Accelerating FFAR Research & Impact

2020 IMPACT REPORT

**FOUNDATION FOR
FOOD & AGRICULTURE
RESEARCH**

Bold science for big challenges

Together We'll Go FFAR

Thank you for supporting Foundation for Food & Agriculture Research's (FFAR) work to advance food and agriculture research. Visit the FFAR website and connect with us on social media to learn more about funding opportunities, grant updates, impacts and the latest food and agriculture industry news.

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Letter from Our Board Chair

Welcome

Dear Friends of FFAR,

As FFAR's Board of Director Chair, I could not be more pleased with FFAR's success in 2020. The Foundation has grown from a small start-up to a powerful force in agricultural research. The policies and processes that FFAR has developed with the board further helped it navigate and respond to the unprecedented events of 2020.

I would also like to express my appreciation to my fellow Board members who contribute their time, energy and effort to ensure FFAR's continued success. In 2020, we were saddened to see Dr. Rob Horsch, the former deputy director for Agricultural Research and Development at the Bill & Melinda Gates Foundation, and Beth Ford, president and CEO of Land O'Lakes, leave the FFAR Board of Directors. We are grateful for their insights and contributions. We also welcomed Ben Noble, executive vice president and chief operating officer at Riceland Foods, Inc., on to the board this year.

FFAR is leveraging the $385 million we received from Congress in the 2014 and 2018 Farm Bills to invest nearly one billion dollars in agriculture research funding.

FFAR is the first and only public-private partnership model for public agriculture research, and the model is working. The 2014 Farm Bill established FFAR and requires that it match every federal dollar allocated with a dollar from a non-federal source. We are surpassing the match requirements, garnering on average $1.40 in non-federal funding for every federal dollar we spent. That ratio specifically in 2020 is even more significant,

generating $1.92 for every federal dollar. FFAR is leveraging the $385 million we received from Congress in the 2014 and 2018 Farm Bills to invest nearly one billion dollars in agriculture research funding.

Currently, there is no greater importance than equipping farmers with the tools, strategies and technologies they need to increase resiliency in the face of climate change and other emerging obstacles. Collaborative public-private partnerships are the key to preparing our food system to weather existing and future challenges.

FFAR's ability to build public-private partnerships is evident now more than ever. Over 90 percent of FFAR projects integrate more than one funding partner and over 40 percent have three or more partners. Since 2016, FFAR has gained, on average, 76 new funding partners each year. FFAR's ability to bring together a vast network of partners across academia, industry, NGOs, foundations and the government enables the Foundation to serve as a central convening force in agriculture research.

We know there is much work to be done to strengthen our food system and are prepared to meet these challenges head-on by investing in scientific innovation. Thank you for supporting FFAR in its journey to support audacious research addressing the biggest food and agriculture challenges.

Sincerely,

Mark E. Keenum, Ph.D.
Chairman and Inaugural Member, FFAR Board of Directors
President, Mississippi State University

Letter from Our Executive Director

Dear Friends of FFAR,

Along with the rest of the world, the FFAR team packed up our desks last March and began teleworking. The COVID-19 pandemic quickly exposed severe vulnerabilities in our food supply chain and highlighted the urgent need to invest in research to cope with continued fallout from the current pandemic and prepare for future shocks to the food system.

While the world seemed to be at a standstill in 2020, FFAR forged ahead. We adapted our programs to a new reality and awarded 64 grants last year. A comprehensive list of our 2020 grant awards can be found on the FFAR website. In addition to awarding grants, we are seeing impacts from the grants we have funded. We are thus transitioning our annual report into an impacts report that showcases our grantees' accomplishments.

A major accomplishment this year was FFAR's agile response to the COVID-19 pandemic. We quickly launched three research opportunities to understand emergency food systems, identify supply chain weaknesses and increase knowledge of zoonotic diseases.

To further zoonotic disease research, we expanded the applicant pools for two scientific workforce development programs, our New Innovators in Food & Agriculture Research and Vet Fellows, by covering the normally required 1:1 match with excess match secured by other projects. This adjustment in 2020 enabled researchers to focus exclusively on their research and removed a barrier for researchers at under-resourced institutions.

FFAR has funded climate change research since it was established in 2014, and in February 2020, we amplified these efforts by establishing AgMission (formerly the Agriculture-Climate Partnership) with U.S. Farmers & Ranchers in Action. This global partnership mobilizes farmers, ranchers, scientists, data providers, stakeholders and funders to develop, implement and accelerate climate-smart farming practices at scales previously unimagined.

Agriculture research delivers actionable tools, technologies and strategies that support the mounting challenges farmer, producers and consumers face.

The pandemic amplified the need for agile organizations, like FFAR, that can swiftly respond to emerging issues by investing in research. We must act urgently to address the known and future challenges by funding pioneering research s that can mitigate the threat of future pandemics, climate change and other looming crises.

Agriculture research delivers actionable tools, technologies and strategies that support the mounting challenges farmer, producers and consumers face. FFAR's funding model leverages Congressional funding to form partnerships with the private sector and maximize investment in agricultural research. We have seen firsthand the power of public-private partnerships and are grateful to our more than 500 partners for their collaboration.

Thank you for partnering and investing in research today to overcome tomorrow's biggest challenges.

Sincerely,

Sally Rockey, Ph.D.

Executive Director

Who We Are

The Foundation for Food & Agriculture Research (FFAR) was established by the Agricultural Act of 2014 to identify research gaps and build public-private partnerships to fund pioneering food and agriculture research. The 2014 law allocated FFAR $200 million with the requirement that FFAR match every federal dollar with non-federal funds. Congress allocated FFAR $185 million in the Agriculture Improvement Act of 2018 with the same matching requirement.

While an independent non-profit, FFAR complements and advances the US Department of Agriculture's (USDA) mission and builds programs that are of mutual interest to USDA, FFAR and the agricultural community at large.

