

Biofuels: "Green Energy" Panacea or Just the Latest Hype?

THE REAL SCOOP ON BIOFEULS

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by Brian Tokar, WW4REPORT

You can hardly open up a major newspaper or national magazine these days without encountering the latest hype about biofuels, and how they're going to save oil, reduce pollution and prevent climate change. Bill Gates, Sun Microsystems' Vinod Khosla, and other major venture capitalists are investing millions in new biofuel production, whether in the form of ethanol, mainly derived from corn in the US today; or biodiesel, mainly from soybeans and canola seed. It's virtually a "modern day gold rush," as described by the New York Times, paraphrasing the chief executive of Cargill, one of the main benefactors of increased subsidies to agribusiness and tax credits to refiners for the purpose of encouraging biofuel production.

The Times reported June 25, 2006 that some 40 new ethanol plants are currently under construction in the US, aiming toward a 30% increase in domestic production. Archer Daniels Midland, the company that first sold the idea of corn-derived ethanol as an auto fuel to Congress in the late 1970s, has doubled its stock price and profits over the last two years. ADM currently controls a quarter of US ethanol fuel production, and recently hired a former Chevron executive as its CEO.

Several well-respected analysts have raised serious concerns about this rapid diversion of food crops toward the production of fuel for automobiles. WorldWatch Institute founder Lester Brown, long concerned about the sustainability of world food supplies, says that fuel producers are already competing with food processors in the world's grain markets. "Cars, not people, will claim most of the increase in grain production this year," reports Brown—a serious concern in a world where the grain required to make enough ethanol to fill an SUV tank is enough to feed a person for a whole year. Others have dismissed the ethanol gold rush as nothing more than the subsidized burning of food to run automobiles.

The biofuel rush is having a significant impact worldwide as well. Brazil, often touted as the most impressive biofuel success story, is using half its annual sugarcane crop to provide 40% of its auto fuel, while accelerating deforestation to grow more sugarcane and soybeans. Malaysian and Indonesian rainforests are being bulldozed for oil palm plantations—threatening endangered orangutans, rhinos, tigers and countless other species—in order to serve at the booming European market for biodiesel.

Are these reasonable tradeoffs for a troubled planet, or merely another corporate push for profits? Two recent studies aim to document the full consequences of the new biofuel economy and realistically assess its impact on fuel use, greenhouse gases and agricultural lands. One study, originating from the University of Minnesota, is moderately hopeful in the first two areas, but offers a strong caution about land use. The other, from Cornell University and UC Berkeley, concludes that every domestic biofuel source—those currently in use as well as those under development—produce less energy than is consumed in growing and processing the crops.

The Minnesota researchers attempted a full lifecycle analysis of the production of ethanol from corn and biodiesel from soy. They documented the energy costs of fuel production, pesticide use, transportation, and other key factors, and also accounted for the energy equivalent of soy and corn byproducts that remain for other uses after the fuel is extracted. Their paper, published in the July 25, 2006 edition of the Proceedings of the National Academy of Sciences, concluded that ethanol production offers a modest net energy gain of 25% over oil, resulting in 12% less greenhouse gases than an equivalent amount of gasoline. The numbers for biodiesel are more promising, with a 93% net energy gain and a

41% reduction in greenhouse gases.

The researchers cautioned, however, that these figures do not account for the significant environmental damage from increased acreages of these crops, including the impacts of pesticides, nitrate runoff into water supplies, nor the increased demand on water, as "energy crops" like corn and soy begin to displace more drought-tolerant crops such as wheat in several Midwestern states.

The most serious impact is on land use. The Minnesota paper reports that in 2005, 14% of the US corn harvest was used to produce some 3.9 billion gallons of ethanol, equivalent to 1.7% of current gasoline usage. About 1 1/2 percent of the soy harvest produced 68 million gallons of biodiesel, equivalent to less than one tenth of one percent of gas usage. This means that if all of the country's corn harvest was used to make ethanol, it would displace 12% of our gas; all of our soybeans would displace about 6% of diesel use. But if the energy used in producing these biofuels is taken into account, the picture becomes worse still. It requires roughly eight units of gas to produce 10 units of ethanol, and five units of gas to produce 10 units of biodiesel; hence the net is only two units of ethanol or five units of biodiesel. Therefore the entire soy and corn crops combined would really only less than 3% of current gasoline and diesel use.

This is where the serious strain on food supplies and prices originates.

The Cornell study is even more skeptical. Released in July 2005, it was the product of an ongoing collaboration between Cornell agriculturalist David Pimentel, environmental engineer Ted Patzek, and their colleagues at the University of California at Berkeley, and was published in the journal *Natural Resources Research*. This study found that, on balance, making ethanol from corn requires 29% more fossil fuel than the net energy produced and biodiesel from soy results in a net energy loss of 27%. Other crops, touted as solutions to the apparent diseconomy of current methods, offer even worse results.

