

Biofuels in Brazil

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Biofuels in Brazil

Section I – Ethanol successful experience
Background
Evolution
Flex-fuel revolution

Section II – The Biodiesel program

Conclusion

Biofuels Reality in Brazil

Production (2006)

Ethanol: 17.0 billion litres (3.4 exp)

Biodiesel: 0.84 billion litres

Production (2010)

23.3 billion litres

3.3 billion litres

Ethanol represents 38% of all car fuel sold in Brazil

Brazil is the 2nd largest ethanol producer behind the US

Brazil is the largest ethanol and sugar exporter

Sugarcane industry generates 3 million jobs 3.6% of GNP

High energy balance of Brazilian sugarcane 8.3:1

Relatively low production costs (USD 0.3 per litre FOB)

Approaches to biofuels public policies

- Energy security
- Economic
- Environmental
- Social (new jobs, family farms & income redistribution)

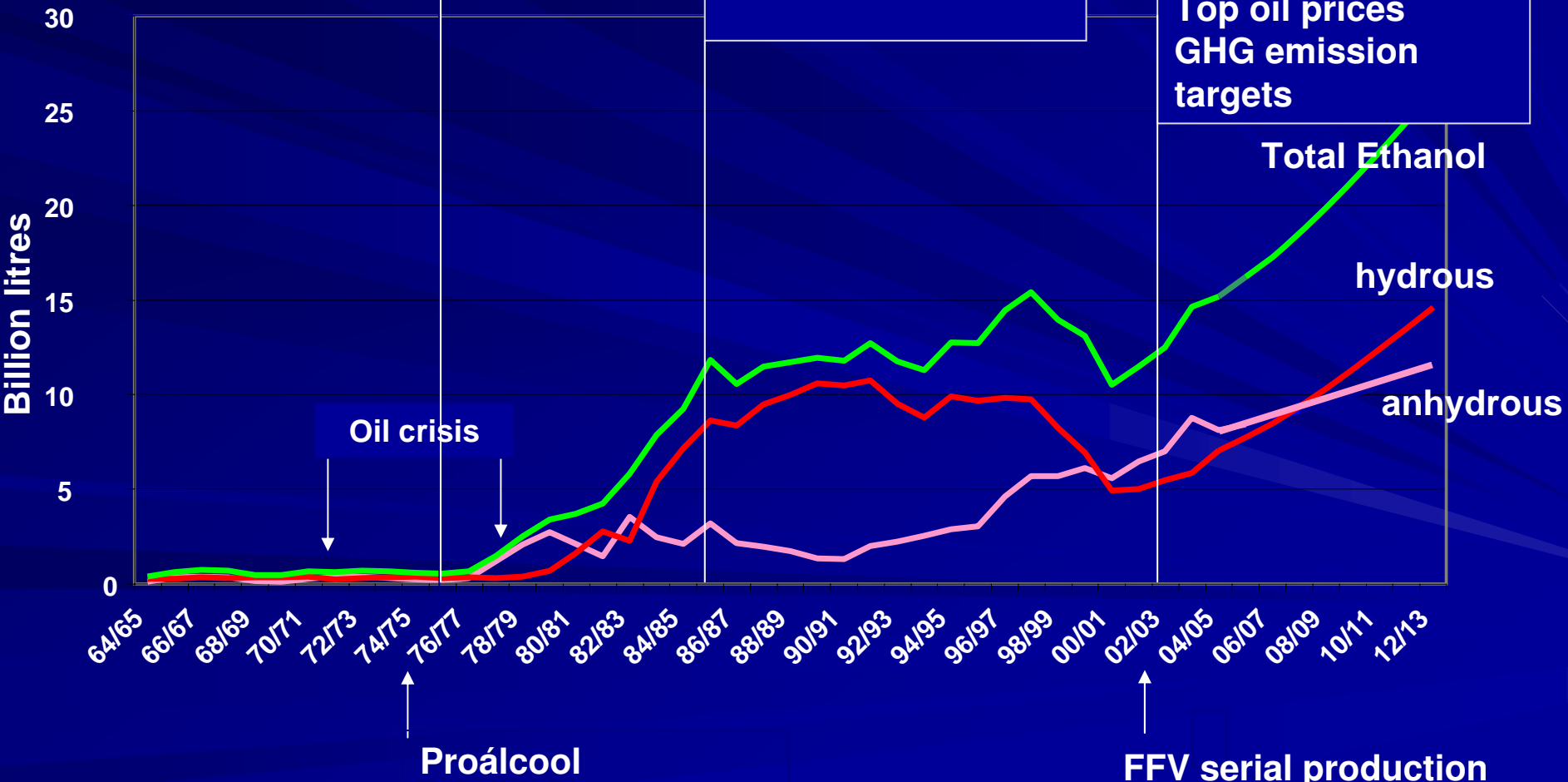
Brazilian Ethanol Timeline

First reforms

Governmental action

Free market
 Flex fuel revolution
 High international sugar and ethanol demands
 Top oil prices
 GHG emission targets

Oil prices stabilized
 E100 shortages
 High sugar exports



Mandates and Confidence

1931 - First mandate (E-5)

1942 - World War II (up to E-40)

1976 - Proálcool (E-10 to E-20)

2000 - CIMA (E-20 to E-25)

Today - E-23

Proálcool National Alcohol Program

- Goals: to increase production and consumption of sugarcane ethanol as a substitute for petrol
- Means: Mandates, credit lines; subsidies; price controls; regional quotas; tax incentives; R&D
- Results: gains in productivity; developed infrastructure; 5m E-100 fleet; new technologies

Market Deregulation

1990

End of maximum prices at the petrol stations

1991

End of maximum prices at the fuel distributors

1995

End of Petrobras oil monopoly

1996

End of consumer price controls: ethanol and petrol

1997

{ Deregulation of anhydrous ethanol prices at the producer
Definition of a transition period for final deregulation

1999

{ Liberalization of hydrated ethanol prices at the producer
Subsidy reduction
End of subsidies for hydrated ethanol

2001

CIDE taxes from 2002 on

2002

Complete deregulation of fuel market

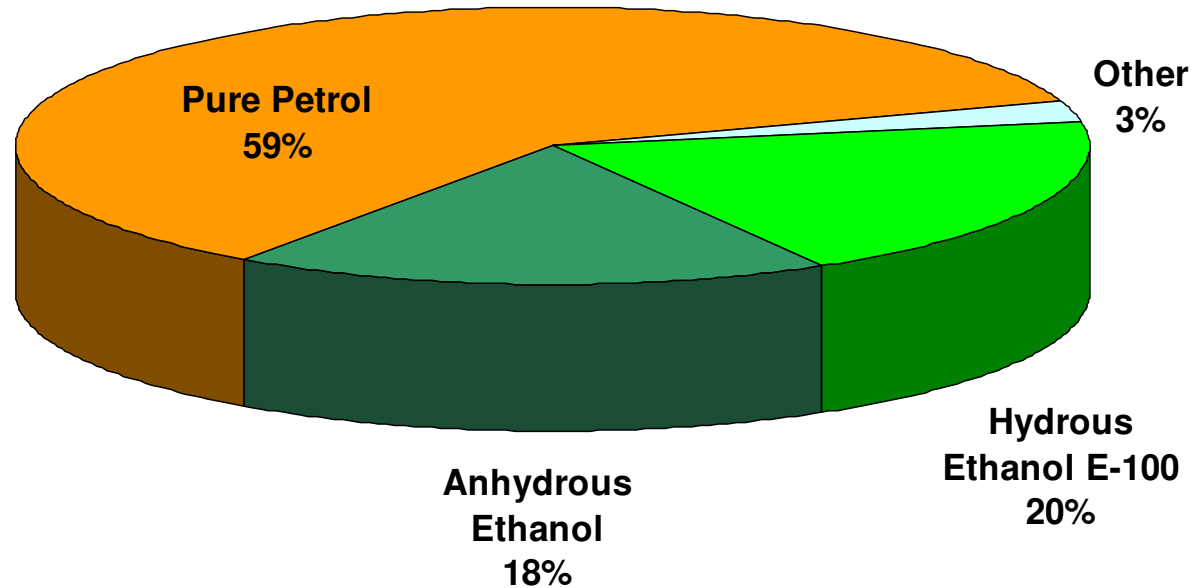


Regulatory Tools

- ~~Controlled prices (ethanol and petrol)~~
 - ~~Guaranteed remuneration to the producer~~
 - **Tax rebate for E-100 cars**  The only remaining incentive nowadays
 - ~~Low interest rates loans for ethanol producers~~
 - ~~Petrol stations obligated to sell E-100~~
 - ~~Regulatory ethanol stocks~~
-

