Cultivating Actionable Solutions

FOUNDATION FOR FOOD & AGRICULTURE RESEARCH®



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What We Do

The Foundation for Food & Agriculture Research (FFAR) builds public-private partnerships to support bold science. Our research, co-created with the agriculture community, increases public agriculture research investments, fills critical research gaps and complements the U.S. Department of Agriculture's (USDA) research agenda.

Priority Area Research

With the release of our <u>Research Strategy</u>, FFAR-funded research focuses on four Priority Areas:

Cultivating Thriving Production Systems

Our Production Systems research supports animal and crop systems by increasing productivity, combating pests and disease, supporting animal welfare and safeguarding farmers' livelihoods.

Sustaining Vibrant Agroecosystems

Our Agroecosystems research deepens our understanding of how agriculture systems interact with the surrounding environment to help farmers optimize resource use, address climate change and enhance farm productivity and resilience.

Bolstering Healthy Food Systems

Our Food Systems research promotes the availability of nutritious foods, improves human health, develops novel food processes and products and advances the United States food system's functionality.

Strengthening the Scientific Workforce

Our Scientific Workforce programs continue our longstanding commitment to address critical shortages in research and scientific workforce training.

Our Mission

We build collaborative partnerships to support audacious science addressing today's food and agriculture challenges.

Our Vision

We envision a world in which pioneering, collaborative science provides every person access to affordable, nutritious food grown on thriving farms.

2023 Year in Review

2023 marked FFAR's eighth year of grantmaking and our biggest yet. With matching funding from our partners, FFAR awarded 74 grants, investing \$145 million in audacious food and agriculture research. Of this \$145 million, \$60 million was FFAR funding, which was matched with \$85 million from our partners.

2023 was also FFAR's most impactful year. The year brought a new research direction, a unique partnership opportunity with USDA as well as unprecedented federal funding.

Developing & Unveiling a Research Strategy

FFAR established a <u>Research Strategy</u> in 2023 to ensure our research investments meet our stakeholders' evolving and future needs.

In January 2023, FFAR began assessing the state of food and agriculture to identify where research investments can best address major challenges today and tomorrow. FFAR engaged with a range of stakeholders to develop a comprehensive understanding of current and emerging food and agriculture research needs. Specifically, FFAR solicited input from 23 industry, nonprofits, academia and international actors and interviewed 74 stakeholder organizations, including 23 companies, 13 commodity groups, 10 producer trade associations, six foundations, seven nonprofits, five federal agencies, the National Association of State Departments of Agriculture, six research universities, four scientific societies and the Association of Public and Land-grant Universities. FFAR also hosted a public webinar, through which FFAR received 76 written comments.

We then developed an evidence-based research framework informed by stakeholder feedback, analyses, gaps assessments and forecasting. The resulting Research Strategy aligns FFAR's research with industry, farmer and consumer needs.

FFAR completed the Research Strategy in December 2023 and transitioned our research focus from our previously established Challenge Areas to four overarching <u>Priority Areas</u>. These Priority Areas seek to foster greater collaboration across disciplines, strengthen the scientific workforce and provide the impacts stakeholders need.

AIM for Climate Summit

In May 2023, FFAR supported the <u>Agriculture Innovation Mission (AIM) for Climate Summit</u>, a three-day event hosted by the U.S. government in Washington, D.C., that brought together global partners to increase and accelerate investment in and support for agriculture and food systems innovation for climate action. The Summit, planned with USDA, included over 1,150 participants from 42 countries.

During the AIM for Climate Summit, FFAR Executive Director <u>Dr. Saharah Moon Chapotin</u> led a <u>plenary session</u> on the importance of agriculture climate research that featured remarks from several FFAR stakeholders. FFAR grantees and partners also spoke on panels, hosted interactive exhibits and opened their research sites for tours. Ultimately, the Summit was a significant opportunity to highlight the importance of food and agriculture research in addressing climate change.

