Strategies for Production of Biodiesel

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XXI Century's Challenges

- Energy
- Sustainable Growth
- Climate Change
- Biodiversity
- Social Inequality
In the World

- **Canada - Ethanol**
  - 2010: E10

- **USA - Biofuels**
  - 2012: 15.2 bi galons
  - 2015: 20.5 bi galons
  - 2022: 36 bi galons

- **Argentina: Biofuels**
  - 2010: B5
  - 2012: E5

- **UE – Biodiesel**
  - 2010: B5,75
  - 2020: B10

- **Brazil - Biofuels**
  - 2011: B5 e E25

- **Colombia: Biofuels**
  - 2012- E10 e B20

- **Uruguay - Biofuels**
  - 2012: B5
  - 2015: E5

- **China - Ethanol**
  - 2020: E10

- **Japan - Biodiesel**
  - 2030: B5

- **Malaysia - Biodiesel**
  - 2010: B5

- **Indonesia - Biodiesel**
  - 2010: B2,5 - 2025: B5
Motivations

- New Renewable Energy Sources;
- Environmental;
- Social Inclusion.
Brazil: importer of diesel;

On the global stage with Alcohol Program in the 70s;

Land area, climate and soil conditions conducive;

Experience in the cultivation of oil across the territory;

Global demand for biofuels;

- Castor Beans
- Sunflower
- Soybean
- Palm
- Cottonseed
Biodiesel is part of the Brazilian energy matrix originated from its regulatory framework, law number 11.097/2005.

Regulatory framework for biodiesel - Law 11097/05

- Voluntary Blend B2: Jan/2005
  - Step 1: The time needed to organize the production chain

- Compulsory Blend B2 + Optional Blend B5: Jan/2008
  - Step 2: Market Structure
  - Market Regulator

- Compulsory Blend B5*: Jan/2013
  - Step 3: Advance 2010

Mature Market
To implement a sustainable program promoting social inclusion
To ensure competitive prices, quality and supply
To produce biodiesel from different oil-producing plants in several different regions
• **Social Fuel Label**: Ministry of Agrarian Development-MDA has created rules mandating the participation of small family farms.

• **Support program for family producers**: Rural technical assistance, research and dissemination of new knowledge, co-operativism, productive organization.

• **Purchase policy**: Auctions secure marketshare to companies with Social Fuel Label (80% of the commercialized amount).

• **Tax Policy**: There are tax incentives for businesses who buy from family farms, based on the kind of producer, such as small family farms, and region.
Anticipation of the Legally Established Blend

Biodiesel introduction into Brazilian by Law 11.097

- 2005 to 2007 (2% voluntary)
- Jul/2008 to Jul/2009 (3% mandatory) (5% voluntary)
- Jul/2009 to Dec/2009 (4% mandatory)
- From 2010 on (5% mandatory)

<table>
<thead>
<tr>
<th>Brazil Market</th>
<th>Brazil Market</th>
<th>Brazil Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 840 million liters</td>
<td>1.6 - 2.5 billion liters</td>
<td>2.5 billion liters</td>
</tr>
</tbody>
</table>
### Location of Production Units

**Biodiesel plants Authorized by ANP**

<table>
<thead>
<tr>
<th>Region</th>
<th>nº plants</th>
<th>Capacity (thousand m3/year)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>6</td>
<td>193</td>
<td>3%</td>
</tr>
<tr>
<td>NE</td>
<td>6</td>
<td>741</td>
<td>12%</td>
</tr>
<tr>
<td>CO</td>
<td>25</td>
<td>2.395</td>
<td>40%</td>
</tr>
<tr>
<td>SE</td>
<td>13</td>
<td>1.144</td>
<td>19%</td>
</tr>
<tr>
<td>S</td>
<td>8</td>
<td>1.534</td>
<td>26%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>58</strong></td>
<td><strong>6.007</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Source: MME/SPG/DCR – 30/09/2011
Projection of Demand for Biodiesel in Brazil

(B)10 in 2019: 8.4 billion liters

(Hypothetical Scenarios)

Source: MME / PDE 2010-2019 (projection of demand for biodiesel B5)
Projection of Demand and Supply

