Ministry of Mines and Energy

THE BRAZILIAN EXPERIENCE WITH BIOFUELS

7th IPHE Steering Committee Meeting

Ricardo de Gusmão Dornelles
Director - Renewable Fuels Department

Brasília, 04.25.2007

Brazil Biofuels Experience: Summary

1. Introduction
2. Ethanol
3. Biodiesel
4. Final Remarks

WORLD ENERGY CONTEXT

- World economy growth (China, US...)
- Demand growth
- Climate change reality
- High prices for energy
- Refining capacity in the limit
- Geopolitical instability and conflict at important energy supplier countries
- Strong dependency on non-renewable energy sources

THE CHALLENGE FOR ENERGY POLICY

- Long term energy supply security
- Cheaper prices for energy sources
- Keeping the local energy competitiveness
- Dealing with climate change and environment

BIOFUELS

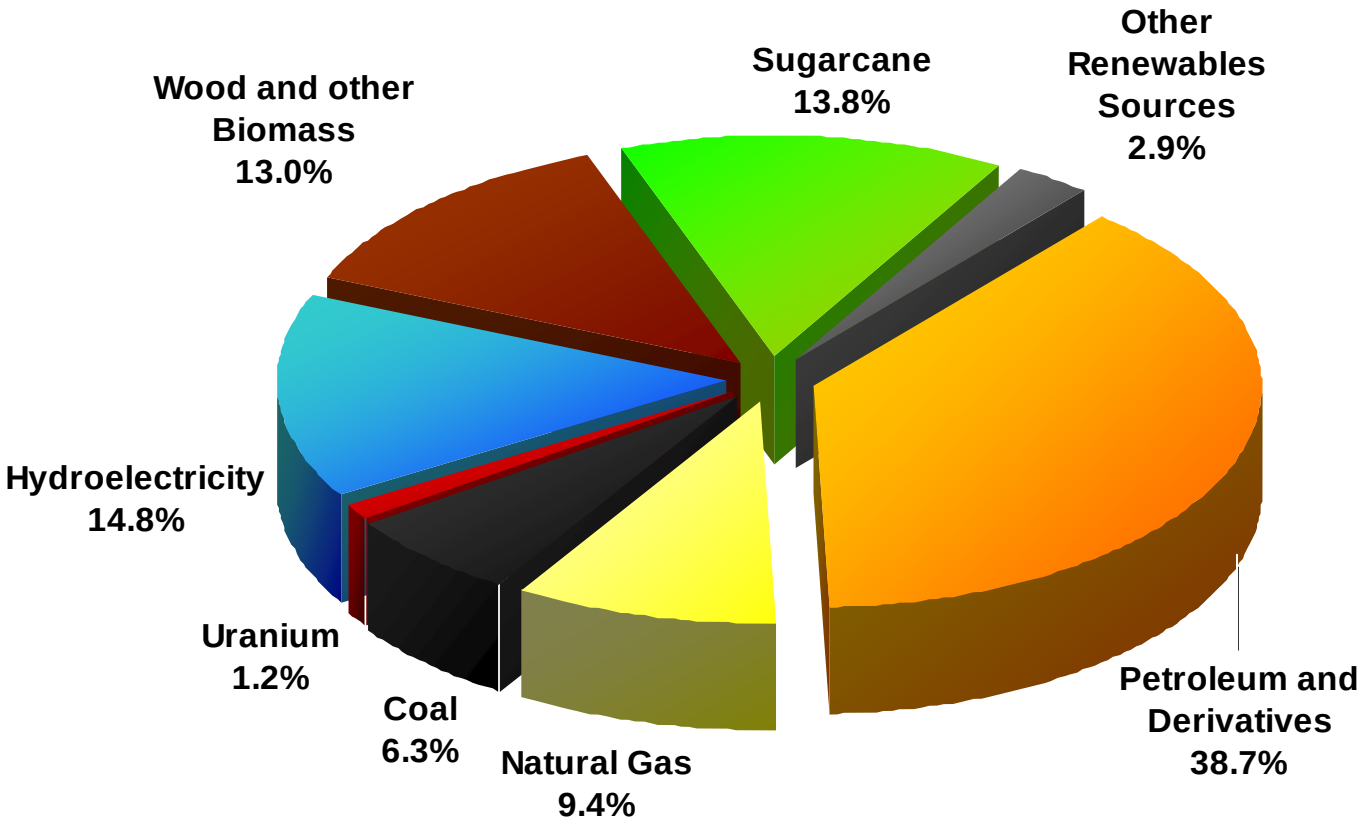
Brazilian Energy Policy

Law nº 9.478/1997

Objectives established by Law:

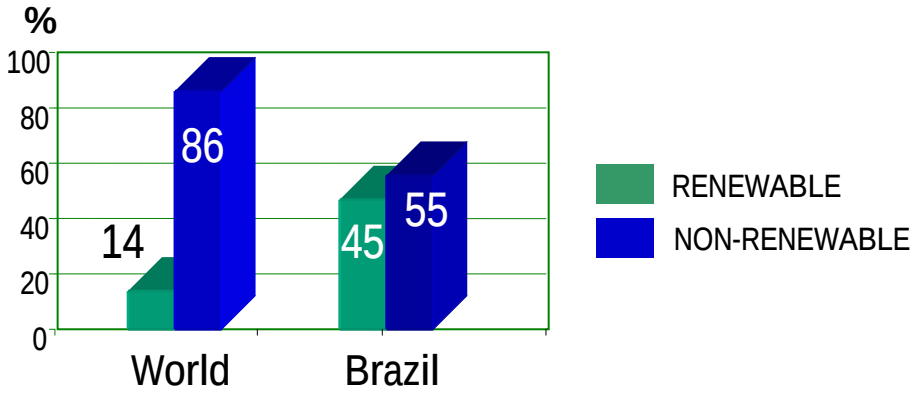
- To increase the share of biofuels in the national energy matrix;
- To protect the environment;
- To promote energy security with lesser external dependency;
- To protect the consumer best interests through regulation mechanisms and surveillance at the Regulatory Agencies;
- To promote free competition.

BRAZILIAN ENERGY MIX - 2006



RENEWABLE SOURCES 44.5 %

218.7 MILLION TOE



Source: Brazilian Energy Balance (BEN,2006)

Ministry of Mines and Energy (MME)

Fuel Production and Dependency - 2006

Fuel	Production	Consumption	Net Imports	Net Exports	Net Imports	Net Exports
	Thousand m3	Thousand m3	Thousand m3	Thousand m3	% of demand	% of production
GASOLINE A	**21,325**	**18,656**	**-**	**2,668**		13%
DIESEL	**38,660**	**41,604**	**2,943**	**-**	7%	
ETHANOL	**17,764**	**14,445**	**-**	**3,319**		19%
FUEL OIL	**15,220**	**8,680**	**-**	**6,541**		43%
JET KEROSEN	**3,748**	**4,449**	**701**	**-**	16%	
NATURAL GAS (million m³/day)	**21.5**	**47.8**	**26.3**	**-**	55%	