Ethanol Revolution

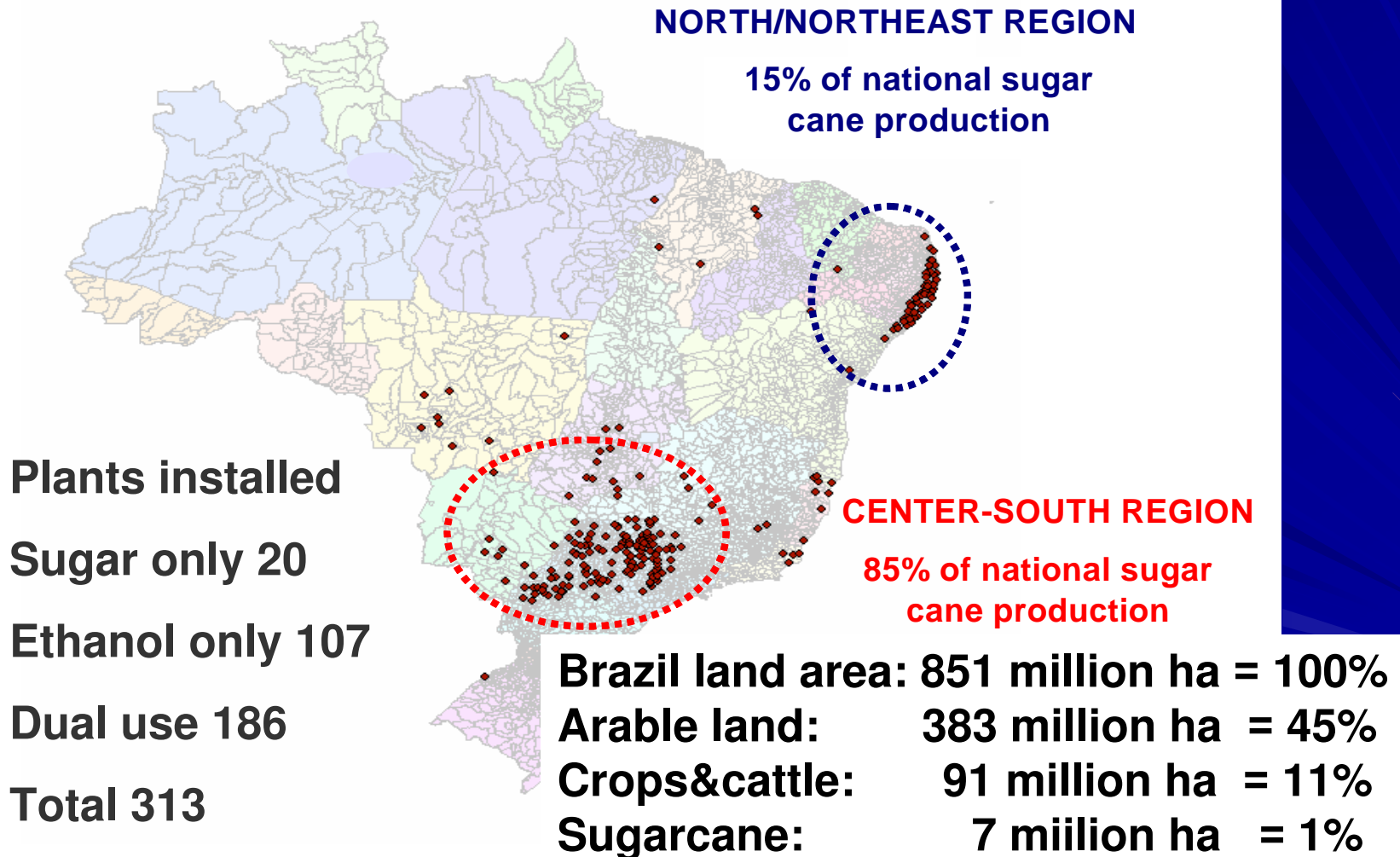
**FUEL USE MATRIX FOR
PASSENGER & LIGHT COMMERCIAL VEHICLES IN
BRAZIL (2006)**



Total Ethanol = 38%

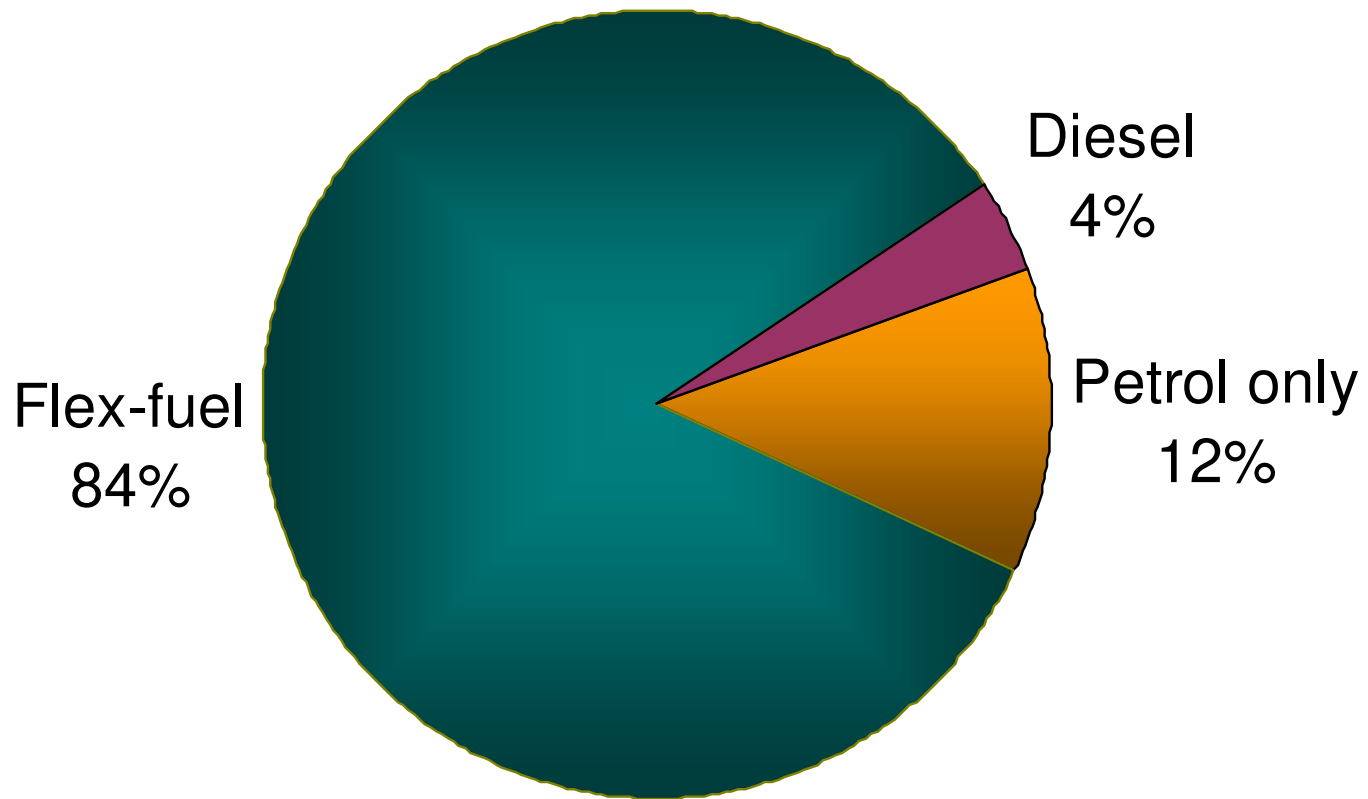
Sugarcane Production

Source: Min. Agriculture/2006



