



**Ministério da  
Agricultura, Pecuária  
e Abastecimento**



**Ministry of Agriculture, Livestock and Food Supply**

# **BRAZIL: A PIONEER IN BIOFUELS**

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# SUMMARY

**1. BIOFUELS IN BRAZIL'S ENERGY MATRIX**

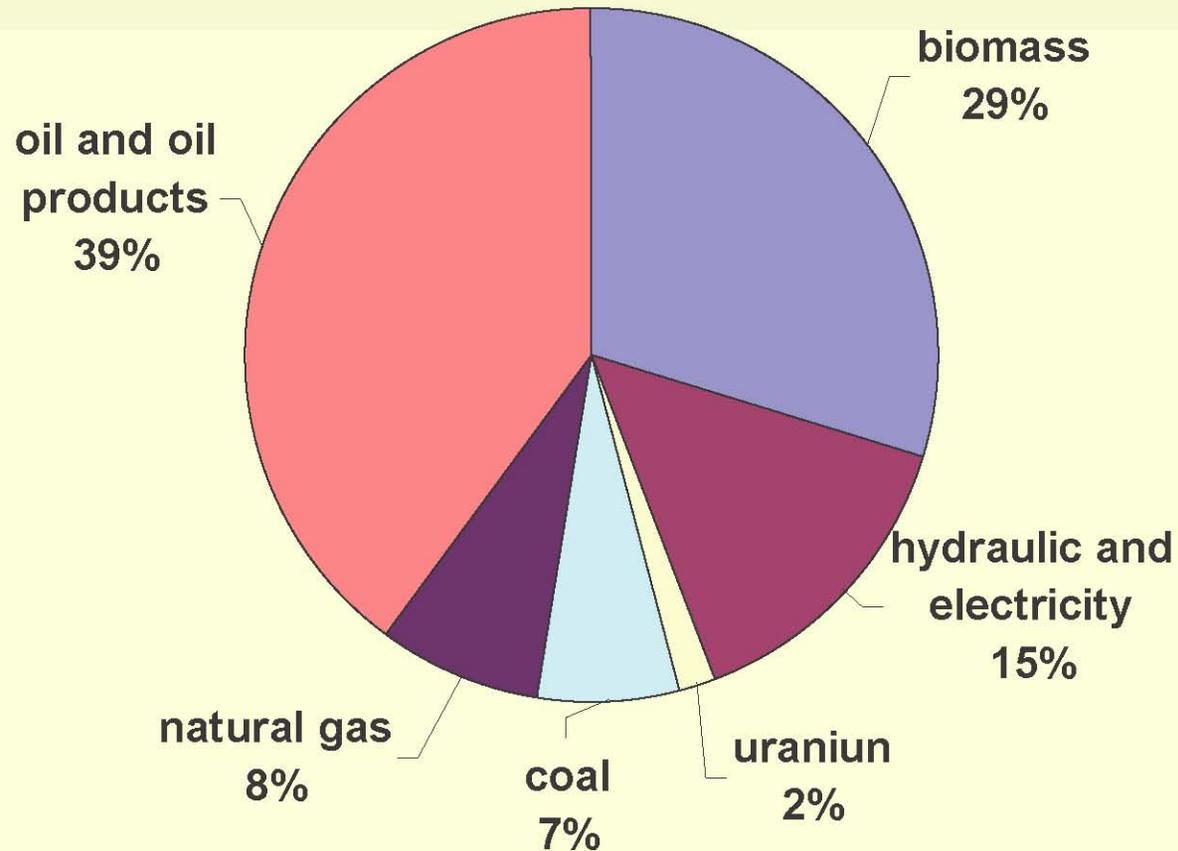
**2. BRAZIL'S ETHANOL: PRODUCTION, POLICIES AND PROSPECTS**

**3. BIODIESEL: THE NEW CHALLENGE**

**4. FINAL REMARKS**



# BRAZILIAN ENERGY MIX



**World: biomass 11%; hydraulic and electricity 2%**

Source: MME/BEN (2005)

