

Ethanol Production in Brazil

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Outline

- Global Situation
- Brazilian Industry Development
- Brazilian Production Situation
- Brazilian Demand
- Future Advancement

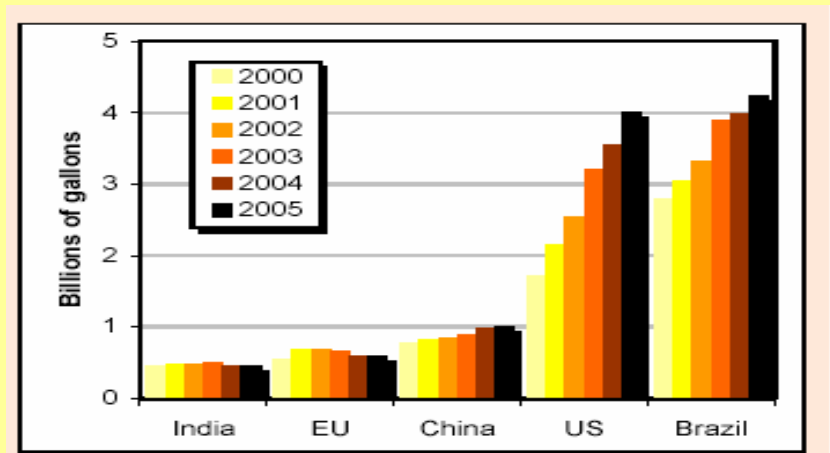
POTENTIAL FUEL ETHANOL MARKET: billion liters

Countries	Potential Demand bil. liters	Ethanol addition %	Remarks
JAPAN	1,8	3%	Potential consumption if the voluntary 3% addition of ethanol to gasoline is adopted for all of the gasoline consumed in that country.
USA	16,8		Forecast volume for 2012 based on the Renewable Fuels Act, pending approval. <i>The maximum addition rate permitted is 5.7% (1)</i>
CHINA	4,5	10%	Potential consumption if the 10% addition to gasoline effective in some provinces is implemented for all of the gasoline consumed in China.
EU	7,4	5%	Potential 5% addition of ethanol to all of the gasoline in 2011, the limit permitted by the European Directive among the 5.75% of biofuels.
INDIA	?	5%	Authorized 5% ethanol addition in some regions.
THAILAND	0,7	5%	Potential consumption considering the legislation that determines a 5% addition to all of the gasoline consumed.
TOTAL	31,1		

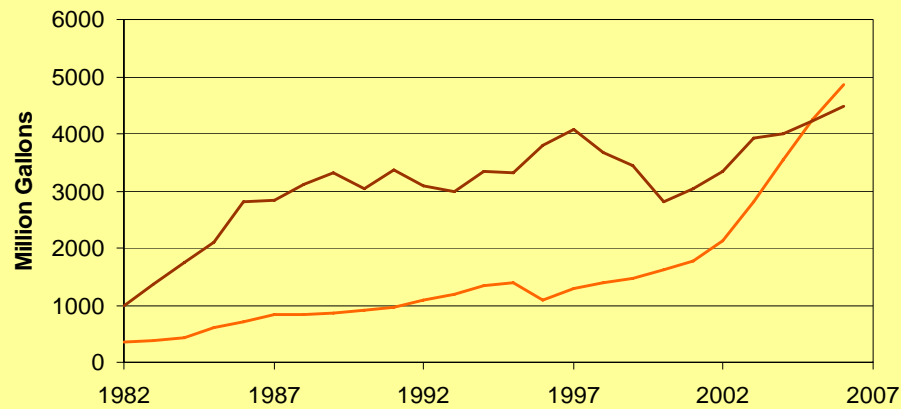
(1) In the United States, the 5.7% addition to all of the gasoline means consumption of 30 billion liters of ethanol/year.