FFAR's mission, vision and Strategic Plan guide our efforts to fund research, develop the scientific workforce and engage with a robust network of stakeholders.

The Strategic Plan

FFAR's Strategic Plan outlines five organizational goals that influence all aspects of our work.

Goal 1: Build inclusive public-private partnerships to fund innovative food and agriculture research.

Goal 2: Serve as a leading voice representing food and agriculture research.

Goal 3: Develop the scientific workforce for food and agriculture.

Goal 4: Further FFAR by strengthening the core and achieving financial sustainability through expanding resources.

Goal 5: Further FFAR's mission by honing a high-performing organizational culture and living our values.

Mission, Vision, Values

FFAR rebranded in 2020 and updated our values in the process to better reflect the organization.

Mission

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

Vision

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

Our Values

Audacity
We are an audacious organization, building bold partnerships to fund pioneering research.

Collaboration
We build inclusive, collaborative public-private partnerships to fund research that achieves common goals.

Rigor
We employ a rigorous scientific review process to produce credible results benefiting the public and private sectors.

Pioneer
We pioneer scientific exploration, expanding the frontiers of food and agriculture research to develop solutions that benefit farmers and consumers.

Agility
We agilely approach research and partnerships from multiple perspectives to identify connections across disciplines and opportunities that benefit multiple stakeholders.

FFAR

2020 Progress

Pioneering Food & Agriculture Research

FFAR identifies gaps in food and agriculture research where increased investment will propel science into action. The Foundation then convene a wide range of diverse partners to fund and conduct research.

6
RESEARCH CHALLENGE AREAS

64
2020 GRANTS AWARDED

10
CONVENING EVENTS HELD IN 2020

15
NEW RESEARCH OPPORTUNITIES LAUNCHED IN 2020

FFAR's partnerships successfully leverage federal funds to increase investment in food and agriculture research.

500+
TOTAL FUNDING PARTNERS SINCE 2014

$82M
MATCHING FUNDS*

$42M
FFAR AMOUNT INVESTED IN RESEARCH*

$1:$1.92
RATIO OF FFAR TO MATCHING FUND

Due to the strength of our partners and staff, FFAR leveraged $42M of its federal funding to secure $82M in match funding.

Developing the Scientific Workforce

FFAR offers several fellowships opportunities to equip the scientific workforce with expertise critical for addressing future food and agriculture challenges.

1
NAS PRIZE WINNER

8
NEW INNOVATORS

23
FFAR FELLOWS

11
VET FELLOWS

Engaging Stakeholders

FFAR's focus on collaboration necessitates stakeholder input at all project stages.

When developing a research program, FFAR seeks broad participation from the agriculture community, the FFAR Board of Directors and USDA. FFAR brings together farmers, ranchers, scientists, academics, researchers, philanthropists and members of industry and government to identify research gaps through FFAR Convening Events and other stakeholder engagements. Based on input from these convenings and other sources, FFAR designs scientific programs that generate real-world results. FFAR further engages expert reviewers to evaluate the scientific merit of proposed research.

Additionally, farmers are involved at all levels of advisory and

stakeholder engagement at FFAR, including:

• Concept Development
• Convening Events
• Board of Directors
• Advisory Councils
• Direct Outreach by Program Staff

Farmers have a voice in how FFAR develops research programs from the concept development phase through program approval. The inclusion of farmers in FFAR's work ultimately leads to research results that can be implemented sooner and directly address the problems farmers face.

FFAR's publicly available results are shared with the scientific and agriculture communities in academic journals, reports and updates on the FFAR website.

Aligning with the UN Sustainable Development Goals

FFAR advances research on the United Nations Sustainable Development Goals (SDGs), 17 global goals to enhance peace and prosperity, eradicate poverty and protect the planet:

• Each FFAR Challenge Area supports the SDGs to create a more sustainable future and food system for all.
• FFAR's Scientific Workforce Development programs provide exceptional food and agricultural scientists with funding and mentorship to bolster their careers and

advance the SDGs.
• FFAR and U.S. Farmers & Ranchers in Action (USFRA) teamed up to form AgMission™, uniting farmers, ranchers, scientists and industry to mitigate greenhouse gas (GHG) emissions in agriculture.

Collectively, FFAR's work supports research that advances seven SDGs:

2020 FFAR-Funded Research

FFAR funded 64 grants in 2020. Detailed information about these grants is available on the FFAR website. Following are highlights of these awards.

Research Spotlight

FFAR's COVID-19 Pandemic Response

FFAR agilely responds to critical threats, including the COVID-19 pandemic. FFAR quickly launched three research projects to understand emergency food systems, identify supply chain weaknesses and increase knowledge of zoonotic diseases.

Tipping Points

Supporting FFAR Strategic Goal #1

Scientific Program Director: Dr. John Reich

During the pandemic, a lack of clear federal guidance forced local governments to devise a patchwork of services to support low-income families. FFAR provided a total of $482,642 in supplemental funding to existing Tipping Points program grants to understand and improve emergency food access in response to COVID-19. The researchers worked with emergency food service providers in five cities to understand how decisions made by schools, governments and other emergency food service providers impacted food access.

The Tipping Points program explores the complexities of local food systems in Albany, New York; Austin, Texas; Cleveland, Ohio; Denver, Colorado and Flint, Michigan. FFAR's supplemental COVID investment:

- Established a wide network of partners consisting of 38 companies, universities and organizations, including local and state governments across five states, to yield multifaceted and community-driven projects and impacts.
- Delivered real-time food chain insights during the pandemic that integrated community-specific information and programs.
- Developed new tools including a menu of actions for systems change and a statewide food systems map.
- Discovered the success of local responses to low-income food insecurity depended on three factors:
  1. Cross-sector collaboration: Cities with strong working relationships among stakeholders better supported food security efforts.

