

BIOFUELS IN BRAZIL: A CASE STUDY

Brazil is the current global leader in the use of ethanol as a fuel source. An examination of the history of Brazil's sugarcane ethanol industry can provide valuable insight into the factors that contribute to the success or failure of a large-scale biofuel program. Countries that are looking into increasing their biofuel use in order to become less dependent on petroleum-based fuels can learn from the success stories of countries such as Brazil. Of course, even Brazil's relatively successful ethanol industry has had its fair share of setbacks. Understanding the obstacles faced by this well-established industry will be useful in determining how future biofuel industries can be even more efficient and successful.



Sugarcane: the primary feedstock for ethanol production in Brazil (by Department of Energy & Climate Change)

Though alcohol can be fermented from almost any plant, the efficiency, energy yield and environmental effects of the fermentation process vary depending on the plant.

Ethanol in Brazil is primarily produced using sugarcane, which is currently considered one of the most efficient feedstocks for biofuel production. This efficiency is largely a result of using sugar cane bagasse (the fibrous residue remaining after the juice is extracted from the sugarcane) to power the process.

There are quite a few advantages to supplementing petroleum with biofuels such as sugarcane ethanol. Petroleum is more toxic, more dangerous and produces more threatening pollutants than ethanol. It is also more likely to explode and more likely to impact the environment negatively if spilled. However, there are also disadvantages associated with ethanol fuels. For instance, they corrode engines more easily and provide less energy per unit volume than petroleum. Despite these drawbacks, the Brazilian government has provided and continues to provide strong support for the production, use and distribution of sugarcane ethanol.

Brazil's ethanol industry has a long history beginning in the 1930s when the Brazilian government ordered that ethanol be blended into all gasoline in a 5-to-100 proportion. This proportion increased to 40% in certain parts of the country during and directly following World War II. At this time, the government began to implement policies in support of the ethanol industry.

The OPEC embargo in the early 1970s caused a financial crisis in Brazil due to the fact that, at the time, the country was importing approximately 80% of its petroleum. Furthermore, the collapse of sugar prices caused sugar producers to seek out ways to increase growth and stability. These two events set the stage for the expansion of the country's ethanol industry. Sugar producers desired to increase sugar production, as several mills were working below capacity, and the country wanted to decrease its dependence on foreign fuel. In response to the oil crisis, President Ernesto Geisel launched the National Alcohol Program (Proalcool) in 1975. This program aimed to reduce demand for imported fuel by supplementing gasoline with alcohol. It has since become the largest bioenergy program in the world.

Rising oil prices were followed by drastic increases in sugarcane ethanol production. Government action in the form of support policies provided the impetus necessary to encourage the auto industry to get on board with the country's biofuel initiatives. Car companies in Brazil began to manufacture vehicles that could use ethanol rather than gasoline for fuel. By the end of 1980, cars that could run on alcohol made up about 73% of the total car sales. Companies also began to retrofit existing gas cars with the technology necessary to allow them to use ethanol-based fuels.

Government policies played a large role in encouraging biofuel use. Registration tax for alcohol-run cars was reduced and a ceiling was put on ethanol prices so that they would not rise above 65% of gasoline prices. The government also established high minimum ethanol fuel blend requirements and ordered that ethanol be available at all fuelling stations.



The boom in biofuel use and production did not last for long. As oil prices began to fall and sugar prices began to rise, the biofuel industry lost a great deal of public support. The government was forced to raise ethanol prices, causing many consumers to lose interest in cars that ran solely using ethanol. Moreover, many biofuel research programs were shut down in the 1990s. However, the government was not ready to give up on biofuels yet. Law still mandated that all gas be blended with 20 – 25% alcohol. Still fewer and fewer alcohol-run cars were being produced, and in 1997, only 0.06% of cars were built to run on alcohol.

In the early 2000s, Brazil's ethanol market regained momentum due to a combination of tax breaks and advancements in biofuel-related technologies. A technological advancement that had a huge impact on the biofuel industry was the invention of the flex fuel car in 2003. Owners of these vehicles are given a choice as to how much ethanol they mix into their fuel. As the prices of oil and sugar continue to fluctuate, people can alter the ratio of ethanol to petroleum that they use to power their cars. The changes in prices that have altered consumer interest in biofuels in the past should no longer affect the production of alcohol-run cars because the same cars that can run on ethanol can also run on petroleum. Approximately 90% of the automobiles being produced in Brazil today are dual fuel.



Deforestation, similar to that pictured here, near Capixaba, Acre, Brazil, could be a result of expanding the biofuel industry in the country (by visionshare)

In response to the increasing demands for biofuels in Brazil, scientists continue to research new biofuel technologies in order to work towards making the process of creating alcohol even more efficient. However, many people have concerns regarding the expansion of the biofuel industry. Sugarcane production will need to increase to meet increasing ethanol demands, and many worry that deforestation will become an issue as more and more land is designated for sugarcane plantations. Though sugarcane takes up a relatively small amount of space for its energy yield, there is the possibility that the biofuel industry could offset its carbon savings through deforestation. Expanding the biofuel economy has also led to the mechanization of the harvesting process, causing unemployment among labourers. Those labourers remaining in the industry only have seasonal jobs, and the ethanol industry is also criticized for having substandard working conditions.

There are obvious benefits as well as some potential costs associated with the implementation of a fuel system based in ethanol use. Moving towards a more renewable fuel source is good for the environment as long as extensive deforestation does not occur. What can other countries learn from the Brazilian biofuel industry's journey? First of all, energy transitions gain much more public support in times of crisis. The economic conditions in Brazil just after the OPEC embargo were ideal for transitioning to an ethanol based fuel economy.

However, having the right economic, political and global conditions is not enough to begin a large-scale transition on its own. Why did Brazil succeed in transitioning to biofuels while other countries that were also affected by the 1970s oil crisis remained reliant on petroleum? The support policies put forth by the Brazilian government were definitely an important factor in the success of the country's biofuel industry. Providing incentives for workers and consumers seems to be an effective method of gaining public support. Furthermore, placing the responsibility of fuel mixture ratios in the hands of the consumer in terms of flex fuel cars will hopefully lead to stability in the biofuel economy. Though many countries do not have the climatic harvesting advantages that Brazil does, they can still learn from the government policies that fuelled the expansion of the ethanol industry.

Source: <http://www.sassweb.ca/3bb3/volume1-0/biofuel1-0/biofuels-in-brazil-a-case-study>