Source: Various: EIA/DOE; European Commission, FO Licht; Copersucar

Leading Ethanol Producing Nations



U.S. and Brazilian Ethanol Production 1982-2006



Costs per Gallon

- U.S.
 - Variable Costs
 - \$0.96 per gallon
 - Fixed Costs
 - \$1.05 to \$3.00 per gallon
- Brazil
 - Variable Costs
 - \$0.89 per gallon
 - Fixed Costs
 - \$0.21 per gallon

Source: Martines-Filho, Burnquist, Vian; *Choices 2nd Quarter, 2006*

Relative Efficiency of Ethanol Production

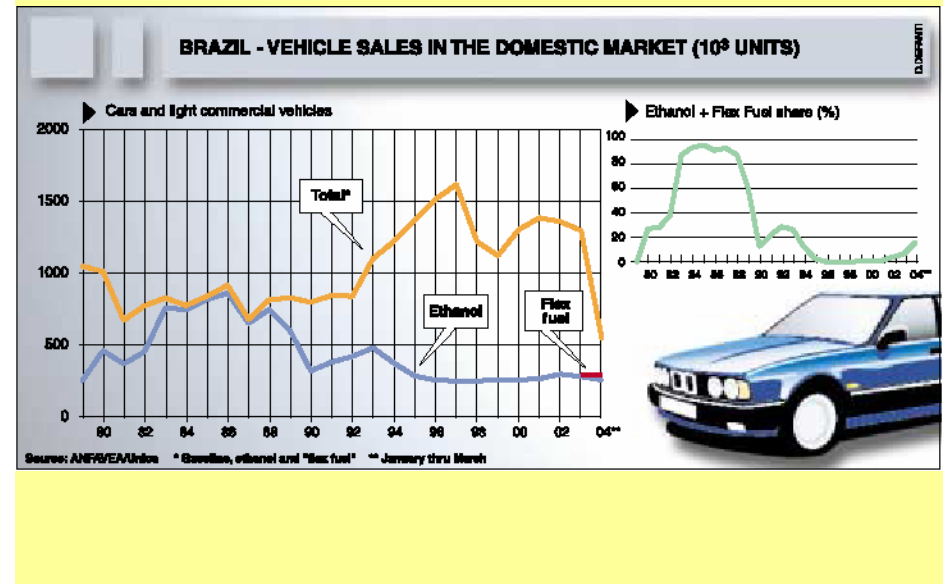
Raw Material	Production / ha (kg)	Quantity of Product (liter of Ethanol)	Quantity of Ethanol / ha
SUGAR CANE	85,000	12 kg	7,080 liter
CORN	10,000	2.8 kg	3,570 liter

Development of Brazil's Ethanol Sector

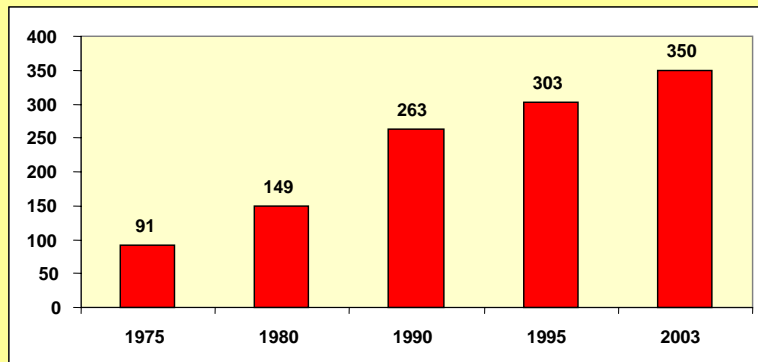


Proalcool Incentives (1973)

- Guaranteed alcohol price lower than gasoline price
- Guaranteed remuneration to the producer
- Loans for alcohol producers to increase capacity
- Tax reduction for alcohol cars
- Mandatory alcohol selling in gas stations
- Maintenance of strategic alcohol stocks



