Seeding Solutions Request for Application

The Foundation for Food and Agriculture Research (FFAR) is once again seeking applications through our Seeding Solutions funding opportunity. FFAR, as a core component of our mission, is putting a call out to the community in an effort to encourage the development of unique partnerships that support innovative and potentially transformative research focused on our newly updated Challenge Areas. For 2019, FFAR anticipates funding at least one meritorious and transformative application in each of our newly redesigned Challenge Areas. This year, FFAR is placing priority on those projects that demonstrate strong partnerships and significant agricultural advancements through innovation.

> ## Key Dates
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> Pre-Application Open: March 1, 2019 at 12:00pm ET
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> Pre-Applications Due: April 19, 2019 at 5:00 PM ET
> ***Submitting a pre-application is required to submit a full application.***
>
> Full Application Invitation: June 12, 2019
>
> Full Application Receipt Open: June 12, 2019 at 12:00pm ET
> ***Only open to applicants invited to submit a full application.***
>
> Full Applications Due: August 7, 2019 at 5:00 PM ET
>
> Award Notification: Early Winter 2019
>
> Anticipated Project Start Date: Early Winter 2020

We encourage applicants to reach out to the appropriate Scientific Program Director for their Challenge Area of interest to hone their ideas prior to submitting a pre-application (details below).

To be considered, applications must address and provide solutions to an intractable problem and/or accelerate innovation within FFAR's Challenge Areas.

What we are looking for

To be considered, applications must describe transformative research that addresses and provides solutions to an intractable problem and accelerates **innovation** within FFAR's Challenge Areas.

We define innovation for this request for applications (RFA) in three categories:

1. Applied Innovation: Application and validation of **new or emerging** technologies, processes or management strategies to address major challenges in food and agriculture.
2. Re-imagined Innovation: Adaptation of **existing** technologies, processes or management strategies for use in entirely new agricultural applications.
3. Radical Innovation: **Development** of **new** technologies, software, algorithms, methodology or products.

We are actively seeking projects that foster innovation with the potential for transformative impact in each of FFAR's Challenge Areas. FFAR will only consider research applications that:

1. Have the potential for a transformative impact within the selected Challenge Area. The Challenge Areas are:
   - Health- Agriculture Nexus
   - Advanced Animal Systems
   - Sustainable Water Management
   - Soil Health
   - Next Generation Crops
   - Urban Food Systems

2. Demonstrate partnerships with different sectors (private, NGOs, governments, academia, end users, etc.), such that research outcomes may be scalable and applicable to food and agriculture systems. **Applications that demonstrate strong partnerships by way of matching from external sources outside the applicant institutions are encouraged. These partners may include but are not limited to private sector, non-profits, commodity and trade groups, state governments, and others that do not traditionally work in agriculture.**

3. Contribute to the goal of sustainable food and agriculture, defined as practices that, "satisfy human food and fiber needs; enhance environmental quality and the natural resource base upon which the agricultural economy depends; make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; sustain the economic viability of farm operation; and enhance the quality of life for farmers and society as a whole." (Food and Agriculture, Conservation and Trade Act of 1990, Public Law 101-624, Title XVI, Subtitle A, Section 1603).

4. Serve the public good by making data open and accessible to the public, creating unique economic development opportunities, and/or contributing to food and agriculture workforce development.

Eligibility

The Foundation for Food and Agriculture Research welcomes applications from all U.S. institutions of Higher Education, non-profit and for-profit organizations, government-affiliated researchers, and domestic and international organizations.

Any individual(s) with the skills, knowledge, and resources necessary to carry out the proposed research as Program Director(s)/Principal Investigator(s) is invited to work with his/her organization to develop an application for support.

Award Information

     Anticipated Project duration: Between 12 and 60 months

     Minimum Request from FFAR per Application: $300,000

Maximum Request from FFAR per Application: $1,000,000

Applicants are advised not to interpret the maximum allowable amount under this opportunity as a suggestion that they should expand their anticipated budget to this level. Reasonable budgets clearly work in favor of the applicant. Budgets that are not commensurate with proposed work or poorly justified will likely have a negative impact on the overall evaluation of the application.