COP28

FFAR expanded our presence at the 28th Conference of Parties (COP28) hosted by the United Nations Framework Convention on Climate Change in Dubai, United Arab Emirates. COP28 featured agriculture on the agenda in a more significant way this year, with a new themed day for "Food, Land Use and Agriculture." FFAR participated in five panels discussing the importance of agriculture research to mitigate climate change. COP28 presented FFAR with a global platform to showcase FFAR-funded research at the intersection of agriculture and climate.

2023 Farm Bill Extension

Congress passed and President Biden signed into law a one-year Farm Bill extension on November 17, 2023. For the first time, the <u>Farm Bill extension included funding for FFAR</u> and other orphan programs – programs that received funding in past Farm Bills but are not guaranteed continual funding in future Farm Bills. This Farm Bill extension included \$37 million for FFAR, which allows us to continue funding pioneering food and agriculture research in 2024.



FFAR Grants 2016-2023

Congress created FFAR in 2014 and the Foundation has been awarding grants since 2016.

380 **GRANTS AWARDED**

550 +FUNDING PARTNERS \$750M FFAR & MATCHING **FUNDS AWARDED**

\$1:\$1.40 40%+ RATIO OF FFAR FUNDING TO MATCHING FUNDS

OF PROJECTS ARE CLIMATE-RELATED

National & Global Reach

FFAR has made awards in 46 states, the District of Columbia and 16 countries (including the United States).





2023 Grantmaking Research & Convenings in 2023

FFAR awarded 74 new grants in 2023 totaling \$145 million – our largest grantmaking year yet. The <u>FFAR website</u> contains a full list of FFAR grants awarded in 2023 as well as those awarded since 2014.



FFAR remains committed to competitive funding opportunities to ensure inclusivity and increase access to FFAR grants. Of the 74 grants awarded in 2023, 72% were awarded through competitive grant opportunities and 28% of grants from direct solicitation.



Percent Matching Funds Received, by Donor Type 2023



Percent of FFAR Grantees, by Institution Type 2023

2023 Scientific Workforce Awardees

Addressing the accelerating and unprecedented global challenges faced by the U.S. food and agricultural enterprise requires a dynamic and highly skilled scientific workforce. Moreover, developing a diverse and inclusive workforce is critical to drive innovation, foster creative solutions and lead pioneering science. FFAR supported training and career advancement for more individuals in 2023 than in any previous year. These 68 fellows, grantees and prize winners represent bold scientific leaders who are providing unique research advancing the food and agriculture sectors.



NATIONAL ACADEMY OF SCIENCES PRIZE IN FOOD & AGRICULTURE SCIENCES WINNER





FFAR's Initial Results & Impact

FFAR awarded 74 new grants in 2023 totaling \$145 million invested in bold food and agriculture research. A full list of FFAR grants awarded in 2023 can be found on the FFAR website. Additionally, the FFAR website lists all grants awarded since the Foundation's creation in 2014. Through 2023, FFAR has expanded our national and global reach, funding grants in 46 states, the District of Columbia and 16 countries (including the United States).

In addition to awarding grants, FFAR focused on evaluating and improving our operations. FFAR incorporated stakeholder feedback from across the food and agriculture industry while developing our Research Strategy in 2023 to ensure that our research is current, actionable and impactful. In 2023, FFAR also evaluated the funding models for our various consortia. In 2024, we are enacting lessons learned from this evaluation to continue improving our processes and generate the greatest impact.

The impact stories captured in this report reflect highlights from our recently completed grants in 2023. FFAR also regularly updates the <u>Breakthroughs section of our website</u> with successes and accomplishments from our FFAR-funded research. Our Breakthroughs discuss how our research enhances our food supply, increases environmental resilience and/or improves human health.

FFAR invests in research that produces actionable results. The following pages include highlights of five FFAR grants that ended in 2023.



Closing Soil Information Gaps on Tribal Lands

Native American Tribes often lack access to basic soil information, land management tools and conservation programs that help other U.S. producers achieve high productivity. These communities also experience a high incidence of food insecurity, with a reported 1 in 4 Native Americans regularly experiencing food insecurity.

