



ECOSYSTEM SERVICES MARKET RESEARCH CONSORTIUM (ESMRC) REQUEST FOR PROPOSALS

Ecosystem Services Market Consortium LLC (ESMC) is working with partners and collaborators across the agricultural supply chain to invest in critical research to build a technologically advanced ecosystem services market to reward and incentivize beneficial impacts of sustainable agricultural practices and systems. The member-driven research consortium – known as the ESMRC - will support development of a cost-effective and scalable approach to farmer and rancher engagement in ecosystem service markets, an approach needed to scale the beneficial impacts of sustainable practice adoption on working agricultural lands. The ESMRC will also meet corporate and societal needs by quantifying, monitoring and verifying the environmental benefits achieved on an annual and ongoing basis. To achieve these goals, four ESMRC Working Groups have been established and tasked with developing and implementing specific research and development initiatives. The Working Groups, co-led by ESMC members and informed by Science Advisors chosen from a slate of national experts, will focus on the research, development, demonstration and deployment of cost-effective, scalable technologies and approaches to launch the market.

ESMRC Working Group 1 was established to support development of accurate, cost-effective and scalable quantification of agricultural management system impacts on soil C and net GHG (carbon, methane, and nitrous oxide). This includes supporting the development of innovative and advanced analytical tools and technologies to cost-effectively quantify, assess, monitor, and verify systems based GHG 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. These quantification approaches and tools will be used and refined for use in market-based protocols, including through field testing in pilot projects.

N₂O is a critical agricultural GHG and responsible for most emissions from crops that require nitrogen fertilizer. The N₂O Measurement Strike Team was established to specifically address the challenges of quantifying N₂O emission reductions. There is no scalable and cost-effective system to monitor this gas at field scale, although there is considerable effort in government to build these types of sensors. Until new technology can be validated, near term market demand for emission mitigation could potentially be satisfied based on quantifying the correlation and uncertainty of scalable measurements and adopting more precise technology as it is developed.

PROJECT TITLE: WG1 PROJECT 3 – N₂O Quantification Through Surrogate Measurements

PROJECT SUMMARY:

The purpose of this RFP is to find surrogate measurements for N₂O to generate credits based on these measurements. The group would also like to quantify the tradeoffs and correlations between ecosystem services – e.g. correlations among GHG fluxes and correlations between GHG fluxes and water quality/quantity measurements. Much as a single GHG flux may be estimated from another measurement, there is a strong potential that improvements in one ecosystem service will tend to improve another. Whether this is generalizable or whether there are risks that market-driven solutions for GHG or water will not have unintended consequences is not fully understood.

PROJECT BACKGROUND and JUSTIFICATION:

The ESMC is building a measurement platform and protocols to quantify multiple GHG and water impacts of agricultural systems. An ideal system would directly measure each GHG and water quality, providing a direct data product that is valuable to entities wishing to reduce emissions or improve water quality. Unfortunately, developing and scaling accurate measurements is a significant challenge and will be expensive to scale.

The predominant GHGs from agriculture are N₂O, CO₂, and CH₄ which are products of the related carbon and nitrogen cycles. The water cycle is tightly linked because it is critical for biological processes as a primary component of reactions (e.g. photosynthesis) and by supporting microbes that catalyze the transition between chemical species. Water also drives non-organic processes such as absorption and runoff.

Direct measurement of key elements of agriculture's carbon footprint is difficult, and there is no scalable measure for N₂O or soil carbon. Instead of waiting until these sensor suites are available, it is still possible to create an incentives program based on a set of measurements or surrogates that are more easily measured and correlate with GHG fluxes and other co-benefits. While credits in this market must be discounted based on their uncertainty, they will create an appetite for improved sensors and better quantification to realize more precise measurements.

This RFP looks to determine the accuracy of surrogate measurements for N₂O estimation. The research will also explore sensors that are available and cost and accuracy of data outputs. These surrogate measurements could provide data inputs to agricultural GHG and crop models allow calculation of additional uncertainty in the model as well as a range of measurements where the model is known to produce accurate results.

As an example:

Yield and applied fertilizer might be used as a first level approximation of N₂O and water quality assuming standard emission factors with local weather data used to improve the N₂O estimate. A second level approximation of N₂O might incorporate soil moisture, temperature, and nitrate sensor data to further improve the estimator. As each new sensor set is added, credits that are

generated from the system would become more valuable by removing discounting due to uncertainty. Correlation of these first level approximation and second level approximation data with any available direct N₂O measurement data would demonstrate capacity of these surrogate estimates to be used in credit/asset generation.

PROJECT RELEVANCE TO ESMC FFAR GRANT:

ESMRC Working Groups support the research, development, demonstration and deployment of cost-effective, scalable technologies and approaches to achieve the ESMRC Foundation for Food and Agricultural Research (FFAR) Grant Objectives and Outcomes. Working Group 1 specifically is charged with **1) developing a framework to rigorously and efficiently identify the science- and outcomes-based impacts of agricultural management practices on soil C and net GHG (carbon, methane, and nitrous oxide) at multiple scales.**

This project specifically addresses:

FFAR Grant Objective 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

FFAR Grant Outcome 2. Accurate quantification of agricultural management system impacts on ecosystem services.