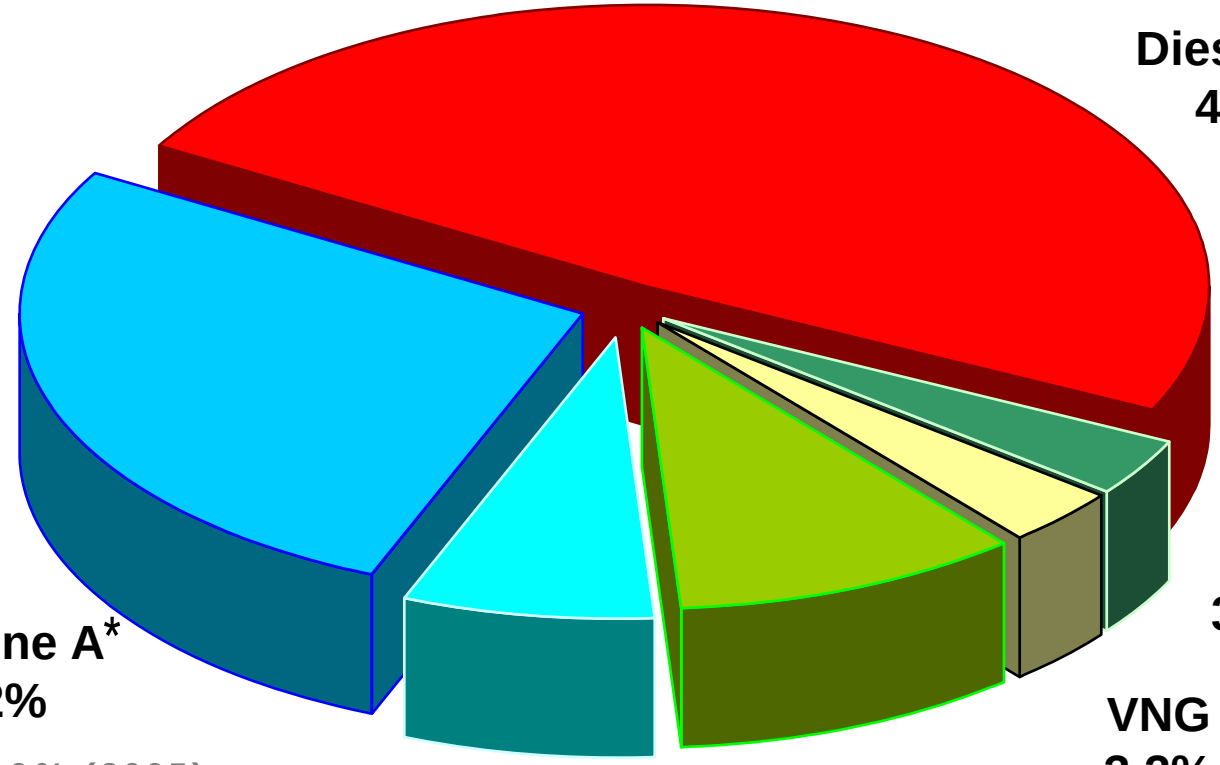
Dependency

Self-Suficiency

(1) Apparent Consumption = production + net imports.

Source: ANP, MAPA e MDIC (Elaborated by MME – Fev/07)

CURRENT MATRIX OF VEHICLE FUELS - 2006



Diesel
48.9%

Diesel (Total)
48.9 + 3.3 = **52.2%**
54.5% (2005)

Gasoline A*
27.2%
25.6% (2005)

B2♦
3.3%
0% (2005)

VNG
3.2%
2.9% (2005)

Anhydrous Ethanol
7.3%
8.5% (2005)

Hydrated Ethanol
9.9%
8.4% (2005)

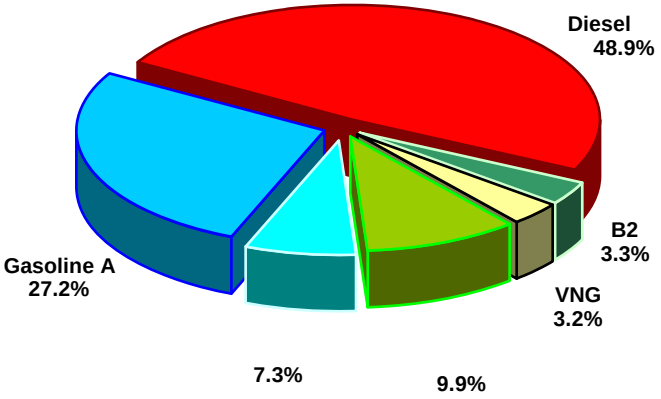
Gasoline C
27.2 + 7.3 = **34.5%**
34.1% (2005)

Ethanol (Total)
7.3 + 9.9 = **17.2%**
16.9% (2005)

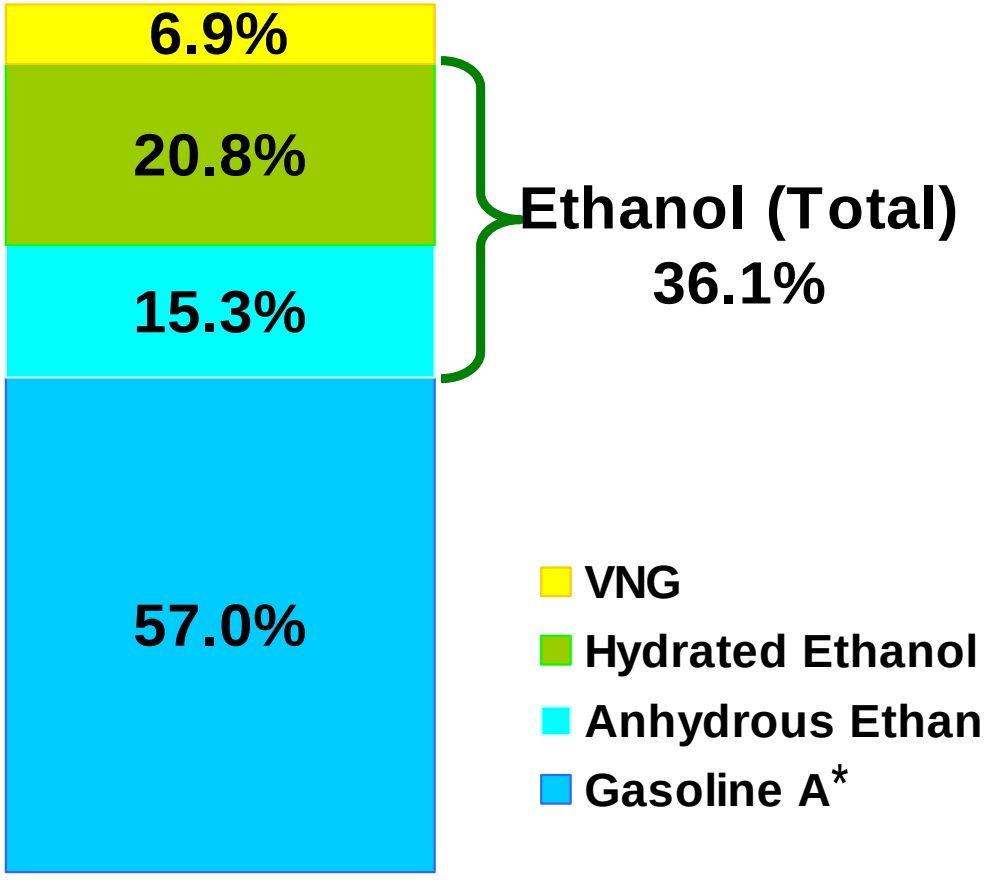
* Pure Gasoline – Before blending with ethanol

♦ Diesel blended with 2% of Biodiesel

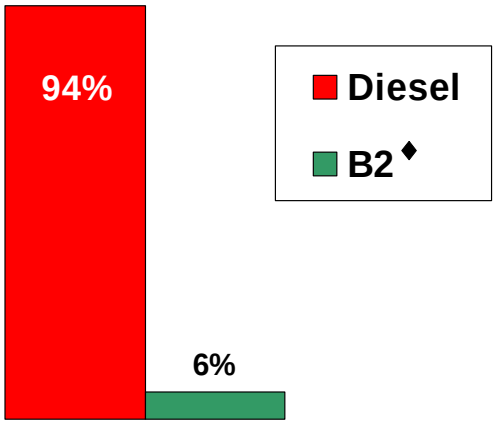
CURRENT MATRIX OF VEHICLE FUELS - 2006



LIGHT VEHICLES (OTTO-CYCLE)



HEAVY-DUTY VEHICLES



♦ Diesel blended with 2% of Biodiesel

* Pure Gasoline – Before blending with ethanol

ETHANOL

1925: First tests using ethanol blends with gasoline

2006: Sustainability and environmental benefits

In the near future …

Harvesting Hydrogen?