# Why BIOFUELS?

- \* **Environmental gains**

- carbon sequestration
- lower emission levels in consumption

- \* **Renewability**

- short production cycle
- man-controlled process

- \* **Economic aspects**

- new demand component
- impacts on trade balance

- \* **Social aspects**

- jobs creation
- income deconcentration

- \* **Norman Borlaug**



# **BRAZILIAN ETHANOL: PRODUCTION, POLICIES AND PROSPECTS**

# THE BRAZILIAN SUGAR CANE AND ETHANOL EXPERIENCES



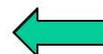
**1532: Martim Afonso de Sousa introduces sugar cane in Brazil**



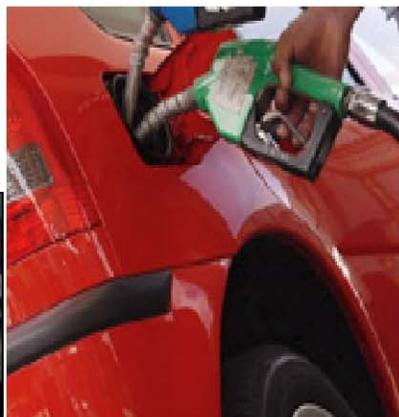
**1925: First ethanol powered vehicle tested in Brazil**



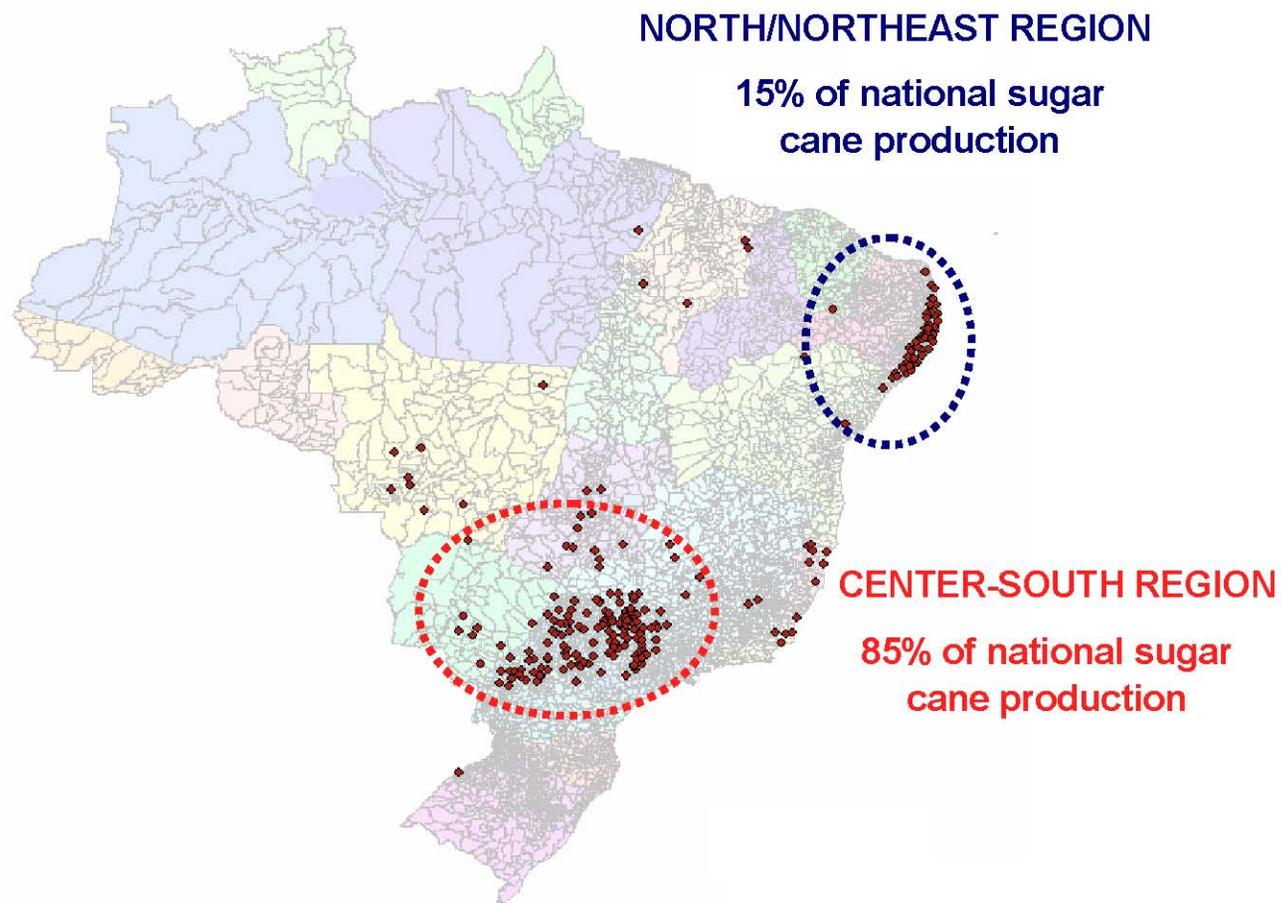
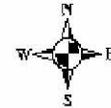
**1979: First commercial ethanol moved vehicle in Brazil**



