



# CANE TECHNOLOGY CENTER CTC - BRAZIL



Álcool combustível: mais vantagens sobre a gasolina



With the support of the Seventh Framework Programme.





# CANE TECHNOLOGY CENTER

## CTC - BRAZIL



- Non-for-profit private organization - OSCIP  
(Organização da Sociedade Civil de Interesse Público) BRA
- Expenses for :
  - Agricultural research (R&D&I)
  - Processing research (R&D&I)

### CTC Mission

**Generate value for the associates developing and transferring technologies and innovations applied to the sugarcane value chain**

### Focus

**High value R&D&I**



# CTC – Piracicaba - Brazil

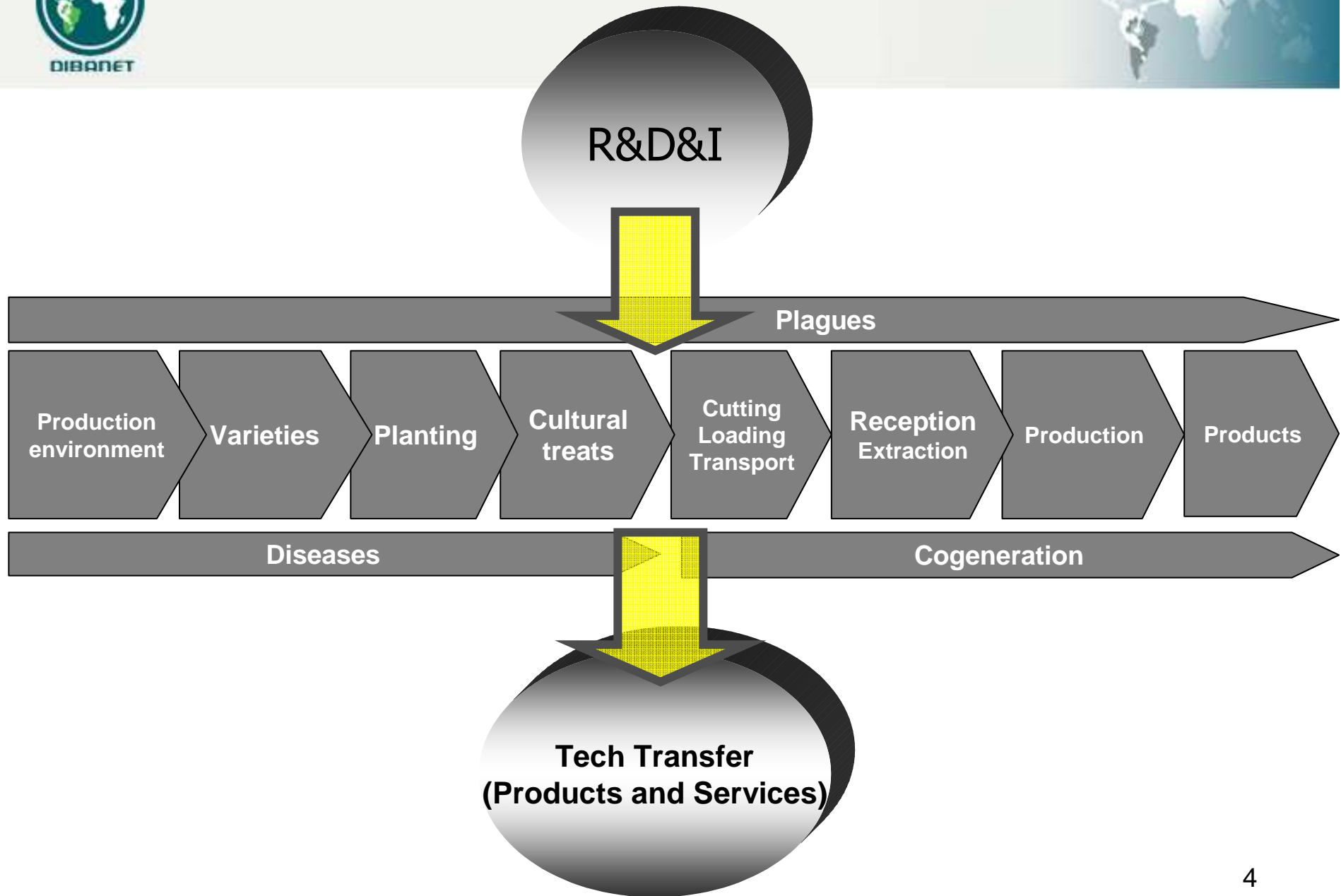


- 168 associated
  - ✓ 150 mills
  - ✓ 18 cane farmers
- 260 million t (season 09/10)