  2. Adaptable supply chains: Cities that could handle food shortages and distribution disruptions had success at feeding their vulnerable populations.
  3. Addressing gaps in service to increased risk populations: Prioritizing services to underserved communities decreases instances of food insecurity.

- Published results in an *Applied Economic Perspectives and Policy* article, "Emergency Food Provision for Children and Families during the COVID-19 Pandemic: Examples from Five US Cities."

FFAR also built on an existing Feeding America grant assessing how food systems, and especially emergency food systems, operate and adapt in times of stress. Feeding America used FFAR's supplemental funding to assess how food banks use various supply chains to procure food for clients. The organization is also analyzing data to understand the use of food banks during the pandemic, predict how COVID-19 will impact food systems in the next two years and prepare for future food system shocks.

Grant to Purdue University to Map Food Supply Chain Vulnerabilities

Supporting Strategic Goal #1

Scientific Program Director: Lucyna Kurtyka

FFAR awarded a grant to Purdue University to create a series of open-access online dashboards that quantify and illustrate potential disruptions to the food supply chain. The dashboards focus on COVID-19 but can be tailored to future market disruptions. Microsoft matched FFAR's $221,743 grant for a total investment of $506,743. Microsoft is also supplying cloud technology, business intelligence, artificial intelligence and machine learning tools.

FFAR

Funding Additional Zoonotic Research

Supporting FFAR Strategic Goal #3

Scientific Program Director: Dr. Tim Kurt

FFAR's Veterinary Student Research Fellowship program supports student research on agricultural productivity, public health and environmental sustainability. FFAR adjusted the parameters of the 2020 fellowship to include zoonotic and pandemic research.

FFAR recognizes that supporting the next generation of agricultural scientists is an important investment that benefits both the public and private sectors, therefore the 2020 Vet Fellows were not required to secure matching funds. Periodically, FFAR secures matching funds greater than what it awards to a grant (i.e. greater than 1:1), resulting in "excess match." The Foundation used a portion of excess match to fully fund the Vet Fellows this year, allowing more students to apply to this important program.

The 2020 FFAR Vet Fellows in zoonotic disease research include:

Xinyu Xu, University of Georgia
As environmental change brings wild and domestic animals in increasingly close contact, disease transmission between wildlife and livestock is an emerging threat to food production and human health. Xiu is studying how viruses interact with their human and animal hosts to better understand and predict potential viral spillover between wildlife and livestock.

**Dayna Kinkade, University of Illinois at Urbana-Champaign**
Researchers hypothesize that the influenza A viruses (IAV), also known as the flu, can be transmitted between species, including between humans and pigs. Kinkade is examining the transmission of Influenza A subtype H3N2 virus, a strain of the flu, between humans and pigs from 2014 to 2019. These genetic-analysis tools help determine which strains of the virus are spreading between species and if this transmission is occurring in any specific pattern, information necessary to better monitor the movement and evolution of the Influenza virus.
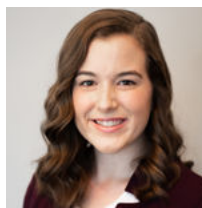
Cassandra Barber, Mississippi State University
Non-antibiotic treatments for zoonotic bacteria and viruses are needed to protect human and animal health and avoid development of antimicrobial resistance. Increased expression of naturally occurring antimicrobial proteins (AMP) by an animal's cells could treat some infections. Using bovine coronavirus and Pasteurella bacteria as models, Barber is investigating whether AMPs can improve animal health and help prevent zoonotic disease transmission.
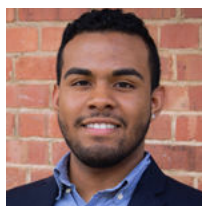
Eddy Cruz, University of Wisconsin
The intestinal pathogen Salmonella enterica causes disease in many animal species as well as humans. It is unclear how the gut environment primes Salmonella for transmission, but researchers understand that animal gut microbiota produce sulfur-containing molecules, which can enhance Salmonella infection. Cruz is examining how Salmonella uses these sulfur molecules, to help to inform treatment and prevention strategies.

Kenzie Schwartz, University of Georgia
The east Asian longhorned tick, Haemaphysalis longicornis, can carry several pathogens that are harmful to cattle and humans. Schwartz is determining the diversity and abundance of the east Asian longhorned tick and other ticks in urban and forested parks in Athens, Georgia and whether species abundance and diversity is related to differences in habitat.

Research Spotlight

AgMission

Supporting FFAR Strategic Goal #1

Scientific Program Director: Dr. LaKisha Odom

In February 2020, FFAR and U.S. Farmers & Ranchers in Action (USFRA) established the Agriculture Climate Partnership, since rebranded as AgMission, a global partnership with the goal of helping agriculture achieve net negative greenhouse gas (GHG) emissions. AgMission mobilizes farmers, ranchers, scientists, data providers, stakeholders and funders to develop, implement and accelerate climate-smart farming practices at scales previously unimagined.

AgMission envisions an expansive, public-private partnership grounded in technology, research and worldwide data sharing that coordinates the efforts of organizations and companies currently focusing on climate science. This effort will result in

customized solutions for individual farms and ranches that will initially be deployed nationwide, and ultimately, worldwide.

FFAR has already invested $50 million in projects advancing research to reduce GHG emissions from agriculture and are seeking matching funds from outside partners to accelerate and expand the program.

AgMission builds on several existing FFAR-funded climate change initiatives, including:

- Ecosystem Services Market Research Consortium (ESMRC)
- Open Technology Ecosystem for Agricultural Management (OpenTEAM)
- Adaptive Multipaddock Grazing Project

Research Spotlight

Partnering with CIMMYT

Supporting FFAR Strategic Goal #1

Scientific Program Director: Dr. Jeff Rosichan

Wheat constitutes 20 percent of all calories and protein consumed, making it a cornerstone of the human diet. However, hotter and drier weather, driven by a changing climate, threatens the global wheat supply. To address this threat, we awarded a $5 million grant to the International Maize and Wheat Improvement Center (CIMMYT) to develop climate-resilient wheat.

