University of São Paulo (USP), School of Business and Economics

Providing Interdisciplinary Education on Biofuels Technology

Markets, Economics and Policies

Eduardo Leão de Sousa

Executive Director, Brazilian Sugarcane Industry Association (UNICA)

São Paulo, August 5, 2009

ABOUT UNICA

- UNICA is the **leading sugarcane industry association**, institutionally representing 127 mills in Brazil, responsible for **60% of all ethanol and sugar production** in Brazil
- Technical expertise in **Economics, Sustainability, International and Public Affairs, Communication, Law and Bioeletricity**
- International presence in Washington & Brussels, to engage in **constructive dialogue**

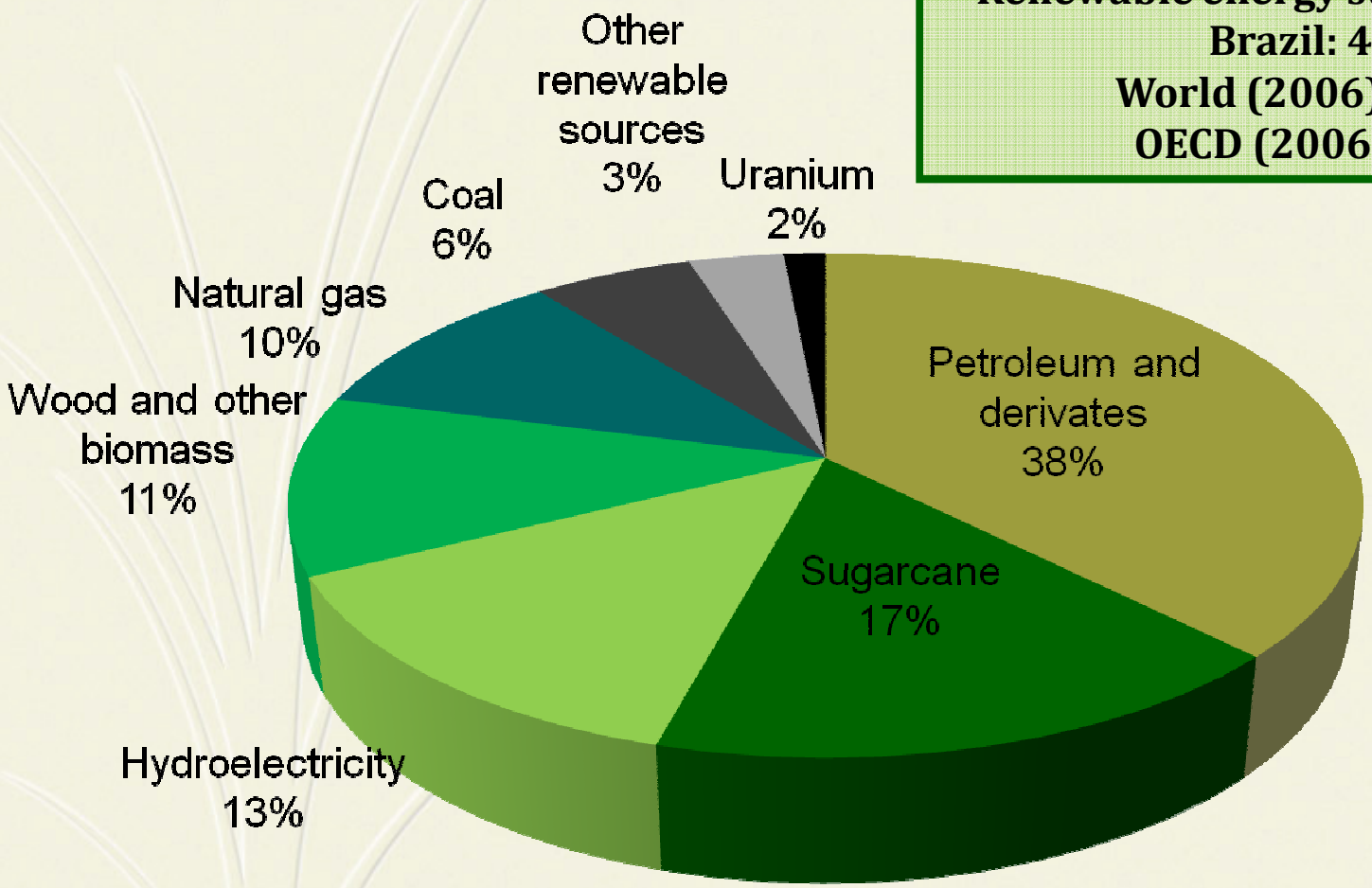
KEY NUMBERS OF BRAZILIAN SUGARCANE SECTOR

Annual gross earnings	US$ 23 billion
Foreign revenue	US$ 7.9 billion (2008)
Direct investments	more than US$ 20 bln (2006-2009)
Composition	380 plants nationwide
Sugarcane growers	70,000
People directly employed	845,000
Participation in Brazilian energy matrix	16.4%, ahead of hydroelectricity
Sugarcane production	562 mln ton
Sugar production	31.2 mln ton
Ethanol production	27 bln liters
Avoided CO_2 emissions	45 mln tons since 2003

Elaboration: UNICA. Note: data refers to the 2008/09 crop year

BRAZILIAN ENERGY MATRIX INPUT

Renewable energy supply structure
Brazil: 46%
World (2006): 12,9%
OECD (2006): 6,7%



Source: BEN (2009). Elaboration: UNICA

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Ethanol Growth: What are the main drivers?

RECENT EVOLUTION OF THE BRAZILIAN SUGARCANE SECTOR

The growth of Brazil's ethanol production is currently driven by two main factors:

DOMESTIC MARKET:

- Increase of the flex-fuel vehicles market

INTERNATIONAL MARKET:

- Rising global interest in ethanol
  - ✓ Environmental concerns (global warming)
  - ✓ Energy security → f (dependence on foreign oil)
  - ✓ Support to farm incomes

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Perspectives for Brazilian domestic market

THE BRAZILIAN FUEL ETHANOL HISTORY

Brazil is a pioneer in using ethanol as a vehicle fuel. It first began using ethanol as automotive fuel in the 1920s

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PROÁLCOOL

- The “Proalcool”program started in 1977 as a response to the oil crisis and, at first, established a 5 mandatory blend on the gasoline, that increasingly achieved 25%

- This energy substitution also included the development and support to pure ethanol fueled cars (E-100)

First domestic E-100 car produced in Brazil, known as the “the little cachaça”

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FLEX FUEL VEHICLES (FFV) IN BRAZIL

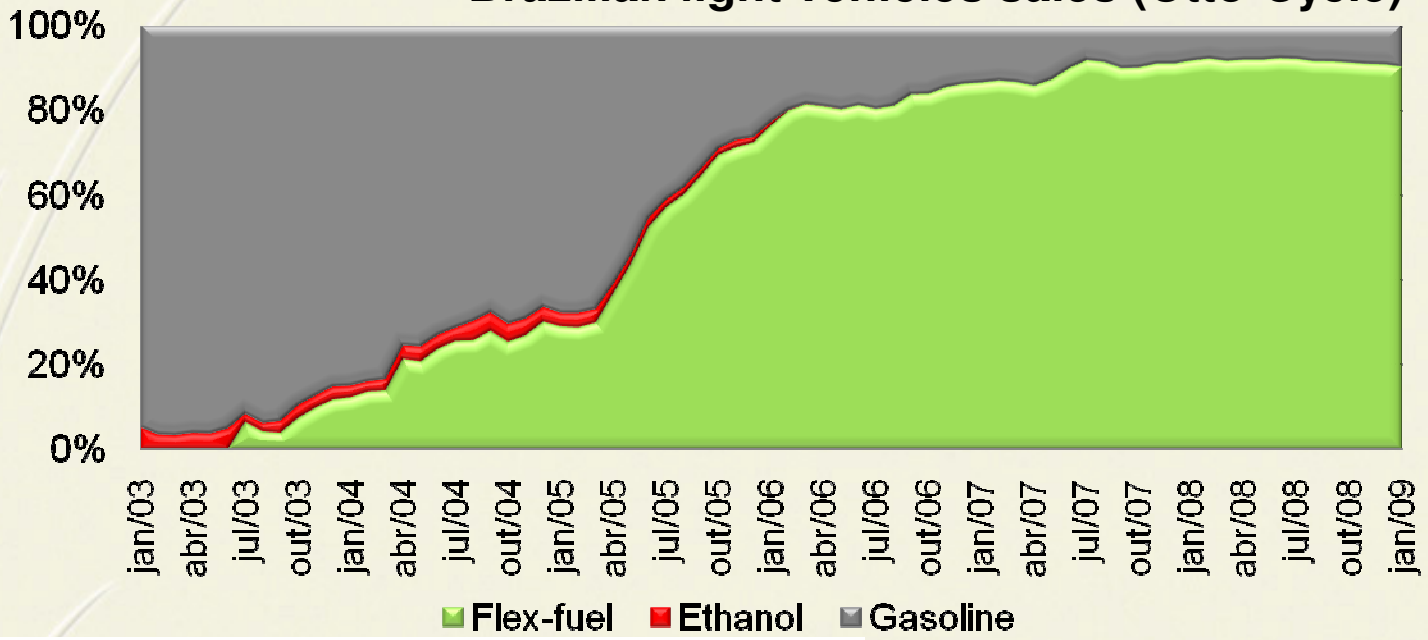
Through some special electronic sensors, the on-board computer recognizes the fuel and properly adjust the engine combustion parameters, without any interference from the driver.

- **Introduced in the Brazilian market on March 2003**
- **These vehicles are designed to be fueled with gas, ethanol, or any blend of gas and ethanol (today from E23 to E100)**
- **Thirteen brands and 63 models**
- **33.000 gas stations all over the country with at least one dedicated E100 pump**

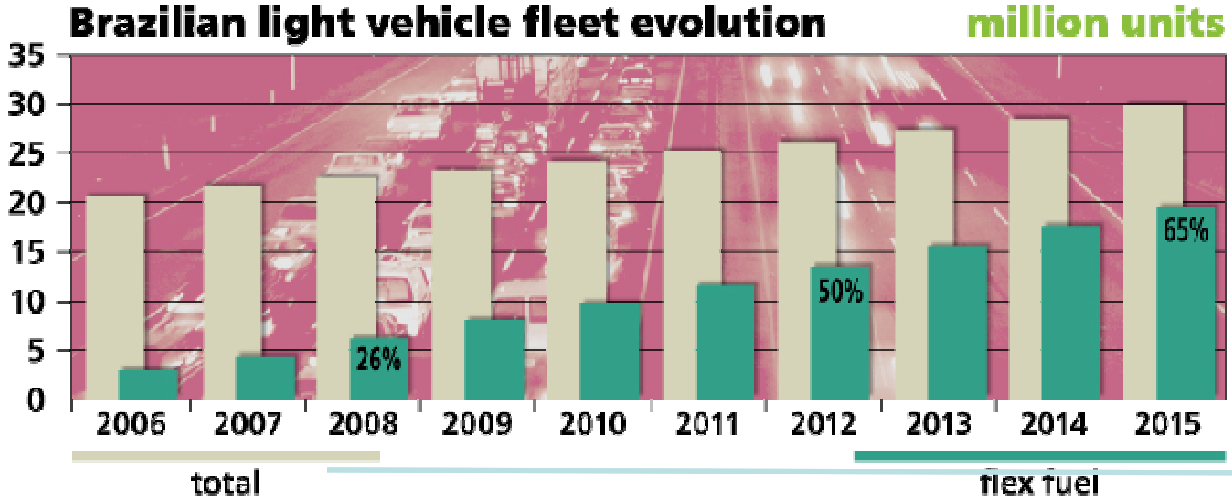
GM · Ford · FIAT · CITROËN · RENAULT · HONDA · PEUGEOT · TOYOTA · unica

Source: ANFAVEA e Unica

Brazilian light vehicles sales (Otto-Cycle)

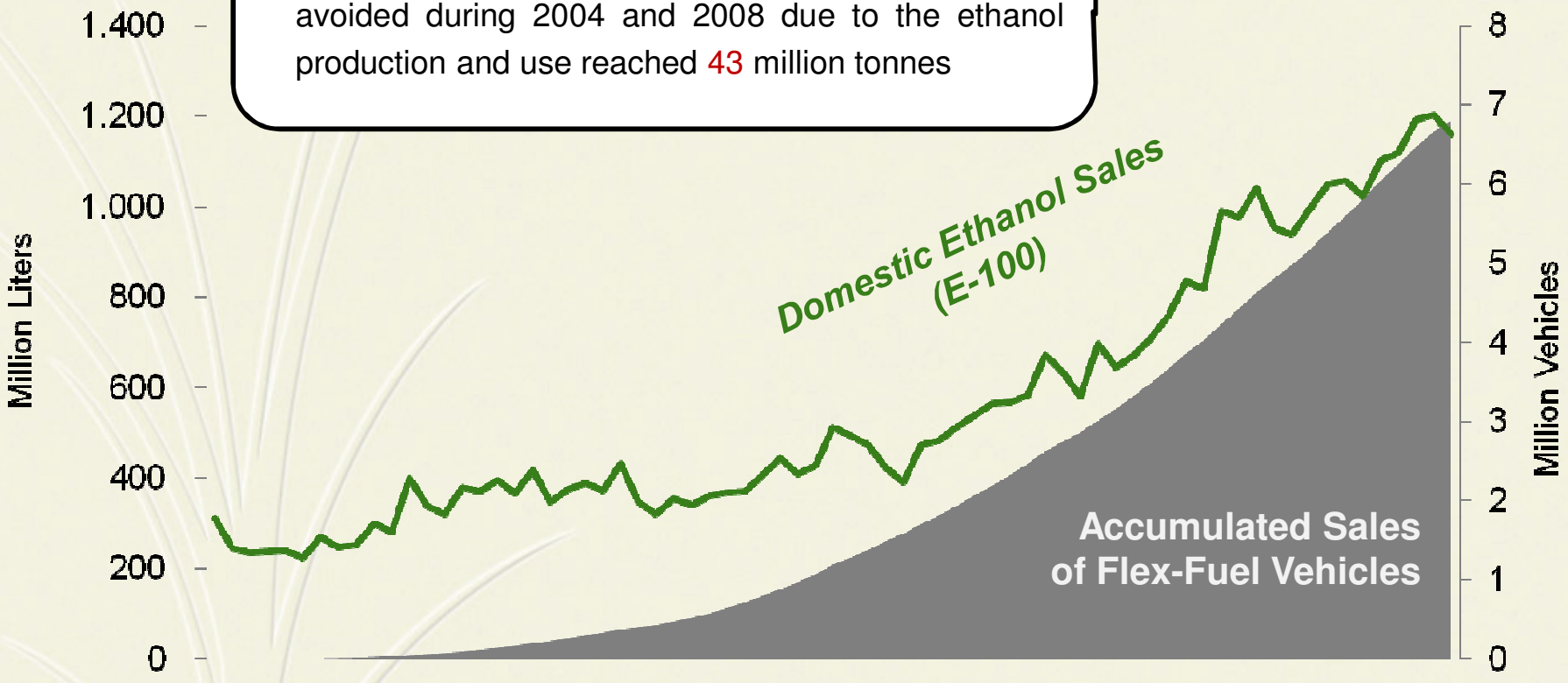


Source: ANFAVEA. Elaboration: UNICA



FLEX FUEL CARS THAT USE ETHANOL . . .