Flex-Fuel Power

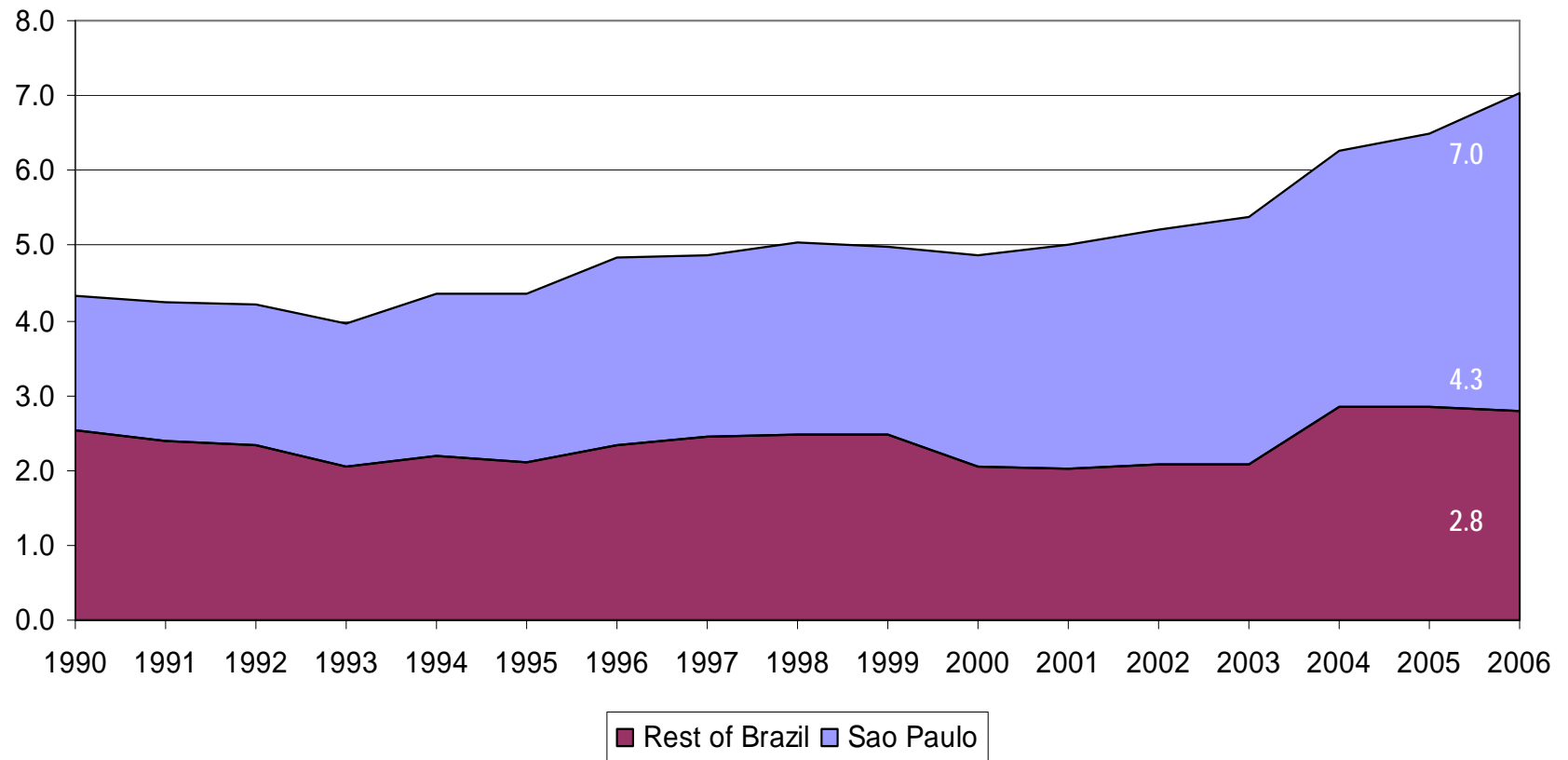
Brazil: Car Sales by Engine Type Q1 2007



A flex-fuel car can use any blend of ethanol into petrol (0 to 100%)

Brazilian Sugarcane

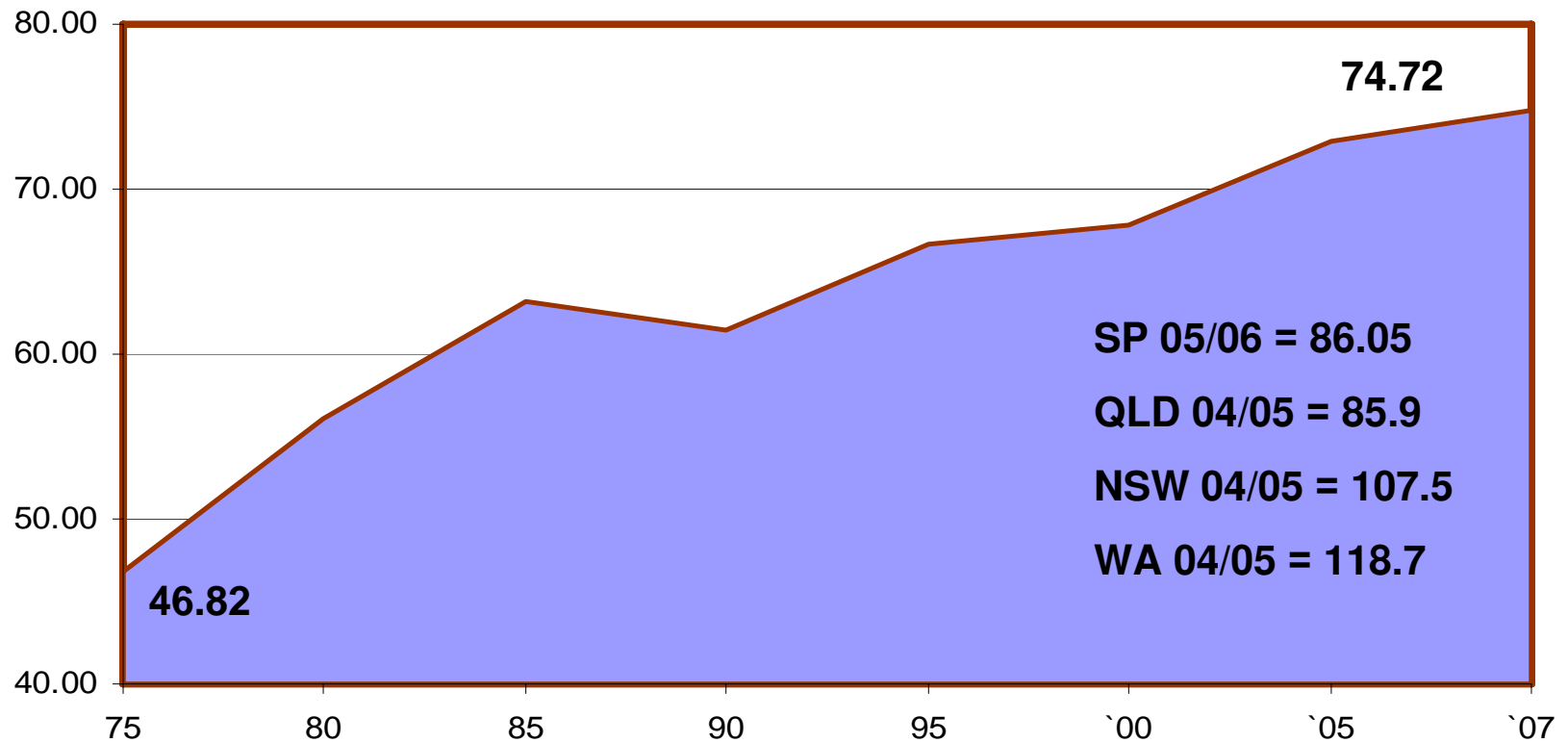
Area planted to sugarcane (million ha)



