

## Summary

### Expanding the Conversion of Habitat in the Northern Great Plains Ecosystem (EXCHANGE) University of Nebraska-Lincoln

The goal of EXCHANGE is to quantify and monetize ecosystem services by targeted deployment of switchgrass and other perennial bioenergy grasses into irrigated annual crop landscapes in central and western Nebraska, as a proxy for the Northern Great Plains region, using a transdisciplinary approach to design biodiverse farming systems to compare BAU with perennial bioenergy grasses.

Specifically, EXCHANGE will evaluate whether perennialized agroecosystem landscapes can reach or exceed targets of 20% increase in soil organic carbon (SOC) storage, 20% reduction in nutrient loss, and concomitant improvements in other ecosystem services, including GHG emissions, soil health, soil/insect/avian diversity, and their provisioning functions. Expected outcomes from controlled small-plot experiments, leveraged with on-farm data, are to quantify the proposed ecosystem services, provide a monetary valuation of these services, assess system greenhouse gas mitigation potential, and provide evidence-based guidelines for best management practices, risk management, and decision-making for bioenergy production stakeholders in the Northern Great Plains. The EXCHANGE team will work with landowners, natural resource, and bioenergy stakeholders to estimate productivity, monitor key ecosystem services, and evaluate economic indicators of EXCHANGE compared to current agricultural practices for this region.

Work will combine small-plot and on-farm experiments include evaluation of perennial grass production and measurements of soil organic C, GHG emissions, soil health, and soil biodiversity. Arthropod and avian biodiversity will be evaluated within the same field sites as soil measurements. Regional groundwater modeling efforts will characterize water quantity and quality, and a techno-economic analysis, based on ecosystem service valuations and farm net return distributions over baselines scenarios will be performed. Developments on ecosystem system valuation from **EXCHANGE** will be illustrated to stakeholders on potential rural economic and environmental outcomes over current business-as-usual approaches.

The EXCHANGE team is led by Daren Redfearn, University of Nebraska-Lincoln (UNL), will serve as Project Director/Investigator and lead the UNL team. Faculty co-PIs at UNL include Jay Parsons, Andy Little, and Julie Peterson. This project is a transdisciplinary, multiagency collaboration including Rob Mitchell and Virginia Jin and Marty Schmer, who will lead all USDA-ARS project activities. John Quinn will lead collaborative research activities at Argonne National Laboratory, along with other co-PIs including Cristina Negri, Shruti Mishra, Jules Cacho, Colleen Zumpf, and Lee Walston.