Switchgrass, for example, can grow on marginal land and presumably won't compete with food production (you may recall George Bush's mumbling about switchgrass in his 2006 State of the Union speech), but it requires 45% more energy to harvest and process than the energy value of the fuel that is produced. Wood biomass requires 57% more energy than it produces, and sunflowers require more than twice as much energy than is available in the fuel that is produced. "There is just no energy benefit to using plant biomass for liquid fuel," said David Pimentel in a Cornell press statement this past July. "These strategies are not sustainable."

The Cornell/Berkeley study has drawn the attention of numerous critics, some of whom suggest that Ted Patzek's background in petroleum engineering disqualifies him from objectively assessing the energy balance of biofuels. Needless to say, in a field where both oil and agribusiness companies are vying for public subsidies, the technical arguments can become rather furious. An earlier analysis by the Chicago-area Argonne National Laboratory (once a Manhattan Project offshoot) produced data much closer to the Minnesota results, but a response by Patzek pointed out several potential flaws in that study's shared assumptions with an earlier analysis by the USDA. In another recent article, Harvard environmental scientist Michael McElroy concurred with Pimentel and Patzek: "[U]nfortunately the promised benefits [of ethanol] prove upon analysis to be largely ephemeral."

Even Brazilian sugarcane, touted as the world's model for conversion from fossil fuels to sustainable "green energy," has its downside. The energy yield appears beyond question: it is claimed that ethanol from sugarcane may produce as much as eight times as much energy as it takes to grow and process. But a recent World Wildlife Fund report for the International Energy Agency raises serious questions about this approach to future energy independence. It turns out that 80% of Brazil's greenhouse gas emissions come not from cars, but from deforestation—the loss of embedded carbon dioxide when forests are cut down and burned. A hectare of land may save 13 tons of carbon dioxide if it is used to grow sugarcane, but the same hectare can absorb 20 tons of CO₂ if it remains forested. If sugarcane and soy plantations continue to spur deforestation, both in the Amazon and in Brazil's Atlantic coastal forests, any climate advantage is more than outweighed by the loss of the forest.

Genetic engineering, which has utterly failed to produce healthier or more sustainable food (and also failed to create a reliable source of biopharmaceuticals without threatening the safety of our food supply) is now being touted as the answer to sustainable biofuel production. Biofuels were all the buzz at the biotech industry's most recent mega-convention in April 2006, and biotech companies are all competing to cash in on the biofuel bonanza. Syngenta (the world's largest herbicide manufacturer and number three, after Monsanto and DuPont, in seeds) is developing a GE corn variety that contains one of the enzymes needed to convert corn starch into sugar before it can be fermented into ethanol. Companies are vying to increase total starch content, reduce lignin (necessary for the structural integrity of plants but a nuisance for chemical processors), and increase crop yields. Others are proposing huge plantations of fast-growing genetically engineered low-lignin trees to temporarily sequester carbon and ultimately be harvested for ethanol.

However, the utility of incorporating the amylase enzyme into crops is questionable (it's also a potential allergen), gains in starch production are marginal, and the use of genetic engineering to increase crop yields has never proved reliable. Other more complex traits, such as drought and salt tolerance (to grow energy crops on land unsuited to food production), have been aggressively pursued by geneticists for more than twenty years with scarcely a glimmer of success. Genetically engineered trees, with their long life-cycle, as well as seeds and pollen capable of spreading hundreds of miles in the wild, are potentially a far greater environmental threat than engineered varieties of annual crops. Even Monsanto, always the most aggressive promoter of genetic engineering, has opted to rely on conventional plant breeding for its biofuel research, according to the New York Times (Sept. 8, 2006). Like "feeding the world" and biopharmaceutical production before it, genetic engineering for biofuels mainly benefits the biotech industry's public relations image.

Biofuels may still prove advantageous in some local applications, such as farmers using crop wastes to fuel their farms, and running cars from waste oil that is otherwise thrown away by restaurants. But as a solution to long-term energy needs on a national or international scale, the costs appear to far outweigh the benefits. The solution lies in technologies and lifestyle changes that can significantly reduce energy use and consumption, something energy analysts like Amory Lovins have been advocating for some thirty years. From the 1970s through the '90s, the US economy significantly decreased its energy intensity, steadily lowering the amount of energy required to produce a typical dollar of GDP. Other industrial countries have gone far beyond the US in this respect. But no one has figured out how to make a fortune on conservation and efficiency. The latest biofuel hype once again affirms that the needs of the planet, and of a genuinely sustainable society, are in fundamental conflict with the demands of wealth and profit.

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RESOURCES:

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See also: "Peak Oil Preview: North Korea & Cuba Face the Post-Petrol Future"
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