Flex-Fuel technology contributes to reduce greenhouse gas (GHG) emissions. In Brazil, GHG emissions avoided during 2004 and 2008 due to the ethanol production and use reached 43 million tonnes



GM · Ford · FIAT · PEUGEOT · RENAULT · CITROËN · HONDA · TOYOTA · NISSAN

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Source: ANP & ANFAVEA

MARCH 2009
HARVEST SEASON

DECEMBER 2008
ETHANOL INTER-
HARVEST PERIOD

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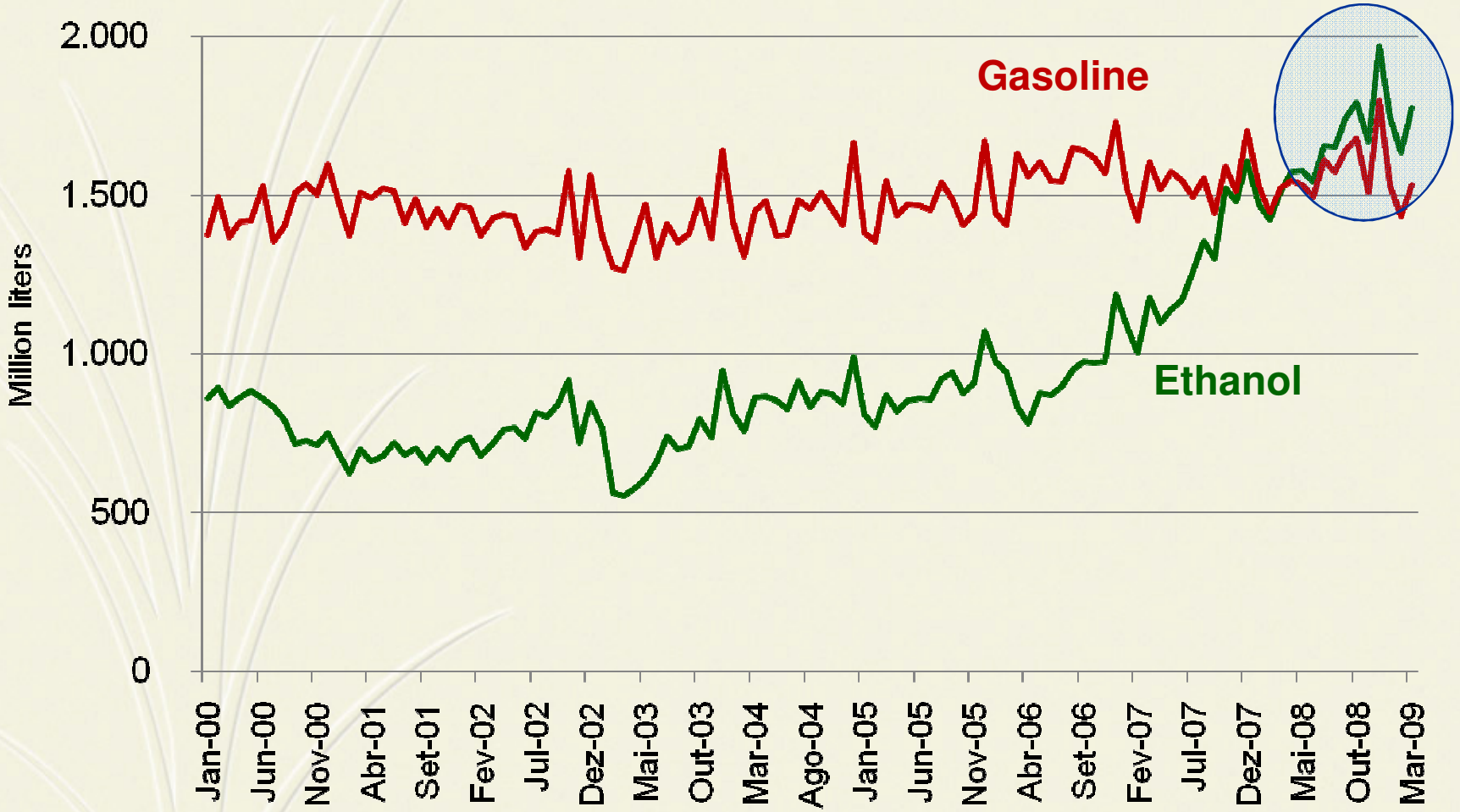
GASOLINE AND ETHANOL CONSUMPTION IN BRAZIL



Source: ANP and UNICA.

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ETHANOL USE: NOT LIMITED TO PASSENGER CARS

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

Flex-fuel motorcycles
Honda 150 cc Flex in the market

Bio-plastics (PHB, polyethylene, PVC)

Brazilian-made crop dusting planes running on ethanol

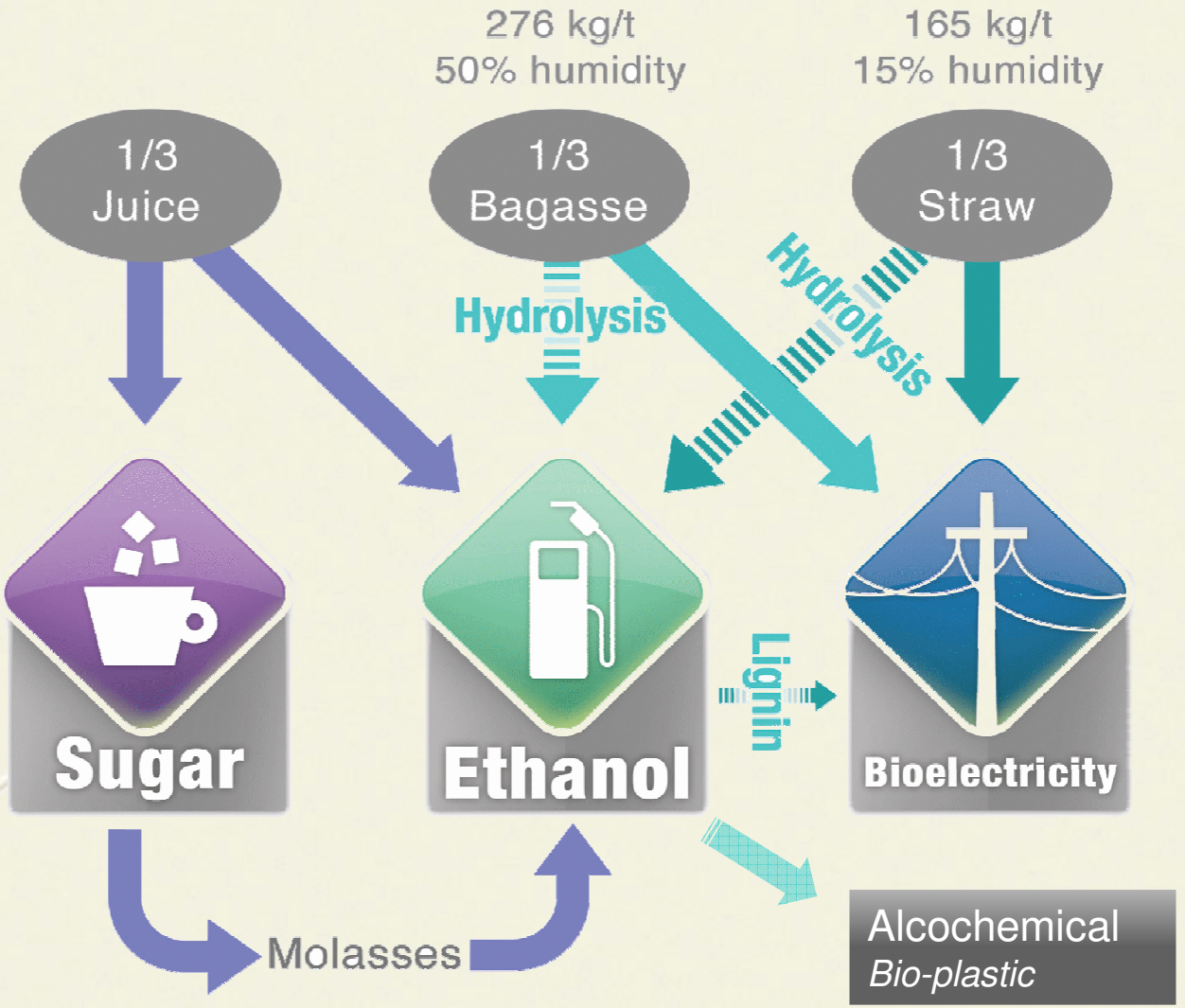
Production of diesel from sugarcane at commercial scale after 2010

