Brazilian Sugarcane Sector’s approach to the Agro-environmental Protocol

March 2013
Agenda

1. About Raízen
2. Sugarcane sector in Brazil
   - Brazilian Energy Matrix
   - Sector’s Key Figures
3. Agro-environmental Protocol
   - Definition
   - Objectives and Directives
4. Mechanization Impacts
5. Environmental Impacts
6. Social Aspects
7. Q&A
Vision
To be globally recognized for excellence in the development, production and commercialization of sustainable energy

Mission
To promote sustainable solutions in energy through technology, talent and swift actions, maximizing and creating value for our clients and shareholders and contributing to society
**Dimension**

- R$ 50 bi worth of revenues
- R$ 20 bi estimated market value
- Over 40,000 employees

**General numbers**

World’s largest sugarcane ethanol producer and Brazil’s largest sugar producer

- 860,000 ha of cultivated area
- 2 bi liters of ethanol
- 4 m tons of sugar
- 86% mechanized harvesting
- 930 MW of installed capacity

**Fuels Commercialization**

A highly efficient and trustworthy network

- 4,700 service stations
- 64 distribution bases
- 22 billion liters/year
- 700 convenience stores
- 54 airports
Ethanol, Sugar and Bioenergy
Sugar-energy production clusters

24 Mills

- São Francisco, Rafard, Bom Retiro, Santa Helena, Costa Pinto
- Barra, Dois Córregos, Diamante
- Bonfim, Tamoio, Serra, Zanin
- Paralcool, Tarumã, Maracai, Ipaussu
- Gasa, Univalem, Destivale, Mundial, Benalcool, Junqueira
- Jataí
- Caarapó

Greenfield in
- MS 2,3 Mtc
- GO 4,0 Mtc
- 2,8 Mtc
- 9,4 Mtc
- 11,0 Mtc
- 10,7 Mtc
- 11,6 Mtc

Santos Port
Logistics, Distribution and Trading
Structure set up to distribute 40 billion liters of fuel

Type of operation

- Own base: 58%
- Raízen Pool: 25%
- 3rd party Pool: 10%
- 3rd party cession: 7%

DISTRIBUTION VOL
Sugarcane Sector in Brazil

- Brazilian Energy Matrix
- Sector’s Key Figures
Brazilian energy matrix input

Sugarcane 15.7%
# 1 Source of Renewable Energy in BR- 2010 But decreasing

World (%)

- World (2008) 87.1
- OCDE (2009) 92.4
- Brazil (2011) 55.9

- Non-renewable
- Renewable

<table>
<thead>
<tr>
<th>Year</th>
<th>Non-renewable</th>
<th>Renewable</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>52.7%</td>
<td>47.3%</td>
</tr>
<tr>
<td>2010</td>
<td>54.5%</td>
<td>45.5%</td>
</tr>
<tr>
<td>2011</td>
<td>55.9%</td>
<td>44.1%</td>
</tr>
</tbody>
</table>
# The Brazilian sugarcane sector

## Big figures

<table>
<thead>
<tr>
<th>Production structure: Plants (2010)</th>
<th>432</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cane suppliers</td>
<td>70,000</td>
</tr>
<tr>
<td>Registered jobs</td>
<td>1,28 million</td>
</tr>
<tr>
<td>GDP for sugar-energy chain</td>
<td>US$ 28 billion</td>
</tr>
<tr>
<td>Foreign currency (2010)</td>
<td>US$ 13.8 billion</td>
</tr>
<tr>
<td>% of national power matrix</td>
<td>18% (&gt; hydroelectricity)</td>
</tr>
<tr>
<td>Reduction in CO₂ emissions</td>
<td>&gt; 600 million tons since 1975</td>
</tr>
<tr>
<td>Sugar Production</td>
<td>37,9 million Tons</td>
</tr>
<tr>
<td>Domestic consumption: 10.4 mil tons</td>
<td>Exports: 27.5 mil tons</td>
</tr>
<tr>
<td>Ethanol production</td>
<td>27.4 Billion Litters</td>
</tr>
<tr>
<td>Domestic consumption: 25.5 mil tons</td>
<td>Exports: 1.9 billion L</td>
</tr>
<tr>
<td>Production of anhydrous ethanol: 8.3 billion L</td>
<td></td>
</tr>
<tr>
<td>Production of hydrous ethanol: 19.1 billion L</td>
<td></td>
</tr>
<tr>
<td>Production mix</td>
<td>46.2% sugar - 53.8% Ethanol</td>
</tr>
<tr>
<td>Annual Revenue of the sector</td>
<td>More than US $50 Billion</td>
</tr>
</tbody>
</table>