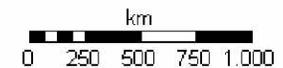
**2003: Flex fuel motors are launched**



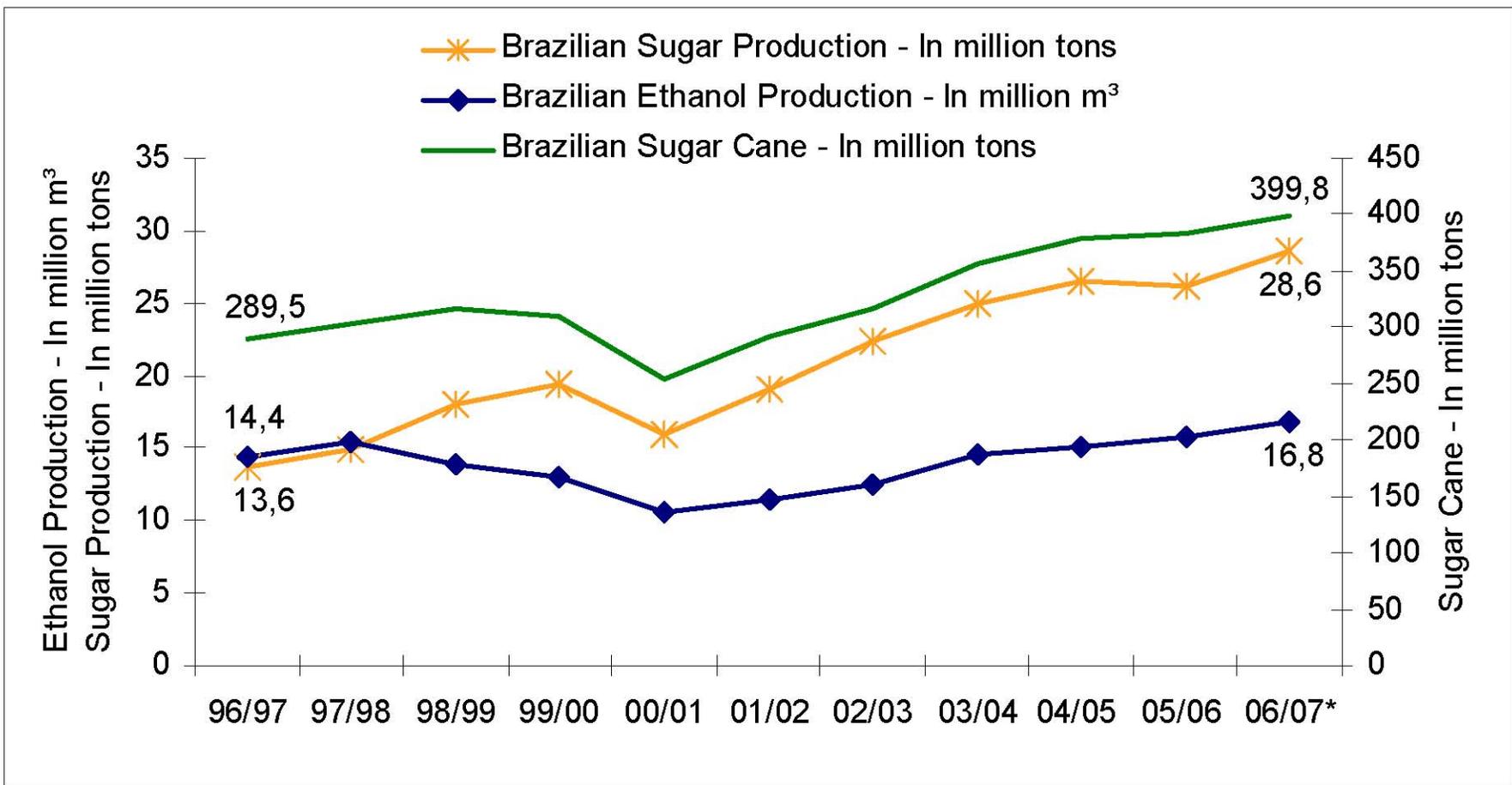
# SUGAR CANE IN BRAZIL



• Mill



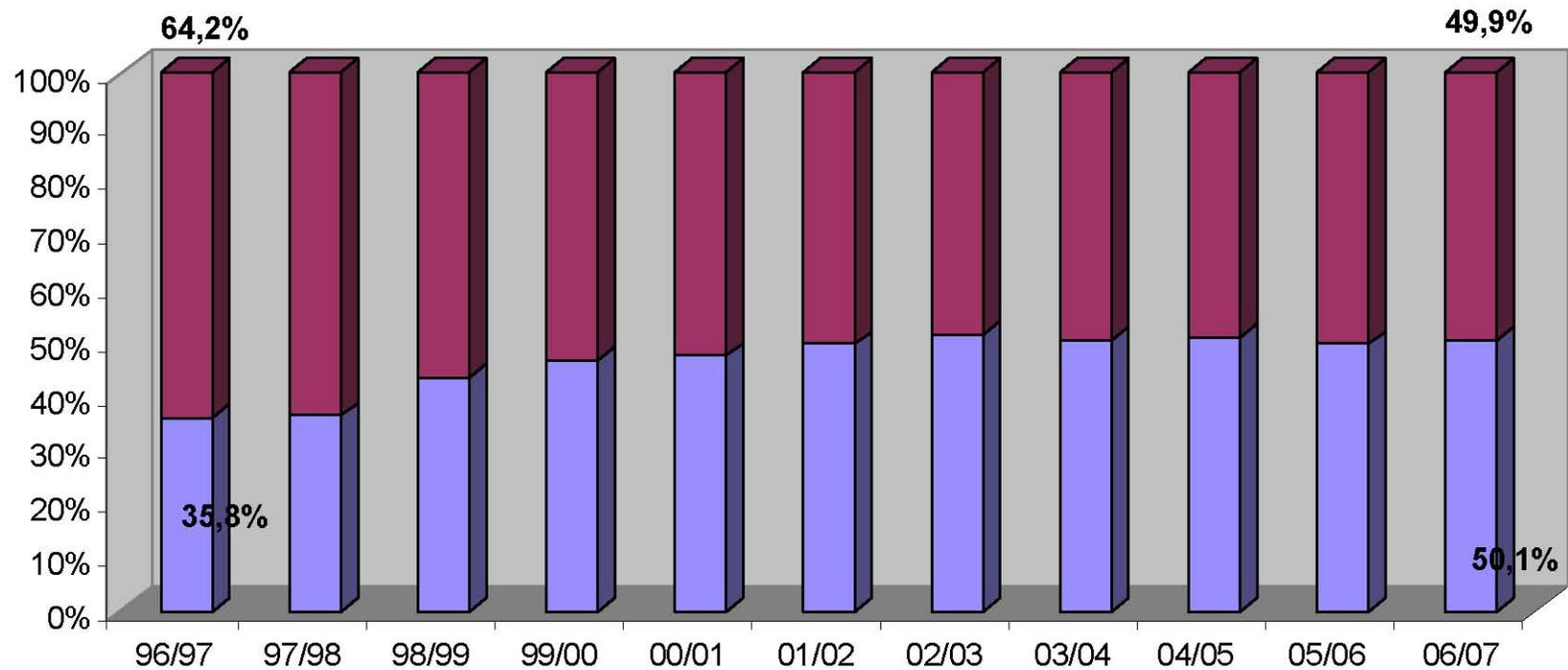
# PRODUCTION DATA FROM THE BRAZILIAN SUGAR CANE SECTOR



# PRODUCTION DATA FROM THE BRAZILIAN SUGAR CANE SECTOR

## Sugar Cane Destination by Product

■ Sugar   ■ Ethanol



# BRAZILIAN ETHANOL PROGRAMS

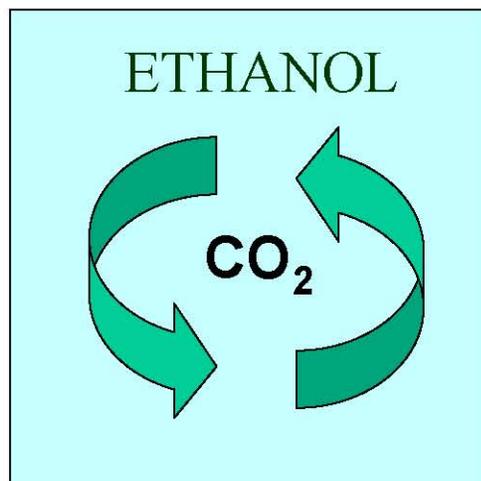
YEAR	PROGRAMS
1975	<b>- HYDROUS ETHANOL -</b>
1985	<b>- ANHYDROUS ETHANOL -</b> FIXES THE MIX LEVEL AT A MANDATORY 22%
2003	<b>FLEX FUEL VEHICLES</b>