Biobutanol

Bioelectricity: sugarcane's next frontier

BREAKDOWN OF SUGARCANE'S ENERGY

Energy equivalent of 1 ton of sugarcane = 1.2 oil barrel



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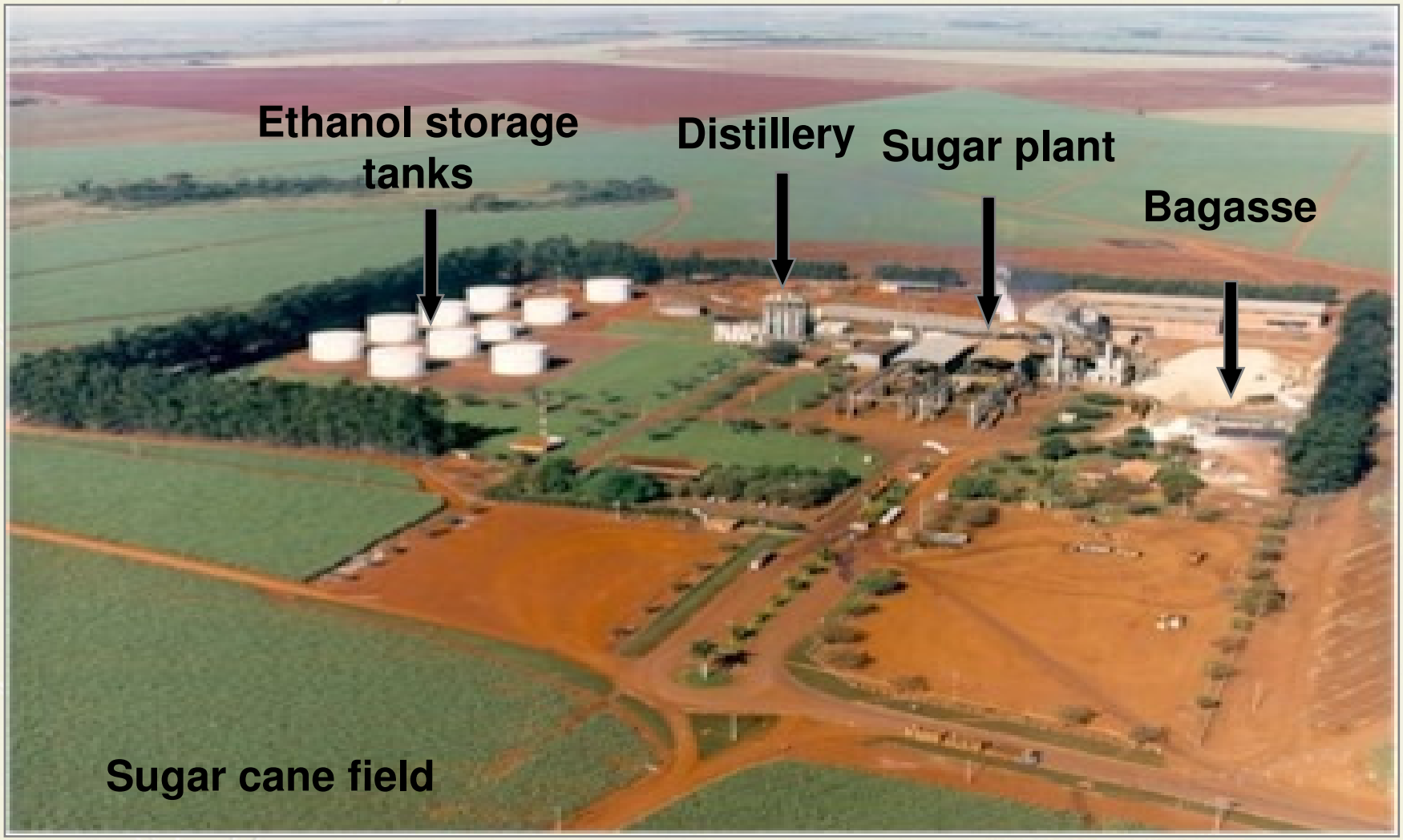
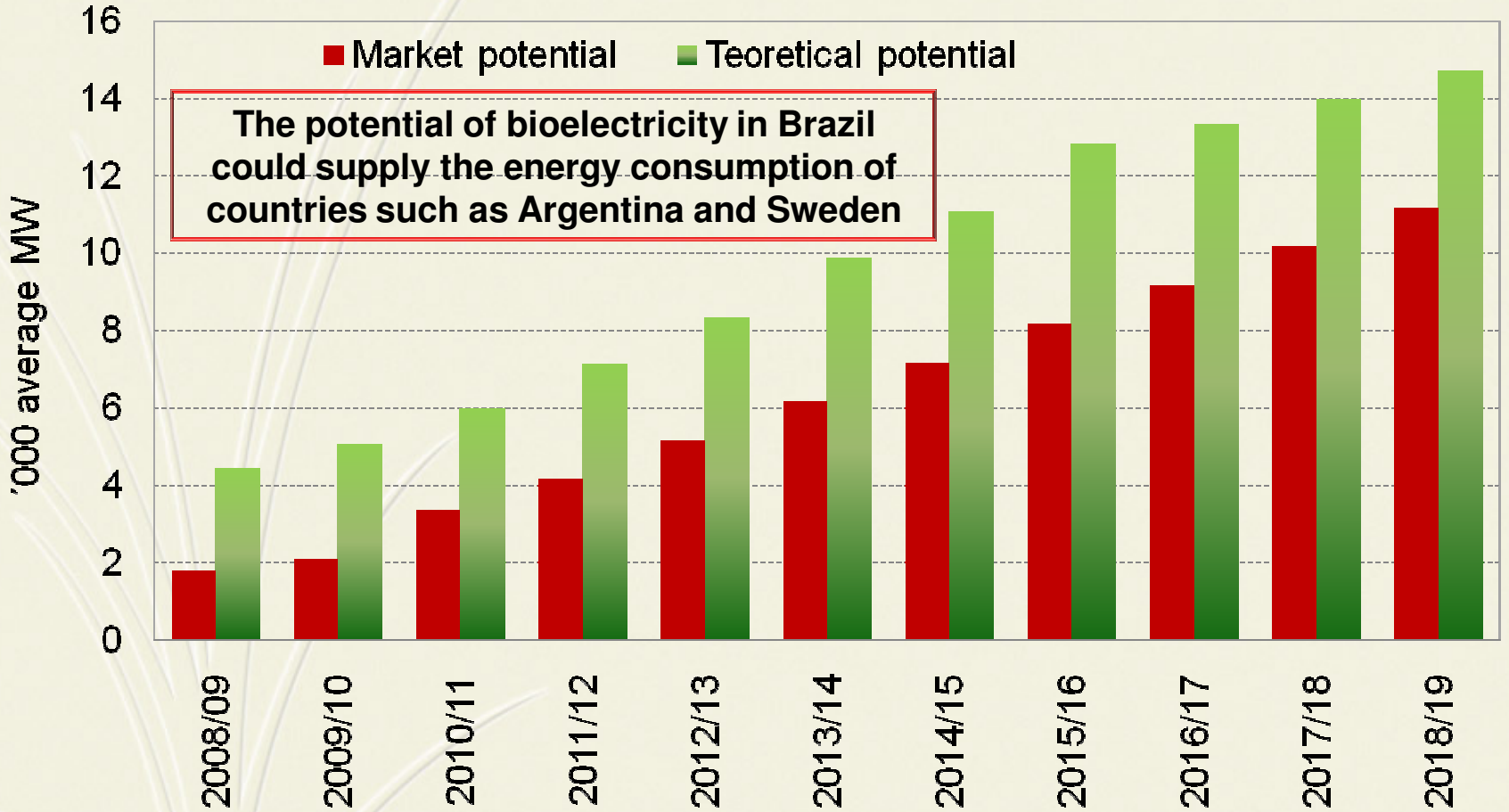
A SUGAR, ETHANOL & BIOELECTRICITY PLANT IN BRAZIL



BIOELECTRICITY: POTENTIAL IN BRAZIL



Notes: 1 ton of sugarcane produces 250 kg of bagasse and 204 kg of straw, 1 ton of sugarcane (bagasse + straw) generates 199,9 KWh for exporting; the straw inferior calorific value = 1,7 bagasse inferior calorific value; capacity factor = 0,5 (Koblitz). It is assumed that 75% of the bagasse is used for cogeneration. The percentage of straw use starts at 5% (2008) going up to 70% (2015) . Until 2010 the potential market prediction consider the regulated energy auctioning; for 2011 an increase of 1600 MW is assumed, for subsequent years a 2000 MW increase per year is assumed. Source: Cogen, UNICA.

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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,

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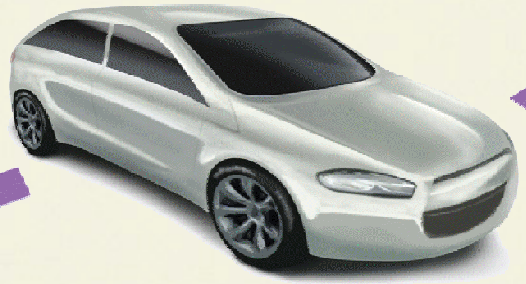
BREAKDOWN OF SUGARCANE'S INTEGRATED ENERGY SYSTEM

+495 mln tones



22.5 bln liters

Ethanol

Bioelectricity

+ 3.000 MW

Bagasse

Sugar

31 mln tones

Note: value s refers to 2007/08 crop season

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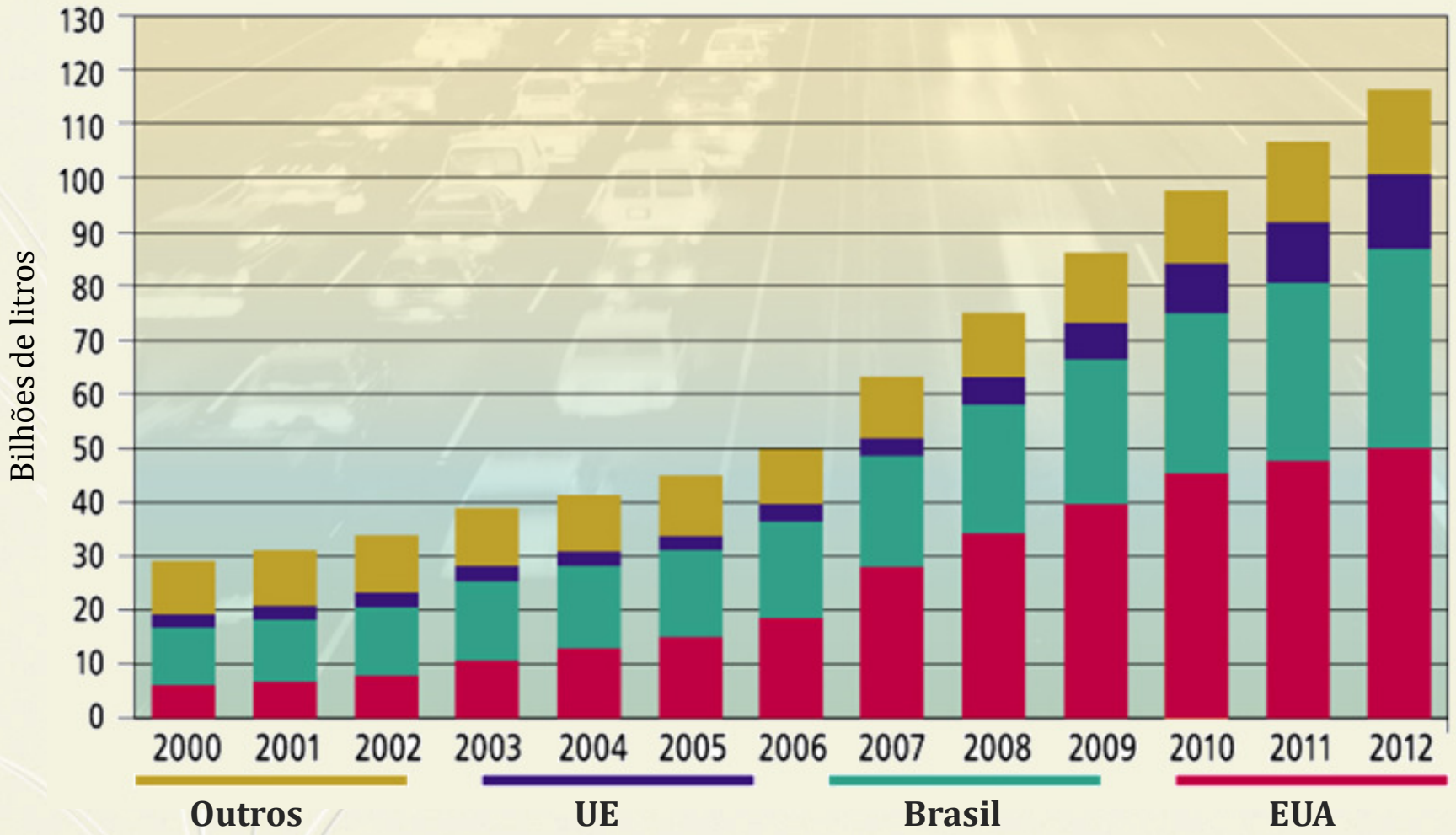
Perspectives for international market

PRODUÇÃO MUNDIAL DE ETANOL

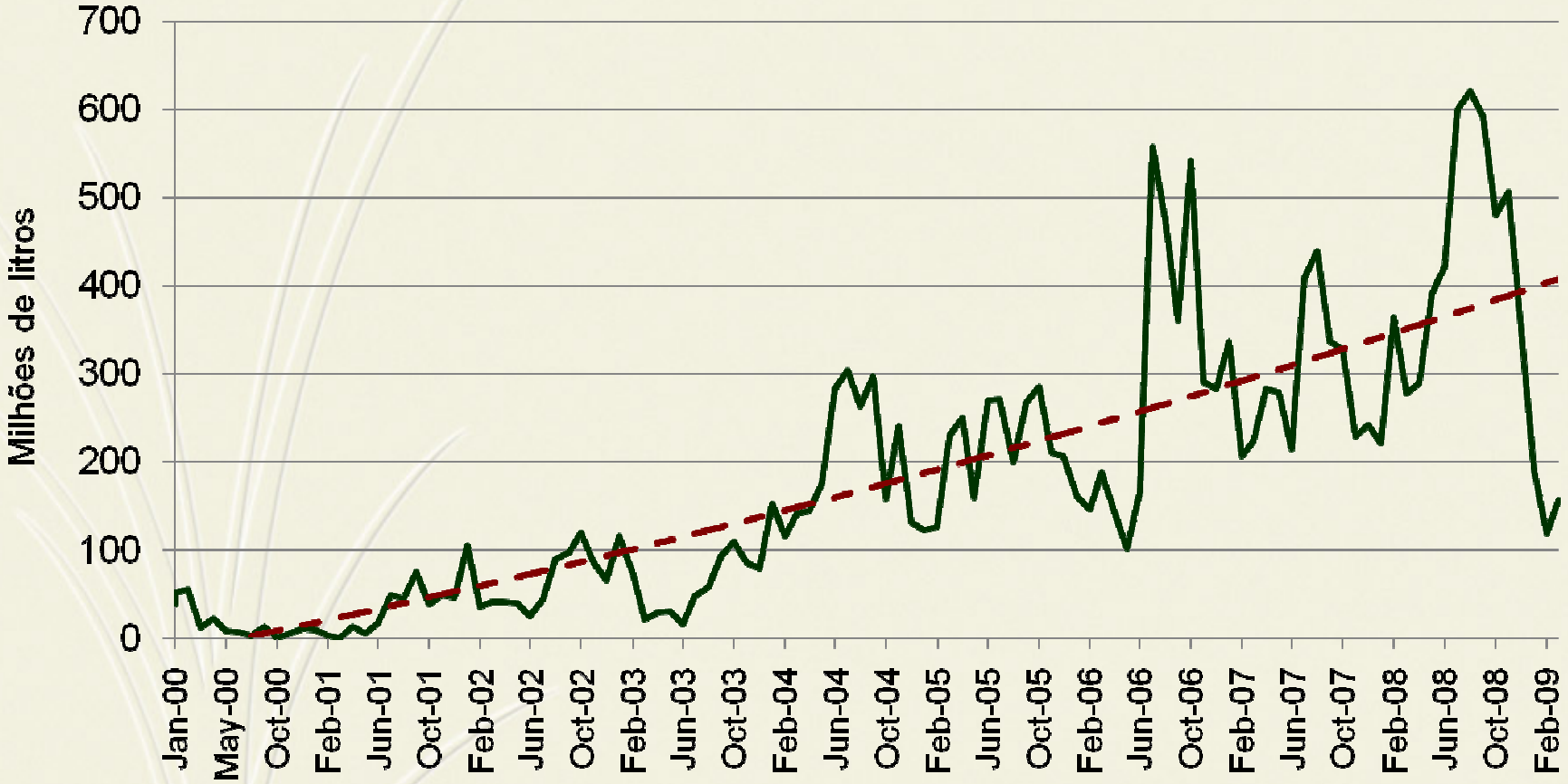


Nota: projeções para 2008/2012 baseadas na capacidade de produção e metas de consumo nos principais países. Fonte: Fapri, Acti, FO Licht, Unica e Toepfer. Elaboração: UNICA.

