SUGARCANE INDUSTRY IN BRAZIL

Ethanol
Sugar
Bioelectricity

500-YEARS-YOUNG

Portuguese sailors discovered Brazil in the year 1500, and one of their first acts was to plant sugarcane. Sugar has been an integral part of Brazil's social, political and economic history ever since. Five centuries later, sugarcane is set for another quantum leap, this time to offer the world a dual source of clean, renewable energy that produces both a biofuel and bioelectricity, at a moment when this is urgently needed.

As from March 2008, ethanol consumption produced from sugarcane surpassed that of gasoline representing over 50% of the fuel used by light commercial vehicles in Brazil. Its production and use help reduce greenhouse gas emissions by up to 90% compared to gasoline, and drivers can buy it in any of the country's 35,000 fueling stations.

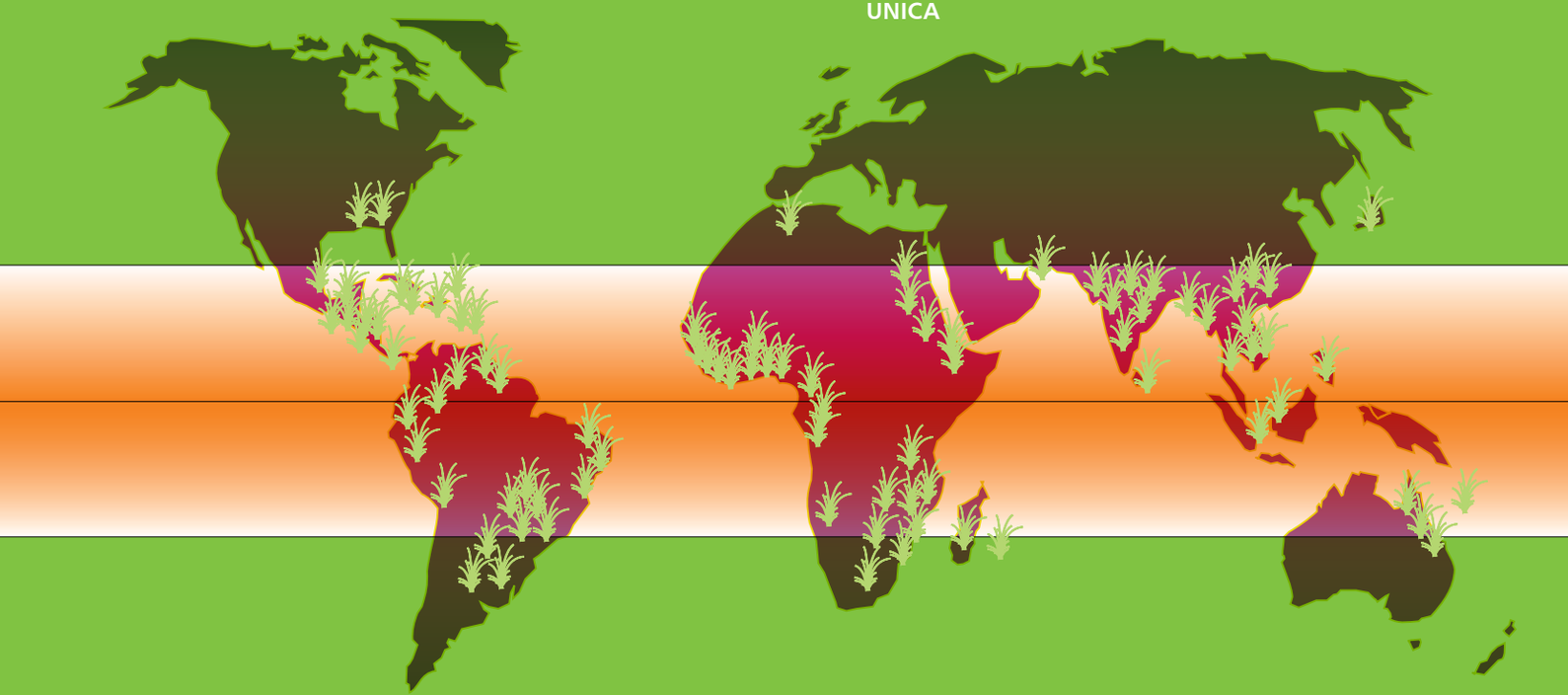
None of this is theoretical: it is happening as I write this, in Brazil, without deforestation or adverse effects on food prices or supplies.

Simply put, sugarcane ethanol is by far the most successful and efficient feedstock for the production of ethanol with existing technologies. It stands head and shoulders above alternatives like corn, wheat and sugarbeet in terms of energy and environmental balances, productivity and cost-effectiveness. As the global pioneer and leader in the successful large-scale production and use of ethanol and bioelectricity, Brazil's sugarcane industry is now working to expand global production, use and open trade of ethanol.

Already widely grown in tropical and subtropical regions, sugarcane can now make a significant contribution to development by turning many emerging economies into producers and exporters of ethanol for the world. Sustainably-produced biofuels can and should be part of a broad solution to challenges like energy security and global warming. And sugarcane ethanol, produced with all due environmental and social care, has all the prerequisites to become a global energy commodity.

We are on the threshold of this revolution, with the enormous potential contribution of sugarcane and its derivatives now becoming evident. Its already significant contributions have barely scratched the surface, as it becomes an increasingly decisive ingredient in our efforts to ensure our planet's future.

Marcos Sawaya Jank
President and CEO
UNICA



ABOUT UNICA

The Brazilian Sugarcane Industry Association (UNICA) is the largest organization representing the sugar and ethanol sectors. It speaks and acts in Brazil and around the world on behalf of the country's leading sugar, ethanol and bioelectricity producers. UNICA's more than 110 member companies represent around 60% of the ethanol and sugar produced in Brazil.

UNICA is governed by a Board of Directors comprising representatives of its member companies and has a full-time staff of experienced executives, specialists and technical advisors. UNICA's expertise covers key areas including the environment, energy, technology, international trade, corporate social responsibility, sustainability, regulation, economics and communications. UNICA has already opened two international offices in the United States and Europe, with another scheduled for Asia in 2009 as part of a policy to provide consumers, governments, NGOs, industry and the media with objective, detailed and up-to-date information on the important socio-economic and environmental contributions of sugar, sugarcane ethanol and bioelectricity.

MISSION

UNICA's mission is to spearhead the transformation of the traditional sugarcane industry into a modern agribusiness sector, capable of competing sustainably in Brazil and around the world in the areas of ethanol, sugar and bioelectricity production.




PRIORITIES

- Consolidate ethanol as a global commodity in the fuels sector;
- Promote demand for ethanol as a motor vehicle clean fuel and expand its use in other sectors;
- Foster large-scale production of bioelectricity for the Brazilian market;
- Help member companies become benchmarks for socio-environmental sustainability; and
- Disseminate credible scientific data relating to the competitive advantages of sugarcane ethanol.

STRATEGIES

- Support best practices in sugarcane agribusiness within a competitive, free-market economy;
- Promote the global expansion of ethanol production and consumption, and its unrestricted international trade;
- Continuously improve the socio-environmental sustainability of the sugarcane supply chain;
- Lead negotiations to reduce and/or eliminate barriers that distort trade in sugar and ethanol;
- Promote bioelectricity generation as a reliable alternative to fossil energy;
- Encourage research into new technologies for ethanol, including biorefineries; and
- Become a global reference for credible information and analysis on the sugarcane industry.

UNICA – Brazilian Sugarcane Industry Association

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sugarcane ethanol

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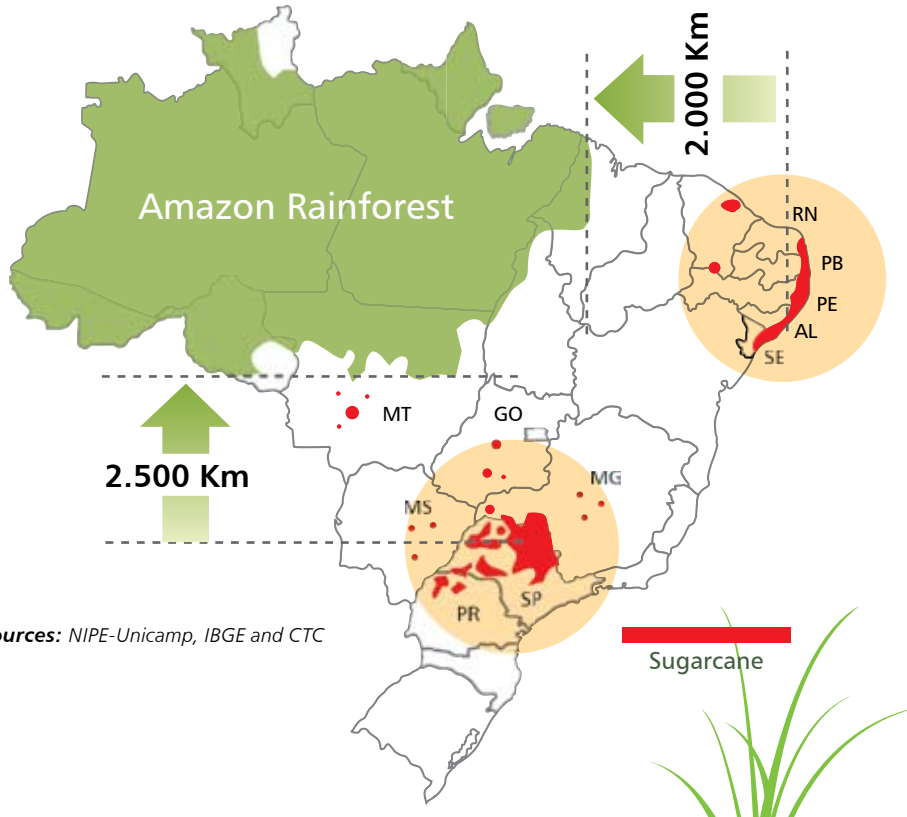
SUGARCANE INDUSTRY IN BRAZIL

ETHANOL
SUGAR
BIOELECTRICITY



Sources: *NIPE-Unicamp, IBGE and CTC*

Sugarcane

Overview of the industry in Brazil.