CIMMYT researchers and collaborators are applying cutting-edge approaches in genomics, remote sensing and big data analysis to develop new breeding technologies that produce heat-tolerant, drought-resistant and climate-resilient wheat. A key intervention explores the vast and underutilized reserve of wheat genetic resources to fortify the crop against current and future climate-related stresses.

$5 million
FFAR Award Amount

Matching Funder Awards

- $4.5 million contribution from the CGIAR Research Program on Wheat
- $7.5 million contribution from Accelerating Genetic Gains for Maize and Wheat, which is jointly funded by the Bill & Melinda Gates Foundation and the UK Foreign, Commonwealth, and Development Office

$17 million
Total Project Budget

Dr. Kevin Pixley
CIMMYT Interim Deputy Director for Research

'Heat,' 'drought' and 'wheat' are three of the most important words for billions of people. This partnership between CIMMYT and FFAR will help ensure that the best agricultural science is applied to sustainably raise production of one of the world's most important staple crops, despite unprecedented challenges.

cultivate. discover. g

FFAR signature event

2020 Events

Sen. Debbie Stabenow (D-MI), Ranking Member, US Senate Committee on Agriculture, Nutrition, & Forestry, 2015–2021 and former Vice President Al Gore discuss agriculture's role in addressing climate change during Foster Our Future's keynote address.

Supporting FFAR Strategic Goal #2

FFAR hosts numerous events annually to develop, fund, refine and review research concepts and grants. In light of COVID-19, FFAR pivoted to host several virtual events to identify gaps, generate scientific programs and connect members across the food and agricultural community.

Event Spotlight

Foster Our Future 2020

FFAR hosted its second signature event, Foster Our Future, in Washington, D.C., on February 5, 2020. This exciting food and agriculture exposition included interactive exhibits and discussion forms with leaders in the field. More than 450 individuals attended this first-of-its-kind event.

Participants discovered how research and science is changing the food and agriculture landscape. They wandered through

exhibits, heard from leading experts and interacted with the next generation of food and agriculture scientists.

The evening session featured Congressional Agriculture Research Caucus co-chairs Rep. Rodney Davis (R-Il.) and Rep. Jimmy Panetta (D-CA) and a keynote address with former Vice President Al Gore and Senator Debbie Stabenow (D-MI), chairwoman of the Senate Committee on Agriculture, Nutrition, and Forestry.

From left to right: FFAR Executive Director Dr. Sally Rockey with former Vice President Al Gore and Sen. Debbie Stabenow (D-MI) backstage during Foster Our Future's evening session.

From left to right: FFAR Executive Director Dr. Sally Rockey introduces Chief Operating Officer Julie Reynes, who moderates a panel featuring Congressional Agriculture Research Caucus co-chairs Rep. Rodney Davis (R-IL) and Rep. Jimmy Panetta (D-CA).

FFAR

Impact in Action

Impact Snapshot

Since 2014, FFAR has awarded more than 210 grants across 40 states and six countries and allocated more than $272 million to fund audacious food and agriculture research. FFAR has exceeded our 1:1 matching requirement by achieving an average 1:1.4 matching ratio over the past six years and a ratio of 1:1.92 in 2020. Additionally, the Foundation has collaborated with more than 500 partners in funding research-related activities.

Value of Our Impact

FFAR's work is greater than the sum of its parts. Through public-private partnership and research grants, FFAR:

- Continues to establish a network of collaborative partners;
- Tackles challenges facing farmers, ranchers, processors and retailers as well as those that exist across food and agriculture supply chains;
- Maximizes federal and private research investments;
- Integrates applicability and feasibility throughout projects, ensuring that research goes beyond shelves to farmers and other producers for swift implementation.

70%

70% OF FFAR-FUNDED PROJECTS ENGAGE PARTNERS FROM MULTIPLE SECTORS

6

SIX CONSORTIA HAVE BEEN ESTABLISHED WITH A TOTAL OF 70+ PARTNERS

>40%

>40 PERCENT OF FFAR PROJECTS DEVELOP ACTIONABLE TOOLS FOR IMMEDIATE USE BY INDUSTRY AND ON FARMS

Mohammed Oufattole
VP of Research and Development, Benson Hill

FFAR's collaborative approach to accelerate the development of breakthrough technologies aligns with Benson Hill's mission to empower innovators and leverage the untapped natural genetic diversity of plants. Forging unlikely partnerships between various industry leaders and public institutions is exactly the type of congruence required to address the grand challenges facing agriculture.

FFAR

Impact in Action
Grants, Programs and Initiatives

FFAR-funded initiatives are already yielding results and generating impact. Below are several projects that showcase FFAR's pioneering impact, which provides applicable knowledge and tools to support farmers, producers and consumers.

Impact Highlight
Adaptive Multi-Paddock Grazing for Cattle

Supporting FFAR Strategic Goal #1

Scientific Program Director: Dr. LaKisha Odom

ASU Foundation for A New American University
Grantee

$1.25 million	$4.5 million	McDonald's USA	2018
FFAR Award Amount	Total Award Amount	Matching Funder	Year Awarded

Adaptive multi-paddock (AMP) grazing uses light-weight, portable fencing systems to move animals strategically around a large pasture, allowing for dense grazing interspersed by long periods of recovery for the land. This technique mimics the natural grazing patterns of wild ruminants and is highly adaptive for a variety of livestock.

Researchers are collaborating with cattle ranchers to study farming operations in the Southeast and Great Plains regions in the US, understand producer perceptions about AMP grazing and evaluate real-world applications of the practice. This project is addressing issues of animal wellbeing and productivity.

