a coordinated national strategy for biotechnology.

A National Biotechnology Coordination Office would promote federal coordination and streamline regulatory structures currently inhibiting biotechnology innovation. This would ensure a whole-of-government strategy to advance innovations in agricultural biologicals, improving the resilience and competitiveness of U.S. agriculture.

Recommendation 2.2a

Establish an Independence Investment Fund.

This recommendation would establish an Independent Investment Fund (IIF) at the Department of Treasury to invest in technology companies that strengthen U.S. national and economic security and help bridge the gap for developers from lab to market. An IIF would help finance agricultural biologicals by signaling the importance of these products to private investors and provide a strategic alternative to U.S. dependence on foreign chemical fertilizers supplies.

Recommendation 2.3a

Develop a network of manufacturing facilities for precommercial bioindustrial product scale-up.

One of the biggest roadblocks to commercialization for U.S. biotechnology innovators is the manufacturing of products at scale. Investing in a network of manufacturing facilities across the country would allow developers to prove that their products and processes can scale and help onshore a key agricultural input.

Recommendation 4.1a

Build a Web of Biological Data to serve as a single point of entry for researchers to access high-quality biological data.

A Web of Biological Data would create a centralized database for researchers to gain insights on soil, microbial, environmental, genomic, and longitudinal field data, all of which are necessary to build evidence for farmer and regulator confidence in the products.

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Option 4

Leverage information from prior reviews to speed review of similar products.

Biotechnology developers noted that regulators often require a full review even when a new biotechnology product is closely related to another product that regulators have already deemed safe. By leveraging information from prior reviews of similar products, regulators can accelerate review of familiar products and focus their attention on truly novel products.

Option 20

Require clear, consistent regulatory guidance.

Uncertainty around regulatory deadlines, the data required for review, and unclear definitions of products result in confusion for developers entering the regulatory system. Agencies should issue clear guidance on details such as qualifications for risk tiers, data requirements for submitters, standard analytical approaches used for biologicals, as well as clearly delineate agency jurisdiction and the regulatory pathways applicable to different product categories. This process should include coordinating with researchers and developers to establish clear and consistent definitions for biofertilizers and plant biostimulants and clarify how those definitions interact with existing federal and state authorities.

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Option 7

Focus APHIS regulation on plausible risks to plant health.

USDA-APHIS oversight of modified microorganisms should be tied to a scientifically plausible plant-pest risk rather than triggered by the use of biotechnology or an association with a plant-pest organism. APHIS should adopt a tiered, risk-proportionate framework that fast-tracks or exempts well-characterized, low-risk microorganisms while reserving greater scrutiny for organisms presenting novel or credible plant-health risks.

Option 8

Delineate clear pathways for GEMs in the environment.

Currently, an environmentally released genetically engineered microorganism (GEM) may implicate EPA and/or USDA-APHIS authorities, creating the potential for overlapping review. EPA and USDA-APHIS should clarify jurisdictional boundaries and develop coordinated guidance that eliminates duplicative review while preserving each agency's statutory responsibilities.

Clarify FIFRA definitions for pesticide regulations.

EPA interprets certain products marketed as biostimulants as meeting the definition of “plant regulators”, and thus subject to FIFRA, which creates uncertainty regarding the boundary between federally regulated plant regulators and products that are excluded from that definition. Congress should establish a consistent definition of plant biostimulant and direct EPA to provide clear, science-based guidance distinguishing biostimulant uses and claims from pesticidal and plant-regulator uses.

Provide risk-proportionate permitting for GEMs.

Multiple federal authorities and regulatory pathways are implicated in regulating outdoor field trials, depending on the size of the trial and definition of the products. Developers reported uncertainty regarding which requirements apply to microorganisms with multiple potential functions and whether existing containment requirements are proportionate to the actual risks presented. APHIS and the EPA should collaboratively develop clear, risk-proportionate guidance for developers, including outlining a stepwise approach to field trials with smaller trials that scale over time and lighter requirements for well-understood products.

New Policy Option

De-risk adoption through financial incentives.

Several convening participants discussed the potential for either insurance or other financial incentives to promote adoption by farmers through de-risking farmer experimentation with biofertilizers. There is already a pilot of this type of policy at the state level. Minnesota’s “Biofertilizer Innovation and Efficiency Pilot Program” pays farmers \$15 per acre to cut commercial nitrogen by the lesser of 15% or 30 pounds per acre when using a qualifying microbial biofertilizer for the 2026 and 2027 growing seasons, providing a useful proof-of-concept for mechanisms to de-risk adoption.⁶

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Staff at the National Security Commission on Emerging Biotechnology authored this paper with input from the expert Commissioners. The content and recommendations of this white paper do not necessarily represent positions officially adopted by the Commission.