BRAZIL’S ETHANOL EXPERIENCE

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Representative of Brazil to the UN Agencies in Rome

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Brazil’s Ethanol Experience: Summary

1. Background
2. Brazil and Biofuels
3. Brazilian Ethanol
CRUDE OIL PRICES

Oil - Brent Dated

1998 a Jul-2006
+ 475%

THE CHALLENGE FOR ENERGY POLICY

- Long term energy supply security
- Cheaper prices for energy sources
- Keeping local energy competitiveness
- Dealing with climate change and environment

→ BIOFUELS
2. BRAZIL AND BIOFUELS
**Brazilian Energy Matrix - 2007**

- **Renewable Sources**
  - Sugarcane: 13.9%
  - Hydroelectricity: 15.0%
  - Other Renewables: 2.7%
  - Wood and other Biomass: 13.1%
  - Uranium: 1.2%
  - Natural Gas: 9.3%
  - Petroleum and Derivatives: 38.4%
  - Other Renewables Sources: 2.7%

- **Non-Renewable Sources**
  - Coal: 6.4%
  - Petroleum and Derivatives: 38.4%

**World and Brazil**

- 218.6 Million TOE

### CURRENT MATRIX OF VEHICLE FUELS - 2007

- **Gasoline A**: 25.6%
  - 26.5% (2004)

- **Anhydrous Ethanol**: 8.5%
  - 8.8% (2004)

- **VNG**: 2.9%
  - 2.4% (2004)

- **Hydrated Ethanol**: 8.4%
  - 6.6% (2004)

- **Diesel**: 54.5%
  - 55.7% (2004)

**Total Ethanol**:

- 8.5 + 8.4 = **16.9%**
  - 15.4% (2004)

**Gasoline C**:

- 25.6 + 8.5 = **34.1%**
  - 35.3% (2004)
## Fuel Production and Dependency on Imports - 2007

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Production</th>
<th>Net Imports</th>
<th>Net Exports</th>
<th>Net Imports (%)</th>
<th>Net Exports (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure Gasoline</td>
<td>19.978</td>
<td>-</td>
<td>2.760</td>
<td></td>
<td>14%</td>
</tr>
<tr>
<td>Diesel</td>
<td>38.396</td>
<td>2.070</td>
<td>-</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Ethanol</td>
<td>16.062</td>
<td>-</td>
<td>3.429</td>
<td></td>
<td>21%</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>48,5</td>
<td>24,4</td>
<td>-</td>
<td></td>
<td>33%</td>
</tr>
</tbody>
</table>

## World's Top Ethanol Producers

### Table 1. Selected Leading Ethanol Producers in the World (2005)

<table>
<thead>
<tr>
<th>Country</th>
<th>Million of liters</th>
<th>World output share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>16,203.2</td>
<td>35.1</td>
</tr>
<tr>
<td>Brazil</td>
<td>16,062.6</td>
<td>34.8</td>
</tr>
<tr>
<td>China</td>
<td>3,815.2</td>
<td>8.3</td>
</tr>
<tr>
<td>India</td>
<td>1,706.2</td>
<td>3.7</td>
</tr>
<tr>
<td>Thailand</td>
<td>300.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Indonesia</td>
<td>171</td>
<td>0.4</td>
</tr>
<tr>
<td>Australia</td>
<td>125.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Japan</td>
<td>114</td>
<td>0.2</td>
</tr>
<tr>
<td>Pakistan</td>
<td>91.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Philippines</td>
<td>83.6</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Total world</strong></td>
<td><strong>46,170</strong></td>
<td></td>
</tr>
</tbody>
</table>
Source: Worldwatch Institute 2007, from various data sources
3. BRAZILIAN ETHANOL
1925: First tests using ethanol blends with gasoline
Incentives established by the Pro-Alcohol in 1975

- Ethanol price lower than gasoline price
- Guaranteed remuneration to the producer
- Tax reduction for hydrated ethanol cars
- Loans for ethanol producers to increase their capacity
- Gas stations were obligated to sell ethanol
- Maintenance of strategic safety stocks
1979: Manufacturers begin to sell 100% Ethanol Vehicle

April, 1979: Publication in a technical magazine of the first test-drive of a 100% ethanol vehicle
Incentive Today

- Ethanol price lower than gasoline price
- Guaranteed remuneration to the producer
- Tax reduction for hydrated ethanol cars
- Loans for ethanol producers to increase their capacity
- Gas stations were obligated to sell ethanol
- Maintenance of strategic safety stocks
Any mixture of gasoline and ethanol can be used, from 0 to 100%;

In July/2006: The domestic flex-fuel vehicle sales represented 76% of all light vehicles (including imported) sold in the same period;

Total domestic flex-fuel vehicle sales (2003-2006): 1.78 million units(*)

(*) until July/2006.