The AMP Grazing project fosters collaboration across eight universities, five private/industry partners, one federal agency and eight states. This project further integrates farmers and ranchers into the research and has done so from the beginning. Such collaboration ensures the results can be easily and immediately implemented during the project and after it is completed.

Impact

- Early results indicate AMP is an effective and climate-smart land practice.

- AMP grazing improves carbon storage in the soil as compared to conventional grazing. This research was published in the *Journal of Environmental Management*.

- Researchers further note improved vegetation composition and biomass and forage quality, which indicates improved soil health.*

- The research team also sees a correlation between AMP grazing and a higher presence of rare grassland bird species, indicating that AMP grazing may produce conservation benefits.*

Pre-peer reviewed results

Eileen Hyde
Director, Walmart.org

Our investment in research with FFAR aims to foster innovative initiatives to reduce food waste from farm to fork and benefit all stakeholders. Leveraging the strengths of both the public and private sectors helps amplify the impact of the Walmart Foundation's philanthropic capital.

Impact Highlight

Crops *in Silico*

Scientific Program Director: Dr. John Reich

University of Illinois
Grantee

$2.5 million	$5 million	University of Illinois	2019 & 2017
FFAR Award Amount	Total Award Amount	Matching Funder	Award Year

Crops *in silico* received an initial FFAR grant in 2017 to provide seed funding for this work and a grant in 2019 to continue building the model.

With the global population increasing and the climate continuing to change, understanding how crops respond – and may be adapted to environmental changes – is critical to current and future food security. Developing crops using traditional methods is research, labor and cost intensive. FFAR awarded grants to the University of Illinois' Crops *in silico* (Cis) project to build a computational platform that integrates multiple models to study a whole plant virtually. Researchers have models depicting individual plant processes. This project integrates the individual models into a whole plant system model. Instead of assessing one aspect of the plant process, *Cis* allows researchers to determine how crops respond to multiple environmental changes at all biological levels.

Cis allows researchers to quickly determine and test characteristics that help crops thrive in specific environments. This modeling allows researchers to conduct more experiments than can be realistically achieved in a field. With *Cis*, billions of possible changes and combinations of changes can be tested to achieve more productive and sustainable crops in different environments.

Impact

- This grant maximized an initial investment of $274,000 to secure a seven-fold reinvestment, totaling $5 million from FFAR and partners.

- The initial seed funding yielded an innovative platform to link computational models to simulate plant growth and development.

- The project is yielding a publicly accessible platform for plant scientists around the globe.

- Models simulate growth cycles that may reduce the need for lengthy field trials.

Impact Highlight
Chick Vaccination

Scientific Program Director: Dr. Tim Kurt

Applied LifeSciences & Systems
Grantee

$800,000	$1.6 million	Merck Animal Health	2017
FFAR Award Amount	Total Award Amount	Matching Funder	Award Year

Large commercial hatcheries, which produce over a million chicks per week in the US, must quickly and efficiently vaccinate day-old chicks to protect them from disease. These hatcheries rely on wide-scale spray vaccines, which are imprecise and leave an estimated 5-20 percent of chicks unvaccinated or partially vaccinated. Thus, when a disease outbreaks strike, hatcheries must use antibiotics to treat secondary infections, resulting in animal welfare concerns and significant economic losses.

Currently, the only way to vaccinate individual chicks is manually, which is not viable at the commercial scale. FFAR's grant to Applied LifeSciences & Systems (ALS-S) is developing a device to efficiently vaccinate individual chicks. Using imaging technology and robotics, the device can recognize each bird's position and deliver a vaccine to each chick. This research provides greater protection against disease, improves animal welfare and increases overall productivity.

Impact

- Based on the research conducted under the initial FFAR grant, the grantee secured an additional $8 million from a third-party funder for further research and business development.

- Results indicate the device's vaccination rate is 95 percent and the device can individually vaccinate 100,000 chicks per hour.

- This research is directly applicable to food production and antibiotic stewardship.

FFAR

Impact Highlight

Crops of the Future Collaborative

Supporting FFAR Strategic Goal #1

Scientific Program Director: Dr. Jeff Rosichan

$10 million	$20 million	2018
FFAR Award Amount	Total Award Amount	Award Year

Matching Funders

Bejo Zaden; Benson Hill; CIMMYT; Elo Life Systems; Enza Zaden Research and Development; Gautier Semences; KeyGene; KWS Saat; Nunhems Netherlands; Progeny Genetics; Ramiro Arnedo; Rijk Zwaan Zaadteelt en Zaadhandel; Sakata Seed Corporation; Sao Paulo Research Foundation (FAPESP); Syngenta Crop Protection AG; Takii and Company, Ltd.; Vilmorin S.A.

Keeping farmers competitive and profitable requires developing products at an unprecedented pace. Yet, research and development (R&D) can be financially risky, making it costly for companies to maintain independent research programs. Participation in research consortia allows companies to cost-effectively advance R&D. Crops of the Future (COTF), a public-private collaborative, expands knowledge of traits that give rise to characteristics crops need to adapt to a changing future.

COTF develops resilient crops with genes and traits that allow them to thrive despite pests, pathogens and extreme weather. The research further focuses on increasing crop diversity and developing crops with higher nutritional content. COTF research yields the traits needed to meet global nutritional demands in a changing environment by focusing on four key areas:

- Crop resilience
- Crop diversity
- Cross-crop technologies
- Market development for new crops

The initial research projects focus on maize, leafy greens, wheat and small grains.

FFAR provided COTF with an initial $10 million investment, which COTF participants matched for a total investment of $20 million to further crop science. COTF participants jointly define the research issues, pool resources and knowledge and use the research outcomes to compete in the marketplace.

Impact

- COTF's partner network has grown from nine founding partners to include 17 participants and funders.

