

Scientists harvest hybrid poplar stand in next step toward a biobased economy

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A self-propelled forage harvester with a specialized woody harvesting head harvests a 10-acre stand of hybrid poplars being studied to advance lignocellulosic biomass as part of a USDA-funded project coordinated by the University of Tennessee Center for Renewable Carbon. Credit: Genera Energy Inc.

A small stand of poplar trees harvested from a University of Tennessee AgResearch Center is set to help scientists progress further down the path toward low-cost, high-quality biomass and a bioeconomy.

Located on UT's East Tennessee AgResearch Center in Blount County, the 10-acre plot of hybrid poplars was planted just over four years ago and the now 30-ft trees are expected to produce some 60-100 tons of woody biomass—a crop Tennessee and other Southeastern farmers could potentially sell to biorefineries for conversion into advanced fuels or other biobased products.

The harvest is part of a five-year \$15 million multi-disciplinary research and development effort funded by the U.S. Department of Agriculture to reduce barriers to the development of the Southeastern bioeconomy. UT's CRC, located within the UT Institute for Agriculture, leads the effort, which is called the Southeastern Partnership for Integrated Biomass Solutions, or IBSS. Partners in the broad-based effort include Auburn University, North Carolina State University, the University of Georgia, ArborGen, and Genera Energy Inc.

Tim Rials, director of the CRC explains, "The goal of the IBSS partnership is to demonstrate the production of advanced biofuels from sustainable sources of lignocellulosic biomass, that is, biomass made from designed herbaceous and woody crops." IBSS has focused on perennial switchgrass and short-rotation woody crops like eucalyptus, pine and hybrid poplar.



Center for Renewable Carbon Director Tim Rials (standing) and his research assistant Jessica McCord examine some stumps remaining after the harvest of a 10-acre grove of hybrid poplars grown as a potential biomass crop. The poplars should regenerate for a second harvest in about three years. Credit: University of Tennessee Institute of Agriculture.

"It's important for the industry and producers to have a portfolio of crops that can supply the cellulosic biomass for the biorefineries," Rials said. "Very little information is available on the performance of hybrid poplar in the Southeast. This project is designed to identify the effect of both genetic differences and management practices on the growth and yield of this potentially important energy crop. The data should provide the basis for future productivity improvements."

The harvest included plots of several hybrid poplar varieties, called clones. Although genetic differences clearly impacted the overall yield, research has shown little difference in the chemical composition of the different hybrid poplar clones. "This information provides valuable guidance for continued enhancement of this new energy crop," Rials said.

Similar field trials, some with the same varieties, are also underway in Alabama, Mississippi and North Carolina to evaluate environmental impacts on biomass yield.

IBSS partner Genera Energy, a biomass supply company based in Vonore, Tenn, led the harvesting effort for the poplars. The harvester utilized in the project is a standard self-propelled forage harvester with a very unique harvesting head attached to it. Only two of these woody harvesting heads exist in the world, and proving new harvesting technologies and logistics are at the core of improving the biomass supply chain for [woody crops](#). In addition to the Knoxville harvest, Genera Energy also conducted additional harvesting of poplars in Mississippi with IBSS and Greenwood Resources.

Reducing the risk of supplying lignocellulosic feedstock and ensuring a sustainable, predictable supply of feedstocks with desirable properties for optimal performance during industrial processing is a challenge that must be confronted to make the Southeast a more attractive location for a new industry, Rials maintains. "The IBSS Partnership is working with that end in mind," he says.

A portion of the harvest from the UT AgResearch poplar stand, along with similar samples from the harvests at other sites, will be sent to different partner labs at the CRC, Auburn University and North Carolina State University for physical property analyses such as moisture content analyses and specific gravity examinations - important measurements to

gauge the materials' usefulness for industry. Scientists with the CRC will also use NIR (near infrared) technology to examine the chemistry of the wood with an eye toward the development of future bio-based products.

The IBSS partners are working to match the economic and environmental performance of each feedstock with a preferred conversion platform so that the ultimate product, whether it's a biofuel or chemicals derived from the distillation of the biomass into its component parts, will be reliable, available and affordable.

Once the samples for examination at the CRC are set aside, additional samples from the harvest will be delivered to Genera Energy for pre-processing and further analysis, including spectroscopic monitoring. Genera's facility, which is the country's largest and most comprehensive industrial biomass management and processing facility, employs real-time feedstock monitoring technology to improve feedstock pre-processing, which reduces the risk of delivering material that fails to meet specifications. "The biomass preprocessing step helps guarantee to potential biomass users a consistent and uniform feedstock from which they can refine fuels and other products," said Sam Jackson, Genera's vice president for business development.

While the feedstock needed for biorefineries to produce biofuels and other biobased industrial products is currently readily available in the Southeast because abundant supplies of forest and agricultural residues, dedicated bioenergy crops will be needed to meet industry requirements for a sustainable industry to develop.

"The beauty of the poplars we are harvesting is that they will regenerate and continue to grow," said Rials. "In just 2 or 3 years they could be harvested again as a [biomass](#) crop. This makes them attractive to both producers and industry."

Provided by University of Tennessee at Knoxville

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