



Sustainability and biofuels: lessons from Brazil

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CONTENT

- The Brazilian energy context
- The biofuels market
- The impacts of expansion
- A sustainability scenario for biodiesel
- The need for certification
- Conclusions





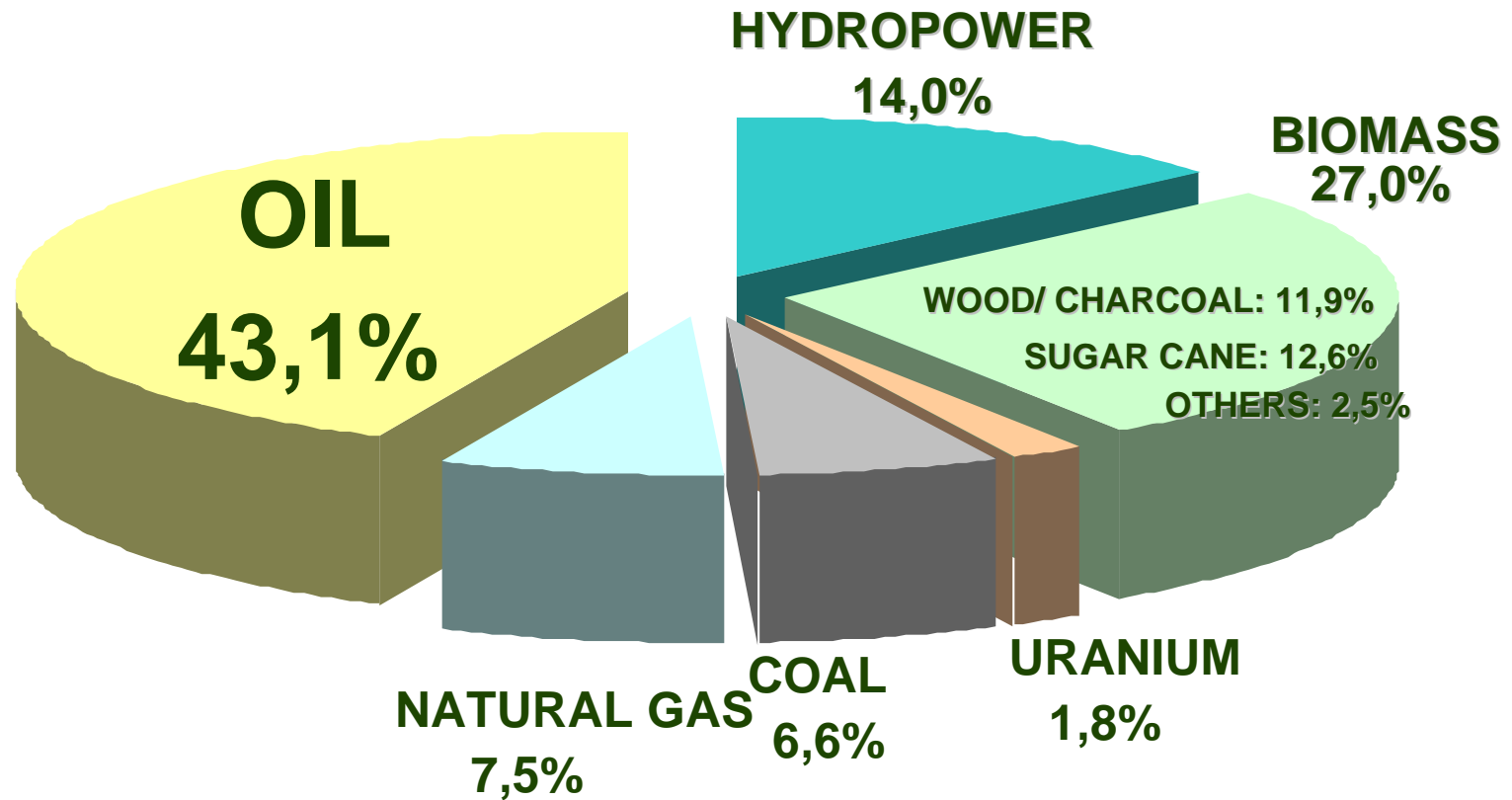
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ENERGY MIX (2003)



SOURCE : MME 2004





TRADE BALANCE OF FUELS (2003)

FUEL	PRODUCTION	IMPORTS	EXPORTS	IMPORTS	EXPORTS
	mil m3	mil m3	mil m3	% OF DEMAND	% OF SUPPLY
GASOLINE	18,537	-	2,497		13%
DIESEL	37,020	3,698	-	9%	
ETHANOL	14,660	-	1,200		8%
NATURAL GAS	15,792,031	5,946,859	-	27%	

