

Towards a Strategy for Sustainable Production and Trade of Bioenergy: the Brazilian Experience

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Secretaria de Mudanças Climáticas
e Qualidade Ambiental
SMCQ

Ministério do
Meio Ambiente



Ethanol in Brazil: 81 Years of Experience



The Proalcohol Program

- Motivation for a more aggressive program on the use of renewable biofuels in light weight vehicles
 - Two petrol crisis in the 70s
 - Need to minimize the impact of these crisis on Brazilian economy
 - Reduce the net import expenditures
 - Creation of the Proalcohol program in 1975

Incentives established by the Pro-Alcohol in 1975

Ethanol price lower than gasoline price

Guaranteed remuneration to the producer

Tax reduction for hydrated ethanol cars

Loans for ethanol producers to increase their capacity

Gas stations were obligated to sell ethanol

Maintenance of strategic safety stocks

Uses of Ethanol in Transport

- Mixed with petrol
 - 20-25% anidrous alcohol
- Pure ethanol (hydrated alcohol)

First Results for a 100% Ethanol Vehicle: 1979

1979: Manufacturers begin to sell 100% Ethanol Vehicle



**April, 1979:
Publication in a technical magazine of the first test-drive of a 100% ethanol vehicle**

TESTE FIAT A ÁLCOOL

Ele atinge a velocidade máxima de 142 km/hora

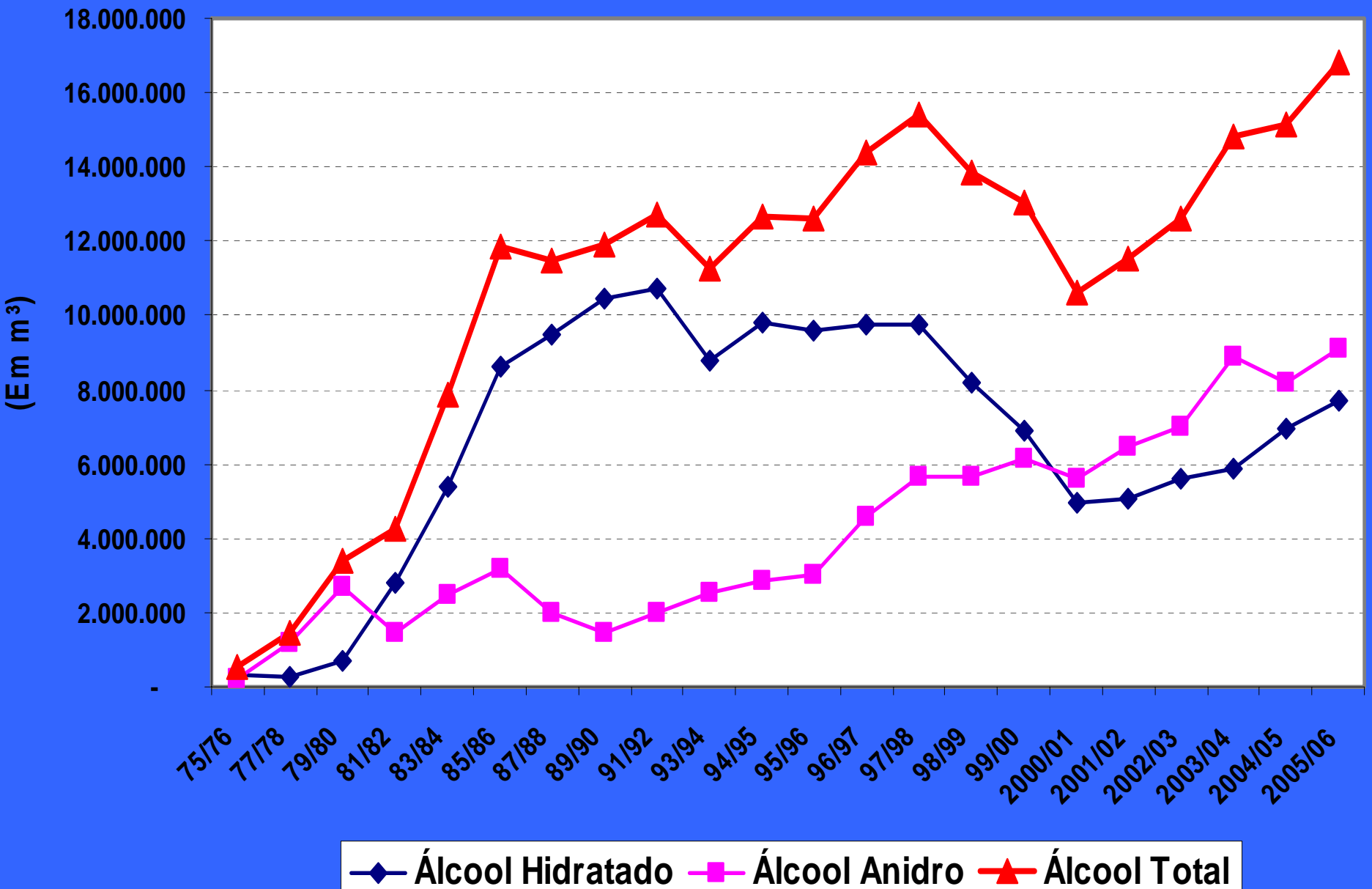
Como anda um carro movido apenas a álcool? Para responder a essa pergunta, **Quatro Rodas** testou com exclusividade um Fiat a álcool produzido na fábrica de Betim, Minas Gerais, e já na sua versão praticamente definitiva.