SHARE OF ETHANOL EXPORTS IN THE WORLD ETHANOL PRODUCTION

Sources: F.O.Licht, Secex, USITC, European Commission, LMC. Elaboration: UNICA. Note: 2008* - preliminary results.

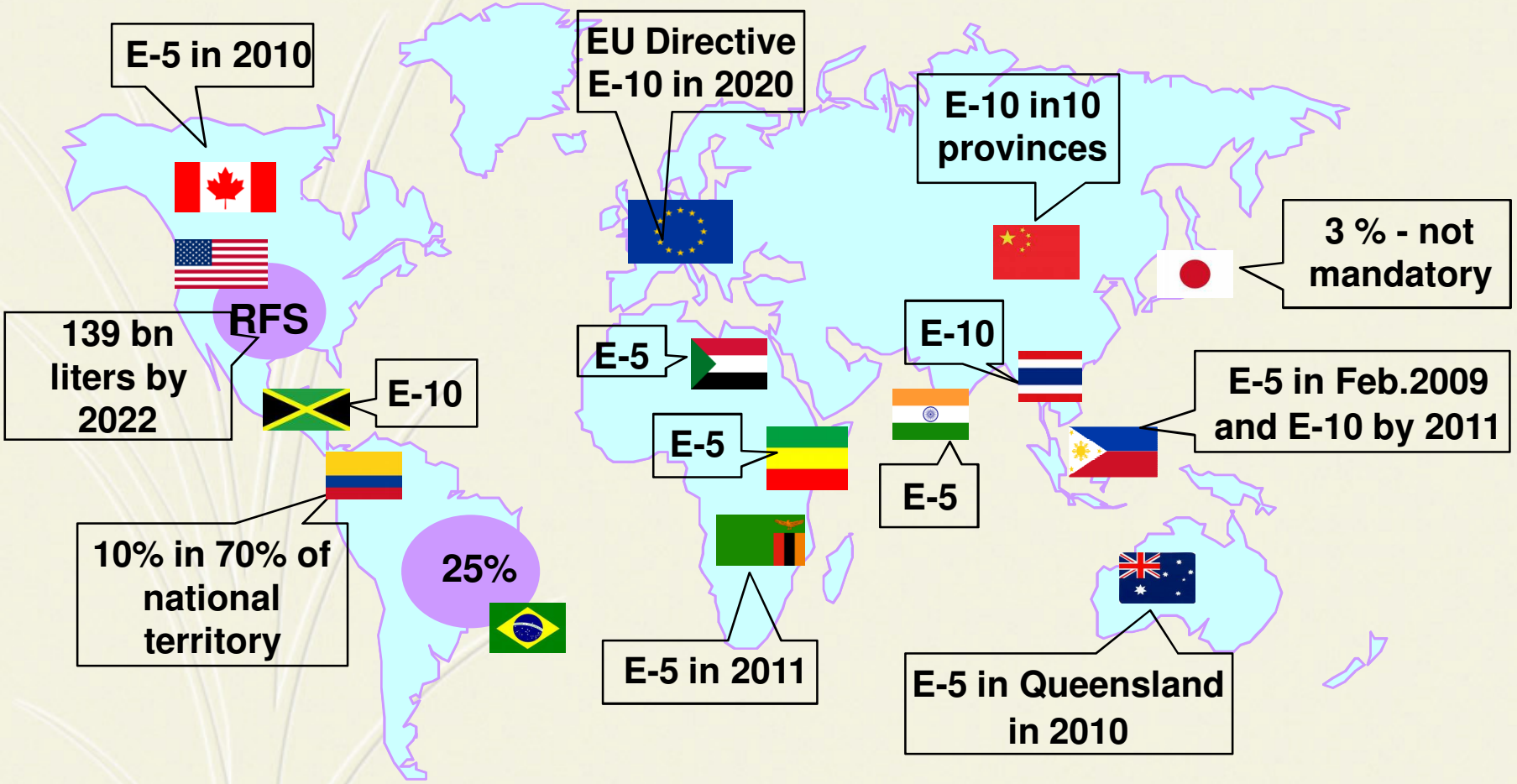
BRAZILIAN ETHANOL EXPORTS



Despite the small and volatile international market, Brazilian exports have presented a continuous trend of growth

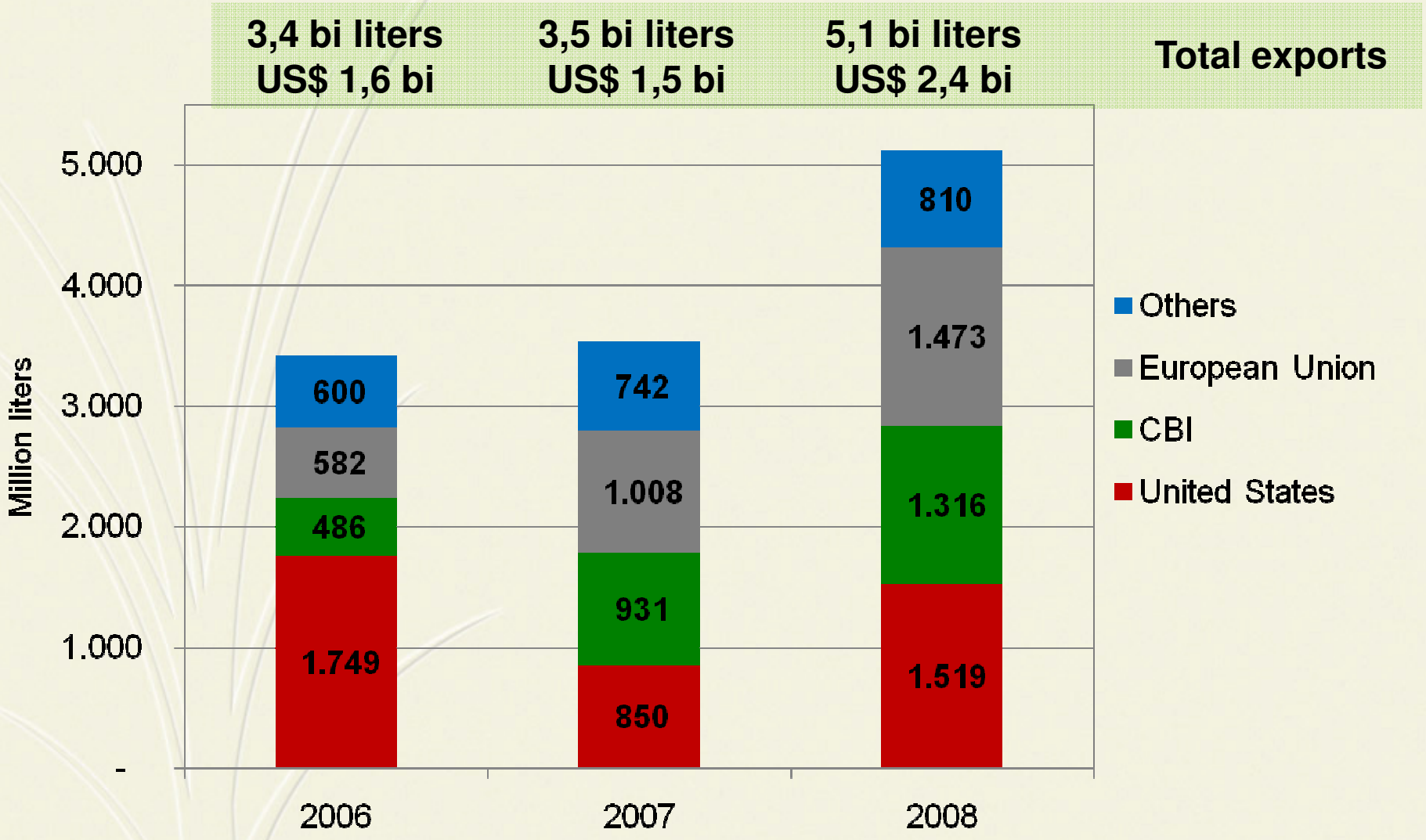
Fonte: Secex. Elaboração: UNICA

PUBLIC POLICIES FOR ETHANOL - MANDATORY BLEND



Source: JOLLY, Lindsay - Future Trends in World Food Security; WSRO Annual Meeting 2008 ; F.O.Licht and LMC International

BRAZILIAN ETHANOL EXPORTS BY DESTINATIONS



Source: SECEX. Elaboration: UNICA

SOME INSIGHTS ON THE U.S. MARKET

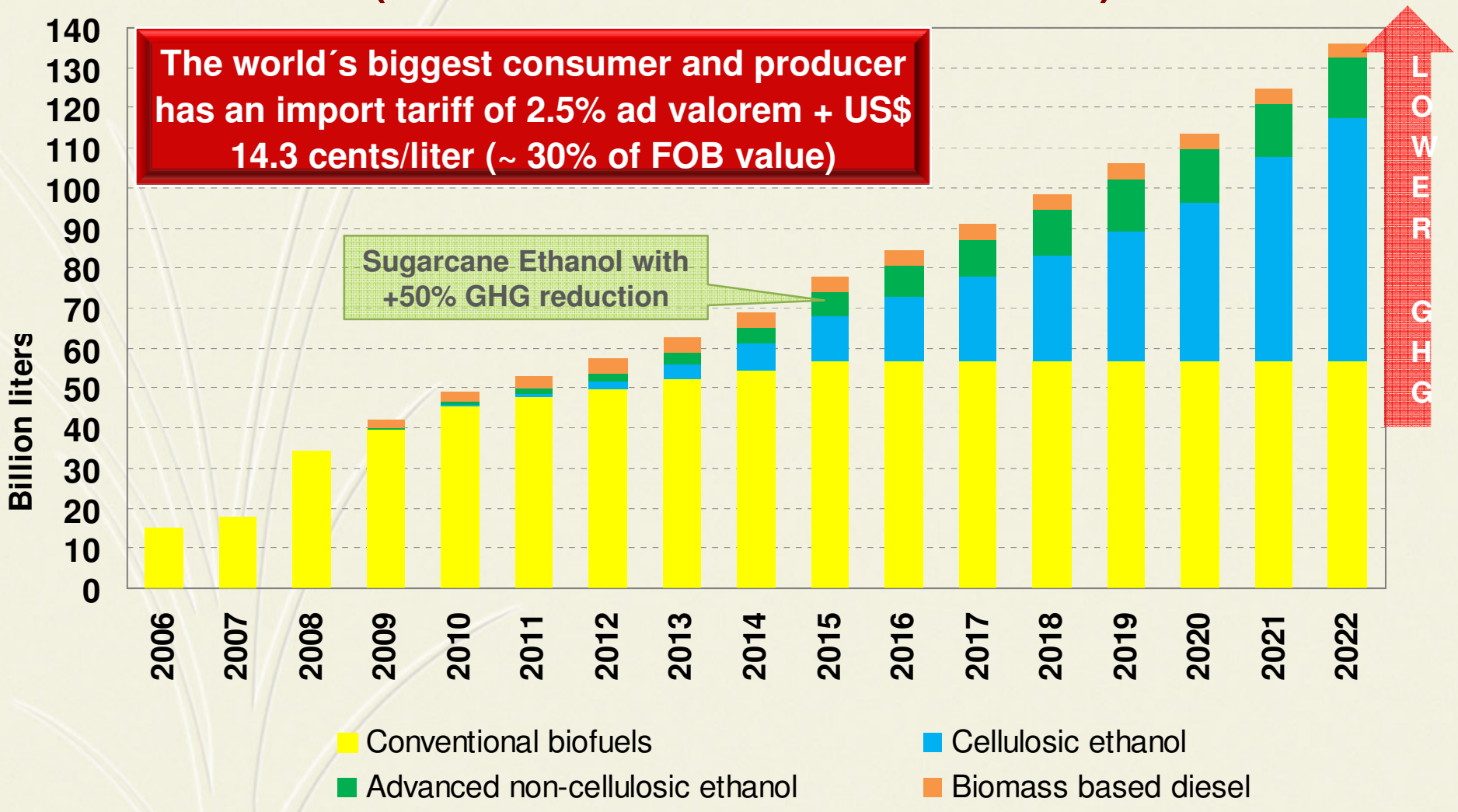
Largest ethanol producer and consumer in the world

- Consumption of 135 billion liter by 2022

Main issues

- Import tariff of US$ 0.54/galon (or US$ 14 cents/liter)
- Important debate for the implementation of the Renewable Fuels Standard (RFS)

ETHANOL CONSUMPTION IN THE U.S.
(RFS - Renewable Fuels Standard)