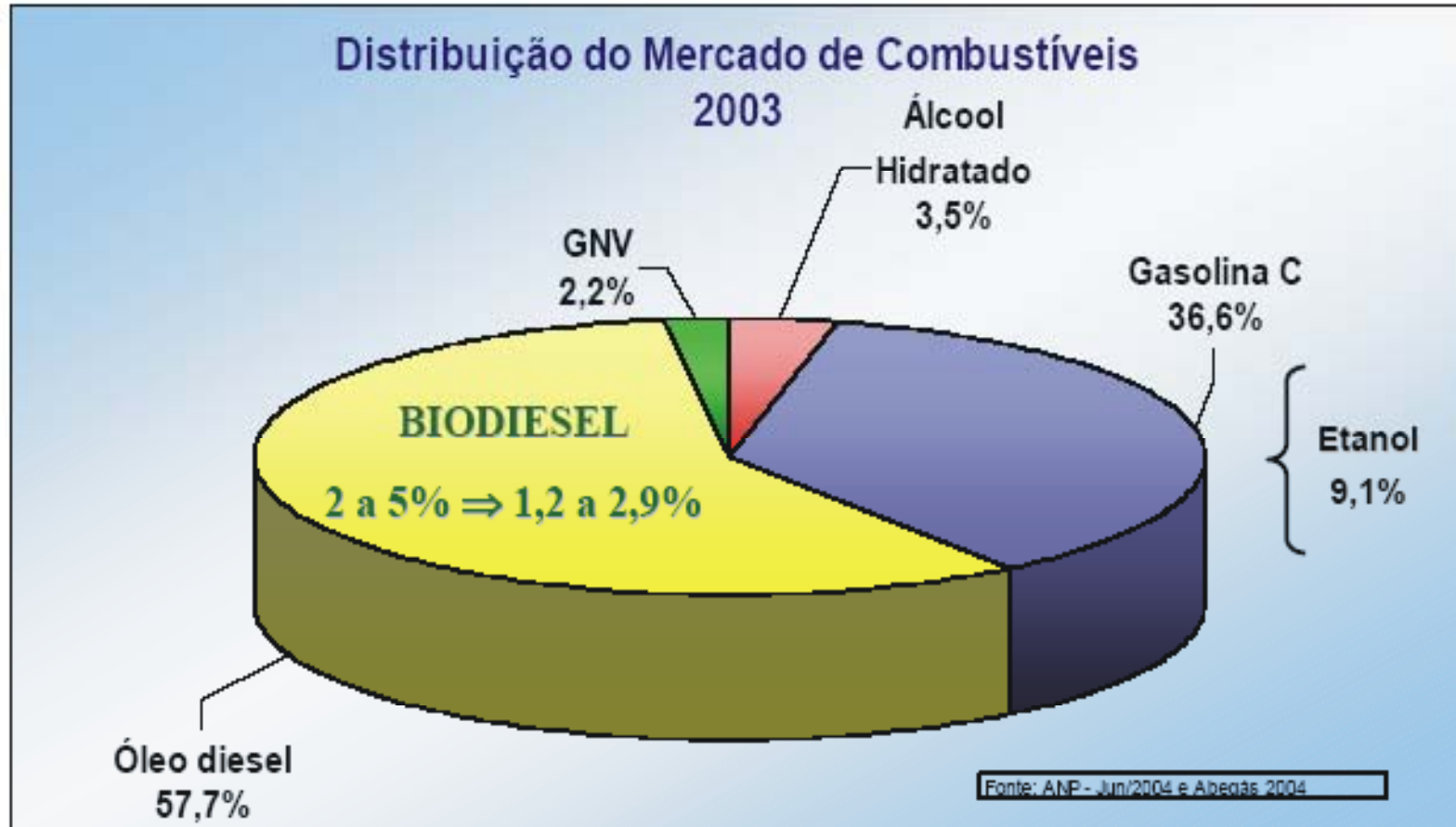
IMPORT DEPENDENCY

OVERSUPPLY





MARKET SHARE BY FUEL (2004)





DRIVERS FOR BIOFUELS PRODUCTION

DOMESTIC

- Ethanol: gasoline price increase and introduction of hybrid engines (35% of new car sales)
- Biodiesel: launch of a biodiesel obligation: 2% by 2007 (800 M l/y), 5% by 2013 (2 B l/y), and goal of 20% by 2020 (12 B l/y).