Source: Min. Agriculture/2006

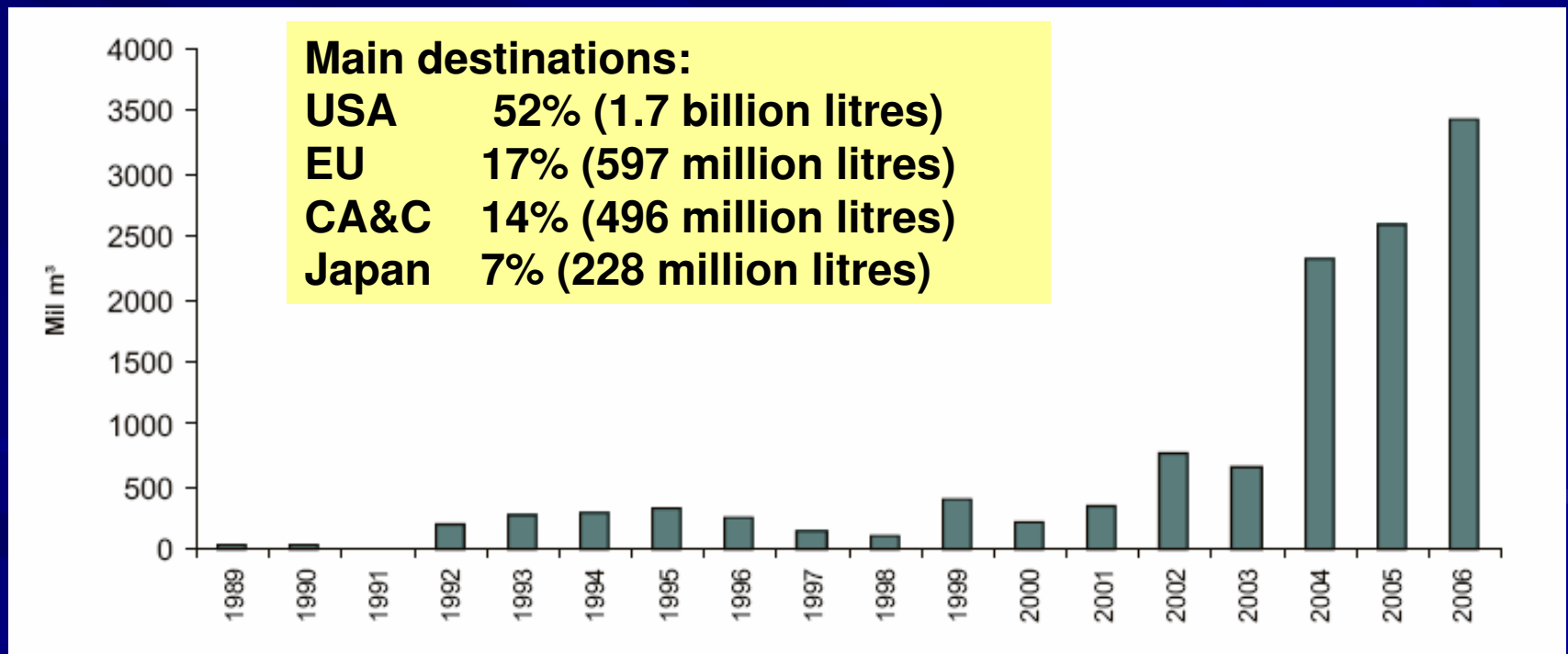
Sugarcane Productivity

Brazilian Sugarcane Yield (tonnes/ha)



Brazilian Ethanol Exports

Total exports 2006
3.4 billion litres
USD 1.6 bi



Source: MDIC 2007

INDUSTRY EFFICIENCY

- TO PRODUCE ETHANOL IN THE SAME INDUSTRIAL UNIT THAT PRODUCES SUGAR (“TURN KEY” CONCEPT), THUS INCREASING GLOBAL EFFICIENCY.
- TO TAKE ADVANTAGE FROM VINASSES AND WASTES AS FERTILIZERS.
- TO COGENERATE ENERGY FROM BAGASSE, SELLING SURPLUS ELECTRICITY TO THE GRID.

Energy Balance (output/input)

Wheat	1.2:1
Corn (US)	1.8:1
Beet (EU)	1.9:1
Sugarcane (Brazil)	8.3:1

Source: F.O.Licht (2004)/Macedo (2005)

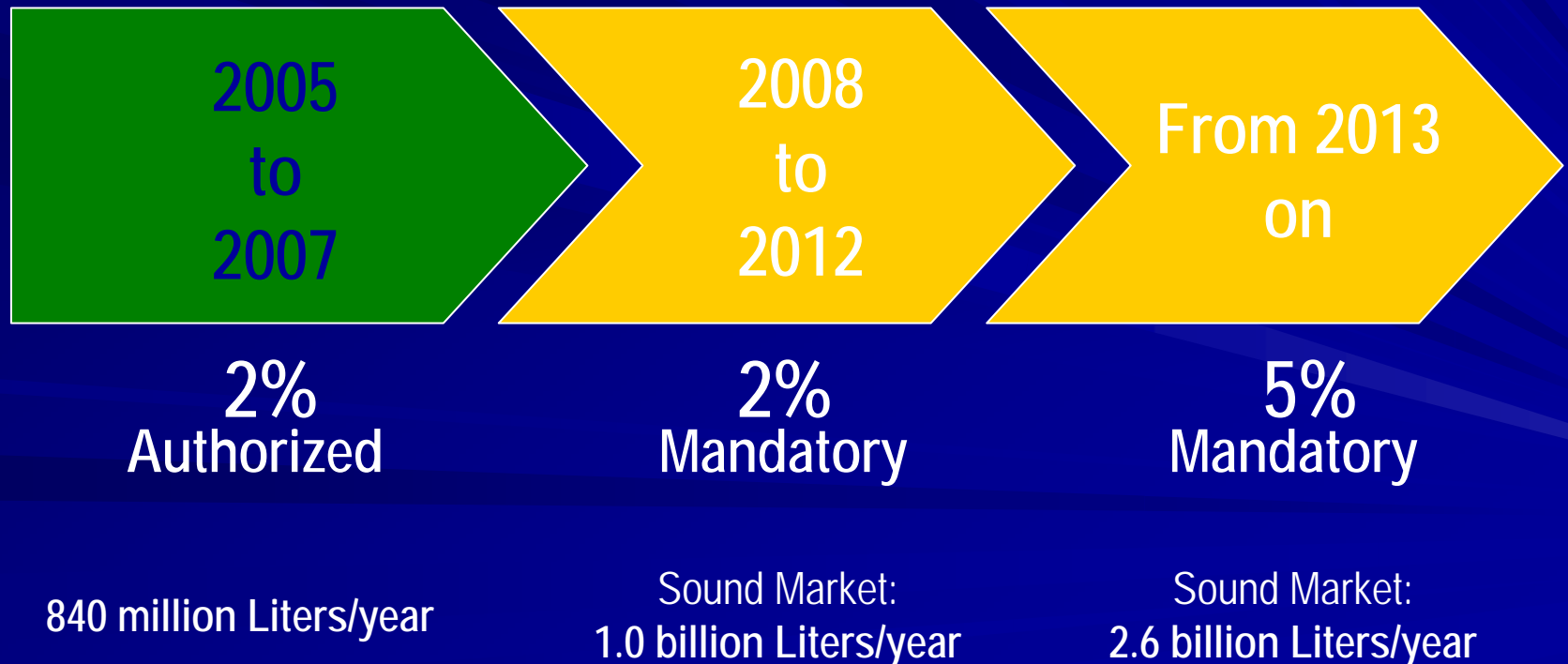
Evolution

1975 – Proálcool	32 Years Later
Production costs: over USD 800/m ³	Production costs: below USD 200/m ³
Sugarcane yield: Brazil mean 46.82 ton/ha	Sugarcane yield: Brazil 74.29 ton/ha
Sugarcane yield: São Paulo 61.5 ton/ha	Sugarcane yield: São Paulo 83.54 ton/ha
No environmental or social concerns	Environmental issues are present and strongly related to the definition of energy policies
Non existence of external markets	Perspectives of strong trade flows. Ethanol as an energy commodity.