1975: National Alcohol Program (Proalcool)

- Main goals at that time:
  1. To introduce in the market the mixture gasoline-ethanol
  2. To stimulate the development of pure ethanol motors

- Two types of ethanol used, produced and tested in Brazil:

anhydrous	Mixed with pure gasoline (20 a 25%)
hydrated	Directly used in Otto-cycle motors (100%)

1979: Manufacturers begin to sell
100% Ethanol Vehicle

Incentives established by the Pro-Alcohol in 1975

- ~~Alcohol price lower than gasoline price~~
- ~~Guaranteed remuneration to the producer~~
- Tax reduction for hydrous alcohol cars

The only remaining incentive nowadays

- ~~Loans for alcohol producers to increase their capacity~~
- ~~Gas stations were obligated to sell alcohol~~
- ~~Maintenance of strategical alcohol stocks~~

The Deregulation of Fuel Market and the Ethanol Fuel

1990	Maximum Prices at the Gas Stations (Jul/90)
1991	Maximum Prices at the Fuel Distributors (Nov/91)
1992	
1993	
1994	
1995	Constitutional Amendment Nº 09: petroleum monopoly made flexible (Nov/05)
1996	Liberalization of Consumer Prices: Alcohol and Gasoline (Apr/96)
1997	Liberalization of Anhydrous Alcohol prices at the producer (May/97) Petroleum Law defines the transition period for deregulation (Aug/97)
1998	
1999	Liberalization of Hydrated Alcohol prices at the producer with the subsidy reduction (Feb/99) End of subsidies for Hydrated Alcohol (Nov/99)
2000	
2001	Federal Law n° 10.336/01: Creates the "CIDE" from 2002 on (Dec/01)
2002	Complete Liberalization of Fuel Prices (Jan/02)

Free prices in the whole chain of production and commercialization

Economic Agents of Sugar Cane Industry

Sugar Cane Agriculture Phase

• 1.000.000 jobs in the countryside

Sugar and Alcohol Industrial Phase

• 367 Industrial Plants

Regulatory Domain: Ministry of Agriculture

Regulatory Domain: Ministry of Mines and Energy / ANP (National Petroleum Agency)

Gas Stations

• 92% of total gas stations in Brazil have an ethanol pump.

• Free Prices Market

Fuel Distributors

• 160 Operating Distributors
• Only distributors may blend ethanol with motor gasoline

Exporters

• 3,42 Billion litters exported in 2006

Source = MAPA – MME – MDIC - 2006

SUGARCANE AGRO-INDUSTRY

Ethanol Figures (2006):

- **Production: 18 million m^3**
- **Production Capacity: 20 million m^3**
- **Cropped Area for ethanol Production: 3 million hectares**
- **Exports in 2006: 3,4 million m^3**
- **Exports infrastructure: 4 million m^3/year**

As of 2010:

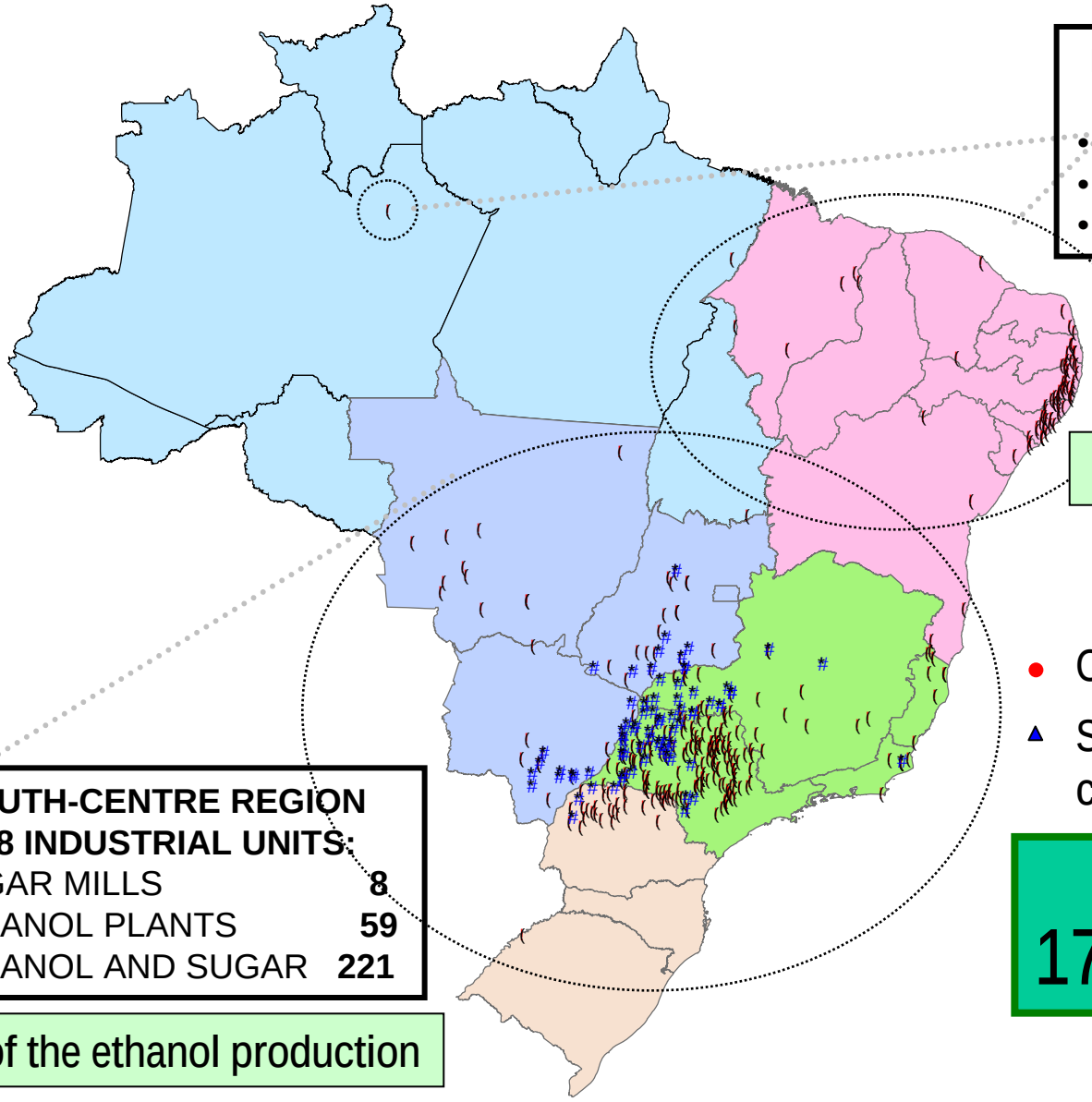
- **Investments* that will amount US$ 8.6 billion in 77 plants**
- **Increase in the ethanol production (in comparison with 2006): 6 million m^3**
- **Expansion in the sugarcane cropped area: 2 million hectares**
- **Expansion in exports infrastructure: to reach a capacity of 8 million m^3/year**

* Agricultural and Industrial phases

BRAZIL (Territorial Extension):	851
Total Agriculture Area:	383
of which:	
Fertile and free areas for agriculture:	91
Present cropped area for ethanol:	3
(in million hectares)	

Source: Ministry of Mines and Energy;
Ministry of Agriculture, Livestock and Food Supply - 2007

Ethanol in Brazil – Sugar Mills Location - 2007



NORTH-NORTHEAST REGION
79 INDUSTRIAL UNITS:

• SUGAR MILLS	**8**
• ETHANOL PLANTS	**19**
• ETHANOL AND SUGAR	**52**

9% of the ethanol production

- Operating Sugarcane Mills
- Sugarcane Mills under construction

SOUTH-CENTRE REGION
288 INDUSTRIAL UNITS:

