

Brazilian experience with biofuels

Department of Sugar Cane and Agroenergy



Ministério da
Agricultura, Pecuária
e Abastecimento



Why BIOFUELS?

- **Environmental gains**
 - carbon sequestration
 - lower emission levels in consumption
- **Renewability**
 - short production cycle
 - man-controlled process
- **Economic aspects**
 - new demand component
 - impacts on trade balance
- **Social aspects**
 - jobs creation
 - income distribution
- **Energy Security**
 - diversification;
 - reduction on imports.



AGRICULTURE IN CURRENT CONTEXT

- Historic challenge: food security
- 1960s: focus on technical progress – gains in productivity
- 1980s: focus moves to food safety
- 1990s: new concern - environmental safety
- 2000s: biofuels as a new demand
- Current challenge: agriculture must supply four “f” (food, feed, fibers and fuels), competitively and in a sustainable way.



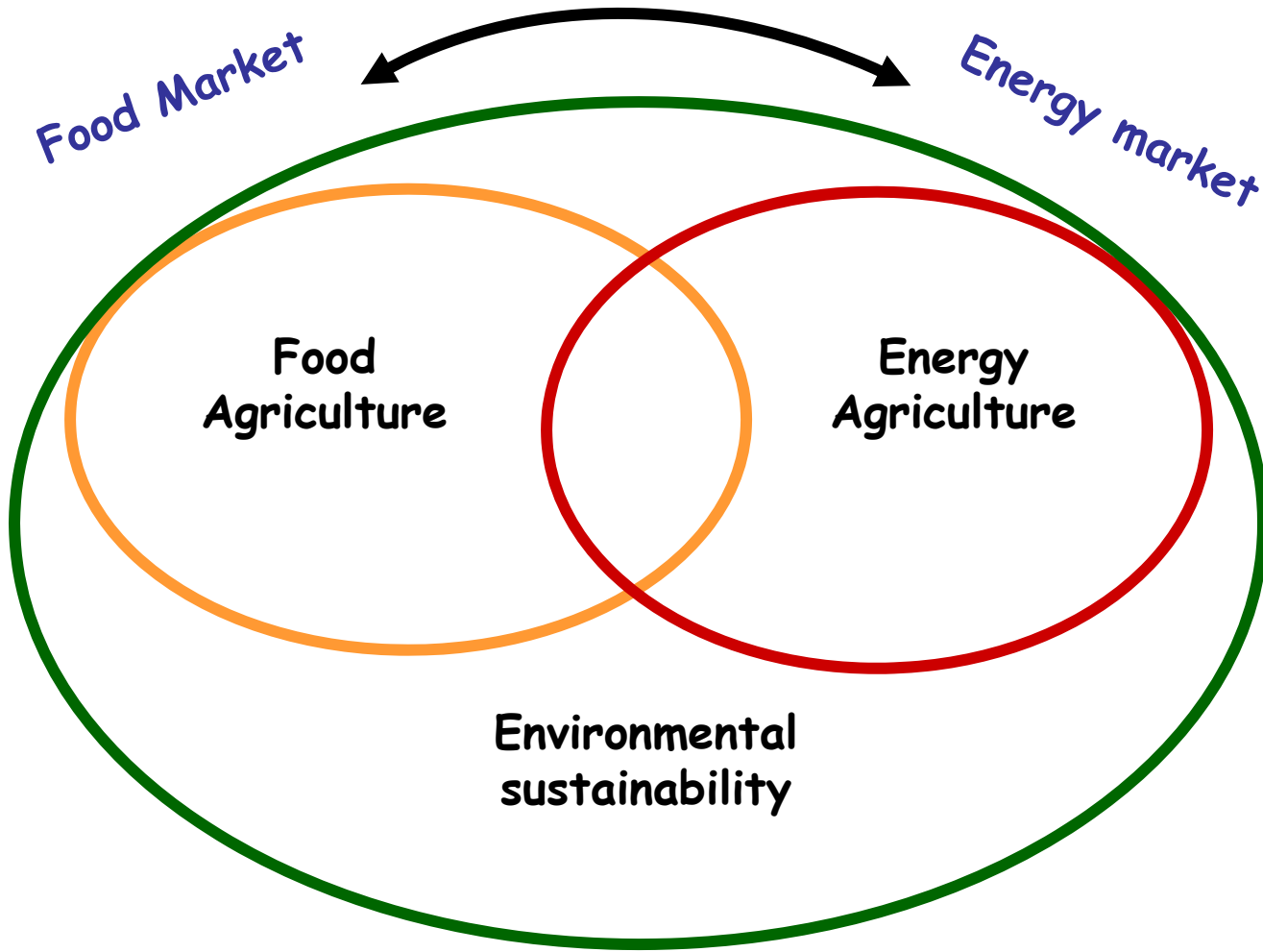
PERSPETIVES TO BIOFUELS MARKET

- Increase in global demand
 - strengthen socio-environmental concerns
 - Development of trades
 - However, there are important challenges:
 - Biodiesel: development of new raw materials (algae, for example), reducing dependence on conventional oilseeds;
 - Ethanol: new technological pathways (hydrolyses of cellulosic materials);
 - New possibilities: synthetic diesel; biological diesel; etc.
- Technical progress will be helpful to harmonize energy security and food security.