7 multinational automotive manufacturers settled in Brazil are producing 89 different models of Total FFV.

Source: Ministry of Development, Industry and Foreign Trade; Brazilian Association of Automotive Vehicle Manufacturers - 2006
Sugarcane: Productivity Evolution

- Cane production (Million tons)
- Preserved Area (Million hec)
- Harvest Area (Million hec)
Sugarcane & Ethanol: Productivity Gains

Figure 3 - Productivity Gains
Center-South Region

Source: UNICA
Production in 2007:
16 billion liters

82% of the ethanol production

Source = MME – MAPA - 2007
## Land use for Agriculture

### Land Distribution

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Area (million ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon Forest</td>
<td>345</td>
</tr>
<tr>
<td>Pastures</td>
<td>220</td>
</tr>
<tr>
<td>Protected Areas</td>
<td>55</td>
</tr>
<tr>
<td>Season food crops</td>
<td>47</td>
</tr>
<tr>
<td>Permanent food crops</td>
<td>15</td>
</tr>
<tr>
<td>Cities, lakes, roads</td>
<td>20</td>
</tr>
<tr>
<td>Planted Forests</td>
<td>5</td>
</tr>
<tr>
<td>Subtotal</td>
<td>707</td>
</tr>
<tr>
<td>Other uses</td>
<td>38</td>
</tr>
<tr>
<td>Non-exploited areas available for agriculture</td>
<td>106</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>851</strong></td>
</tr>
</tbody>
</table>

*Source: Veja Magazine*  
*Source: IBGE, organized by Ministry of Agriculture*
Formal Jobs in Sugarcane Crops

- 2000: 642,848 million
- 2002: 764,593 million
- 2004: 900,768 million
- 2005: 982,604 million

Legend:
- Green: Center
- Blue: North
Ethanol in Brazil: Oil economy and environmental benefits

FUEL DEMAND FOR LIGHT VEHICLES IN BRAZIL

and Laura Tetti – USP – 2002

Accumulated economy of 7 years and 9 months of pure gasoline consumption.

IN THIS PERIOD, WITH THE ETHANOL USAGE, THE EMISSION OF 644 MILLION TONNES OF CO₂ WAS AVOIDED

US$ 61 billions

+ US$ 16 billions

and Laura Tetti – USP – 2002
Emissions of GHG with gas x ethanol substitution

Among biofuels, sugarcane ethanol is the one which allows greater reduction of GHG emissions.

With the substitution of 1,000 diesel buses by ethanol buses would avoid the emission of 96 million tons of CO₂ per year, the same record of 20,000 gas vehicles.

Source: IEA estimates based on a review of recent studies
“If we get it right, bioenergy provides us with a historic chance to fast-forward growth in many of the world’s poorest countries, to bring about an agricultural renaissance and to supply modern energy to a third of the world’s population.”

Jacques Diouf, Director-General, FAO
BIOFUELS PRODUCTION

Agribusiness

- Plantation
- Grains
- Oil Crushing
- Refined Oil

Ethanol or Methanol

Transesterification Unit

- Biodiesel
- Glycerin
- Others

H-BIO

- Hydrogen
- Fractions of diesel

Diesel

- Refinery
- Refine

Distributors

Gas Station

- B2 or B5 mixture
- Diesel

OR

OR
ELECTRICITY PRODUCTION:
SUGARCANE ESTIMATED POTENTIAL

<table>
<thead>
<tr>
<th>Year</th>
<th>1000 MW médio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006/07</td>
<td>1.6</td>
</tr>
<tr>
<td>2007/08</td>
<td>2.0</td>
</tr>
<tr>
<td>2008/09</td>
<td>2.4</td>
</tr>
<tr>
<td>2009/10</td>
<td>3.4</td>
</tr>
<tr>
<td>2010/11</td>
<td>5.1</td>
</tr>
<tr>
<td>2011/12</td>
<td>7.0</td>
</tr>
<tr>
<td>2012/13</td>
<td>9.6</td>
</tr>
</tbody>
</table>

Legend:
- bagaço (75%)
- bagaço (75%) + palha (50%)

Notes:
- bagasse
- straw