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Energy agriculture - Brazilian ethanol

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(Fourth in a series on energy agriculture)

The energy crisis of the 1970s brought about high gas prices and limited supplies that generated an intense interest in renewable fuels and weaning ourselves from foreign sources of oil. However, when gas prices plummeted in the 1980s, renewable fuels and energy independence were quickly forgotten.

The story went differently in Brazil. After investing heavily in renewable fuels in the 1970s, they kept the program alive during the 1980s. This has given them a head start on the current situation. With its robust ethanol program, Brazil is expected to become energy independent this year.

This is a far cry from the U.S. which still imports over half of its oil. However, remember that the U.S. economy is much larger, the number of U.S. cars is much greater and the U.S. highway system is much more extensive than in Brazil. So, U.S. energy independence is a much bigger task.

Brazil's ethanol history

In 1975 Brazil implemented four policies to stimulate ethanol production.

1) It required Petrobras, its major oil company, to purchase a required amount of ethanol.

2) It provided $4.9 billion of low-interest loans to stimulate ethanol production.

3) It provided subsides so that ethanol's pump price was 41 percent lower than the price of gasoline.

4) It required that all fuels be blended with a minimum of 22 percent ethanol (E22).

In 2000, Brazil deregulated the ethanol market and removed is subsidies. However, depending on market conditions, all fuels are required to be blended with from 20 to 25 percent ethanol.

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Handbook updates

For those of you subscribing to the handbook, the following updates are included.

Income Tax Provisions of Property Transfers – C4-20 (2 pages)

Gift Tax – C4-23 (4 pages)

Federal Estate Tax – C4-24 (5 pages)

Iowa Inheritance Tax – C4-25 (2 pages)

Please add these files to your handbook and remove the out-of-date material.

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Flex-fuel vehicles were introduced in 2003. These vehicles can run on straight ethanol, straight gasoline or a blend of the two. Today more than 70 percent of the new cars sold in Brazil are flex-fuel.

To receive an operating license, all fueling stations must provide an ethanol or ethanol-blend pump. Ethanol at the pump is sold at 60 to 70 percent of the price of gasoline. This compensates for the lower energy content of ethanol. However, the prices of gasoline and ethanol vary independently of each other. So Brazil's flex fuel vehicle program means that consumers have discretion in the combination of gasoline and ethanol they purchase.

U.S. and Brazilian ethanol comparison

The feedstock for Brazilian ethanol is sugarcane. The Brazilian government has invested in research designed to improve sugarcane varieties that have resulted in sugarcane that is more resistant to drought and pests and yields higher sugar content. During the last 30 years, sugarcane yields have increased three-fold.

In the U.S. the feedstock is corn. Below is a comparison of Brazil's sugarcane-ethanol industry and the U.S. corn-ethanol industry.

Brazil – Sugarcane	**United States – Corn**
Sugarcane provides five cuttings over six years and then is replanted	Corn provides a crop every year and is planted every year.
Sugarcane yields about 35 tons per acre	Corn yields 4.2 tons per acre (150 bushels)
About 100 pounds of sugarcane to produce 1 gallon of ethanol	About 20 pounds of corn to produce 1 gallon of ethanol
Sugarcane feedstock is cheaper than corn per gallon of ethanol	Corn feedstock is more expensive than sugarcane per gallon of ethanol
An acre of sugarcane produces about 650 gallons of ethanol	An acre of corn produces about 400 gallons of ethanol
The sugar in sugarcane can be converted directly into ethanol	The starch in corn is first converted into sugar. Then the sugar is converted into ethanol
Sugarcane-ethanol can be produced cheaper than corn-ethanol	Corn-ethanol is more expensive to produce than sugarcane-ethanol
About 6,500 kcal of energy is used to produce one gallon of ethanol	About 28,000 kcal of energy is used to produce one gallon of ethanol
The energy source for ethanol production is bagasse (sugarcane by-product)	The energy source for ethanol production is natural gas, coal and diesel
Brazil is the second leading ethanol producer at 35% of total	U.S. is the leading ethanol producer at 37% of total
Currently about 7 million acres are used for ethanol production	Currently about 14 million acres are used for ethanol production
Brazil has great potential for expanding sugarcane acreage without limiting the acreage of other crops.	U.S. expansion of corn acreage will come at the expense of reduced soybean and other crop acres.
No subsidies for ethanol	A $.51 per gallon subsidy.
No import tariffs on ethanol	A $.54 per gallon import tariff.

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Brazil's ethanol production potential

Brazil has a natural advance in ethanol production. It has a vast unused or little-used land area that can be converted to agricultural production. In addition, it has a tropical climate well suited for sugarcane production.

Brazilian Acreage *

Of Brazil's land mass, about half of it consists of the Amazon forest and natural forest reserves. The other half breaks down as follow:

	Million Acres
• Pasture land (cattle)	550
• Cropland (soybeans, etc.)	105
• Permanent crops (oranges, sugarcane, etc).	37
• Reforestation (pine and eucalyptus)	12
• Other (urban centers, lakes, etc.)	185
• Savannah (Cerrado)	225

* Source: Latin Business Chronicle, May 18, 2007

Brazil currently devotes about 14 million acres to sugarcane production, of which about 7 million acres are for ethanol production (the remainder is for sugar production). This is about ten percent of Brazil's current cropland acreage.