Over the last 30 years, the Brazilian sugarcane industry has experienced major and continuous technological improvement. Today, Brazilian sugarcane is the basic input for an extraordinarily diverse range of value-added products including food, animal feed, biofuel and electricity coming from modern, integrated biorefineries that produce sugar, ethanol and bioelectricity. In the near future, bioplastics will join the list.

Brazil is the world's leading sugarcane producer. The 2007/08 harvest year saw a record crop estimated at 496 million tonnes of sugarcane, processed at around 350 plants nationwide. Of these, some 230 were combined mills and distilleries producing both sugar and ethanol, while around 100 produced strictly ethanol. All mills are self-sufficient in electricity.

Brazilian sugarcane cultivation today occupies 7.8 million hectares, or 2.2% of the country's total arable land. Sugarcane is grown mainly in South-Central and Northeastern Brazil, with two different harvest periods: from April to December in South-Central Brazil, and from September to March in the Northeast. The South-Central area accounts for over 85% of total production. São Paulo alone produces around 60% of all Brazil's sugarcane.

Annual gross earnings from the sugar and ethanol sectors stood at around US$20 billion in 2007/08 crop year, with about 44% of that generated by sugar sales, 54% from ethanol and the remaining 2% from bioelectricity sold to the domestic market. Sugar sales were split 35% – 65% between the domestic and foreign markets respectively in 2007/08, while ethanol sales were heavily concentrated on the domestic market, which generated 85% of revenues against 15% from exports.

Brazilian sugarcane, sugar and ethanol production (2007/08)

REGION / STATE	SUGARCANE PRODUCTION (millions of tonnes)	% OF TOTAL	SUGAR PRODUCTION (millions of tonnes)	ETHANOL PRODUCTION (billions of liters)
Southeast	**339.8**	**68.54%**	**21.56**	**15.49**
São Paulo	296.3	59.76%	19.11	13.35
Minas Gerais	35.7	7.20%	2.12	1.78
Midwest	**50.9**	**10.27%**	**2.10**	**2.98**
Goiás	21.1	4.26%	0.95	1.21
Mato Grosso	14.9	3.01%	0.54	0.89
Mato Grosso do Sul	14.9	3.01%	0.62	0.88
Northeast	**63.7**	**12.85%**	**4.79**	**2.15**
Alagoas	29.4	5.93%	2.52	0.85
Pernambuco	19.8	3.99%	1.68	0.51
South	**40.5**	**8.17%**	**2.51**	**1.87**
Paraná	40.4	8.15%	2.51	1.86
North	**0.9**	**0.18%**	**0.04**	**0.04**
TOTAL	**495.8**	**100%**	**31.00**	**22.53**

Source: *UNICA and MAPA.*
Compiled by: *UNICA*
Note: *production for North/Northeast region calculated from data obtained up to August 16, 2008*

Ethanol

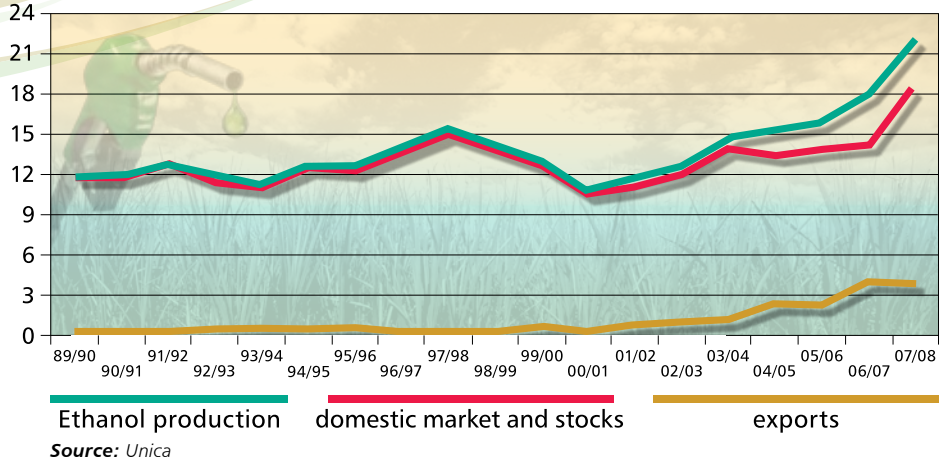
Ethanol, also known as ethyl alcohol, can be produced by the fermentation of sugarcane juice and molasses. It has been used in various forms for thousands of years, and has recently emerged as a leading fuel for combustion engines. Since March 2008, ethanol represents more than 50% of Brazil's overall gasoline consumption.

Brazil produces two types of ethanol: hydrous, which contains about 5.6% water content by volume; and anhydrous, which is virtually water-free. Hydrous ethanol is used to power vehicles equipped with pure ethanol or Flex-Fuel engines, while anhydrous ethanol is mixed with gasoline before it reaches pumps. Several countries are now blending anhydrous ethanol with gasoline to reduce petroleum consumption, boost the octane rating and provide motorists with a less-polluting fuel.

Brazil is a pioneer in using ethanol as a motor vehicle fuel. The country began using ethanol in automobiles as early as the 1920s, but the industry gained significant momentum in the 1970s with the introduction of ProAlcool, a trailblazing federal program created in response to global oil crises. ProAlcool succeeded in making ethanol an integral part of Brazil's energy matrix, but the program faced numerous challenges, particularly in the late 1980s when oil prices tumbled and sugar prices were high. Ethanol use blossomed again in Brazil because of sky-high gasoline prices, environmental concerns and the introduction in 2003 of Flex-Fuel vehicles (FFVs) that can run on ethanol, straight gasoline or any mixture of the two.

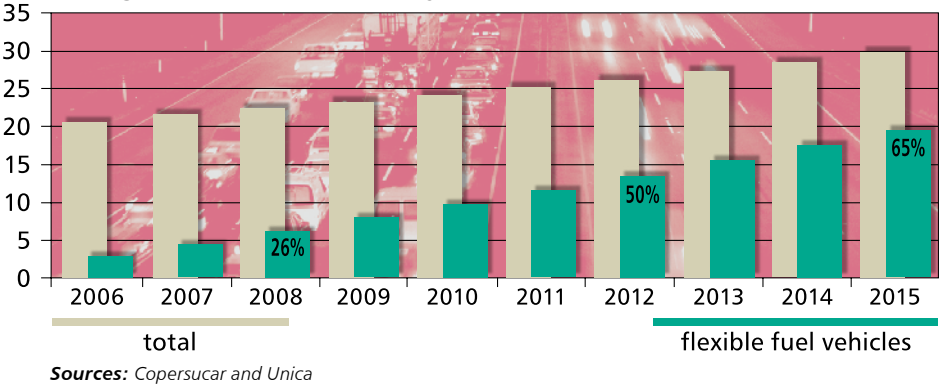
Brazilian ethanol production is expected to reach 22.5 billion liters in the 2007/08 sugarcane harvest, up 27% on the previous year. As in the past, the domestic market will absorb most of this – some 84% – with the remaining 3.6 billion liters going to export. Twenty-nine new plants began operations in South-Central Brazil in 2008, with investments in the sector expected to total US$33 billion through 2012. Foreign investors currently own 22 plants, a total expected to rise to 31 by 2012/13, when foreign capital is projected to reach 12% of the sector, compared to 7% in 2007/08.