The Biodiesel Program

Learning from past mistakes

Social fuel certificates



Tax incentives and social fuel certificates

In search of the right feedstock

Castor-oil	470 kg/ha	Cottonseed	361 kg/ha
Palm-oil	4,000 kg/ha	Peanutoil	788 kg/ha
Jatropha	2,000 kg/ha	Soy	560 kg/ha

Federal tax incentives scheme

31% tax exemption for agribusiness in North, Northeast or “Semi-arid” regions producing castor or palm oils.

68% tax exemption for family-farmers in any region producing any oilseed.

100% tax exemption for family-farmers in North, Northeast or “Semi-arid” regions producing castor and/or palm oils.

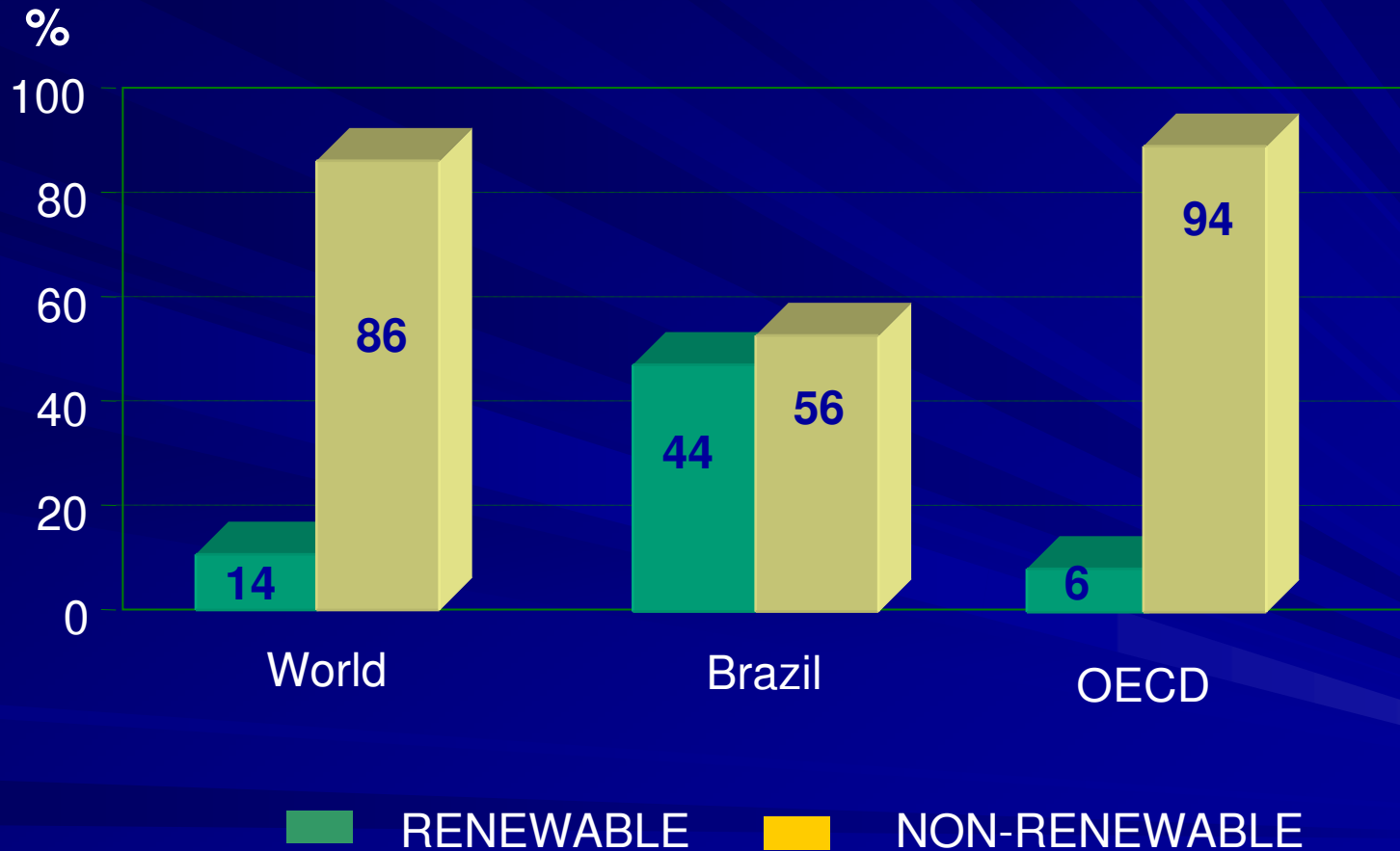
In summary

- Biofuels can be cost-effective (feedstocks).
- Adequate policies lead to economic scale, high productivity, R&D inventory.
- Brazil still has the potential for rapid crop expansion (sustainable).
- Social and environmental issues are present.
- New domestic market opportunities: biodiesel.
- Potential foreign markets (US, EU, Japan, China)
- Direct foreign investments expected as global demand increase / CDMs.
- Future technologies – cellulosic ethanol and fuel-cells