About 250 million acres of degraded pastureland can be converted to sugarcane production along with the 225 million acres of savannah for a total of 475 million acres. If the entire 475 million acres are devoted to sugarcane/ethanol production (it is unlikely that all of it would be used for cane production), 310 billion gallons of ethanol would be produced annually assuming a production rate of 650 gallons per acre. This would convert into the energy equivalent of 205 billion gallons of gasoline because ethanol only has about two-thirds the energy of gasoline. By comparison the U.S. consumes about 120 billion gallons of gasoline per year.

Over the next six years, a sugar ethanol plant is planned to be built every month. However, Brazil lacks the financial capacity to adequately expand its ethanol industry. Foreign investment will likely be needed for Brazil to achieve its ethanol production potential.

The path to Brazil's ethanol future will not be smooth. For example, high world sugar prices have stimulated expanded sugarcane plantings worldwide. Once planted, sugarcane produces for several years before replanting. Expectations of depressed sugar prices would shift sugarcane production to ethanol in the short term.

Environmental impact

From 1975 to 2000, the replacement of gasoline with ethanol reduced carbon emissions by 100 million tons. Big city improvements in air quality in the 1980s were evident. Conversely, the air quality degradation from a partial return to gasoline in the 1990s was also evident.

Traditionally, sugarcane fields have been burned just before harvest to remove leaves and fertilize the fields with ash. The smoke, which is blown into nearby towns, turns the sky gray and makes the air hazardous. However, a recent law bans the burning of sugarcane fields.

Sugarcane production requires hand labor at harvest. This creates a large group of migrant workers who can only find work a couple of months a year during sugarcane harvest. Machines will replace human labor for harvesting cane. Although this will increase sugarcane production efficiency, it will impact migrant workers.

Thirty-five percent of sugarcane is made up of fibrous material that is left over after pressing. This is called "bagasse". Bagasse is burned to provide an energy source for the ethanol facility. This allows ethanol plants to be energy self-sufficient while also selling a portion of the generated electricity to utilities. Currently it is possible to generate 288 millijoules (MJ) of electricity from one ton of sugarcane. Of this amount, 188 MJ are needed to provide energy for the plant. Burning the sugarcane waste has allowed Brazil to become energy self-sufficient in electricity.

U.S – Brazil ethanol alliance

In March of 2007, President Bush and Brazilian President Luiz Inácio "Lula" da Silva formed an ethanol alliance. This relationship focuses on creating a global ethanol market. The geopolitical relationship has the potential for creating a global presence for Brazil as a major ethanol exporter to the world's energy starved markets.

Currently about 20 percent of Brazil's ethanol is exported. Of this amount, one-third goes to the U.S. with Japan and India consuming most of the remainder. Japan and Sweden are looking to increase ethanol imports from Brazil to help meet the Kyoto agreement requirements. Concerns about global warming will further improve Brazil's opportunity.

In addition to Brazil's ethanol potential, the increased usage of U.S. corn for ethanol production and the

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resulting decrease in soybean acres will serve to open up export markets for Brazil to increase its corn and soybean production.

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Flexible leases and USDA payments

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The Farm Service Agency (FSA) recently issued a notice that clarifies the possible effects that a flexible cash rent agreement can have on the division of direct and counter-cyclical payments (DCPs) between the tenant and land owner. Basically, any lease in which the crop that is produced from the farm or the proceeds derived from the crop on the farm is used to set the rent each year is considered a "share" lease for DCP purposes. Under a share lease the DCPs must be shared in proportion to the risk assumed by each party. One way to estimate this share is to divide the amount of the rent that would be variable, assuming expected yields and prices, by the total gross revenue expected from the crop.

For example, assume the lease calls for the rent to be equal to $100 per acre plus 40 percent of the gross revenue in excess of $300 for corn. If the expected yield is 160 bushels and the expected price is $3.30 per bushel, the gross revenue would be $528 per acre and the "flex bonus" added to the rent would be 40 percent of $228, or $91.20. The proportion of risk born by the owner would be $91.20 divided by $528, or 17 percent. The agreement could call for the owner to receive 17 percent of the DCPs.

If land owners do not wish to be involved in the DCP process, alternative flexible lease provisions are available. If the formula used to determine the rent does not contain the actual farm yield or proceeds derived from it, the lease is considered to be a cash lease and all DCPs are paid to the tenant. For example, a fixed number of bushels or the county average yield can be used to determine the actual rent, instead of the farm yield. County yield values are estimated by the USDA, and using them does not increase the tenant's rent if higher farm yields are achieved through superior management. However, final estimates of county yields may not be available until March each year.

If the tenant pays the owner a "cash bonus" in years in which returns are better than expected, but the amount of the bonus is not directly tied to the farm yield or actual proceeds derived from the farm yield, the lease is still considered a cash rent agreement by FSA.