Evolution of Brazilian ethanol market — billions of liters



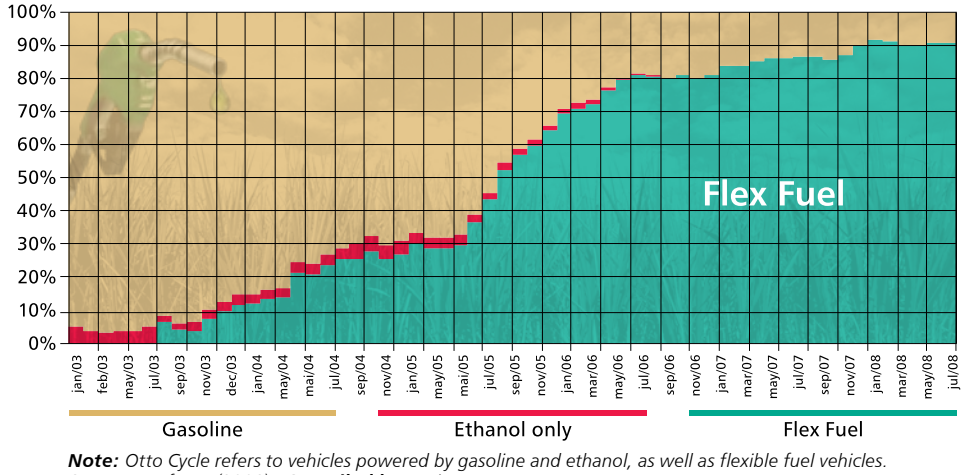
Source: *Unica*

Brazil: estimated automobile and light vehicle fleet – Otto Cycle — millions of units



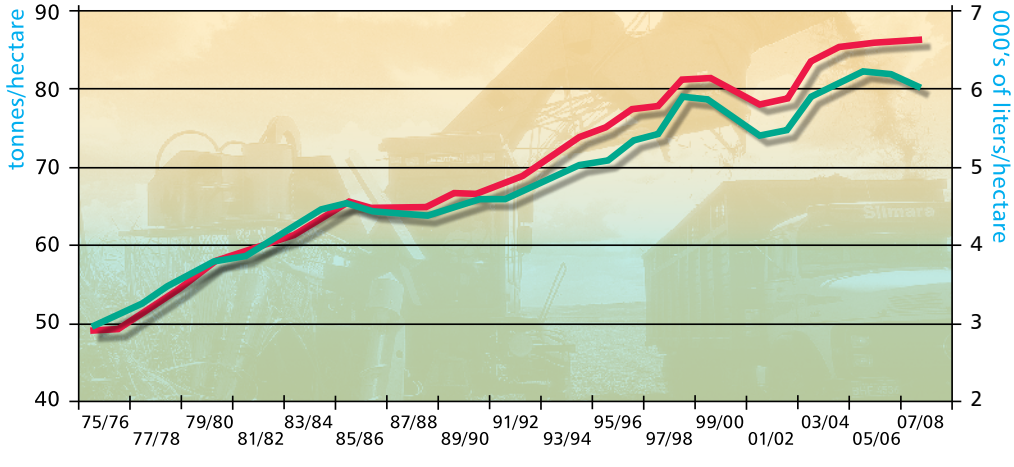
Sources: *Copersucar and Unica*

Brazilian Automobile Market
Automobile and light vehicle sales – Otto Cycle



Note: *Otto Cycle refers to vehicles powered by gasoline and ethanol, as well as flexible fuel vehicles.*
Source: *Anfavea (2008)* ***Compiled by:*** *Unica*

Evolution of agricultural and industrial productivity in ethanol production



Source: *Unica*

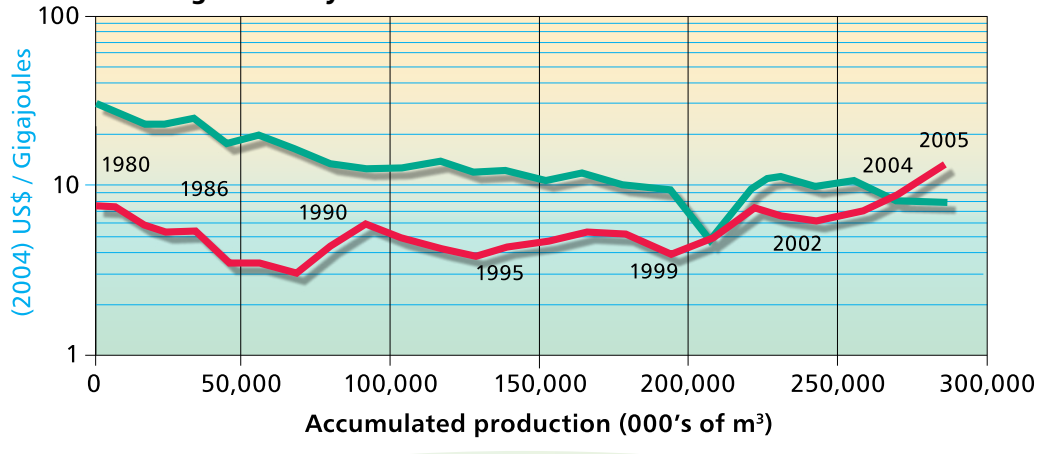
The success of Brazil's ethanol program is currently driven by two main factors: mandatory blending and the expansion of the FFV market. All gasoline sold in the country is blended with 20% to 25% anhydrous ethanol, and roughly nine out of every 10 new cars sold in the Brazilian market are FFVs. By the end of 2008 more than seven million vehicles, or more than 25% of Brazil's light vehicle fleet, will be FFVs, rising to 50% in 2012 and 65% in 2015. The auto industry has invested heavily in Flex-Fuel technology and now offers over 60 FFV models from 10 automakers, with two additional companies announcing flex models for 2009.

The use of fuel ethanol is not limited to light vehicles. Plans are in the works to introduce ethanol-powered buses (E-95) to the São Paulo city fleet as part of a pilot project co-sponsored by UNICA to use biofuels in public transportation, with significant potential benefits for the environment. For instance, replacing 1,000 diesel buses with ethanol-powered models would reduce CO_2 emissions by an estimated 96,000 tonnes per year, or the equivalent of emissions from 18,000 gasoline-powered automobiles. Ethanol has also been used to power flexfuel motorcycles and small Brazilian-made crop dusting airplanes. Future uses include the development of other fuels from ethanol, such as hydrocarbons.

The success of the Brazilian ethanol program is rooted in the proven economic and environmental advantages of sugarcane ethanol, which offers an unrivalled fossil energy balance. New studies show that 9.3 units of renewable energy are obtained from sugarcane ethanol for each unit of fossil fuel used in its production cycle and that this ratio can be further improved in coming years. The energy balance of other ethanol feedstocks such as corn, grains and sugarbeets rarely exceeds two units. When it comes to climate change mitigation, the performance of sugarcane ethanol is even more impressive. Based on a complete life-cycle analysis, up to 90% of CO_2-equivalent greenhouse gas (GHG) emissions can be avoided when sugarcane ethanol is used instead of gasoline. In 2007, ethanol production and use in Brazil reduced emissions of GHG by about 25.8 million tonnes of CO_2 or equivalent gases. Ironically, under the Kyoto Protocol, the use of sugarcane ethanol is not generating emission abatement credits.

Throughout Brazil, ethanol is economically competitive with gasoline and viable without subsidies for producers. Unfortunately, many developed countries protect their domestic ethanol industries with high trade-distorting tariff and non-tariff barriers, while encouraging the free trade of environmentally aggressive fossil fuels.

Learning curve – hydrous ethanol



Source: *Nastari, P. "Competitividade da produção de etanol de cana-de-açúcar: as 3 ondas de desenvolvimento", 5th Datagro Conference, São Paulo, September 20, 2005.*

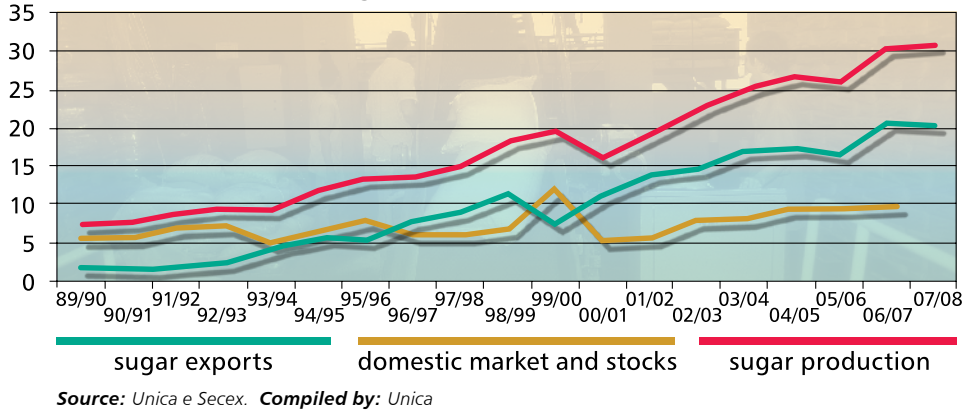
Ethanol

Sugar

Brazil is the world's leading sugar producer and exporter, accounting for approximately 20% of global production and 40% of world exports. National output reached an estimated 31 million tonnes in 2007/08. Roughly two-thirds of the sugar produced in Brazil (18.6 million tonnes) is dedicated to export. More than 100 countries in the world import sugar from Brazil. In recent years, major markets for Brazilian sugar have been the Russian Federation, Nigeria, the United Arab Emirates and Canada. It is important to highlight that virtually all Brazilian exports are traded in the free market. The preferential import-quotas devoted to Brazil by developed countries are extremely small compared to the total volume of Brazilian sugar sales. The United States and the European Union import less than 210,000 tonnes of Brazilian sugar under preferential conditions, which represents just 1% of the country's international sales.