Brazil: Raw Sugarcane Production - Million Tons



Proalcool

Ethanol car is a success

Sugar exports by private sector

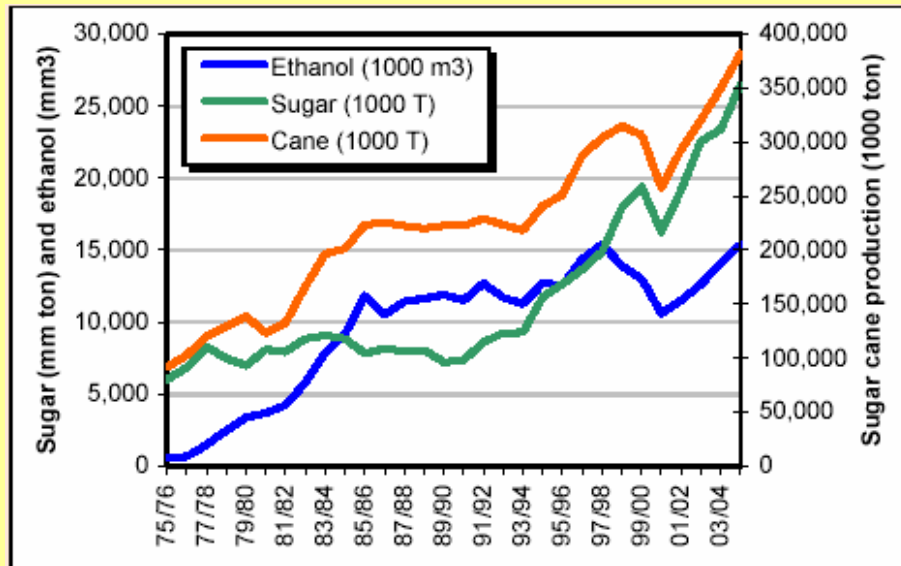
End of the control system

Flex fuel car

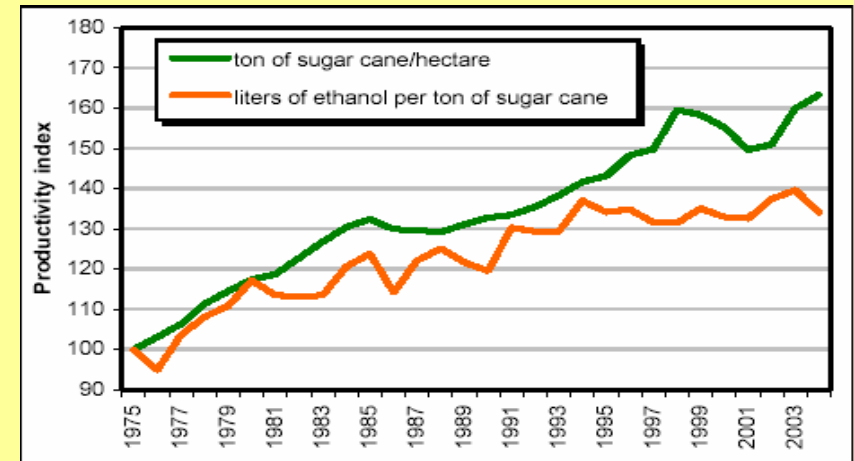
Sugarcane Production in Brazil



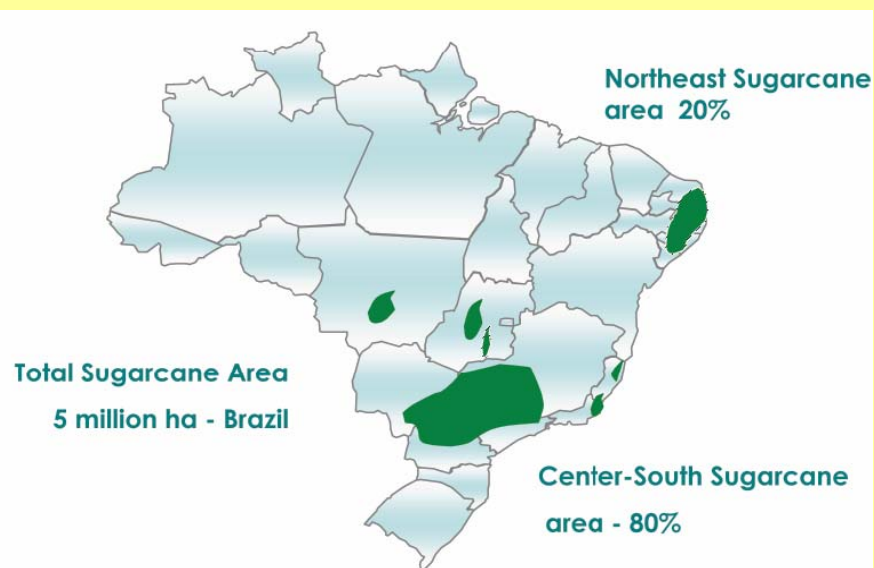
Sugarcane, Sugar, and Ethanol production in Brazil, 1975/76-2004/05