- The number of projects selected for funding may vary by Challenge Area.
- At least <u>one-to-one match is required for this opportunity</u>. Matching funds must come from a non-federal source. Our Matching Guidelines can be found [here].
- Matching funds must correspond to line items in the full application budget. At least 50% of matching funds must be cash match. The remainder could be in-kind match. Matching funding must supplement and not supplant any pre-existing funds for the project. FFAR encourages applicants to reach out early in the process to work through any issues with how the funds will meet FFAR's matching requirements. Establishing a relationship with FFAR will ease the process going forward for this and future interactions the two organizations may have.
- Indirect Expenses: A maximum of 10% of the total award may be used for indirect costs. FFAR's indirect cost allotment is not an indirect cost rate applied to the total modified direct costs but instead it is an overall allotment from the Total Funds Request, also known as the Total Project Costs, to be used for IDC. This means 90% of the total funds requested must go directly to the proposed research. For example, if you request the maximum, the total direct cost available to the project is $1,000,000/1.\overline{1} = \$900,000$. Indirect costs cannot exceed 10% of the total.
- Indirect costs cannot exceed 10% of the total budget (FFAR contribution+ grantee's matching funding). Please carefully review our IDC policy in the Instructions Tab of the budget template.
- Estimated Number of Awards: to be determined. The number of awards depends on the quality and the total funds requested of successful application. The number of applications funded is left totally to the discretion of FFAR including choosing not to fund any applications under this opportunity.

Anticipated Award Date: Late Fall 2019

Application Components
Applicants are required to upload a 3-page project description of their pre-application **AND** complete the online application form. The uploaded pre-application should be formatted using Calibri or Times New Roman, 11pt font, single spaced, 1-inch margins. Figures may be included as a separate file. If you have questions, please contact the FFAR Grants Management staff at grants@foundationfar.org.

To view the application, please download the application template here. Note that all applications must be submitted through FFAR's grant management system to be evaluated.

Pre-Application Components
Required components
- Project title (*up to 250 characters*)
- Key personnel involved in the project – name(s), affiliation, expertise, role on the project
- Proposed project overview/description
  - What is the issue the project is trying to address? (*up to 500 words*)
  - What research gaps will the project fill? (*up to 500 words*)
  - Innovation: Please describe how the approach, methodology, technologies or products will significantly advance the food and agriculture sector, provides solutions to an intractable problem and accelerates **innovation** within FFAR's Challenge Areas. (*up to 500 words*)
- Budget
  - Total FFAR funding request
  - Total matching funds
  - Total proposed budget (*FFAR funds + matching funds*)
- Proposed project start date
- Proposed project duration (*in calendar months*)
- Funding partners: List any committed or potential funding partners, describe why they are an appropriate source of matching funds, and any prior contact you have had or relationship you have developed with them about this project.

Applications that demonstrate strong partnerships by way of matching from external sources outside the applicant institutions are encouraged. These partners may include but are not limited to private sector, non-profits, commodity and trade groups, state governments, and others that do not traditionally work in agriculture.

Full Application Components
Required components
- Project title (*up to 250 characters*)
- Proposed budget
  - Total FFAR request
  - Total matching funds
  - Total proposed budget (*FFAR funds + Matching Funds*)
- Budget justification (*up to 1,330 words*)
- Key Personnel

- Public abstract (*up to 330 words*)
- Project Executive Summary (*up to 6,000 words*)
- Project Description (*up to 1,665 words*)
- Innovation to be developed or accelerated (up to 665 words).
- Goals and objectives (*by year*; *up to 1,000 words*)
- Anticipated outcomes or outputs (*up to 1,000 words*)
- Data Management Plan (*up to 500 words*)
- Barriers to adoption of your research outcome(s) (*Note: Collaboration on this issue with socio-economic scientists is highly encouraged.*) (*up to 665 words*)

- Organization Assurances
  - Research involving human subjects
  - Research involving vertebrate animals
  - Research involving Recombinant DNA
  - Research involving National Security implications
  - Research involving hazardous materials
  - Research involving human fetal tissue
  - Research involving NEPA review

Attachments
- Required Attachments
  - Budget Form
  - PI and Key Personnel Biosketch: three-page limit per individual listed as PI or key personnel in the project
  - Current and Pending Support Form: complete for everyone listed as PI or Key personnel on the project
  - Project timeline (by year)
  - References cited
  - 5-slide summary/description of project