Brazil is a member of the Global Alliance for Sugar Trade Reform and Liberalization, an organization that defends fair and free trade in sugar. In 2003, after years of protracted negotiations, Brazil, Australia and Thailand filed a World Trade Organization (WTO) complaint against EU sugar subsidies alleging violation of international trade agreements. In 2005 the of commitments the WTO ruled in favor of Brazil and as a result, the EU had to restrain its subsidized exports of sugar according to its WTO schedule of commitments (1.27 million tons) and could no longer cross-subsidize exports of quota C sugar. In order to comply with the WTO ruling, the EU had to reform its sugar program, reducing production quotas and reference prices.

Evolution of Brazilian sugar market millions of tonnes



Source: *Unica e Secex.* ***Compiled by:*** *Unica*

Production expansion prospects

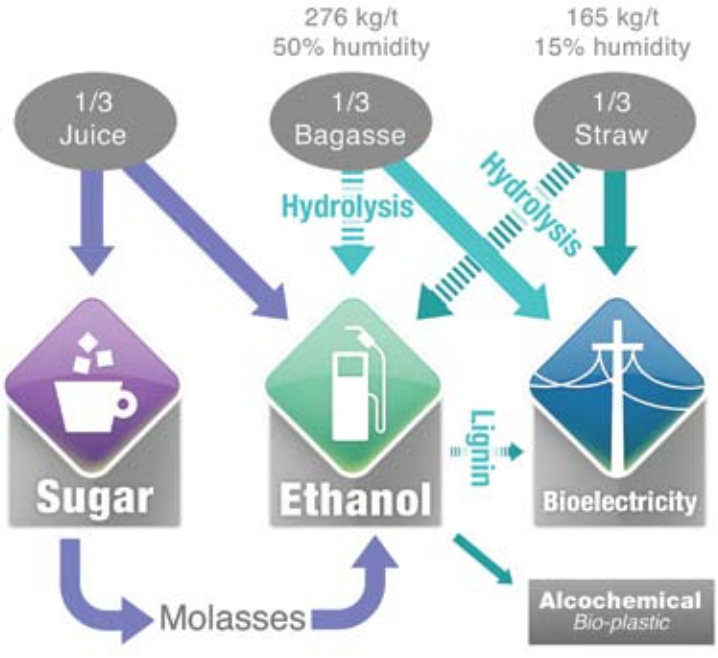
	2007/08e	2015/16	2020/21
Sugarcane production (millions of tonnes)	496	829	1,038
Cultivated area (millions of hectares)	7.8	11.4	13.9
Sugar (millions of tonnes)	31.0	41.3	45.0
Domestic consumption	12.4	11.4	12.1
Surplus for export	18.6	29.9	32.9
Ethanol (billions of liters)	22.5	46.9	65.3
Domestic consumption	18.9	34.6	49.6
Surplus for export	3.6	12.3	15.7
Bioelectricity (MWa)	1,800	11,500	14,400
Share of Brazilian energy grid	3%	15%	15%

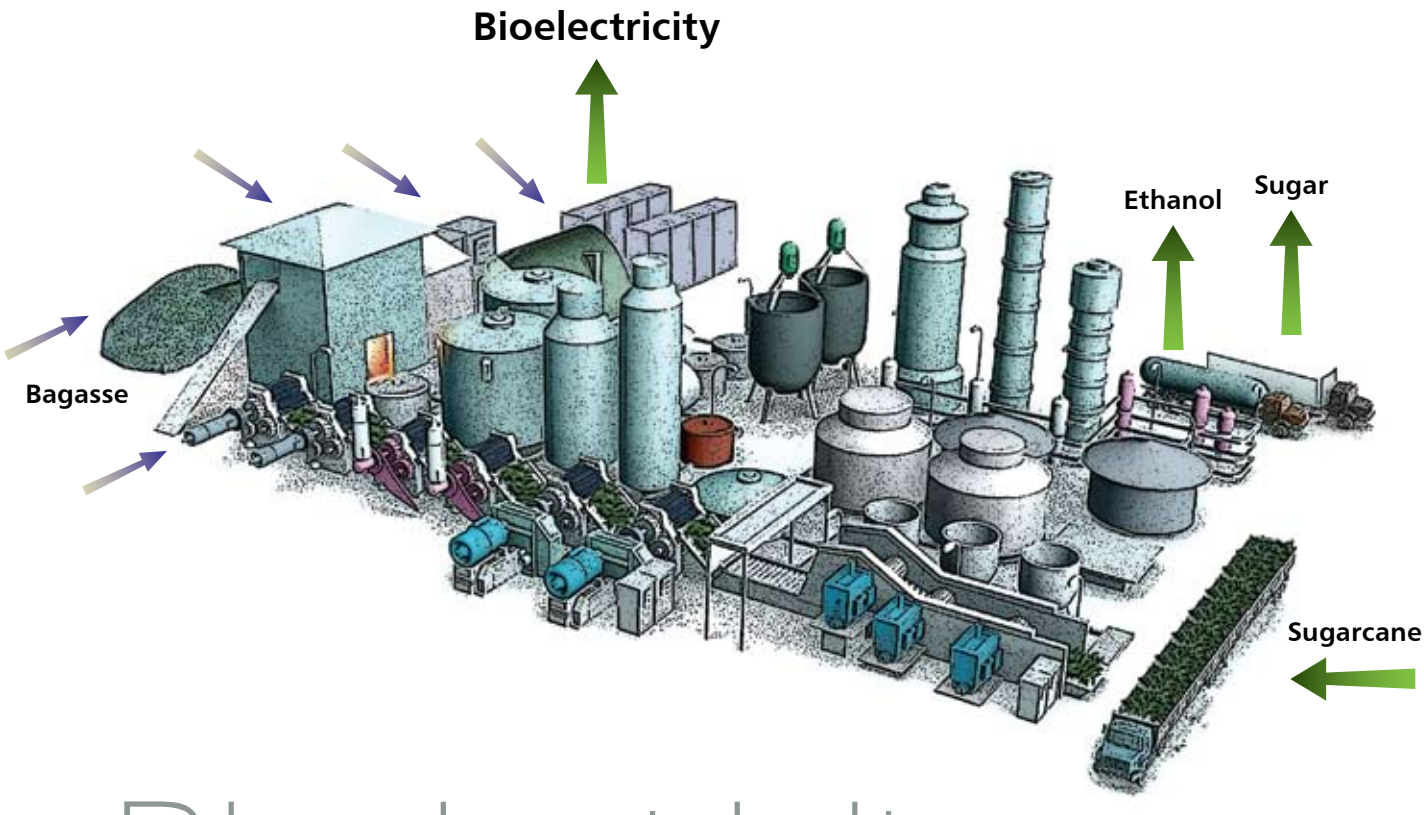
Note: *e = Production of Northeast region for 2007/08 crop was estimated based on data available up to August 2008; bioelectricity potential considered utilization of 75% of bagasse + 50% of straw available.*
Compiled by: *UNICA, Copersucar and Cogen.*

Bioelectricity

Bioelectricity may well be the most significant new area of activity for Brazil's sugarcane industry and one that can spark another revolution on the scale of ethanol. Bioelectricity is produced by burning bagasse, the dry, fibrous waste that is left after sugarcane has been processed. This already happens in all Brazilian sugarcane mills and ethanol distilleries, but much more energy could be produced if the bagasse as well as the sugarcane straw – the tops and leaves of stalks – were to be burned in high-efficiency boilers. Much of the approximately two thirds of the sugarcane's theoretical total energy potential, contained in the bagasse and straw, remain unharnessed.

Sugarcane energy is composed of roughly one third juice, one third bagasse and one third straw. Until now, the juice has been used to produce sugar and ethanol while most of the bagasse has been burned in low-efficiency boilers to produce steam and generate bioelectricity to cover only the plant's own needs. With hydrolysis technologies now under development, it will be possible to produce additional ethanol from bagasse and straw, while the lignin that remains after both are burned to produce electricity will also be used as biomass to generate additional bioelectricity.