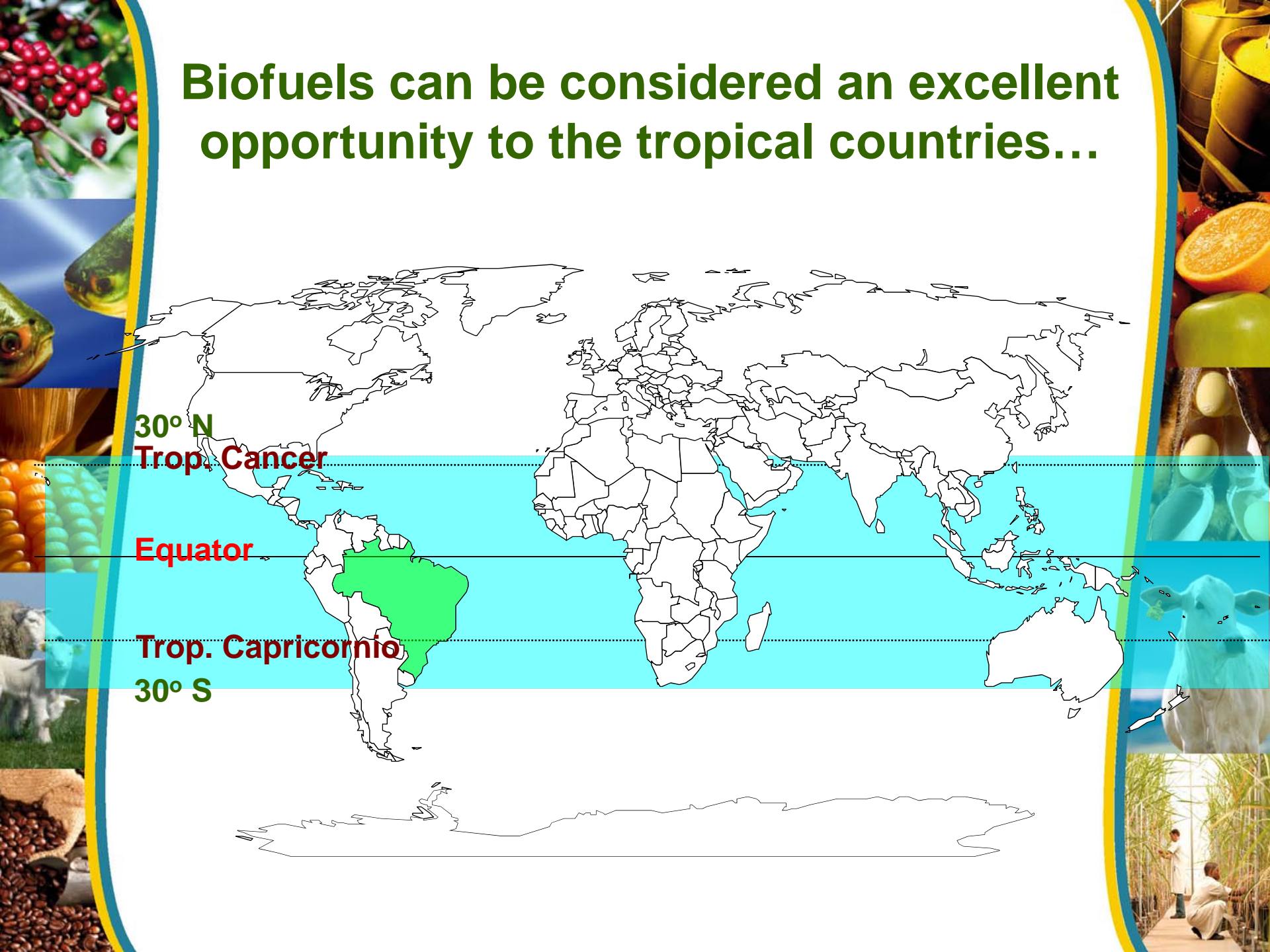


WORLD CHALLENGE

INTEGRATION



Biofuels can be considered an excellent opportunity to the tropical countries...