- Optional attachments to support project description: This section should not be used to circumvent the page/word limit for the Research Program Plan Section.
  - Letters of Support: Applicants can provide letters of institutional, collaborator, or stakeholder support for the proposed project, especially from matching funders. Please combine all letters of support into a single PDF document before uploading as an attachment.
  - Graphics, Figures, Equations, and Tables: The textbox for the Research Program Plan does not support equations, tables, graphics, and figures. Applicants may upload a PDF document with graphics, figures, tables, or a list of equations to support the research program plan. **Five-page limit.**

Application Submission Guidelines
Applications must be submitted through FFAR's online application receipt system. If you are a new user, register for an account by clicking the green "Register" button at the top right corner of the

[home page](#). You will receive a confirmation email to activate your account before you can sign-in to your account. Once you log in, click on the corresponding program to start your application.

Only applications submitted through this portal will be considered eligible for evaluation. FFAR will not accept applications submitted by any other medium. There is a two-hour grace period for all deadlines. Applications that are not submitted by the deadline or within the grace period will not be accepted. To be fair to all our applicants, FFAR cannot grant an extension to applicants who missed the deadlines posted in the [Key Dates](#) section.

Application Review Process
Pre-Application Review
All submitted pre-applications will go through an internal review process to ensure that the proposed project is relevant to the RFA and suitable to FFAR's mission. Only the most innovative and cutting-edge projects with significant potential for advancing agricultural research will be invited to submit a full application. Applicants should expect to be notified by email of whether they are invited or not invited to submit a full application no later than June 12, 2019. ***The pre-application is a prerequisite, therefore, only applicants submitting a pre-application are eligible to receive an invitation to submit a full application.***

Full Application Review
Successful applicants invited to submit a full application will undergo further review using a two-stage peer review process: (1) External Peer Review, and (2) FFAR Advisory Council review. In the first review stage, applications will be evaluated by an independent, external peer review panel of scientific experts using the application review criteria below. In the second review stage, applications judged to be most meritorious by external peer review panels will be evaluated and recommended for funding by the FFAR Advisory Council based on comparisons with applications from the same cycle and FFAR's program priorities. All reviewers are required to read and acknowledge acceptance of FFAR's [Conflict of Interest Policy](#) and [Non-Disclosure Agreement](#). We make reasonable efforts to ensure that applications are not assigned to reviewers with a real or apparent conflict with the applicant or project personnel. Reviewers with a conflict of interest are recused from evaluating or participating in the discussions of applications with which they have a conflict. Each stage of the review is conducted confidentially, and as such, FFAR is responsible for protecting the confidentiality of the contents of the applications. Applications recommended for funding by the Advisory Council will go to the Scientific Program Director and FFAR's Executive Director to consider program priorities set by the Advisory Board, portfolio balance across programs, and available funding. FFAR's Executive Director will approve each grant award recommendation made by the Science Program Director.

Review Criteria

Full applications are evaluated based on scored primary review criteria and unscored secondary review criteria. The bullets under each criterion may serve as a guideline to applicants when writing their applications, and as a guideline to reviewers on what to consider when judging applications. The bullets are illustrative and not intended to be comprehensive. Reviewers will evaluate and score each primary criterion and subsequently assign a global score that reflects an overall assessment of the application. The overall assessment will not be an average score of the individual criterions; rather, it will reflect the reviewers' overall impression of the application. Evaluation of the scientific merit of each application is within the sole discretion of the peer reviewers and they may raise additional factors to consider that are not covered in the bullets for each criterion.

Primary Review Criteria

Primary criteria will evaluate the scientific merit and potential impact of the proposed project. Concerns with any of these criteria potentially indicate a major flaw in the significance and/or design of the proposed work. Examples of primary review criteria are, Significance and Impact, Research Plan, Scientific Merit, Innovation or Novelty, Qualification of project personnel, and Outcomes.

Novelty, Innovation, and Originality
- Has the applicant demonstrated that this research has not been done elsewhere, or that this research accelerates a current research challenge or addresses an agricultural challenge in a new or innovative manner?
- Does the applicant propose new paradigms or challenge existing ones?
- What research gaps will the application address?
- How well has the applicant described the need for the project?
- How is this application meeting that need through innovation as defined by FFAR this RFA?