With her FFAR 2018 <u>New Innovator in Food & Agriculture Research Award</u> funding, <u>U.S. Department of Agriculture Agricultural Research</u> <u>Service</u> (USDA-ARS) Soil Scientist <u>Dr. Amanda Ashworth</u> worked to advance the democratization of water and nutrient-smart technology, improve productivity of Tribal lands, and ultimately enhance food security for those living on Tribal lands and protect Tribal food sovereignty.

Principal Investigator: Dr. Amanda Ashworth, USDA-ARS Year: 2018 Location: Quapaw, OK Program: New Innovator in Food & Agriculture Research Matching Funders: David Miller, Janie Hipp \$300,000 FFAR Award Amount

\$600,000 Total Award Amount

Research

Ashworth took a systems-based approach to deliver real-time resource management and efficient farming practices to Tribal farmers, including installing auto-guidance on tractors to reduce the use of inputs without sacrificing yields and developing the first-ever continuous soil maps for Tribal lands.

Impact

Though tractor guidance is available for large farms, it's often economically unattainable for small- and medium-size farms. Ashworth and colleagues developed <u>Tractor Guidance Analysis</u> (TGA), a precision agriculture tool for smaller operations. Ashworth's team found that auto-guidance on tractors and self-propelled machinery can reduce overapplication of inputs by 6-20%, saving U.S. farmers up to \$10.8-13.5 million annually while improving production efficiency and increasing yields. The tool has been used by farmers 150 times to date.

Ashworth also created the first-ever high-resolution <u>digital maps</u> of soil properties and land-use interpretations of Quapaw, or Ugahxpa, Tribal lands in northeastern Oklahoma. These maps, which offer detailed and current soil information, are now guiding crop choices and land-use decisions at the farm and Tribal level. The Tribe is also using the maps to inform cleanup of an EPA-designated Superfund site, the first time the agency has granted this authority to a sovereign Tribal nation.

Additional information on this grant can be found on the FFAR website.



Protecting Soil Health & Food Safety in Almond Orchards

Orchard resilience is vital to California, which produces <u>80% of the world's almonds</u> — a crop valued at \$19.6 billion. To ensure food safety, U.S. almond growers must clear organic matter, including manure and compost, from the orchard floor before the nuts are shaken from the trees and left to dry on the ground. This practice deprives the soil of vital nutrients, requiring growers to incur additional costs by applying synthetic fertilizers to boost production. Irrigation is simultaneously withheld for up to 12 days, worsening heat stress at a critical time in the trees' growth cycle.

In a bid to increase soil fertility while protecting food safety, a University of California, Davis research team led by <u>Dr. Patrick Brown</u> used a <u>Seeding Solutions</u> grant to test a mechanical almond harvester.

Principal Investigator: Dr. Patrick Brown, University of California, Davis
Years: 2018-2023
Location: Davis, CA
Program: Seeding Solutions
Matching Funders: Almond Board of California, Bays Ranch Inc., Muller Berry Farms, Ples
Due Family Farms

\$225,000 FFAR Award Amount

\$450,000 Total Award Amount

Research

Brown and soil scientist Dr. Sat Darshan Khalsa ran trials using a mechanical almond harvester that shakes the trees, catches the nuts before they fall to the ground and deposits the almonds in a clean area for drying. This "shake and catch" method protects harvested almonds from contamination during the drying process and allows growers to improve soil health by keeping the shells and hulls in the orchard to act as an organic fertilizer. The research team also applied technology that enables the mechanical harvester to track tree-specific yield data.

Impact

About 5% of California's almond producers have already adopted this new technology, despite the absence of state and federal

incentives for off-ground almond harvesters, because it saves them time and money while benefiting the environment and orchard health. Researchers documented that returning almond hulls to the soil supplies 70-80% of a tree's potassium requirements, reducing the need for costly added fertilizers and cuts water use by 12-15%. Off-ground harvesting shortens the harvesting process and also reduces dust in the air by 80%, an important factor for the health of local communities. Trees can be returned to irrigation schedules more quickly, reducing heat stress.

Additionally, the site-specific yield monitoring generates data that allows growers to make more informed decisions about inputs. Almond growers using this technology report improved soil health, increased root growth and reduced fertilizer use.

