

## Biofuels research searches for new sources

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The words are becoming familiar, even if the products aren't: biofuel, biobased, biodiesel, bioethanol. All refer to fuel that's made from bio-produced materials such as plants. Chengci Chen (pronounced Chen-see Chen), an assistant professor of cropping systems at the Central Agricultural Research Center at Moccasin, Mont., and his collaborators are investigating Montana's potential for producing biofuels using "biomass," which refers to all biologically produced materials like grains, straw, hay, trees and fruits. He and his collaborators are working on a project to evaluate the ethanol production potential of various straws, hays, and silages in Montana.

People can make fuel from many kinds of plants, though over 90 percent of ethanol made in the United States comes from corn grain. However, other sources of ethanol are needed, because even if the entire United States' corn crop was used for ethanol, it would meet only 10 percent of the country's fuel needs.

So researchers are looking for new sources for ethanol. Since the jury is still out on what combination of sources will be best to replace petrol, Chen is working with sources that will be more universally available -- especially in Montana.

Chen is working on the issue from two directions. First, he is looking at how to maximize the volume of Montana crops or their residues with less input. At the same time, he is looking for the most efficient enzyme to break down the biomass into sugars and also looking at microorganisms that can ferment the sugars into fuel.

Daniel Kammen, director of the Renewable and Appropriate Energy Lab at the University of California at Berkeley, said in a recent email that rapid technological advances in the production of such cellulosic ethanol are contributing to its tremendous potential as an easy-to-use fuel in conventional vehicles.

How best to bring that tremendous potential to Montana is just what Chen and his collaborators are researching.

"If we use grass and straw, you can find the stock everywhere," Chen said. "It is widely available in many regions of the country, rather than being limited to the Corn Belt, and it has the potential to have higher production in Montana."

The United States is facing increasing energy challenges. President Bush's proposal for additional clean-energy research in his State of the Union Address acknowledged the need for extensive research in biofuel, and the U.S. Department of Energy announced this month an ambitious research agenda for developing cellulosic ethanol. The Department of Energy called it in a news release "a renewable, cleaner-burning, and carbon-neutral alternative to gasoline" and "an economically viable transportation fuel."

"Montana farms produce 10 million tons of wheat and barley straw that are typically left in the field. An additional five million tons of hay are produced annually," said Dave Wichman, superintendent of the Central Ag Research Center "The advantage of using annual farm crops for ethanol production is that farmers can produce biomass with conventional crops and equipment, and can alternate crop production for energy, food or feed," he added.

In areas with irrigation and enough heat, a double-cropping system with winter cereals and warm season grasses like winter triticale and sweet

sorghum, can be adopted.

"The biomass production increases by as much as 50 percent using this system compared to a single-cropping system," Chen explained. "Even perennial grasses like switchgrass might be grown on marginal lands or lands retired from the Conservation Reserve Program."

Chen is working with scientists at the Biological Engineering Department of North Carolina State University to screen chemicals and enzymes that pretreat and convert biomass into sugars.

"Biomass energy can contribute to cleaner air through reduction in greenhouse gas emissions. It can also improve rural economies, and reduce energy dependence on foreign petroleum oils," said Ralph Peck, director of the Institute for Biobased Products at MSU. The institute has funded Chen's research after receiving a line-item appropriation through Sen. Conrad Burns, R-Mont.

"One of our goals is to make the new ethanol production methods from biomass competitive," Peck said.

Source: Montana State University

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