- COTF is currently funding nine research projects from three distinct consortia initiatives.

- FFAR's $10 million initial investment has been matched by $47 million in non-federal funding, a nearly 1:5 enhancement of the initial commitment.

- The research projects have yielded field trials focused on corn drought, molecular marker development for pathogens and characterization of effective resistance genes for downy mildew in leafy greens.

Impact Highlight
National Strategy to Reduce Food Waste

Supporting FFAR Strategic Goal #1 & #2

Scientific Program Director: Lucyna Kurtyka

National Academies of Sciences, Engineering and Medicine
Grantee

$336,000	$673,000	Walmart Foundation	2018
FFAR Award Amount	Total Award Amount	Matching Funder	Award Year

Every American wastes, on average, a pound of food daily. Consumer food waste contributes to food insecurity, unhealthy diets and climate change. Food waste also generates losses of revenue, nutrients and the inputs used to grow the food.

To better understand consumer food waste, FFAR invested in a National Academies of Sciences, Engineering and Medicine report, "A National Strategy to Reduce Food Waste at the Consumer Level." The report offers actionable suggestions that multiple stakeholders can implement to reduce consumer food waste. According to the report, food waste behaviors are driven by conscious and unconscious factors that act collectively in different ways. The report suggests tools and motivations to help consumers change their habits.

Report Insights & Recommendations

The report offers three pathways that institutions, including industry associations, schools and government agencies, can take to reduce food waste at the consumer level:

1. Change the US food environment to discourage waste by consumers by:
   - Including food waste reduction in industry certification.
   - Developing and standardizing "best by" date labeling.
   - Implementing state and local policies and incentives to prevent consumer food waste.
   - Implementing change and innovation in the food industry.

2. Strengthen consumers' motivation, opportunity and ability to reduce food waste by:
   - Conducting a national behavior change campaign.
   - Boosting messaging about food waste through influencers.
   - Promoting food literacy in education curricula.

3. Apply research findings and technology to support consumers in food waste reduction by supporting research and technology to accurately measure food waste, helping consumers reduce food waste reduction and tracking the effectiveness of these strategies.

Impact

- The report identified 11 drivers of food waste, and other interventions that focus on education, financial incentives and value appeals.

- The report is timely and being distributed widely. According to the National Academies, this report is in the top 11 percent of National Academies reports by download statistics. Further, the public at large accounted for 72 percent of the report downloads.

- This report leverages FFAR's "voice" and relationships to amplify a broad strategy specific to food and agriculture.

FFAR

Impact Highlight
Seeding Solutions

Supporting FFAR Strategic Goal #1

Scientific Program Director: Dr. Kathleen Boomer

Launched in 2017, Seeding Solutions is FFAR's annual competitive grant program supporting bold research in any Challenge Areas. FFAR awards up to ten grants annually ranging between $300,000 to $1 million. Grantees must provide matching funds from non-federal partners.

This program supports innovative projects addressing challenges in food supply and agroecosystem management with a focus on novel partnerships. Such collaborations provide opportunities to engage stakeholders as integral members of the research team and increase the likelihood of a project's application beyond its scope.

Impact

- 80 percent of projects develop industry-focused tools.

- 50 percent of projects directly engage farmers and ranchers in the research.

- 40 percent of projects provide publicly accessible tools and data before or by the end of the project.

- 30 percent of projects directly engage communities in research.

FFAR Convening Events

Convening events are a central part of how FFAR develops and funds research. FFAR brings together partners from across the food and agriculture industry to identify gaps, generate scientific programs with real-world applications and highlight funded research.

These events foster collaboration and advance knowledge across the food and agriculture landscape. Furthermore, this approach ensures funded research addresses problems farmers face by bringing all stakeholders together to focus efforts solutions, opportunities, implementation and knowledge transfer.

FFAR host an average of 12 convenings events each year, with over half of them specifically focusing on potential research gaps.

>30%

>30 PERCENT OF CONVENING EVENTS GENERATE NEW OR EXPAND RESEARCH OPPORTUNITIES WITHIN A YEAR

2020 Scientific Workforce Development

FFAR's Scientific Workforce Development programs and fellowships support the next generation of food and agriculture scientists.

Zachary B. Lippman

Cold Spring Harbor Laboratory
Howard Hughes Medical Institute

For genetic studies into developing hardier crop breeds.

2020
NAS Prize in Food and Agriculture Sciences

National Academy of Sciences Prize in Food & Agriculture Sciences

In partnership with the Bill & Melinda Gates Foundation, FFAR established the National Academy of Sciences (NAS) Prize in Food & Agriculture Sciences in 2017. The award recognizes extraordinary contributions to agriculture and the biology of species important to food and agriculture production. The annual prize recognizes one mid-career scientist at a US institution working in a scientific field applicable to agriculture.

Dr. Zachary B. Lippman, a Jacob Goldfield Professor of Genetics at Cold Spring Harbor Laboratory and an Investigator of the Howard Hughes Medical Investigator, is the 2020 recipient of the NAS Prize in Food & Agriculture Sciences.

Lippman's research focuses on increasing crop productivity to address threats to food security from climate change and population growth. His research is harnessing genes that determine when, where and how many flowers are produced on a plant. Specifically, Lippman discovered timing mechanisms that control how many flowers a plant produces. This discovery allows him to control how much fruit and how many seeds a plant generates. When combined with gene editing and hormones that control flowering, Lippman and his team can accelerate the domestication process of a wild plant. Lippman's work is increasing yields, creating new crops and adapting crops to new environments. This research ultimately advances the domestication of new and underutilized crops needed to meet global food demands.

New Innovators in Food & Agriculture Research Award (New Innovator Award)

Supporting FFAR Strategic Goal #3

Young scientific faculty often struggle to secure grant funding. FFAR's New Innovator Award provides early-career scientists the investment needed to propel them into successful research careers.