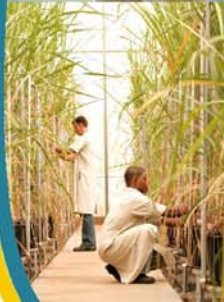


BRAZILIAN STRATEGY FOR AGROENERGY

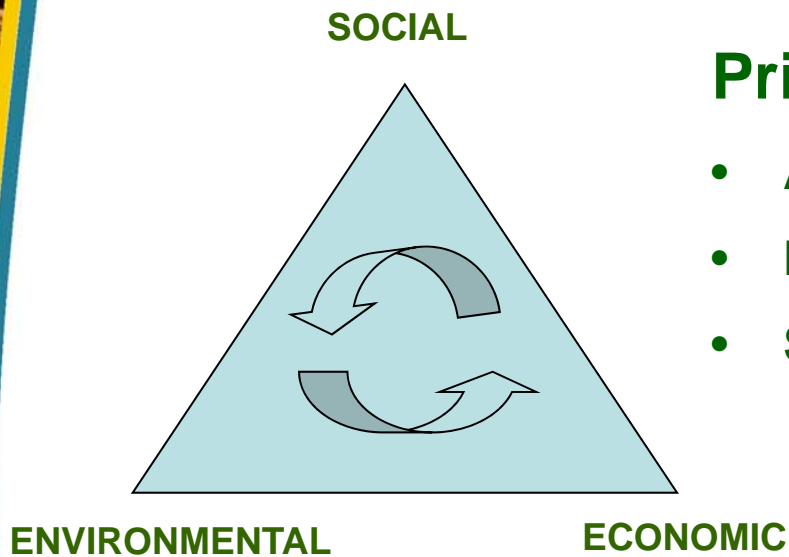


BRAZILIAN AGROENERGY PLAN:

- BIODIESEL
- ETHANOL
- WASTES OR RESIDUES
- ENERGETIC FORESTS



Brazilian challenge: how to promote sustainable production and use?



Priorities:

- Agro-Ecological Zoning
- Research and Development
- Support to Household Farmers



ETHANOL FUEL HISTORY IN BRAZIL



THE BRAZILIAN SUGAR CANE AND ETHANOL EXPERIENCES



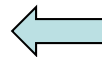
1532: Martim Afonso de Sousa introduces sugar cane in Brazil