Source: RFS Legislation. Elaboration: UNICA

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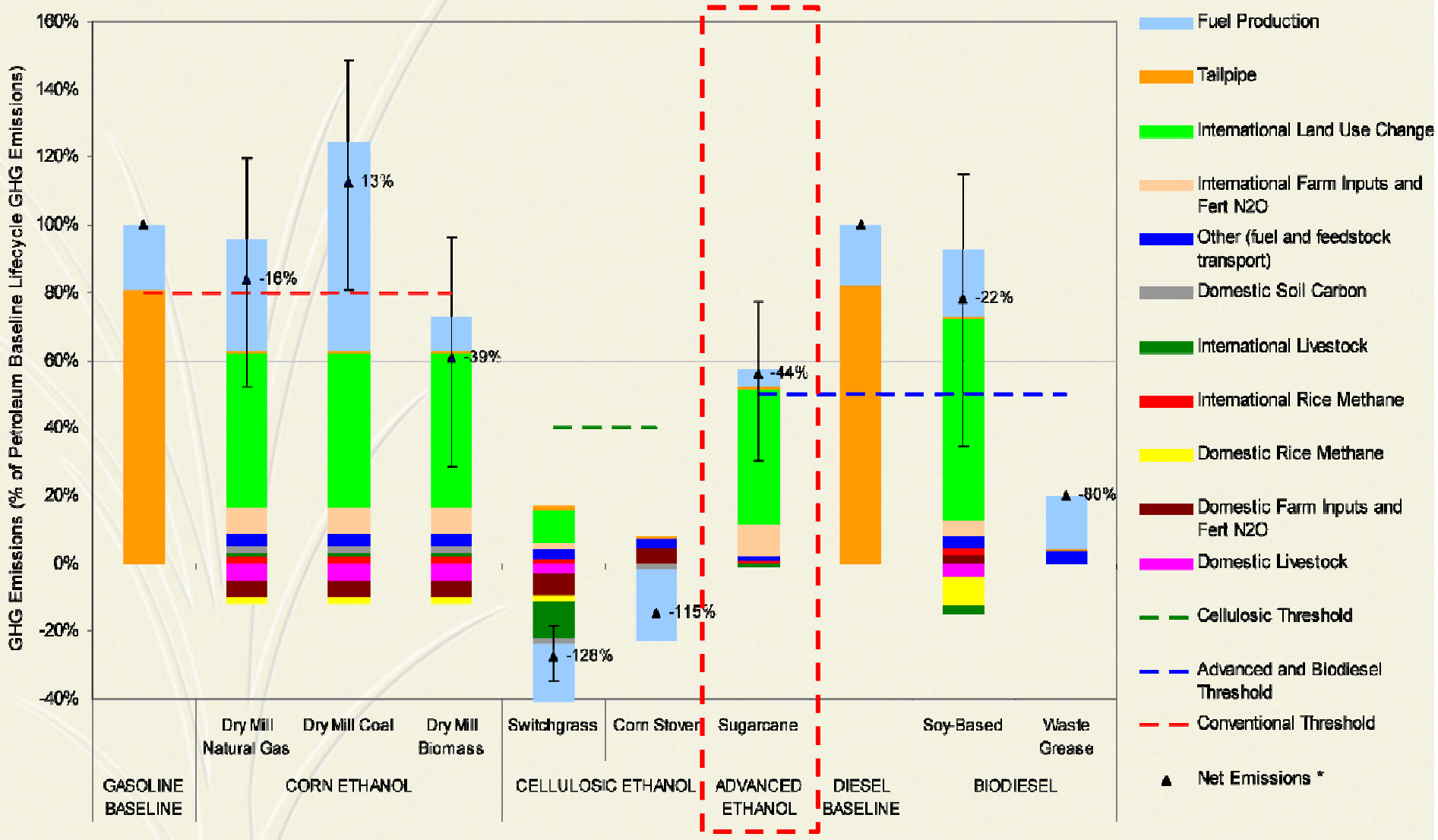
EPA: "INDIRECT LAND USE" EFFECT



Source:s See Figure 2.1-2, "Lifecycle GHG Results Using 100-Year Net Present Value with 2% Discount Rate" in page 282 of Discussion Draft of Environmental Protection Agency (EPA) Regulatory Impact Analysis, May 2009. Range shows net emissions if EPA assumes all land conversion from forest (upper bound) and all from grassland (lower bound).

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EU Perspectives for ethanol consumption

Mandatory target

- Second largest potential market in the world
- 10% of renewable energies in the transport sector by 2020

Issues

- EU ethanol tariff (EUR 0.19/liter)
- Some concepts of the sustainability criteria still to be clarified

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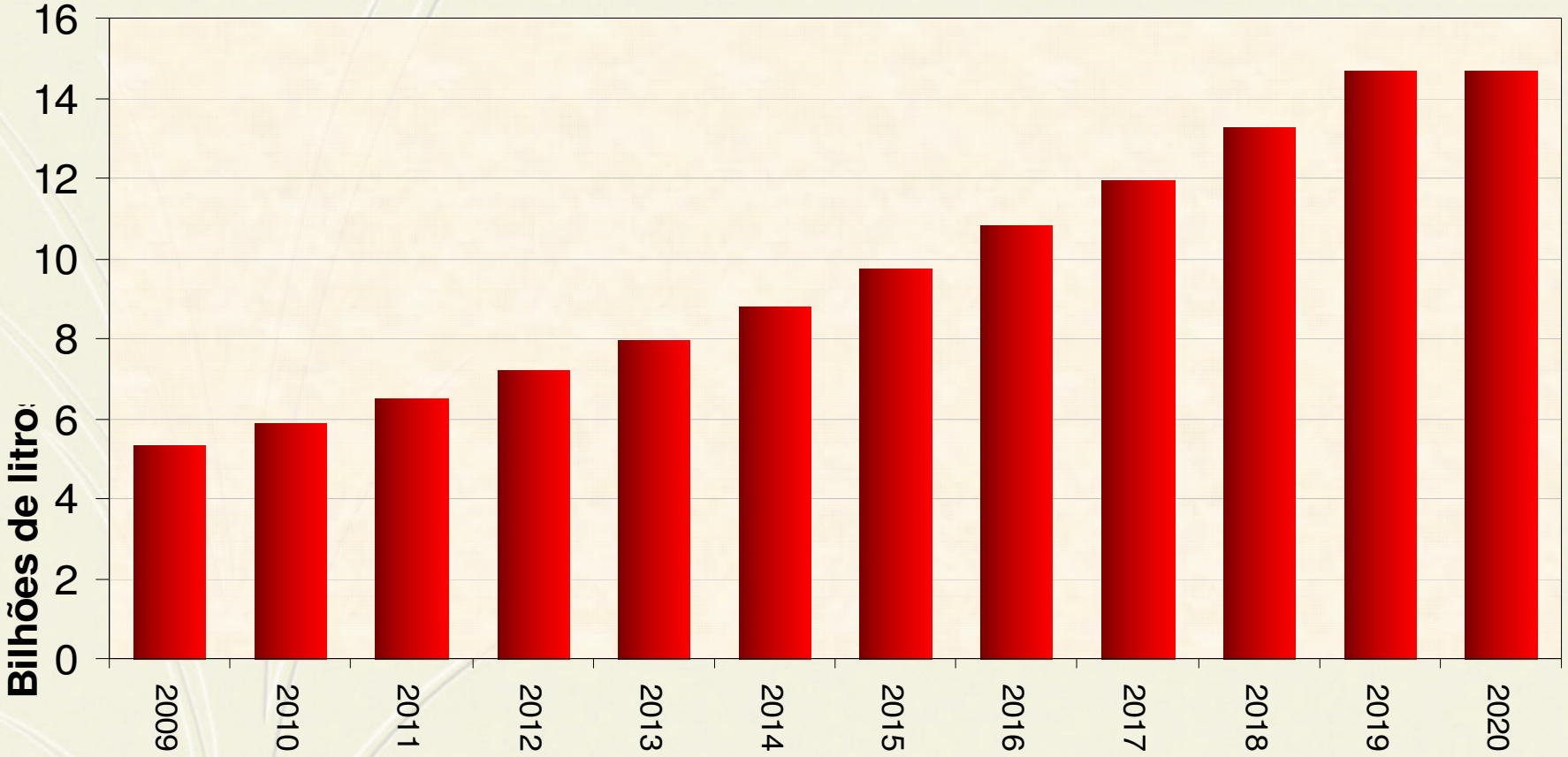
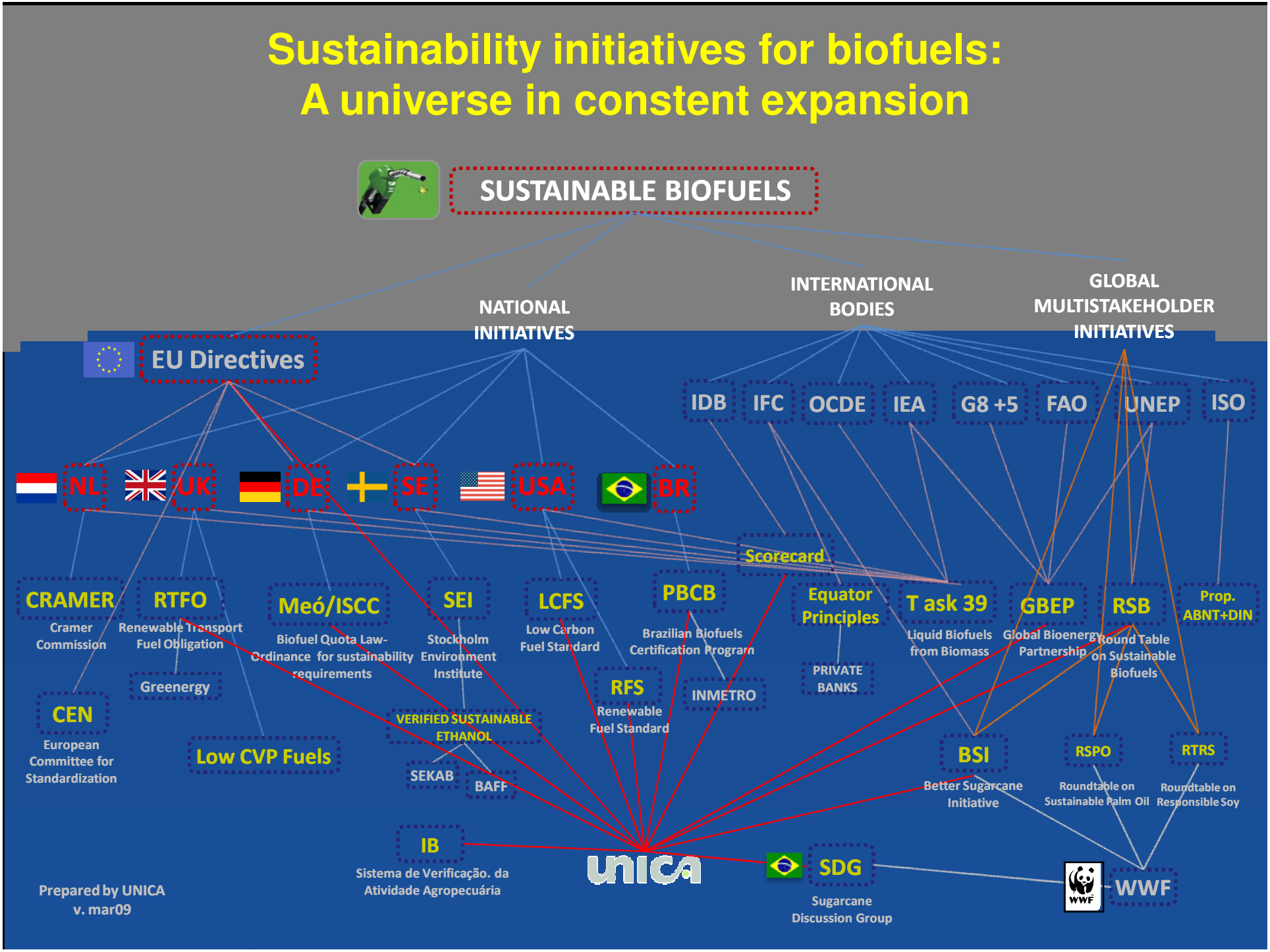
POTENTIAL CONSUMPTION OF ETHANOL IN THE EUROPEAN UNION



