

Booneville Plant Materials Center
USDA-NRCS

Switchgrass Biofuel Study

2008

Report of Progress

Switchgrass is a perennial warm-season grass grown for decades on marginal lands not well suited for conventional row crop production. It is being recognized as a potential renewable energy source and an alternative cash crop. Preliminary studies indicate that switchgrass has potential for significant biomass production.



Switchgrass Seedhead

Switchgrass may one day help ease the heartburn that the American motorist has been experiencing every time they go to the gas pump. The ability to use energy crops produced on America farms as a source of renewable fuels is a concept with great relevance to current economic and environmental issues. In the near future, switchgrass may provide an answer to this problem.

Development of a substantial capacity to use perennial forage crops such as switchgrass for biofuels production could benefit our agricultural economy by providing an important new source of income for farmers. Biofuel production from perennial cropping systems would help reduce loss of agricultural soils, reduce our dependence on

imported oil supplies, and lower greenhouse gas emissions and other toxic material in the atmosphere.

American produced ethanol can help reduce imports of oil by 1.5 billion barrels a year. Corn which has been used to produce ethanol must first be converted to sugar and the sugar then fermented into alcohol for marketing as ethanol. Cellulosic material, which can be produced directly from switchgrass, may be directly converted into ethanol and this requires less energy to produce.

The Booneville Plant Materials Center (PMC) has initiated a study with two cultivars ('Alamo' and 'Cave in Rock') of switchgrass, using irrigated/non-irrigated and commercial fertilizer/animal waste fertility treatments to determine the optimum combination of these variables to maximize production of annual biomass. Since currently, there are no cellulosic biofuels feedstock markets in western Arkansas or eastern Oklahoma, harvested materials are being analyzed for forage quality. Ranchers, who want to produce switchgrass for the biofuel market, can utilize it as high quality, high yielding forage until those markets become available.



Switchgrass Field

The 'Alamo' and 'Cave in Rock' switchgrass cultivars were established in 40'X40' plots (randomized complete block design with three replications) in the spring of 2007. Soil samples were collected from each treatment/replication prior to planting. Samples were analyzed by the University of Arkansas soils lab in Fayetteville. Soil amendments were applied to bring nutrient levels up to medium production prior to planting.

A clean firm seedbed was prepared. The cultivars were then planted on March 5, 2007 at a rate of 5 lb/acre PLS, using a Marliss grain drill. The seedbed was then rolled with a water filled roller.



Planting Switchgrass Plots

A permanent irrigation system was installed in replicated irrigation treatments in the summer of 2007. Rain gauges were placed in the irrigated plots to enable technicians to calibrate the delivery system. Rainfall data is collected by Dr. David Burner with the Agricultural Research Services' Dale Bumpers Small Farms Research Station.

Fertility was applied at green up in early April, 2008. The animal waste treatment plots received four tons/acre of dry broiler litter. Commercial fertility treatment was 300 lb/ac of 13-13-13.

The study is designed to be harvested on multiple dates and also an annual harvest after a killing frost. The two harvest plans will identify harvest dates that yield the greatest amount of annual biomass with the least harvest cost.



Installation of Irrigation System



Irrigating Switchgrass Plots

The first harvest (see table 1) was made on June 17, 2008. No irrigation water was applied prior to the June 17 harvest. Samples were taken and dry matter per acre was calculated from plot weight, wet weight, and dry weight data. The dry samples were then ground to 1mm particle size and analyzed by the University of Arkansas Forages Lab in Fayetteville for forage quality (see table 1 below).



June Harvest

Table 1:

Dry-matter (DM) production (lb/acre), % crude protein, % acid detergent fiber, and % neutral detergent fiber, of Alamo and Cave-in Rock switchgrass.

Cultivar/Treatment	DM	CP	ADF	NDF
	lb/ac	-----%-----		
Alamo Fertilizer	10827	6.75	34.83	65.99
Alamo Litter	11872	7.81	36.76	65.94
Alamo Irrigated Fertilizer	7952	6.44	33.09	64.99
Alamo Irrigated Litter	12230	7.99	36.74	66.21
Cave-in Rock Fertilizer	8363	7.99	35.24	63.92
Cave-in Rock Litter	9641	9.23	38.65	66.34
Cave-in Rock Irrigated Fertilizer	9442	7.61	33.14	63.91
Cave-in Rock Irrigated Litter	12109	9.13	36.44	66.35