1925: First ethanol powered vehicle tested in Brazil



2003: Flex fuel motors are launched



1979: First commercial ethanol moved vehicle in Brazil



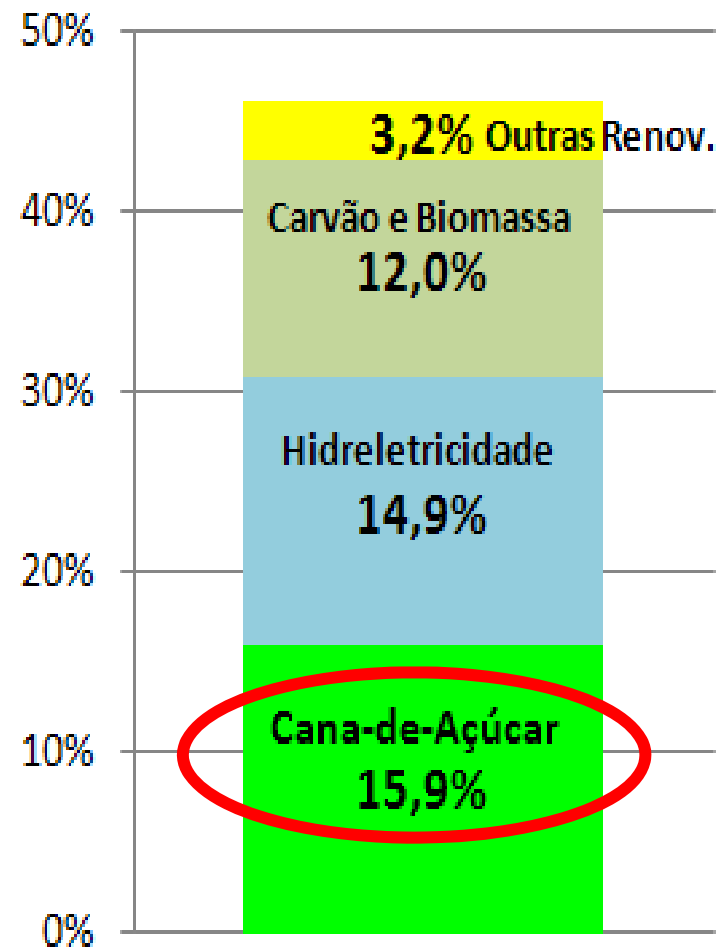
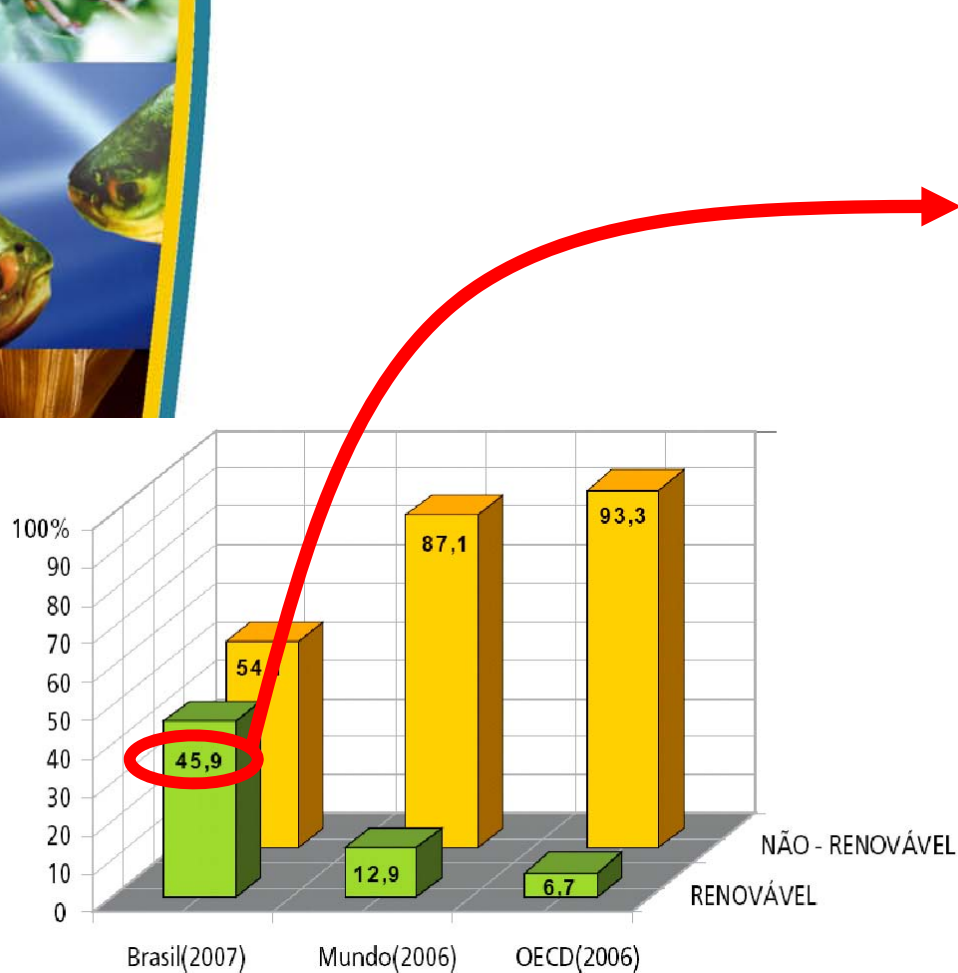
Brazilian Experience: nowadays...



1) Since 2003, more than 100 new models of Flex-Fuel Vehicles, by eleven automakers: it can use any mixture of gasoline and alcohol, from 0 to 100%, without any action of car driver.

2) Since 2007, Flex Fuel vehicles sales has represented more than 80% of total light vehicles sold (8,4 million of units).

Energy Matrix – World and Brazilian - 2008



Sugarcane is the main renewable source.

Ethanol and environmental impacts in Brazil.

DEMANDA DE COMBUSTÍVEL PARA VEÍCULOS CICLO OTTO

- DEMANDA TOTAL COMB CICLO OTTO (COM GNV)
- DEMANDA TOTAL COM CICLO OTTO (SEM GNV)
- PRODUÇÃO DE GASOLINA
- CONSUMO DE GASOLINA

921 million of boe saved, or 16 months of domestic production of oil, considering current capacity(*).

During this period, ethanol gave the condition to save the emission of 851 MILLION TONS of CO₂

