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Another Recipe for Ethanol: Homegrown Sweet Sorghum

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WASHINGTON _ What's sweet like sugarcane, looks something like corn and could be grown in much of the United States to make ethanol?

Sweet sorghum.

American pioneers used sweet sorghum as a substitute for sugar to make syrup. The syrup is still available today, mostly made in Kentucky and Tennessee, but for decades most American sweet sorghum has been used for livestock feed. Today, some researchers are looking at using it to make ethanol to blend with gasoline and help reduce the country's dependence on oil.

The timing may be right for sweet sorghum. The United States is reaching its limits on using corn for ethanol, and global concerns are rising about using grains to make fuel while food prices soar. At the same time, researchers are looking for ways to make biofuels that would do more to reduce carbon dioxide emissions. Sweet sorghum gets good marks on all counts.

In India, where researchers have made ethanol from sweet sorghum recently, it's known as a smart crop, because farmers can grow it for grain for food or for the stalks for animal feed or ethanol. It will grow in hot and dry conditions, and it tolerates salty land and waterlogging.

Sweet sorghum is harvested for its juice before the mature plant forms clusters of grain. The stalks are pressed, and the juice is fermented and distilled to make ethanol. The process is simpler and requires less electricity than making ethanol from corn.

Growing sweet sorghum requires only about half the water needed for corn and about half the nitrogen fertilizer. And unlike sugarcane, which grows best in tropical conditions, fast-growing sweet sorghum can be grown in much of the country during the summer.

But the crop has a big drawback: It's bulky to transport and can't be stored. In fact, processing has to start within about 24 hours after harvesting or sugar will be lost.

Researchers are looking for better breeds of sweet sorghum and small-scale processing systems that might make economic sense.

"Sweet sorghum is really the sugarcane of the Middle West," said Michael McNeill, who runs an agricultural consulting business in Algona, Iowa.

Studies at American universities have shown that an acre of sweet sorghum could yield enough juice for 400 to 600 gallons of ethanol, compared with 434 gallons from an acre of corn.

"It's pretty simple. It's low-energy input. I just think it makes a whole lot of sense," said Danielle Bellmer, an associate professor of biosystems engineering at Oklahoma State University.

Ismail Dweikat, who researches sorghum genetics at the University of Nebraska, said studies suggest that it might be feasible to ferment the sugar to ethanol and distill it to an ethanol-water solution that could be transported to a central facility for making fuel-grade ethanol.

With water shortages, "we need a crop like sweet sorghum that requires no supplemental irrigation," Dweikat said.

When the sugar is pressed from the stalk for ethanol, the leftover stalk, called bagasse, can be burned to make electricity or used as a livestock feed that's rich in nutrients and minerals, he said.

Dweikat said the cellular structure of the sweet sorghum plant also makes it a good choice for cellulosic ethanol, which uses the plant's leaves and stems instead of its juice or grain.

The 2007 energy bill has called for annual production of 36 billion gallons of ethanol and specified a split of 15 billion gallons from corn and 21 billion from non-corn sources. Rick Tolman, the CEO of the National Corn Growers Association, said American farmers will be able to produce enough corn for food and up to 15 billion gallons of fuel. Corn ethanol plants that could produce nearly that much ethanol are already built or are under construction.

Tolman said sweet sorghum may become a supplement to corn ethanol in the future.

The use of crops for ethanol already has provoked debate about the use of farmland.

"We have so much available acreage to plant, and we're going to have to choose," said Bellmer. "Will we grow food or fuel or both? I don't think we can get around that."

Sweet sorghum in the Midwest is harvested in September and October _ after nights get cool, but before a hard frost. That means there's only about a two-month harvest period when ethanol plants could run. The crop would have a longer window in the South, but still couldn't be grown from October to March.

Robert P. Anex, of the Department of Agricultural and Biosystems Engineering at Iowa State University, said it would be difficult to make an ethanol plant pay for itself if it ran for only a few months each year. Anex figures it would be "exceedingly difficult" to make a viable business out of sweet sorghum ethanol in North America, especially in the northern plains states.

But several companies have developed business plans to use sweet sorghum.

One of them is Florida-based Renergie Inc., which wants to build the first U.S. ethanol plant that uses only sweet sorghum. Renergie plans to start with 10 5-million-gallon plants in Louisiana and expand with another 10 in Florida. Florida gave Renergie a \$1.5 million grant last year.

The company would blend its ethanol with gasoline at gas station pumps and sell it directly to the public locally, minimizing transportation costs, said Brian Donovan of Renergie.

Renergie plans to use technology provided by the Rusni Distillery in India. Rusni worked out a way to use the crop for ethanol by working with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), a nonprofit dedicated to improving agriculture to reduce poverty and improve food security while protecting the environment. Rusni began making ethanol last June, using sweet sorghum grown by 791 local farmers.



"There is tremendous interest in sweet sorghum for ethanol worldwide," said Bellum Reddy at ICRISAT in India. Most dry land farmers in India are poor, and sweet sorghum is a crop that works well for them, he said. "So farmers will have wider opportunities for marketing their produce and extra income and be part of the bio-energy revolution."

Some types of sorghum can provide both a grain, which can be ground and used for food, or harvested earlier for the stalks for ethanol. The plant is also common in parts of China and Africa, where there's also interest in using it for ethanol.

"Many countries pay great attention to sweet sorghum," said Li Dajue, a botanist in China who introduced sweet sorghum he got from research agronomist D.M. Broadhead of Mississippi in 1974 for food when world sugar prices spiked and over the past three decades has been researching the use of sweet sorghum for fuel.

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