FOREIGN

- Kyoto Protocol implementation
- Exports to Japan, South Korea and US





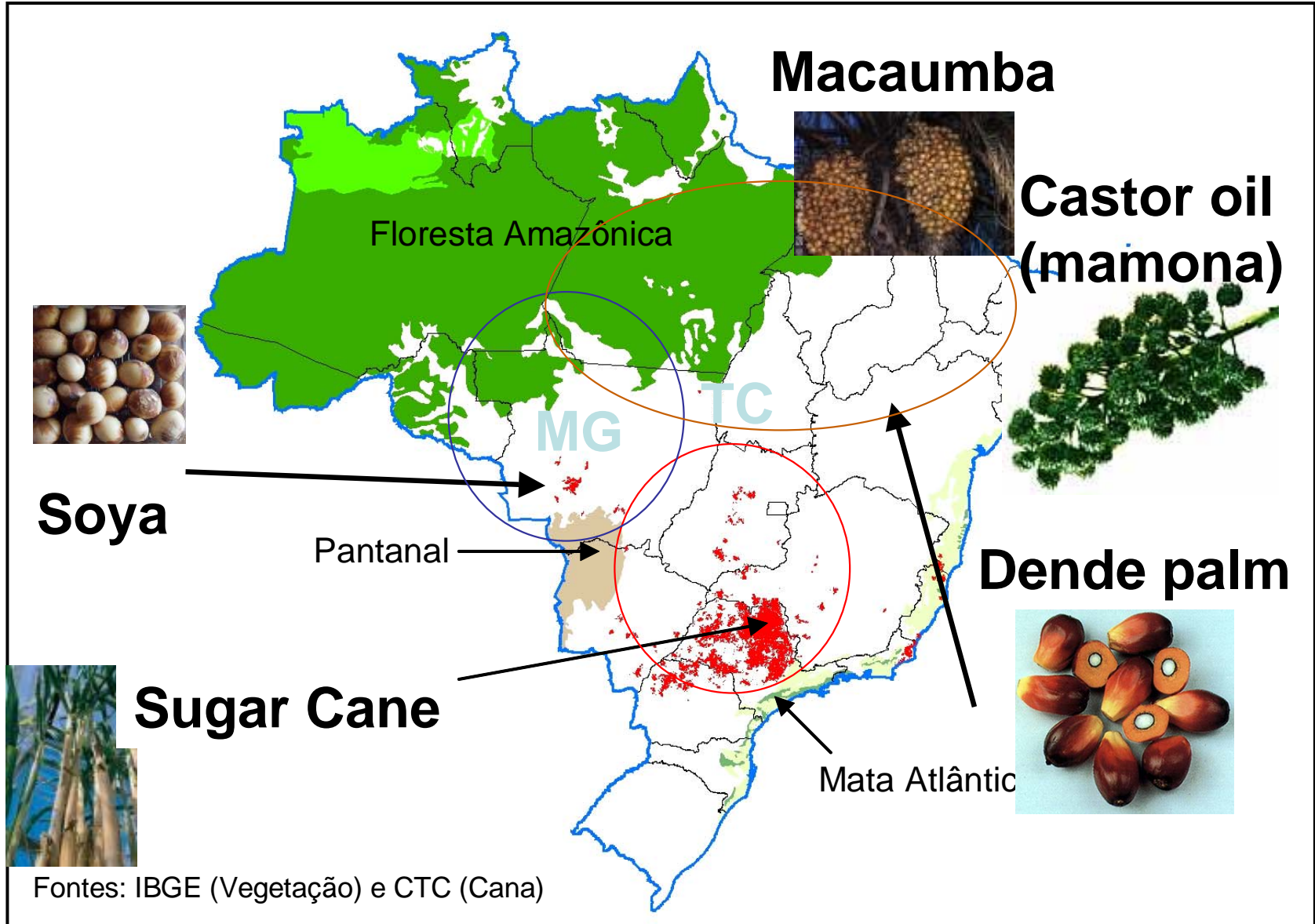
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CROPS FOR BIOFUELS





POSITIVE IMPACTS OF BIOETHANOL

- Hard currency savings average 1.8 billion US dollar/year with the replacement of \approx 200,000 barrels of gasoline/day (last 20 years)
- Air quality improvements in large cities (reduction of major pollutants: CO, NO_x, VOC)
- Creation of 720,000 direct jobs and 200,000 indirect jobs in rural area
- CO₂ emission reduction in the transport sector \sim 9 Mtons/year





CLIMATE BENEFITS

Net CO ₂ emissions reduction (1990-91)	Mtons C/Year
Ethanol Substitution for Gasoline* *Including blending 22% of ethanol with gasoline and 4.2 million pure ethanol-fired cars	- 7.41
Bagasse Substitution for Fuel Oil Burning as Heat Source in Other Industries	- 3.24
Fossil Fuel Utilization in Sugarcane Industry	+ 1.20
Net Contribution (uptake)	- 9.45

Source: Macedo, 1992





NEGATIVE IMPACTS OF BIOETHANOL

- Massive development of ecologically harmful monocultures based on large-scale land owners and land concentration (covering 80% of agriculture land)
- Transfer of subsidized public funds equal to \approx US\$ 10 billions to the sugar sector
- Local air pollution due to burning of cane plantations
- Mechanisation in the agricultural sector will lead to job losses for hundreds of thousands of rural workers

