



Ag Decision Maker

A Business Newsletter for Agriculture

Vol. 11, No. 6 www.extension.iastate.edu/agdm April 2007



Energy agriculture - beyond corn ethanol

by Don Hofstrand, value-added agriculture specialist, co-director AgMRC, Iowa State University Extension, 641-423-0844, dhof@iastate.edu

Corn ethanol is just the beginning of a revolution that is changing both the energy and agricultural industries. Although I don't think anyone foresees new technologies replacing corn ethanol anytime soon, the production of renewable fuels beyond corn ethanol has already started.

The discussion below examines some of the major drivers of the energy industry that will allow the renewable fuels industry to grow.

Then we discuss some of the technologies on the horizon that may emerge onto the landscape.

Although production agriculture is currently safely ensconced in the alternative energy industry through the production of corn ethanol and soybean biodiesel, future technology could circumvent agriculture. Only diligence on the part of the agriculture community will ensure that production agriculture is a significant player in future energy technologies that emerge.

energy needs. The Chinese economy has been expanding by about 10 percent per year. The cumulative effect of this is to greatly increase the standard of living of the Chinese people. This has lead to an explosion in the demand for cars. Last year car sales jumped 25 percent in China.

To accommodate this expansion in cars while also stimulating economic development, China has plans to link the country's 31 provinces together with an extensive highway system. By the year 2020, China is expected to overtake the U.S. in total miles of interstate highways. Their goal is to use this highway

continued on page 2

Handbook updates
For those of you subscribing to the handbook, the following update is included.

Corn and Soybean County Yields – A1-14 (4 pages)

2007 Iowa Farm Custom Rate Survey – A3-10 (2 pages)

Please add these files to your handbook and remove the out-of-date material.

continued on page 6

Drivers of the energy market
The current energy markets show an industry undergoing structural change. Although we don't know the eventual outcome, three of the major drivers of the energy market are discussed below.

Demand growth
The demand for transportation energy is growing rapidly. A major factor in this increase is the growth in the economies of developing countries around the world. An example is China's burgeoning

Inside . . .

No "basis shifting" in related party like-kind exchange Page 4

"Adjustable cash rent leases" and division of farm program payments..... Page 5

Energy agriculture - beyond corn ethanol, continued from page 1

system to help develop the Chinese interior, just as we used our interstate system to help develop the U.S. interior in the 1950s. More cars and more highways will require more transportation fuel.

Unstable supply

The ten largest oil companies in the world, none of which are U.S. companies, control 68 percent of the world's crude oil reserves. The largest U.S. company is Exxon Mobil, at number 12, which controls just over one percent of the reserves. The five largest companies are based in Saudi Arabia, Iran, Iraq, Kuwait and Venezuela. Although we have eight companies that make the top 50 list, Russia has six.

Global warming

Global warming has changed from a fringe concern by environmentalists to a widely accepted serious threat to the world's economy and society. How this is going to play out in the energy industry is up for debate. But we can be sure that the focus on greenhouse gas emissions (carbon dioxide and others) will be a major driving force.

However, the impact of global warming on the renewable fuels industry is not just from reducing greenhouse gas emissions. Another aspect is the effect it will have on our agricultural production capacity. Granted, plants grow better in an atmosphere with increased amounts of carbon dioxide, and global warming will increase the growing season in northern climates. But global warming is expected to bring volatile weather patterns and increased periods of serious drought.

Cellulosic ethanol

Much of the ethanol industry is focused on the potential of converting cellulosic materials to ethanol. This includes materials such as corn stalks, wheat straw, grasses, trees, etc. Its appeal is the ability to greatly expand the ethanol industry using feed sources that are byproducts of the crop production process (stalks and straw) and sources that don't compete for prime agricultural farmland (grasses and trees). So, cellulosic ethanol is less of a threat to the food and feed industries.

When the ethanol industry emerged, corn was a natural feedstock for ethanol. The production, storage and transportation infrastructure was already in place. And the conversion of corn into ethanol was a relatively easy process. However, the collection, transportation, storage and processing of cellulosic feedstocks is more difficult. This makes the cost of producing cellulosic ethanol higher than corn ethanol. So, new processes

and techniques need to be designed to improve the efficiency of each of these stages.

However, a major advantage of cellulosic ethanol over corn ethanol is the significantly lower emissions of greenhouse gases. Although estimates vary, corn ethanol produces about 80 percent of the greenhouse gases that gasoline does (20 percent reduction). By contrast, cellulosic ethanol produces only about 10 percent of greenhouse gases that gasoline does (90 percent reduction). As concerns about global warming increase, this difference in emissions will become more important. Direct subsidies or the development of private sector mechanisms to transfer this difference to the bottom line will make cellulosic ethanol more competitive with corn ethanol.