- **Total oils and fatty materials produced**
- **Demand for Biodiesel (B5)**
- **Capacity (feb 2011)**

Source: EPE Plano Decenal de Energia 2020
Mains Feedstock

- 2008:
  - Soybean Oil: 73.6%
  - Animal Fat: 14.1%
  - Other Fatty Materials: 9.8%
  - Cotton Oil: 2.3%

- 2009:
  - Soybean Oil: 77.4%
  - Animal Fat: 16.6%
  - Other Fatty Materials: 2.3%
  - Cotton Oil: 2.3%

- 2010:
  - Soybean Oil: 83.3%
  - Animal Fat: 13.1%
  - Other Fatty Materials: 1.2%
  - Cotton Oil: 1.2%

Source: EPE Plano Decenal de Energia 2020
<table>
<thead>
<tr>
<th>Species</th>
<th>Oil Content (%)</th>
<th>Cycle (year)</th>
<th>Harvest Months</th>
<th>Productivity (ton oil/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palm</td>
<td>20</td>
<td>8</td>
<td>12</td>
<td>3,0 – 6,0</td>
</tr>
<tr>
<td>Babassu</td>
<td>66</td>
<td>7</td>
<td>12</td>
<td>0,1 – 0,3</td>
</tr>
<tr>
<td>Sunflower</td>
<td>38-48</td>
<td>Annual</td>
<td>3</td>
<td>0,5 – 1,9</td>
</tr>
<tr>
<td>Canola</td>
<td>40-48</td>
<td>Annual</td>
<td>3</td>
<td>0,5 – 0,9</td>
</tr>
<tr>
<td>Castor Beans</td>
<td>43-45</td>
<td>Annual</td>
<td>3</td>
<td>0,5 – 0,9</td>
</tr>
<tr>
<td>Soybeans</td>
<td>17</td>
<td>Annual</td>
<td>3</td>
<td>0,2 – 0,4</td>
</tr>
<tr>
<td>Cottonseed</td>
<td>15</td>
<td>Annual</td>
<td>3</td>
<td>0,1 – 0,2</td>
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</table>

Source: Costa e Santos (2008)
Petrobras Biofuel is a wholly owned subsidiary of Petrobras.

Founded in 2008, is responsible for production of biodiesel and ethanol with social and environmental sustainability, helping to reduce emissions of greenhouse gases and promoting development in the countries where it operates.

The Business Plan 2011-2015 provides for investments of $ 4.1 billion in biofuel production in the period.
Petrobras Biofuel

**MISSION**

“Production of biofuels on safely and profitable ways, on a structured agricultural supply chains, socially and environmentally sustainable in Brazil and abroad, with contribution to green gas emissions reduction and the correspondent country development”

**VIEW 2020**

“To be one of the top five global biofuel producers”
Petrobras Biofuel - Biodiesel and Ethanol Production Units

15 operational plants

- **Biodiesel PBIO**
- **Biodiesel Partnership**
- **Biodiesel PBIO (Implementation)**
- **Biodiesel Partnership (Implementation)**
- **Ethanol Partnership**
- **Estratora Partnership**

2011

- **Boa Vista-GO** (Plant PBIO-São Martinho)
- **Guarani-SP** (Plant PBIO-Total)
- **Passo Fundo-RS** (Usina Petrobras-BS Bios)
- **Bambuí-MG** (Plant PBIO-Bansinos)
- **Guimarães-RN** (Plant Experimental)
- **Montes Claros-MG** (Plant PBIO)
- **Quixadá-Ce** (Plant PBIO)
- **Candeias-BA** (Plant PBIO)
- **Projeto Belém-PA** (Implementation)
- **Projeto Pará-PA** (Implementation)
- **Projeto Belém-Portugal** (Implementation)
- **Guarani-Moçambique** (Plant Sena)
- Marialva-PR

**Biodiesel**
- 5 plants running
- 2 under implementation
Own Plant - Quixadá

- Biodiesel Production Capacity: 108,000 m³/year
- Feedstock: Soybean Oil and refined cotton oil / degummed, animal fat, Waste Fats / Greases
- Employees: 179 (own and outsourced)
- Scope: Ceará, Pernambuco, Paraíba and Rio Grande do Norte
- Number of Family Farming (Crop 2010-11): 40,303
- Number of Technical of ASTEC: 404
Own Plant - Guamaré

