

Request for Information: Data Solutions for Accelerating Climate-Smart Agriculture Research and Action

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Deadline for Comments: December 21, 2022

Comments can be submitted via a web form at:

https://www.GrantRequest.com/SID_6242?SA=SNA&FID=35136

Summary:

AgMission is a collaboration of the Foundation for Food & Agriculture Research and the World Farmers' Organisation to co-develop climate-smart solutions to achieve net zero emissions and bolster adaptation and resilience to climate change globally. Key to this effort is identifying barriers and closing knowledge gaps to accelerate adoption of farming and ranching practices that reduce and mitigate greenhouse gas emissions and promote resiliency. Over the past two years, AgMission has worked with consultants, experts and stakeholders to identify key areas where research investment can overcome these barriers.

One emerging area of need is to enable agricultural research and decision support modeling to find, access and use the wealth of data and knowledge on agricultural systems and practices and climate change mitigation and adaptation. These data are heterogeneous, stored in a range of public repositories and systems or held privately, and current efforts to transform this data into actionable knowledge remain fragmented.

AgMission is therefore exploring investments that would increase the use of [FAIR](#) (Findable, Accessible, Interoperable, Reusable) standardized data in agricultural research. The specific focus is to develop capacity to make data FAIR with a focus on data and research relevant to farming and ranching practices that contribute to climate mitigation and adaptation. With sufficient volume of relevant standardized and interoperable data, agricultural sciences can leverage data analytics that require machine actionable information, accelerating research and improving the accuracy and utility of decision support tools available for agricultural producers. This advance would help meet the urgency of the climate challenge by supporting all stakeholders – researchers, producers, NGOs, governments, etc. - with access to actionable data.

We recognize that this initiative could also be beneficial and relevant in other areas of agricultural research, and welcome input on a broad range of scientific disciplines as they relate to the [FFAR Challenge Areas](#), including Advanced Animal Systems, Health-Agriculture Nexus, Next Generation Crops, Soil Health, Sustainable Water Management and Urban Food Systems.

This Request for Information (RFI) is intended to gather further insight from relevant research and data science communities as to the need for the identified strategies, the scope of effort(s) required and the technology solutions appropriate to the purpose. Interested parties who respond to this RFI may be contacted for a follow-up strategic discussion. Responses may inform one or more competitive proposal solicitations from the AgMission initiative and guide strategic data initiatives across FFAR's research programs. These opportunities may cover some or all of the following topics:

- Identifying and curating legacy data sets, from identifying priority data through to making it machine actionable and accessible to an open knowledge network, facilitating both use and future updates
- Establishing and promoting the use of specific metadata standards, vocabularies and ontologies for climate relevant agricultural data to enable interoperability
- Promoting the value of FAIR data use among all data actors, including the private sector; developing the conditions and tools necessary to assure data owners they can maintain sovereignty of FAIR data shared with other actors.
- Data use agreement templates and standards, as well technologies to comport with those agreements and standards, to ensure privacy and sovereignty of data while making data findable and accessible to users of open knowledge networks.
- Designing and building and/or adapting a knowledge network or other visual navigation technology capable of identifying and connecting across diverse data sets and supporting queries relevant to climate-smart agriculture.

Who should respond to this RFI:

- Scientists and researchers focused on research areas of interest to FFAR's Challenge Area programs and AgMission initiative;
- Experts in agricultural data, data management and ontologies; data privacy and sovereignty; and/or open source knowledge network management;
- Developers of metrics and digital tools used in the public or private sector for supporting on-farm decision making with environmental information with an interest in greater data accessibility across tools;
- Developers and managers of digital data repositories with agricultural and environmental data from government, NGOs, and the private sector.

