

Grain, Forage, and Bioenergy Research Unit, Lincoln, NE

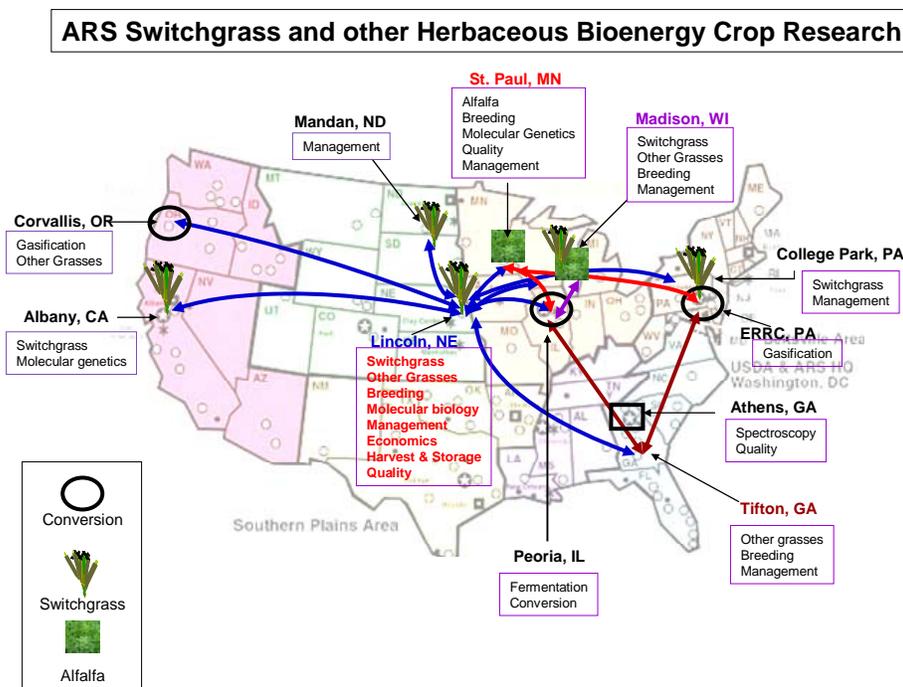
Primary Contact: Kenneth P. Vogel, Research Leader

Telephone: 402-472-1564; Email: Ken.Vogel@ars.usda.gov.

Bioenergy Research Projects:

- “Improved plants and production practices for grasslands and biomass crops in the mid-continental USA.” Switchgrass for bioenergy. Ken Vogel, Lead Scientist.
- “Genetic improvement of sorghum for enhancing energy yield, nutrient content, and disease resistance.” Sorghum grain and forage for bioenergy. Jeff Pedersen, Lead Scientist. Telephone 402-472-1754; Email: Jeff.Pedersen@ars.usda.gov.
- “Genetic improvement and evaluation of hard winter and spring wheats. Major emphasis on grain quality, minor on bioenergy.” Robert Graybosch, Lead Scientist. Telephone 402-472-1563. Email: Bob.Graybosch@ars.usda.gov.

Switchgrass for Bioenergy: ARS forage and bioenergy project at Lincoln, NE is the primary USDA location for switchgrass research. The project is conducting research on all aspects of developing switchgrass into a biomass energy crop and has cooperative research in progress with other ARS locations as illustrated below.



The Lincoln switchgrass team consists of Ken Vogel, research geneticist, Rob Mitchell, research agronomist, and Gautam Sarath, molecular biologist.

Recent accomplishments:

- Determined the economic feasibility of growing switchgrass as a biomass energy crop in field scale trials with 10 cooperating farmers in a three state region for five years.
- Quantified the net energy balance of switchgrass using data from the same trial and demonstrated that switchgrass grown as a biomass energy crop produces over 5x the amount of energy as used in its production.

- Developed Plant Adaptation Regions as a mechanism to classify perennial plant materials including switchgrass and their adaptation regions.
- Molecular biology – in cooperation research with ARS and Univ. NE staff, a complete set of Expressed Sequence Tags (ESTs) are being developed for switchgrass.
- Characterized genetic variation for biomass quality in switchgrass; identified seed quality as a primary factor that can effect stand establishment.
- Demonstrated the feasibility of using hybrid cultivars to increase switchgrass biomass yield for use as a bioenergy feedstock.
- Potential new cultivars and germplasms are in seed increase for official release for use in bioenergy production systems.

**ARS Lincoln Sorghum Research:
Grain & Biomass**



Jeff Pedersen, research geneticist
 Scott Sattler, molecular biologist
 Deanna Funnell, plant pathologist

Recent Accomplishments:

- Characterized the U.S. photoperiod sensitive sorghum collection for: fermentation, starch, energy, protein, oil, fiber, mineral content, and entered into GRIN.
- To date, this project has released 162 germplasms, genetic stocks and lines and provided germplasm to 41 U.S. Seed Companies, 24 U.S. Public Institutions, & 21 Foreign Countries.
- Genetic stocks near-isogenic for brown midrib genes were developed and released; established that bmr-12 is superior to bmr-6 for feed quality, bmr-12 superior to bmr-6 for agronomic performance, yield drag is associated with both genes (bmr-6 and bmr-12), grain yield drag can be overcome by heterosis, and lignin precursors are a source of disease resistance.
- A new waxy allele has been discovered in sorghum, and waxy parental lines classified for alleles. Isogenic lines in diverse backgrounds are being developed.