

2015

## Brazil's ethanol industry - part two

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### Recommended Citation

Hofstrand, Don (2015) "Brazil's ethanol industry - part two," *Ag Decision Maker Newsletter*: Vol. 13 : Iss. 4 , Article 3.

Available at: <http://lib.dr.iastate.edu/agdm/vol13/iss4/3>

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*Managing through a recession: options for farm operators, continued from page 3*

**Consider refinancing long-term obligations.** Compare possible interest savings to the costs of rewriting the loan. It may be a good time to convert variable rate loans to a fixed rate.

**Keep assets liquid.** If gross revenue is not enough to cover production costs and family living expenses this year, keep funds in savings or short-term investments rather than assets that would be hard to convert to cash.

**Use equity in land, livestock and equipment.** If cash

reserves aren't enough, talk to your lender about borrowing against fixed assets, with a multi-year repayment plan.

Agriculture has always been a cyclical industry. A good financial manager learns to balance the profits and losses to ensure long-term survival.

You can learn more about the strategies mentioned above by enrolling in Financial Decision Making, an on-line home study course available from the ISU Ag Management E-School.



## Brazil's ethanol industry - part two\*

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

**B**razil has made great strides in running its economy on renewable energy. Renewable energy represents 46 percent of Brazil's total annual energy supply. By comparison, renewable energy accounts for only seven percent of the U.S. annual supply. The largest source of renewable energy in Brazil is ethanol, accounting for over one-third of Brazil's renewable energy.

In addition, 90 percent of Brazil's electricity comes from renewable sources, predominantly hydroelectricity. By comparison, only nine percent of the U.S. electricity supply is from renewable sources. About half of our electricity is generated from coal.

Due in part to its ethanol program, Brazil became net energy independent in 2006 after many years of energy dependence.

Although we need to remember that the U.S. economy is much larger than that of Brazil (the U.S. economy is nine times larger), Brazil's accomplishments in renewable energy and energy independence are nevertheless impressive.

### Ethanol history

During the 1970s, Brazil was importing over 80 percent of the oil it consumed. Large oil imports and high oil prices were damaging Brazil's economy. In 1975 Brazil implemented the National Alcohol Program. It contained 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 subsidies 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).

Although crude oil prices were low in the 1980s and 90s, Brazil kept its ethanol program alive and moving forward. In 2000, Brazil deregulated the ethanol market and removed its subsidies. The ethanol mandate was maintained. Depending on market conditions, all fuels were required to be blended with 20 to 25 percent ethanol. The current mandate is 25 percent ethanol in gasoline set June 1, 2007.

Brazil aggressively developed cars that operated only on 100 percent ethanol. In 1979 the Fiat 147 was the first modern car to run on pure ethanol. By 1988 almost 90 percent of all new cars manufactured in Brazil were E100 (alcohol only) cars. However, an ethanol shortage in early 1990 caused a major downturn in the demand for E100 cars. In 1990, only 10 percent of the new cars were E100.

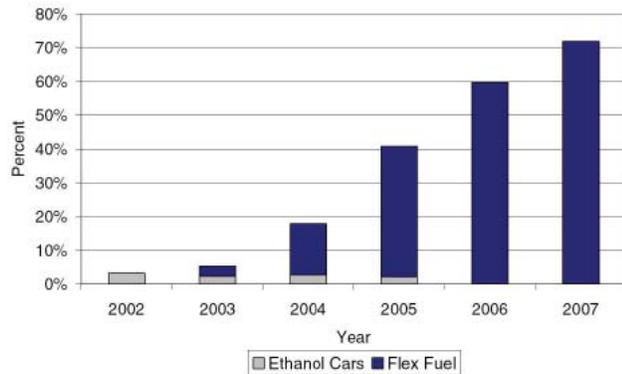
Flex-fuel vehicles were introduced in 2003. These vehicles can run on 100 percent ethanol, 25/75 percent ethanol/gasoline blend (the 25 percent minimum ethanol mandate) or any combination of the two. Today more than 70 percent of the new cars sold in Brazil are flex-fuel as shown in Figure 1. Consumers have 49 models to choose from. Flex fuel vehicles have electronic sensors that detect the fuel blend mix and automatically adjust the engine combustion. The production of E100 cars, popular in the 1990s, has virtually disappeared. The remaining 28 percent operate on the mandated E25 minimum blend. There are no light vehicles running on pure gasoline.

Seventy percent is the generally accepted tipping point of whether consumers purchase ethanol or gasoline for their flexible fuel vehicles. In other words, if ethanol price is less than 70 percent the price of gasoline, they will purchase ethanol. Anything over 70 percent and consumers will purchase gasoline. The need for the discount is due to ethanol lower energy level per gallon than gasoline. However, the prices

*continued on page 5*

Brazil's ethanol industry - part two, continued from page 4

**Figure 1. Ethanol car manufacturing in Brazil (percent) (2002-2007)**



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. Midsummer is the sugarcane crush season. In July of 2008, the price ratio ranged from a low of 52 percent in Sao Paulo to a high of 69 percent in Porto Alegre. By contrast the ratio in Jan. 2008 ranged from 54 percent in Sao Paulo to 73 percent in Porto Alegre.

Because high ethanol blends have a low vapor pressure, starting in cold weather is a problem. This is one of the reasons why the U.S. maximum blend is E85. So a small secondary pure gasoline tank is installed for starting in cold weather. An improved flex fuel motor installed in 2009 models will eliminate this problem.