**>50%**  
of  
Sugar cane  
in  
South center of Brazil



# CTC: Acting in the whole value chain



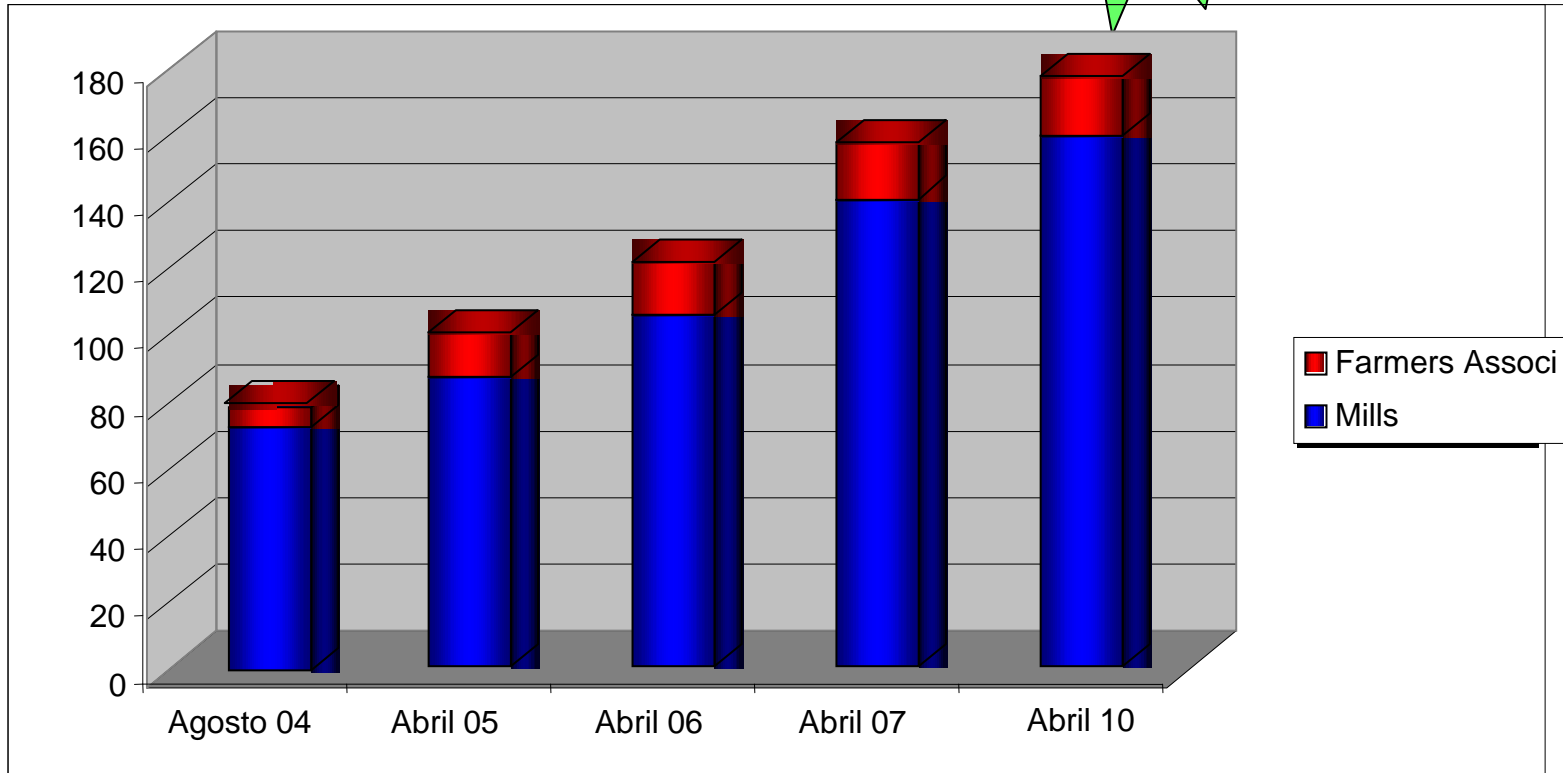


# Increasing the number of Associated Mills



2004 - 2010

168





# SUGAR SECTOR IN NUMBERS

2009/2010



**US\$ 32 bilhões (Production of cane, sugar, ethanol and energy**

**2% of GDP**

**4.5 million of employes**

**72.000 farmers**

**Process 580 million tons of cane**

**33 million ton of sugar**

**29 billion liters of ethanol**

**165 million ton of bagasse**

**128 million ton of straw**

**20 million ton of sugar for exportation – US\$ 9 billion**

**2 billion liters of ethanol for exportation – US\$ 1 billion**

**US\$ 8 billion of tax**

**US\$ 4.5 billion of investment/year**

**400 mills (nearly)**



## Main Activities in this Project



### WP2: Feedstocks for Levulinic Acid and Diesel-Miscible-Biofuel Production



- Detailed chemical and spectral characterisation of sugarcane bagasse and trash. Produce a comprehensive networked database for all participants.
- Develop predictive calibration equations for as many feedstock parameters as possible, using laboratory NIR and LF-NMR spectra. Validate these in preparation for online application.
- Integration of online NIR into a sugar mill for bagasse analysis and utilisation.
- Develop robust applications based on the online data, assess options such as payment systems, feedstock analysis, process monitoring and process control



# Bagasse composition – bibliographic - CTC

<b>Celulose</b>	<b>Hemicelulose</b>	<b>Lignin</b>	<b>Ashes</b>	<b>Author</b>
<b>(% dry matter basis)</b>				
<b>37</b>	<b>28</b>	<b>21</b>	<b>n.d.</b>	<b>Bon(2007)</b>
<b>26-47</b>	<b>19-33</b>	<b>14-23</b>	<b>1-5</b>	<b>Paturau(1989)</b>
<b>38</b>	<b>33</b>	<b>22</b>	<b>3</b>	<b>Trickett and Neytzell-de Wilde (1982)(*)</b>
<b>(*) work presented in (Walford, 2008)</b>				