# ENERGY EFFICIENCY OF ETHANOL IN BRAZIL

Raw material	Energy output / Energy input
Wheat <sup>1</sup>	1.2
Corn <sup>1</sup>	1.3 – 1.8
Sugar Beet <sup>1</sup>	1.9
<b>Sugar Cane<sup>2</sup></b>	<b>8.3</b>

<sup>1</sup> F.O. Licht, 2004.

<sup>2</sup> Macedo, I et al., 2004 – Under Brazilian production conditions.



- High photosynthesis efficiency (C4 crop).

- Possibility for using the sugar cane by-products in the production process, avoiding external energy sources.

# CO-GENERATION WITH SUGAR CANE BAGASSE IN BRAZIL



**CURRENT POWER: ~ 2200 MW**

**(700 MW are exported to the grid and 1500 MW are consumed in the own mills)**

**ACTUAL MEASURED POTENTIAL:**

**3.000 MW – 14.000 MW (extra)**

**Depending of the technology applied in the generation process.**

- **Possibility to obtain carbon credits from CDM Projects (Kyoto Protocol)**
- **Complementary to the hydraulic generation in the Center-South Region**

# THE USES OF VINASSES IN BRAZIL

Good fertilizer: high amount of potassium ( $K_2O$ )

Vinasses can be applied on the soil by irrigation

A new technology is being developed in Brazil: to dehydrate and transform vinasses into a new commercial product