• SUGAR MILLS	**8**
• ETHANOL PLANTS	**59**
• ETHANOL AND SUGAR	**221**

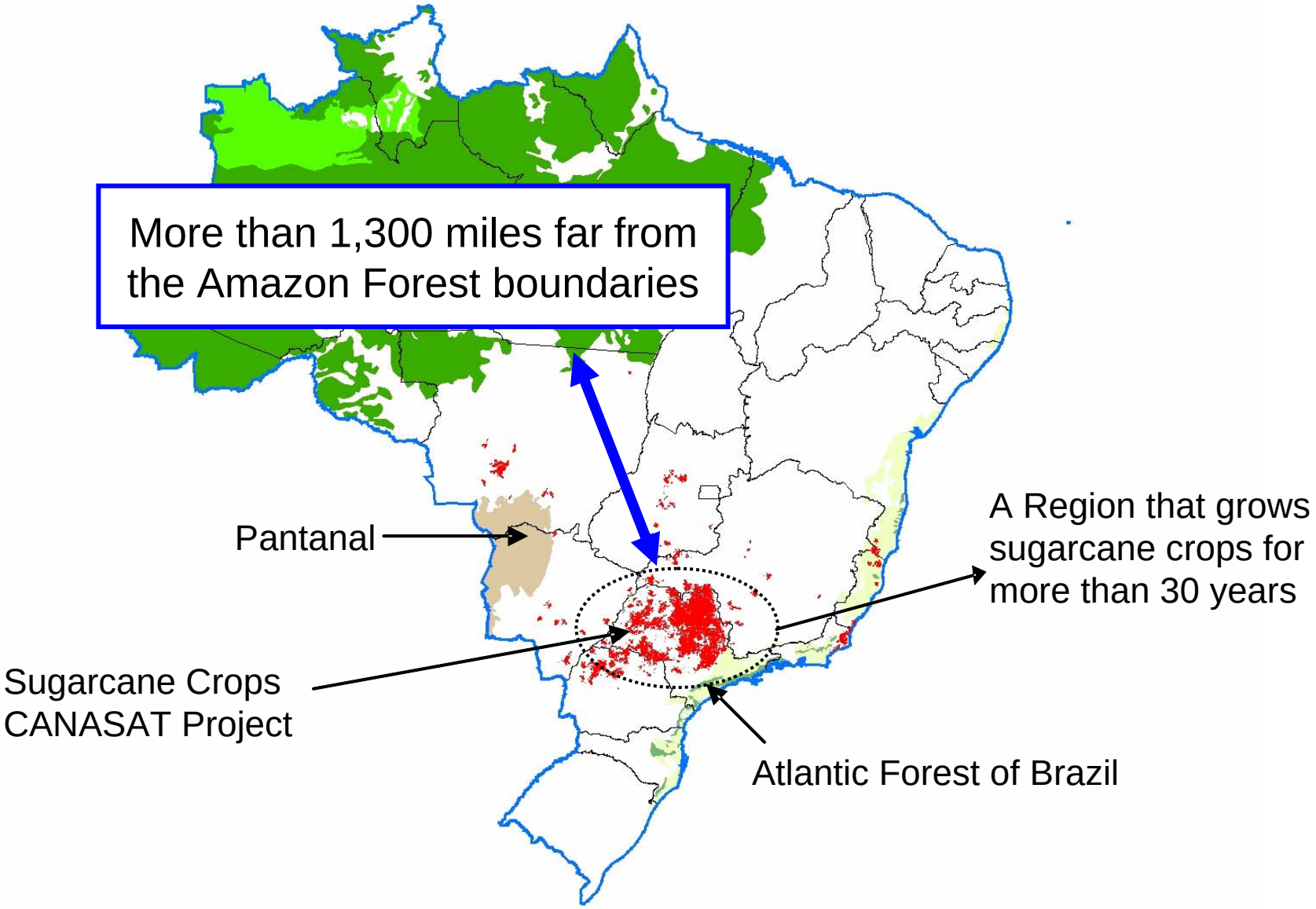
91% of the ethanol production

Production in 2006:
17,8 billion liters

↑ 11% (2005)

Source: Ministry of Mines and Energy – Ministry of Agriculture, Livestock and Food Supply - 2007

Center-South Region Crops Location – 2005/2006



Source: IBGE (Preservation Areas) and CTC (Sugarcane Crops)

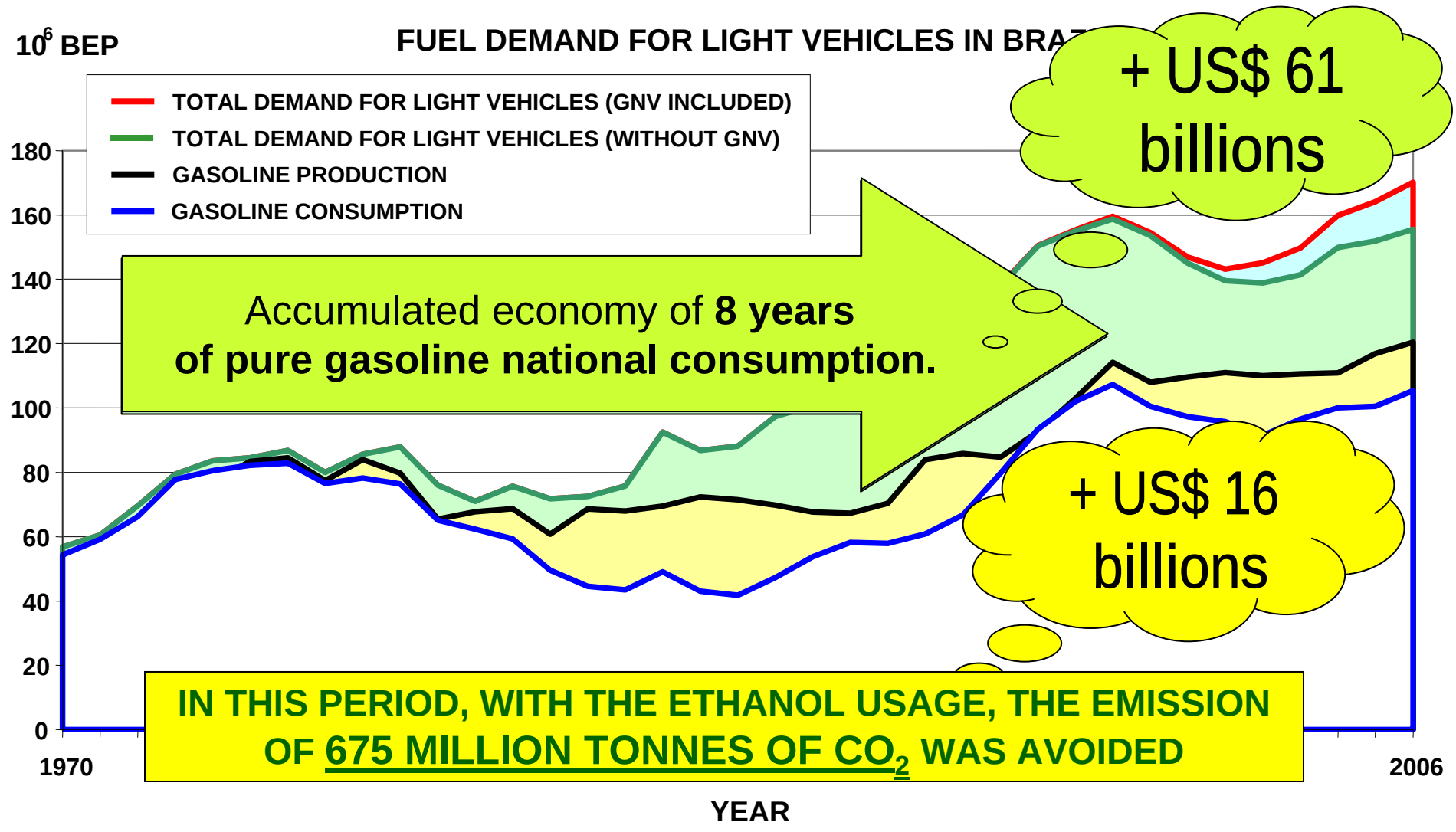
2006: Total FFV – a Brazilian reality

- Any mixture of gasoline and ethanol can be used, from 0 to 100%;
- In 2006: The domestic flex-fuel vehicle sales represented 78% of all 1,824,266 light vehicles sold in the same period (imports included);
- Total domestic flex-fuel vehicle sales (2003-2006): 2.67 million units)

8 multinational automotive manufacturers settled in Brazil are producing nearly 100 different models of Total FFV

Source: Ministry of Development, Industry and Foreign Trade; Brazilian Association of Automotive Vehicle Manufacturers - 2007