Bioelectricity

For centuries, sugarcane fields around the world have been burned before cutting to facilitate the manual harvest. New technology to mechanize the harvest with considerable efficiency gains is now in place. In an effort to gradually phase out manual cutting, more than 130 sugar and ethanol plants that operate in São Paulo State have subscribed to a "Green Protocol" sponsored by UNICA and the São Paulo State government. This calls for the eradication of pre-harvest burning by 2014 in areas where harvesting can be mechanized and by 2017 where mechanization is currently not feasible – for example, where the cane is planted on steep slopes. With the harvest fully mechanized, the straw will no longer be wasted. Instead, it will be collected and burned along with the bagasse in high efficiency boilers (more than 60 bar), thus allowing a growing number of sugar and ethanol plants to sell their surplus bioelectricity to the national grid. At the start of the 2008/09 harvest, about 50% of the sugarcane harvest in São Paulo State was already mechanized.

By 2008, sugar and ethanol plants had the potential to generate 1,800 average megawatts (MWa) in surplus electricity, or about 3% of Brazil's overall needs. With the increased use of biomass from sugarcane and the implementation of high pressure boilers, estimates suggest this could rise by 2015 to as much as 11,500 MWa or 15% of the country's electricity needs. Generating bioelectricity offers numerous benefits: the environmental impact is low and producers can obtain carbon credits, while projects are relatively small and usually involve a broad range of investors. This means reduced risks, in particular of the kind that frequently cause construction delays in large-scale hydroelectric projects. Moreover, bagasse and straw cogeneration represents a boost for the Brazilian equipment industry and creates numerous jobs, while drawing on know-how developed over many years of cogeneration for internal consumption at sugar and ethanol plants.

Bioelectricity from sugarcane is a particularly interesting option for Brazil because so much of the country's electricity comes from large hydro dams. The sugarcane harvesting period, when most biomass is available, coincides with the dry season when hydroelectric power stations sometimes have to reduce output because of low water levels in their reservoirs. This makes the two sources of electricity complementary. In addition, the majority of sugar and ethanol plants are located fairly close to the more populous regions of Brazil, where electricity demand is the highest.

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SUSTAINABLE BRAZILIAN SUGARCANE

Competitive advantages of Brazilian sugarcane

Brazil's sugarcane industry offers an excellent example of how social, economic and environmental concerns can be addressed within the framework of sustainable development. Today, sugarcane ethanol represents the best option for large-scale, sustainable biofuel production and use.

Mitigating Global Warming:

Unmatched GHG Reduction Several well-to-wheel estimates show that Brazilian sugarcane ethanol reduces emissions of greenhouse gases (GHG) by up to 90%, when used instead of gasoline.

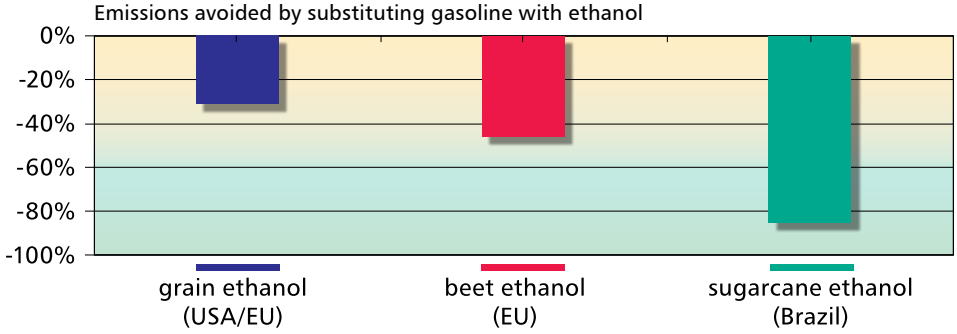
Superior Energy Balance The energy balance of Brazilian ethanol is 4.5 times better than that of ethanol produced from sugar beet or wheat, and almost seven times better than ethanol produced from corn.

100% Energy Self-Sufficiency Brazil's sugar and ethanol plants generate their own electrical energy by burning bagasse. This process, known as cogeneration, not only supplies the plant's own energy requirements but also produces surplus electricity that can be sold to commercial distribution systems.

Higher Yields Brazilian sugarcane ethanol offers higher productivity than other alternatives in terms of liters of biofuel per hectare harvested. New varieties of sugarcane developed in Brazil, combined with the future introduction of hydrolysis, have the potential to push yields beyond 10,000 and as high as 13,000 liters per hectare, from the current 7,500. Beyond the direct implications for production costs, increased productivity is vital because it will allow for higher yields without need for further expansion of cultivated areas.

Balance of GHG Gas Emissions Based on Product Life-cycle

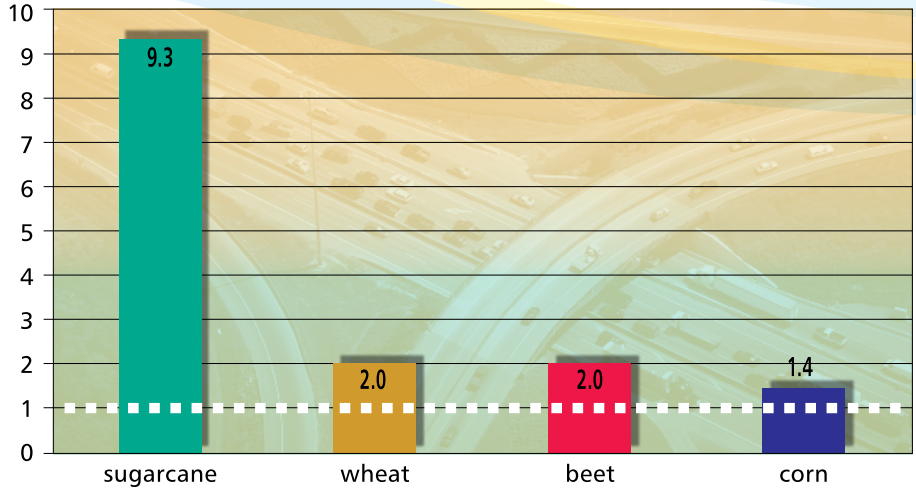
Emissions avoided by substituting gasoline with ethanol



Note: *emissions calculated based on product life cycle (from well-to-wheel).*
Source: *IEA – International Energy Agency (2004) e Macedo, I. de C. et al. (2004).*
Compiled by: *Icone and Unica.*

Energy Balance

Energy contained in ethanol per unit of fossil energy used to produce it



Note: *estimate*
Source: *World Watch Institute and Macedo et al (2008).*
Compiled by: *Icone and Unica.*

Best Agricultural and Environmental Practices

Less Agrochemicals The use of pesticides in Brazilian sugarcane fields is low and the use of fungicides is practically non-existent. Major diseases that threaten sugarcane are fought through biological control and advanced genetic enhancement programs that help identify the most resistant varieties of sugarcane. Thanks to the innovative use of recycled production residues such as vinasse and filter cake as organic fertilizers, Brazilian sugarcane harvesting uses less industrialized fertilizers than other major crops.

Low Soil Loss Brazilian sugarcane fields have relatively low levels of soil loss, thanks to the semi-perennial nature of sugarcane, which only needs replanting every five to six years. Future trends indicate that current losses, however limited, will decrease significantly in coming years through the use of sugarcane straw, some of which is left on the fields as organic matter (mulch) after mechanical harvesting.

Minimal Water Use Brazilian sugarcane fields require practically no irrigation because rainfall is abundant and reliable, particularly in the main South-Central production region. Rainfall is complemented by fertirrigation, a process that involves applying vinasse, a water-based residue from sugar and ethanol production which is rich in organic nutrients. Water use during industrial processing has decreased significantly over the years, from around 5 m^3 per tonne to approximately 1.5 m^3 per tonne of sugarcane processed. With improved technologies such as dry wash, the industry expects to reduce water use further in coming years.

The "Green Protocol" in São Paulo State

One of the most important initiatives launched by the sugar and ethanol sector is the "Green Protocol", also called the "Agro-environmental Protocol," signed in 2007 between the sugarcane industry and the São Paulo State government. Under the agreement, the industry agreed to speed up the elimination of sugarcane burning, a traditional practice that facilitates manual cane harvesting. The "Green Protocol" brought forward from 2021 to 2014 the eradication date for areas where mechanized harvesting is currently possible, and from 2031 to 2017 the deadline for other areas, for example steep slopes. The Protocol also states that as of November 2007, new sugarcane fields must have fully mechanized harvesting. By mid-2008, some 140 of 162 sugar and ethanol plants in São Paulo State had signed the Green Protocol. Mechanized harvesting is expected to surpass 50% of the sugarcane harvest in the state during the 2008/09 harvest. Sugar and ethanol producers, together with labor organizations and different levels of government, are developing job training and requalification programs to mitigate the effects of mechanization on sugarcane cutters.

Improving Working Conditions and Social Responsibility

UNICA and its member companies continually develop programs aimed at improving labor conditions and establishing national benchmarks. With just over 300,000 workers earning average salaries that are double the national minimum wage, sugarcane workers in the State of São Paulo are among the best paid in Brazilian agriculture. The industry takes a leadership role in developing innovative programs to improve working conditions and social responsibility.