Additional information on this grant is available on the FFAR website.



Increasing Dietary Fiber in Wheat Crop

Some 95% of Americans do not meet the <u>National Heart Association's recommendations</u> for daily fiber consumption. Diets low in fiber are linked to serious health concerns. Producing high-fiber wheat varieties that deliver the taste and texture qualities that make low-fiber white bread so appealing to consumers is one way to encourage people to eat more fiber.

Through a <u>Seeding Solutions</u> program award, <u>Dr. Jorge Dubcovsky</u>, distinguished professor at the University of California-Davis, tackled this challenged by developing three high-fiber and tasty wheat varieties.

Principal Investigator: Dr. Jorge Dubcovsky Years: 2019-2023 Location: Davis, CA Program: Seeding Solutions Matching Funders: Bay State Milling, California Wheat Commission, Limagrain Cereal Seeds

\$479,997 FFAR Award Amount

\$959,997 Total Award Amount

Research

Higher fiber content can be achieved by increasing the amount of resistant starch in the wheat crop. Resistant starch behaves like dietary fiber when ingested because it is a type of carbohydrate that the small intestine cannot digest. Dubcovsky created the high-fiber wheat varieties by using mutations that increase amylose, a type of resistant starch, without sacrificing taste.

Impact

Dubcovsky produced three distinct wheat varieties — Hard Red Spring wheat variety UC-Lassik-RS, Hard White Spring wheat variety UC-Patwin-RS and Pasta wheat variety UC-Desert King-RS — that are licensed by Bay State Milling and used to produce pasta, ice cream cones and other consumer products.

By making high-fiber wheat more available, Dubcovsky's research can help consumers eat <u>a fiber-rich diet that may protect</u> against colorectal cancer, type 2 diabetes, obesity and cardiovascular diseases.

Additional information about this <u>grant</u> and its <u>breakthroughs</u> is available on the FFAR website.

Reducing Pig Mortality & Protecting Producer Profits

Though pig health is essential to profitable pig production, an estimated 30-35% of commercial pigs die before reaching market weight. Producers often lack proven, effective strategies to prevent pig mortalities and an accurate method for fully quantifying the associated economic losses.

Led by Iowa State University (ISU) Extension Livestock Specialist <u>Russ Euken</u> and ISU Extension Livestock Economist <u>Dr. Lee Schulz</u>, a research team used a FFAR-funded grant to develop tools that help producers decide whether and when to adopt mortality-reducing strategies. This was part of a larger project team led by <u>Dr. Jason Ross</u>, chair of the ISU Department of Animal Science, focused on improving pig livability.

Principal Investigators: Dr. Jason Ross, Iowa State University Year: 2018 Location: Ames, IA Matching Funder: National Pork Board \$1,000,000 FFAR Award Amount

\$2,000,000 Total Award Amount

Research

The ISU team created two decision tools: one for wean-to-finish operations and the other for breed-to-wean operations. These are the first publicly available economic tools to allow producers to analyze mortality costs specific to their farms and weigh these costs against the projected economic benefits of implementing mortalityreducing strategies.

Impact

The decision tools are available at no cost on the <u>ISU Ag Decision</u> <u>Maker</u> website. Swine producers have used the wean-to-finish decision tool over 2,700 times and the breed-to-wean decision tool over 1,600 times to forecast the economic benefit of potential interventions to improve pig survival. In one on-farm trial where caretakers assessed sows individually and treated issues early, a 4.9% reduction in sow mortality was achieved. The breed-to-wean decision tool supported the effort by demonstrating that reduced sow mortality could have a \$240,000 beneficial impact on the 4,800sow farm. Some of the resources have also been published by the Pork Information Gateway.

Additional information on this grant can be found on the FFAR website.

Rapid Response to Corn Tar Spot in South Florida

New plant and animal pests and pathogens can quickly devastate crops, livestock and livelihoods, necessitating an equally rapid response strategy. When the corn tar spot pathogen — previously restricted to Central and South America — was detected in several U.S. locations in 2016, researchers knew little about best management strategies.