Thank you

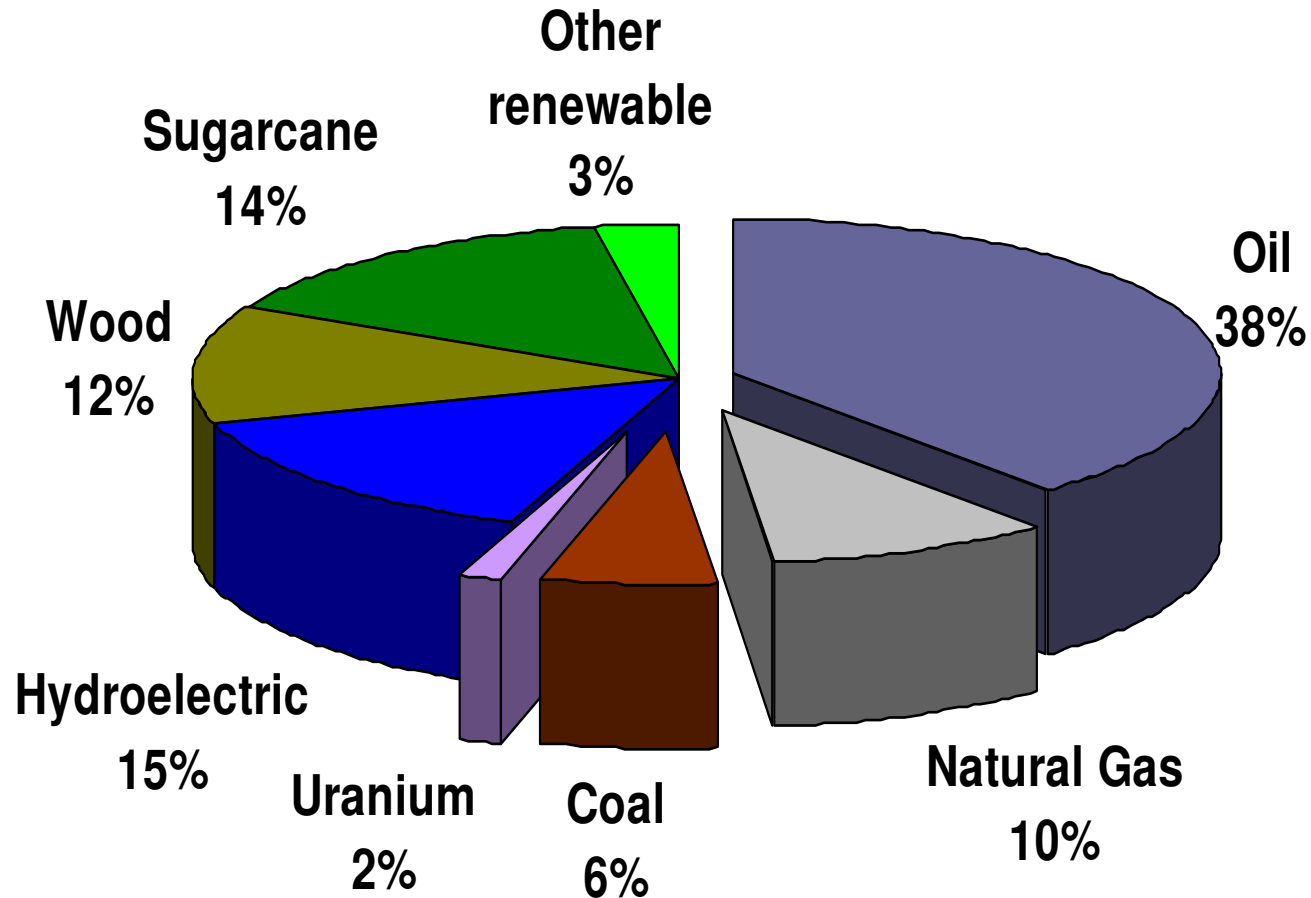
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Primary Energy Supply



Brazil: Primary Energy Supply

Total non-renewable 55.6% / OECD 94%



Total renewable Brazil 44.4% OECD 6%

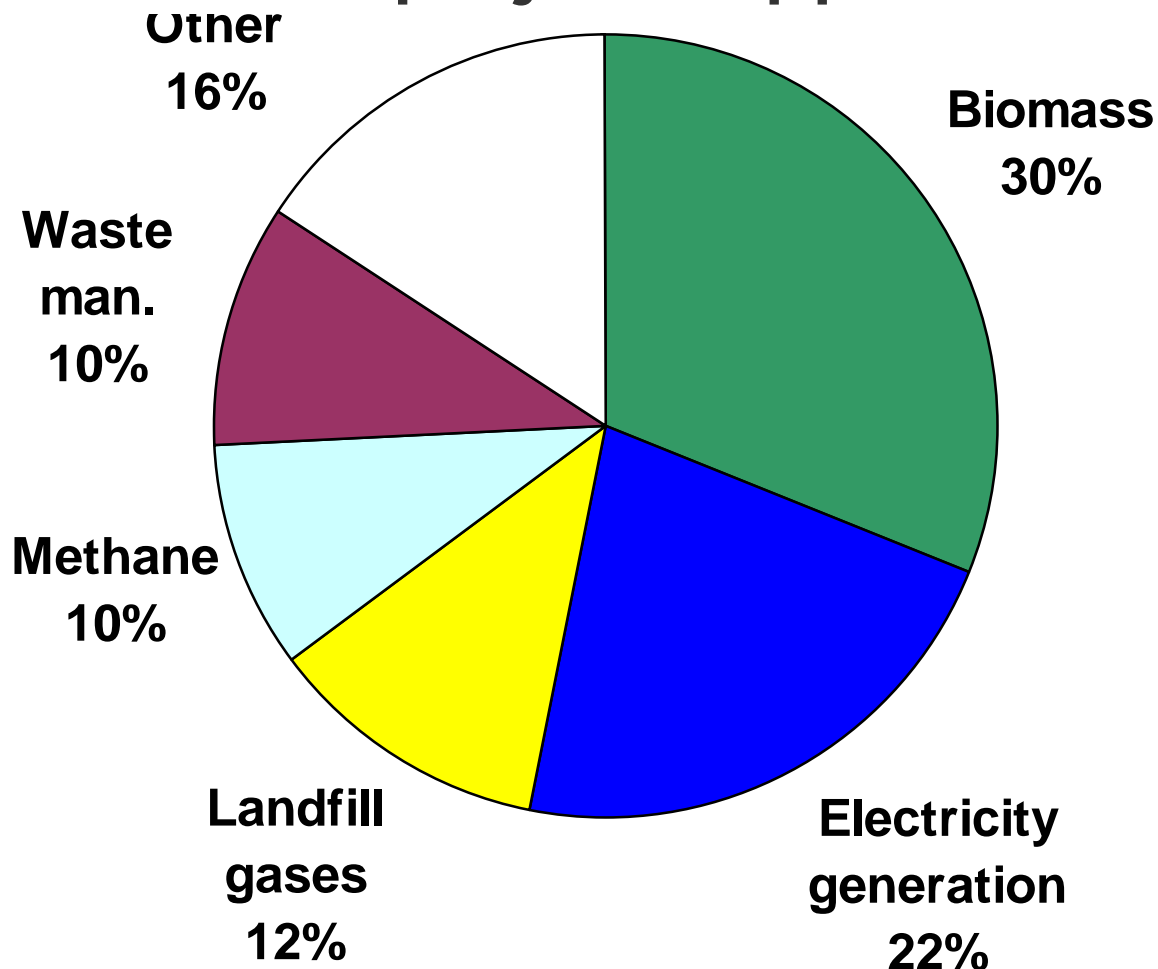
Source: MME/IEA

Brazilian Ethanol Timeline

- 1532 – First reference to “cachaça” or firewater
- 1931 – First ethanol mandate (E-5)
- 1932 – IAA Sugar and Alcohol Board
- 1935 – IAC Campinas Agronomical Institute
- 1959 – Copersucar farmers and millers cooperative
- 1960-70's the Brazilian “miracle”
- 1973 – 1st Oil Shock
- 1975 – Proálcool The National Alcohol Program
- 1979 – 2nd Oil Shock
- 1980/86 – Hydrous ethanol is king (E-100 car sales reach x% of market)
- 1986-95 – Stagnation (ethanol shortage – decline of E-100 car sales)
- 1995-2000 – Redefinition (market totaly deregulated)
- 2003 – Flex fuel revolution (serial production of FFVs begins)