E, entre os resultados alcançados no teste, destacam-se o desempenho muito bom, superior ao dos modelos de série (apenas o esportivo Rallye tem, em alguns pontos, marcas um pouco superiores, mas, no conjunto, perde para o modelo a álcool), o consumo bem mais elevado e a ótima dirigibilidade.

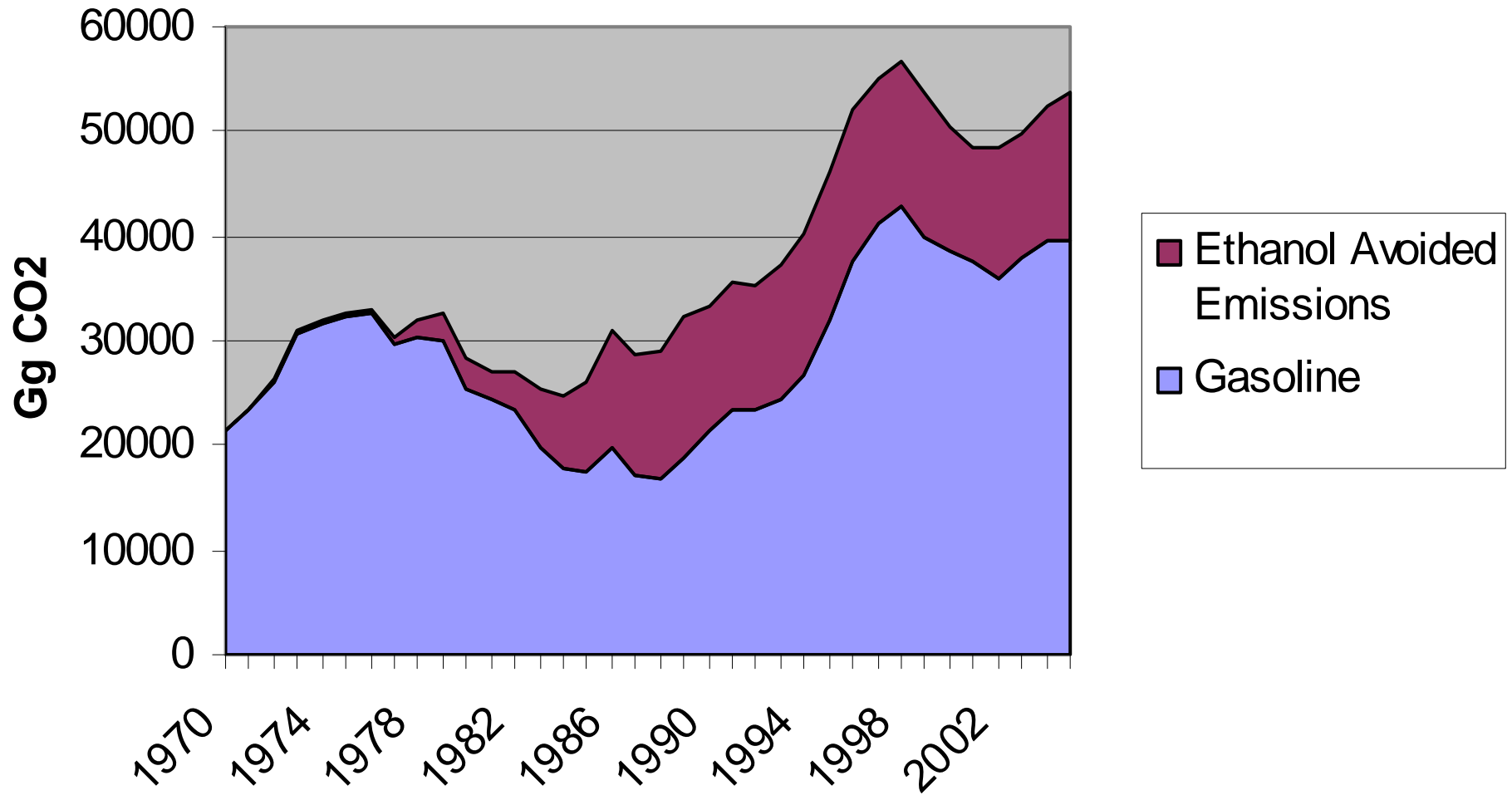


Com a instalação da quinta roda, medições exatas.

