

# **Growing Sustainable Biofuels #1 Biofuels Market Breakthrough Opens Way to Cellulosic Fuels Revolution**

**By Patrick Mazza**

For biofuels these are breakthrough times. Driven by volatile energy markets and new public policy initiatives, biofuels production is booming and production capacity is rapidly growing. For the first time since petroleum emerged as the overwhelmingly dominant vehicle fuel around a century ago, oil's near monopoly on the market is breaking while farmers and rural communities are discovering a new source of prosperity – all good news.

At the same time a biofuels backlash is mounting. Record high corn prices are raising worries about food supplies. A new energy demand for agricultural products is bringing to the fore long-time concerns about soil erosion as well as use of chemicals, fertilizers, water and genetically modified crops. Fears that oil crop demand will decimate tropical forests are also appearing. An old debate over whether biofuels really reduce energy use and global warming emissions continues. Some biofuels critics are even calling for outright opposition to biofuels growth.

Yet a halt to rapid biofuels industry ramp-up is unlikely for reasons given by one of the industry's harshest critics, Lester Brown of the Earth Policy Institute. "Investment in crop-based fuel production, once dependent on government subsidies, is now driven by the price of oil," Brown writes. "With the current price of ethanol double its cost of production, the conversion of agricultural commodities into fuel for cars has become hugely profitable. In the United States, this means that investment in fuel distilleries is controlled by the market, not by the government."<sup>1</sup>

Evidence for this comes from the acceleration of biofuels capacity growth far in excess of the federal Renewable Fuels Standard for 7.5 billion gallons per year (BGY) by 2012. A.G. Edwards projects U.S. ethanol capacity will reach 13-14 BGY by 2009.<sup>2</sup>

A combination of high corn prices and not quite high enough oil prices might result in some slowing of growth. Even now there is talk of a slowdown in ethanol plant construction. But in a world where petroleum demand is accelerating while new supplies are becoming increasingly difficult and expensive to recover, the long-term trend seems clear. The question is not whether there will be significantly larger biofuels production. That combine has left the barn. The significant issues now circle around how the industry will grow – how much it will contribute to global environmental sustainability as well as the economic sustainability of rural communities. To these issues biofuels

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<sup>1</sup> Lester Brown, "The Earth Is Shrinking: Advancing Deserts and Rising Seas Squeezing Civilization," Earth Policy Institute, Nov. 15, 2006

<sup>2</sup> Ethanol Industry Outlook 2007-2010, A.G. Edwards, Jan. 9, 2007

advocates and critics alike must now turn, to enacting the public policies and devoting the resources needed to make this new fuels market pay for both the planet and farmers.

The fact that biofuels are securing a place of their own in the market provides the opportunity to put a growing biofuels industry on a sustainable basis. Industry observers are in general consensus that corn-starch ethanol, well over 90 percent of all biofuels produced in the U.S. today, will reach its production limit somewhere in the area of 15 BGY, with the highest projections just a few billion gallons above. Some analysts place ultimate corn capacity significantly below these levels. But at some point, interactions with food and animal feed markets will make corn economically impractical as a feedstock.

Beyond that point, it is generally agreed, biofuels growth will depend on new feedstocks of cellulose and hemicellulose, of which most of the plant world is constituted. The most important way corn ethanol provides a transition to the environmentally preferable cellulosic ethanol is by creating market growth and certainty. On this foundation are emerging both the powerful market drivers and the strong political constituencies required to move ethanol to the next stage.

Cellulosic biofuels offer tremendous environmental and economic sustainability advantages. They can be produced from organic residues that are now often a waste management and pollution problem, though care must be taken to leave sufficient residues to retain soil fertility. Another source is perennial grasses that dramatically reduce soil erosion, and chemical and water use while providing wildlife habitat. This opens serious opportunities to restore native grassland ecosystems. A recent University of Minnesota study reported in *Science* finds that high-diversity grasslands can produce biofuels in ways that actually remove carbon from the atmosphere, by sequestering carbon in soils and roots while yielding up to 238 percent more energy than monoculture crops.<sup>3</sup>

The biofuels world is starting the transition to cellulose. Emerging cellulosic ethanol technologies are coming on two tracks. In one, biological processes such as enzymatic digestion break the tough molecular bonds of plant matter into fermentable sugars. The other uses heat to convert cellulose into gas from which it can be transformed into a number of fuel products including ethanol, synthetic gasoline and renewable diesel. Cellulosic feedstocks are much more abundant and cheaper than grains, but processing technologies are still more expensive.

While cellulosic ethanol costs have dropped from \$5.66 a gallon in 2001 to \$2.26 in 2005, according to the U.S. Department of Energy, conventional ethanol production costs range around one-third to one-half less. Public support will be needed to develop both cellulosic technologies and markets. One proposal by the farmer-led 25x'25 Coalition proposes \$7.5 billion in new federal funding over the next five years to research, develop and demonstrate cellulosic technologies and build new markets. 25x'25, which aims to

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<sup>3</sup> David Tilman; Hill, Jason and Lehman, Clarence, "Carbon-Negative Biofuels from Low-Input High-Diversity Grassland Biomass," *Science*, Dec. 8, 2006, Vol. 315, p 1598-1600

produce 25% of U.S. energy from farm-based sources by 2025, also proposes \$14 billion over five years to build up sustainable bioenergy crops. These proposed budgets total less than one month's U.S. oil import bill, and would pay many times over in improved energy security and rural economic revival, not to mention reduced pollution.

Biofuels are only one piece of an agenda to reduce petroleum use and pollution in transportation. Other priorities include more efficient vehicles with an average U.S. new car standard of 40 mpg by 2015, as well as increased use of fully electric and plug-in hybrid vehicles fueled with renewable energy. More compact land use patterns with much improved walkability and improved transit service are also a requisite. Biofuels can make an important contribution to this agenda, particularly if we enact the policies and devote the resources needed to accelerate the commercialization of cellulosic ethanol.

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