ANO

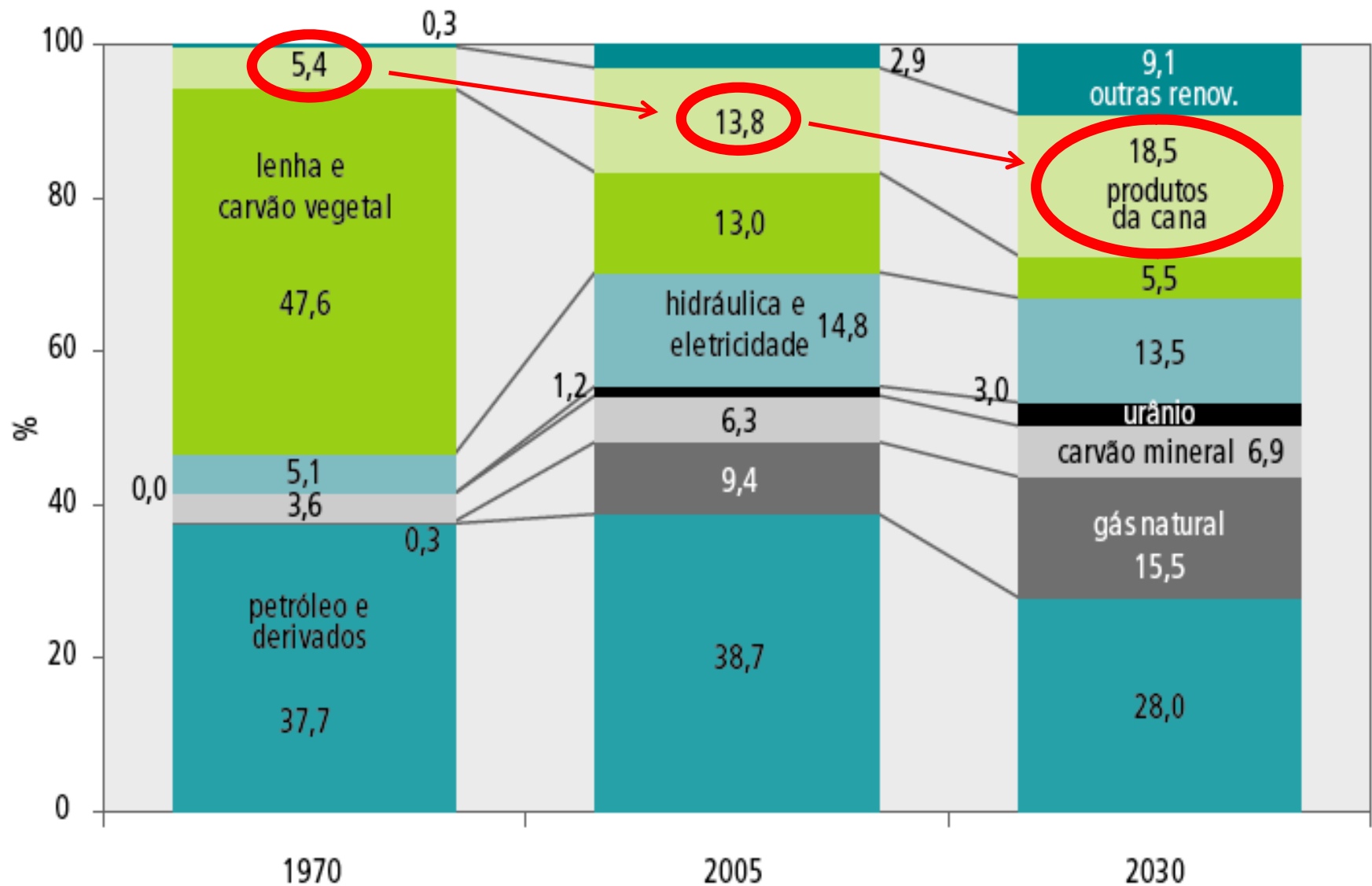
*It considers daily capacity of 1.996 mil barris (average Jan-Mar/2009)

Source: MME 2009, BEN 2008

Land use in Brazil

USES	Area	
	Million ha	%
Amazon Rain Forest	357	42,0%
Pastures	172	20.2%
Annual Crops	55	6.5%
Perennial Crops, except sugarcane	9	1.1%
Sugarcane (for sugar and ethanol)	7.8	0,8%
Planted Forests	6	0,7%
No exploited	115	13.5%
Cities	21	2,5%
Protected areas	71	8.3%
Other uses	38	4,5%
Total	851	100%

Brazilian Energy Matrix - perspectives



What about this success of ethanol?

- It is easy to be produced in large scale;
- It has competitive costs, compared to present oil prices;
- It can be produced from different raw materials;
- It is a way of promoting the economic development in rural areas;
- It has excellent perspectives in the world market.



What about this success of ethanol?