- In partnership with the Federation of Registered Rural Workers of the State of São Paulo (FERAESP), UNICA is implementing recommendations for enhanced working conditions for rural laborers in the sugarcane industry. Key aims of the labor protocol include the elimination of outsourcing for manual sugarcane cutters, better standards for transportation of rural workers to and from fields, and increased transparency in performance measurements and employee compensations.
- With support from the World Bank Institute, UNICA set up a Social-Environmental and Responsibility Unit, to implement various programs within the industry and build on best practices for corporate, social and sustainable competitiveness among current and future workers in the industry. The Unit also works with industry suppliers, the media, NGOs and industry executives to encourage sustainable practices.
- Together with the São Paulo-based Ethos Institute, UNICA developed a Socio-Environmental Responsibility encouraging best environmental and Responsibility Indicator that tracks corporate responsibility performance in the industry, with the aim of encouraging best environmental and sustainable practices.
- Other projects include the Social Balance Program developed with the Brazilian Institute for Social and Economic Analysis (iBase) and data gathering for UNICA's Global Reporting Initiatives on Sustainability (GRI).

UNICA also works with a variety of other non-governmental organizations, including the Inter-American Development Bank (IDB), and is always open to consider new initiatives to improve labor conditions and industry performance.

UNICA's first socio-environmental report (2007/2008) showed that member companies invested over R$ 160 million in 618 projects within social, environmental, cultural, education, sport and health areas, benefiting approximately some 480 thousand people.

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sugarcane ethanol

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FREQUENTLY ASKED QUESTIONS

ABOUT THE BRAZILIAN SUGARCANE INDUSTRY

1 How much sugarcane is produced in Brazil and in the world?

Industry estimates indicate Brazil will produce about 496 million tonnes of sugarcane during the 2007/08 harvest season. World production is close to 1.6 billion tonnes and is concentrated mainly in tropical regions, particularly the developing nations of Latin America, Africa, and South and Southeast Asia. There are roughly 100 countries producing sugarcane today.

Sugarcane currently covers 7.8 million hectares in Brazil, or 2.2 % of the country's total arable land. It is grown primarily in the South-Central and Northeastern regions with different harvesting periods: in South-Central Brazil the harvest runs from April to December and in the Northeast from September to March. The South-Central region produces close to 90% of Brazil's sugarcane. São Paulo State accounts for 60% of the country's total sugarcane production.

2 What is the sucarcane's share in Brazil's energy matrix?

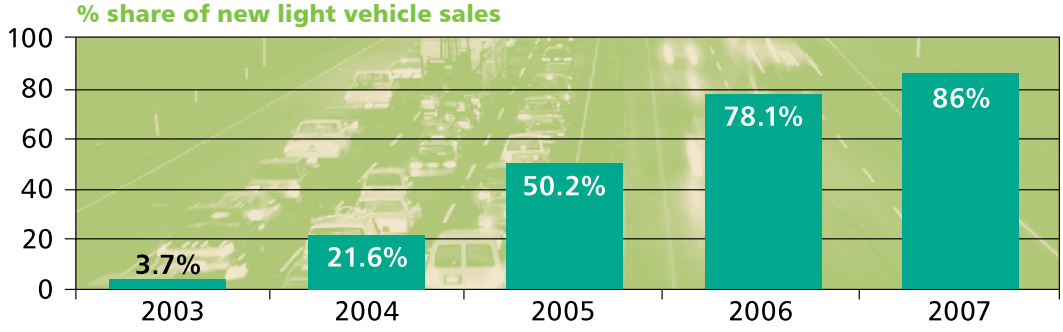
Together, ethanol and sugarcane bagasse represent 16% of the Brazilian energy matrix. Ethanol use in Brazil has grown steadily, especially since the introduction of Flex-Fuel Vehicles (FFVs) in 2003. In May 2008, ethanol accounted for over 50% of all fuel consumed by automobiles and light commercial vehicles capable of running on ethanol and/or gasoline – i.e., excluding vehicles powered by diesel or natural gas. In addition to economic and environmental benefits, domestic ethanol production has saved Brazil billions in oil imports over the last three decades.

3 What is the outlook for the Flex-Fuel Vehicle market in Brazil?

Ethanol pumps began to appear in 1976, and today each of the 35,000 service stations in the country has at least one dedicated pump offering pure hydrous ethanol (E-100). However, car engines were at first designed to run exclusively on gasoline or ethanol, but not both. This meant consumers had to choose their fuel when purchasing the vehicle. With the introduction in 2003 of FFVs, which accept ethanol, gasoline or any combination of the two, consumers gained the freedom to choose between fuels at the pump, not in the showroom. In addition to the E-100 pumps, all gasoline sold in Brazil has for many years contained between 20% and 25% anhydrous ethanol as a mandated blend.

In 2008, FFVs represented approximately 90% of all new light commercial vehicles sold in the country, a remarkable jump from the 4% sold in 2003. Market projections suggest that FFV sales will tend to stabilize at around 90%, with the remainder being diesel-powered light vehicles and gasoline-powered imported models that do not offer Flex-Fuel technology.

FFV share of new automobile and light vehicle sales



Note: *Data refers to all new light vehicles in the Brazilian market, including those powered by diesel.*
Source: *Anfavea (2007).*

According to Brazil's National Association of Automotive Vehicle Producers (ANFAVEA), by July 2008 there were 6 million FFVs on Brazilian roads, some 23% of all light vehicles. Estimates indicates there will be 10 million FFVs by 2010, or about 40% of the Brazilian light vehicle fleet. Companies offering FFVs include Citroën, Fiat, Ford, General Motors, Honda, Mitsubishi, Peugeot, Renault, Toyota and Volkswagen. Hyundai and Nissan have announced they intend to join the list in 2009.

Steady progress in ethanol engine technology has brought additional gains in mileage and emission standards. Moreover, the success of Flex-Fuel technology has led to the development of Flex-Fuel motorcycles, due to hit the market in early 2009. Buses powered by ethanol (E-85) are also being tested in streets of São Paulo under a pilot program supported by UNICA.

4 What is the outlook for the Brazilian sugarcane industry?

Brazil's sugarcane production for all purposes – sugar, ethanol and bioelectricity – is projected to reach one billion tonnes by 2020/21. This is more than double the estimated 496 million tonnes harvested in 2007/08. The total planted area is expected to expand from 7.8 million hectares at the start of 2008 to around 14 million hectares through the same period. Output is expected to grow faster than the total cultivated area, thanks to ongoing improvements in crop productivity.

Investments in new ethanol, sugar and bioelectricity plants should total US$33 billion through 2012. The majority of new projects involve Brazilian investors, but foreign capital participation in the sector is expected to grow from the current 7% to around 12% by 2012.

5 What is second-generation ethanol, and what could be its impact?

Current technology for production of ethanol from biomass relies on processes of fermentation and distillation, and requires feedstocks that contain sucrose (sugarcane, sugar beet, etc.) or starch (corn, wheat, cassava, potato, etc.). Global demand for alternative, sustainable fuel sources has created the need to experiment with new feedstocks and develop innovative processes for the production of ethanol. Generally speaking, "second-generation" biofuels are those produced from cellulose and hemicelluloses, which can be found in agricultural and forestry residues as well as organic wastes. There are other emerging processes, such as gasification, that may be able to produce hydrocarbons from biomass feedstocks such as sugarcane bagasse.

Research into hydrolysis technology is advancing quite rapidly in many countries, and the prevailing opinion in technical and academic circles is that second-generation ethanol will become commercially viable within the next five to ten years. In Brazil, sugarcane straw and bagasse are particularly attractive as feedstock for the production of second-generation ethanol because they would allow for increased fuel production without expanding cultivated areas.

Conservative estimates indicate that hydrolysis has the potential to increase ethanol production by around 40 liters per tonne of sugarcane, raising the total yield from the current average of 85 liters per tonne of sugarcane in South-Central Brazil to around 125 liters per tonne. By 2020, the introduction of second-generation ethanol, together with new varieties of sugarcane, should allow for continued growth of production without further expansion of the planted area.

6 What is bioelectricity, and what is its potential in Brazil and other developing countries?

Bioelectricity is electric power generated from vegetable biomass. For the sugar and ethanol sector this normally means cogeneration – producing two types of energy, thermal and mechanical – using biomass (bagasse and/or sugarcane straw) as the primary energy source. With current technology, Brazil's sugarcane sector has the installed capacity to generate 1,800 average megawatts (MWa) in 2007/08. Bearing in mind that industry estimates for 2020/21 indicate a sugarcane harvest of one billion tonnes, the bioelectricity potential from bagasse should then be 7,600 MWa, reaching 14,400 MWa when both bagasse and straw become available thanks to mechanical harvesting.

Bioelectricity represents an economically and environmentally sound solution for sugarcane producing countries, especially those with high oil import bills.