Source: LaRovere, 2004





CONTENT

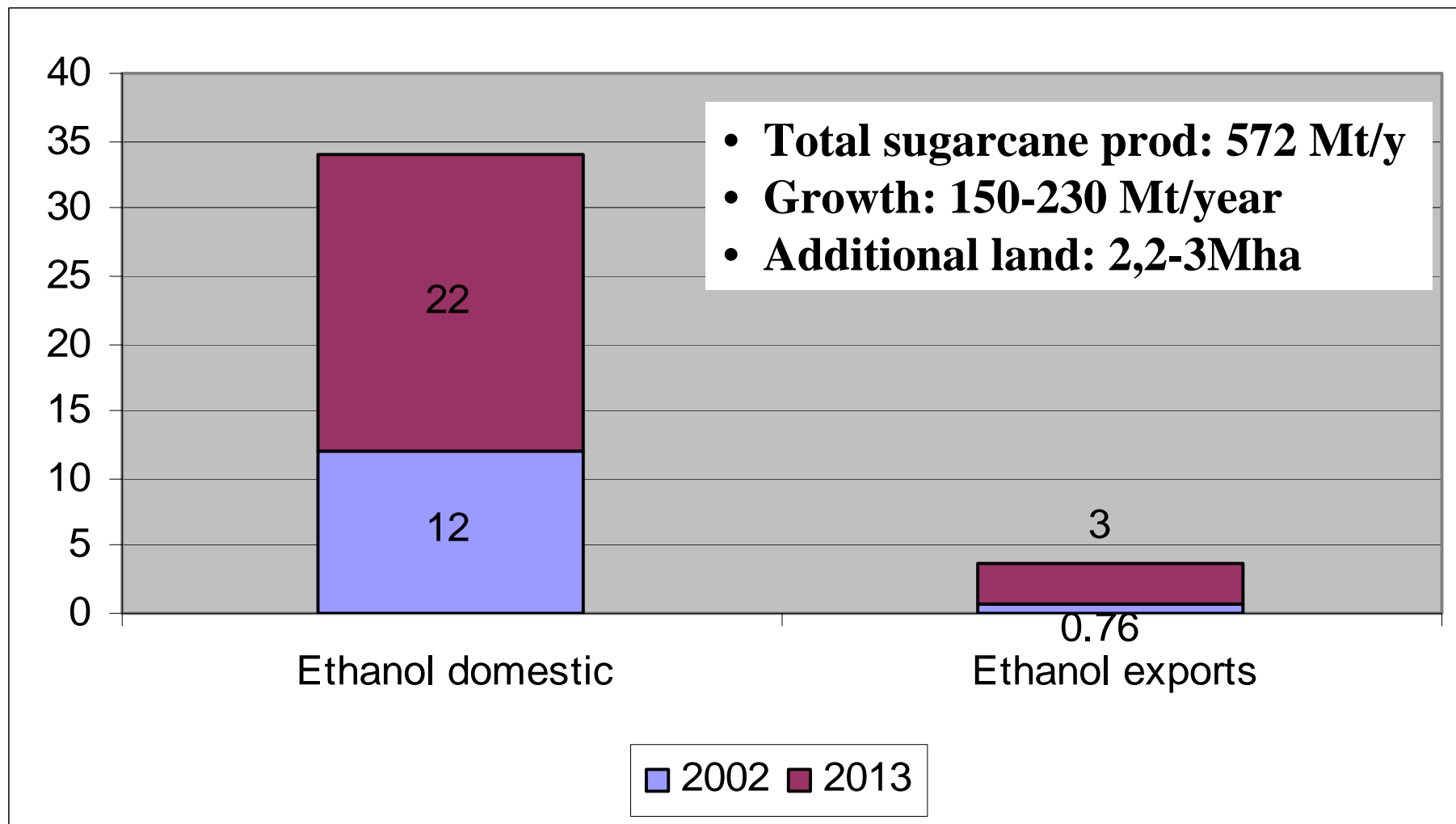
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FUTURE ETHANOL PRODUCTION

