



The Trouble With Biofuels

By Bryan Walsh , Thursday, Feb. 14, 2008

Maybe it was simply too good to be true. For proponents, biofuels — petroleum substitutes made from plant matter like corn or sugar cane — seemed to promise everything. Using biofuels rather than oil would reduce the greenhouse gases that accelerate global warming, because plants absorb carbon dioxide when they grow, balancing out the carbon released when burned in cars or trucks. Using homegrown biofuels would help the U. S. reduce its utter dependence on foreign oil, and provide needed income for rural farmers around the world. And unlike cars powered purely by electric batteries or hydrogen fuel cells — two alternate technologies that have yet to pan out — biofuels could be used right now.



The cornfield at Didier Farms in Prairie View, Illinois.
Tim Boyle / Getty

But according to a pair of studies published in the journal *Science* recently, biofuels may not fulfill that promise — and in fact, may be worse for the climate than the fossil fuels they're meant to supplement. According to researchers at Princeton University and the Nature Conservancy, almost all the biofuels used today cause more greenhouse gas emissions than conventional fuels, if the full environmental cost of producing them is factored in. As virgin land is converted for growing biofuels, carbon dioxide is released into the atmosphere; at the same time, biofuel crops themselves are much less effective at absorbing carbon than the natural forests or grasslands they may be replacing. "When land is converted from natural ecosystems it releases carbon," says Joseph Fargione, a lead author of one of the papers and a scientist at the Nature Conservancy. "Any climate change policy that doesn't take this fact into account doesn't work."

Many environmentalists have been making the case against biofuels for some time, arguing that biofuel production takes valuable agricultural land away from food, driving up the price of staple crops like corn. But the *Science* papers make a more sweeping argument. In their paper, Fargione's team calculated the "carbon debt" created by raising biofuel crops — the amount of carbon released in the process of converting natural landscapes into cropland. They found that corn ethanol produced in the U.S. had a carbon debt of 93 years, meaning it would take nearly a century for ethanol, which does produce fewer greenhouse gases when burned than fossil fuels, to make up for the carbon released in that initial landscape conversion. Palm tree biodiesel in

Indonesia and Malaysia — one of the most controversial biofuels currently in use, because of its connection to tropical deforestation in those countries — has a carbon debt of 86 years. Soybean biodiesel in the Amazonian rainforest has a debt of 320 years. "People don't realize there is three times as much carbon in plants and soil than there is in the air," says Fargione. "Cut down forests, burn them, churn the soil, and you release all the carbon that's been stored."

Worse, as demand for biofuels go up — the European Union alone targets 5.75% of all its transport fuel to come from biofuel by the end of the year — the price of crops rises. That in turn encourages farmers to clear virgin land and plant more crops, releasing even more carbon in a vicious cycle. For instance, as the U.S. uses more biodiesel, much of which is made from soybeans or palm oil, farmers in Brazil or Indonesia will clear more land to raise soybeans to replace those used for fuel. "When we ask the world's farmers to feed 6 billion people and ask them to produce fuel, that requires them to use additional land," says Fargione. "That land has to come from somewhere."

Industry groups like the Renewable Fuels Association criticized the studies for being too simplistic, and failing to put biofuels in context. And it's true that the switch to biofuels can have benefits that go beyond climate change. Biofuels tend to produce less local pollution than fossil fuels, one reason why Brazil — which gets 30% of its automobile fuel from sugar-cane ethanol — has managed to reduce once stifling air pollution. In the U.S., switching to domestically produced biofuels helps cut dependence on foreign oil, and boosts income for farmers. But in all of these cases, the benefits now seem to pale next to the climate change deficits. Fargione points out that if the U.S. managed to use 15 billion gallons of ethanol by 2015 — as is mandated in last year's energy bill — it would still only offset 7% of projected energy demand. That won't put Venezuela or Iran out of business.

This is all depressing news, especially if you're a corn farmer. Biofuels are one of the few alternative fuels that are actually available right now, but the evidence suggests we be better off not relying on them. But even Fargione doesn't argue that we should ditch biofuels altogether. Biofuels using waste matter — like wood chips, or the leftover sections of corn stalks — or from perennial plants like switchgrass, effectively amount to free fuel, because they don't require clearing additional land. "There's no carbon debt," notes Fargione. Unfortunately, the technology for yielding fuel from those sources — like cellulosic biofuels — is still in its infancy, though it is improving fast. In the end, the right kind of biofuel won't be a silver bullet, but just one more tool in the growing arsenal against climate change.