Sugarcane and ethanol productivity in Brazil, 1975-2004

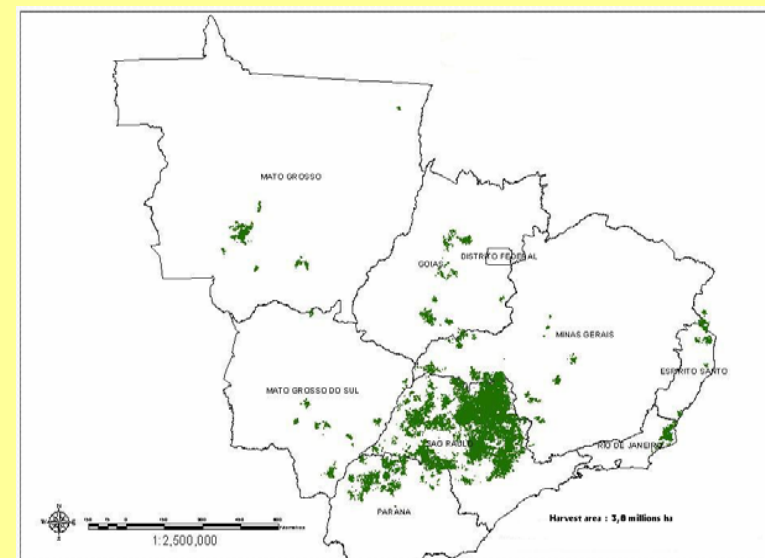


Brazilian Sugarcane Production



Center-South: sugar-cane crop area

2004/05 estimate



Brazil Production Characteristics

- Raw sugar-cane maturation varies
- Harvest all the year
 - Center-south : April-November
 - North-northeast: September-March

DESTINATION OF BRAZIL'S PRODUCTION

2004/2005 CROP

	MARKET	
	DOMESTIC (%)	EXPORT (%)
SUGAR	37	63
ETHANOL	85	15
SUGARCANE	61	39

Source: UNICA

Processing Sugarcane

- 306 Mills
- Producing 55 million tons of sugar or ethanol
- One mill
 - 27,000 ha
 - Within 40 km
 - Land price 2002; \$1350 per ha
 - Land price 2005; \$3070 per ha

Processing Sugarcane

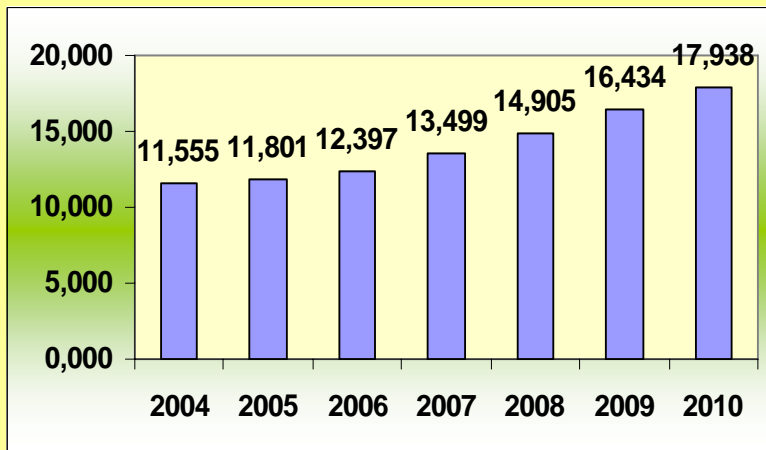
- Production process generates 100 million tons of waste
 - Bagasse
 - Straw
- Used for heat and power generation
- Mills are nearly entirely self-sufficient and some sell surplus electricity