7 Will ethanol become a global commodity?

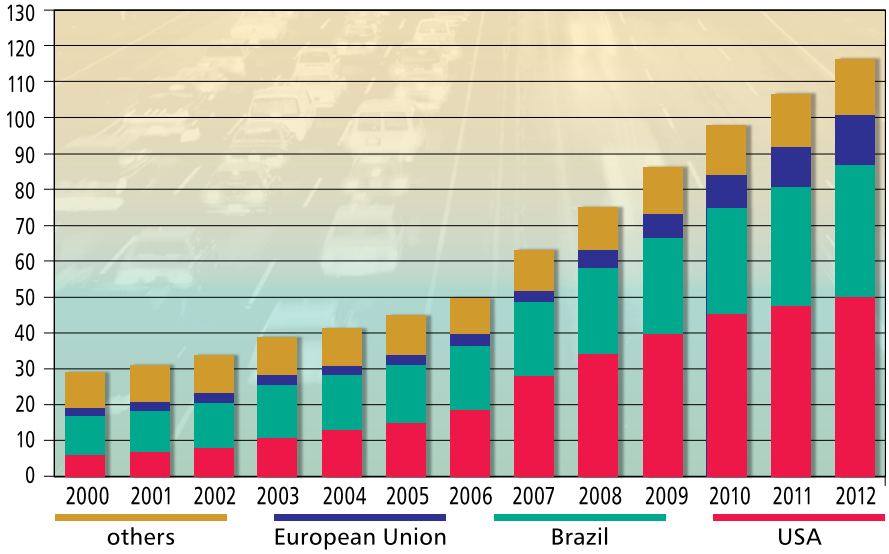
Ethanol will be consolidated as a global energy commodity only when it is produced, used and traded by many more countries. Other essential steps include developing and implementing universal product standards and mechanisms for mandatory blending of gasoline and ethanol. An important step in this direction came with the Memorandum of Understanding (MoU), signed in 2007 between Brazil and the United States, the world's two leading ethanol producers which together account for over 70% of global production. The MoU calls on both countries to work together towards the harmonization of international specifications for fuel ethanol.

Sustainably-produced biofuels are a key element in any global solution to the growing challenges of energy security, environmental degradation and global warming. However, while ethanol enjoys all the qualities necessary to become an established global energy commodity, this can happen only with the reduction of commercial barriers imposed by developed countries. Until then, one of today's great global contradictions will continue: fossil fuels are traded freely but renewable fuels, which represent progress towards energy security and a safer future, face highly protected markets. In the world of fossil fuels some 20 countries, often located in politically-troubled regions, supply about 200 countries. In the world of renewable fuels, more than 100 countries will be potential suppliers.

8 Why is the world so interested in biofuels?

Many countries have demonstrated a firm interest in biofuels. Policies to promote their production and use have been adopted recently not just by Brazil – the world pioneer in successful large-scale ethanol production and use – but also in the U.S., the European Union, China, India, Thailand and various African and Central American countries. Enthusiasm for biofuels is driven by the urgent need to mitigate the effects of global warming, stem the dramatic rise in energy prices and increase energy security by reducing the reliance on politically troubled oil producing-regions. Biofuels are also seen as a way to enhance farmers' incomes by providing new outlets for agricultural products.

Ethanol Production billions of liters



Note: *2008/2012 projections based on production capacity and consumption targets released by main producing countries.*
Compiled by: *Unica*

Ethanol is the renewable fuel most produced and consumed around the world. Between 2000 and 2007, global production more than doubled and is expected to reach 115 billion liters a year by 2012, with the U.S. and Brazil as the largest producers. But despite growing interest in renewable fuels, international trade in ethanol remains small, at around 6 billion liters, because of tariff and non-tariff barriers in many developed countries.

9 Why did Brazil and USA sign a Memorandun of Understanding (MoU) on biofuels, and what does it contemplate?

As the world's largest producers of ethanol, Brazil and the U.S. signed an MoU in 2007 in order to work together to further develop global ethanol production and markets. The MoU calls for a joint effort with three key objectives:

- Working bilaterally and multilaterally to establish global standards and codes for biofuels through a partnership between the U.S. National Institute of Standards and Technology (NIST) and Brazil's National Institute of Metrology, Standardization and Industrial Quality (Inmetro). The effort includes the International Biofuels Forum, a joint project involving China, India, South Africa, the European Union and other countries;
- Promoting technical and scientific cooperation between the two countries for developing next generation biofuels, mainly cellulosic ethanol research; and
- Bringing the benefits of biofuels to less developed nations, starting with Central America and the Caribbean – the Dominican Republic, El Salvador, Haiti and St. Kitts & Nevis. The scope of this cooperation program should be expanded to other key regions in the future.

10 What are the differences between ethanol produced from sugarcane, corn, sugarbeet, wheat and other feedstocks?

Sugarcane ethanol offers significant and quantifiable economic and environmental advantages over other alternative fuels. Under current Brazilian conditions, the production of a given quantity of sugarcane ethanol yields nine times more energy than it consumes during its production. This in turn contributes to a significant reduction of greenhouse gas (GHG) emissions. For each unit of fossil energy used to produce Brazilian sugarcane ethanol, 9.3 units of renewable energy are generated, an energy balance that is over four times better than that of ethanol from sugarbeet and wheat and nearly seven times that of corn ethanol.

According to the U.S. Department of Energy, the production of gasoline and diesel not only does not yield renewable energy, but also results in negative energy efficiency. For each unit of fossil energy consumed during the production process, only about 0.8 unit of fossil energy is generated. Brazilian sugarcane ethanol also features the highest level of productivity in terms of liters of fuel per hectare of land required. While South-Central Brazil produces around 7,500 liters per hectare, European sugarbeet ethanol yields an average of 5,500 l/ha while U.S. corn ethanol reaches around 3,800 l/ha.

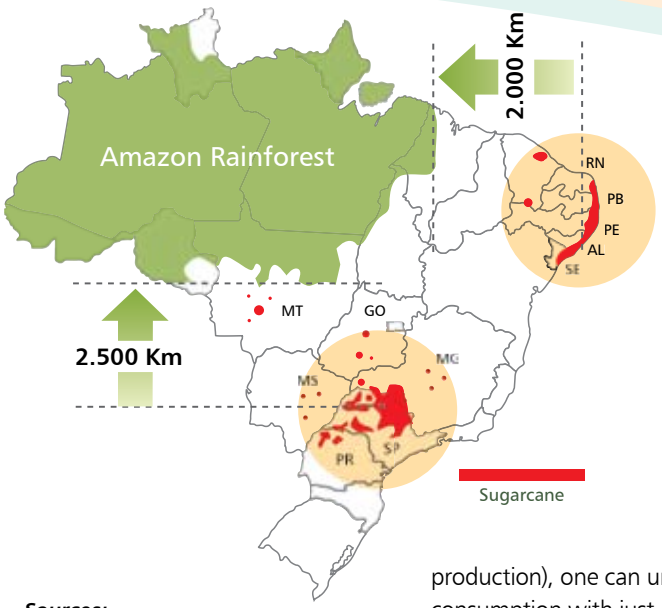
11 How does sugarcane ethanol help slow global warming?

According to the International Energy Agency, the production and use of sugarcane ethanol in Brazil as a substitute for gasoline reduces GHG emissions by up to 90%, based on a well-to-wheel analysis. Sugarcane is a renewable, semi-perennial fast-growing primary feedstock that only needs to be replanted every five or six years, with an annual harvest and a high capacity to absorb carbon dioxide (CO_2) from the atmosphere. CO_2 is the most significant GHG contributing to global warming. The use of agrochemicals and insecticides in sugarcane harvesting is low when compared to other major crops, while fungicide use is practically non-existent. This happens partly because of advanced genetic improvement programs that help identify more resistant sugarcane varieties for specific conditions. Biological control methods, including the innovative use of organic fertilizers produced from residues of the sugar and ethanol production process, also contribute to limit the use of industrial fertilizers, which require fossil fuels to be produced and add GHG emissions.

12 Is sugarcane expansion a threat to the Amazon Rainforest?

No. First, sugarcane expansion since the mid 1980s has occurred primarily in South-Central Brazil, in traditional sugarcane harvesting areas that are distant from the Rainforest and other important ecological areas such as the Pantanal wetlands. In fact, most of this expansion has occurred in the populous State of São Paulo, in regions that have been committed to agricultural activity for decades and near established sugar and ethanol processing plants. This is directly related to the perishable nature of the sugarcane itself. Unlike grains and other crops, sugarcane, once harvested, must be processed within a few hours in order to not lose its value (sugars) through natural fermentation. Consequently, all sugarcane fields must be relatively close to processing plants.

Second, the Amazon Rainforest does not offer favorable economic and agronomic conditions for sugarcane production, namely alternating dry and wet seasons needed to grow the plant and build up sucrose levels in the cane. Moreover, the absence of a reliable transportation infrastructure to move the final product (either sugar or ethanol, since the cane itself cannot be transported for long distances) out of remote processing areas is a major inhibiting factor that discourages sugarcane production in regions such as the Amazon.