<b>Authors</b>	<b>C</b>	<b>H</b>	<b>O</b>	<b>N</b>	<b>S</b>	<b>Ashes</b>
<b>Deerr(1925)</b>	<b>46,5</b>	<b>6,5</b>	<b>46,0</b>			<b>1,0</b>
<b>Tromp</b>	<b>44,0</b>	<b>6,0</b>	<b>48,0</b>			<b>2,0</b>
<b>Hugot(1972)</b>	<b>47,0</b>	<b>6,5</b>	<b>44,0</b>			<b>2,5</b>
<b>Chenú(1981)</b>	<b>46,4</b>	<b>6,4</b>	<b>44,2</b>			<b>3,0</b>
<b>Copersucar(1983)</b>	<b>49,5</b>	<b>6,2</b>	<b>44,3</b>			
<b>Wienese (2001)</b>	<b>44,3</b>	<b>5,7</b>	<b>42,0</b>			<b>4,0</b>
<b>Gabra et al.(2001)*</b>	<b>45,2</b>	<b>5,4</b>	<b>41,8</b>	<b>0,2</b>	<b>0,0</b>	
<b>US DOE(2006)*</b>	<b>48,4</b>	<b>6,0</b>	<b>41,6</b>	<b>0,2</b>	<b>0,0</b>	
<b>Average</b>	<b>46,4</b>	<b>6,1</b>	<b>44,0</b>	<b>0,2</b>	<b>0,0</b>	<b>2,5</b>
<b>Standard Deviation</b>	<b>1,9</b>	<b>0,4</b>	<b>2,2</b>			<b>1,1</b>

*C = carbon; H = hydrogen; O = oxigen; N = nitrogen; S = sulfur e Ashes \* (50% moisture)*



## Bagasse utilization



- **The excess of bagasse has been used recently to generate electricity, sold to other companies to produce steam and in small quantities for animal feed.**
- **4.2% of Brazil electric energy is generate from bagasse.**





## Trash utilization



**The trash is left on the field to keep the humidity, increase the organic material and to avoid erosion.**



**The CTC has been developed projects to use the straw to produce electric energy.**



## ACTIVITIES PERFORMED - 2010



- Report about sugarcane characteristics, including some information about bagasse and straw;
- Workshop participation in December 2009 – UL;
- Assembly of the exclusive Laboratory for the Dibanet, including NIR equipment;
- Standardization and adjustments of analytical methods and equipment for biomass characterization by HPLC;
- Collection of bagasse and straw samples in Mills;
- Sending samples for CERTH (Greek), Aston (England) and UL (Limerick)
- Translation of Dibanet website to Portuguese.



