Bipartisan Briefing Document: 2023 Farm Bill Priorities

Prepared by the Federation of American Scientists
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Overview: This brief was developed to help inform priorities for the 2023 update of the Agricultural Improvement Act of 2018 ("Farm Bill"). We believe this Farm Bill arrives at a critical juncture in American history.

- Stalled progress in American agriculture innovation threatens U.S. national security. Over the last decade China has surpassed the United States as the largest funder of agricultural R&D, and since the CRISPR-driven gene editing revolution, China has filed twice as many agricultural biotechnology patents as the United States. Overall, agricultural productivity has increased worldwide by 33% in the last twenty years, but has only gone up 13.5% in the United States.

- The food and agriculture industry is slow to adopt new innovations and the sector is difficult for new firms to break into. Of twelve major industries, food and agriculture had the lowest market share occupied by startups, at just 2%. Agriculture relies on many rural producers, making technological diffusion much slower than in other industries that are more centralized and where top-down decisions can happen quickly.

- Our lack of progress poses a separate, direct threat to the homeland: over the past century, every foreign state biological weapons program developed agricultural bioweapons, a worrisome precedent in our era of increased geopolitical tensions.

Our core thesis: unleash American agricultural innovation with high-leverage policy interventions in productivity enhancements, entrepreneurship, and R&D. Below are a series of recommendations curated from a library of over 200 science and technology policy ideas, developed by a diverse network of 300+ contributors from across the age, geographic, and political spectrum. More information can be provided on each of these ideas upon request.

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AgARDA (R&D)

If the United States is going to successfully compete with China on agriculture R&D, the nation needs paradigm-shifting advances that farmers will use. We generally agree with the AgARDA roadmap established here and are aware that USDA has yet to provide a strategic plan, despite several requests from Congress. We have setup time to meet with USDA R&D teams to ground truth our belief in the utility of AgARDA, a vehicle to build on the innovative research performed by the Foundation for Food and Agriculture Research (FFAR) by focusing on investments that can bring breakthrough technologies to the marketplace. Based on our work with former DARPA Director Arati Prabhakar and ongoing contract with the Department of Transportation to help spin up the authorized ARPA-I, our team has collected a list of characteristics that underpin a successful ARPA-like program:

- Flexibility in hiring and in award/contracting authority
- Transformational challenge orientation
- Foster "great groups" and communities of expertise
- Employ an island/bridge approach to shield inquiry and connect research / innovation
- Minimal bureaucracy
- Identify clear and actionable pathways for scaling and implementation
- Senior leadership buy-in
- Find ways to ensure a sufficiently risky portfolio

AgARDA will likely resemble ARPA-E

Unlike defense, the energy and agriculture sectors are overwhelmingly private and highly distributed, and unlike emergency medical countermeasures, their products are used daily. This required ARPA-E to develop not just new technologies but also strategies for bringing these innovations into a highly established market. To direct these and other efforts, AgARDA should explore a similar version of ARPA-E's Tech-to-Market Team, a separate group of staffers working full time to find marketing opportunities for novel technologies.

Congress should consider granting AgARDA prize authority

As currently proposed, AgARDA does not have prize authority, but this should be changed so that it can better replicate the success of other ARPAs. Prizes are often extremely successful in attracting, such as a $10 million prize for innovations in private space fairing technology attracting over $100 million in investment from competitors. Prizes also reduce agency overhead since evaluators only have to assess final outcomes without first preselecting teams based on likely success. In general, we believe strongly in the idea that government should utilize financial contingencies based on success, not failure, by identifying where market failures exist and defining metrics of success and the reward (e.g., prize, purchase order, milestone payment, etc.). We offer additional detail on different kinds of innovative procurement techniques in this memo.

Potential Technology Focus Areas

- ***Automated, passive monitoring of known and emerging livestock and crop diseases***
  Monitoring livestock disease as a matter of national security, given Presidential Policy Directives 7 and 9 order Department of Homeland Security to assist in surveillance efforts. However, the

main monitoring strategy is veterinary reporting, meaning that diseases are only detected when a farmer notices an animal displaying symptoms. Even then, a new disease may not be recognized. The USDA's National Center for Foreign Animal and Zoonotic Disease Defense is focused on developing diagnostic kits for known diseases, rather than innovating ways to detect emerging diseases. Likewise, plant disease surveillance centers on certifying that U.S. fields are free from a select group of known diseases so that America can export produce. This process depends on manual inspection that is impossible to scale to the level needed to closely monitor the nearly 400 million acres, 16% of U.S. land, occupied by crops. However, advances in remote sensing, environmental DNA sequencing, machine learning, and other fields are promising new ways to detect disease occurrence at scale. Many of these innovations, however, are likely to be neglected by the private companies and producers since much of the benefit to early disease detection is to the sector as a whole. If a farmer detects a disease early, they may nonetheless have to cull their herd or plow over their field, so they still suffer the economic loss, but their neighbors benefit from this early action. AgARDA should fill in this funding gap and focus on technologies for passive agricultural diseases monitoring.