- Biodiesel Production Capacity: 15,000 m³/year
- Technology: CENPES
- Project: Improvements and bottlenecks tuning 20,000 m³/year
  - New input
  - New Feedstock
  - New technological challenges
Own Plant - Candeias

- **Biodiesel Production Capacity**: 217,000 m³/year
- **Feedstock**: Soybean Oil and refined cotton oil / degummed, animal fat, palm
- **Employees**: 164 (own and outsourced)
- **Scope**: Bahia and Sergipe
- **Number of Family Farming (Crop 2010-11)**: 20,210
- **Number of Technical of ASTEC**: 203
Own Plant – Montes Claros

- Biodiesel Production Capacity: 108,000 m³/year
- Feedstock: Soybean Oil and refined cotton oil / degummed, animal fat, Waste Fats / Greases
- Employees: 164 (own and outsourced)
- Scope: Minas Gerais
- Number of Family Farming (Crop 2010-11): 3,836
- Number of Technical of ASTEC: 39
Plant in Partnership – BSBIOS Marialva

- Biodiesel Production Capacity: 127,000 m³/year
- Feedstock: Soybean Oil degummed, cotton oil and animal fat
- Employees: 107
- Scope: South Region
- Start of Operation: 7/1/2010
- Paraná is one of the largest consumers of biodiesel
- Access logistic easy, fertile soil and favorable climate for the production of oilseeds
- Regional award for "Entrepreneurial Company of the Year 2010"
Plant in Partnership - BSBIOS Passo Fundo

- Biodiesel Production Capacity: 160,000 m³/year
- Feedstock: Soybean Oil and degummed
- Employees: 227
- Scope: South Region
- Crushing capacity: 825,000 ton/year
- Vertically integrated production
- Plans to build a bio-lubricants plant, based on canola and flax.
Belém Project

- Integrated Project in partnership (shared management)
- PBIO / GALP Bioenergy
- 250,000 ton/year greendiesel in Portugal
- 330,000 ton/year of palm oil in Brazil
- Target: European Market
- 1,000 family farmers
- 50,000 ha
- Tailândia and Tomé Açú
Pará Project

- PBIO integrated project
- Target: Internal Market (North Region Brazil)
- 120,000 ton/year of Biodiesel from palm oil
- 1,250 family farmers
- 250 medium and large producers
- 25,000 ha
- Igarapé-Miri, Mocajuba and Baião
PBIO-DBIO Capacidade de Produção

<table>
<thead>
<tr>
<th>Trimestre / Ano</th>
<th>3 Usinas: Quix, Cand e MC</th>
<th>Desengargalamento 3 Usinas</th>
<th>Marialva</th>
<th>Duplic. Candeias</th>
<th>Guamaré</th>
<th>Nova Usina</th>
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<td>1º/2009</td>
<td>169.200</td>
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<td>2º/2009</td>
<td>169.200</td>
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<tr>
<td>3º/2009</td>
<td>169.200</td>
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<td>4º/2009</td>
<td>325.800</td>
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<td>1º/2010</td>
<td>325.800</td>
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<tr>
<td>2º/2010</td>
<td>325.800</td>
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<td>3º/2010</td>
<td>385.800</td>
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<td>4º/2010</td>
<td>494.400</td>
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<td>2011/12</td>
<td>549.400</td>
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<td>699.400</td>
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M3 / Mês

PBIO CONTINUOUS GROWTH
Fluxos Logísticos Usina de Montes Claros
Modal Rodoviário

Legenda
Saída B100
Entrada MP
Alternativa para Cabotagem de MP

Legenda

- Entrada MP
Challenges of Sustainable Development of the Biodiesel

- Technological Development
  - Focus on production systems;
  - Focus on breeding.

