Next Generation Miscanthus: Hybrid Performance Evaluation and Enhanced, Sustainable Feedstock Production and Supply in the Southeast U.S. for Biofuels and Bioproducts

Project Summary

To promote the growth of a bioeconomy in the United States, lignocellulosic feedstock development and production methods that provide reliable biomass materials for biofuels and bioproducts, that add value to underutilized spaces, are price-competitive, and offer ecosystem benefits are needed. Giant miscanthus (*Miscanthus ×giganteus*) is a perennial grass that has the potential to meet these needs through yield and positive environmental impacts as part of a suite of emerging regionally-specific, diversified renewable feedstocks.

Our multi-disciplinary project team from North Carolina State University and Oak Ridge National Labs is partnering with Iogen and Novozymes North America as conversion technology developers to focus on evaluating the potential of new hybrid varieties of miscanthus to provide higher biomass yields, improve the value of underproductive soils and support enhanced crop production systems that will lead to price reductions in delivered bioenergy feedstocks.

Through a 10-year breeding program we have access to 15 advanced, high biomass yielding triploid hybrids of *Miscanthus ×giganteus* as well as experience establishing and managing significant acreage of standard commercial miscanthus lines (e.g. Illinois). The proposed project will build on the team's experience and address performance and productivity data collection as well as evaluation of environmental sustainability of new energy crop varieties. Furthermore, we will make use of the three distinct regions of North Carolina (Mountains, Piedmont and Coastal Plain) that have differences in soils, climate and crop productivities in order to assess range in miscanthus crop adaptability. It is anticipated that the new varieties will show improvements in parameters measured related to dry matter, composition, nutrient use, soil quality, water quantity, water quality, and biodiversity benefits when planted on less suitable acreage in these regions and compared to commercial varieties.

Through this project we will exploit high yielding characteristics of newly developed varieties, capture relevant data to address gaps in knowledge surrounding impacts on local and watershed scale soil and water ecosystems, and generate field data to address barriers in harvest operations, handling and transportation options that affect affordability of miscanthus as a viable feedstock in different US regions. Specifically we will make significant advancements in: 1) Variety Assessment by identifying new varieties that outperform commercial varieties by 50% dry matter yield, higher propagation capabilities, and are sterile; 2) Sustainability by capturing localized environmental data collection on microbial-soil-water-miscanthus interactions from multiple regions to promote environmental stewardships decisions; 3) Supply chain development by defining regionally specific supply chain scenarios to meet delivery cost and quality performance metrics; and 4) Dissemination of miscanthus cropping systems and supply chain parameters to databases serving advancement of a US bioeconomy.