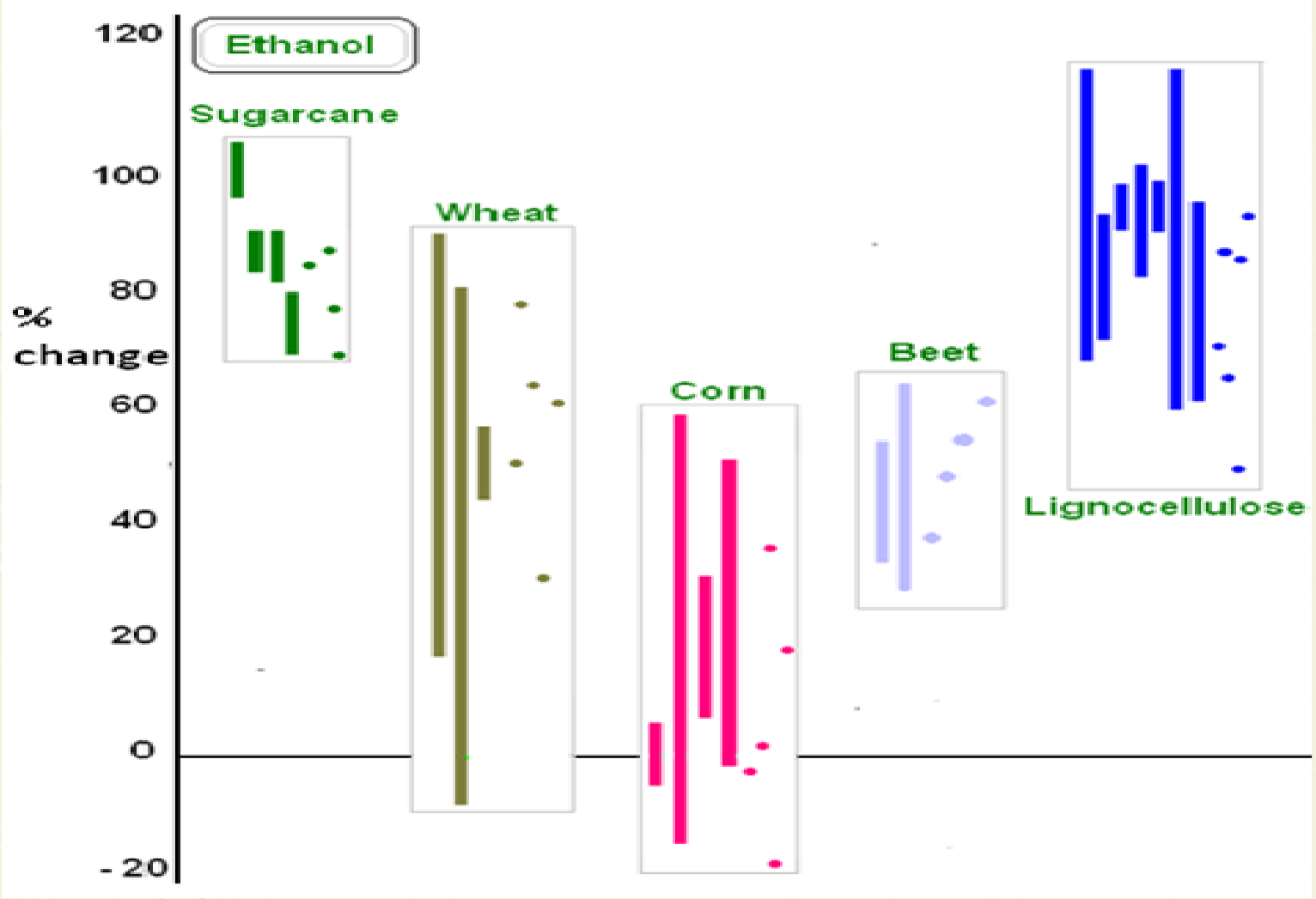
Source: Eurostat e CERA. Elaboração: UNICA. Nota: dados a partir de 2008 são projeções. Demanda potencial de etanol calculada sob o consumo de gasolina informado pelo Eurostat e projetado pelo CERA, considerando percentual de adição de etanol à gasolina de 4%, em volume.

Sustainability initiatives for biofuels: A universe in constent expansion



Ethanol:
an instrument for climate change mitigation

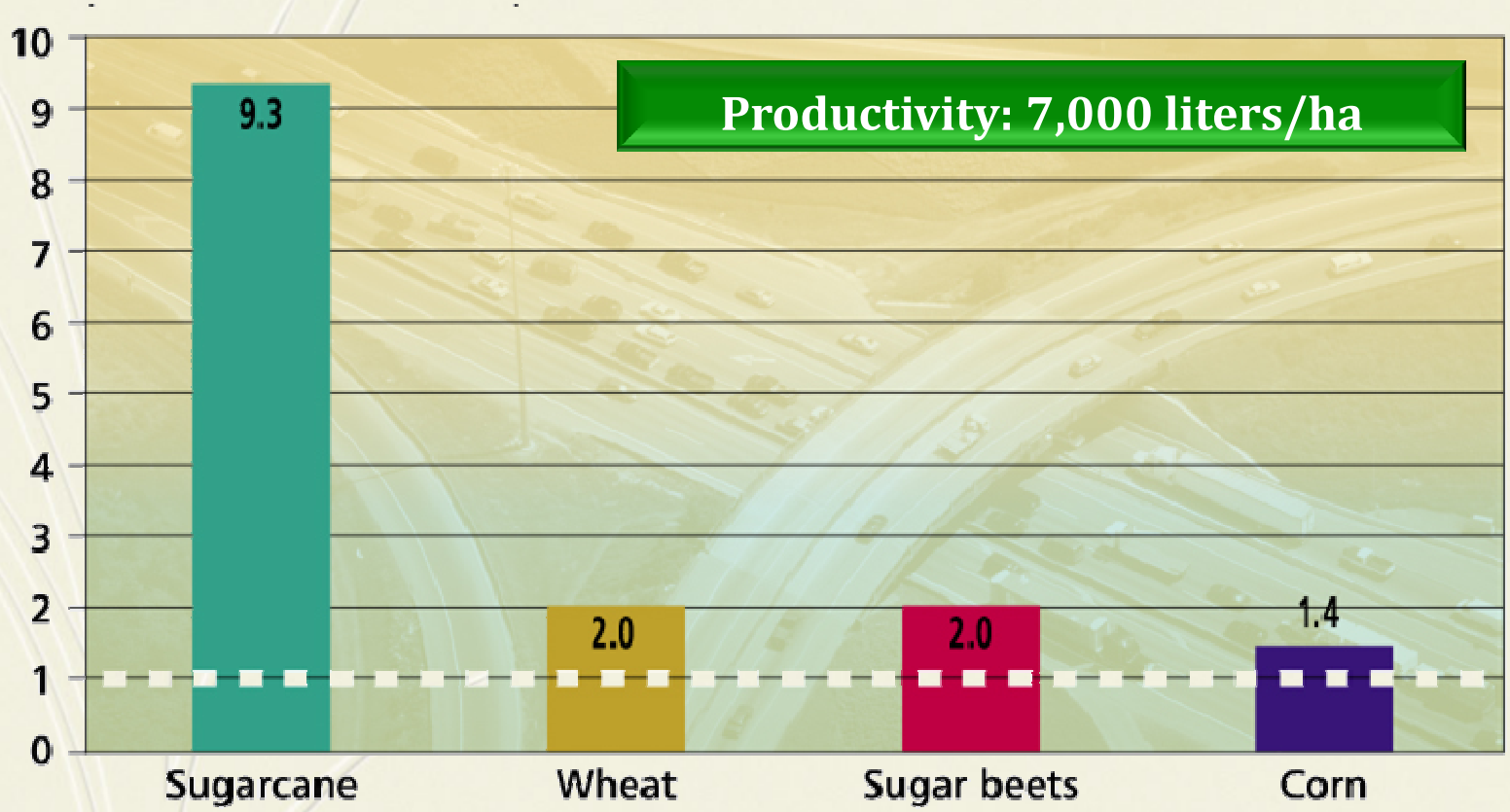
MITIGATING GLOBAL WARMING



Note: Reduction of GHG emissions avoided from unit of ethanol compared to gasoline, calculated on a life-cycle basis. Source: IEA and UNEP for OECD (2008), Economic assessment of biofuel support policies, based on a review of recent articles.

Energy Balance

Data represent the amount of energy contained in ethanol per unit of fossil fuel input.



Note: *estimated data*
Source: *World Watch Institute (2006) and Macedo et al (2008).*
Data compiled *by Icone and Unica*

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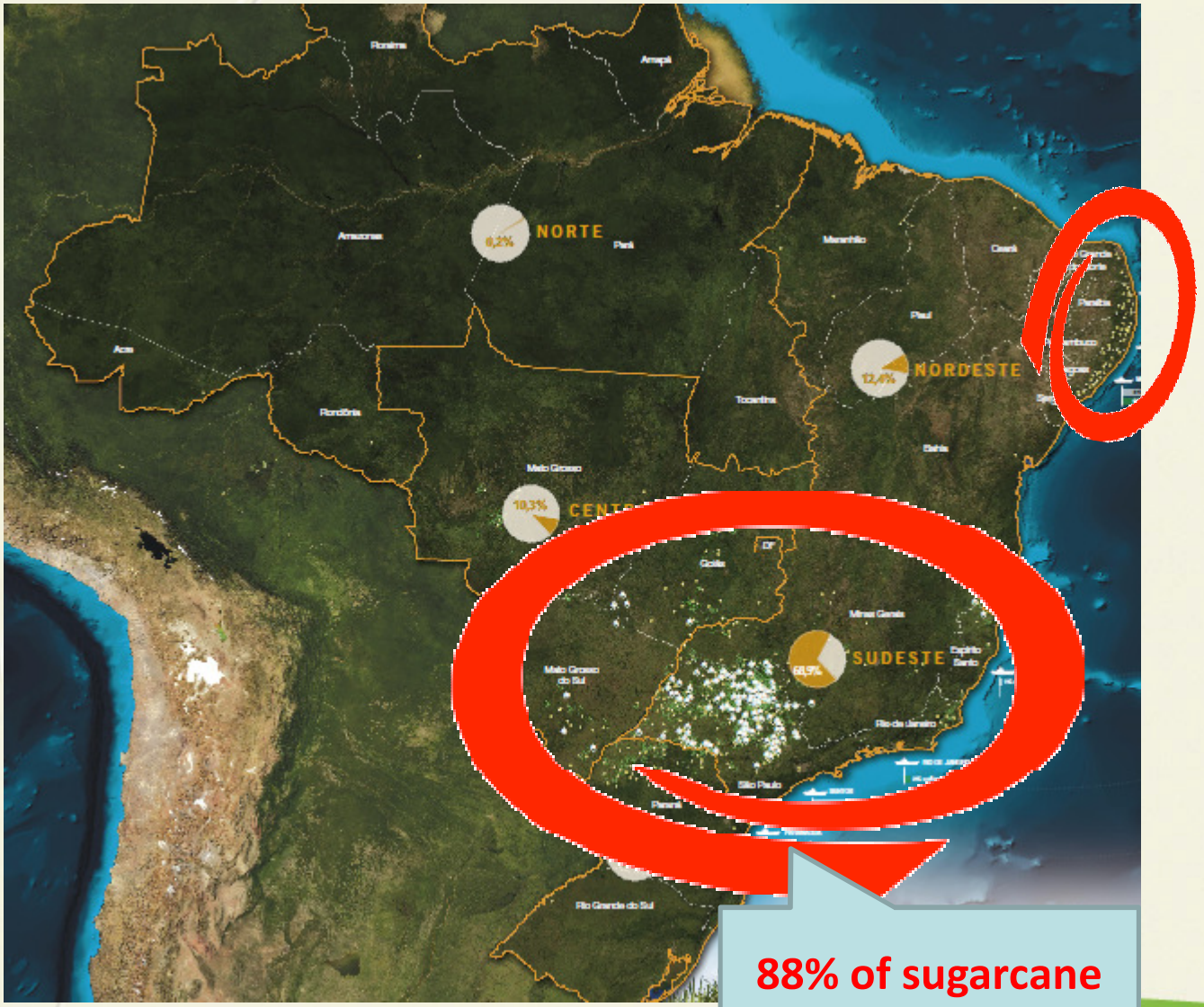
Where sugarcane is grown



88% of sugarcane production

Sources: NIPE-Unicamp, IBGE and CTC

… 1% OF ARABLE LAND DISPLACES 50% GASOLINE

Millions of Hectares (2007)		% total land	% arable land
BRAZIL	**851**		
TOTAL ARABLE LAND	**354.8**		
1. Total Crop Land	**76.7**	***9.0%***	***21.6%***
Soybean	20.6	*2.4%*	*5.8%*
Corn	14.0	*1.6%*	*3.9%*
Sugarcane	7.8	*0.9%*	*2.2%*
Sugarcane for ethanol	**3.4**	***0.4%***	***1.0%***
Orange	0.9	*0.1%*	*0.3%*
2. Pastures	**172.3**	***20%***	***49%***
3. Available area **Total arable land – (crop land + pastures)**	**105.8**	***12%***	***30%***

Sources: IBGE, UNICA

A CARBON ABSORBING MACHINE?

SUGARCANE *X* PASTURES: CARBON UPTAKE **Annual tons carbon per hectare**

Source: Brazilian Center for Biofuels (www,polobio,esalq,usp,br Weber Amarall - from various sources),