Brasil: Produção de Álcool Hidratado e Anidro

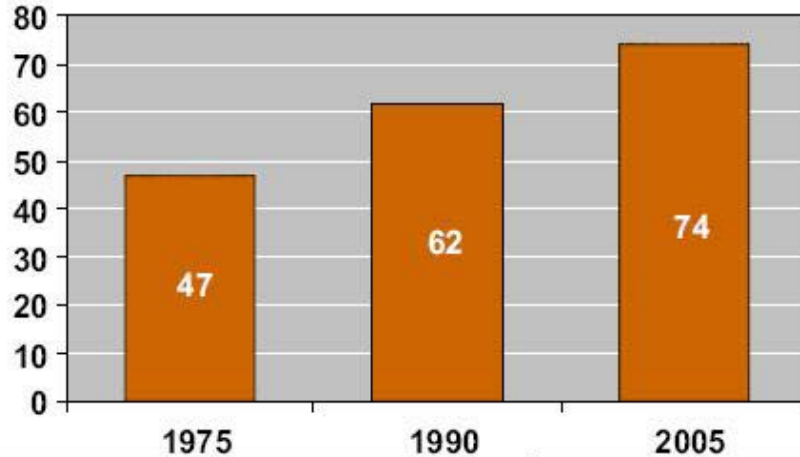


Avoided CO₂ Emissions from Ethanol Use in Road Transportation

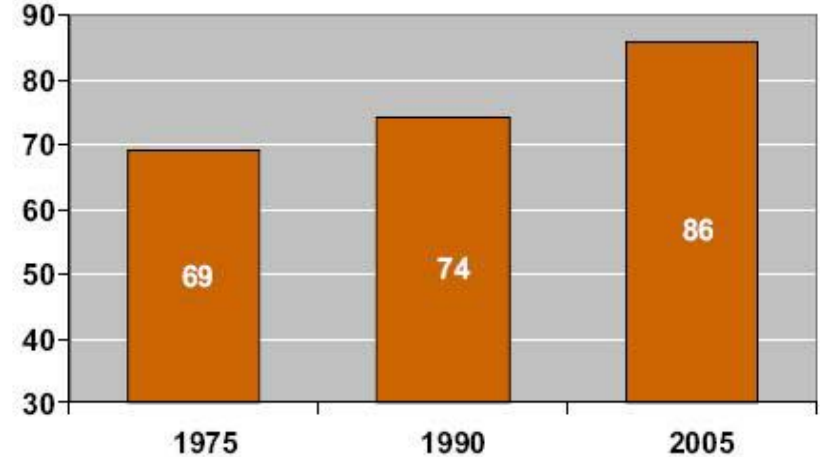


EVOLUTION OF ETHANOL PRODUCTIVITY

SUGARCANE PRODUCTIVITY
(tonnes of sugarcane / ha)



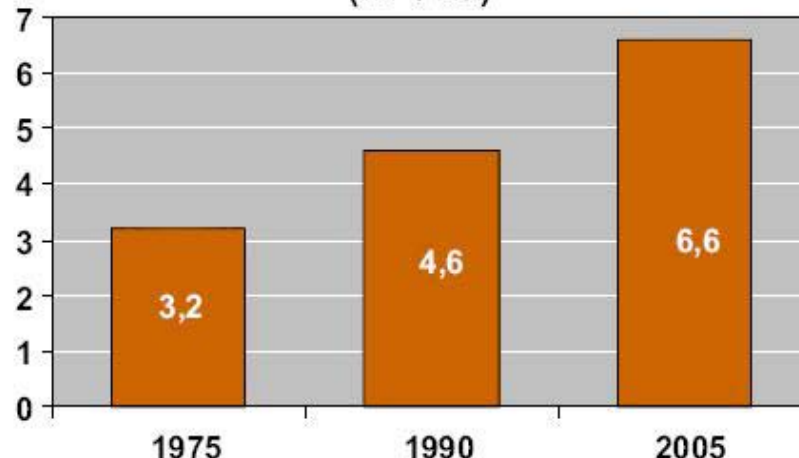
ETHANOL PRODUCTIVITY
(liters / tonnes of sugarcane)



Sugarcane Production 2006 = 457 10^6 t
33% of the world production

World Average = 69 t/ha

ETHANOL PRODUCTIVITY
(m^3 / ha)



Corn X Sugar Cane (average values)

Feedstock	Cost	Liter/tonne (gallon/tonne)	Liter/ha (gallon/acre)
Corn	More expensive	390 (103)	3,500 (374.5)
Sugar Cane	Less expensive	85 (22.5)	6,500 (695.5)