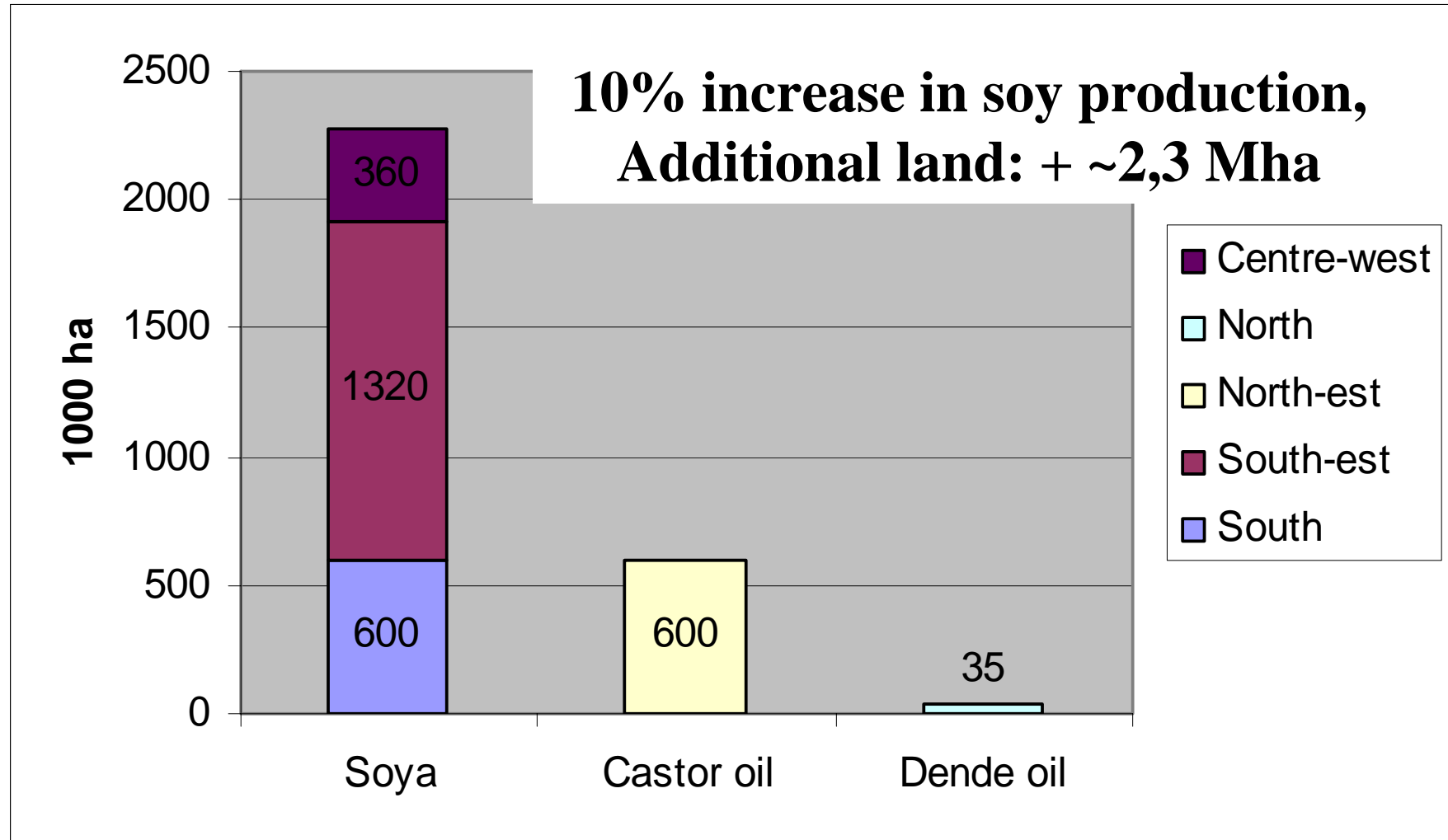


Source: Macedo, 2004





FUTURE BIODIESEL PRODUCTION

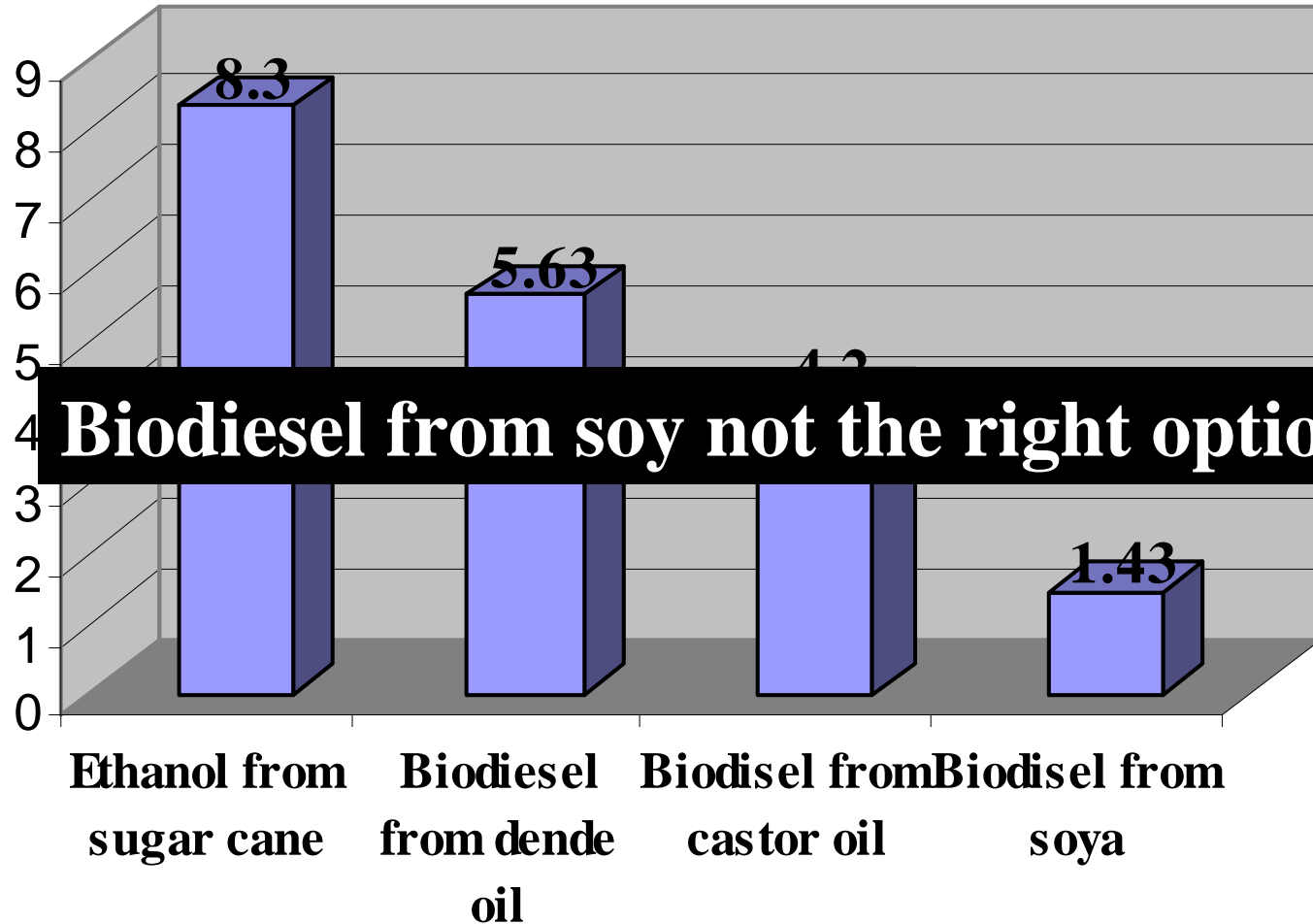


Source: Macedo, 2004





ENERGY BALANCES OF BIOFUELS



Source: Macedo, 2004





POTENTIAL FOR EXPORTS

- Short and medium potential from Brazil is mainly in bioethanol, little in biodiesel where national production will hardly meet demand
- Sugar conversion in hybrid plants (sugar or bioethanol) requires centralized production
- For biodiesel a more decentralized production and conversion is possible due to broader range of products, but centralized soy production is to play a major role