Raw Material	Production/ ha (kg)	Ethanol Efficiency (kg/liters)	Ethanol per ha
Sugarcane	85,000	12	7,080
Corn	10,000	2.8	3,570

Ministry of Agriculture - Brazil

Brazil: domestic consumption of ethanol

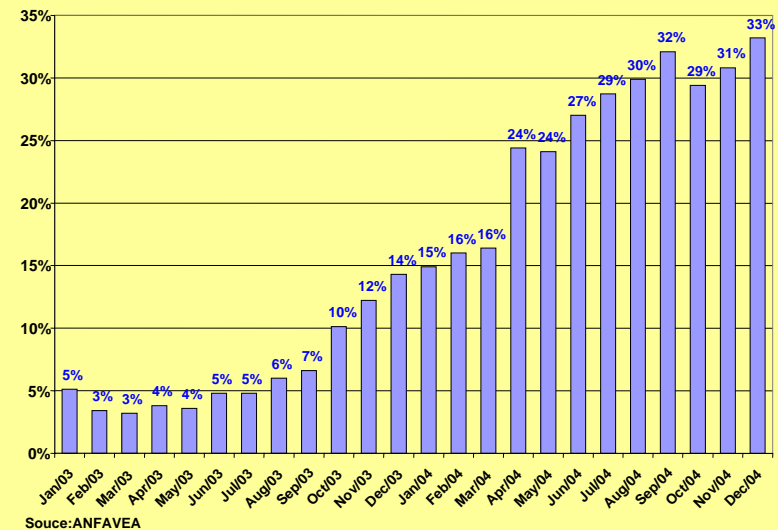
Brazil: ethanol demand billion liters



Source: Sugar and Ethanol Sectoral Group

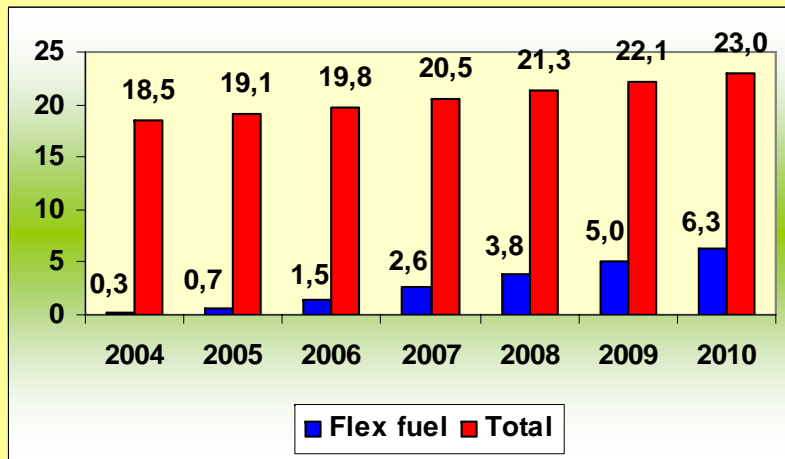
INCREASING ACCEPTANCE BY CONSUMERS

Ethanol and Flex-Fuel car sales as a Percentage of Total Sales in the Domestic Market