Well-to-wheel Emission Reduction

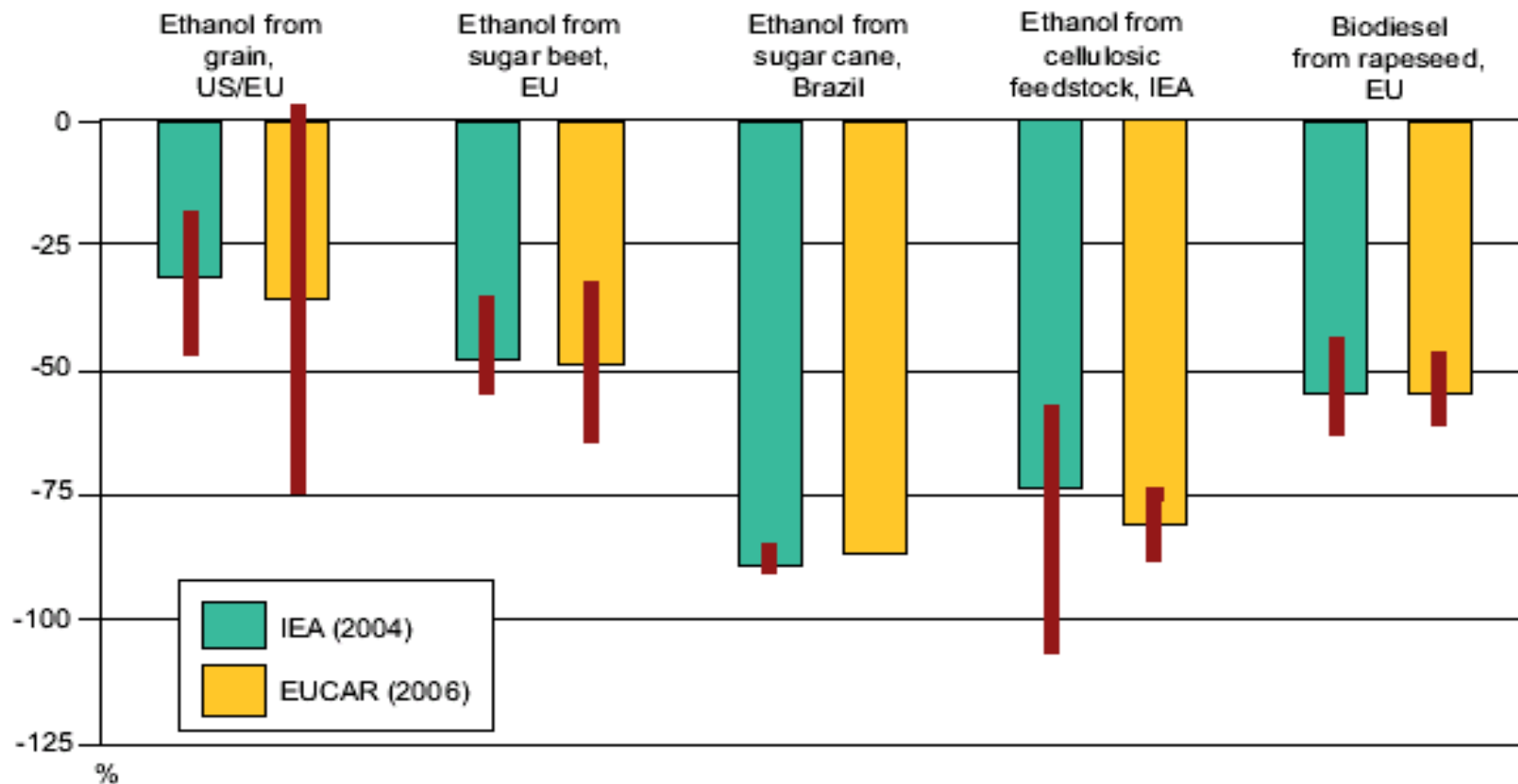


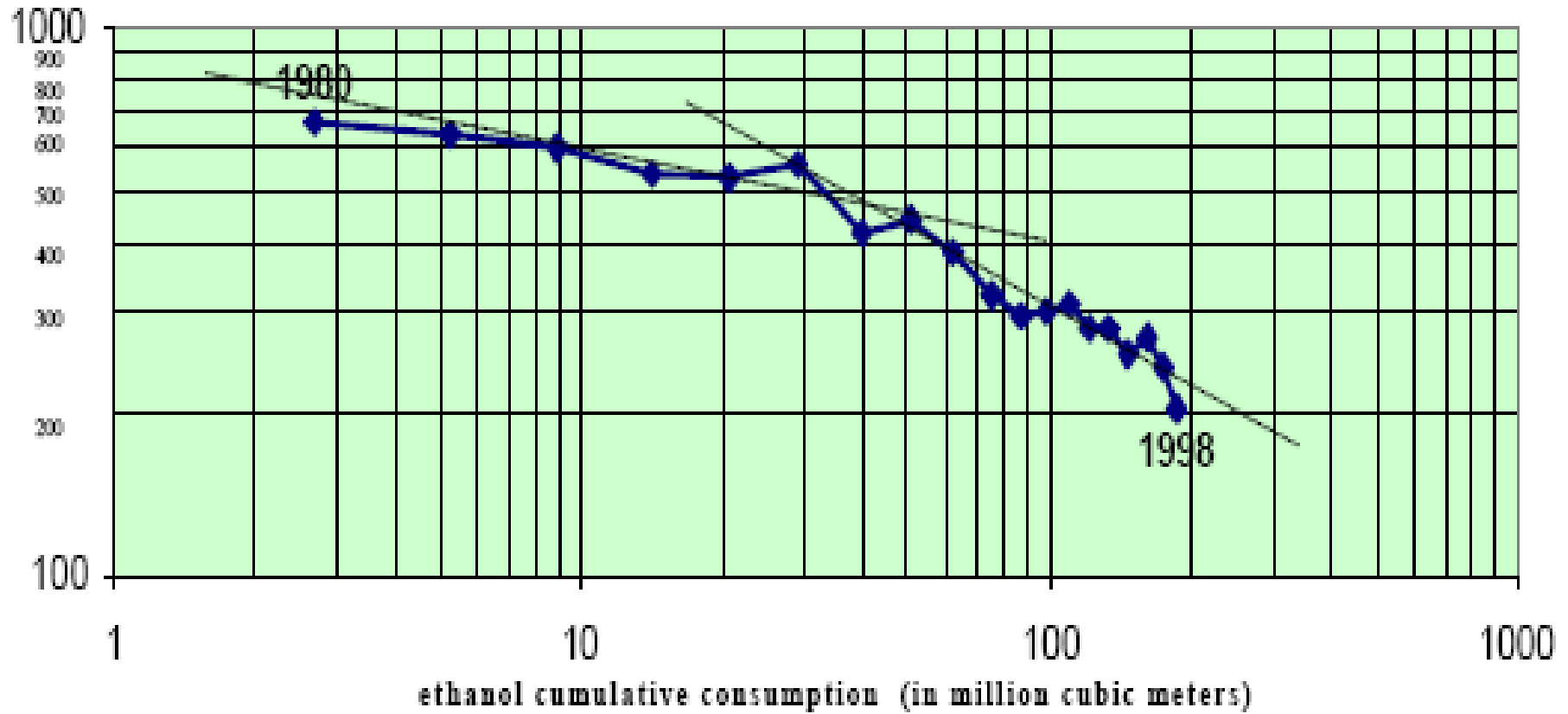
Figure 5.10: Reduction of well-to-wheels GHG emissions compared to conventionally fuelled vehicles

Note: bars indicate range of estimates.

Source: IEA, 2004c; EUCAR/CONCAWE/JRC, 2006.

Ethanol cost "learning curve"

(US\$/m³)