Tenants and landlords who enter into a flexible cash lease that could be considered a "share lease" should provide a copy of it to their county FSA office, and get approval for any proposed sharing of the direct and counter cyclical payments. The notice from FSA regarding flexible cash leases can be viewed at http://www.fsa.usda.gov/Internet/FSA_Notice/dcp_172.pdf or from any county FSA office.

Marketing E85: Big oil obstacles and ethanol industry opportunities

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The development of a new industrial sector like ethanol faces two major challenges: production and marketing. The first challenge has been met by corn farmers who have financed and organized ethanol cooperatives to provide added value to the low priced corn they were producing. As they developed the industry they lobbied for and received fuel tax credits, tariff protection, and in some states the mandatory blending of 10 percent ethanol in the gasoline as an oxygenate to reduce some forms of air pollution.

In some ways ethanol is like the aging actor who suddenly finds herself in a hit TV series with the press all abuzz as they proclaim her an "instant success." It only took thirty years of casting calls and bit parts to achieve "instant success."

With high oil prices due to Katrina and Middle East instability, ethanol went from inside pages in farm publications to front page news as the President and auto company officials proclaimed ethanol to be an important element of the nation's quest to reduce its dependence on oil from politically unstable regions.

Add to this concern about global warming and the role played by the burning carbon from fossil sources and the number of ethanol plants in the planning process began to mushroom as private investors joined farmers in seeking to become a part of the ethanol boom. Major oil firms began to reposition themselves away from seeing themselves as petroleum suppliers to envisioning themselves as energy suppliers.

None have done this clearer than BP. BP has used its initials to proclaim that BP means "Beyond Petroleum." As they say on their global website, in addition to "the development of new ways in which to produce and supply oil and gas – through clean fuels, through greater efficiency and through substitution – particularly of gas for coal in the power sector," Beyond Petroleum involves "working to bring the next generation of biofuels to market."

Here comes the current marketing challenge facing ethanol producers. Despite the verbal commitment of BP and the other major oil companies to renewable energy, an April 2, 2007 Dow Jones news story on the DTN website reports "oil-company policies make it [hard] for many service stations to stock a fuel called E85, a blend of 85 percent ethanol and 15 percent gasoline."

According to the story, the major oil companies make it difficult to sell E85 through a series of policies including: (1) requiring stations "to purchase all the fuel they sell from the oil company" and the oil company does not produce ethanol, (2) limiting local service stations from advertising E85, (3) not allowing service stations to charge E85 on oil company credit cards, and (4) requiring "that any E85 pump be on a separate island, not under the main canopy."

As a result less "less than 1 percent" of fuel stations "stock E85." The story reports that "some experts say that to really take hold and be seen as a viable alternative to gasoline, [E85] would have to be available at, roughly, 10 percent of stations." One way to achieve this goal would be for non-petroleum based companies like supermarkets and big box stores to offer E85 at their fuel stations.

In addition to cultivating sales to major supermarket chains and big box stores that have on-site fuel stations, the fledgling ethanol industry needs to look to its own resources to meet the marketing challenge. One strategy is for ethanol cooperatives and plants to increase the demand for E85 by offering incentives for investors and workers to purchase flexible fuel vehicles (FFV). With more FFVs on the road, the ethanol plants could then work with local and regional farm supply cooperatives to install E85 pumps at their fuel stations.

At present many fuel injected automobiles on the road could be converted to FFVs for a modest cost, adding to the market for E85. According to the National Ethanol Vehicle Coalition, the problem is that "there are no conversions or after-market parts that have been certified by the EPA as meeting the standards to maintain clean exhaust emissions. Technically speaking, converting a vehicle that was designed to operate on unleaded gasoline only to operate on another form of fuel is a violation of the federal law and the offender may be subject to significant penalties. No after-market

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conversion company has successfully certified an E85 kit that would allow a gasoline vehicle to operate on 85 percent ethanol."

The production of an EPA certified after-market FFV conversion kit represents a opportunity for the ethanol industry to reach a large number of drivers who are not ready to turn in their current vehicles. Some targeted investment by the ethanol industry should be able to overcome this problem.

Then they could also offer their investors and workers an incentive to convert their present fuel injected vehicles to run on E85 or any blend up to that percentage. While the cooperation of major oil companies would be the simplest way to increase the availability of E85, the ethanol industry is not without alternatives.

"If ethanol were available on the supply side, the demand is there," says Dan Kammen, co-director of the Berkeley Institute of the Environment and UC Berkeley's Class of 1935 Distinguished Chair of Energy.

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Internet Updates

The following updates have been added to www.extension.iastate.edu/agdm.

Economics of Scope – C5-205

Economics of Size – C5-206

Strategic Planning for Farm Businesses – C6-41

Setting Personal, Family and Business Goals for Business Success – C6-42

What is Important to Me? – C6-43

External Scanning - Industry Analysis – C6-44

Internal Scanning – C6-45

Farm Business Strategies – C6-46

Growth Strategies by Type of Farm – C6-47

Portfolio Analysis and Enterprise Strategy Development – C6-48