The biofuel illusion

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One might imagine that the old adage about something too good to be true would have sunk in by now. But in the realm of biofuels, hope springs eternal. With more than $240 million in Department of Energy funding, six pilot projects using "cellulosic materials" to produce biofuels are under way. Despite the prospect of technical breakthroughs, none have produced biofuels on commercial terms. This is especially unsettling given the federal order to blend 36 billion gallons of biofuels by 2022, of which 21 billion are mandated to be cellulose-based.

Advocates of making these fuels from anything and everything abound: wood chips, municipal waste, algae, corn stalks, switchgrass, exotic weeds or whatever. These advocates are partly right. One can convert just about anything (including cardboard) into biofuel. The problem is less about science than logistics, economics and politics.

First, cellulose sounds good, mainly because there is a lot of biomass out there. But how to get it into biofuels is the issue. Cellulose has physical properties that make it hard to digest, and digestion is what fermentation into fuel is all about. To successfully digest cellulose requires breaking down the lignins — either by brute physical force, or by finding enzymes that can do it through chemical interactions.

So far, despite decades of research and lots of money, no method of converting cellulose to fuel comes close to the cost-effectiveness of converting either sugar (the basis of Brazil's burgeoning ethanol industry) or corn (the U.S. feedstock for 98 percent of all ethanol).

When asked about how much of an existing corn ethanol plant in southern Minnesota could be converted to a cellulosic facility, experts at the University of Minnesota ventured 10 percent. It follows that one would not retrofit corn-ethanol plants to cellulose, but build new ones. But where? Surely not in the Corn Belt. In the face of global recession, corn futures prices on the Chicago Board of Trade are still close to $4, 60 percent more than in 2007, despite record production in the years since.

If cellulosic plants are built near the existing corn ethanol plants, who, exactly, will grow the switchgrass (or whatever) to supply them, given $4 corn? Since cellulose, even according to its advocates, can travel economically less than 50 miles to its destination distillery, why would farmers give up on a proven commodity in the Corn Belt to convert their fields to exotic, unproven (and sometimes noxious) alternatives?

There are also bulk-handling issues. The U.S. has developed an extraordinary infrastructure to grow, harvest, dry, store and transport corn to market. When a southern Minnesota ethanol producer was asked

about how much switchgrass he would need if he were to produce an equivalent amount of cellulosic ethanol, he replied "a semi-trailer load every six minutes, 24 hours a day." Who will grow and deliver this product in corn country? And if not there, where will these cellulosic plants be based? These are questions that President Barack Obama and Energy Secretary Steven Chu need to consider carefully.

Then comes economics. Cellulosic ethanol is roughly twice as expensive to produce as corn-based fuel, and corn ethanol is roughly twice as expensive, in turn, as sugar. This clearly suggests that U.S. ethanol will be at a comparative disadvantage vis-à-vis Brazil, and cellulose will be at a comparative disadvantage relative to both. The U.S. has chosen to convert roughly a third of its corn crop, which enjoys a serious comparative advantage over most of its agricultural exports, to a fuel that has a serious disadvantage relative to Brazil. To compound this error by shifting to even higher-cost cellulosic ethanol is simply folly.

Last, but perhaps not at all least, are the politics of biofuels. Much of Congress is on record in support of corn ethanol and has also made statements in favor of "cellulosic alternatives," especially when impacts on food prices or land use are raised. Yet corn growers did not spend millions on campaign contributions for ethanol subsidies to give the game away to cellulosics. There is no tony office on K Street with a sign reading "American Switchgrass Growers Association." In fact, in a recent press release, the National Corn Growers Association, a sometime defender of cellulosics, began to back off its position that corn would be a platform for cellulose.

In response to a report analyzing the air quality and greenhouse gas implications of corn ethanol, calling for more cellulosic alternatives (appearing in the Proceedings of the National Academies of Science), Corn Growers President Bob Dicky stated (accurately): "All assumptions made for the production and processing of 'biomass' feedstocks for cellulosic ethanol have yet to be validated and executed economically."
Corn is still king of the ethanol game.

C. Ford Runge is Distinguished McKnight University Professor of Applied Economics and Law at the University of Minnesota. This article reflects his views, and not those of the University of Minnesota.