Ethanol Perspectives: Aviation Industry



SCIENTIFIC AMERICAN



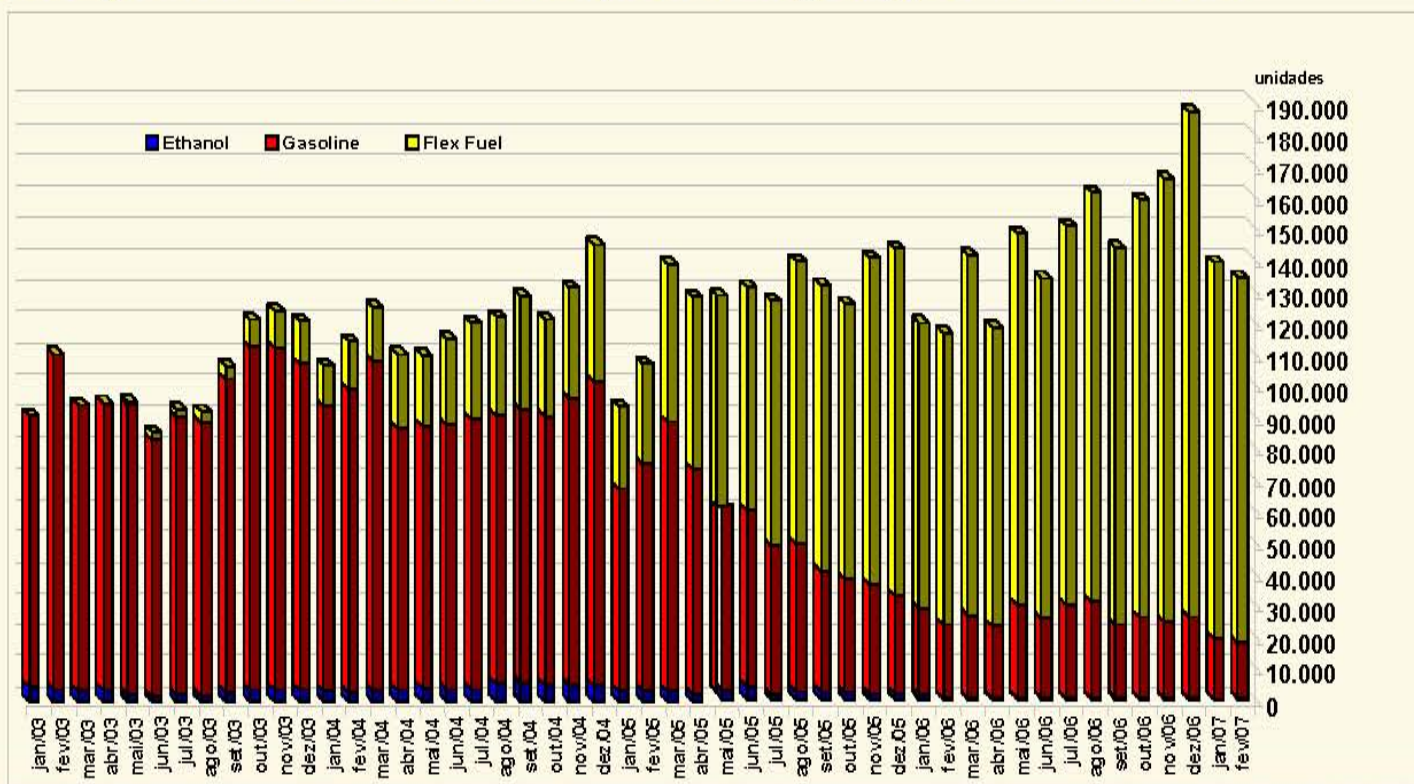
The EMB-202 was awarded with the prizes "Flight International Aerospace Industry Award" General Aviation category (June /2005) in Paris and The Scientific American 50 (December/2005) as one of the best inventions of the year in the world.

- Brazilian Aviation Industry sells the first 100% ethanol aircraft, the Ipanema (EMB-202) a single-seat agricultural utility .
- Embraer, in partnership with an Italian company, announces the development of the first aircraft with Flex-Fuel technology.



Flex Fuel Vehicles

- Consumer decides the fuel at the gas station
- Fuel price is one the most important factor
- Consumer is aware of pollution and renewable fuels
- Today cars manufacturer is producing 80% of FFV in Brazil



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)

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



RENAULT

FIAT



BRAZIL CHALLENGE

Energy and Food Production

In millions of hectares

	AREA (EXTENSION)	PERCENTAGE
BRAZIL (TOTAL)	851	100%
ARABLE AREA	383	45%
PASTURES	210	25% (55% of arable area)
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)