# Reports, Publications and Book



**SUGAR CANE, BAGASSE AND STRAW**  
 Historic, distribution on the countries of Central and South America, Varieties,  
 Energy cogeneration and chemical composition  
 Wokimar Teixeira Garcia  
 CTC Centro de Tecnologia Canavieira - SP - Brazil

**Mapa AGROENERGIA**  
**AgriEnergy**  
 Statistical Yearbook  
 2009

**Introduction**  
 In recent decades the world has been discussing ways to deal with the effects caused by human impact on the globe and win the heavy reliance on petroleum products is increasingly dependent on oil. Estimation of the International Energy Agency (IEA), released in late 2004, indicates that global demand for all forms of energy had reached 10,500 million tons of oil equivalent, up 70% compared to time immediately preceding the first price shock in 1973. The IEA also forecasted 2030, a new 50% increase in world demand for energy, with increasing participation of emerging countries, which should reach 56% of the market by the end of the period. In this sense, processes such as the Kyoto Protocol are taking the company to recognize the importance of finding alternative energy matrix based on oil. Renewable energy such as biofuels, seems to be the best answer now to address the issue. Unlike crude oil, these sources are distributed around the globe more evenly, by considering the biomass to produce ethanol and biodiesel. This current has shown that the main target of change is the transportation sector, where biofuels have replaced gasoline and diesel, added to petroleum products or in cases such as Brazil, 100% ethanol use in automobiles. Ethanol is the most commonly used biofuel to replace gasoline and petroleum products. Both, under certain conditions, have compared to petroleum products, lower emissions of polluting waste and better energy balance. The

**Ministry of Agriculture, Livestock and Food Supply**

$$\begin{array}{c} \text{H} & \text{H} \\ | & | \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ | & | \\ \text{H} & \text{H} \end{array}$$

$\text{C}_2\text{H}_5\text{OH}$

$\text{C}_2\text{H}_5\text{OH}$

$\text{C}_2\text{H}_5\text{OH}$

**Sugarcane-Based Bioethanol**  
 Energy for Sustainable Development

Coordination  
 BNDES and CGEE  
[www.sugarcanebioethanol.org](http://www.sugarcanebioethanol.org)

1<sup>st</sup> Edition  
 Rio de Janeiro – November 2008

$\text{C}_2\text{H}_5\text{OH}$



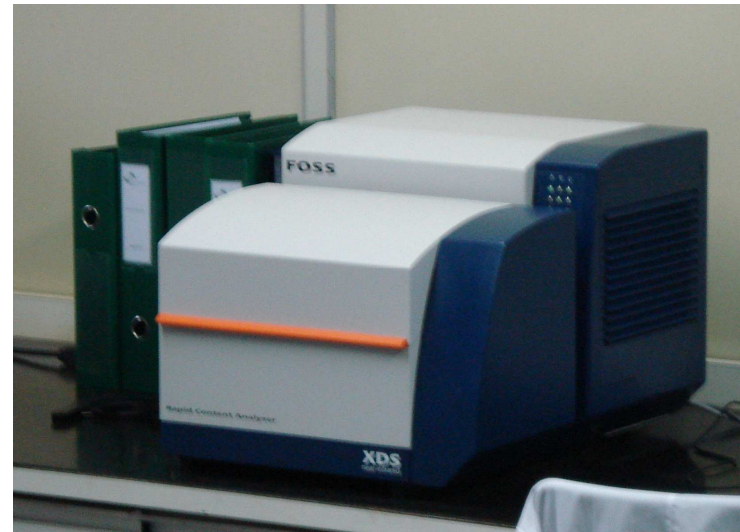
## Acquisition of NIR equipment



- Acquisition in December 2009 the equipment NIR-XDS;



Limerick University



CTC

- Training (data collection, software with Mr. Daniel Hayes);
- Began the data collection (bagasse, straw and other biomass from UNICAMP).



# LABORATORY FOR DIBANET



## Assembly of the exclusive Laboratory for the Dibanet

- Equipments acquisition and room prepare for the Dibanet Laboratory





# LABORATORY FOR DIBANET





# CTC – Cane Technology Center



**Collection of bagasse  
and straw samples in  
mills;**





# CTC – Cane Technology Center



## Dibanet time working at CTC



**Aparecido R. Alves, Fernanda F. Neme, Wokimar T. Garcia, Daiane Diehl, Paulo R. de Gouvea**



# CTC – Cane Technology Center



Ok  
Cheers  
Go raibh maith agat  
Thank  
Köszö  
Mange tak  
Gracias  
Efharisto poli