Accelerated growth of the flex fleet

ETHANOL: Accelerated growth of the flex fleet

Estimate of the Brazilian fleet of light vehicles (Otto cycle)

In the first half 2012, 53% of motorcycles sold were flex

Brazil will need to double the supply of fuels (ethanol and gasoline) to attend the demand in 2020

Source: Estimate of UNICA
Sugarcane demand scenario

To supply 50% of the country’s automotive fleet with ethanol (anhydrous + hydrous) and maintain Brazil’s current share in world sugar market (~50%):

- **~120 new mills**
- **~US$65 million of new investment**
- **~9% per year**
- **1.2 billion tons**

<table>
<thead>
<tr>
<th>Year</th>
<th>Sugar (million tons)</th>
<th>Anhydrous Ethanol (billion liters)</th>
<th>Hydrous Ethanol (billion liters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011/12</td>
<td>555</td>
<td>36</td>
<td>8.5</td>
</tr>
<tr>
<td>2015/16</td>
<td></td>
<td>45</td>
<td>18</td>
</tr>
<tr>
<td>2020/21</td>
<td></td>
<td>51</td>
<td>28</td>
</tr>
</tbody>
</table>

Source: UNICA. Note: the hydrous ethanol is pure sold at the pumps and used without modification by the flex-fuel vehicles, then it competes directly with gasoline by the preference of consumers (this product is 4.9% water), the anhydrous ethanol is blended with gasoline in proportions ranging from 18% to 25% (the anhydrous ethanol has a lower water content – 0.4%)
Sugarcane production in Brazil: an overview of the last decade

- World financial crisis: acquisitions involving affected companies
- Weather problems in three consecutive harvests
- Loss of domestic competitiveness for ethanol compared to gasoline

Sources: UNICA and MAPA Note * - forecast
Evolution of the number of new production facilities in center-south Brazil

High investment level to expand production

Units registered with MAPA

<table>
<thead>
<tr>
<th></th>
<th>2007/08</th>
<th>2012/13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mix units</td>
<td>249</td>
<td>290</td>
</tr>
<tr>
<td>Ethanol only</td>
<td>161</td>
<td>94</td>
</tr>
<tr>
<td>Sugar only</td>
<td>16</td>
<td>10</td>
</tr>
</tbody>
</table>

In recent years, 65 distilleries also installed sugar factories

Source: Estimate of UNICA
## Land Usage

Significant potential for sustainable growth

<table>
<thead>
<tr>
<th>Millions of hectares</th>
<th>Total Area</th>
<th>Protected / Native</th>
<th>Area Land</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>851.48</td>
<td>554</td>
<td>329.94</td>
<td>25.92</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>58%</td>
<td>39%</td>
<td>3%</td>
</tr>
</tbody>
</table>

**Usable**

- 111.34
- 33%

**Pasture**

- 158.75
- 48%

**Agriculture**

- 51.7
- 16%

**Sugar Cane**

- 8.14
- 2.4%
Agro-environmental Protocol

- Definition
- Benefits
The green protocol of São Paulo state

- **Voluntary agreement** reached between São Paulo State Government, the sugarcane industry (UNICA) and the cane suppliers (ORPLANA)

- **It anticipates the deadline for ending sugarcane burning:** from 2021 to 2014 in areas that can be mechanized and from 2031 to 2017 in other areas

- **It also includes other conservation measures**, such as the protection of river side woods, the recovering of those near water springs and the reduction of water use

- 173 mills and 29 association of sugarcane suppliers joined the initiative, **representing 90% of the state production and 50% of Brazilian production**
Objectives and Directives