The New Innovator Awardees are promising scientists whose research addresses significant food and agriculture challenges. FFAR awards these grants to individuals with creative ideas, skills, knowledge and the resources necessary to carry out the proposed research program.

Scientific Program Director: Lucyna Kurtyka

Impact

- FFAR granted more than 40 New Innovator Awards since 2016, with recipients conducting research that supports all FFAR Challenge Areas.

- New Innovator Awardees pursue applied research and publish results in academic journals.

- New Innovator projects are yielding software tools valuable beyond the project.

FFAR Veterinary Student Research Fellowships (FFAR Vet Fellows)

Supporting FFAR Strategic Goal #3

Population growth, climate change, emerging infectious diseases and antimicrobial resistance threaten sustainable livestock production globally. Veterinarians trained in multi-species medicine, animal science and public health are key to addressing these challenges. However, few funding opportunities exist for veterinary students to gain experience in these research areas.

FFAR and the Association of American Veterinary Medical Colleges created a summer fellowship for veterinary students

Scientific Program Director: Dr. Tim Kurt

to prepare future veterinarians for research and public service careers. FFAR Vet Fellowships are paired with a qualified mentor to gain hands-on research experience examining urgent issues that threaten animal health. This Fellowship is currently in its second year and has funded grants to 20 veterinary students.

Impact

- FFAR seamlessly integrated relevant zoonotic research into the program in response to the coronavirus pandemic.

Kirchner Food Fellowship

Supporting FFAR Strategic Goal #3

Bold business investment is critical to solving mounting food and agriculture challenges. While the amount of investment capital focusing on social and environmental impact is increasing, global access to this capital is not. FFAR began partnering with the Kirchner Food Fellowship in 2018 to fill this

Scientific Program Director: Dr. LaKisha Odom

gap. The Fellowship trains student on evaluating investment decisions that support agriculture-related businesses. The Fellowship provides mentorship from investors and offers students discretion over investment decisions for companies solving critical food and agriculture challenges.

FFAR Fellows Program

US food and agricultural systems regularly experience new challenges, including climate change and evolving pests and pathogens. Employers need early-career scientists trained to conduct research that helps farms and food systems adapt to these unprecedented changes.

The FFAR Fellows Program, established with North Carolina State University, provides grants to pursue research that aligns with FFAR Challenge Areas as well as career guidance. Unique to this program, FFAR prepares fellows for the workforce by breaking down the disciplinary silos, providing professional development and focusing on soft skills. Additionally, students are paired with industry mentors who offer career guidance. In partnership with industry leaders, this $2.7 million grant prepares the future agricultural workforce.
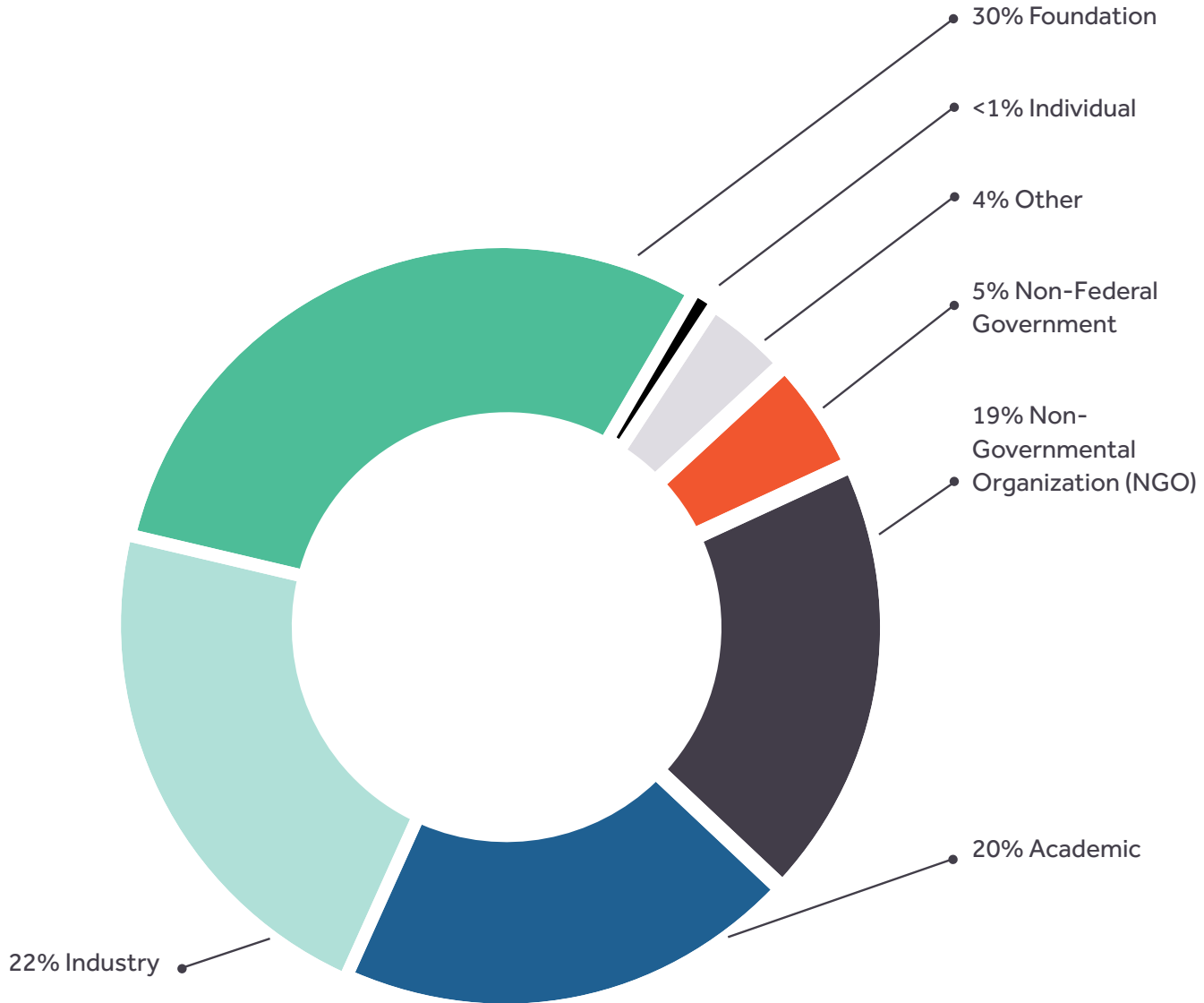
Impact

- Based on the success of the initial three cohorts, totaling 57 fellows, the National Science Foundation provided over $1 million to North Carolina State University to further support this research.