- Productive Inclusion
  - Focus on structuring agricultural production;
  - Focus on agricultural supply strategy - social label;
  - Focus on the contractual terms of family farming.
Technological Development - Potential for Oilseed

Legend:
- AMAZÔNIA
- CAATINGA
- CERRADO
- MATA ATLÂNTICA
- PAMPA
- PANTANAL

Source: IBGE 2004
Technological Development – Strategic Technologies

PBIO/CENPES

UFC, UFRSA, UFCG
UFRN
UFRB, UFBA
EPAMIG, UFMG, UFV, UNIMONTES
UFRRJ, UFRJ
IAC
UNICAMP, UNESP, IPA
Technological Development - Network Partners

- Sunflower
  - UFRRJ
  - UFERSA
  - IPA
  - UFC
  - UFCG
  - EPAMIG
  - UFBA

- Castor bean
  - UFRRJ
  - UFC
  - UFBA
  - EPAMIG
  - UFERSA
  - IAC
  - UFRB
  - Unicamp
  - UFRJ

- Jatropha
  - UFRRJ
  - UFAL
  - UFC
  - UFBA
  - Unesp, IAC, Epamig
  - Unicamp
  - UFRJ

- Palm
  - UFRRJ
  - UFAL
  - UFC
  - UFBA

- Macauba
  - UFV
  - Epamig
  - UFMG
  - Unimontes

- New Oilseeds – Faveleira

CENPES
Productive Inclusion - Structuring Agricultural Production Program

Ensure the participation of family farming organizations.

Provide qualified technical assistance and capacity building (ASTEC) for family farmers included in the program.

Prioritize strategic alliances with MDA, INCRA, States and Municipalities Governments, Banks and Regional Development Organizations.

Participation of EMBRAPA, Research Institutes and Universities.

Participation of Companies and Cooperatives of Technical Assistance.
More than 65,000 farmers engaged (MG, BA, SE, PE, PB, NB, EC and PI);

Production of biodiesel from different oilseeds.

Productive Inclusion - Agricultural Supply Strategy

- 5-year contract;
- Technical Assistance Provided (ASTEC);
- Availability of certified seed;
- Provision of sacks;
- Ensures production logistics and purchasing;
- Market price x Minimum price;
- Payment within 7 days;
- Participation of the representative entities.

Hiring of Family farming

Seal Fuel Social
Productive Inclusion – Increase of productivity

Source: Crop 2007 / 2008

- R&D
- Fertilization and Management
- ASTEC
- Seed
- Soil Remediation

Crop (year)
Productive Inclusion – Family Farming in PNPB

# Family Farmer Feedstock Suppliers

- 2005: 16,328
- 2006: 40,595
- 2007: 36,746
- 2008: 27,858
- 2009: 51,047
- 2010*: 109,000

*Note: 2010 data is estimated.
Use of waste fats/greases (OGR)

**CONCEPT**
- Use of waste oils and fats from the food frying processes.

**Benefits**
- Prevents contamination of the environment
- Encourages the concept of recycling in urban areas
- Reduces costs of sewage treatment
- Promotes environmental rehabilitation actions
- Favors the development of associations and cooperatives
- Cooperatives and individual collectors of recyclables

Cooperatives and individual collectors of recyclables
Productive Inclusion - Agricultural Supply Strategy

- Hiring
  - + 64,000 Family Farmers

- ASTEC
  - + 600 Agricultural Technicians

- Agricultural Technology
  - 20 Research Institutions

- Expansion
  - Production Productivity

Agricultural Technology Expansion Productivity + 64,000 Family Farmers + 600 Agricultural Technicians 20 Research Institutions
Distribution PBIO

**Step Agricultural**
- Small Family Farmers (66,599-8 states)
- Technical Agricultural (646)
- Area Cultivated (75,000 ha)
- Sunflower, Castor, Macaúba, Palm,....
- Universities, institutes and CENPES (20)

*Including Pará and Belém

**Step Industrial**
- Producing plants B100 (5)*
- States covered (8)
- Capacity (720,000 m³/year)*
- B100 Experimental Plant (1)
- New Projects (3)

* 2 in partnership

*Considering 100% of Marialva and Passo Fundo 11

**New Projects (3)**
- Plant extraction of vegetable oil
Garantia das especificações
óleo diesel - biodiesel - mistura

Produtor de Biodiesel (65)  

Produtores de Diesel (14)

Distribuidoras (130)

TRR (394)  

Revenda Varejista (37.235)

Consumidor
Thank you very much!

We produce more than clean, renewable energy.

We produce Quality of Life and Citizenship.