- Main commitments established:
  - Reduction to the legal deadline for ending sugarcane straw burning (State Law No. 11.241/02) to 2014, instead of 2021, in areas where machinery can be used, and to 2017, instead of 2031, in other areas
  - Not to use sugarcane burning for harvesting in plantation expansion areas
  - To avoid burning of sugarcane bagasse, or any other sub-product of sugarcane, in the open air
  - To protect riverside woodlands in the sugarcane plantation areas, because of their importance in preserving the environment and protecting biodiversity
  - To protect water springs in the rural areas of the sugarcane plantations, and recover the vegetation surrounding them
  - To propose and implement a technical soil conservation plan
  - To propose and implement a technical plan for conserving water resources and minimizing water usage;
  - A plan for handling waste generated in the agro-industrial process
  - A plan for minimizing generation of atmospheric pollutants

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**Deadline for eliminating cane straw burning in São Paulo State**

**Areas where machinery can be used**

**Other areas**

*Note: The points shown on the lines of the graph indicate specific years cited in the Law or the Protocol. Prepared by Unica.*
The green protocol of São Paulo state

Mechanization in the State exceeded 65% of all cane fields in 2011/2012

Source: INPE, UNICA and the São Paulo State Secretariat for the Environment.
Note: Values of mechanized harvest correspond to the entire São Paulo State sugarcane area and not just the area of Protocol signatories.
Harvest 2006/2007

S. J. do Rio Preto
P. Prudente
Marília
Sorocaba
Campinas
Harvest 2009/2010

S. J. do Rio Preto
P.Prudente
Marília
Franca
Sorocaba
Campinas

Raw cane
Burned cane
Environmental Impacts
Environmental Impacts

Comparative harvest

Area 3 times the size of São Paulo city

Hectares (millions)

Planted cane area
- Harvest 06/07: 3.34
- Harvest 07/08: 3.96
- Harvest 08/09: 4.43
- Harvest 09/10: 4.91
- Harvest 10/11: 4.98
- Harvest 11/12: 5.40

Harvested cane area
- Harvest 06/07: 3.24
- Harvest 07/08: 3.79
- Harvest 08/09: 3.92
- Harvest 09/10: 4.34
- Harvest 10/11: 4.72
- Harvest 11/12: 4.79

Raw Cane
- Harvest 06/07: 1.11
- Harvest 07/08: 1.77
- Harvest 08/09: 1.92
- Harvest 09/10: 2.42
- Harvest 10/11: 2.62
- Harvest 11/12: 3.12

Burnt Cane
- Harvest 06/07: 2.13
- Harvest 07/08: 2.02
- Harvest 08/09: 1.99
- Harvest 09/10: 1.91
- Harvest 10/11: 2.10
- Harvest 11/12: 1.67

Harvest 06/07: 2.06 M ha + 61%
Harvest 07/08: 1.55 M ha + 48%
Harvest 08/09: 2 M ha + 181%
Harvest 09/10: -0.46 M ha - 22%

Area 3 times the size of São Paulo city
Environmental Gains in SP State

Equivalent to run 47 thousand buses for 1 year

Reduction of 2.7 million tons of CO₂ emitted and
Reduction of 16.7 million tons of pollutants emitted **

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</tr>
</thead>
<tbody>
<tr>
<td>Area that could have been burnt according to Law 11.241 (ha)</td>
<td>2,3 m (ha)</td>
<td>2,13 m (ha)</td>
<td>2,4 m (ha)</td>
<td>1,67 m (ha)</td>
<td>0,7 m (ha)</td>
<td>4,5 m (ha)</td>
<td></td>
</tr>
<tr>
<td>Area actually burnt (ha)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction in area burnt</td>
<td>0,14 m (ha)</td>
<td>0,7 m (ha)</td>
<td>0,14 m (ha)</td>
<td>0,7 m (ha)</td>
<td>0,7 m (ha)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Total area where burning has ceased since start of Protocol in 2007
** Carbon Monoxide, Hydrocarbons and Particulate Material
Water Consumption in the Agro-industry

Consumption levels at signatory plants (m³/ton of cane) %

- 0.7 - 1.0: 41
- 1.0 - 2.0: 40
- More than 2: 19

Bar chart showing water consumption levels from 1990s to forecast 2014.
Biomass

Leaves/straw cover on soil

39 million tons of straw on 3.1 million hectares (12.6 ton/ha)

50% for Cogeneration

19.5 million tons of leaves available for cogeneration

1.124 MW

- Protection of soil from wind and rain
- Can be transported to the plant for power generation
- Can be used to produce the 2nd Generation Ethanol

~ 29% of residential consumption in SP State (~ 3.906 MW)
~ 25% of potential generation at Belo Monte hydroelectric plant (~ 4.571 MW)

1 ton of leaves = 500 KWh
Production
social aspects
Response to the process of mechanizing the sugarcane harvest to eliminate burning.