- ***Paradigm shifting applications of genetic engineering and synthetic biology to enhance plant productivity and stress tolerance***
  In most settings, the efficiency with which plants use photosynthesis to convert solar energy into chemical energy does not exceed 1%. The theoretical potential for photosynthesis efficiency, however, is about 12%. The USDA's Agricultural Research Service is currently conducting research into improving photosynthetic efficiency improvements, but the work is focused on gene mapping to find existing variation, rather than taking an ambitious bet on new pathways to engineer better plants. Modern gene editing and synthetic biology could allow for much more fundamental changes to plant physiology. Advanced biotechnology could also reduce the inputs required for agricultural production, such as by engineering soil microbes that fix atmospheric nitrogen to associate with non-leguminous plants, decreasing our dependence on imported fertilizers. AgARDA could be the only agency suited to aggressively tackle the challenge of revolutionizing crop biotechnology, meeting the world's growing demands with fewer resources and making our agriculture more resilient to production shocks.

- ***Securing food supply chains with decentralized food production systems***
  Conventional agriculture concentrates production in places far from major population centers, leaving consumers vulnerable to transportation disruptions and dependent on regional or international trade. The food in a typical American meal travels 1,500 miles, meaning that disruptions such as truck driver shortages from a pandemic can quickly cause food supply shortages. Advances in cellular, microbial, and other indoor agricultural technologies could diversify food supplies. DARPA has two ongoing projects on alternative food production. However, while DARPA aims to pioneer dual-use technologies—those with both defense and civilian applications—their focus with these projects is providing food supplies to U.S. troops cutoff from supply lines. This means that they are not optimizing for highly scalable, cost effective innovations. AgARDA should fill this gap and focus on developing food technologies, such as cellular agriculture or precision fermentation, that have public appeal and are readily affordable. The agency's goal should be to launch technologies that completely transform the

food and agriculture sector, eventually leading to a world where a large fraction of calories are produced in distributed production facilities located in and around population centers.

Food Supply Chain Guaranteed Loan Program (Credit)

With major food production concentrated in five states, often far from major population centers, the farm-to-table supply chain is extraordinarily susceptible to disruptions. For example, the food in a typical American meal travels 1,500 miles, meaning that this supply chain is vulnerable to truck driver shortages. In response, the American Rescue Plan Act created the Food Supply Chain Guaranteed Loan Program to support "activities in the middle of the food supply chain." This definition naturally includes a broad range of companies, whether involved in "aggregation, processing, manufacturing, storing, transporting, wholesaling or distribution of food." It provided a needed dose of financing support structures to help small- and medium-sized enterprises scale up in solving a matter of national security. This program should be continued and resourced going forward. In contrast to the Business & Industry Loan Guarantees Program (B&I), which focuses on much-needed rural community financing, this program is still part of the Rural Business Cooperative but has less geographic restrictions. As a result, this program would unleash American entrepreneurship across the country. Separately, Congress may consider adding a complementary urban component to the B&I program in lieu of this supply chain program.

Unleashing Economic Growth with USDA Climate Hubs

In the last 15-20 years, a whopping 90 percent of all the new high tech jobs have arisen in about 10 U.S. cities. The growth of regional innovation efforts represents an exciting opportunity to bring real, 21st century economic opportunities to underdeveloped regions across the United States. For example, attracting more scientists to a city yields productivity gains 6 times greater than the production costs, while innovation-focused job creation yields a multiplier effect that reverberates throughout industries beyond the sector in question. Furthermore, in June this year, the USDA showcased the Food System Transformation plan, which develops framework that will invest over $2 billion in strengthening local and regional food supply chains, and which we believe has the potential to improve health and wellness in rural and urban communities across the country As such, FAS has supported several federal innovation programs seeking to build regional technology clusters, including providing technical assistance to the Economic Development Agency's $1B Build Back Better Regional Challenge as well as advising the rollout of the National Science Foundation's Regional Innovation Engines program.