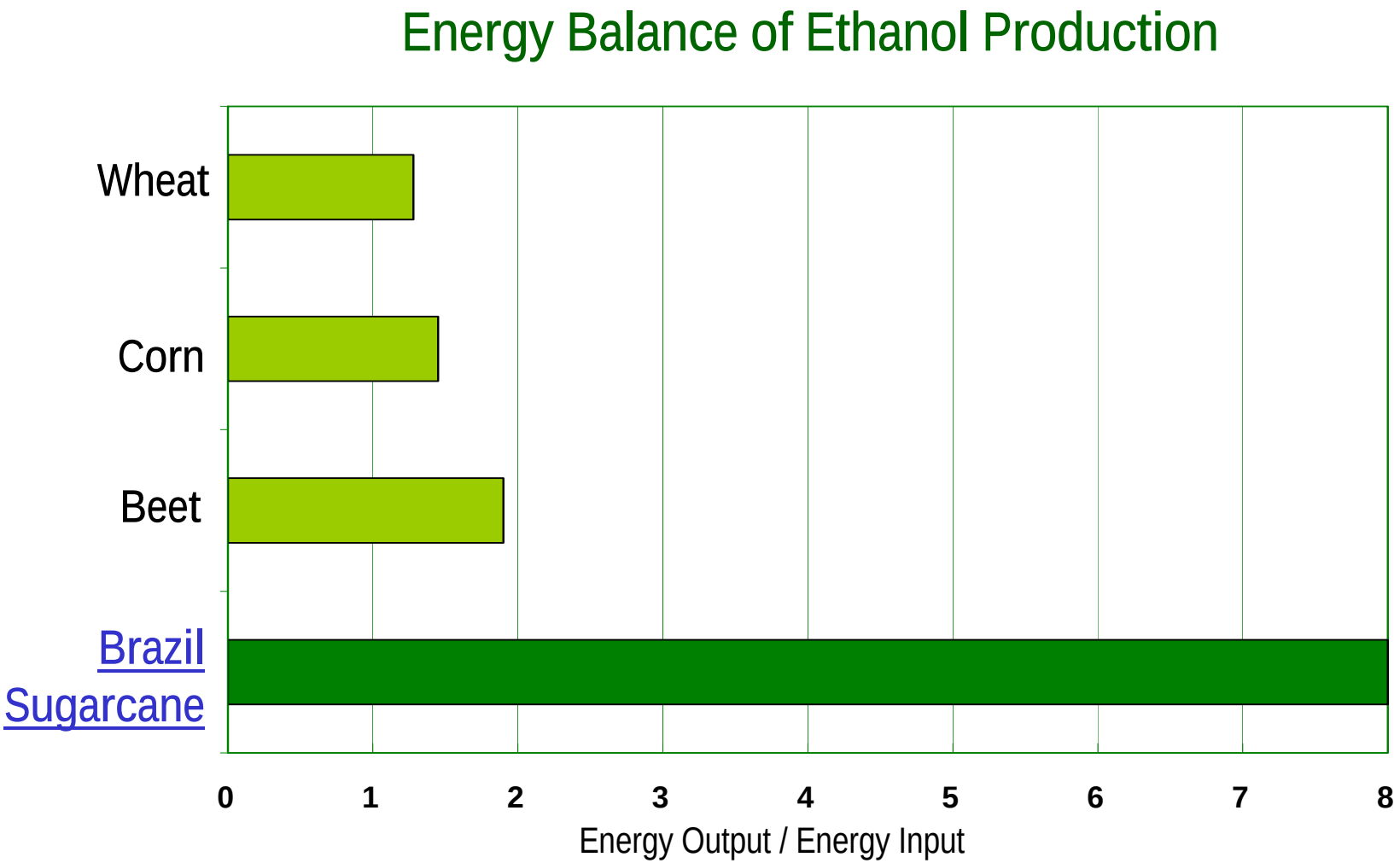
Ethanol in Brazil: Oil economy and environmental benefits



Total economy of 1,194 billion boe or 23 **months of the present Brazilian petroleum production.**.

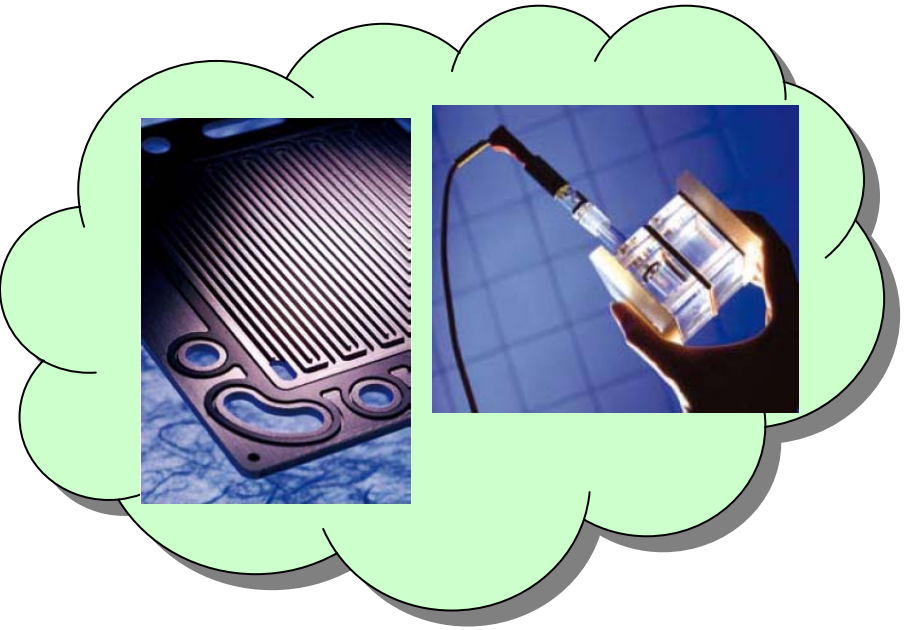
y - Brazilian Energy Balance – 2006
and Laura Tetti – USP – 2002

Another Competitive Advantage of Brazilian Ethanol



Source: F.O.Licht (in “New trends to the ethanol supply chain in Brazil”, Simoes, R.B., Master Thesis, Universiteit Van Tilburg, Holanda, Jul-2006)

Ethanol Contribution to Hydrogen Economy

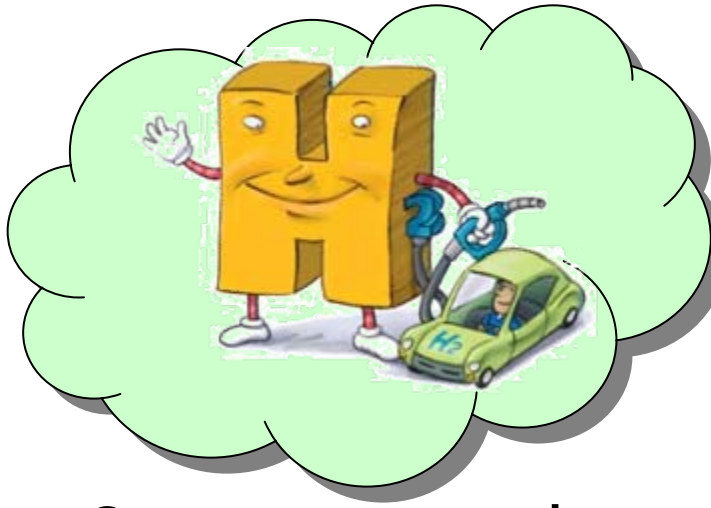


+

+

and ...

=



One step towards Hydrogen Economy!