Brazil has 33,000 gas stations offering pure ethanol side-by-side with gasoline. By comparison, the U.S. has about 1,500 stations distributing E-85 ethanol, mostly in the corn-belt. Federal taxes on gasoline are higher than ethanol. States provide similar incentives. To receive an operating license, all fueling stations must provide an ethanol or ethanol-blend pump.

To provide perspective on Brazilian ethanol prices, during the first six months of 2008, ethanol sold for \$2.75 to \$4.25 per gallon, depending on the location in Brazil. By comparison, ethanol sold for \$1.60 to \$2.45 per gallon during the first six months of 2005. Most of this price increase was due to the exchange rate between the U.S. dollar and the Brazilian real. The real strengthened from 2.5 reals per dollars during this period in 2005 to 1.7 reals per dollar in 2008.

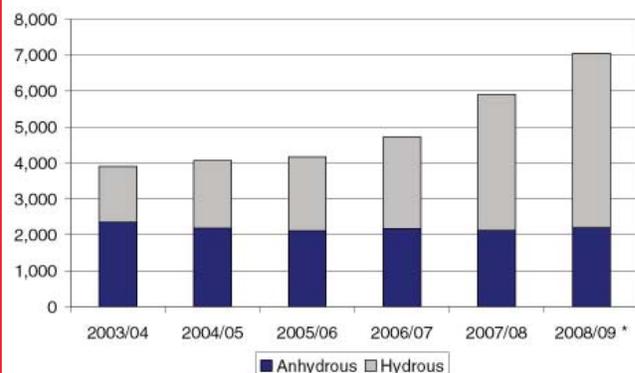
### Ethanol production and usage

Brazilian sugarcane production reached 423 million tons in 2005/06. This represented 31 percent of the world sugarcane production. Sugarcane production is divided equally between sugar production and ethanol production. As shown in Figure 2, Brazilian ethanol production is expected to top

7 billion gallons in the 2008/09 marketing year. This is up from about 4 billion in 2005/06.

In ethanol production, the "beer" resulting from the fermentation is processed in distillation columns where an azeotropic mixture of ethanol and water is separated out from the rest of the stillage. This is called hydrous ethanol and contains about 96% ethanol and 4% water. As shown in Figure 2, the growth in Brazilian ethanol production has been in hydrous ethanol.

**Figure 2. Brazilian ethanol production**



Source: USDA/FAS/ATO/Sao Paulo.

Note: Marketing Year starts in May and ends in April of the following year.

\* Forecast

Anhydrous ethanol does not contain any water. Anhydrous ethanol is created by putting hydrous ethanol through a dehydration process after distillation to remove the remaining water. The dehydration process is costly and energy-consuming. Anhydrous ethanol is used in the U.S.

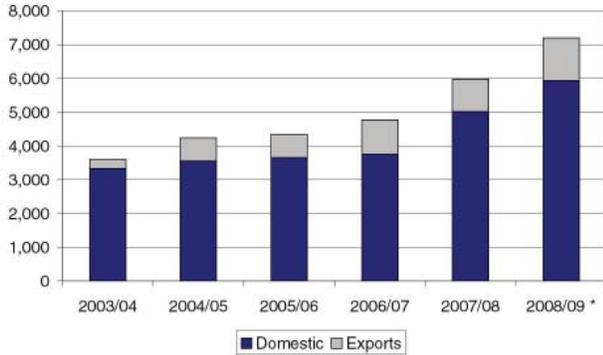
During 2008, hydrated ethanol has sold in Brazil for an average discount of about 12 percent compared to anhydrous ethanol. In Brazil both ethanol-only and flex fuel vehicles are manufactured to utilize hydrous ethanol. Anhydrous ethanol is used in the more traditional cars that run on the mandated E25 minimum ethanol blend.

As shown in Figure 3, the usage of ethanol has increased substantially in recent years. Strong demand for ethanol is due to mandated ethanol in gasoline, robust sales of flexible fuel vehicles (FFV) and a favorable ethanol/gasoline price ratio. Despite production growth in the industry, ethanol supply lags demand. An ethanol shortage occurred in 2006.

Ethanol currently replaces about 50 percent of the fuel needed to operate light vehicles on gasoline. When trucks and other diesel vehicles are included, ethanol represents about 20 percent of the road transportation usage. Ethanol represents 15 percent of the total supply of liquid fuels in Brazil.

Brazil's ethanol industry, part two, continued from page 5

**Figure 3. Brazilian ethanol usage**



Source: USDA/FAS/ATO/Sao Paulo.  
 Note: Marketing Year starts in May and ends in April of the following year.  
 \* Forecast

### Labor and environmental impact

Traditionally sugarcane has been harvested by hand. The fields were usually burned to remove leaves and other debris and rid the fields of snakes, making it easier and safer for the workers to harvest the cane. Due to advancements in harvesting technology, concerns about worker exploitation and environmental concerns about burning the fields, mechanical harvesting is becoming more common, especially in southern Brazil. This is displacing many of the workers who are usually the poorest in Brazil. Although the work is hard and may be dangerous, it does provide employment for a seg-

ment of the population. The Brazilian Sugar Cane Industry Association believes that 500,000 jobs will be lost of which 80 percent will disappear within three years. No alternative employment opportunities appear to be available.

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.

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Updates, continued from page 1

### Current profitability

The following profitability tools have been updated on [www.extension.iastate.edu/agdm](http://www.extension.iastate.edu/agdm) to reflect current price data.

**Corn Profitability – A1-85**

**Soybean Profitability – A1-86**

**Ethanol Profitability – D1-10**

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