A number of feed sources for cellulosic ethanol are emerging. Grasses are a primary feed source in the Midwest. Grasses such as switchgrass and miscanthus hold promise as feed sources. Research to increase the yields of these grasses holds great promise. Also, researchers at the University of Minnesota have found that highly diversified mixtures of native grassland perennials can provide more usage energy per acre than corn ethanol or soybean biodiesel. Moreover, it can be produced on agriculturally degraded lands. The potential to use grasses as a feedstock holds great economic potential for the fringes of the Corn Belt where land values are low.

Other energy sources

There are a variety of other energy technologies on the horizon. A few of them are discussed below along with how agriculture might be involved.

Corn butanol

Butanol as an alternative to ethanol is gaining popularity. Butanol is an alcohol compound like ethanol. However, proponents claim there are several advantages of butanol over ethanol. Compared to ethanol, butanol;

- Has a higher energy content (25 percent higher) making the fuel mileage decline when blended with gasoline less severe.
- Can be blended in higher concentrations with gasoline without modifications to car engines.
- Has a lower vapor pressure making it safer and easier to blend with gasoline.
- Can be transported through pipelines
- Yields hydrogen during the fermentation process as another energy source.

Energy agriculture - beyond corn ethanol, continued from page 2

As with ethanol, butanol can be made from the same feedstocks as ethanol including corn, sugar cane, other crops and possibly cellulosic materials. So the emergence of butanol would not be a threat to farmers but another biorenewable fuel that can be made from farm commodities. Also, it is not a threat to the existing ethanol industry because ethanol plants can easily be retrofitted to produce butanol (minor changes in fermentation and distillation). To be viable, butanol requires the development of a genetically-modified microbe for the efficient conversion of feedstocks into butanol.

Algae

Producing biodiesel with algae is a promising technology. The mark of a good biofuel feedstock is its efficiency in converting sunlight into chemical energy. Some species of algae are very efficient in this conversion. They are also ideally suited for biodiesel production due to their high oil content (some species well over 50 percent) and extremely fast growth rates.

Research has focused on developing algae farms in the desert using shallow saltwater pools. An example is research focused on the impact of building algal ponds around the Salton Sea in Southern California. The algae would feed off of the agricultural waste streams that pollute the sea, including 10,000 pounds of nitrogen and phosphorus fertilizer that finds its way into the Sea annually.

However, algae farms could be spread across the country. The feed source may include agricultural wastes, animal wastes and human sewage. Nutrients could also be extracted from the algae for producing nitrogen and phosphorus fertilizers.

Scientists believe algae farms have the potential to sustain production of 5,000 gallons per acre per year, with the theoretical yield potential being much higher.

Hydrogen

Hydrogen has been touted as the magic bullet to wean us off of foreign oil and eliminate greenhouse gas emissions. When used, the only emission is water. Hydrogen may eventually fill this role. But there are many obstacles to overcome.

Different than oil, hydrogen has to be made. You can make it by extracting hydrogen from fossil fuels or by using electricity to split the hydrogen from water. With current technology, most of the hydrogen would probably be made from fossil fuels, as it is now. This process creates carbon dioxide which is released into

the air, adding to amount of greenhouse gases in the atmosphere. The problem could be rectified by sequestering carbon dioxide underground. Put simply, oil could be pumped out of the ground, processed into hydrogen and carbon, and the carbon dioxide pumped back down the hole. But we would not break our dependency on oil.

The other method of making hydrogen is to use electricity to split the water molecule into hydrogen and oxygen. However, the majority of our electricity is made by burning fossil fuels (mainly coal). So the problem of greenhouse gas emissions still exists. Generating electricity from solar or wind would eliminate the problem.

Regardless of how hydrogen is made, it appears that it takes more energy to make hydrogen than is contained in the hydrogen.

Hydrogen also has problems to overcome in storage and distribution. Hydrogen is the lightest gas in the universe. Although a pound of hydrogen contains a lot of energy, it takes a lot of hydrogen gas to make a pound of hydrogen. Hydrogen gas can be compressed to make it easier to transport. It is sometimes compressed up to 10,000 pounds per square inch and still requires storage space substantially greater than gasoline. Research is examining the option of converting hydrogen gas into a solid.

Considering the problems of transporting and distributing hydrogen, making hydrogen at the fueling station is being investigated. Also, the option of making hydrogen on-board the car is being studied.

Hydrogen may be the energy source of the future, but the future is a ways off. But researchers are examining ways to involve agriculture in hydrogen production. For example, researchers at New Mexico State University are examining ways to use cow manure and other organics solid wastes to make hydrogen.