BIODIESEL

BRAZIL: Raw material diversity for production of Biodiesel

Castor Beans

Sunflower

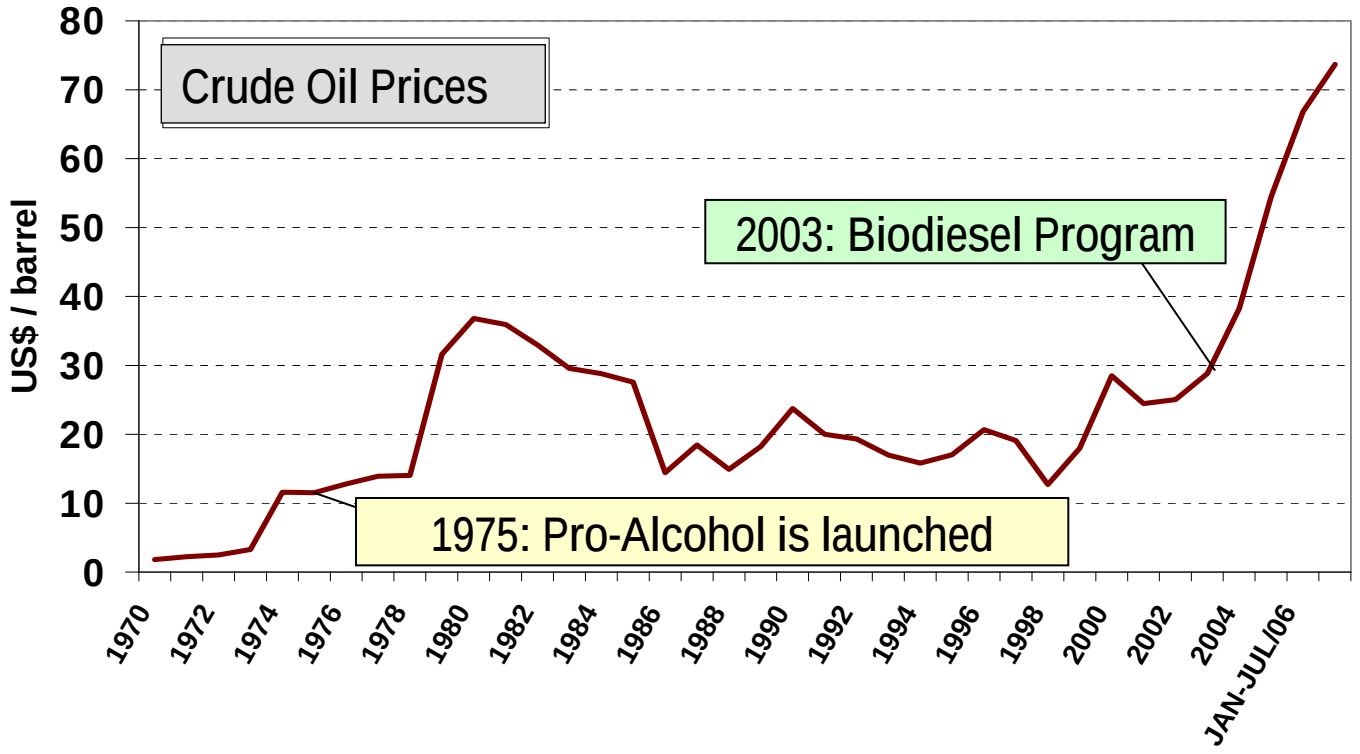
Soy

Palm Oil

Cotton

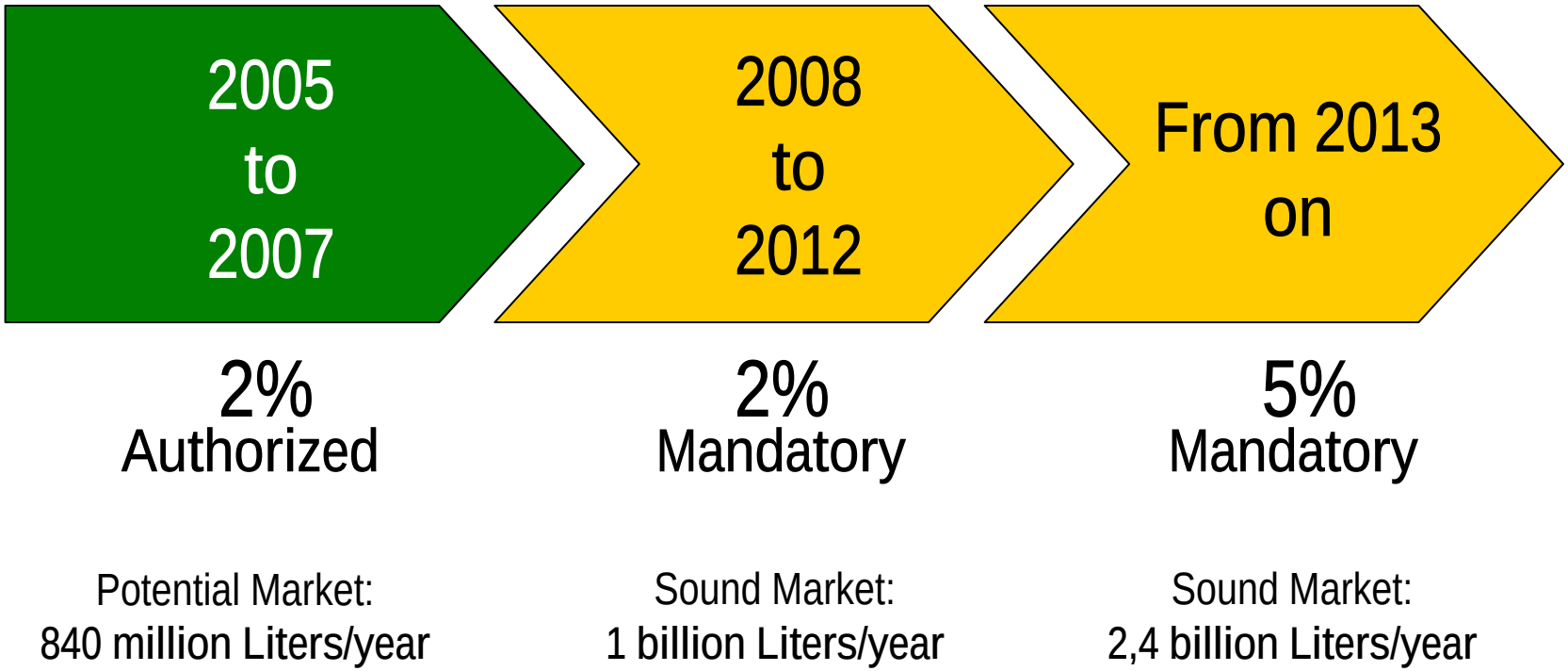
Biodiesel versus Ethanol: Different Reasons

- Ethanol (1975): basically economics.
- Reasons for biodiesel (today):
  - Economic: high crude oil prices again, but Brazilian dependence is now very low
  - Social: needs for jobs and permanent settlement of families in countryside
  - Environmental: to introduce another renewable and friendly fuel