# THE FLEX FUEL CAR – A NEW DOMESTIC ETHANOL DEMAND

- **Flex-Fuel Engine:** allows the use of ethanol or gasoline in any concentration of these fuels
- **Current Manufactures:** VW,GM, Ford, Fiat, Renault, Peugeot, Citroen and Honda
- **Sales of Flex-Fuel Vehicles in Brazil:**
  - 2003: 48.000 units
  - 2004: 330.000 units
  - 2005: 865.000 units
  - 2006: 1.447.000 units

***15,5 million gasohol cars (20% anhydrous ethanol blend)***

***2,6 million flex fuel cars***

***3,6 million motorbites (20% anhydrous)***



# ETHANOL: The Brazilian Experience

- Total production: 18 billion liters
- Production per ton of sugar cane: 82 L/t
- Production per hectare: 7000 L/ha
- Production ratio: 160 thousand ha to produce 1 billion liters ethanol

## EXPORTS: ETHANOL AND GASOLINE PRICE RELATIONSHIP

YEARS	ETHANOL			GASOLINE			PRICE RELATIONSHIP Ethanol x Gas
	Million US\$ F.O.B.	Liters (Billion)	Average US\$/m <sup>3</sup>	Million US\$ F.O.B.	Liters (Billion)	Average US\$/m <sup>3</sup>	
2003	158,0	0,757	208,56	548,0	2,640	207,48	-0,5%
2004	498,0	2,408	206,68	570,0	2,002	284,49	+37,7%
2005	766,0	2,592	295,31	1.066,0	2,857	373,01	+26,3%

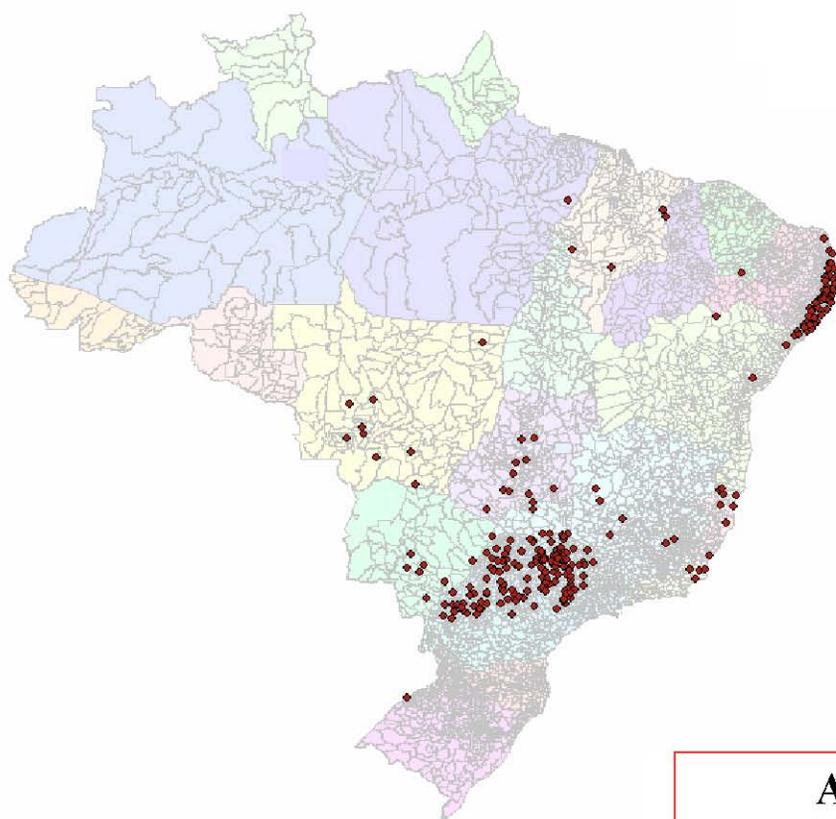
Source: MDIC (Alice System)