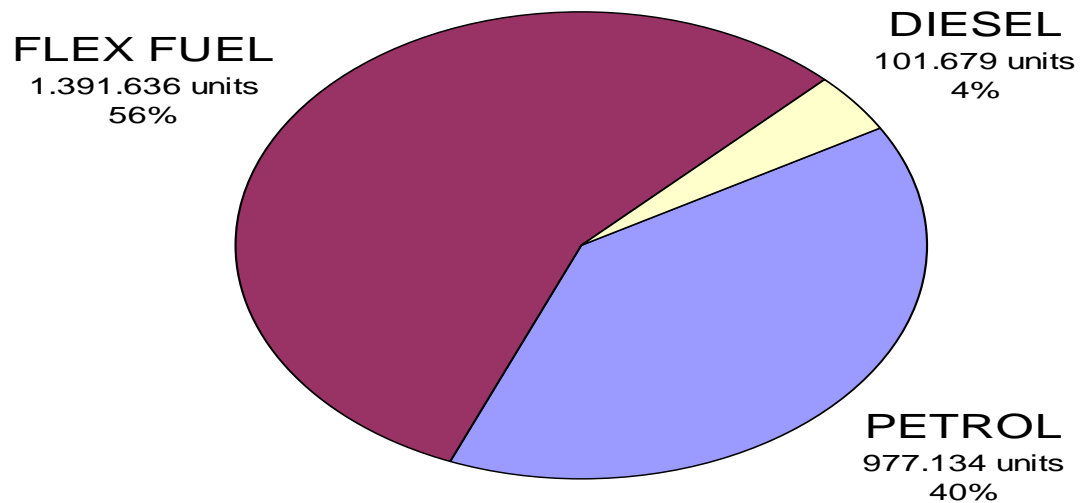
Biofuels and CDMs

221 CDM projects approved



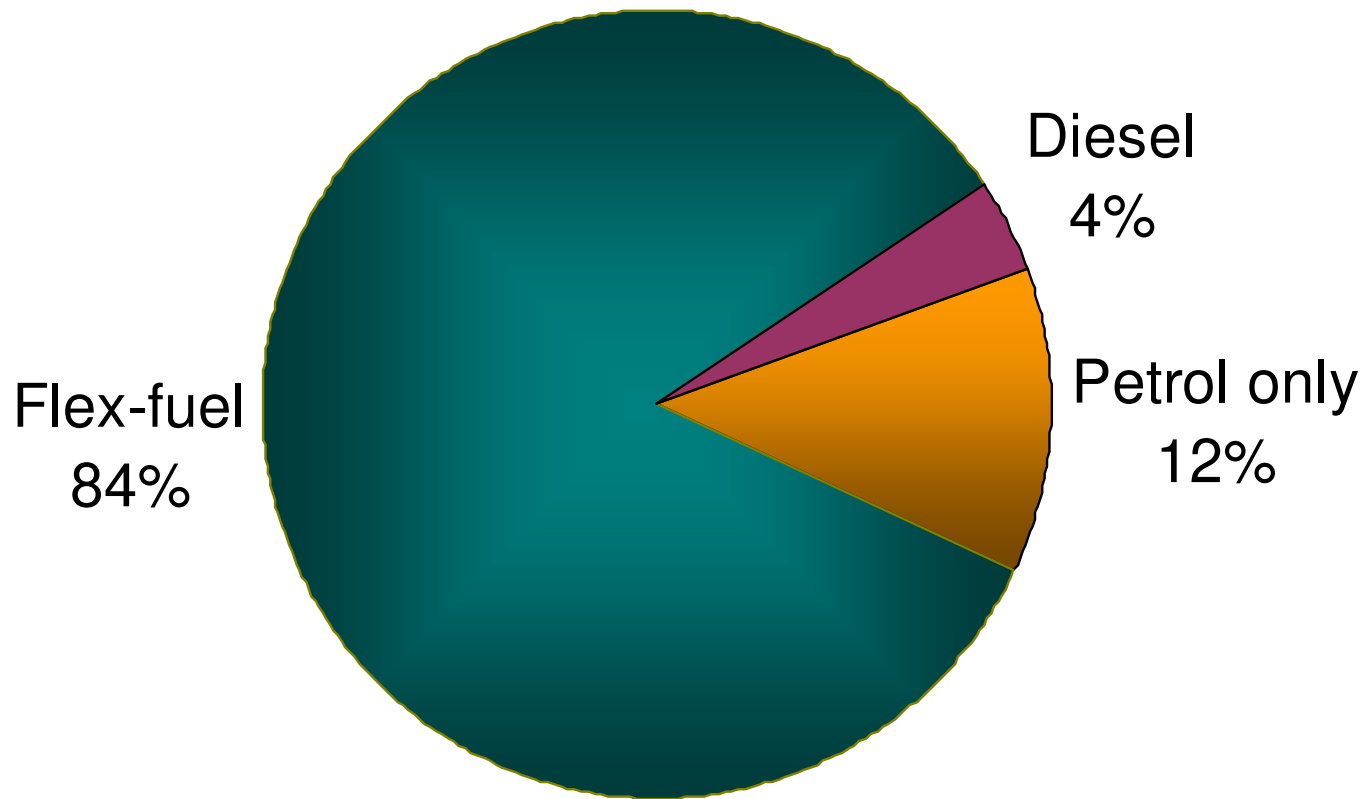
Flex-Fuel Power

**Passenger and Light Commercial vehicles
Domestic production by fuel type in 2006
Total = 2.4 million**



Flex-Fuel Power

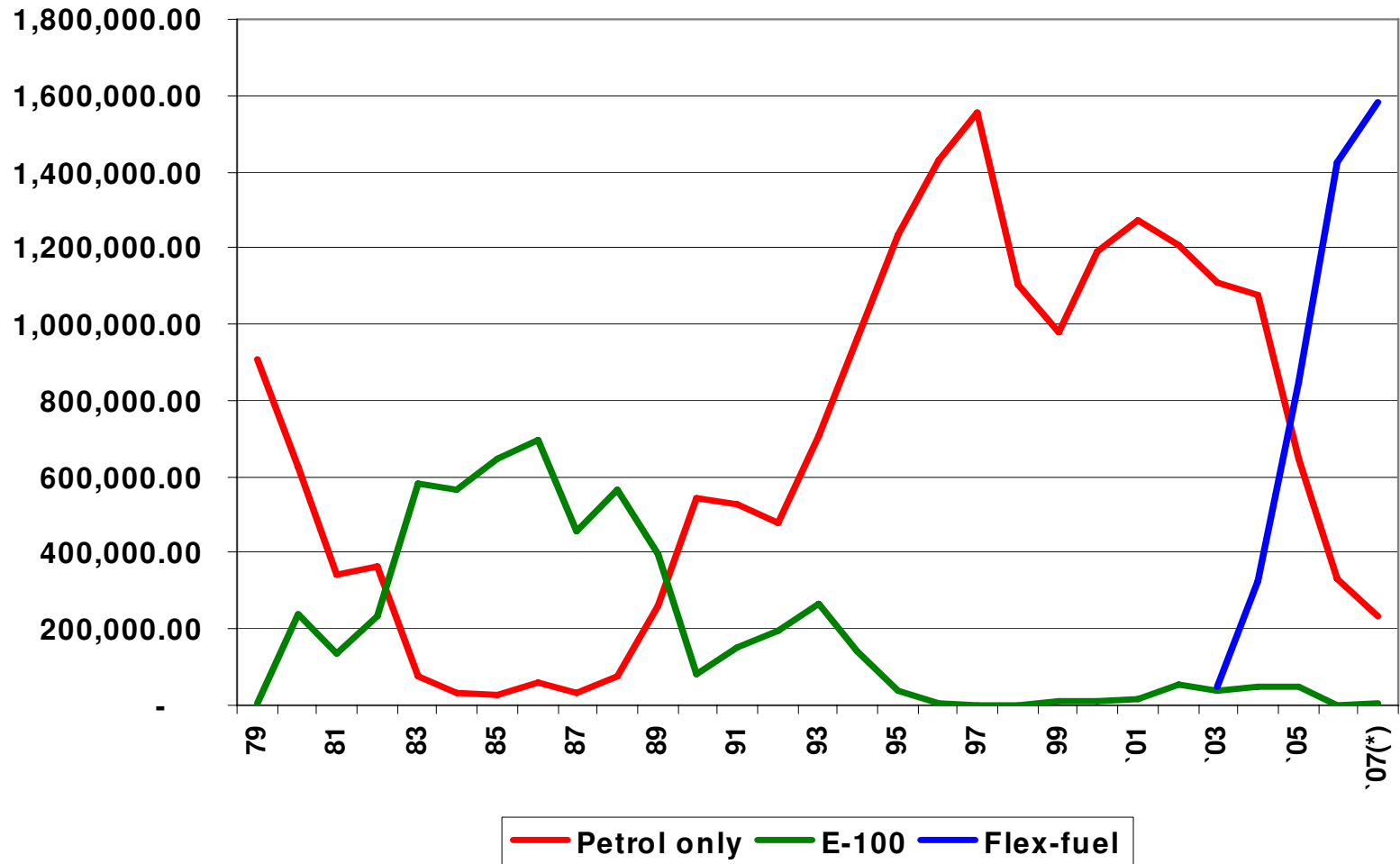
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Flex-Fuel Power

