Two Post Doctoral positions on synthesis and analysis of Large GHG / Soil Organic Carbon and Management Data Inventories at the National Lab for Agriculture and the Environment

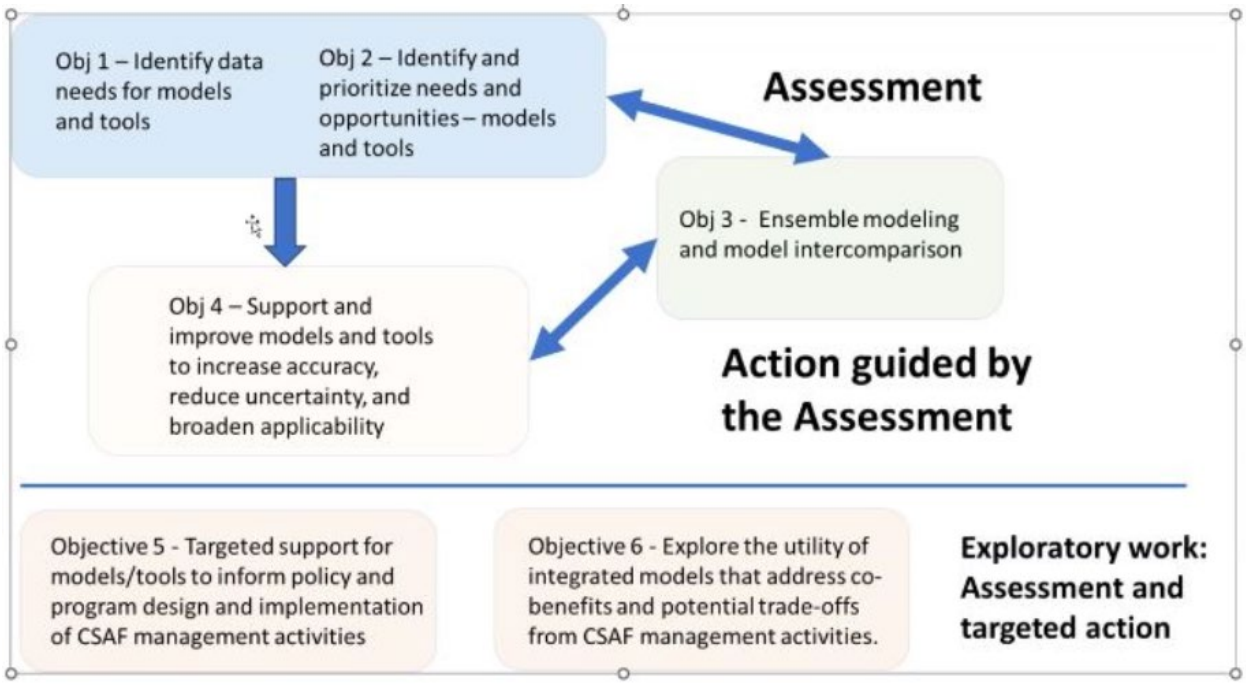
Background:

The Upper Midwest cropping-livestock region (Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin) represents one of the most intense areas of agriculture in the world and one of key contributors to N2O and CH4 emissions. Critical knowledge gaps remain in the cycling, efficiency and fate of resource inputs for Midwestern cropping-livestock systems as for other systems as well. The recent increase in precipitation whiplashing in Midwestern landscapes, where flooding and water ponding from tile clogging have become re-occurring, provide another set of challenges and opportunities with respect to agricultural GHG emissions. In June/July 2019, for example, a period when extreme flooding was occurring in the U.S. Midwest, uncertainties in top-down estimates of N2O emissions were of the order of 50% or higher. Moreover, the interplay of wet-dry conditions affect variability in gas fluxes and make them highly non-stationary. Potential climate change-driven effects on GHG emissions, and particularly the drivers of high temporal variability in N2O emissions across scales in the Midwest remain poorly documented. Spatial variability can be also significant depending on cover, management practice and input rates, grazing, organic farming, and due to presence or absence of subsurface “tile” drainage patterns. Point sources such as deep pits and livestock management waste operations for swine and

cattle are other contributors. The interaction of weather events with management ultimately shapes N_2O emission, and long-term data sets are required to accurately evaluate management impact on N_2O emissions and GHG balance.

Research Objectives and Methodology:

- Identify historic and current sources of data surveys on conservation practices, and analyze geospatial data of representative sites based on land use/landcover, management practices, landscape characteristics, and hydrologic regimes (humid, arid, etc.); expand existing surveys and utilize geospatial data to improve the timeliness of conservation statistics. Especially on input data (e.g., fertilizer inputs/rates and timing, type of fertilizer, integrated crop/livestock systems) that are missing to the DayCent modeling team.
- Organize and evaluate input data for accuracy and sensitivity for inclusion in the model operationally.
- Work with other post docs nationwide to develop dynamic maps of geospatial data to be used into the development of national Greenhouse Gas (GHG) inventories.



Goals:

The goals of the post doc associates are to: (1) accelerate the collection and release of conservation trend data, (2) expand existing surveys and utilize geospatial data to improve the timeliness of

conservation statistics, (3) incorporate improved and updated conservation trends into national Greenhouse Gas (GHG) inventories, and (4) fill existing and future temporal gaps in spatial coverage of conservation practice data for national and USDA reporting. The candidates contributions to this mission are knowledge of working with large geospatial data inventories on conservation and management, quantifying transitioning trends and emergent patterns on type of conservation trends around the country based on climatic, soil, land use and other criteria, and ability to work with AI and statistical analysis to analyze data sources, particularly those related to available soil surveys and crop management, as well as expand discrete point observations that are often sparse and fail to adequately represent the diverse ecoclimate regions of the U.S.

Expected Results:

Successful completion of the research objectives will result in an improved temporal and spatial coverage of national conservation activity and contribute to the estimation of national-scale emissions of CO2 flux from soil respiration, N2O, and CH4 via the DayCent agroecosystem model.

Training needed:

Hydrometeorologist /Agronomist/ Environmental Scientist/HydroSciences and Biosystems Engineering/BioEnvironmental geospatial Statistician/

Point of contact for inquiries

Thanos Papanicolaou, PhD

Director

National Laboratory for Agriculture and The Environment: USDA ARS

United States Department of Agriculture

Agricultural Research Service

Midwest Area

1015 N. University Boulevard

Ames, IA 50011-3611

E-mail: Thanos.Papanicolaou@usda.gov

Desk Phone: 515-294-2251