The USDA should continue support of the the Climate Hubs play as they key role in connecting diverse geographical regions through data-driven information and collaborative technological advances in agriculture and land management. With the unique severe weather conditions each geographic region faces, from increased wild fires in the west and hurricanes in the south, the Climate Hubs offer local extension officers and land managers access to workforce development opportunities. Through this, local economies benefit from having a highly skilled and diverse workforce that tailor to the region's needs. Furthermore, with the level of expertise the Climate Hubs have in translating climate science into tangible actions for stakeholders, they have been pivotal in the development of climate-adaption plans for agricultural managers around the Country. We recommend further financial support of this program in hopes that continued collaborations and relationships will grow between land managers and the USDA to find innovative climate solutions that fit every regional hub across the nation. In particular, following lessons learned from the EDA's BBBRC and recent economics literature, we recommend **investing more resources in fewer places** to achieve innovation takeoff.

Groundwater Management for the Ogallala Aquifer: A Reduce, Repurpose, Recharge Initiative (Conservation)

With an estimated value of $35 billion, the Ogallala aquifer supports one-fifth of the nations' wheat, corn, cotton, and cattle. The Ogallala once held enough water to fill Chicago's Sears Tower over 2,000 times. Today, the aquifer has lost 30% of its supply — and it is being recharged at half the rate it is being depleted. The consequence of inaction is 70% aquifer depletion by 2060, which will reduce crop output by 30–40%. This $14 billion loss to the High Plains agricultural production may be slowed and eventually reversed by (1) reducing Ogallala use, (2) repurposing existing supplies, and (3) recharging the aquifer. The U.S. Department of Agriculture (USDA), in collaboration with the Department of the Interior (DOI) and the Federal Emergency Management Agency (FEMA), should accordingly create the Reduce, Repurpose, Recharge Initiative (RRRI), a voluntary program designed to keep farmers engaged in groundwater conservation. This multi-state program will provide financial incentives to participating farmers in exchange for pledges to limit groundwater withdrawal and participate in training that will equip them with knowledge needed to fulfill those pledges. The RRRI will also make expert advisors available to consult with farmers on policies and funding opportunities related to groundwater conservation. Finally, this program will connect farmers across state lines, allowing them to learn from each other and work together on sustainable management of the Ogallala. The program should be funded through the various water-sustainability budgets of the DOI and USDA, as well as through FEMA's Building Resilient Infrastructure and Communities grant program. (Full Memo).

Catalyzing US Leadership in Livestock Enteric Methanes (Conservation)

Scalable methane solutions and accessible methane measurement would let American farmers and ranchers rapidly improve their productivity, export competitiveness to climate-sensitive markets, and climate footprint. Current solutions only address 10% of these emissions without evidence of converting the avoided methane to increased milk or meat productivity. Congress could rapidly establish global leadership through a $72m per year research and innovation program towards solutions that easily drop into existing farmer practices.

Fund basic & applied livestock enteric methane research

Science-based Livestock enteric methane solution development rests upon a detailed understanding of bovine gut microbiology as well as understanding of what makes a solution easy to adopt. Research funding could rapidly build a portfolio of potentially scalable solutions. We recommend $50m per year of funding towards:

- Basic research in livestock methane biology to create knowledge that provides a map for new win-win solution development.
- Applied livestock methane solutions research based on livestock methane biology knowledge. This work should prioritize solutions with new mechanisms, those that provide an increase in the production of milk or meat, and those that have the potential to be in a once-per-year product format.
- Performing a detailed survey of livestock management practices to understand what solutions would be low cost and complexity for American Farmers & Ranchers.

Create public fee-for-service testing facilities for livestock methane.
Access to methane test facilities from the petri dish to the dairy barn limits the number of testable innovative ideas. A small number of institutions worldwide have the tools needed to test methane with limited external access. We recommend $15m per year of funding.

- Establish a nationwide network of fee-for-access livestock methane research facilities equipped with research measurement equipment and technical staff.
- Develop a national center for pre-livestock testing and screening of potential products, which would serve as a user facility.

Fund development of low-cost cow methane measurement technology.
Current livestock methane measurement costs over $100,000. This high cost makes them inaccessible to all farmers and most researchers. A dedicated funding program of $15 million per year should:

- Develop lower-cost measurement systems so every research barn can be turned into a livestock methane research barn.
- Develop farm-integrable measurement systems that make methane emissions visible to US farmers, enabling them to experiment and innovate.
- Develop low-cost proxies for livestock methane (e.g., milk measurements).