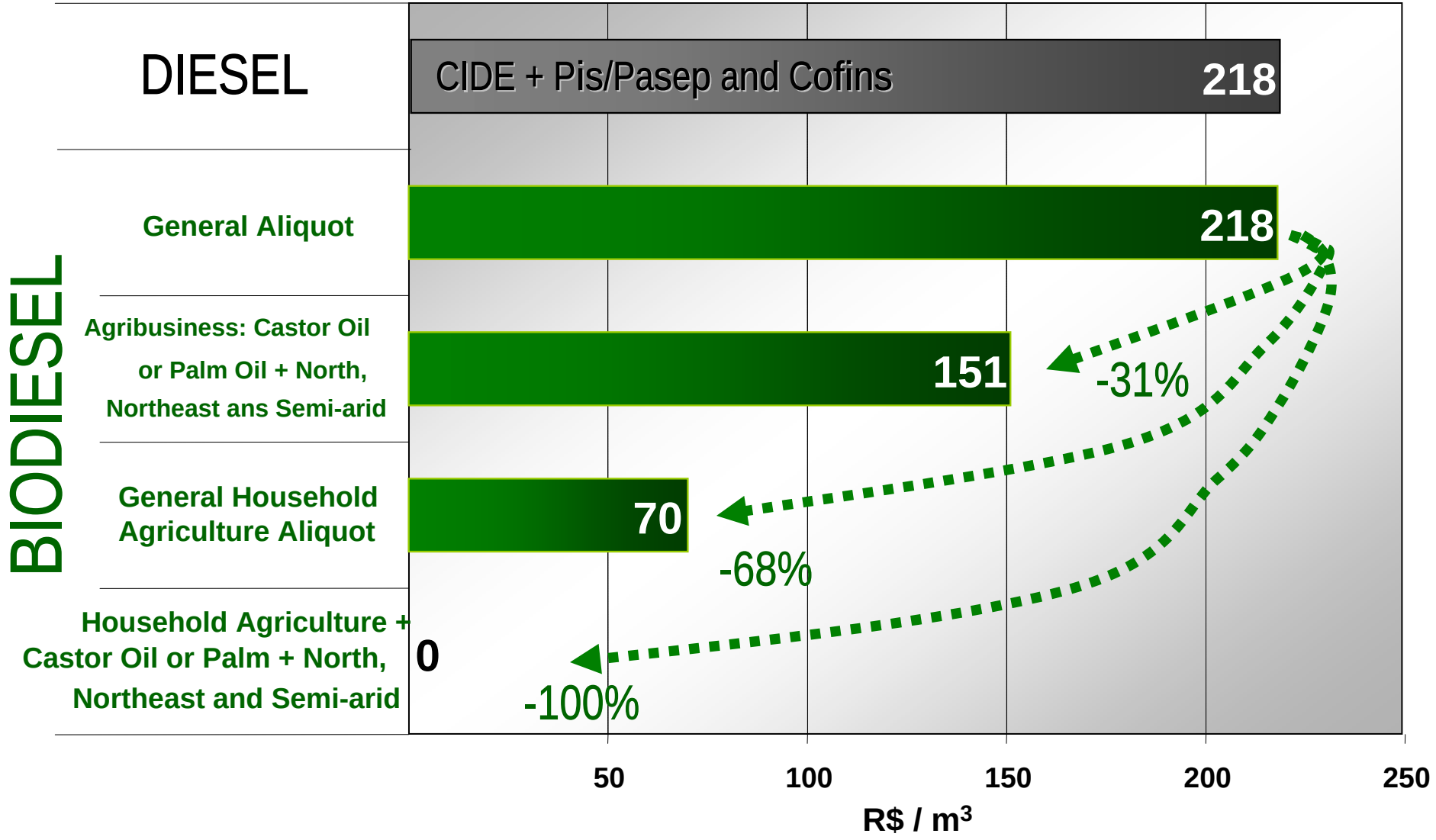
Biodiesel: Regulatory Framework

➢ Law 11.097/2005: Establishes minimum percentages to mix biodiesel to diesel, besides the monitoring on the introduction of this new fuel into the market.



BIODIESEL: FEDERAL TAXATION POLICY

Law n° 11.116/ 2005



CIDE: A Federal Tax that is present on fuels. It is an abbreviation form of "Contribution of Intervention in the Economic Domain"
PIS/PASEP and Cofins: A Federal Tax for social security

Biodiesel: CIDE is not present + Tax on Industrialized Products has zero aliquot

BIODIESEL: Producers in Commercial Operation and Projects Forecast (As of Dec/2007)

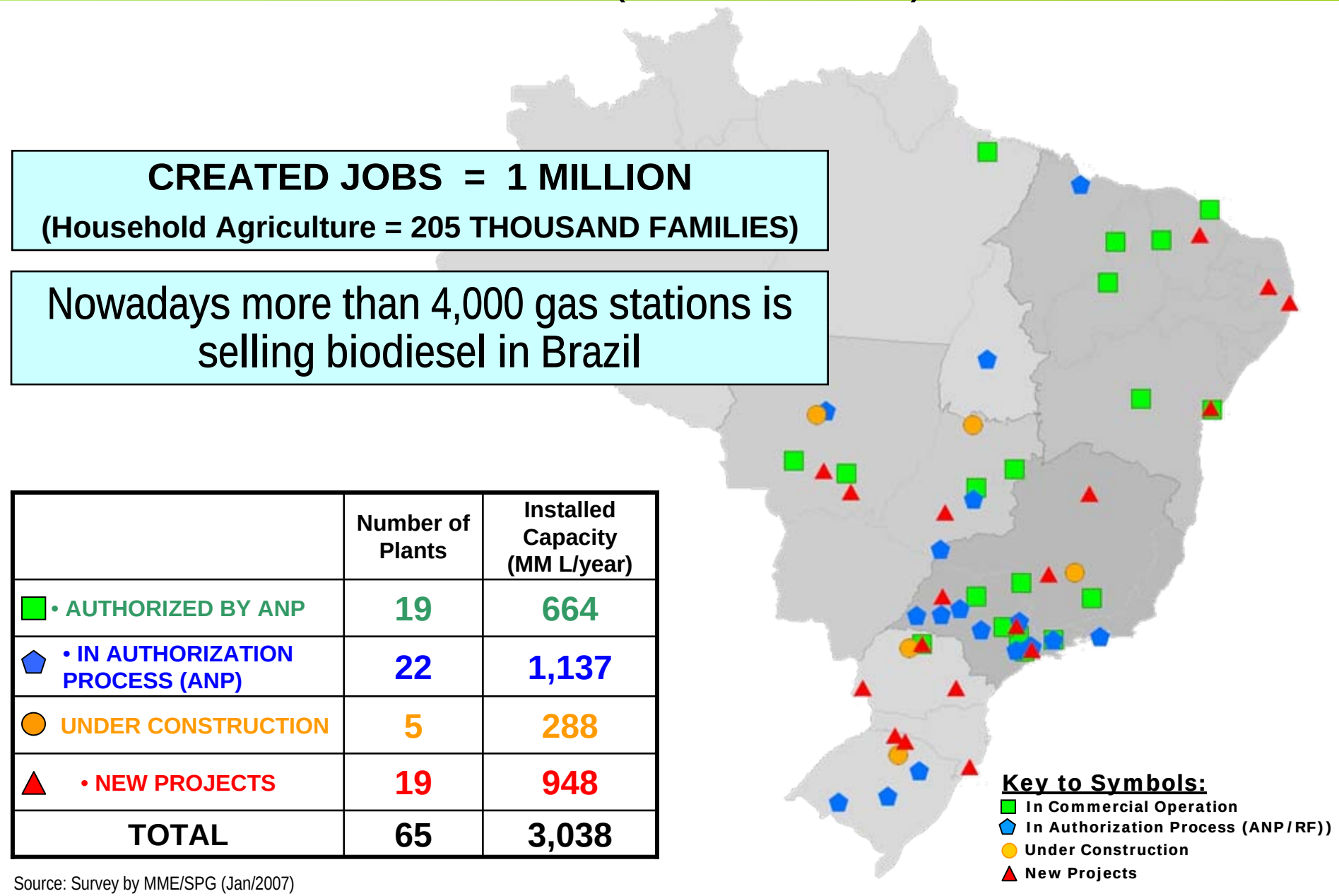
CREATED JOBS = 1 MILLION

(Household Agriculture = 205 THOUSAND FAMILIES)

Nowadays more than 4,000 gas stations is selling biodiesel in Brazil

	Number of Plants	Installed Capacity (MM L/year)
• AUTHORIZED BY ANP	19	664
• IN AUTHORIZATION PROCESS (ANP)	22	1,137
UNDER CONSTRUCTION	5	288
• NEW PROJECTS	19	948
TOTAL	**65**	**3,038**

Source: Survey by MME/SPG (Jan/2007)



Biodiesel Auctions

The Federal Government has established:

- The mandatory B2 mixture is now anticipated for January of 2006, only for biodiesel produced by industries that have the so-called Social Fuel Certificate and commercialized in public auctions promoted by the National Agency of Petroleum – ANP.

- The biodiesel with certificate acquired in the auctions must be acquired by producers and importers of petroleum diesel.

- The certificate indicates that the industrial producer of biodiesel has fulfilled the minimum social prerequisites (minimum amount of raw-material from small farmers – depending on the region – and technical assistance).

