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MIZZOU

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Harvesting energy

Putting plants to work

Story by Tara Ballenger

Tree crops

When MU's power plant fires up its new biomass boiler in 2012, it will do more than make the campus energy supply more sustainable — it will create a new market for Missouri-grown tree crops, says Hank Stelzer, an associate professor of forestry in the College of Agriculture, Food and Natural Resources. The boiler, a $75 million project that will replace a 24-year-old coal-burning unit, will run on up to 140 tons of biomass each year.

Stelzer is studying which plants would work best as energy crops grown solely for biomass materials, not food.

Willow and cottonwood trees are performing especially well, he says. Within three years, they spring up 20 feet and can be cut and sold as biomass. Then, the trees regenerate and the process can be repeated. One tree can yield seven harvests in 20 years before it needs to be replaced.

Stelzer is comparing these trees to other biomass crops and observing how they fare on land that isn't optimal for growing wheat and corn. "On soils that are highly erodible and not suited for grain crops, woody systems have the potential to be a more productive crop and help rebuild the soil at the same time," he says.

Sorghum

Felix Fritschi is investigating how sorghum could be a sweet deal for Midwestern wheat farmers. Fritschi is an assistant professor in the plant sciences division of the College of

Agriculture, Food and Natural Resources.

Winter wheat is planted in late fall and harvested early the following summer. To keep their fields profitable during the interim, many farmers have started to plant quick-growing biofuel crops — mainly soy.

But for farmers north of Interstate 70, that can be risky business. Soybean oil is extracted from the seeds of the plant, but if there is an early frost — not uncommon in northern areas — the plant won't produce seeds.

Better known as an ingredient in some syrups, sorghum's stalks have a high sugar content that produces cane juice. Once extracted, the juice can be fermented into ethanol without advanced technology. And because the biomass is found in the stalk and not the seed, the plant doesn't need to reach maturity to be harvested, so early frosts are not an issue.

"We're interested in it because it's drought-tolerant, fast-growing and easier to make in small-scale operations," Fritschi says. "It also doesn't take as much water."

Studying crops at MU's Bradford Research and Extension Center, Fritschi has documented which types of sorghum produce the most biomass and which are more drought-resistant so scientists can use selective breeding to raise the optimum plants.

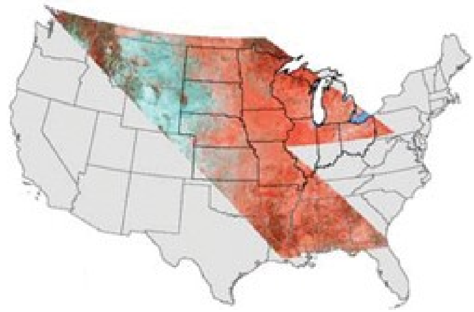
Coffee grounds

In 2010, a group of agricultural systems management students from Germany teamed up with Assistant Professor Bulent Koc to produce biofuel from discarded coffee grounds. The team used the typical solvent — hexane — to extract the oil, which can be mixed with traditional petroleum fuels.

The results were encouraging: 14 percent of the coffee grounds mixture was converted to biofuel. Not bad for a waste product that doesn't require cultivation. Since then, Koc has improved the system by treating the grounds with high-intensity ultrasound, a beefed-up version of the technology doctors use to create images of muscles and tendons. The method has increased the oil yield by nearly 30 percent.

GIS imaging

Geographer Cuizhen Wang is leading a team of researchers in using remote sensing and geographic information systems (GIS) to map out tracts of land suitable for biomass crops. The system creates a database by analyzing an area's soil type and vegetation. That information is then used to generate maps that illustrate the available areas and the percentage of land conducive to growing.



Algae

Scientists have long known that algae contain oil that can be used to make biofuel, but figuring out how to extract the oil efficiently remains a challenge.

In the meantime, agricultural engineering Professor David Brune is using algae research to increase yields at shrimp farms.

Algae growing in shrimp raceways underneath a greenhouse at Bradford Research and Extension Center maintain high water quality, ensuring rapid shrimp growth. Tilapia then consume algae and shrimp waste to prevent algal overpopulation.

The process produces four times as much shrimp as conventional systems, eliminates the need for aerators and produces no discharge. Translation: more food, less pollution.

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