Brazil: Car Sales by Engine Type



Research & Development

Public sector

- IAC - Campinas agronomic institute (cultivars varieties)
- CTA – Airspace technological centre (origins of E100 and FFV)
- Embrapa – Network of federal R&D centres for agriculture
- Ridesa – Sugarcane R&D network of Federal Universities
- USP/ESALQ – São Paulo State Universities

Private sector

- CTC – Sugarcane technology center (Copersucar)
- Canavialis/Alellyx (Votorantin)
- Magneti Marelli / Bosch (flex-fuel systems)

Experience

1975 – Proálcool	32 Years Later
Skepticism regarding the use of alternative fuels. No environmental concerns.	Far better receptivity to new fuels. Green is good.
Consumers feared supply problems. Prices of ethanol powered cars devalued in the market.	Flex-Fuel Technology: end of ethanol supply problems. Consumers embraced the new technology.
Regulated market. Ethanol was subsidized and prices were controlled.	Ethanol production is not subsidized and the fuel market is totally free.
Ethanol demand was a direct function of the total circulating fleet. Control price by Government.	Flex-Fuel Vehicle is a mean of self-regulation mechanism to the fuel market.
Ethanol Production: 580 million litres	Ethanol Production: 17 billion litres

Parties involved in the sugarcane industry

Sugarcane Plantation Phase

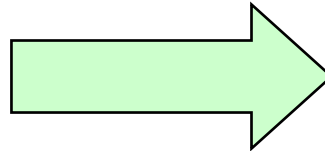


- 50 thousand sugarcane growers



Monitored by the Ministry of
Agriculture

Sugarcane



Sugar and Ethanol Industrial Phase

- 313 Industrial Plants



Regulatory Domain: Ministry of Agriculture

- 1 – **Registration of the sugar/ethanol mill** in the Ministry of Agriculture:
 - **Basic Information** of the Industrial Unit (Installed capacity, location, infrastructure etc.);
 - **Status of Operation.**
- 2 – **Gathering of biweekly information** about:
 - **Production (milling) and**
 - **Supplies.**

Parties involved in the sugarcane industry

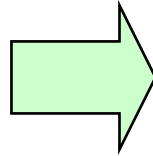
Sugar and Ethanol Industrial Phase



Regulatory Domain : MAPA – ANP

3 - The Ministry of Agriculture sends the data from the Sugar Mills Database to the National Petroleum Agency (ANP).

4 - The ANP registers ethanol production. **All ethanol suppliers must be registered before the ANP.**



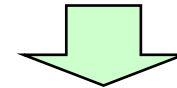
Fuel Distributors



- There are 160 Operating Distributors

- Only distributors may blend ethanol with petrol

5 – The Fuel distributors must acquire ethanol exclusively from industrial units that are **registered at ANP**. Regulatory Domain: Ministry of Mines and Energy / ANP (National Petroleum Agency)



Gas Stations

- 32,030 petrol stations sell E-100 ethanol. (92% of total petrol stations in Brazil)



- Anhydrous Alcohol must be orange-colored.
- Hydrated Alcohol is uncolored.

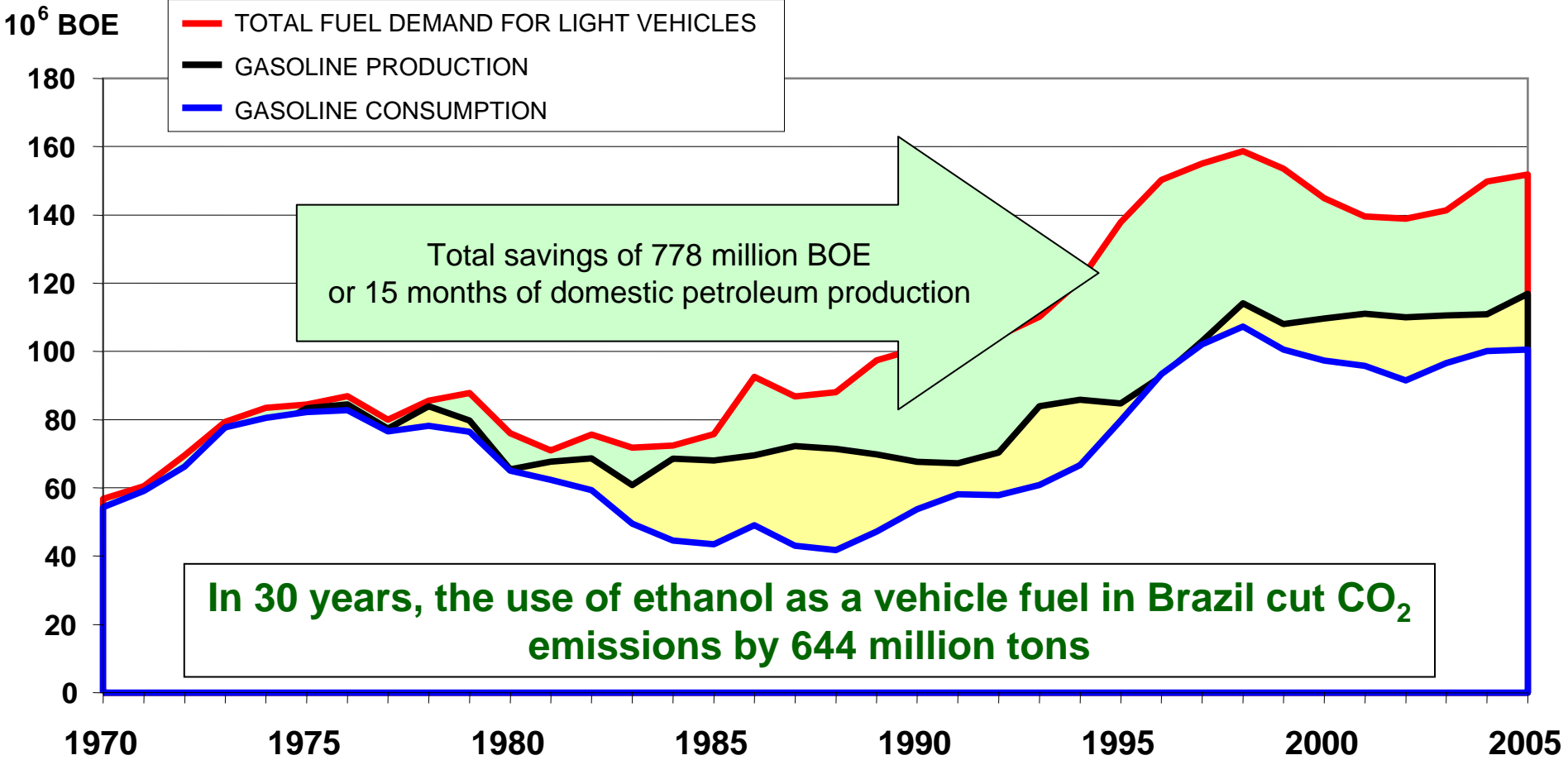
Fuel Quality Control





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

Ethanol in Brazil

FUEL DEMAND FOR LIGHT VEHICLES IN BRAZIL



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  ⇒
 Total economy of 1.14 billion BOE or 22 months of the 2005 Brazilian petroleum production.

Source: Ministry of Mines and Energy
 Brazilian Energy Balance – 2005
 and Laura Tetti – USP – 2002