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Biofuels Boom Raises Tough Questions

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By Matt Crenson, AP National Writer

Biofuels Boom Raises Tough Questions Over Environmental Benefits of Corn-Based Ethanol

NEW YORK (AP) -- America is drunk on ethanol. Farmers in the Midwest are sending billions of bushels of corn to refineries that turn it into billions of gallons of fuel. Automakers in Detroit have already built millions of cars, trucks and SUVs that can run on it, and are committed to making millions more. In Washington, politicians have approved generous subsidies for companies that make ethanol.

And just this week, President Bush arranged with Brazil's President Luiz Inacio Lula da Silva for their countries to share ethanol production technology.

Even alternative fuel aficionados are surprised at the nation's sudden enthusiasm for grain alcohol.

"It's coming on dramatically; more rapidly than anyone had expected," said Nathanael Greene, a senior policy analyst at the Natural Resources Defense Council.

You'd think that would be good news, but it actually worries a lot of people.

The problem is, ethanol really isn't ready for prime time. The only economical way to make ethanol right now is with corn, which means the burgeoning industry is literally eating America's lunch, not to mention its breakfast and dinner. And though ethanol from corn may have some minor benefits with regard to energy independence, most analysts conclude its environmental benefits are questionable at best.

Proponents acknowledge the drawbacks of corn-based ethanol, but they believe it can help wean America off imported oil the way methadone helps a junkie kick heroin. It may not be ideal, but ethanol could help the country make the necessary and difficult transition to an environmentally and economically sustainable future.

There are many questions about ethanol's place in America's energy future. Some are easily answered; others, not so much.

WHAT IS ETHANOL?

Ethanol is moonshine. Hooch. Rotgut. White lightning. That explains why the last time Americans produced it in any appreciable amount was during Prohibition. Today, just like back then, virtually all the ethanol produced in the United States comes from corn that is fermented and then distilled to produce pure grain alcohol.

WILL MY CAR RUN ON IT?

Any car will burn gasoline mixed with a small amount of ethanol. But cars must be equipped with special equipment to burn fuel that is more than about 10 percent ethanol. All three of the major American automakers are already producing flex-fuel cars that can run on either gasoline or E85, a mix of 85 percent ethanol and 15 percent

gasoline. Thanks to incentives from the federal government, they have committed to having half the cars they produce run on either E85 or biodiesel by 2012.

HOW FAST IS ETHANOL PRODUCTION GROWING?

About as fast as farmers can grow the corn to make it. According to the Renewable Fuels Association, a trade group, ethanol production has doubled in the past three years, reaching nearly 5 billion gallons in 2006. With 113 ethanol plants currently operating and 78 more under construction, the country's ethanol output is expected to double again in less than two years.

IS ETHANOL BETTER THAN GASOLINE?

For all the environmental and economic troubles it causes, gasoline turns out to be a remarkably efficient automobile fuel. The energy required to pump crude out of the ground, refine it and transport it from oil well to gas tank is about 6 percent of the energy in the gasoline itself.

Ethanol is much less efficient, especially when it is made from corn. Just growing corn requires expending energy -- plowing, planting, fertilizing and harvesting all require machinery that burns fossil fuel. Modern agriculture relies on large amounts of fertilizer and pesticides, both of which are produced by methods that consume fossil fuels. Then there's the cost of transporting the corn to an ethanol plant, where the fermentation and distillation processes consume yet more energy. Finally, there's the cost of transporting the fuel to filling stations. And because ethanol is more corrosive than gasoline, it can't be pumped through relatively efficient pipelines, but must be transported by rail or tanker truck.

In the end, even the most generous analysts estimate that it takes the energy equivalent of three gallons of ethanol to make four gallons of the stuff. Some even argue that it takes more energy to produce ethanol from corn than you get out of it, but most agricultural economists think that's a stretch.

BUT AREN'T THERE ENVIRONMENTAL BENEFITS TO ETHANOL?

If you make ethanol from corn, the environmental benefits are limited. When you consider the greenhouse gases that are released in the growing and refining process, corn-based ethanol is only slightly better with regard to global warming than gasoline. Growing corn also requires the use of pesticides and fertilizers that cause soil and water pollution.

The environmental benefit of corn-based ethanol is felt mostly around the tailpipe. When blended into gasoline in small amounts, ethanol causes the fuel to generate less smog-producing carbon monoxide. That has made it popular in smoggy cities like Los Angeles.

WHAT ABOUT ETHANOL'S ECONOMIC BENEFITS?

Making ethanol is so profitable, thanks to government subsidies and continued high oil prices, that plants are proliferating throughout the Corn Belt. Iowa, the nation's top corn-producing state, is projected to have so many ethanol plants by 2008 it could easily find itself importing corn in order to feed them.

But that depends on the Invisible Hand. Making ethanol is profitable when oil is costly and corn is cheap. And the 51 cent-a-gallon federal subsidy doesn't hurt. But oil prices are off from last year's peaks and corn has doubled in price over the past year, from about \$2 to \$4 a bushel, thanks mostly to demand from ethanol producers.

High corn prices are causing social unrest in Mexico, where the government has tried to mollify angry consumers by slapping price controls on tortillas. Lester R. Brown, president of the Earth Policy Institute, predicts food riots in other major corn-importing countries if something isn't done.

U.S. consumers will soon feel the effects of high corn prices as well, if they haven't already, because virtually everything Americans put in their mouths starts as corn. There's corn flakes, corn chips, corn nuts, and hundreds of other processed foods that don't even have the word corn in them. There's corn in the occasional pint of beer and shot of whisky. And don't forget high fructose corn syrup, a sweetener that is added to soft drinks, baked goods, candy and a lot of things that aren't even sweet.