Potential Impact
- Will the results of this research, if successful, significantly impact the current challenge to sustainably feed the 9.7 billion people projected to populate the world by 2050?
- If the research project is successful, will it lead to truly substantial advances in the field rather than add modest increments of insight?
- How effectively does the applicant align the proposed project with FFAR's Challenge Areas?
- How well did the applicant identify how FFAR is uniquely positioned to fund this project versus other Federal agencies or non-governmental funding organizations?

Feasibility
- Are the aims/objectives of the proposed project outlined clearly?
- Are the methods outlined to achieve the project's aims feasible? Are the methods appropriate, and are potential experimental obstacles and unexpected results discussed?
- What risks could inhibit the success of the project and how well did the applicant describe their plan to avoid/overcome them?
- Is the timeline appropriate for the proposed work?

- Is the budget commensurate with the proposed work?

Research Environment and Institutional Support
- How qualified is the team conducting the proposed activities?
- Are the levels of effort of the key personnel appropriate?
- Does the team have the needed facilities and resources to accomplish all aspects of the proposed research?
- Is there evidence of institutional support of the research team and the project?

Outcome
- What is the potential of the proposed research outcomes to have a significant impact on U.S. food and agriculture systems?
- How well did the applicant address what segment of the food and agriculture community this project will impact and how is it likely to affect it/them?
- What would be the tangible outcomes of this project? How well did the applicant describe those outcomes?

Barriers to Adoption or Scaling of Research Outcome(s)
- Did the applicant identify barriers that might inhibit the uptake and adoption of research outcome(s) and proposed to address them?
- Did the applicant identify barriers that might hinder the optimal or intended use of research outcome(s) and propose to address them?
- Will the research outcome(s) be scale neutral? If not, did the applicant identify barriers that might obstruct them from scaling up or down, and proposed to address these barriers?

Intellectual Property and Data Dissemination
- What potential intellectual property or proprietary information may be generated because of this project?
- How well did the applicant describe how they plan to handle potential proprietary information or intellectual property?
- In the case of projects producing proprietary information/technology, how effectively did the applicant describe the funding of the production of proprietary information and/or judicious use of public funding?
- How will the grantee manage and disseminate data generated by this project?
- How adequate is the dissemination plan outlined by the applicant to share results of the project with the food and agriculture community during and at the end of the project?
- How did the applicant describe, where applicable, how they would implement or incorporate results and/or products into existing food production systems?

Partnerships
- How effectively did the applicant detail the partnerships involved in the project?
- Did the applicant include industry, nonprofit, state or local partnerships?
- How integral are those partners to the proposed project?
- Do the letters of recommendation detail the potential for the research to make a significant contribution to field in the specified Challenge Area?

<u>*Secondary Review Criteria*</u>
Secondary criteria contribute to the global score assigned to the application. Concerns with these criteria potentially question the feasibility of the proposed research. Examples of secondary review criteria are, Budget, Duration of the project, Scalability and Dissemination, Protections for Human and Animal Subjects, and Previous Project Performance.

Award Administration
<u>*Selection Notic*e</u>
Following the full application review, the principal investigator and the authorized organization representative listed on the project will be officially notified by email whether (1) the application has been selected for funding pending award negotiations, or (2) the application has not been selected funding. If an application is selected for funding, the Foundation for Food and Agriculture Research reserves the right to request additional or clarifying information for any reason deemed necessary, including, but not limited to, matching funds, or other budget information. Potential grantees are free to accept or reject the Grant Agreement as offered.

<u>*Award Notice*</u>
FFAR notifies applicants of whether they are selected for funding through email. The notice does not constitute an award or obligate funding from FFAR until there is a fully executed Grant Agreement.

<u>*Grant Period(s)*</u>
Upon receipt of the Grant Agreement, the potential grantee should note the Start Date and the End Date. Grantees may only use FFAR funds on project expenditures on or after the Grant Agreement is fully executed, or with prior approval of pre-award expenditure. Charging expenditures to the grant prior to the fully executed date is strictly prohibited. Likewise, grantees may not use FFAR funds after the End Date except to satisfy obligations to pay allowable project costs committed on or before that date. Grantees may have up to the last day of the month of expiration to fulfill obligated expenses.

Once the Grant Agreement is fully executed, the Start Date cannot be changed. The End Date may be changed with a written approval of a no-cost extension request by FFAR. If a no-cost-extension request is approved, FFAR will issue an amendment to the Grant Agreement.