Sources:
NIPE-Unicamp, IBGE and CTC

Third, future expansion is anticipated to continue in South-Central Brazil, particularly in degraded pastures. The most promising areas for expansion are in Western São Paulo State and the States of Minas Gerais, Mato Grosso do Sul and Goiás.

Finally, while the Brazilian Amazon Rainforest occupies some 420 million hectares of land (about half of Brazil's total landmass of 851 million hectares), sugarcane fields for the production of sugar and ethanol occupied just 7.8 million hectares at the start of the 2008 harvest season, or 0.9% of all land in Brazil. Looking at it another way, Brazil's total arable land (excluding the Amazon and other sensitive areas) totals about 355 million hectares. This means that sugarcane for all purposes occupies 2.2 % of all arable land. Since only about half the sugarcane crop goes to ethanol (the remainder is used in sugar production), one can understand why, as of March 2008, Brazil had replaced over 50% of its gasoline consumption with just 1% of its arable land.

Brazilian sugarcane, sugar and ethanol production (2007/08)

REGION / STATE	SUGARCANE PRODUCTION (millions of tonnes)	% OF TOTAL	SUGAR PRODUCTION (millions of tonnes)	ETHANOL PRODUCTION (billions of liters)
Southeast	**339.8**	**68.54%**	**21.56**	**15.49**
São Paulo	296.3	59.76%	19.11	13.35
Minas Gerais	35.7	7.20%	2.12	1.78
Midwest	**50.9**	**10.27%**	**2.10**	**2.98**
Goiás	21.1	4.26%	0.95	1.21
Mato Grosso	14.9	3.01%	0.54	0.89
Mato Grosso do Sul	14.9	3.01%	0.62	0.88
Northeast	**63.7**	**12.85%**	**4.79**	**2.15**
Alagoas	29.4	5.93%	2.52	0.85
Pernambuco	19.8	3.99%	1.68	0.51
South	**40.5**	**8.17%**	**2.51**	**1.87**
Paraná	40.4	8.15%	2.51	1.86
North	**0.9**	**0.18%**	**0.04**	**0.04**
TOTAL	**495.8**	**100%**	**31.00**	**22.53**

Source:
UNICA and MAPA.
Compiled by:
UNICA
Note:
production for North/ Northeast region calculated from data obtained up to August 16, 2008

13 Will the expansion of the sugarcane sector push other agricultural activities, such as cattle and soybean, into the Rainforest?

No. First, the dynamics of the cattle industry, which has been active in the Amazon region for the past 30 years, are unrelated to sugarcane production. Cattle raising activities in the greater Amazon are linked to the logging industry, which unfortunately has been the "cash crop" of the Rainforest. Reliable estimates show that about 80% of all illegal clearings in the Amazon eventually are converted into cattle raising pasture, until the land loses its inherent value for most agricultural activity.

Second, in terms of other crops such as soybeans or other grains, there is very limited expansion of total arable land in Brazil. What has occurred, to a small extent, is the replacement of soybean fields in traditional growing areas by sugarcane production, without the expansion of the soybean area. In the last few years, total soybean areas have decreased from 23.3 million hectares (7% of total arable land) to 21.3 million hectares (6%) despite an increase in sugarcane production.

Availability of arable land in Brazil

Millions of Hectares (2007e)			
Brazil	**851**		
Total arable land	**354.8**	**% of total**	**% of arable land**
1 Total cultivated area	**76.7**	**9,0%**	**21.6%**
Soybeans	20.6	2.4%	5.8%
Corn	14.0	1.6%	3.9%
Sugarcane	7.8	0.9%	2.2%
Sugarcane for ethanol	**3.4**	**0.4%**	**1.0%**
Oranges	0.9	0.1%	0.3%
2 Pasture	**172.3**	**20.2%**	**48.6%**
3 Area available land (total arable – cultivated area - pasture)	**105.8**	**12.4%**	**29.8%**

Note: *1) Total cultivated area: refers to permanent and temporary cultivated areas, flower growing, including hydroponics and plasticulture, seedling nurseries and greenhouses; 2) Soybean, corn, sugarcane and orange areas obtained from PAM-IBGE (Produção Agrícola Municipal); The total of arable land, cultivated area and pasture area was obtained from the preliminary results of the 2006 Agriculture and Livestock Census; 4) 2007e – estimate; 5) The sugarcane area destined for ethanol production was estimated based on data from the Ministry of Agriculture, Livestock and Supply. Balanço Nacional de cana-de-açúcar e agroenergia. 2007.*
Source: *IBGE.* ***Compiled by:*** *UNICA.*

14 Will the expansion of sugarcane affect food production in Brazil?

No. First, while sugarcane production has increased steadily in recent years, there has been no drop in food production. On the contrary, Brazil's 2007 grain and oilseeds harvest set a new record at 144 million tonnes, a doubling of production over ten years. Brazil is not just feeding itself better but also much of the world with its high-productivity agriculture.

Second, Brazilian agriculture has been transformed into a high-productivity, sustainable agribusiness, particularly in the more developed South-Central region. Brazil today has improved conditions to promote the increase of the sugarcane harvest, by focusing the expansion on degraded pastures and consequently not affecting other crops or the country's biodiversity. Brazilian government estimates indicate there are some 25 million hectares of degraded, low productivity pastures, ready to be improved with sustainable, modern agricultural practices. In the State of São Paulo, thanks to the industry's technology-based agribusiness practices, there has been an increase in livestock yields at the same time that sugarcane growing areas have expanded. Growth has been driven by productivity, not mobility or deforestation.

Finally, agricultural technologies continue to improve. As is also the case with other food crops, enhanced varieties of conventional sugarcane have raised sucrose levels by as much as 20%, resulting in many more liters of ethanol per hectare. Looking ahead, cellulosic hydrolysis technology is likely to be commercially viable as of 2015, allowing for the production of additional ethanol from sugarcane straw and bagasse. The combination of these new technologies will boost ethanol production per hectare, from the current 7,500 liter average to as much as 10,000 liters per hectare. Consequently, demand for new cultivated areas will be reduced, even as the industry expands.

15 What are labor conditions in the sugarcane sector?

The sugarcane industry is one of Brazil's most important economic sectors in terms of job creation, with around 844,398 people employed nationwide. The average wage paid by UNICA member companies is roughly double the current federal minimum wage, which makes salaries for sugarcane industry workers second only to those in the highly mechanized soybean sector. Brazilian legislation, in compliance with International Labor Organization standards, covers all aspects of work conditions and must be observed by employers, who are subject to frequent government inspections. Cane cutters are covered by collective labor agreements, but it is common for employers to offer upgrades that go beyond the parameters negotiated with labor unions.

For as long as it lasts, manual sugarcane harvesting will be heavy work, as is the case with numerous other primary activities, in agriculture and other sectors. UNICA and its member companies have taken a leadership role in developing innovative programs to improve labor conditions, working with local and global organizations ranging from the Federation of Registered Rural Workers in the State of São Paulo to the World Bank Institute. UNICA is open to consider new initiatives, to enhance labor standards and develop improved national benchmarks.

The sector's growth is rapidly generating new job opportunities and employers are increasingly demanding more skills and offering better salaries. With the gradual introduction of mechanized harvesting, manual cane cutting is scheduled to end by 2017 in São Paulo State, where most UNICA member companies are established. Around 50% of the harvest was mechanized by early 2008 in the State of São Paulo, a total expected to reach 70% by 2010. Looking ahead to the decline of manual harvesting jobs, UNICA is working with different levels of government and labor unions to develop programs to teach sugarcane workers new skills.

16 What is UNICA's position on biofuels certification?

UNICA is in favor of a transparent and voluntary biofuels certification process that includes all feedstocks, processes and producers. The certification process should aim at enhancing product reliability and sustainability, while promoting free and fair international trade.

Certification is a growing global trend in many sectors as manufacturers seek to show customers that their products have been produced in a sustainable manner, respecting clearly-defined environmental, social and economic criteria.

Discussions for the development of certification standards for biofuels, and in particular sugarcane ethanol, must be conducted in a multilateral and multi-stakeholder environment so that the sector can develop strong, efficient certification parameters with legitimacy and transparency. Ideally, discussions should progress within a framework of principles, criteria, indicators and forms of evaluation covering technological, environmental, social and economic themes related to the production of biofuels.

UNICA understands that only a global multi-stakeholder initiative can prevent the proliferation of unilateral certification processes, a possibility that may well turn out to be counter-productive if some certification systems become vehicles for overt or covert trade protectionism.

For more information, visit our web sites

www.unica.com.br/en

www.sugarcaneethanolfacts.com

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Santa Cruz	www.usinasantacruz.com.br
Santa Fé	www.usinasantafe.com.br
Santa Rosa	
São Domingos	www.usinasaodomingos.com.br
São José	www.grupofarias.com.br
Unialco	www.unialco.com.br
Vale do Vacaria	
Vista Alegre	
Zanin	www.uzanin.com.br

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