Some freaks even eat it off the cob.

It's true that animals eat more than half of the corn produced in America; guess who eats them? On Friday the Agriculture Department announced that beef, pork and chicken will soon cost consumers more thanks to the demand of ethanol for corn.

It's also true that there's a difference between edible sweet corn and the feed corn that's used for ethanol production. But because farmers try to grow the most profitable crop they can, higher prices for feed corn tend to discourage the production of sweet corn. That decreases its supply, driving the price of sweet corn up, too.

In fact, many agricultural economists believe rising demand for feed corn has squeezed the supply -- and boosted the price -- of not just sweet corn but also wheat, soybeans and several other crops.

America's appetite for corn is enormous. But Americans consume so much gasoline that all the corn in the world couldn't make enough ethanol to slake the nation's lust for transportation fuels. Last year ethanol production used 12 percent of the U.S. corn harvest, but it replaced only 2.8 percent of the nation's gasoline consumption.

"If we were to adopt automobile fuel efficiency standards to increase efficiency by 20 percent, that would contribute as much as converting the entire U.S. grain harvest into ethanol," Brown said.

ISN'T THERE A BETTER RENEWABLE FUEL SUBSTITUTE FOR GASOLINE?

Most experts think it will take an array of renewable energy technologies to replace fossil fuels. Ethanol's main drawbacks come not from the nature of the fuel itself, but from the fact that it is made using a critical component of the world's food supply. Ethanol would be more beneficial both environmentally and economically if scientists could figure out how to make it from a nonfood plant that could be grown without the need for fertilizers, pesticides and other inputs. Researchers are currently working on methods to do just that, making ethanol from the cellulose in a wide variety of plants, including poplar trees, switchgrass and cornstalks.

But plant cellulose is more difficult to break down than the starch in corn kernels. That's why people eat corn instead of grass. Plus it tastes better.

There are also technical hurdles related to separating, digesting and fermenting the cellulose fiber. Though it can be done, making ethanol from cellulose-rich material costs at least twice as much as making it from corn.

HOW LONG WILL IT TAKE BEFORE CELLULOSIC ETHANOL IS COMPETITIVE WITH CORN ETHANOL AND GASOLINE?

Some experts estimate that it will take 10 to 15 years before cellulosic ethanol becomes competitive. But Mitch Mandich, CEO of Range Fuels, thinks it will be a lot sooner than that. The Colorado-based company has started building a cellulosic ethanol plant in Georgia that converts wood chips and other waste left behind by the forest products industry. Another company, Iogen Corp., has been producing cellulosic ethanol from wheat, oat and barley straw for several years at a demonstration plant in Ottawa, Canada.

HOW MUCH MORE EFFICIENT WOULD CELLULOSIC ETHANOL BE COMPARED TO CORN ETHANOL?

Studies suggest that cellulosic ethanol could yield at least four to six times the energy expended to produce it. It would also produce less greenhouse gas emissions than corn-based ethanol because much of the energy needed to refine it could come not from fossil fuels, but from burning other chemical components of the very same plants that contained the cellulose.

HOW MUCH GASOLINE COULD CELLULOSIC ETHANOL REPLACE?

The U.S. Department of Energy estimates that the United States could produce more than a billion tons of cellulosic material annually for ethanol production, from switchgrass grown on marginal agricultural lands to wood chips and other waste produced by the timber industry. In theory, that material could produce enough ethanol to substitute for about 30 percent of the country's oil consumption.

A University of Tennessee study released in November reached similar conclusions. As much as 100 million acres of land would have to be dedicated to energy crops in order to reach the goal of substituting renewable biofuels for 25 percent of the nation's fuel consumption by 2025, the report estimated. That would be a significant fraction of the nation's 800 million acres of cultivable land, the study's authors said, but not enough to cause disruptions in

agricultural markets.

"There really aren't any losers," said University of Tennessee agricultural economist Burton English.

REALLY? NO LOSERS AT ALL?

There might be losers. Simple economics dictates that if farmers find it more profitable to grow switchgrass rather than corn, soy or cotton, the price of those commodities is bound to rise in response to falling supply.

"You can produce a lot of ethanol from cellulose without competing with food," said Wallace Tyner, an agricultural economist at Purdue University. "But if you want to get half your fuel supply from it you will compete with food agriculture."

There may also be ecological impacts. The government currently pays farmers not to farm about 35 million acres of conservation land, mostly in the Midwest. Those fallow tracts provide valuable habitat for wildlife, especially birds. Though switchgrass is a good home for most birds, if it became profitable to grow it or another energy crop on conservation land some species could decline.

WILL ETHANOL SOLVE ALL OF OUR PROBLEMS?

Ethanol is certainly a valuable tool in our efforts to address the economic and environmental problems associated with fossil fuels. But even the most optimistic projections suggest it can only replace a fraction of the 140 billion gallons of gasoline that Americans consume every year. It will take a mix of technologies to achieve energy independence and reduce the country's production of greenhouse gases.

"I think we're in a very interesting era. We are recognizing a problem and we are finding lots of potential solutions," said David Tilman, an ecologist at the University of Minnesota.

But if we're serious about achieving energy independence and mitigating global warming, Tilman and other experts said, one of those solutions must be energy conservation.

That means doubling the fuel economy of our automobiles, expanding mass transit and decreasing the amount of energy it takes to light, heat and cool our buildings. Without such measures, ethanol and other innovations will make little more than a dent in the nation's fossil fuel consumption.

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