



Ecosystem Services Market Research Consortium (ESMRC) Objectives, Outcomes Working Groups per FFAR Grant Award (2019-2022)

ESMRC FFAR Grant Objectives

1. Develop ability to rigorously and cost-effectively quantify science- and outcomes-based impacts of agricultural management practices on ecosystem services from agriculture at multiple scales (2019-2021)
2. Develop rigorous, secure, automated science-based methodologies to monitor, report and verify ecosystem service outcomes from agriculture at scale (2019-2021)
3. Develop a rigorous, secure, automated, technologically advanced science-based platform for a national-scale geospatial framework to track ecosystem service market attributes from agriculture (2019- 2021)
4. Develop a national-scale gridded Land Ledger that tracks and reports ecosystem service attributes from agriculture using static and trend data at multiple geospatial scales, either horizontally (e.g. metrics at field, farm, watershed or other geographic scales) and vertically (e.g. metrics as tied to each land- based grid). (2019-2021)
5. Quantify technical capacity for carbon and water quality outcomes based on soil carbon sequestration potentials by soil types, land management approaches and climate. (2019-2021)

ESMRC FFAR Grant Outcomes

1. A functioning ESM protocol for the three ecosystem services (carbon, water quality, and water quantity)
2. Accurate quantification of agricultural management system impacts on ecosystem services
3. Innovative and advanced analytical techniques for more sophisticated quantification, monitoring and verification (MRV) technologies to better quantify and assess systems-based impacts of farmers and ranchers and reduce market-based program costs
4. An online platform that prepares and feeds collected data inputs into the appropriate biogeochemical and process models to track and quantify changes in outcomes for ecosystem service attributes
5. A Land Ledger that tracks ecosystem services in a geospatial manner and will harmonize and standardize the data collection
6. Quantification of the carbon sequestration capacity of prioritized significant agricultural soils through a combination of modeling and field validation.

ESMRC Working Groups as Revised by ESMRC Members on 14 August 2019

Working Groups are tasked with developing and implementing specific research and development initiatives under each of the five ESMRC research themes. Working groups are shown in the ESMRC organizational structure; and descriptions of working group objectives are elaborated below. All working group activities will focus on the research, development, demonstration and deployment of cost-effective, scalable technologies and approaches to achieving desired outcomes, as follows:

- **Working Group 1: Quantification of Soil C and net GHG in Protocols, Pilots and Certification** – will work to develop accurate, cost-effective and scalable quantification of agricultural management system impacts on soil C and net GHG (carbon, methane and nitrous oxide), including economic impacts. Areas of focus will include development, pilot testing and refinement of market protocols, including through pilot projects.
- **Working Group 2: Quantification of Water Quality and Water Quantity in Protocols, Pilots and Certification** -- will work to pursue the development of accurate, cost-effective and scalable quantification of agricultural management system impacts on water quality and water quantity, including economic impacts. Areas of focus will include development, pilot testing and refinement of market protocols, including through pilot projects.
- **Working Group 3: Monitoring, Reporting and Verification (MRV) Technologies; MRV Platform; and Gridded Land Ledger** – will work to:
 - develop innovative and advanced analytical tools and technologies to cost-effectively quantify, assess, monitor, and verify systems-based impacts of the operations of farmers and ranchers at scale while providing robust and transparent documentation of outcomes. This includes the utilization, testing and refinement of direct, modeled, and remote quantification tools and technologies with a goal to reduce burden on program participants, including agricultural sector participants, program operators, and verifiers.
 - develop a secure platform enabled by blockchain or similar technologies to cost-effectively collect, store and manage data inputs and outputs in order to support the market place. The platform will include user-friendly interfaces that meet the needs of various users, including producers (for enrollment and data input and to track outcomes); technical assistance providers; program operators, including modelers; verifiers; project supporters, such as corporate partners and NGOs; and credit generation platform(s); and will provide an API to other data platforms.
 - develop a land ledger that tracks ecosystem service outcomes in a geospatial manner based on gridded blocks of land. The land ledger will allow the reporting and tracking of ecosystem service outcomes at any geospatial scale desired, including at watershed, supply shed, farm or field scales, while protecting personal, sensitive or confidential information. The land ledger will store and report data vertically (e.g., stacked ecosystem service metrics tied to land grids) and/or horizontally (e.g. by watershed or farm) to allow tracking over time.
- **Working Group 4: Soil Carbon Research to Quantify and Achieve Ecosystem Service Capacities of Soils** – will work to credibly assess the technical capacity for different soils to absorb and retain carbon and contribute to improved water quality and water use conservation as metrics of soil health.