POTENTIAL IMPACTS OF EXPANSION

- Without strong regulations, exports will maximize the impacts of ‘cash crops’ agriculture:
 - Expansion of large-scale agriculture into ecologically sensitive areas in the Cerrado and the Amazon
 - Contamination of surface water due to growth in sediments and agrochemical inputs use
 - Further land-ownership concentration and marginalization of small farmers
 - Net loss of jobs resulting in uncontrolled migration to marginal areas of the Amazon region or large cities



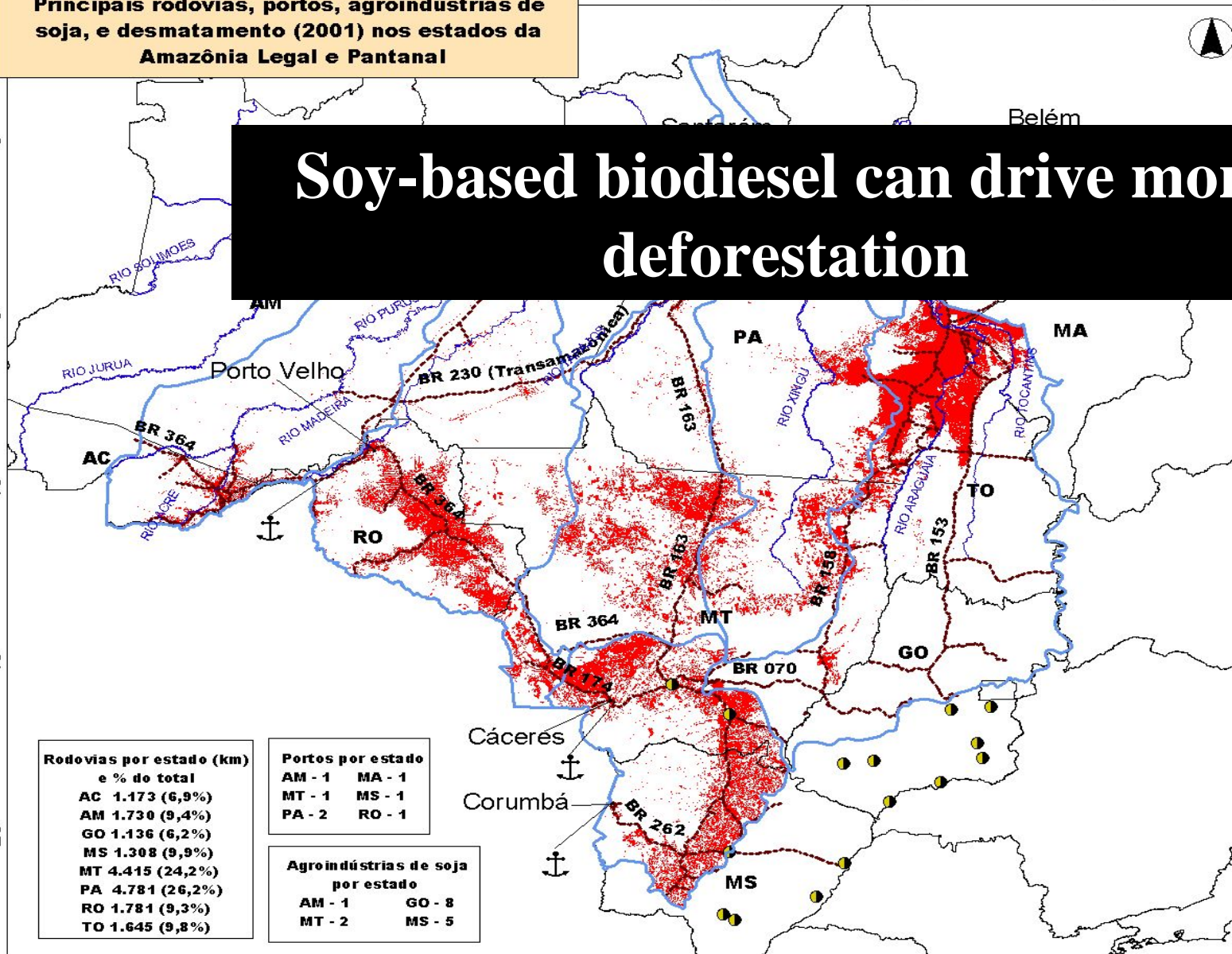
Principais rodovias, portos, agroindústrias de soja, e desmatamento (2001) nos estados da Amazônia Legal e Pantanal

55 50 45

Localização das bacias hidrográficas nos Estados do Brasil

Soy-based biodiesel can drive more deforestation

0
5
10
15
20



- 1- Purus
- 2- Madeira
- 3- Tapajós
- 4- Xingu
- 5- Araguaia-Tocantins
- 6- Alto Paraguai

LEGENDA

- Portos
 - Agroindústrias de soja
 - Rodovias
 - Rios
 - Desmatamento
 - Limites Estaduais
- 200 0 200 400 km
- 1:20.000.000