If the grantee requires additional time beyond the Grant Period and the established End Date to assure adequate completion of the original scope of work within the funds already made available, the grantee may request a one-time no-cost extension of up to 6 months. The request must be submitted to FFAR at least thirty (30) days prior to the End Date of the grant.

The request must explain the need for the extension and include an estimate of the unobligated funds remaining and a plan for their use. This one-time extension will not be approved merely for using the unexpended funds.

Post-award Management
Reporting Requirements
After a grant is conferred, the grantee shall provide an annual financial report to FFAR showing grant expenditures to date. The grantee shall also provide an annual progress report to FFAR showing activities being carried out under the grant, including but not limited to project accomplishments to date and grant expenditures. Within 30 days of completion of all grant activities, the grantee shall provide a final progress report. The final progress report should address the original objectives of the project as identified in the application, describe any changes in objectives, describe the final project accomplishments, and include a final project accounting of all grant funds.

Scientific Integrity
FFAR's ability to pursue its mission to build unique partnerships to support innovative science addressing today's food and agriculture challenges depends on the integrity of the science on which it relies. A fundamental purpose of FFAR is to facilitate the advancement of knowledge and the application of the science to address challenges relevant to the FFAR's mission. All FFAR grants must be conducted with the highest standards of scientific integrity.

Grant Terms and Conditions
The Foundation for Food and Agriculture Research expects applicants to have reviewed the Grant Agreement prior to applying to ensure that the applicants are aware of the applicable terms under which the grant is offered. FFAR will only entertain potential modifications to the Grant Agreement under the most exceptional circumstances. Successful applicants are strongly encouraged to sign the Grant Agreement as presented.

Requirement to Demonstrate Matching Funds
The match share requirement is a one-to-one FFAR-to-awardee ratio. Therefore, for every dollar FFAR awards, the grantee or a third-party institution must contribute a newly dedicated, non-federal dollar towards the project costs. For example, if an application request two hundred thousand dollars ($200,000) of FFAR funds, the applicant or a third-party must be able to come up with an additional two hundred thousand dollars ($200,000) to match the request, for a grand total project budget of four hundred thousand dollars ($400,000).

The applicant agrees to identify and certify matching funds annually prior to disbursement of award funds. At least fifty (50%) of the required matching funds must be a cash match, while the remainder can be in-kind match. The match share is intended to supplement, not supplant existing funding for the principal investigator (PI). The applicant will abide by FFAR's [Matching Guidelines](#) to meet FFAR's matching requirements. To constitute a valid match, all matching funds on a FFAR grant must be expended during the grant period.

Contact Information
<u>Technical Help Contact</u>
Mon–Fri: 8AM EST – 8PM EST, **Weekends:** 10AM EST – 6PM EST
Phone support upon request Mon–Fri: 9AM EST – 7PM EST
Email: support@smapply.com

<u>Grants Questions Contact</u>
        Email: grants@foundationfar.org

<u>Scientific or Programmatic Questions Contact</u>

Challenge Area	Email
Health and Agriculture Nexus	lkurtyka@foundationfar.org
Advanced Animal Systems	tkurt@foundationfar.org
Sustainable Water Management	lodom@foundationfar.org
Next Generation Crops	jrosichan@foundationfar.org
Soil Health	lodom@foundationfar.org
Urban Food Systems	jreich@foundationfar.org

We only accept scientific or programmatic, and grants inquiries by email. We strive to respond to inquiries within two business days, but our response time depends on the volume of questions received and the complexity of the questions asked. Please note that we do not monitor this mailbox on evenings, weekends, or federal holidays.

Challenge Area Priority – Health-Agriculture Nexus
The Health-Agriculture Nexus Challenge Area will use innovative, systems level approaches (both technological and non-technological) aimed at reducing food and nutritional insecurity and improving human health in the United States and around the globe through sustainable food production practices.