We seek feedback on the below identified Priority Data Solutions to act on five critical data categories:

1. Statistical and summary data from government agencies and NGOs (subnational, national, multi-national, global) related to agricultural production and practices (crop yield, fertilizer application rates, irrigation practices, soil properties, etc.).
2. Data from research programs and scholarly publications archived in and publicly available from online data repositories (field experiments; modeling studies; on-farm research, etc.).
3. Field and farm level data or synthesis from agricultural producers made publicly available through on-farm research trial publications.
4. Field and farm level data or synthesis of insights from private sector digital tools including that related to environmental claims and certifications.

5. Agriculture data sovereignty and privacy data standards and templates as well as digital tools to comport with those standards, including tools from outside of agriculture that are applicable to agriculture.

Questions:

We are requesting comments relating to the following questions related to two Priority Data Solutions under consideration:

- *Data Interoperability Through Standardization*
- *Data Synthesis Through Navigation*

Data Interoperability Through Standardization

Achieving greater use of [existing ontologies](#), generating new ontologies specific to climate smart agriculture where needed, developing data and metadata standards to provide context on how data was generated, enabling interoperability across systems, conducting data rescue for critical legacy datasets, creating an environment so those sharing FAIR data retain data sovereignty and those using shared FAIR data do so only for intended purposes. This data standardization work would aim to support FAIR data in practice and provide the semantic backbone to the **Data Synthesis Through Navigation** solution.

1. Are there gaps in the [existing ontologies](#) for agriculture that are priorities to address for climate mitigation and adaptation research? What are the barriers to adoption of these existing ontologies for cataloging research results – awareness, time, accessibility, value proposition?
2. Is there a need for additional metadata reference standards, terms and definitions for agricultural data? What is required to equip researchers to adoption and use existing or new standards? What are the main barriers to awareness and adoption by researchers and other data generators?
3. Are there communities or institutions developing API translation tables, AI approaches, and/or other digital solutions that can transform relevant data sets into a user-desired data and metadata standards on the fly? Are there emerging digital solutions from other fields with potential application in agriculture?
4. Are there existing automatic data annotation and/or self-generative ontology tools or methods that could be adapted for agricultural data? Is there institutional or organizational capacity to support this development for agriculture across relevant scientific disciplines?
5. What are the key requirements or characteristics of data sets that are critical for research on climate-smart agriculture and related decision support tools for agricultural producers? Are there specific data sets, existing data repositories and data catalogs that are critical for efforts on researching and implementing climate-smart practices?
6. What critical legacy datasets are priorities for data rescue to enable them to be machine actionable? **Data Synthesis Through Navigation**

Creating a new web-based visual navigator tool to enable interoperability and aggregation of structured and non-structured data and facilitate knowledge generation and analysis. One

potential approach is to apply an open knowledge network technology to organize and connect relevant public and private data and research, convey logical relationships between data sets and provide a platform for data discovery at scale. Users would be able to search based on cropping system, region, practice, or emissions concern and easily find and access the relevant data.

7. What barriers currently exist for researchers and others seeking to make their data FAIR (Findable, Accessible, Interoperable, Reusable)? Awareness of the principles, data analyst or staff skilled in data curation, support for time and staff, access to an appropriate public repository, or other? Is there community support available for providing access to training, tools, skills, etc., necessary to manage and support FAIR in practice?

8. Are there successful examples or approaches—in agriculture or from other sectors applicable to agriculture-- that have been able to provide secure computing environments at high resolution without compromising data privacy/data sovereignty? Are there other approaches to managing data use agreements, licenses or consent management systems to allow for the same result? Is there a need for the further development of trusted execution environments (TEE) that can conduct analyses across multiple datasets while protecting data privacy and ensuring data integrity?

9. What technology solutions would best enable interoperability and aggregation of structured and non-structured data, allow for rapid automated searches, and navigate through diverse repositories of information to make knowledge generation/analysis easier? What barriers exist to using such technologies across data that are diverse in geographic and temporal scales and scopes covered? How should technology solutions be evaluated or approved to confirm they are effective tools for use of agriculture FAIR data?