Sustainable Bioenergy Research

- The goal of this study is to understand how greater biodiversity of grassland plants could improve two processes that will be key contributors to the emerging clean energy economy: biomass production for energy and the capture and storage of greenhouse gases by plants and soils (biological carbon sequestration).
- Diverse grassland plantings are better equipped to deal with annual variations in climate and probably have fewer problems with pathogen buildup than monocultures. But growing a feedstock consisting of several different grass species would complicate efforts to convert plant cellulose into ethanol.
- We are determining the biomass feedstock yields and carbon sequestration rates in a native perennial bioenergy plots along a gradient of biodiversity, both within and between species diversity. While a number of large, long-term ecological studies have shown benefits of increased species richness on biomass production and soil carbon sequestration, none have investigated whether within-species biodiversity (that is, genetic diversity) can contribute similar improvements.

Argonne Sustainable Bioenergy Plots

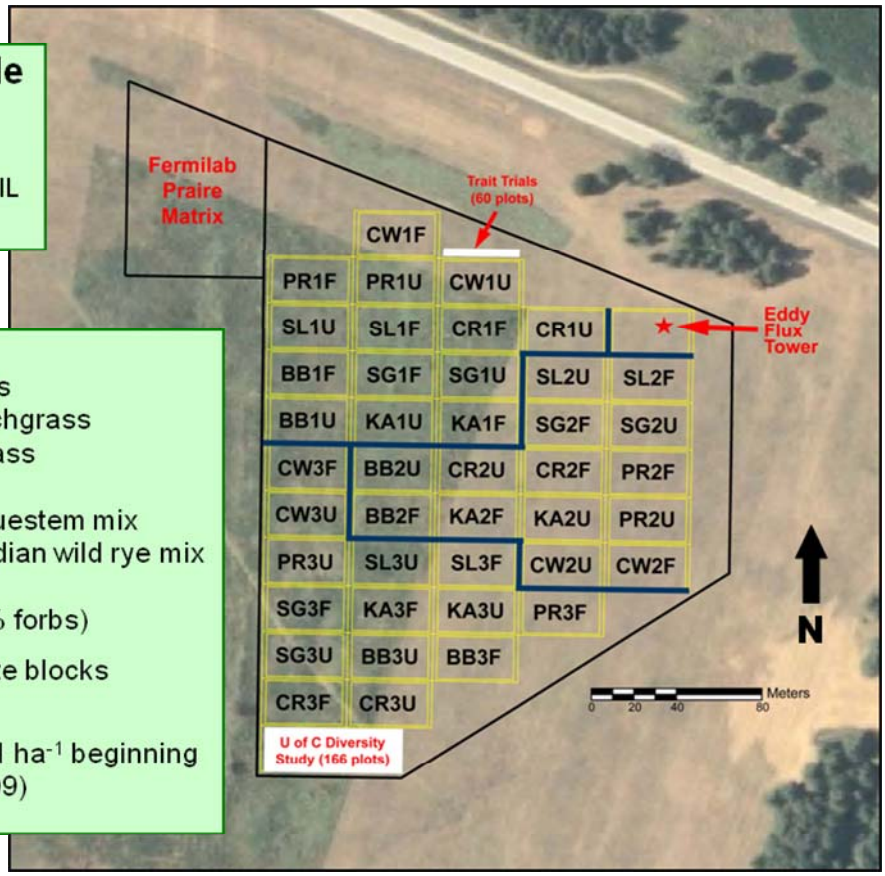
36 x 20 meters
Located at Fermilab, Batavia IL
Planted June 2008

PLOT KEY:

KA = Kanlow switchgrass
CR = Cave-in-Rock switchgrass
SL = Southlow switchgrass
SG = Switchgrass mix
BB = Switchgrass-big bluestem mix
CW = Switchgrass-Canadian wild rye mix
PR = Simple prairie mix (80% grasses; 20% forbs)

Numbers indicate replicate blocks

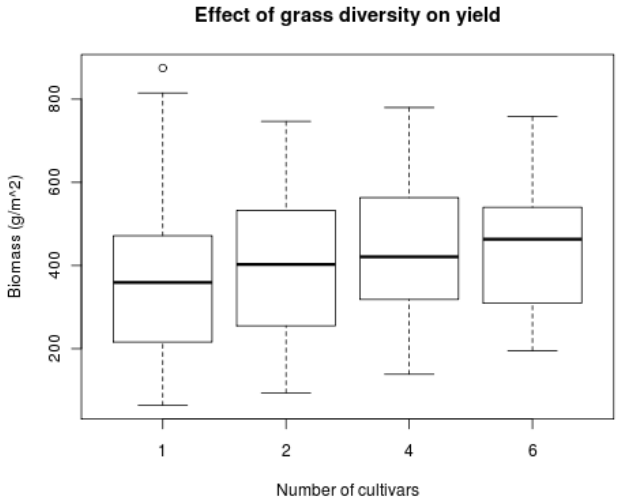
U = unfertilized
F = fertilized with 67 kg N ha^{-1} beginning in the 2nd year (2009)

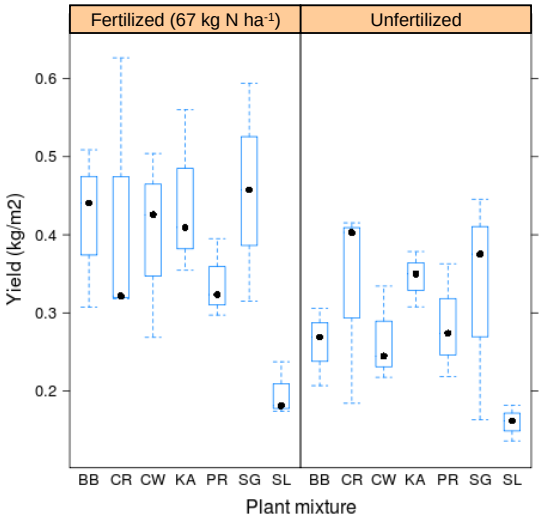


Argonne NATIONAL LABORATORY

BIOMASS 2010

Second-year aboveground biomass yields indicate high-diversity mixtures generally had productivity equal to or greater than monocultures of USDA-recommended switchgrass cultivars





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Harvested biomass shipped to Argonne, Naperville IL, Wisconsin, and Idaho for feedstock evaluations, including:

- Pelletization and combustion properties
- Pilot gasification studies
- Pretreatment studies

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