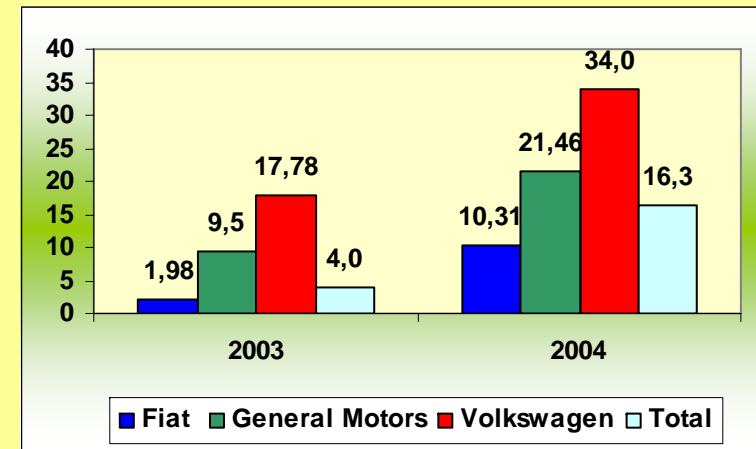
Source: ANFAVEA

Brazil: vehicle fleet million units



Source: Sugar and Ethanol Sectoral Group

Market-share in Brazil: flex fuel/ethanol vehicle sales %



Source: ANFAVEA

2004: January-March

Price comparison

- Ethanol provides fewer miles per gallon
- Ethanol is competitive when it is no more than 70 percent of the price of gas

Future Development of the Sector





Research Programs – Major Accomplishments

- **Breeding Program**
 - 50% of the sugarcane produced with released varieties developed at the CTC
 - Recent varieties have 10% yield advantage
- **Plant Protection Program**
 - Varieties are now resistant to smut, mosaic, rust, and leaf scald
 - Biological controls for major pests such as sugarcane borers, sugarcane weevils and spittle bugs

Research Programs – Major Accomplishments

- **Biotechnology Program**
 - Experimental field trials of transgenic sugarcane have been approved.
 - Commercial development expected in 5 years.
 - Sugarcane genome project has identified 30,000 genes
 - International consortium for sugarcane biotechnology established among 17 research organizations and 13 countries
- **Soil Preparation, Planting, and Cultivation**
 - Development of agricultural technology for green cane management

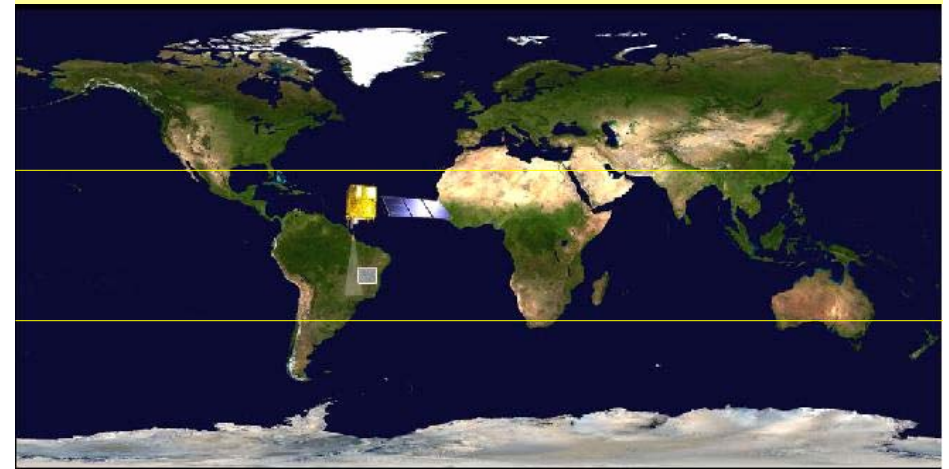
Research Programs – Major Accomplishments

- **Sugar and Ethanol Production Program**
 - Technology has been developed that will in theory increase the yield of ethanol from sugarcane by 50%.
 - Hydrodynamic extraction has been developed which uses 40% less energy and 50% less capital and associated maintenance costs than traditional processes.
- **New Products Program**
 - Biodegradable plastics produced from sugarcane has been developed and is in the pre-commercial stage.
 - Technology to extract and produce wax is in the final stages. Sugarcane has properties similar to carnauba wax.

Research Programs – Major Accomplishments

- Energy Program
 - Sugar mills and ethanol production facilities are energy self sufficient as the energy needs come from sugarcane biomass.
 - An advanced energy generating process, Bagasse Integrated Gasifier – Gas Turbine (BIG-GT) may double the energy efficiency for electricity generation from sugarcane biomass at the mills.

SUGARCANE IN THE WORLD



80 COUNTRIES
SUGARCANE 1.2 BILLION TONS
SUGAR FROM CANE 120 MILLION TONS