Brazilian Energy Policy

Law nº 9.478/1997

Objectives

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

Biodiesel versus Ethanol: Different Reasons

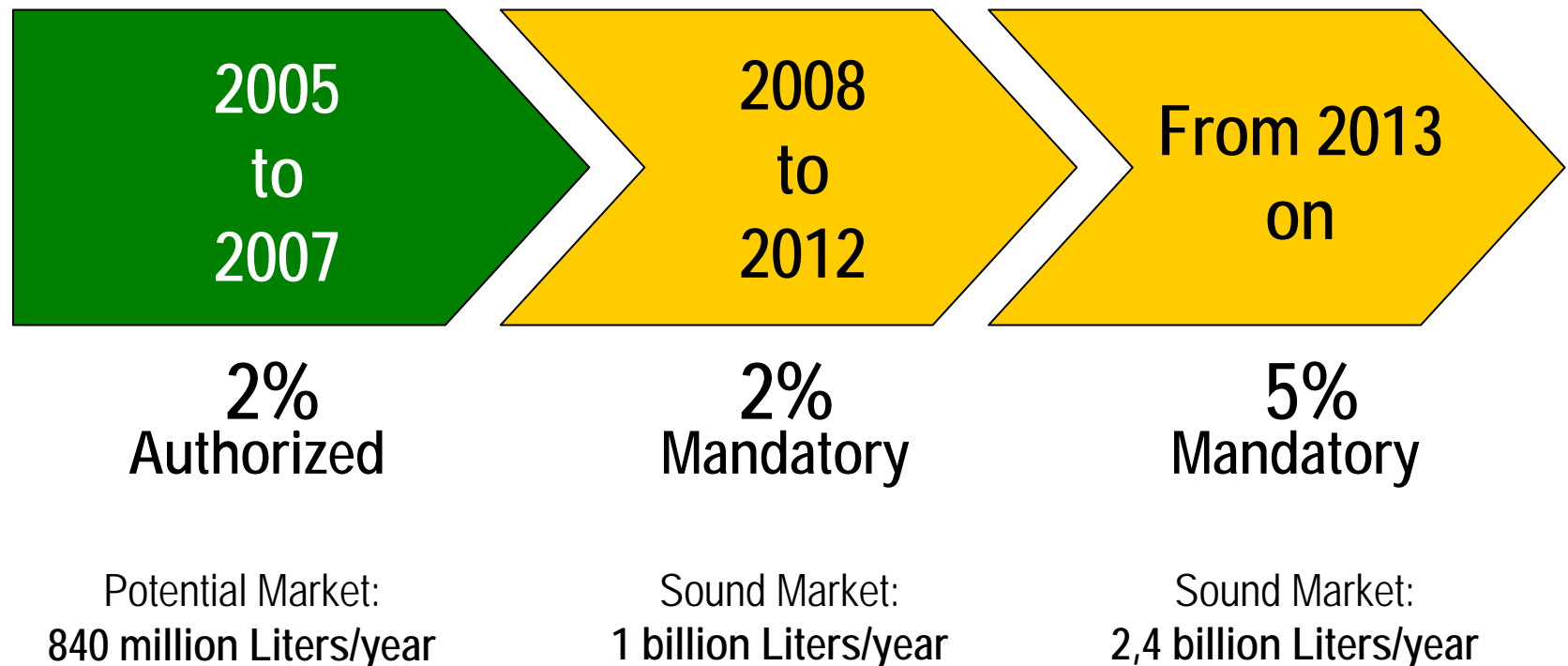
Ethanol (1975): basically economics.

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.



Raw material diversity for production of Biodiesel

Castor Beans



Sunflower



Soy



Palm Oil



Cotton



Average Agriculture Productivity

1.500 kg/ha

1.500 kg/ha

3.000 kg/ha

20.000 kg/ha

3.000 kg/ha

Percentage of Vegetable Oil

47%

42%

18%

20%

15%

Vegetable Oil Production (kg/ha)

705

630

540

4.000

450

Brazilian Production in 2005 m³/year

90.000

23.000

5.600.000

151.000

315.000