Since its launching (2010), the project has trained and requalified more than 4,500 workers for jobs in sugar/ethanol mills as well in other sectors.

Another 16,000 workers have been requalified through the replication of the project by UNICA member companies.

Target for 2012/13 harvest: 3000 workers trained.
Re-qualified worker per year

- **30 courses offered** in 6 regions in São Paulo State

  - 2010/2011 harvest: **2,751 (formed)**
  - 2011/2012 harvest: **1,479 (formed)**

**TOTAL 4,550**
The Project was designed in two training modules:

<table>
<thead>
<tr>
<th>I) Activities within the sugarcane sector (examples)</th>
<th>II) Local communities – jobs in other sectors of the economy (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvester operator</td>
<td>Horticulture</td>
</tr>
<tr>
<td>Mechanic (harvesters, tractor)</td>
<td>Garment making</td>
</tr>
<tr>
<td>Truck driver</td>
<td>Plumber</td>
</tr>
<tr>
<td>Electrician (harvesters, tractors, trucks)</td>
<td>Baker</td>
</tr>
<tr>
<td>Welder</td>
<td>Manicure</td>
</tr>
</tbody>
</table>

**Two additional components:**

- **Pre-RenovAção:** for the least educated, alphabetization courses were also ministered before the actual training
- **Women’s module:** aiming at gender inclusion, some classes were dedicated to women only
Graduates per module

Module I
(courses for the sugar-energy sector)

- Harvester operator 14%
- Mechanic (harvester, tractor, truck) 20%
- Eletrician (harvester, tractor, truck) 28%
- Literacy + re-qualification course 10%
- Tractor driver 6%
- Truck driver 8%
- Welder 8%

Module II
(courses for the other sector)

- Urban services (e.g.: baker) 38%
- Rural services (e.g.: horticulture) 21%
- Agricultural services (e.g.: tractor driver) 10%
- Industrial services (e.g.: welder) 31%
- Literacy + re-qualification course 10%
Results

- International recognition by FAO as an “example” of social inclusion initiative

- 78% of the attendants in module 1 were immediately placed in the labor market (UNICA monitoring).

- At least 50% of the community’s workers in module 2 have established their own business and/or have gathered in a system of cooperative. Another 20% were absorbed by the labour market (FERAESP monitoring)

- Average salaries of the re-qualified professionals raised by 61%

- The number of women retrained has increased from 2% in the first classes to 12% in the second year.

- The program encouraged similar actions multiplying the number of trained workers: more than 16,000 professionals were independently re-qualified by the mills in line the RenovAção courses
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Automotive fuel in short supply in Brazil

Otto Cycle consumption
Productive capacity of gasoline and VNG consumption
Ethanol supply
Fuel

Need to expand production of ethanol and/or gasoline

Ethanol productive capacity (>30 billion liters)

Gasoline production and VNG consumption: stable

Fuel deficit

In billion liters of gasoline equivalent – Source: UNICA February 2012
Protocol Definition

- The Agro-environmental Protocol arose from the need to organize agricultural and industrial activities in such a way as to promote environmental improvements and, consequently, to reduce the impact on the environment and on society.
- This is particularly important in a sector that has grown significantly and represents an increasingly large portion of the economy of the State.
- It is intended to recognize good environmental practices in the sugar-energy sector, and to reward them with a certificate of compliance, renewed annually.
- Through the publicity given to the certificate awarded to agro-industrial units and cane growers associations, the Protocol affects the image of the plants and the associations in the domestic and the foreign markets, providing a positive standard for environmental plans and improvement goals to be followed.
- Now in its third year of operation in São Paulo State.

Aspects:
- Bringing forward deadlines for eliminating cane straw burning
- Protecting forest remnants, springs and riverside woodland
- Erosion control and good soil usage practices
- Management of pesticide containers, and reduction of water usage in the industrial phase.