

With Big Boost From Sugar Cane, Brazil Is Satisfying Its Fuel Needs



Lalo de Almeida for The New York Times

A man headed to work at a sugar plantation in Orlandia in São Paulo State, which accounts for 60 percent of the sugar production in Brazil.

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PIRACICABA, [Brazil](#) — At the dawn of the automobile age, Henry Ford predicted that "ethyl alcohol is the fuel of the future." With petroleum about \$65 a barrel, President Bush has now embraced that view, too. But Brazil is already there.



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Ethanol, or alcohol, is popular at a São Paulo station and across Brazil because it costs less than gas.

This country expects to become energy self-sufficient this year, meeting its growing demand for fuel by increasing production from petroleum and ethanol. Already the use of ethanol, derived in Brazil from sugar cane, is so widespread that some gas stations have two sets of pumps, marked A for alcohol and G for gas.

In his State of the Union address in January, Mr. Bush backed financing for "cutting-edge methods of producing ethanol, not just from corn but wood chips and stalks or switch grass" with the goal of making ethanol competitive in six years.

But Brazil's path has taken 30 years of effort, required several billion dollars in incentives and involved many missteps. While not always easy, it provides clues to the real challenges facing the United States' ambitions.

Brazilian officials and scientists say that, in their country at least, the main barriers to the broader use of ethanol today come from outside. Brazil's ethanol yields nearly eight times as much energy as corn-based options, according to scientific data. Yet heavy import duties on the Brazilian product have limited its entry into the United States and Europe.

Brazilian officials and scientists say sugar cane yields are likely to increase because of recent research.

"Renewable fuel has been a fantastic solution for us," Brazil's minister of agriculture, Roberto Rodrigues, said in a recent interview in São Paulo, the capital of São Paulo State, which accounts for 60 percent of sugar production in Brazil. "And it offers a way out of the fossil fuel trap for others as well."

Here, where Brazil has cultivated sugar cane since the 16th century, green fields of cane, stalks rippling gently in the tropical breeze, stretch to the horizon, producing a crop that is destined to be consumed not just as candy and soft drinks but also in the tanks of millions of cars.

The use of ethanol in Brazil was greatly accelerated in the last three years with the introduction of "flex fuel" engines, designed to run on ethanol, gasoline or

any mixture of the two. (The gasoline sold in Brazil contains about 25 percent alcohol, a practice that has accelerated Brazil's shift from imported oil.)

But Brazilian officials and business executives say the ethanol industry would develop even faster if the United States did not levy a tax of 54 cents a gallon on all imports of Brazilian cane-based ethanol.

With demand for ethanol soaring in Brazil, sugar producers recognize that it is unrealistic to think of exports to the United States now. But Brazilian leaders complain that Washington's restrictions have inhibited foreign investment, particularly by Americans.

As a result, ethanol development has been led by Brazilian companies with limited capital. But with oil prices soaring, the four international giants that control much of the world's agribusiness — Archer Daniels Midland, Bunge and Born, Cargill and Louis Dreyfuss — have recently begun showing interest.

Brazil says those and other outsiders are welcome. Aware that the United States and other industrialized countries are reluctant to trade their longstanding dependence on oil for a new dependence on renewable fuels, government and industry officials say they are willing to share technology with those interested in following Brazil's example.

"We are not interested in becoming the Saudi Arabia of ethanol," said Eduardo Carvalho, director of the National Sugarcane Agro-Industry Union, a producer's group. "It's not our strategy because it doesn't produce results. As a large producer and user, I need to have other big buyers and sellers in the international market if ethanol is to become a commodity, which is our real goal."

The ethanol boom in Brazil, which took off at the start of the decade after a long slump, is not the first. The government introduced its original "Pro-Alcohol" program in 1975, after the first global energy crisis, and by the mid-1980's, more than three quarters of the 800,000 cars made in Brazil each year could run on cane-based ethanol.