Create at the FDA a regulatory category and team for climate-positive livestock products.
Current anti-methane feed additives are regulated as drugs, requiring a ten-year approval process. As European export markets increasingly regulate emissions, this may lead to a lack of competitiveness for US products. To address this, Congress should create a special FDA category for climate-positive livestock products with a dedicated team for ~ $2m per year.

National database of agrobiodiversity characteristics and farmland management (Conservation)

The USDA should create a robust network of 1,000+ agricultural/farmland sites across the United States— organized along single latitudes, regional clusters, or socioeconomic profiles—to identify and track plant species, chemical pesticides, air quality, soil structure, pollinator health, and other agrobiodiversity indicators at each site. Comprehensive understanding of threats to human health and biodiversity—and connections among those threats—requires accurate, transparent, and traceable data. Fortunately, advances in remote sensing and precision agriculture make it possible to observe a variety of properties at a much higher resolution than ever before, and to make these data actionable. These data should be integrated into the firstever open dataset of ongoing agrobiodiversity trends to be used for real-time risk management. Receipt of certain types of federal agricultural support (e.g., crop insurance and Farm Bill conservation programs) could become contingent on collection and provision of such data). This program would be similar to the “Experimental Forests and Ranges” program at the U.S .Forest Service, onfarm Conservation Innovation Grants within National Resource Conservation Service , the Agricultural Research Service Long-Term Agroecosystem Research, and ARPA-E’s Rhizosphere Observations Optimizing Terrestrial Sequestration program. (Page 17).

AgTech-Literacy Program (Rural Development)

As agriculture has become increasingly technologized, tech literacy has become increasingly critical to farming success. However, small- medium-sized farmers have been left behind due to farmer aging, lack of access to capital for system upgrades, a concentration of AgTech at industrial producers, and an absence of tech-training programs. Programs and policies are needed to assess the tech needs of small and mid-size farmers, identify interventions that could educate older farmers in tech and entrepreneurship, and attract a new generation of digital-natives to farming and ranching. Such programs and policies could be implemented as part of the USDA Rural Development Business Services. In addition, regional technology and entrepreneurship hubs could help maintain the viability of smaller farms by building connections between younger and older farmers, facilitating co-design of products and services that meet the needs of smaller farms, and narrowing the tech-literacy gap for farmers across the board. (Page 16).

Broadband Affordability (Rural Development)

Recipients of funds from ReConnect, the U.S. Department of Agriculture (USDA) broadband grant and loan program, must propose their pricing in program applications and report it periodically — but pricing is not among ReConnect's program evaluation criteria. USDA and/or any other agency soliciting applications for grants or loans for broadband infrastructure should take proposed pricing into account when evaluating applications. Affordability evaluation criteria could be modeled on ReConnect's performance evaluation criteria. The FY2020 ReConnect program assigned a maximum of 20 points for performance for providing at least 100/100 Mbps service, out of a total of 140 points maximum across all criteria. An affordability criterion with a maximum of 20 points might allocate zero points for simply meeting the FCC's current benchmark price for broadband public-interest obligations, 20 points for meeting the highest affordability tier price range, and somewhere in between for intermediate price points (Page 5).

Establish "Climate Stress Tests" and other mechanisms to prepare agriculture financing for climate-related risks (Credit)

Agriculturally focused banks need assistance to improve their support of farmers and ranchers in mitigating and adapting to climate change through agricultural activities. Bank stress tests are common tools used to assess how a bank will respond to a crisis, but there are not yet stress tests for the scientifically proven risks of climate change and land degradation associated with current agricultural activities. The USDA's Economic Research Service and Farm Credit Administration should establish a commission to assess these risks and develop new federal guidelines and programs to help banks create climate stress tests, mitigation- and sequestration-oriented lending guidelines, technical assistance, and planned retirement of stranded assets. (Page 24).

Soil Health and Reducing Erosion (Multi-Title):

US farms are currently losing twice as much topsoil to erosion per year as the Great Plains lost in a typical year at the height of the 1930s Dust Bowl. Soil loss and erosion reduces crop yields, destroys species' habitats that are critical to food production, and causes high financial losses. A recent report developed by 22 UK scientists, military minds, NGO leaders, scientists and farmers also describes the emergent implications of soil degradation on national and global security. Below are several recommendations to mitigate the harms of soil loss or regenerate soil health altogether.