FINAL REMARKS

GLOBAL CHALLENGE

ENERGY PRODUCTION

X

FOOD PRODUCTION

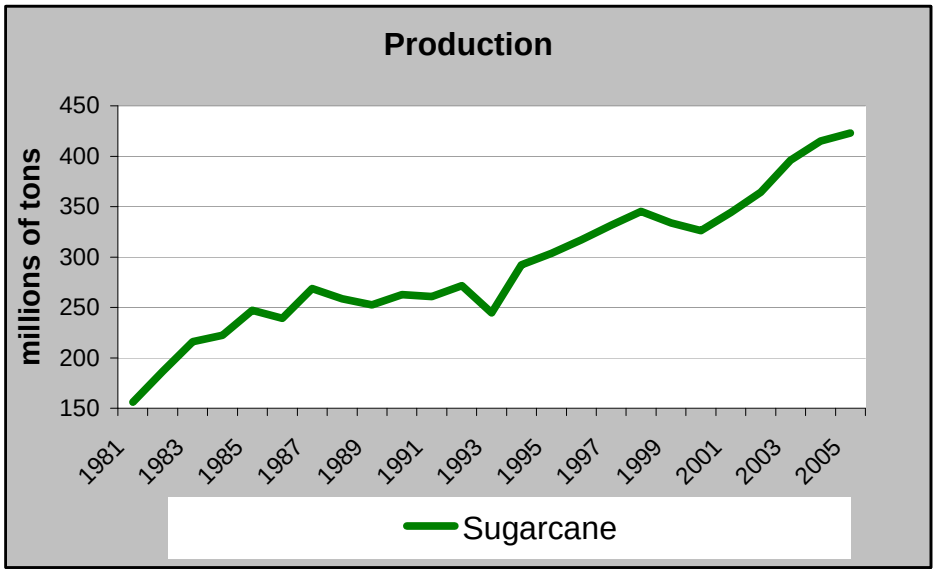
GLOBAL CHALLENGE

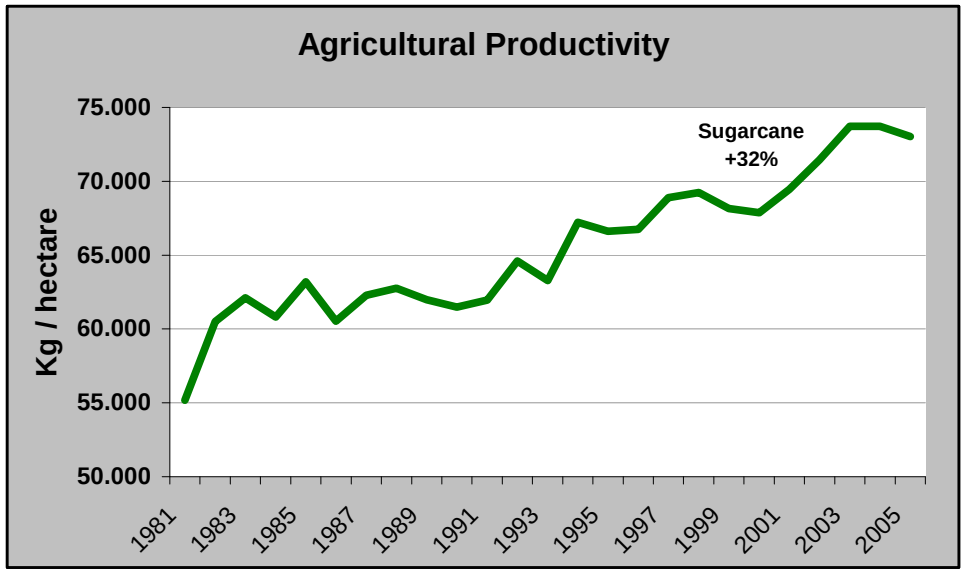
ENERGY PRODUCTION
X
FOOD PRODUCTION

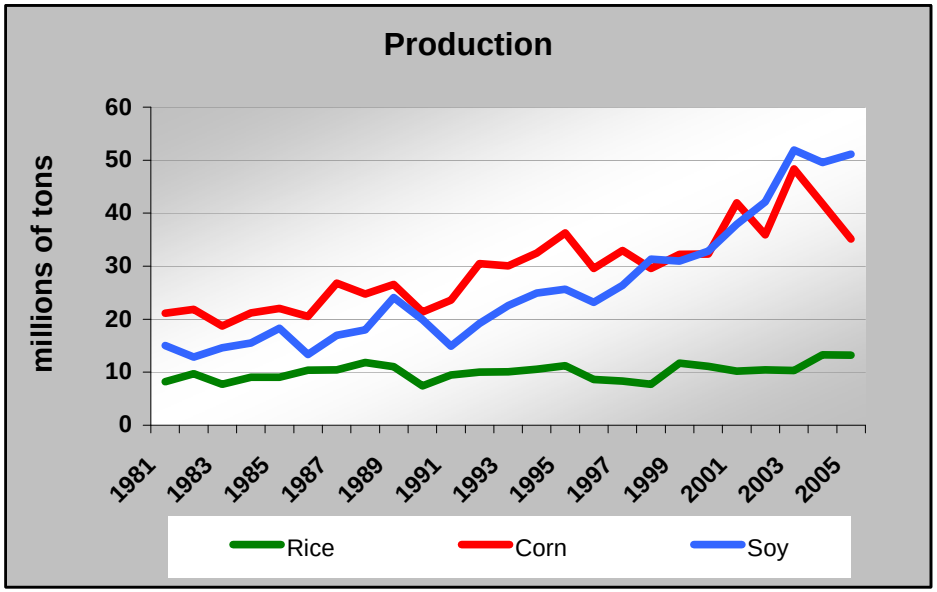
In millions of hectares

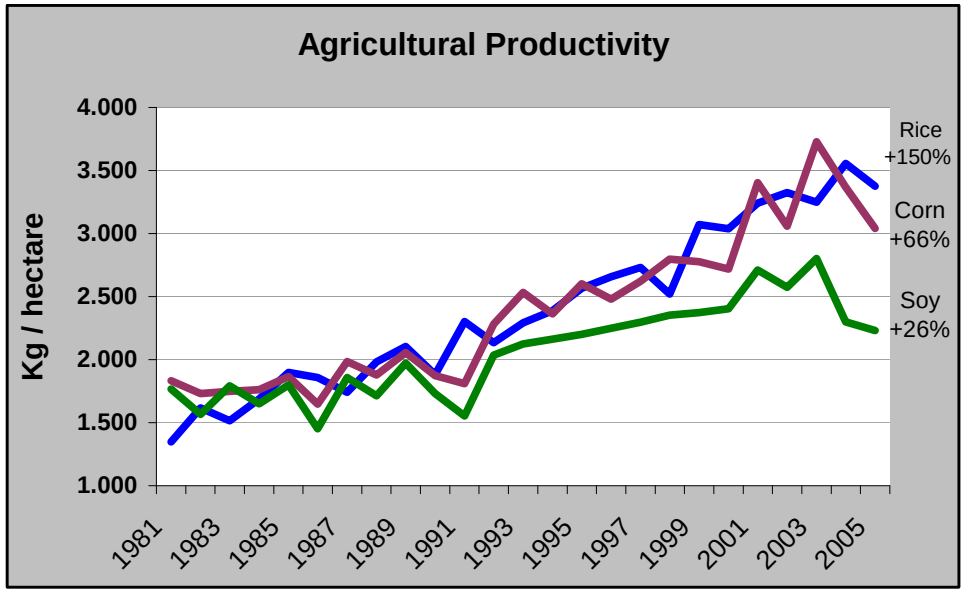
	AREA (EXTENSION)	PERCENTAGE
BRAZIL (TOTAL)	851	100%
ARABLE AREA	383	45%
AVAILABLE FOR EXPANSION	91	11% (24% of arable area)
SUGARCANE AREA FOR ETHANOL	3	0,35% (0,8% of arable area)
OILSEED CROPS FOR B2 and B5	1,7 to 4,0	0,2 a 0,47% (0,4% to 1% of arable area)

Evolution of Agricultural Production (1981-2006)









Source: IBGE - Apr/2007 (elaboration: MME based on production and harvested area)

Biofuels: perspectives in the near future...

- World growing demand
- More rigorous environmental concerns
- Increase in international trade
- Improvement on productivity and on energy balance of biofuels:
  - Biodiesel: new oilseeds (6.000 L/ha) *versus* traditional crops (600 L/ha)
  - Ethanol: new production methods (bagasse/cellulose hydrolysis)

The achieve of this technology will bring:
Energy AND Food Production, not *versus!*

Biofuels = *Commodity?*

Commodities general characteristics:

✓ Patterns in a context of international trade

↳ Compatible Specifications

✓ Possibility of delivery on due dates settled between buyers and sellers

↳ Negotiation with traders

✓ Possibility of storage or sale in standard units of trade

↳ litter, barrel, m^3 ...

But it requires to be a common product and negotiated in an international environment

➡ A market to be established itself.

CONCLUSION

- Biofuels do contribute to:
  - Energy security;
  - Improvement of environment conditions in urban areas;
  - Creation of jobs and income in rural areas;
  - Economic development.
- However, in order to achieve this reality, it is required:
  - Governmental decision with adequate public policies
  - Global efforts towards creation of biofuels international market

Governmental policies do exert strong influence on climate for investment because they can produce immediate impacts over costs, risks and barriers to competition.

THANK YOU!

Ricardo de Gusmão Dornelles
Director - Renewable Fuels Department