➤ Renewable:

- Zero Carbon Balance
- Not dependent on petroleum
- Large scale of production

➤ High miscibility with gasoline and it is a perfect substitute for tetraethyl lead

➤ Oxygenated Compound:

- Reduces whole emission

➤ Low toxicity

➤ Sulfur free

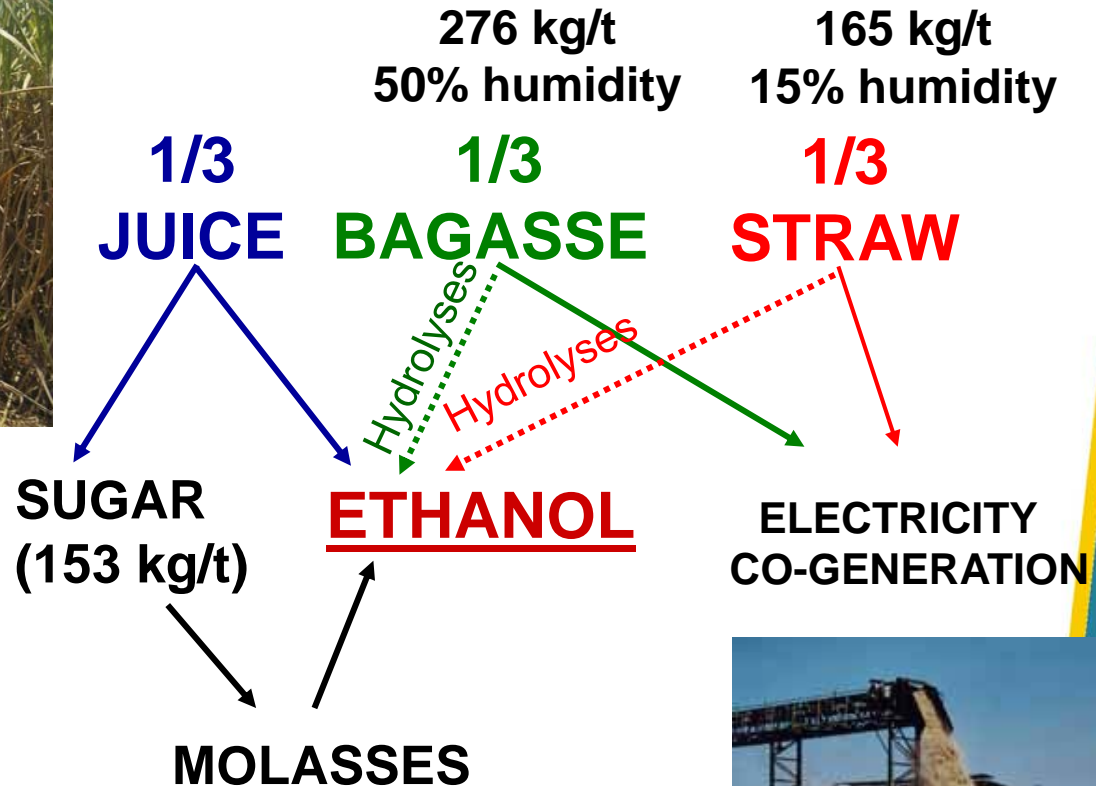


Why choosing sugar cane?

- It allows the highest productivity (liters/hectare);
- It has exceptional thermal and environmental balances;
- It allows an increase in the competitiveness of the mills (flexibility, higher quality and lower costs of sugar);
- It leads to an increase in agricultural yield (industrial residues transformed into fertilizers).



NOT ONLY ETHANOL...



STRAW: includes sugar cane leaves



Celluloses ethanol revolution: when??

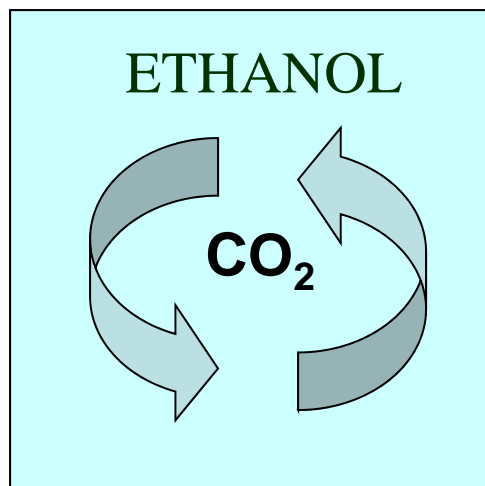


Energy Efficiency of Ethanol in Brazil

Raw material	Energy output / Energy input
Wheat ¹	1.2
Corn ¹	1.3 – 1.8
Sugar Beet ¹	1.9
Sugar Cane ²	9.3

¹ F.O. Licht, 2004.