PROJECT GOALS:

Potential outcomes of this RFP:

- 1) Emission estimators that quantify the correlation and uncertainty between agricultural co-benefits based on high quality measurement of another co-benefit and commonly measured properties, e.g. GHG release based on water quality estimates combined with precision ag data (fertilizer application and yield). The correlations between GHG and water quality will depend on the location, crop type, and cropping system and must be resolved at field level.
- 2) Evaluate and test and optimal deployment of a field specific sensor suites and data collection priorities to quantify farm potential in multiple markets (grain and co-benefits).

Knowledge of these correlations will be beneficial if new markets develop – for example, ammonia currently has a lower focus. If a market should develop in the example around ammonia release from fields, it would require time scale the monitoring. However, if there is a correlation with a measurement that is already scaled, then a market could form using the easier measurement as a surrogate. These correlations for N₂O, as part of this requested research (as well as the example of ammonia in future research) – which are inherent to the natural system - will allow ESMC protocols and accommodate new market demands.

PROJECT DELIVERABLES: (including necessary documentation):

- 1) Identify an optimal field sensor to measure parameters such as soil moisture, temperature, and soil nitrate.
- 2) Correlation analysis of first level approximation and second level approximation data with existing direct N₂O measurement data to determine optimum data combination as surrogate N₂O data for the DNDC model.
- 3) Determine optimal surrogate data set to approximate N₂O based on correlation to direct N₂O measurement, overall cost, time resources required, and reduced uncertainty.
- 4) Documentation of results to be submitted to ESMC/Dagan (DNDC) to be evaluated for use in GHG 3 asset/credit generation.

PROJECT TIMELINE:

September 2020 –

PROJECT BUDGET:

\$TBD

ESMC is committed to maintaining a culture of diversity and equity as we develop and launch an ecosystem services marketplace and lead the research necessary to facilitate that effort. As a consortium, our strength is in our commitment to be inclusive, with purposeful strategies to engage with and collaborate with historically marginalized people and groups, like farmers and ranchers, technical contractors, etc. who are black, indigenous, and/or people of color.

All qualified responses to this RFP will receive equal consideration without regard to race, color, religion, gender, gender identity or expression, sexual orientation, national origin, genetics, disability, age, or veteran status. Proposals from black, indigenous and people of color researchers and representative institutions/organizations are strongly encouraged.

PROPOSAL FORMAT:

- Executive summary
- Vendor/Researcher Background information * Number of projects and time in business/field of study * Experience in similar or related business/research * Project management strategy/techniques
- Proposed services or deliverables
- Detailed description of proposed approach that will be followed for each of the Project Deliverables listed above
- Plans for collaboration and coordination with key ESMRC and ESMC Member contacts
- Timeline and budget
- Project Team
- Portfolio of similar or related work/research projects
- Contact information for two references

Risks and mitigation strategies to executing services, deliverables, timeline, and on budget
Funding notes for contractors: Identification of in-kind or cash match funding (non-federal) is encouraged but not required. Institutional overhead is limited to 10% by FFAR. The unrecovered overhead CANNOT be used as match.

Proposals must be submitted as a PDF document via email to Paul Meints, ESMRC Research Director, at pmeints@ecosystems-services-market.org by September 18, 2020, 5:00pm Eastern. Final decisions will be made by October 9, 2020 and all vendors will be notified by October 15, 2020. If you have questions regarding this RFP please contact Paul Meints directly at pmeints@ecosystems-services-market.org or 507-508-2852 during regular business hours (CDT).

METHOD OF SECURING CONTRACTORS:

Group members have not identified specific applicants or contractors for the work, but options to work internally, award a sole source contract or issue a competitive RFP could be used. WG members decided on several options and desired approaches for applicants:

- The work could be accomplished with multiple contractors working together as a team
- A hybrid approach combining internal proposals from WG members with an external call for additional expertise could be a possibility
- WG would like at least one WG member to sit on the project advisory committee
- Set collaborative expectations for science and research
- Emphasize need for practical application framework of results

Note for contractors: Institutional overhead is limited to 10% by FFAR. The unrecovered overhead CANNOT be used as match.

Advisory Committee (N₂O Measurement Strike Team Members):

ESMC Project Manager
ESMC Research Director
Daniel Northrup, Benson Hill
Michael Moechnig, Corteva/Granular
Bill Salas, Dagan
Greg Rock, Low Carbon Prosperity Institute
Michele Schultz, Syngenta
Stephen Del Grosso, USDA ARS
Steve Wood, TNC
Sally Flis, TFI
Gigi Arino, Syngenta
Gail Phillips/Peter Woodbury, Cornell