Invest in a data repository for agriculture and soil carbon (Conservation):
Advances in soil health of agricultural systems, like advances in human health, will depend on the sector's capacity to aggregate and refine big data. USDA should increase the budget of the National Agricultural Library to be on par with the National Library of Medicine in order to accommodate a larger storage apacity that can house a a broad range and large volumes of agricultural data, as well as the software needed to make the data findable, accessible, interoperable, and reusable. USDA should also provide training and tools to familiarize researchers and students with the repository's structure and assets and encourage researchers and students to link data to publications using Persistent Unique Identifiers (PUIDs). These steps could be carried out using discretionary funding at USDA earmarked for investments in research and development capacity of farmers. (Page 6).

Competitive research grants to reduce soil erosion, increase the nutrient density of food, and sequester carbon stably (R&D).
NIFA and NSF could jointly-fund priority projects of these grants might include:

- (1) Alternatives to intensive tillage for weed control, such as intercropping with competitive plant species, inhibiting weed growth with compost or other additives, planting cover crops that leave a residue that inhibits weeds but not crop plants, or application of weed-killing compounds that are acceptable under organic-certification requirements;
- (2) Decision-support tools that help farmers choose strategies to reduce erosion in a financially viable manner;
- (3) Methods to increase soil-carbon stability;
- (4) Rapid, inexpensive tests to track soil carbon. Such tests would improve accountability and precision of farmer efforts to sequester carbon;
- (5) Methods to integrate remote-sensing data with on-the-ground measurements of soil erosion.

Promoting Crop Variety via Federal Crop Insurance Program (Crop Insurance)
Soil benefits from growing a variety of crops and leads to higher yields overall. Moreover, farms that grow a variety of crops reduce financial risk through diversification (akin to banks and financial institutions diversifying their investments to reduce risk). The USDA should allocate increased funding for the Whole Farm Revenue Protection Program in the Federal Crop Insurance Program to invest in staff training, resources, and increasing awareness among farmers. The goal is to make it easier for farmers to insure a variety of crops rather than ensuring each crop separately, encouraging the planting of different crops.

Alternatively, USDA might eliminate the Yield Exclusion Provision from the Federal Crop Insurance Program. The provision allows farmers to exclude certain years with extremely low yields (usually due to extreme weather like drought or natural disaster) from the yield history that is used to calculate their crop insurance coverage. It incentivizes farmers to continue planting in high-risk locations and planting crops that fail because they know they can fall back on the federal crop insurance without consequences thanks to the Yield Exclusion

Provision. Taxpayers end up footing the bill for these risks with an estimated annual cost of $35.7 million. Eliminating the Yield Exclusion Provision would encourage high-risk farmers to switch their crop mixture to ones that are more resilient to the extreme weather that they face.

Supporting soil-saving practices (Credit)
USDA should (i) provide financial assistance to help producers transition to soil-saving practices and (ii) offer training to help producers realize maximal benefits of soil-protective practices at each phase of the transition. The Farm Service Agency could offer loans based on costsaving projections from reduced need for synthetic inputs and increased potential yield once the transition to soil-protective practices is complete, with loans covering cost of the first five years of projected lost income per acre. During the initial five-year loan period, soil-health specialists affiliated with USDA could provide farmers with training on measuring progress, collecting data, and uploading that data to a centralized database. USDA's Risk Management Agency (RMA) could offer discounted crop insurance rates because the now-healthier soil would engender a more resilient system less likely to experience catastrophic losses during floods and droughts. Participation in the loan program could be contingent on farmers' capacity to maintain soil-protective practices for at least ten years. (Page 9).

Promoting Entrepreneurship from the "Ground Up" (Credit)
The USDA, the Small Business Administration (SBA), and the Minority Business Development Administration (MBDA) should jointly develop a "Ground Up" program with $25 million per year for five years to (i) engage the agriculture industry in identifying circular-economy business opportunities and (ii) engage young people without a high-school education in starting small businesses that conserve, restore, and protect soil and other natural resources. Ground Up would fill gaps created by the uneven and insufficient USDA Extension workforce in underserved and under-resourced communities. Ground Up would also provide more extensive business and entrepreneurship training than is typically possible through Extension programs. For example, a Ground Up enterprise might incorporate grounds from commercial or residential coffee-making operations or municipal waste into commercial compost production. The Participants who complete the Ground Up program would be eligible for nointerest federal business loans, with repayment required once the business was profitable. The federal government could partner with Community Development Financial Institutions (CDFIs) to share the cost of loans and build connections among young entrepreneurs, Extension professionals, and potential partner businesses. This funding would cover the costs of training instructors, building partnerships with industry, and supporting administrative staff. This funding would also initially cover the costs of loans to eligible small businesses, though loan repayment would replenish these funds in the long term. A comprehensive program evaluation should be conducted at the end of the five years to evaluate program accomplishments and suggest improvements for the next program iteration. (Page 10).