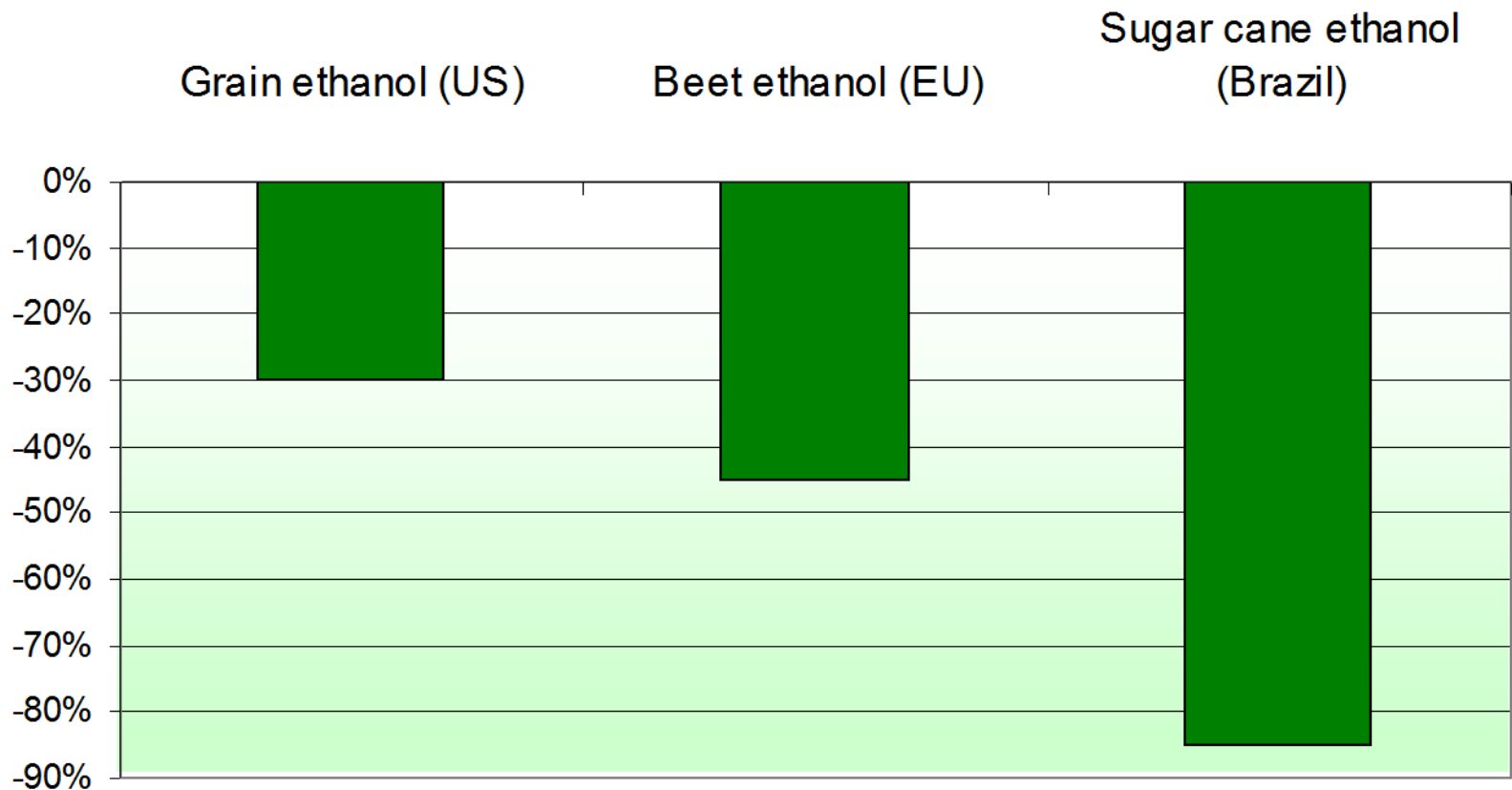
² Macedo, I et al., 2008 – Under Brazilian production conditions.



- High photosynthesis efficiency (C4 crop).
- Possibility of using the sugar cane by-products in the production process, avoiding external energy sources.

EMISSIONS OF GREEN HOUSE GASES

Avoided emissions by the use of ethanol as a gasoline substitute



Note: estimate data

Source: World Watch Institute (2006) and Macedo et al (2008)

Data compiled by Icone and Unica – Brazil.

