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Biotech seeks to ease reliance on corn

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SAN FRANCISCO --

The ethanol craze is putting the squeeze on corn supplies and causing food prices to rise.

Mexicans took to the streets last year to protest increased tortilla prices. The cost of chicken and beef in the United States ticked up because feed is more expensive.

That's where biotechnology comes in.

Scientists are engineering microscopic bugs to extract fuel from a variety of non-corn sources, including the human urinary tract, a Russian fungus and the plant responsible for tequila.

The quest for alternative energy is more complicated than just finding a replacement for petroleum. Scientists and a growing number of biotechnology companies are attempting to remove corn from the ethanol equation because it has created huge demand for the global food staple.

"There is enormous growth potential" for alternative fuels, said McKinsey & Co analyst Jens Riese. "But we need to be smarter than just building the next corn ethanol plant."

Researchers are racing against time. Already, 114 U.S. ethanol biorefineries are in operation and 80 more are under construction. Producers made nearly 5 billion gallons of ethanol last year, a 25 percent increase from the previous year.

And nearly all of it was made from edible corn kernels.

That's good news for U.S. farmers, but consumers are suffering at the checkout stand because corn prices have nearly doubled over the last two years and will continue to climb.

And with farmers planting corn at unprecedented rates, often instead of other crops, prices for other products may soon rise as well.

Corn is a fundamental U.S. food ingredient, found in everything from soft drinks to cough syrup. It's also a staple throughout Latin America, where residents may feel the sting of rising corn prices the most.

Backers of alternative production methods argue that a technological change is needed soon, before corn-based ethanol grows so large that other manufacturing methods will be squeezed out of the market.

That's why genetic engineers from Berkeley to Florida are racing to produce ethanol without corn. They're looking into termite guts, the human urinary tract and sap from palm trees for exotic microbes that can produce alternative fuel sources.

Scientists at DuPont Co., for instance, have been tinkering with the DNA of an agave-loving bug in a bid to make ethanol from corn waste rather than the kernel itself. Working with \$19 million of its own money and the same amount from a Department of Energy grant, the chemical company hopes to have a pilot plant in operation by 2010.

The idea is to genetically engineer microscopic bugs such as bacteria and fungus to spit out enzymes that will break down just about every imaginable crop into ethanol. This would theoretically fulfill President Bush's initiative to support flexible-fuel vehicles, which are capable of using gasoline and ethanol blends, and to cut gas consumption by 20 percent in 10 years.

A growing number of biotechnology companies, backed financially and politically by an odd coalition of national security hawks, venture capitalists and environmentalists, are remaking themselves as ethanol producers to cash in on the alternative fuel craze.

In February, the U.S. Energy Department awarded \$385 million in grant money over four years to six projects dedicated to producing so-called cellulosic ethanol, which avoids the corn problem by making fuel from straw and other inedible agricultural leftovers. Cellulose is the woody material in branches and stems that makes plants hard.

Breaking cellulose into sugar to spin straw into ethanol has been studied for at least 50 years. But the technological hurdles and costs - specifically the expense genetically engineering exotic microbes to produce enzymes - have been so daunting that most ethanol producers instead relied on heavy government subsidies to squeeze fuel from corn.

That's now changing. Enzyme costs have fallen from about \$5 a gallon to less than 20 cents a gallon. Analysts said once enzyme prices get below a dime, cellulosic ethanol will become affordable.

"There really has to be an incredible improvement in the enzyme cost," said Kevin Baum, an executive vice president at Diversa Corp. "This can't be underestimated."

The growing number of biotechnology companies redirecting resources to capitalize on ethanol's popularity said they are getting close to making cellulosic ethanol profitable.

"It will be a very large chunk of what we do," said Per Falholt, an executive vice president with Novozymes Inc., an enzyme maker and the largest industrial biotechnology company. "It has the potential to transform the company."

Earlier this year, San Diego-based Diversa, which made enzymes for animal feed and other industrial uses, merged with the Cambridge, Mass.-based Celunol Inc. and is attempting to remake itself as an ethanol producer.

Silicon Valley billionaire Vinod Khosla, the Sun Microsystems Inc. co-founder, is among the venture capitalists gambling on cellulosic ethanol. His venture capital firm has invested millions in biotech companies pursuing alternative fuel strategies.

"In a short period of time we can replace 100 percent of our gasoline use," Khosla told executives and scientists gathered last month at an industrial biotechnology conference in Orlando, Fla.

Still, there are critics. Oil and automotive industry executives are skeptical that the country will make the investment in basic equipment.

"It does require the pumps to appear when the ethanol appears," said Coleman Jones, who heads General Motors Corp.'s biofuels projects.



J. Pat Carter / AP Photo

Crew member Albert Gray, left, talks to driver Jeff Simmons before the start of the XM Satellite Radio Indy 300 race in Homestead, Fla., Saturday, March 24, 2007. The Energy Department in February awarded \$385 million in grant money over four years to six projects dedicated to producing so-called cellulosic ethanol.

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