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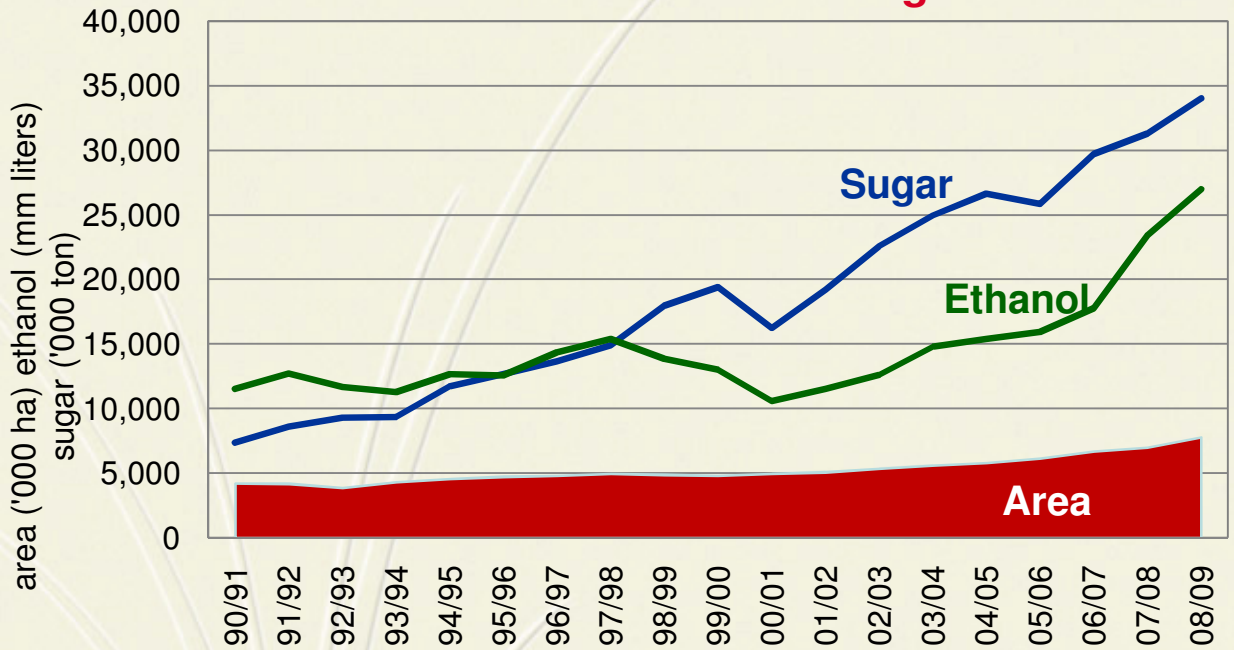
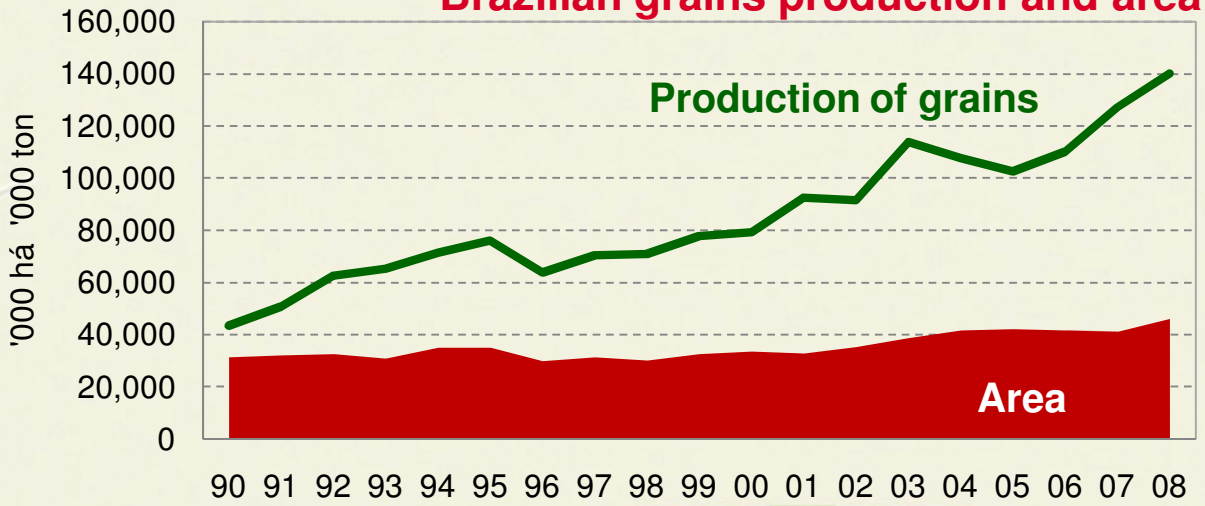
Brazilian sugar and ethanol production and area



While sugarcane area increased 85% since 90/91, ethanol has increased 130% and sugar around 350%

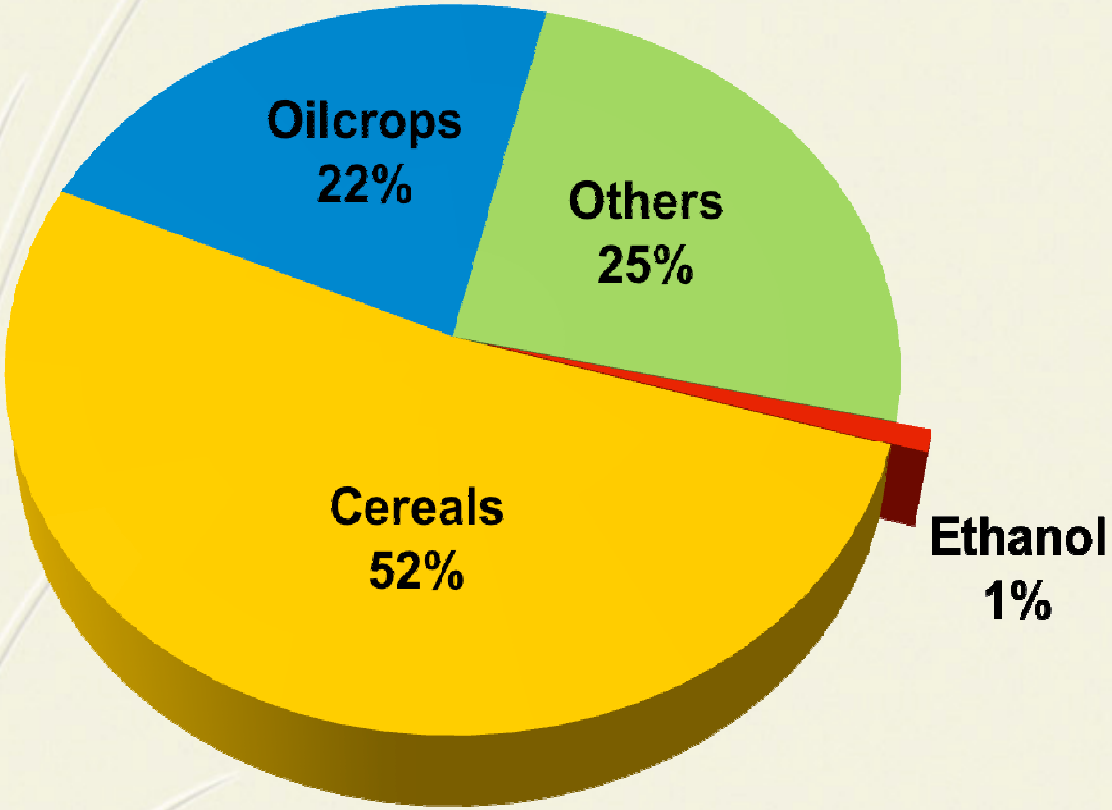
Brazilian grains production and area



Production of food doubled in the last decade and more than tripled since 90/91, mainly due to yield gains

Source: IBGE (2007) and UNICA. Elaboration: UNICA.

WORLD LAND USE



The world's total harvested agricultural area is 1.4 billion hectares.
Only 15 million hectares are devoted to ethanol production.

Note: "Others" include the harvested area for the remaining crops like fruits, fibers, nuts, pulses, roots and tubers, spices and other vegetables. Source: FAO, F.O. Licht, Datagro, USDA, EC, UNICA

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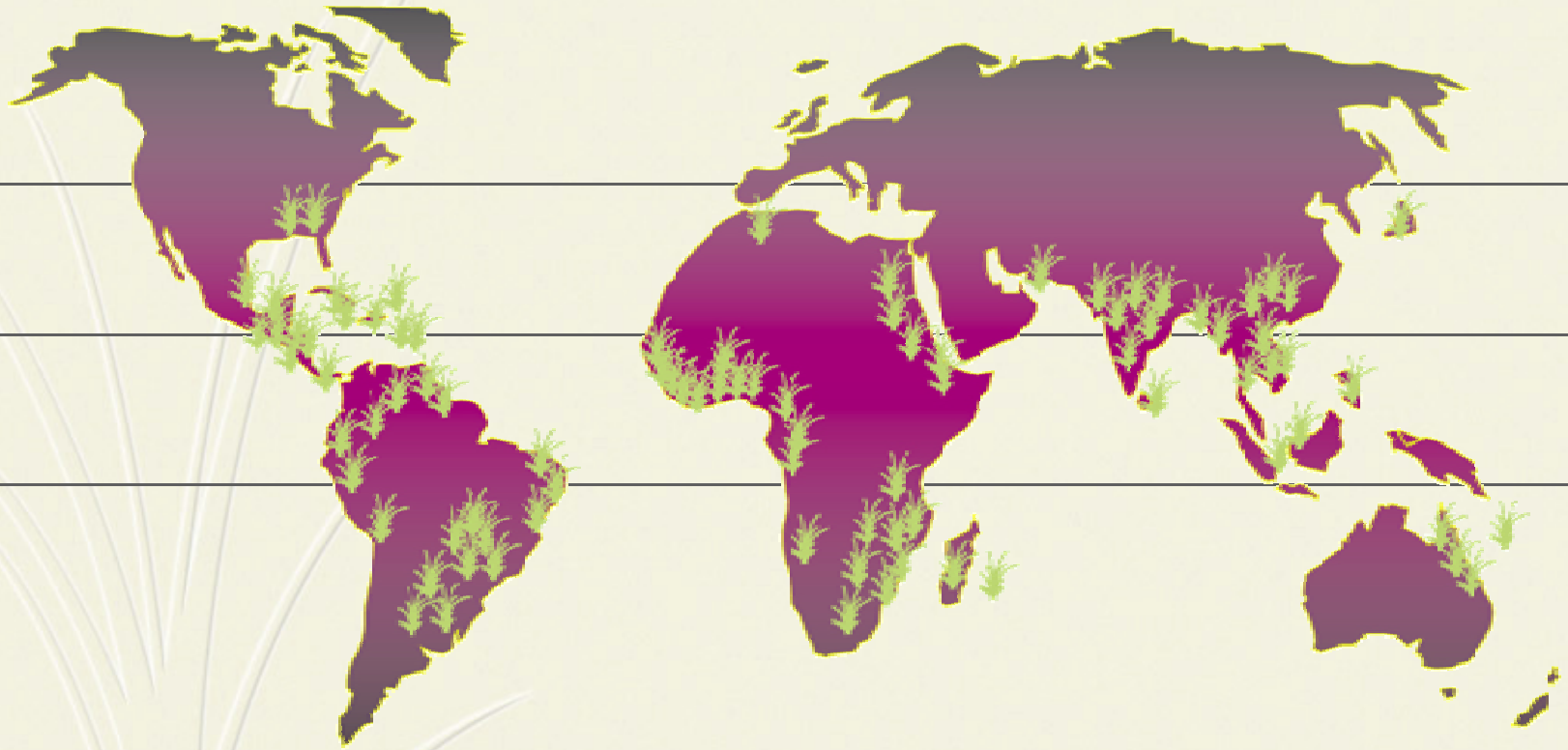
SUGARCANE ETHANOL: A TOOL FOR DEVELOPMENT



Ethanol production in 100 countries
are sugarcane producers and could produce ethanol

Source: British Sugar

UNICA:
Some actions towards higher sustainability and better communication

Some of UNICA´s actions on Sustainability

– Green Protocol;

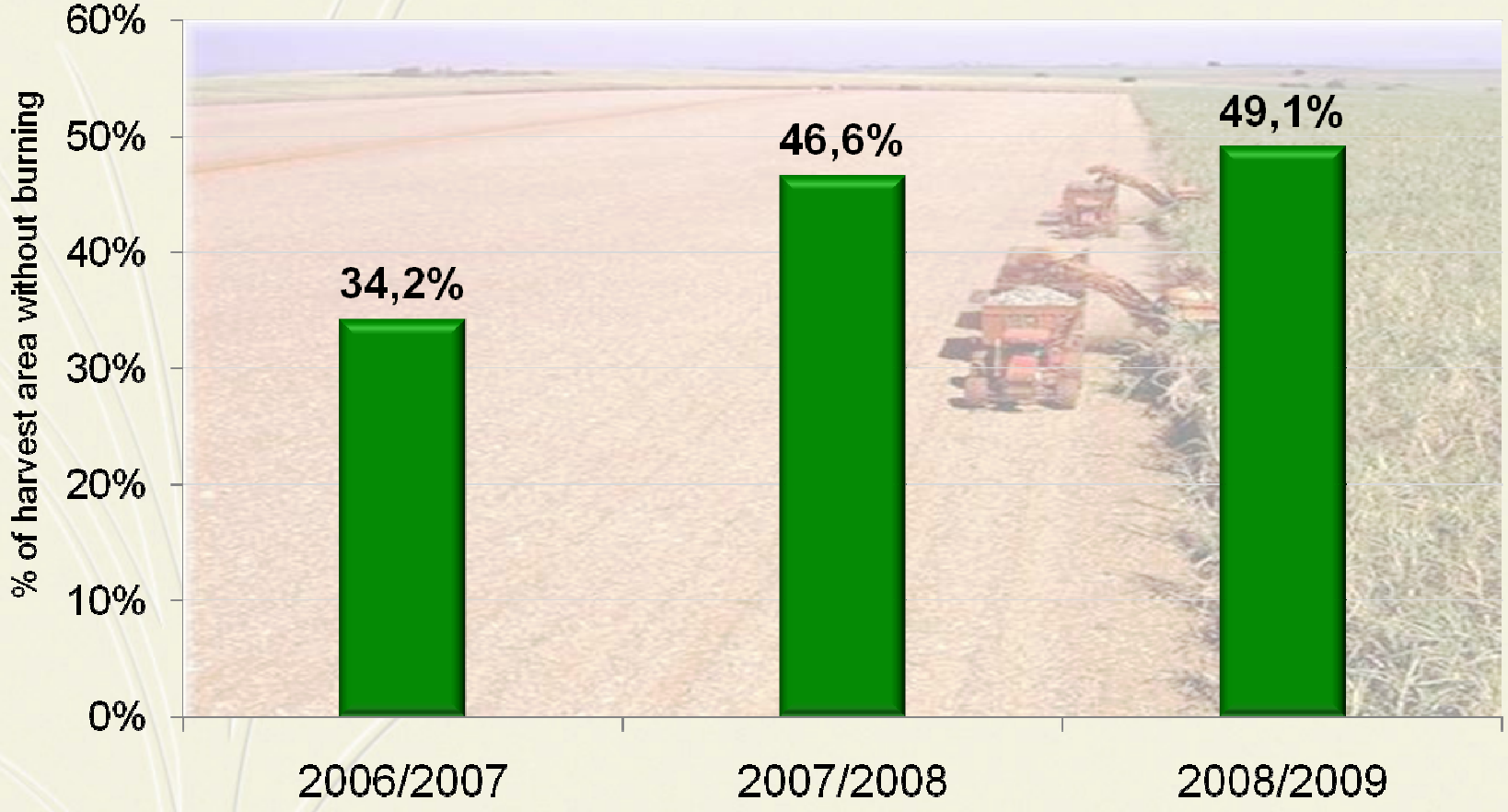
The Green Protocol in São Paulo State

- **Signed between the São Paulo state government and UNICA in June 2007.**
- **Mills and sugarcane suppliers are involved**

Protocol Guidelines

- **Elimination of sugarcane straw burning by 2014. 49% of the harvest is already mechanized**
- **Protection of river side woods and recovering of those near water streams (APPs)**
- **Adoption of technical plans for soil conservation and water resources**
- **Measures to reduce air emissions**
- **New sugarcane areas must be harvested mechanically.**

MECHANIZED HARVEST IN THE STATE OF SÃO PAULO



Source: INPE, UNICA and SMA.