Rodovias por estado (km) e % do total

AC	1.173 (6,9%)
AM	1.730 (9,4%)
GO	1.136 (6,2%)
MS	1.308 (9,9%)
MT	4.415 (24,2%)
PA	4.781 (26,2%)
RO	1.781 (9,3%)
TO	1.645 (9,8%)

Portos por estado

AM - 1	MA - 1
MT - 1	MS - 1
PA - 2	RO - 1

Agroindústrias de soja por estado

AM - 1	GO - 8
MT - 2	MS - 5



Brasília, setembro/2004

Fonte: PRODES/INPE, 2003





POSITIVE IMPACTS OF EXPANSION

- Additional hard currency savings from gasoline substitute and replacement of diesel imports ~1.2 billion USD/y, replacing 2 M m³/y
- Further air quality improvements in large cities
- Further CO₂ emissions reductions due to bioethanol, while for soy-based biodiesel poor GHGs benefit





BIOFUELS COSTS (TONNE/GHG REDUCTION)

Ethanol from sugar cane, Brazil

Ethanol from corn, US

Ethanol from grain, EU

Ethanol from cellulose, IEA

Biodiesel from rapeseed, EU

Ethanol from sugar cane, Brazil

Ethanol from corn, US

Ethanol from grain, EU

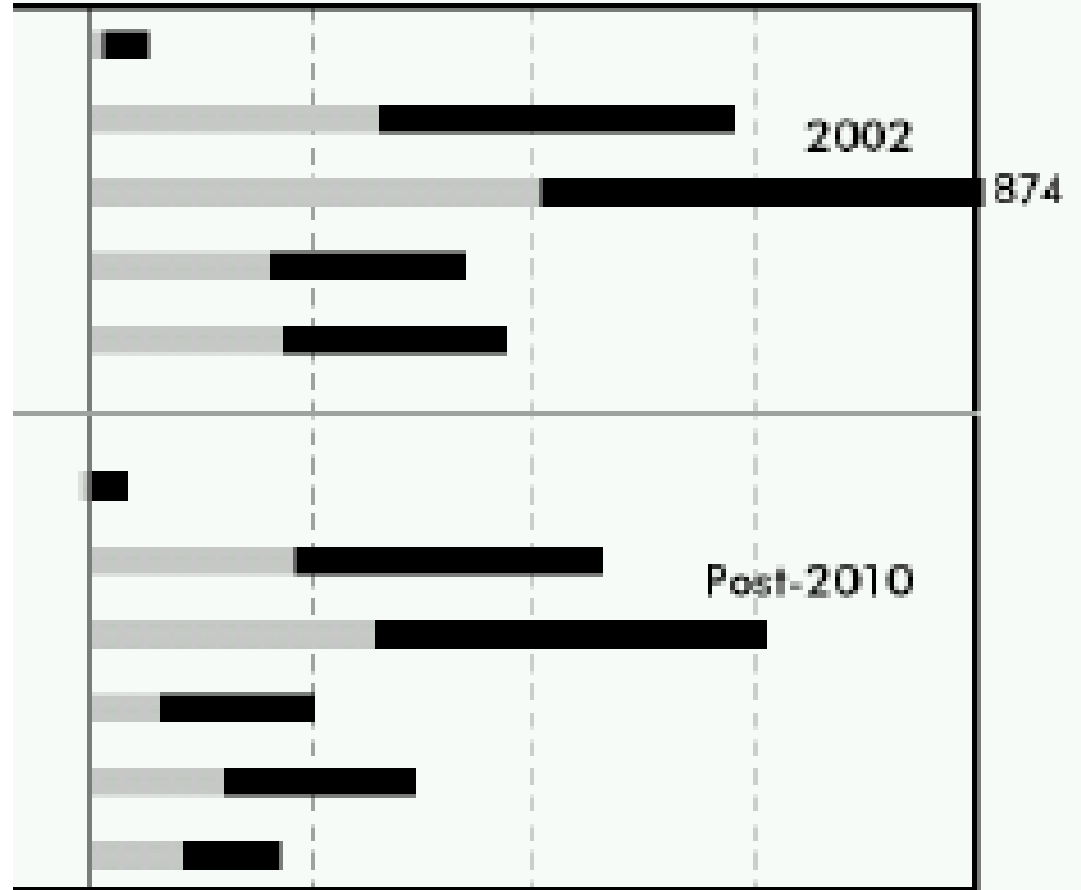
Ethanol from cellulose, IEA

Biodiesel from rapeseed, EU

Biodiesel from biomass/ F-T, IEA

US\$ per tonne CO₂-equiv. GHG emissions

\$0 \$200 \$400 \$600 \$800



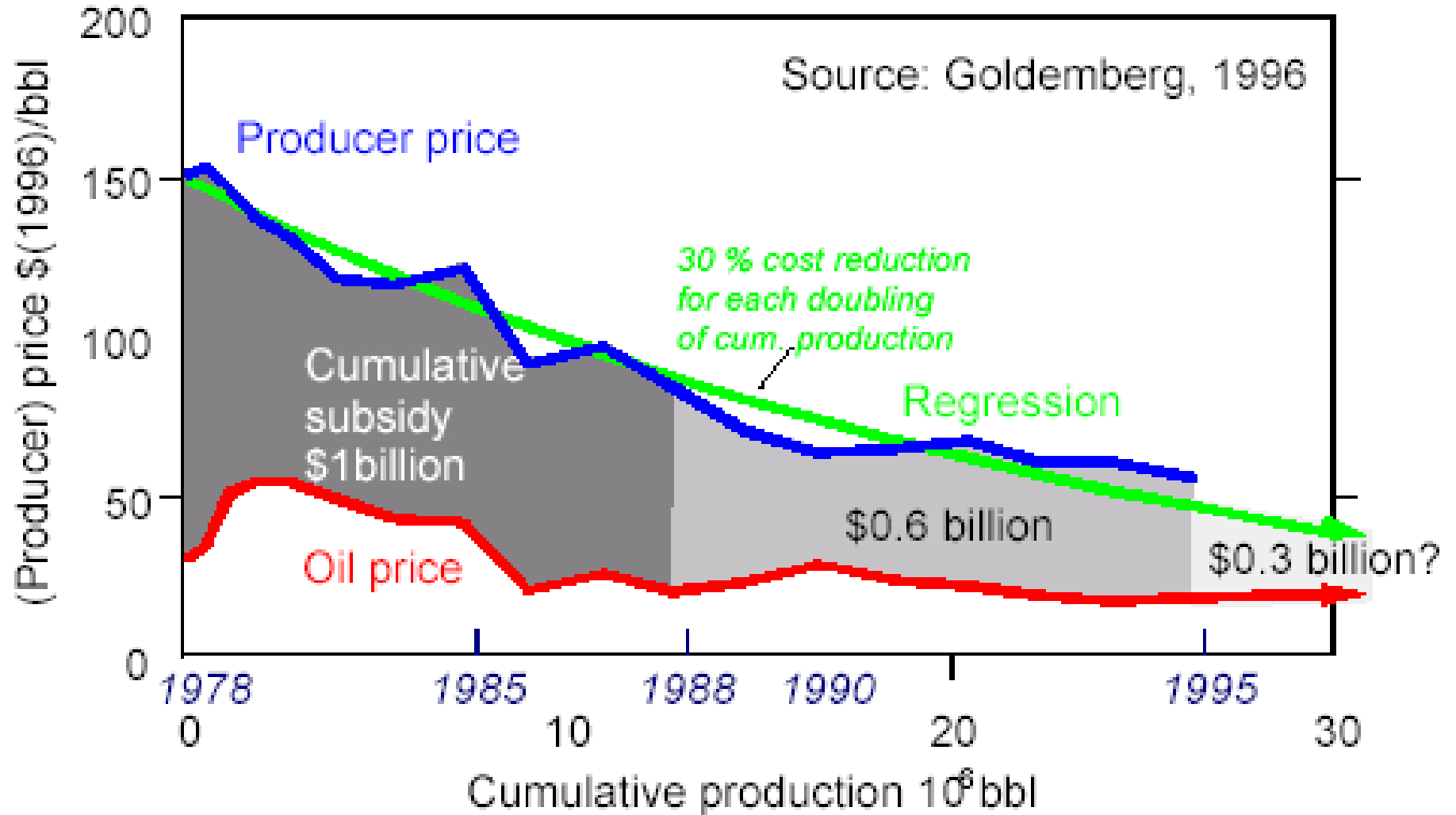
Low High

Source: IEA 2005





LEARNING CURVE FOR BIOETHANOL





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ALTERNATIVE BIODIESEL SCENARIO: FAMILY-BASED AGRICULTURE

- 4,1 millions of family-based farmers
- 600 thousands of families
- 13 millions of workers (%75 of rural jobs)
- 40 millions hectares
- Worth R\$ 55,6 billions, 33% of agriculture sector GDP
- 26,7% of involvement in the biodiesel chain





LIKELY IMPACTS OF ALTERNATIVE SCENARIO under a 2% biodiesel obligation

