

# The IBSS Partnership: Deploying an Advanced Biofuels Industry in the Southeastern United States

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## Background

Almost half of the nation's supply of advanced biofuels, as mandated by the renewable fuels standard, will be met with the lignocellulosic resources of the southeast. While producing roughly 10 billion gallons of alternative fuels is well within the region's capacity, a considered and thoughtful transition is needed to insure a sustainable supply of biomass for this new industry. With more than 30 million acres of southern pine plantations distributed throughout the South, an expansive biomass source for fuels production is in place. Working closely with conversion technology collaborators, The Southeastern Partnership for Integrated Biomass Supply Systems is developing today's forest resources for near-term progress while advancing energy crop supply systems optimized for infrastructure-compatible fuels production. The program's overarching goals are:

**Demonstrate implementable 'real-world' solutions to the economic and environmental barriers that limit sustainable and reliable biofuels production.**

**Introduce new tools and metrics for effective decision-making in site selection and regional deployment of biofuels production from lignocellulosic biomass.**

**Provide credible, impactful, and integrated education, extension and outreach (EZO) programs that train the workforce needed, and inform stakeholders and policy makers with the knowledge necessary to thoughtfully enable the southeast's biofuels industry.**

Substantial work has been directed toward evaluation of new genetic varieties of hybrid poplar and eucalyptus, as well as switchgrass. This poster highlights recent results on the productivity of select clones under different management scenarios and site characteristics. Additionally, the effect of feedstock characteristics on conversion performance will be discussed.

## Regional Industry Development

The southeast has more than 30 million acres of pine plantations immediately available as today's biomass resource. Although this feedstock source is not optimal for biochemical conversion it performs well for thermochemical fuel technologies, and represents the foundation for deployment of today's industry. In contrast, short rotation hardwood crops have demonstrated potential as a feedstock for both technology platforms. The IBSS partnership anticipates woody crops serving an important function as the bridge to a more diverse industry in the region. With greater demand for engineered feedstock, herbaceous crops such as switchgrass will supplement woody biomass in biochemical processes for butanol.



## Near Term Opportunities

### New Varieties

In east Tennessee, rust has been observed in several switchgrass fields. Estimates are that biomass yield may be reduced as much as 10-15 percent in infected fields.

A rust-resistant individual of Alamo was observed in 2010. In 2011, the plant was again free of rust while neighboring plants were infected. Leaves from the resistant plant were collected, DNA extracted and sequenced. In 2012, approximately 200 clones of the resistant plant were grown in a greenhouse. Thirty two plants were transplanted in early May 2012. No plant has been observed to have a pustule of rust.

### Field Trials

Trials and demo plots of short rotation woody crops have been established in Tennessee and Alabama:

Poplar trials at the different sites include 40 varieties of select clones being evaluated at 3 different spacings. Genetic effects are highlighted after 2 growing seasons, including select varieties with exceptional biomass yield.

Eucalyptus demo plots in lower Alabama has trees planted at very high density (1089 and 545 TPA). Similar trials are underway in North Carolina.



### Database

This user-friendly database is providing rapid access to IBSS data for all team members. Chemical and physical properties of the biomass sources (switchgrass, softwood, and hardwood) are helping better understand the natural variability of these feedstocks for the production of biofuels. In addition to cellulose, hemicellulose, lignin, extractives, ash content and inorganic composition, spectroscopic data are also available.



### IBSS Diesel

We have successfully demonstrated the technical feasibility of producing green diesel using IBSS-provided biomass from the region. Rentech sent approximately 500 gallons 'RenDiesel' to Auburn University, North Carolina State University, and The University of Tennessee.

IBSS recently coordinated a tour that touted the successes of the first two years of the IBSS Partnership. The 900-mile mobile tour featured a tractor-trailer scale mobile biomass gasifier from Auburn University. Using IBSS diesel, the gasifier traveled a three-state route and demonstrated to thousands of students and adults how to turn biomass into electricity and drop-in fuels like diesel.



## Long Term Potential

### Increased Biomass Yields

Identification and development of a rust resistant variety of switchgrass will increase biomass yields at least 10 percent, thereby improving production economics and system sustainability.

Many pathogens are "generalists" that can adversely affect major staple crops such as barley, corn, oats, rice, sorghum, and wheat. Discoveries made concerning population dynamics, pathogenicity, virulence, and epidemiology of fungal pathogens on switchgrass may be more broadly applied to diseases (including stand establishment) of these other important crops.

### Herbicide Resistant Woody Biomass

Results from the trials will enhance current knowledge on these superior genetics in newer regions. Demo plots include block planting of the same varietal in three different densities. Information from these plots will be more realistic to use in yield estimates across regions and life cycle analysis.

IBSS is also addressing the impact that herbicide tolerance in hardwoods might have on reducing the cost of biomass production and improving yield. Current herbicide application alternatives are limited, often short lived and care must be taken during applications to minimize damage. Trees with tolerance to certain herbicides could be more economically managed and suffer less chemical damage.

### Feedstock Quality

The generated data from switchgrass in the form of ash content, lignin content, and natural variability will better equip our industrial partners to test and include this new feedstock in their processes. Genetics, growth environment, harvesting method, and storage conditions are some of the factors that influence biomass chemical composition. By understanding biomass heterogeneity, researchers can estimate the quality of the feedstock, design a specific process or adjust process conditions to obtain optimal conversion yield. IBSS will continue to work with industry partners to identify the quality parameters needed for this crop to meet the required specifications of the bioenergy industry.

### Fueling America

The IBSS Partnership is striving to develop drop-in liquid fuels, such as gasoline and diesel from lignocellulosic biomass. The program is working closely with its industrial collaborators – KIOR and Louisiana-Pacific – to efficiently integrate the emerging liquid fuels industry with the region's established forest products industry. This approach will reduce the barriers to deployment and increase the importance of the bioeconomy in the southeastern United States.

