The contribution of Brazilian Ethanol for Sustainable Development

The ETH Bioenergy Experience

Carla Maria Pires

“Sustainable bioenergy: sowing the seeds of sustainable development”
Rome, 10-12 November 2011
ETH Bioenergy Vision

A new paradigm in the sector

Build a leading Company in bioenergy (ethanol and co-generation of electricity), focused on value creation to the stakeholders.

Competitiveness  Sustainability  Culture & People
ETHANOL OPPORTUNITIES

USES

Transportation (fuel)

Energy

PRODUCTION

Consumer goods
Sustainable Ethanol

**GLOBAL ISSUES**
- Brazilian Biomes
- Land Use x Food
- Water Usage
- Agrochemicals
- Monoculture
- Wastes
- Social Responsibility
- Certification

**PRODUCTION ISSUES**
- Destruction of sensitive biomes
  - Amazon Rainforest
  - Cerrado (savanna)
  - Pantanal (wetlands)
- Risks to biodiversity
  - High Value Conservation Areas
  - "Sugarcane expansion pushes agricultural activities into rainforest"

**USES**
- Transportation (fuel)
- Consumer goods
- Energy

**PRODUCTION**
**The Evolution of Legislation**

- **Agro-Ecological Zoning for sugarcane**
  Prohibition of any future sugarcane farming or processing in the Amazon, Pantanal, or in any area of native vegetation.

- **Defined Areas for Permanent Preservation and Areas of Legal Reserve**

- **Today in Brazil, 65% of recent sugarcane expansion took place on degraded pastures in the South-Central region.**

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**PRODUCTION FACTS**

- **Brazilian Biomes**

<table>
<thead>
<tr>
<th>ETH's CASE in Biodiversity</th>
<th>Nagoya / Cop -10</th>
</tr>
</thead>
</table>

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**Source:** NIPE Unicamp, IBGE, CTC Preparation, UNICA

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**Sugarcane**
**Sustainable Ethanol**

- Arable land used for sugarcane ethanol: 1.1%
- In 2017, ethanol double production will be: 1.5%
- Diversified agriculture makes Brazil the world’s leading exporter of beef, coffee, orange juice, soybeans, and sugar
- Degraded pasture land is being used for sugarcane production

**ETH’S CASE:**
Use of already degraded land

<table>
<thead>
<tr>
<th>AREA (in million hectares)</th>
<th>% total</th>
<th>% arable land</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BRAZIL</strong></td>
<td>851</td>
<td></td>
</tr>
<tr>
<td>Total arable land</td>
<td>354.8</td>
<td></td>
</tr>
<tr>
<td>1. Area cultivated – total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soy</td>
<td>76.7</td>
<td>9%</td>
</tr>
<tr>
<td>Corn</td>
<td>20.6</td>
<td>2.4%</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>7.8</td>
<td>0.9%</td>
</tr>
<tr>
<td>Sugarcane for ethanol</td>
<td>4.0</td>
<td>0.5%</td>
</tr>
<tr>
<td>2. Pasture</td>
<td>172.3</td>
<td>20.2%</td>
</tr>
<tr>
<td>3. Available area</td>
<td>105.8</td>
<td>12.4%</td>
</tr>
</tbody>
</table>

Source: IBGE and Conab 2009
Water supply

Agriculture

Fertirrigation with vinasse

Mechanization

Industry

Future: Innovation

Sugarcane water

Self-sufficiency

Commercialization

ETH’S CASE:
Consume 0.86 m³ water / ton of sugarcane while the sector consumes 1.81 m³

Minimum water consumption for sugarcane

Sustainable Ethanol

PRODUCTION FACTS

Brazilian Biomes

Land Use

Water Usage

Trend Curve: Water Capture Rate, Sugarcane Industry

Capture Rate (m³/ton sugarcane)

Less agrochemicals in sugarcane cultivation

- Use of pesticides is low
- Biological control and advanced genetic enhancement programs
- Innovative use of recycled residues as organic fertilizers: filter cake, vinasse.
Sustainable Ethanol

- Competitiveness requires quantity / quality / cost
- Leased areas (70%)
- Small suppliers (30%)
- Establishment of green corridors connecting Permanently Protected Areas and Regularized Legal Reserves

ETH’S CASE: study of local fauna chain to evaluate how species adapt to new crop introduction
~100% of sugarcane processing wastes are reused internally to minimize environmental impacts:

- Vinasse, liquid effluent, filter cake → fertirrigation
  **Advantage:** replaces use of fertilizers and irrigation

- Bagasse and sugarcane straw → energy cogeneration
  **Advantage:** self sufficiency in energy and contribution to the country’s clean energy supply
**Sustainable Ethanol**

**Mechanized harvest**
- Increases productivity of the harvest by around 20%
- Makes the **process safer**
- Improves **life quality of the work**
- Improves **woman jobs**

- Signed in June 2009
- Result of **three-party** negotiations:
  - Companies
  - Workers
  - Federal Government

**ETH’S CASE:** 70% of planting and 100% of harvesting is mechanized

A huge program of training and requalification of **cane cutters** done by the sugarcane sector
**Job Creation**

- The sugarcane industry is the largest employer in Brazilian agriculture – 1.2 million workers (2010);
- Strict labor laws in Brazil, helping to improve occupational health conditions

**Widespread production of ethanol** vs. **Concentrated production of petroleum**

<table>
<thead>
<tr>
<th>Sector</th>
<th>States</th>
<th>Cities</th>
<th>Jobs</th>
<th>Establishments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol(*)</td>
<td>25</td>
<td>1042</td>
<td>465236</td>
<td>16829</td>
</tr>
<tr>
<td>Petroleum (**)</td>
<td>24</td>
<td>176</td>
<td>73075</td>
<td>1239</td>
</tr>
</tbody>
</table>

Note: (*) includes sugarcane farming and ethanol production. (**) includes petroleum extraction and derivatives production.