FFAR awarded a <u>Rapid Outcomes from Agricultural Research</u> (ROAR) grant to <u>Dr. Katia Viana Xavier</u>, assistant professor in plant pathology at the University of Florida, to accelerate understanding of the corn tar spot pathogen and protect Florida's sweet and field corn production.

Principal Investigator: Dr. Katia Viana Xavier, University of Florida Years: 2022-2024 Location: Belle Glade, FL Program: Rapid Outcomes from Agricultural Research (ROAR) Matching Funder: University of Florida

\$120,509 FFAR Award Amount

\$241,537 Total Award Amount

Research

After collecting and analyzing corn leaves, Xavier and her research team determined that tar spot in Florida is caused by a disease complex involving multiple fungi, but primarily *Phyllachora maydis*. The team also compared the genetic makeup of the Florida tar spot pathogen to samples taken in the U.S. Midwest and Central America, thereby expanding understanding of the tar spot population's genetic diversity and structure.

Impact

The study offers valuable information to support breeding tar spotresistant corn varieties and effective disease management practices. It suggests that tillage, which is already practiced by South Florida sweet and field corn growers, is a viable option for controlling the disease locally. Researchers also found that tar spot in Florida remains a late disease, impacting corn only at the end of the growing season, and impacts field corn more severely than sweet corn.

The research team presented its findings to growers and the scientific community at several conferences and through the University of Florida extension network and is working to disseminate the information further through local extension channels.

Additional information on this grant can be found on the FFAR website.

We regularly update the <u>Breakthroughs section</u> of the FFAR website with successes or accomplishments resulting from our grants.



Consortia Models Evaluation

FFAR's public-private partnership model allows FFAR to establish consortia to co-fund research. These consortia bring stakeholders from across the food supply chain to jointly invest in precompetitive research that identifies solutions to food and agriculture challenges. Through this collaborative funding mechanism, research is designed to be actionable and deployable.

In 2023, FFAR commissioned an external team to assess FFAR's consortia models and their success in generating funding commitments, building new collaborations and supporting actionable research. The evaluation team interviewed and/or surveyed 50 consortia partners, PIs and FFAR staff and reviewed numerous program documents and reports. The evaluation identified strengths and challenges of the various models and generated recommendations for future development and management of consortia. The evaluation also highlighted notable outcomes from FFAR consortia.

The evaluation found that partners value the ability to leverage additional funds, noting that several FFAR consortia exceeded their funding goals. For example, the Greener Cattle Initiative surpassed its initial funding goal by 45% in its first solicitation and the Efficient Fertilizer Consortium also exceeded its funding goals and attracted the interest of diverse and international stakeholders.



The evaluation noted additional benefits for members, such as the ability to collaborate with diverse stakeholders, including across industry, and identify research opportunities that address complex food and agriculture challenges:















The International Consortium for Antimicrobial Stewardship in Agriculture (ICASA) has formed strong research networks with diverse subject matter expertise to fund nearly 30 research projects to develop technologies and management practices that reduce antibiotic medication usage and resulting antibiotic resistance in beef and swine. One interviewee noted, "Not only did the cattle industry gain research knowledge through ICASA projects but [the organization] gained sources of collaborations and information through the contacts made and discussions held in the research working groups."

The <u>Crops of the Future</u> collaborative, which convenes companies and global research organizations to develop resilient crops and traits, supports pre-competitive alignment among industry partners, allowing projects to get off the ground that may not have been funded in any other capacity. "We have funded a very aspirational project," one partner noted, "which would be difficult to achieve without bringing many groups together."

The <u>Greener Cattle Initiative</u> members appreciate how the consortium has brought together industry partners focused on reducing methane emissions in cattle. The report notes that members have contributed their diverse perspectives to effectively address knowledge gaps. Strategic research investments include a project with numerous international research partners, indicating strong global interest in the consortium. Partners note that the Greener Cattle Initiative has exceeded expectations in terms of research support, industry expertise and networking.