Establishing an "Earth Cities" Program (Conservation)
Like the Arbor Day Foundation's "Tree Cities" program that encourages communities to steward their tree resources, a national "Earth Cities" program would recognize cities leading the way on urban soil stewardship and management. Criteria for receiving the "Earth City" designation could

include implementation of a centralized municipal composting program, large-scale replanting of public parks and rights-ofway with native grasses and perennials that have soil-health benefits, creative management of excavated soil and rock generated by urban construction, becoming a signatory to the 4p1000 initiative, and observance of World Soil Day on December 5. Taking steps to become an "Earth City" and prioritizing soil management at the 15 municipal level offers communities a way to make a positive difference and experience benefits locally while addressing global climate challenges. (Page 14).

Enable SNAP Online Purchasing Pilot to Cover Direct Sales for Farmers (Nutrition)

Through a cooperation agreement with the National Association of Farmers Market Nutrition Programs, the USDA created and launched access to the SNAP Mobile Transaction Processing Application. This program provides equipment and technical assistance to farmers who want to accept EBT/SNAP benefits at farmers' markets. However, the program has been slow to roll out support for direct sales by farmers, especially for online orders. The SNAP Online Purchasing Pilot should be expanded to include direct sales from farmers. One way to achieve this efficiently would be to include direct sales from farmers on Amazon and Walmart storefronts. This would have the effect of shortening food-supply chains, increasing access to fresh and local food in underserved communities, creating larger markets for small farmers, and providing a new example of public-private partnerships that increase farmers' access to online storefronts and provide farmers with technical assistance in managing supply-chain logistics. (Page 14)

Redefine Nutrition for the 21st Century (Nutrition)

New evidence shows that the macronutrient and micronutrient profiles of a food can differ based on many variables, including how that food was grown. Federal agencies need to redefine human nutrition to include consideration of these variables: i.e., by examining micronutrient nutrition, nutrient bioavailability, and related microbiome factors when issuing nutrition guidelines or policies. Taking these factors into account for nutrition will help to align health, food, agriculture, and environmental policy. The USDA's dietary guidelines advisory committee will need additional funding, cross-sectoral coordination or mandates, and authority in order to update the Dietary Guidelines for Americans (DGAs) with best-inclass science. Relevant agency cooperation: HHS. (Page 12).

Developing a Plan for Securing Food Supply Chains (Misc.)

The Cybersecurity and Infrastructure Security Agency, should update the 2015 National Infrastructure Protection Plan (NIPP) Food and Agriculture Sector-Specific Plan to include a new priority action of establishing a resilient food-processing infrastructure to protect the sector from manmade and natural disasters, increase system resilience and recovery, and engage local and regional food systems in developing localized distribution models. In 2006, the Department of Homeland Security developed the NIPP, a comprehensive risk management framework that clearly defines critical-infrastructure protection. In 2010, the agency partnered with the USDA, FDA, and HHS to develop the first Food and Agriculture Sector-Specific Plan. The 2015 update to the Plan describes five priorities that help further the goals of protecting food and agriculture infrastructure from manmade and natural disasters. But while the report acknowledges the vast interdependencies within the food supply and distribution chains, it falls short of providing a plan for back-stopping those supply chains in case of a national emergency. (Page 20).

Extend the Bioproduct Pilot Program

The National Institute of Food and Agriculture's (NIFA) Bioproduct Pilot Program can help increase economic activity in rural areas of the U.S. while also lowering commercialization risks associated with bringing biobased products to market. The Program aims to study the benefits of using materials derived from covered agricultural commodities for manufacture of construction and consumer products. The Program's exploration of the viability of bioproducts also enables the development of a more circular economy, where finite resources are not just extracted and consumed but also regenerated in a sustainable manner. Adopting a more circular economy ensures that wealth and other economic benefits in the form of jobs and other opportunities are created, and stay in, rural communities, while learnings can be shared throughout the U.S. innovation ecosystem. A total of up to $5 million is available for the Program for each of FY2022 and FY2023, and the availability of funds for the Program should be extended through FY2028, with yearly increases to a level above $5 million per year according to the requests of NIFA/the program team.