Matching Funding

Our top three sectors matching funds are academic institutions, foundations and industry groups.

- 30% Foundation
- <1% Individual
- 4% Other
- 5% Non-Federal Government
- 19% Non-Governmental Organization (NGO)
- 20% Academic
- 22% Industry

Dr. Ken Opengart

VP Animal Welfare & International Sustainability, Tyson Foods

Tyson Foods and FFAR have collaborated on several projects to advance animal welfare practices and innovation. In addition to FFAR's ability to provide matching funds, their facilitation of collaborations, highly engaged and expert staff, and professional management of FFAR supported projects is truly invaluable.

Contributor Information

VISIONARY LEVEL - $500,000 +

The Kroger Co. Zero Hunger | Zero Waste Foundation

McDonald's

Open Philanthropy

INVESTOR LEVEL - $250,000 to $499,999

Anonymous Donor

CHAMPION LEVEL - $100,000 to $249,999

Accenture

Amazon Web Services, Inc.

Inari Agriculture Inc.

KWS SAAT SE

Syngenta Crop Protection, LLC

U.S. Poultry & Egg Association

FRIEND LEVEL - $10,000 to $99,999

BASF

Benson Hill, Inc.

Elo Life Systems

Enza Zaden

Fluence by OSRAM

Genus plc

KeyGene

Nunhems Netherlands B.V.

Rijk Zwaan

Tyson Foods

Vilmorin S.A.

Walton Family Foundation

Zoetis

OTHER - $9,999 AND BELOW

AmazonSmile

Anuvia Plant Nutrients

Combined Federal Campaign

Discovery Park of America

JP Morgan Securities Charitable Gift Fund

Land O'Lakes Inc.

Network For Good

Philanthropic Ventures Foundation

Rochester Institute of Technology

INDIVIDUALS

Anonymous Donor

Anonymous Donor

Kathryn Boor

Douglas Buhler

Douglas Cameron

Amy Chesmer

Nancy Creamer

Deborah Delmer

The Hon. Dan Glickman

Maile Hartsook

Mr. & Mrs. Robert Horsch

Mark Keenum

Lucyna Kurtyka

John Lumpkin

Pamela Marrone

Terry McElwain

Benjamin Noble

Stanley Prusiner

Julie Reynes

Danita Rodibaugh

Bob Stallman

Richard Tashjian

Alton Thompson

FFAR

FFAR Financials

ASSETS

Cash and equivalents	$9,704,723
Certificate of deposit	200,248
Contributions receivable	367,236
Award match receivable	117,920,690
Investments	318,678,897
Security deposits	141,587
Total assets	$447,013,381

LIABILITIES AND NET ASSETS

Liabilities	
Accounts payable and accrued expenses	$605,602
Grants payable	189,580,242
Conditional grant	176,083,551
Deferred rent	655,443
Total liabilities	$366,924,838
Net assets	80,088,543
Total liabilities and net assets	$447,013,381

STATEMENT OF ACTIVITIES

Year Ended December 31, 2020

REVENUE

Recognition of Federal appropriation	$84,328,897
Matching award revenue	85,492,923
Investment income	20,553,439
Consortia revenues	396,500
Contributions	27,915
Event revenues	140,523
Other revenue	53,432
Total revenue	$190,993,629

EXPENSES

Program	
Grants and awards program	$129,782,811
Supporting services	
General and administrative	2,141,007
Development	1,117,726
Total expenses	$133,041,544

TOTAL REVENUE LESS EXPENSES	$57,952,085

On the Horizon

Continuing Core Research

Looking ahead, FFAR continues to fund research to address Challenge Areas and develop the scientific workforce. New and annual funding opportunities arise throughout the year; all are listed on the FFAR website.

Capitalizing on Climate

FFAR continues to fund research that help crops, livestock and farmers mitigate and adapt to the effects of climate change as part of the Challenge Area and Scientific Workforce Development grants.

Additionally, FFAR and USFRA continue developing AgMission to reduce GHGs in agriculture. AgMission's initial work includes mapping existing research and partnerships to avoid duplicative efforts and break down research silos.

AgMission funded a National Academy of Sciences Review to identify how to best implement specific practices necessary to create negative GHG emissions. The review is creating a Scientific Roadmap to a Carbon Negative Agriculture System to implement the most promising strategies to achieve carbon negative agriculture.

PepsiCo committed $5 million to AgMission in 2021. FFAR and USFRA are seeking additional partners to join AgMission with a current focus on improving sustainable agriculture nationally, and eventually, globally.

Addressing Diversity, Equity & Inclusion

Our commitment to diversity, equity and inclusion (DEI) is deeply rooted in our efforts to build public-private partnerships representative of the entire food and agriculture community, while fostering a collaborative working environment. Internally, FFAR is developing a DEI statement and creating a concrete plan to build a more diverse, equitable and inclusive organization. Simultaneously, FFAR is increasing DEI engagement with external stakeholders through targeted-funding initiatives and increased outreach.

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