Some of UNICA´s actions on Sustainability

- Green Protocol;
- Training and Requalification Program for cane-cutters;

Programa renovAção

Objective: Train and requalify 7,000 workers and community members per year for jobs in the sugar mills and ethanol plants and to work in other sectors, as an answer to the process of mechanizing the sugarcane harvest to eliminate burning.

Training courses for the sugar-energy sector	**Retraining courses for other sectors***
Sugarcane field operator	Beekeeping and reforestation
Harvester operator	Horticulture
Harvester electrician	Handicrafts
Truck electrician	Information Technology
Harvester mechanic	Seamstress
Tractor mechanic	Civil construction
Tractor electrician	Hotel labor
Welder	Tourism

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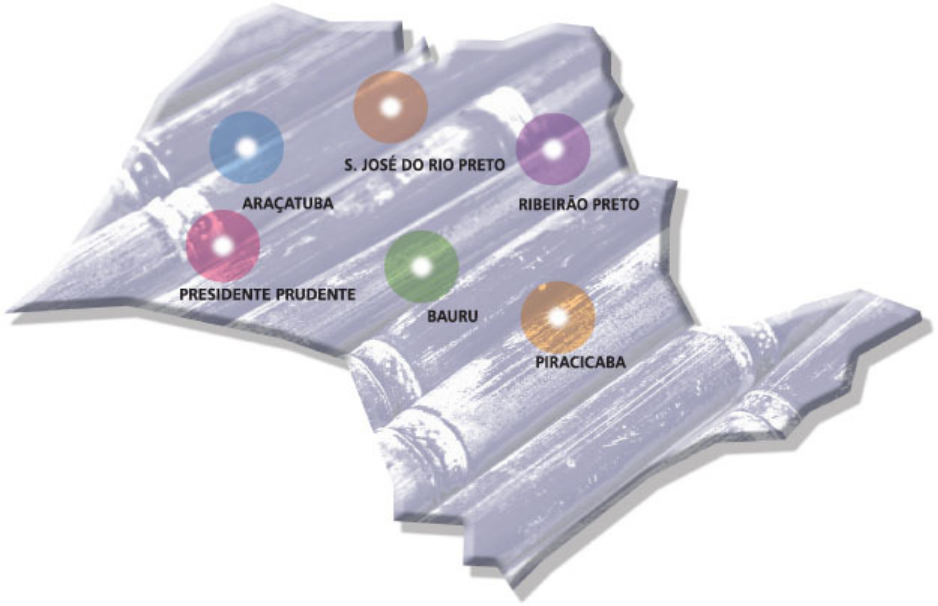

COORDENAÇÃO / COORDINATION

UNIÃO DA INDÚSTRIA DE CANA-DE-AÇÚCAR
ETANOL • AÇÚCAR • ENERGIA SÃO PAULO • BRASIL

FERAESP CUT

PATROCÍNIO / SPONSORS

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APOIO / SUPORT

Banco Interamericano de Desenvolvimento (BID)
Interamerican Development Bank (IADB)

Some of UNICA´s actions on Sustainability

- Green Protocol;
- Training and Requalification Program for cane-cutters;
- Labor Protocol of Brasilia
- Active member of many roundtables on sustainability (Better Sugarcane Initiative and Roundtable for Sustainable Biofuels)

Better Sugarcane Initiative - BSI

What is

- Multistakeholder forum
- ~ 100 institutions and specialists

retailers, investors, traders, producers and NGOs

BSI

Better Sugarcane Initiative

OBJECTIVES

- Sustainable sugarcane production by establishing principles and criteria that are applied in the sugar growing regions of the world through regionally specific strategies and tools.
- Encouragement of better management practices (BMP's),

STRUCTURE (GOVERNANCE)

Steering Committee
Driver process

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Technical working groups
Propose draft standards

- **Production** *agriculture and environment*
- **Cane processing** *Products and co-products*
- **Social / Community**

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Some of UNICA´s actions on Sustainability

- Green Protocol;
- Training and Requalification Program for cane-cutters;
- Labor Protocol of Brasilia
- Active member of many roundtables on sustainability (Better Sugarcane Initiative and Roundtable for Sustainable Biofuels)
- Global Reporting Initiative

Global Reporting Initiative (GRI)

- **The Global Reporting Initiative (GRI) is a network-based organization that has pioneered the development of the world's most widely used sustainability reporting framework and is committed to its continuous improvement and application worldwide.**

- **UNICA is the first business association to release a (checked) sustainability GRI reporting framework in Brazil, and the first agribusiness association in the world to do so**

http://english.unica.com.br/multimedia/publicacao/

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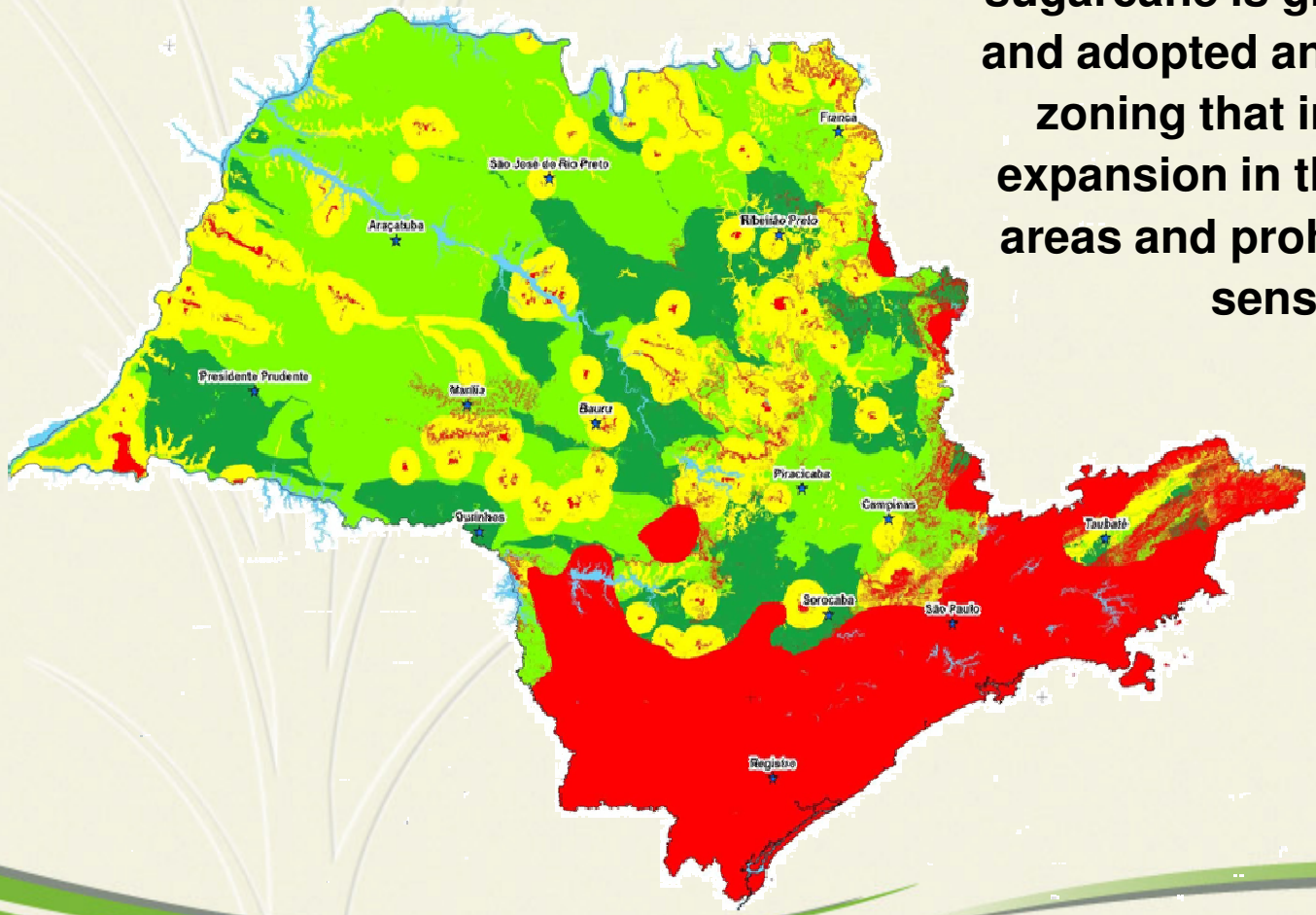
SUGARCANE AGRO-ENVIRONMENTAL ZONING IN SÃO PAULO STATE



São Paulo State, where 60% of sugarcane is grown, has performed and adopted an agro-environmental zoning that induces sugarcane expansion in the most appropriate areas and prohibit new planting in sensitive areas

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sugarcane
ethanol
the smart choice

PUBLICITY CAMPAIGN IN USA

✓ **When**

- Opportunity of the 4th Juy holiday

✓ **Focus**

- Consumers and policy markers
- Import tariff cut

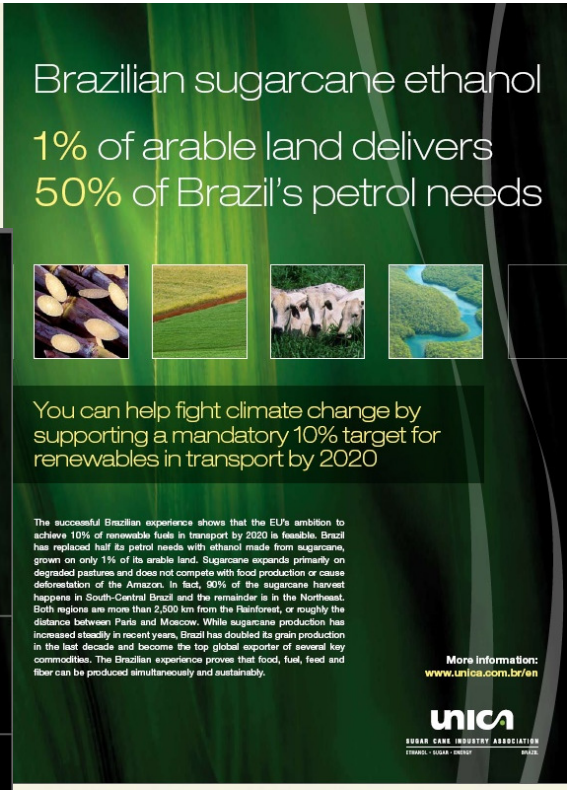
✓ **Media**

- ***Orlando Sentinel*** (Flórida) – 213.400 / day
- ***Sacramento Bee*** (Califórnia) – 264.410 / day
- ***Roll Call*** (Washington, DC) – Congress
- ***RADIO:***
  - ➢ Flórida: 24 radio stations, 239 insertions
  - ➢ Califórnia: 31 stations, 244 insertions

This campaign was awarded with the *Bulldog Reporter Award* (PR)

CAMPAIGN IN EUROPE

- **When**
  - June to November
- **Focus**
  - Members of the EU Parliament, policy markers, civil society
  - Support to the 10% blend of renewables to fossil fuels (EU Directive)
- **Where**
  - 20 announcements (The Economist, L' Express and European Voice newspaper)



Ethanol Summit

Institutional folders

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COMMUNICATION ACTIVITIES IN BRAZIL

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uma atitude inteligente

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etanol

uma atitude inteligente

etanol

uma atitude inteligente

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CAMPAIGN ON TV

CONCLUSIONS

1. **Biofuels use will expand in the world, due to consumers demand and public policy interests.**
2. **What are the factors contributing to the commoditization of ethanol?**
   - Adoption of targets for the use of biofuels in an increasing number of developed and developing countries.
   - Global firms from a wide range of sectors are investing in the production of ethanol.
   - Ethanol helps countries to achieve their emission reduction target and to mitigate climate change.
   - Sugarcane ethanol can be produced in many countries of the world (energy diversification and factor of development).

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CONCLUSIONS

3. What are the factors preventing ethanol to become a global commodity?

- Tariffs and trade-distorting measures.
- The international market remains extremely small and volatile.
- Common standards must be adopted to avoid the distortive non-tariff barriers.
- The proliferation of sustainability criteria should be avoided (differences between firms and countries).

4. What needs to be done?

- An extensive work of communication must be done to repeal the fallacious myths and to inform about ethanol benefits to mitigate climate change.
- Third countries: technical and scientific cooperation, investments.
- Trade: complementing production/consumption policies, elimination of distorting support mechanisms.

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Thank you

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