References

- Benemann, J.R., Van Olst, J., Massingill, M., Weissman, J., Brune, D. "The Controlled Eutrophication Process: Using microalgae for CO₂ Utilization and Agricultural Fertilizer Recycling". Unpublished research. 20 Mar. 2007 <http://www.unh.edu/p2/biodiesel/pdf/algae_salton_sea.pdf>.
- biobutanol fact sheet. biobutanol a better biofuel. 20 Mar. 2007 <http://www.bp.com/liveassets/bp_internet/globalbp/STAGING/global_assets/downloads/B/Bio_biobutanol_fact_sheet_jun06.pdf>.

continued on page 4

Energy agriculture - beyond corn ethanol, continued from page 3

Bio-Hydrogen. Green Car Congress. 20 Mar. 2007 <<http://www.greencarcongress.com/>>.

Brasher, Phillip. "Cellulose would reduce emissions by 90%, experts say." DesMoinesRegister.com 18 March 2007. Des Moines Register. 20 Mar. 2007 <<http://www.desmoinesregister.com/apps/pbcs.dll/article?AID=/20070318/BUSINESS01/70317010/1030/BUSINESS01>>.

Briggs, Michael. "Widespread Biodiesel Production from Algae." August 2004. University of New Hampshire Biodiesel Group. 20 Mar. 2007 <http://www.unh.edu/p2/biodiesel/article_alge.html>.

Chase, Randall. "DuPont, BP join to make butanol, they say it outperforms ethanol as a fuel additive." USA Today.com. 23 June 2006. USA Today. 20 Mar. 2007 <http://www.usatoday.com/money/industries/energy/2006-06-20-butanol_x.htm>.

Energy - Butanol. The Light Party. 20 Mar. 2007 <<http://www.lightparty.com/Energy/Butanol.html>>.

Grant, Kenneth, Ownby, D., Peterson, S. "Understanding Today's Crude Oil and Product Marketing." American Petroleum Institute. 22 Mar. 2007 <[\[fuel.org/gasoline/OilPrimer.pdf\]\(http://fuel.org/gasoline/OilPrimer.pdf\)>.

Hydrogen Fuel – Simply the Alternative! Hydrogen-Fuel.org, 20 Mar. 2007 <<http://www.hydrogen-fuel.org/>>.

Lees, Graham. "All roads lead to China." thestandard.com.hk. 12-13 February 2005. Weekend Standard: China's Business Newspaper. 20 Mar. 2007 <<http://www.thestandard.com.hk/stdn/std/Weekend/GB12Jp02.html>>.

MacLeod, Calum. "China's highways go the distance." USA Today.com. 29 January 2006. USA Today. 20 Mar. 2007 <\[http://www.usatoday.com/news/world/2006-01-29-china-roads_x.htm\]\(http://www.usatoday.com/news/world/2006-01-29-china-roads_x.htm\)>.

Tilman, David, Hill, J., Lehman, C. "Carbon-Negative Biofuels from Low-Input High-Diversity Grassland Biomass." Science. 314:5805 \(2006\). 20 Mar. 2007 <<http://www.sciencemag.org/cgi/content/full/314/5805/1598?rss=1>>.

Wise, Jeff. "The Truth About Hydrogen." Popular Mechanics. November 2006. 20 Mar. 2007 <<http://www.popularmechanics.com/technology/industry/4199381.html>>.](http://www.factson-</p>
</div>
<div data-bbox=)



No "basis shifting" in related party like-kind exchange

By Neil E. Harl, Charles F. Curtiss Distinguished Professor in Agriculture and Emeritus Professor of Economics, Iowa State University, Ames, Iowa. Member of the Iowa Bar, 515-294-6354, harl@iastate.edu

In a late 2006 private letter ruling, the Internal Revenue Service took the position that, in a like-kind exchange of real property among related parties, there was no "basis shifting" because of the effect of a recent death on the income tax basis of the properties.

Thus, the avoidance of federal income tax was not a principal purpose of the exchange or the subsequent disposition of one of the tracts of real property and the disposition of that tract within the two year period after the exchange did not result in recognition of gain. To the extent the ruling represents solid authority, it provides a modicum of comfort for those planning a like-kind exchange involving related parties where cashing out is anticipated by one or more of the parties.

The facts of the ruling

In the ruling the father, now deceased, had acquired several tracts of timberland which were held for the production of income and for investment purposes.

At the father's death, Parcel #1 was transferred to his wife. Parcels #2 and #3 were transferred to a trust. The mother then proceeded to transfer Parcel #1 as a gift to her children in equal undivided interests as tenants in common. The trust held Parcels #2 and #3 for the benefit of the mother during her life with the children as remainder beneficiaries of the trust's assets.

The trustee and the children decided to sell all of the real estate holdings including Parcels #1, #2 and #3. Because one of the children, the taxpayer, did not want to divest herself of her ownership in the real estate, she agreed to exchange her 25 percent interest in Parcel #1 for a 100 percent interest in Parcel #3. The interests transferred were of equal value and, because of the effect of the father's death, the basis figures bore the same relationship to fair market value. After the exchange, the trust and the children sold Parcels #1 and #2 to an unrelated third party.