Energy Crops as an Adaptation Response to Climate Change

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Ethanol is a real alternative to substitute part of the oil consumption in transport

- Currently, transport accounts for 25% of total GHG emissions
- In Brazil, 50% of petrol consumption has been replaced by ethanol:
  - Mandatory blend: 20-25% of ethanol blended with petrol;
  - 90% of new cars sold in the market are Flex-Fuel Vehicles (25% of the fleet);
- Ethanol can also be used for buses (E-95), small airplanes, motorcycles flex, bioplastics, etc.
Sugarcane ethanol reduces significantly CO$_2$ emissions

Energy balance: 9.3

25.8 million tonnes of CO$_2$ equivalent avoided in 2007 thanks to the use of ethanol
Superior yield

Source: IEA – International Energy Agency (2005), MTEC and UNICA. Elaboration: UNICA
Energy Balance
Data represent the amount of energy contained in ethanol per unit of fossil fuel input.

Note: estimated data
Data compiled by Icone and Unica
1% of Brazil’s arable land delivers: ethanol production does not provoke deforestation

Sugarcane for ethanol production occupies 1% of Brazil’s arable land (3.4 million hectares)

25 million hectares of degraded pastures are available for sugarcane expansion

Sources: NIPE-Unicamp, IBGE and CTC
In 2015, bioelectricity from sugarcane will supply 15% of Brazil’s electricity needs.

Source: UNICA
Domestic Ethanol Sales (E-100)

EXPANSION OF ETHANOL DEMAND IN BRAZIL

90% of new cars sold are Flex Fuel, representing over 25% of the Brazilian fleet

Source: ANP and ANFAVEA

Domestic Ethanol Sales (E-100)

Accumulated Sales of Flex-Fuel Vehicles

Source: ANP and ANFAVEA
BENEFITS OF BIOELECTRICITY

- **Experience and know how**
  - Units are self-sufficient in energy

- **Reduced construction period**
  - Construction in 24-30 months

- **Renewable and clean energy**
  - Low environmental impact
  - Provide carbon credits

- **Synergy with hydro production pattern**
  - Bioelectricity is produced during the dry season

- **Smaller projects and broader range of investors**
  - Eliminate risks of delay and construction problems

- **Strengthen the national equipment industry and create jobs**

- **Location close to main load centers**

Sources: PSR, Cogen, UNICA, Elaboration: UNICA,
The potential of bioelectricity in Brazil could supply the energy consumption of countries such as Argentina and Sweden.

Note: ave,MW = MW firm capacity, Assumptions: a) 2006/2007→harvested area; b) 2012/13 harvest→prediction based on the following values: 1 ton of sugar cane produces 250 kg of bagasse e 204 kg de straw, 1 ton of cane (only bagasse) generates 85.6 KWh for exporting, 1 ton of cane (bagasse + straw) generates 199.9 KWh for exporting, the straw inferior calorific value = 1.7 bagasse inferior calorific value, capacity factor = 0.5, Source: Cogen, Unica, Prepared by: UNICA
FUTUREUSESFORETHANOL

Ethanol-powered buses (E95) - still a pilot project in Brazil

Flex-fuel motorcycles

Brazilian-made crop dusting planes running on ethanol

Bio-plastics (PHB, polyethylene, PVC)

Use of ethanol in the biodiesel transesterification process
### PROJECTIONS FOR THE BRAZILIAN SUGARCANE INDUSTRY

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<thead>
<tr>
<th></th>
<th>2007/08e</th>
<th>2015/16</th>
<th>2020/21</th>
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</thead>
<tbody>
<tr>
<td><strong>Sugarcane production (million t)</strong></td>
<td>496</td>
<td>829</td>
<td>1,038</td>
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<tr>
<td><strong>Cultivated area (million ha)</strong></td>
<td>7,8</td>
<td>11,4</td>
<td>13,9</td>
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<tr>
<td><strong>Sugar (million t)</strong></td>
<td></td>
<td></td>
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<tr>
<td>Internal market and stocks</td>
<td>12,4</td>
<td>11,4</td>
<td>12,1</td>
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<tr>
<td>Surplus Export</td>
<td>18,6</td>
<td>29,9</td>
<td>32,9</td>
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<td><strong>Ethanol (billion l)</strong></td>
<td></td>
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<tr>
<td>Internal market and stocks</td>
<td>18,9</td>
<td>34,6</td>
<td>49,6</td>
</tr>
<tr>
<td>Surplus Export</td>
<td>3,6</td>
<td>12,3</td>
<td>15,7</td>
</tr>
<tr>
<td><strong>Bioelectricity (MW average)</strong></td>
<td>1,800</td>
<td>11,500</td>
<td>14,400</td>
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<tr>
<td>Bioelectricity in Brazilian energy matrix (%)</td>
<td>3%</td>
<td>15%</td>
<td>15%</td>
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Nota: e = estimated data as of August/2008; potential generation of surplus electricity has been calculated based on the utilization of 75% of the available bagasse and 50% of the available straw. Elaboration: UNICA, Copersucar and Cogen.
100 countries could supply biofuels to 200 nations, compared to 20 oil exporting countries

Source: British Sugar
Concluding Remarks

• A sustainable alternative to fossil fuel:
  – not necessarily THE solution but, for sure, part of the solution and already available;
  – Environmentally, socially and economically sustainable

• Challenges to overcome to achieve democratisation of energy:
  – Clear signal for investors that renewable energy market will be created;
  – Commoditization of ethanol through harmonized standards and market access (elimination of tariff and non-tariff barriers);
Thank you for your attention

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