While FFAR will not seek to limit pre-applications to specific target areas within health and agriculture nexus, we encourage applications that address the following research topics:

- Transformational approaches to increase access to nutritious foods:
  - Predictive methodologies that inform the supply of and demand for individual crops;
  - Overcoming barriers in the supply chain to improve access to nutritious foods in rural and farm communities;
  - Creating new business opportunities to improve access to nutritious foods in rural and farm communities.
- Advancing production systems for better nutrition:
  - Methodologies for identifying underutilized nutritious crops that are climate resilient, could be sustainably produced, and would maintain their nutritional value throughout processing;
  - Technologies for producing nutritious foods using underutilized crops;
  - Technologies for incorporating plant parts that are nutrient rich and edible, but not seen as food (e.g., broccoli leaves, parsley roots, cauliflower stems and leaves).
- Breeding better nutrition:
  - Innovative approaches to enhancing nutritional value of existing crops;
  - Innovative approaches to bringing to the food system underutilized nutritious crops that can be adapted locally and meet consumer and producer needs;
  - Enhancing nutrient content and quality of existing crops through harnessing the diversity of older varieties;
  - Developing new nutritious crops through innovative technologies.
- Innovative food waste reduction solutions resulting in net-positive environmental, economic, and social benefits:
  - Novel processing and packaging technologies that extend shelf life of food,
  - Innovative technologies for nutrient recycling;
  - Transforming food waste to business opportunities (e.g., conversion of by-products generated on farm or during processing into new value-added products);
  - Overcoming logistical barriers in the supply chain (e.g., sanitary design of waste stream handling and cold chain optimization for the small producer – scale processing).

As noted in its mission, FFAR seeks "not only brilliant minds, but also fresh perspectives tackling today's challenges in food and agriculture. We embrace diversity and promote inclusiveness in all we do, from the teams we build to the grantees we support." FFAR also understands that the outside-the-box thinking needed to drive innovation occurs when researchers with different skillsets and experience collaborate. With that spirit of diversity and inclusiveness in mind, cross- disciplinary research teams, especially those that include disciplines not traditionally associated with food or agriculture science , to develop innovative solutions to address current agricultural challenges are strongly encouraged to apply to this Challenge Area.

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Challenge Area Priority – Advanced Animal Systems

The Advanced Animal Systems Challenge Area will use innovative technologies and environmentally-sound practices to enhance animal production systems. FFAR-funded research promotes health- and welfare-oriented animal production systems for a growing global population with a strong emphasis on the use of big data and sustainable practices that benefit producers, animals and the public.

While FFAR will not seek to limit pre-applications to specific target areas within water scarcity, we encourage applications that propose innovations that address the following research topics:

- Application or Validation of **technologies for precision animal management and high-throughput phenotyping**.

  These may include but are not limited to the use of:
  - Digital cameras
  - Networked sensors/internet of things (ioT)
  - Artificial intelligence
  - Facial recognition
  - Machine learning
  - Predictive analytics
  - Diagnostic tools
  - Robotics and other technologies to **remotely and accurately monitor animal behavior and physiology**.

  Projects with the potential to monitor individual animals in real-time are highly encouraged.

  Applications should clearly describe how development and application of a given technology will improve animal productivity, health and welfare. Other research topics will still be considered.

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Challenge Area Priority – Sustainable Water Systems
The Sustainable Water Management Challenge Area aims to sustainably increase water availability for agricultural use, increase the efficiency of water use in agriculture, reduce agricultural water pollution and develop water reuse technologies using a coordinated landscape approach. FFAR seeks to fund research on water efficiency throughout the production chain, improving crop and livestock varietals and breeds toward water conservation, increasing the social and economic tractability of water-conserving technologies and practices and enhancing extension services support to reduce water scarcity.

While FFAR will not seek to limit pre-applications to specific target areas within Challenge area we encourage applications that propose innovations that address the following research topics:

- Sustainable improvement to water productivity:
    - Analysis of the effects of different options on future water demands from agriculture with the inclusion of other sectors, as well as non-provisioning ecosystem services
    - Impact assessments of climate change on the various components of agricultural water productivity
    - Implications of integrated interventions and of improved agricultural water productivity on food security, economic growth and landscape functioning.
- On-Farm water reuse and recycling
    - Technologies that can address contaminant attenuation in environmental buffers
    - Innovations that address the formation products during water treatment for reuse and ways to minimize or remove them
    - Technologies/Innovations that address pathogen removal efficiencies, variability of performance and/or process optimization
    - Indicators and surrogates for process performance monitoring in reuse scenarios and develop online real-time or near real-time analytical monitoring techniques for measurement.
    - Analyze the need for new reuse approaches and technology in future water management.