# **THE FUTURE OF ETHANOL**

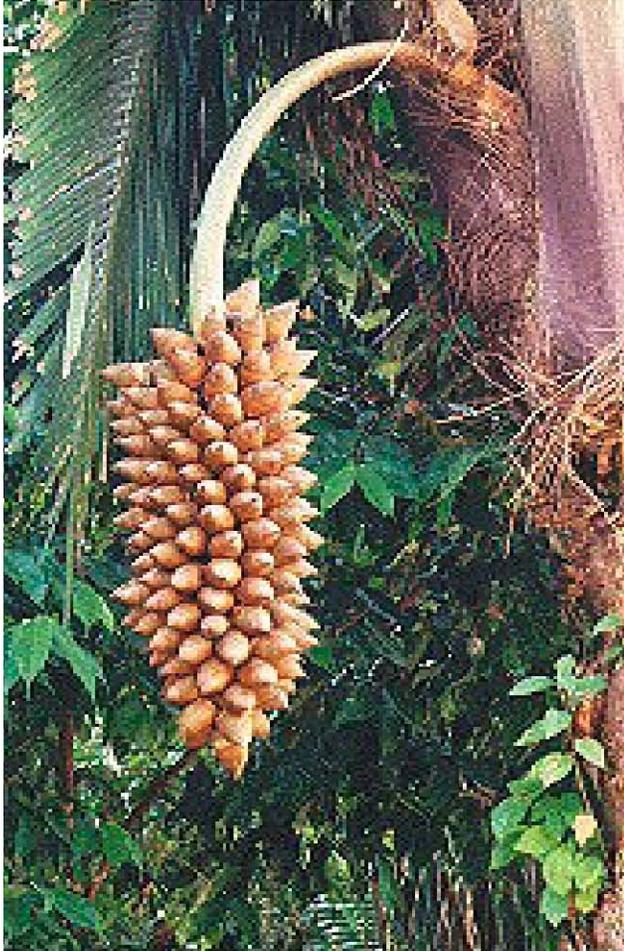
The Brazilian aim is to transform ethanol in a great commodity, together with other countries

# HOW TO EXPAND SUGAR CANE WITH SUSTAINABILITY?



# Production, Export and Consumption of Sugar and Ethanol

	2005			2015		
	Production	Export	Consumption	Production	Export	Consumption
<b>Sugar</b>	26.714	14.624	12.090	43.199	25.317	16.201
<b>Ethanol</b>	16.216	2.661	13.555	36.849	8.484	28.365



# **BIODIESEL: THE NEW CHALLENGE**



# **BIODIESEL in Brazil**

**1970: first experiences (obstacle: vegetable oil prices)**

**1980: first biodiesel patent in the world (Federal University of Ceará)**

**2002: Government Agenda (Working Group)**

**Dec/2003: Inter-ministerial Executive Committee and a management group, responsible for a program implementation**

**Dec/2004: Program launching, with 14 Ministries and various Research Centers**

**2005: States structure research nets**

# **Basic Objectives of the Biodiesel Program:**

- \* Reduce oil dependency**
- \* Produce environmental gains**
- \* Introduce family agriculture into the raw material production process**
- \* Allowed mixture: up to 800 million liters/year**
- \* 2008: Mixture of 2% made compulsory**
- \* 2013: Mixture increases to 5%**



# **FINAL REMARKS**

# **BIG CHALLENGES**

**FREE INTERNATIONAL MARKET FOR AGROENERGY**

**FUTURE PRICE OF PETROLEUM**

**BIODIESEL EFFICIENCY; AGRICULTURAL AND INDUSTRIAL**

**GOVERNMENT POLICIES**

**TECHNOLOGY DEVELOPMENT FOR BIODIESEL**

# **GOVERNMENT POLICIES**

- 1. GOVERNMENT SUPPORT AT THE BEGINNING:  
PROALCOOL (1980s) AND BIODIESEL (NOW!).**
- 2. REGULATION AND SUPERVISION OF THE MARKET**
- 3. FINANCING SUGAR AND ALCOHOL MILLS**
- 4. SOME TECHNOLOGY SUPPORT**
- 5. DRIVE FORCE: MARKET**

# BRAZIL HAS A GREAT POTENTIAL FOR BIOFUELS PRODUCTION...



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