**ETH’S CASE: Job creation**
- Harvest of 2009/10: 3,500 workers
- Harvest of 2010/11: 11,000 workers
- Harvest of 2011/12: 15,000 workers
Sustainable Ethanol

Social impacts on neighboring communities

- Seasonality of labor balanced with mechanization alleviates local labor migration
- Training and use of local labor

ETH'S CASE: The Social Energy for Local Sustainability Program involves the government and community in investments in the region.
The Brazilian sugarcane sector is seeking a process for certification

The sugarcane sector has been seeking continual development of sustainable management of its chain:
- Participating in the creation of solid legislation;
- Encouraging producers to invest in the subject;
- Showing itself to be transparent in verifying its sustainable actions.

The Agro Environmental Protocol defines directives for promoting sustainability, including:
- Burning reduction;
- Protecting of streamside woodlands and headwaters;
- Minimizing water usage;
- Minimizing pollution, among other things;
- Auditing annually with a three-party executive group.
Considering the vast quantity of initiatives, the Brazilian industry is actively involved in a specific scheme: the Better Sugarcane Initiative – BONSUCRO. BONSUCRO defines criteria, indicators, and standards for producing sugarcane, taking into consideration local conditions and involving the whole sugarcane chain; it promotes measurable improvements in social, environmental, and economic impacts of growing and processing sugarcane;
ETHANOL OPPORTUNITIES

USES

Transportation (fuel)

Energy

Consumer goods
PRODUCTION & USES

Transportation

Ethanol cycle (Kg CO₂/1000 l)

1. GROWING AND HARVESTING
   Tractors, harvesters and inputs in the field*
   Emissions: 2,961

2. GROWTH
   Sugarcane is a natural sponge for carbon gases as it grows
   Absorption: 7,650

3. PROCESSING
   Fermentation and bagasse burning for energy generation
   Emissions: 3,604

4. BIO-ELECTRICITY
   Use of bagasse to generate electricity and energy surplus
   Emissions Avoided: 225

5. TRANSPORTATION
   Ethanol is transported to gas stations in diesel lorries
   Emissions: 50

6. ON THE STREETS
   Car motors burning ethanol
   Emissions: 1,520

Total Emissions: 260

89% of carbon emission reduction vs. gasoline production

*Assuming 50% mechanized and 50% manual harvest.

Source: Isaias Macedo and Joaquim Seabra, Unicamp, 2008
ETHANOL OPPORTUNITIES

USES

Transportation
(fuel)

Energy

Consumer goods
USES
Energy
Renewable + Clean

Self-sufficient industry

Produces excess energy

contributes to a

CLEANER NATIONAL ENERGY GRID

Brazil’s green energy matrix

2000

Sugarcane 10.9%
14.4%
15.7%
8.0%
5.4%
45.5%

2008

Sugarcane 16.4%
15.1%
13.8%
7.7%
10.3%
36.7%

Source: BEN (2009). Elaboration: UNICA

ETH’S CASE
Project to earn carbon credits on energy cogeneration with a reduction of 3 million tons of CO₂ in the next 7 years (4 mills)
ETHANOL OPPORTUNITIES

USES

Transportation (fuel)

Energy

Consumer goods
Ethanol - Industrial Uses

Green Plastics
Improving quality of life with renewable raw materials

Capture & Sequestration 2,5 t CO₂/ t green PE

Industry

Consumer goods

- Sugarcane
- Ethanol
- Green PE
- Consumer goods with renewable origins
BRAZIL

Brazilian ethanol: successful business without government subsidies

Brazilian Energy Matrix (2010)

- Hydroelectricity: 15.2%
- Sugarcane: 18.1%
- Petroleum and derivatives: 37.9%
- Wood and other biomass: 10.1%
- Natural gas: 8.8%
- Other renewable source: 3.8%
- Coal: 4.8%
- Uranium: 1.4%

- Reduction of GHG from the use of ethanol: transportation + energy
  - 2006: 22% GHG
  - 2020: 43% GHG

- Business
  - 2010: US$ 28 billion
  - 2020: US$ ????
  - US$ 10 billion collected in taxes

Source: BEN (2010). Elaboration: UNICA
Final Considerations

Ethanol as a sustainable alternative to the bioenergy

Ethanol Contributions in Brazilian Experience

- Environment:
  - Clean and renewable fuel
  - Climate changes mitigation
  - Water use efficiency
  - Biodiversity preservation

- Social Aspects:
  - Largest employer in agriculture
  - Rural & Social development
  - Life quality of work

- Food Security:
  - Compatible

- Limitations:
  - Climate and soil conditions
Thank you for your attention!