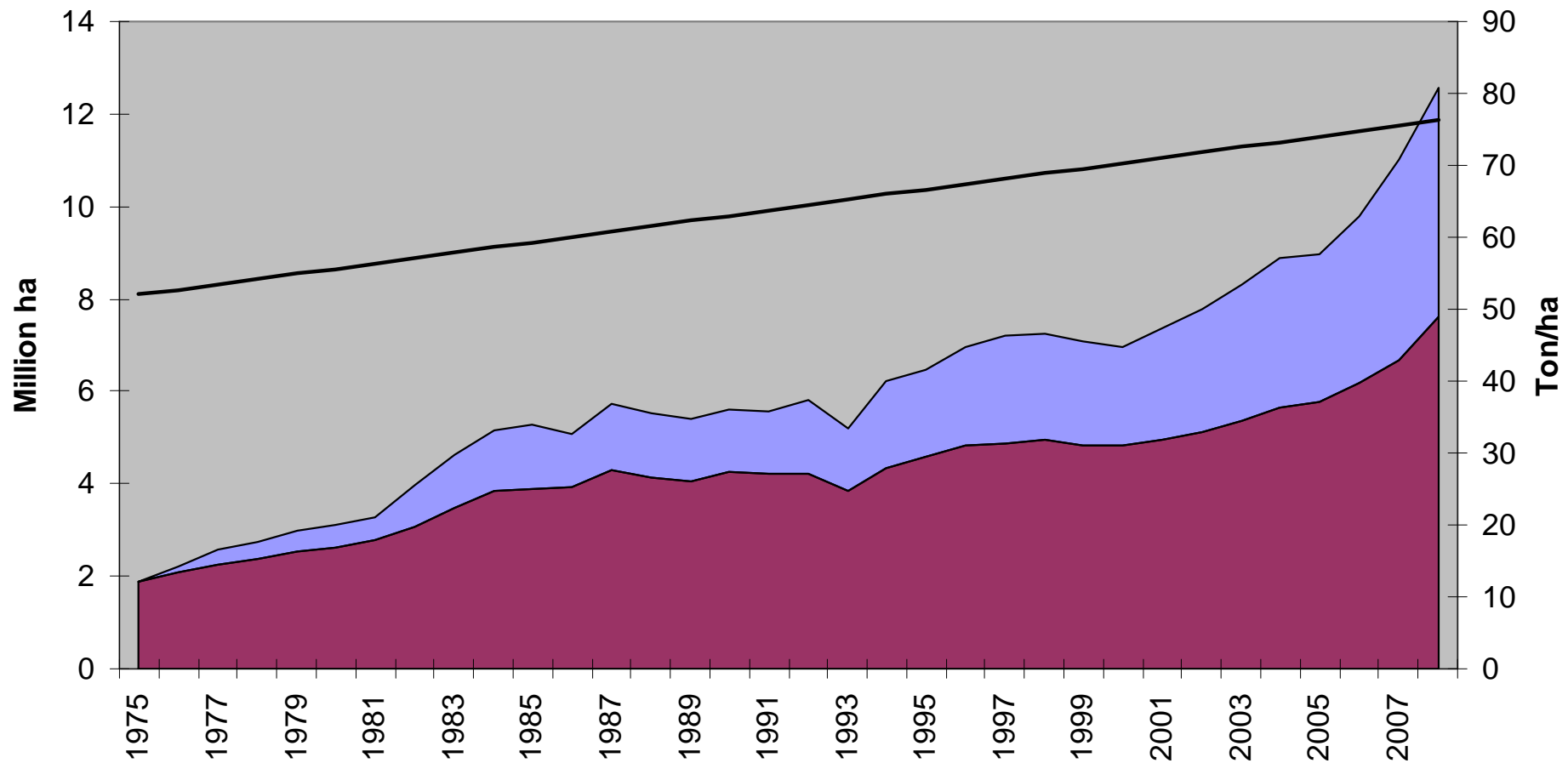
Agricultural phase...

Main advances:

- ✓ Soil conservation
- ✓ Soil chemistry
- ✓ Agrochemical inputs
- ✓ Expansion frontiers
- ✓ Harvest practices
- ✓ Labor



Sugarcane: Cropped and Preserved Areas due to Technological Improvements



Source: DCAA/Mapa

1 ton of sugarcane = 82 liters of alcohol
1 hectare of sugarcane = 7.4 m³ of alcohol

Industrial phase...

Main advances:

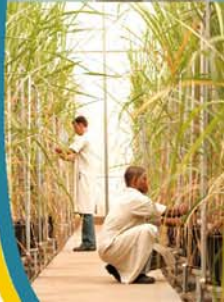
- ✓ The usage of water;
- ✓ Indirect usage of residues;
- ✓ Energy generation using crop residues;
- ✓ New technologies;
- ✓ Carbon market (Kyoto Protocol).



Water treatment station – Usina Santa Elisa – São Paulo
Capacity: 3 million liters/hour



Dry cleaning process for sugarcane- Usina Quatá – São Paulo.



CONCLUSIONS

- Reducing GHG emissions means investing in different possibilities, including biofuels;
- Bioenergy is going to be a great opportunity to tropical countries, like in Brazil;
- Brazilian experience suggests that it is possible to harmonize food and biofuels production, in a sustainable way;
- However, each country must identify its vocation and designing its own programs to promote the production and use;
- Brazilian experience is available to others, which will not have to commit the same mistakes we committed in the past.





THANK YOU!

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