- Ground water Recharge
    - Three-dimensional (3–D) mapping and visualization tools and new applications of geophysical methods;
    - Methods of characterization of aquifer heterogeneity
    - Estimations of recharge, with emphasis on estimates that bridge local and regional scales
    - Measurement strategies for ground-water and surface-water interactions
    - Models of ground-water flow and transport

- Agroforestry:
    - Water use optimization in combination with addressing needs for timber, fuel, mulch, fodder, staple foods etc.*

Application should identify the white spaces/research gaps which are not being suitably addressed at differing state or federal levels.

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Challenge Area Priority – Next Generation Crops

FFAR supports the advancement of novel, nutritious, profitable and resilient on-farm crops. There is a strong emphasis on increasing crop diversity and use of new technologies to benefit consumers, producers and the environment. FFAR seeks to fund projects with an emphasis on innovative technologies and environmentally-sound production practices, as well as the discovery and development of new end uses for both conventional and non-traditional crops. We also prioritize advanced breeding methods and development of biotic and abiotic stress tolerance for crops grown in organic and conventional cropping systems with the aim of providing increased farmer profitability and environmental resilience.

FFAR is seeking ground-breaking research leading to increasing adoption of innovations across the U.S. food system.

While FFAR will not seek to limit pre-applications to specific target areas within this Challenge Area, we encourage research applications that address any of the following areas:
- Crop diversification
- Crop resiliency
- Accelerated breeding methodologies

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Challenge Area Priority – Soil Health

The Healthy Soils, Thriving Farms Challenge Area aims to increase soil health by building knowledge, fueling innovation, and enabling adoption of innovative practices. FFAR is expanding and exploring transdisciplinary approaches that draw linkages between soil health and farm productivity, economics, human health, management practices and other areas. FFAR will continue to support research that provides open, data driven, innovative science that allows farmers to make the most productive and sustainable decisions to conserve and improve soil health while supporting thriving farms.

While FFAR will not seek to limit pre-applications to specific target areas within this Challenge area, we encourage applications that propose innovations that address the following research topics:

- Measurements of available soil water holding capacity/Soil Infiltration
- Assessments of the Soil Microbiome
    - Measurements of microbial processes
    - Investigations of microbial communities at different scales, including spatial, temporal and molecular
- Improvements on Soil Enhancing techniques
    - Alternative Soil Amendments
    - Optimization of Nutrient Use Efficiencies
- Optimization of soil moisture management strategies
- Linkages between farm productivity and soil health
    - Quantitative assessments of how improvements of soil health can be rewarded in ways that may result in increased adoption, mitigation of erosion, reduction in runoff etc.
- Barriers to adoption of soil health practices

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Challenge Area Priority – Urban Food Systems
The Urban Food Systems Challenge Area explores areas of innovation with the potential to transform urban food systems to improve food and nutritional security, human health outcomes, economic opportunities, and food system resiliency. FFAR supports innovative, systems-level approaches aimed at reducing food and nutritional insecurity regionally, nationally and globally in a broad socioeconomic and environmental context. Emphasis is placed on transdisciplinary approaches connecting multiple aspects of the food system that improve food and nutritional security.

While FFAR will not seek to limit pre-applications to specific target areas within urban food systems, we strongly encourage applications that take advantage of existing data and infrastructure to address the following research topics:

- Advancing/development of economically viable production systems in urban and peri-urban agriculture, including production practices as part of an overall strategy to mitigate risk caused by climate variability
- Technologies and/or interventions that promote food and nutritional security within urban populations, including:
  - Utilizing existing interventions in novel ways
  - Transportation and/or the delivery of healthy and nutritious food
  - Increasing the affordability of healthy and nutritious food
- Networked production practices that lead to food system resiliency and take into account connections between multiple production practices to provide healthy and nutritious food regionally.

FFAR, as a part of its mission, seeks "not only brilliant minds, but also fresh perspectives tackling today's challenges in food and agriculture. We embrace diversity and promote inclusiveness in all we do, from the teams we build to the grantees we support." FFAR also understands that the outside-the-box thinking needed to drive innovation occurs when researchers with different skillsets and experience collaborate. With that spirit of diversity and inclusiveness in mind, cross-disciplinary research teams, especially those that include disciplines not traditionally associated with food or agriculture science, to develop innovative solutions to address current agricultural challenges are strongly encouraged to apply to this Challenge Area.

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