But when sugar prices rose sharply in 1989, mill owners stopped making cane available for processing into alcohol, preferring to profit from the hard currency that premium international markets were paying.

Brazilian motorists were left in the lurch, as were the automakers who had retooled their production lines to make alcohol-powered cars. Ethanol fell into discredit, for economic rather than technical reasons.

Consumers' suspicions remained high through the 1990's and were overcome only in 2003, when automakers, beginning with Volkswagen, introduced the "flex fuel" motor in Brazil. Those engines gave consumers the autonomy to buy the cheapest fuel, freeing them from any potential shortages in ethanol's supply. Also, ethanol-only engines can be slower to start when cold, a problem the flex fuel owners can bypass.

"Motorists liked the flex-fuel system from the start because it permits them free choice and puts them in control," said Vicente Lourenço, technical director at General Motors do Brasil.

Today, less than three years after the technology was introduced, more than 70 percent of the automobiles sold in Brazil, expected to reach 1.1 million this year, have flex fuel engines, which have entered the market generally without price increases.

"The rate at which this technology has been adopted is remarkable, the fastest I have ever seen in the motor sector, faster even than the airbag, automatic transmission or electric windows," said Barry Engle, president of Ford do Brasil. "From the consumer standpoint, it's wonderful, because you get flexibility and you don't have to pay for it."

Yet the ethanol boom has also brought the prospect of distortions that may not be as easy to resolve. The expansion of sugar production, for example, has come largely at the expense of pasture land, leading to worries that the grazing of cattle, another booming export product, could be shifted to the Amazon, encouraging greater deforestation.

Industry and government officials say such concerns are unwarranted. Sugar cane's expanding frontier is, they argue, an environmental plus, because it is putting largely abandoned or degraded pasture land back into production. And of course, ethanol burns far cleaner than fossil fuels.

Human rights and worker advocacy groups also complain that the boom has led to more hardships for the peasants who cut sugar cane.

"You used to have to cut 4 tons a day, but now they want 8 or 10, and if you can't make the quota, you'll be fired," said Silvio Donizetti Palvequeres, president of the farmworkers union in Ribeirão Preto, an important cane area north of here. "We have to work a lot harder than we did 10 years ago, and the working conditions continue to be tough."

Producers say that problem will be eliminated in the next decade by greater mechanization. A much more serious long-term worry, they say, is Brazil's lack of infrastructure, particularly its limited and poorly maintained highways.

Ethanol can be made through the fermentation of many natural substances, but sugar cane offers advantages over others, like corn. For each unit of energy expended to turn cane into ethanol, 8.3 times as much energy is created, compared with a maximum of 1.3 times for corn, according to scientists at the Center for Sugarcane Technology here and other Brazilian research institutes.

"There's no reason why we shouldn't be able to improve that ratio to 10 to 1," said Suani Teixeira Coelho, director of the National Center for Biomass at the University of São Paulo. "It's no miracle. Our energy balance is so favorable not just because we have high yields, but also because we don't use any fossil fuels to process the cane, which is not the case with corn."

Brazilian producers estimate that they have an edge over gasoline as long as oil prices do not drop below \$30 a barrel. But they have already embarked on technical improvements that promise to lift yields and cut costs even more.

In the past, the residue left when cane stalks are compressed to squeeze out juice was discarded. Today, Brazilian sugar mills use that residue to generate the

electricity to process cane into ethanol, and use other byproducts to fertilize the fields where cane is planted.

Some mills are now producing so much electricity that they sell their excess to the national grid. In addition, Brazilian scientists, with money from São Paulo State, have mapped the sugar cane genome. That opens the prospect of planting genetically modified sugar, if the government allows, that could be made into ethanol even more efficiently.

"There is so much biological potential yet to be developed, including varieties of cane that are resistant to pesticides and pests and even drought," said Tadeu Andrade, director of the Center for Sugarcane Technology. "We've already had several qualitative leaps without that, and we are convinced there is no ceiling on productivity, at least theoretically."