The <u>Hemp Research Consortium</u> has fostered collaborative research between universities and companies and increased the visibility of industry investment in hemp research. One participant noted that although the process for raising match from industry was slow, they "have now conducted collaborative research across the three institutions, which I think is a big success."

Interviewees also highlighted some notable program outcomes:

The FFAR-funded research arm of the <u>Ecosystem Services Market Consortium</u> (ESMC) developed a robust model and approach to verifying carbon reductions of relevant production practices that has advanced the viability of carbon offset and inset markets and is informing the creation of an ecosystem services market. An ESMC stakeholder also noted that the monitoring of carbon in fields with a handheld device was a success for the consortium.

The <u>Innovation in Post-Harvest Loss & Food Waste Reduction Consortium</u> engaged students and placed a strong emphasis on training future leaders. One participant noted that "a number of university students had the opportunity to receive training in different research capacities working with professionals and experts along the different value chains of the food system."

The Irrigation Innovation Consortium was created to improve agricultural water management in areas with scarce water resources. The consortium invested in research that led to formation of a new company SoilSignal and its patented technology, the Sensor Network for Measuring Soil Moisture.

Consortia Areas for Improvement & Next Steps

The evaluation also identified where FFAR could strengthen its consortia management for greater impact, including in the following key areas:

- Making proposal solicitation, review and execution more expedient
- Process improvements around communication and monitoring & evaluation
- More efficient project and funding approvals to better align with timelines within the private sector
- Greater collaboration within the consortium rather than relying on individually funded projects
- Enhanced focus on the consortium's scope

The evaluation pointed to the need for a standard process to develop and manage consortia, as well as enhanced clarity around different funding models and how those can attract industry support.

In 2024, FFAR is designing and implementing new consortia models as well as developing a standardized process to create and support consortia based on findings from this report. Looking ahead, FFAR aims to continue refining our valuable consortia model that unites broad coalitions of industry stakeholders to generate sustained impact for food and agriculture stakeholders.

2023 Consortia Annual Reports

Several FFAR-led consortia produced annual reports highlighting recent achievements and activities. These reports outline several successes from these three consortia including the generation of nine reports, establishment of new working groups and the development and/or validation of several tools, datasets and programs to support farmers.

AgMission™

AgMission is a global initiative established by FFAR and the <u>World Farmers' Organisation</u> to unlock agriculture's potential to reduce greenhouse gas emissions. In 2023, AgMission projects generated a <u>baseline data set</u> on adoption trends of climate-smart agriculture (CSA) practices, an <u>online climate</u> <u>dashboard</u> providing risk assessments and adaptation strategies, as well as a <u>report</u> highlighting farmer engagement and voices to advance CSA priorities. Additionally, through an AgMission-funded project, <u>multiple datasets and summary metrics</u> were generated that span the continental U.S. from 2015-2021, which may help increase adoption of conservation practices. The AgMission progress report provides highlights from the midway point of this five-year initiative.

Ecosystem Services Market Consortium

In 2023, the FFAR-funded research arm of the <u>Ecosystem Services Market Consortium</u> (ESMC) launched four new technical working groups exploring soil, water, grazing and biodiversity, engaging members and exploring strategies to improve <u>Eco-Harvest program</u> offerings in these critical areas. It also released <u>eight new reports</u> which explore valuable ideas for soil sampling, conservation funding prioritization and for supply and demand of ecosystem services in the Western Range.

ESMC scales carbon and ecosystem markets for the agricultural supply chain. ESMC's SustainCERT Value Change Initiative validated and verified the Eco-Harvest program, which provides the necessary transparency, credibility and integrity for corporations, producers and other stakeholders across the supply chain. ESMC's progress beyond its research arm is available in the full 2023 annual report.

Hemp Research Consortium

The <u>Hemp Research Consortium</u> is a public-private partnership established by FFAR to foster a deeper understanding of the relationship between hemp genetics, physiology and the environment to optimize industrial hemp production. The Executive Committee met twice in 2023 to discuss new membership and make changes to improve organization, accelerate research and aid in the proposal review process. The 2023 annual report provides progress updates on the consortium's current projects.















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