

## Switchgrass: Possibly the Best Solution for America's Energy Needs

Awareness is growing about the untapped potential of switchgrass (*Panicum virgatum*) as a powerful (and renewable) energy source. And unlike ethanol produced from corn, which according to some studies can actually contribute to air pollution, cellulose ethanol from switchgrass reduces greenhouse gases. And since many scientists agree that greenhouse gases are the cause of global warming, switchgrass may become more important to energy production in the future than corn.

But there are still some major hurdles to overcome with the process of burning switchgrass for energy production. This is where the Plant Materials Program steps in.

One of the main problems of using switchgrass as a biofuel has been the amount of ash which is created after burning it. The composition of the ash, which influences conversion technology, contains alkali metals (especially potassium).

Potassium causes slagging and boiler fouling as a result of high temperature reacting with silica and other minerals to create a gummy slag.

“One option to improve the combustion properties of the biomass produced while burning switchgrass is to delay the harvest until potassium has been leached from the biomass,” said Joel Douglas, the Plant Materials Program’s Central Region Plant

Specialist. “However, there is degradation of the biomass if it remains in the field too long.”

To solve this problem, the Plant Materials Centers (PMC) at Knox City, Texas and Elsberry, Missouri, along with the USDA Agricultural Research Service and Mississippi

State University are cooperating on a study to investigate how the timing of harvesting affects biomass yield and the biofuel-quality of switchgrass.

**The Program’s Long History with Switchgrass**  
Several switchgrass cultivars labeled for biofuel consideration were evaluated and selected by the Plant Materials Program in the 1960s and 1970s for soil stabilization and livestock forage. USDA NRCS, along with several land grant universities, have conducted extensive research including variety trials over multiple locations to screen the best



‘Kanlow’ switchgrass is a productive variety for low-lying areas.

adapted and highest yielding switchgrass. Most notable switchgrass cultivars receiving considerable attention through these and other biofuel research endeavors were:

- **'Alamo'** released in 1978 by the Knox City, Texas PMC
- **'Cave-in-Rock'** released in 1974 by the Elsberry, Missouri PMC
- **'Kanlow'** released in 1963 by the Manhattan, Kansas PMC

### More than Just Switchgrass for Energy

The Plant Materials Program has identified other potential energy producing biofuel crops include giant miscanthus (*Miscanthus x giganteus*), big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*) and alkali sacaton (*Sprobolus airoides*) Studies to evaluate them will be established this year.

Initial harvest will begin at seed maturity then sequential harvests will be made at 6 week intervals. In addition to biomass yield, fuel quality parameters will be collected to determine suitability for direct combustion conversion.

PMCs outside the natural range of switchgrass (and other high yielding warm season grasses) are considering evaluating several cool season grasses, such as blue wild rye (*Elymus glaucus*) and tall wheatgrass (*Thinopyrum ponticum*) for biofuel potential. Studies are expected to begin in 2007.

“We anticipate that the results of this cooperative research will provide information on the acceptance of other species for biofuel consideration and refine agronomic management technologies for further advancement of switchgrass and other grasses as a biofuel crop,” said Douglas.

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### Taking the Next Step Using Switchgrass for Energy Production

The Chariton Valley Biomass Project has been testing the effectiveness of 'Cave-in-Rock' switchgrass at a coal burning plant in Ottumwa, IA. The process consists of a 5 percent mixture of switchgrass and 95 percent coal. Approximately 11 tons of switchgrass is consumed every hour.

The environmental benefits include emission reductions and substantially reduced sulfur dioxide release. The coal plant is currently offline to test for slagging of equipment because of the use of switchgrass. The test results are expected by this fall.

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A production field of 'Cave-in-Rock' switchgrass.

### Some Interesting Facts about Switchgrass: Why It's Making Some Impressive Amber Waves

Switchgrass has been designated by the U.S. Department of Energy as a model biomass crop because of the following attributes:

- High biomass productivity over a wide geographic area
- Commercially available cultivars
- Planting and harvesting is compatible with conventional farm equipment
- Low water and nutrient requirements
- Suitable for marginal arable land
- Multiple environmental benefits (soil erosion, carbon sequestration, wildlife habitat, water quality)

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