- Achieving a 2% biodiesel share will require about 5% of the family agriculture enterprises in Brazil
- Land needed: around 1,7 millions of heactars, about 4% of the land for family-based agriculture
- Rural credit needed: 1,2 billion reais, much less than the 7 billion reais provided to large agro-business for the 2004/5 harvest.
- Direct job creation: 250.000 households





THE BIODIESEL SOCIAL LABEL

Eligibility criteria:

- Raw material must come from small scale agriculture, based on minimum quotas per region
- Negotiated contracts with farmers
- Technical assistance provided

Benefits of social label:

- Federal tax credit
- Higher access to federal financing
- Higher commercial competitiveness
- Potential preferential access to national and international markets





HOW GERMAN NGOS CAN HELP?

- Cooperate with NGOs in the South to campaign for sustainable biofuels production domestically (e.g. strengthen family-based agriculture cooperatives)
- Work on an international set of criteria for social and environmental certification of biofuels
- Lobby the German government to implement a sustainability certification scheme for biofuels production (both domestic and imported)





WHY SUSTAINABILITY CERTIFICATION?

- To create a standardised tool to assess the climate benefits and environmental sustainability of a given biofuel
- To make sure that we don't address one problem while creating another
- To incentivise and reward improved production practices, including social performance
- To drive the development efficient technologies, such as lignocellulosic ethanol or Fisher-Tropsch biodiesel



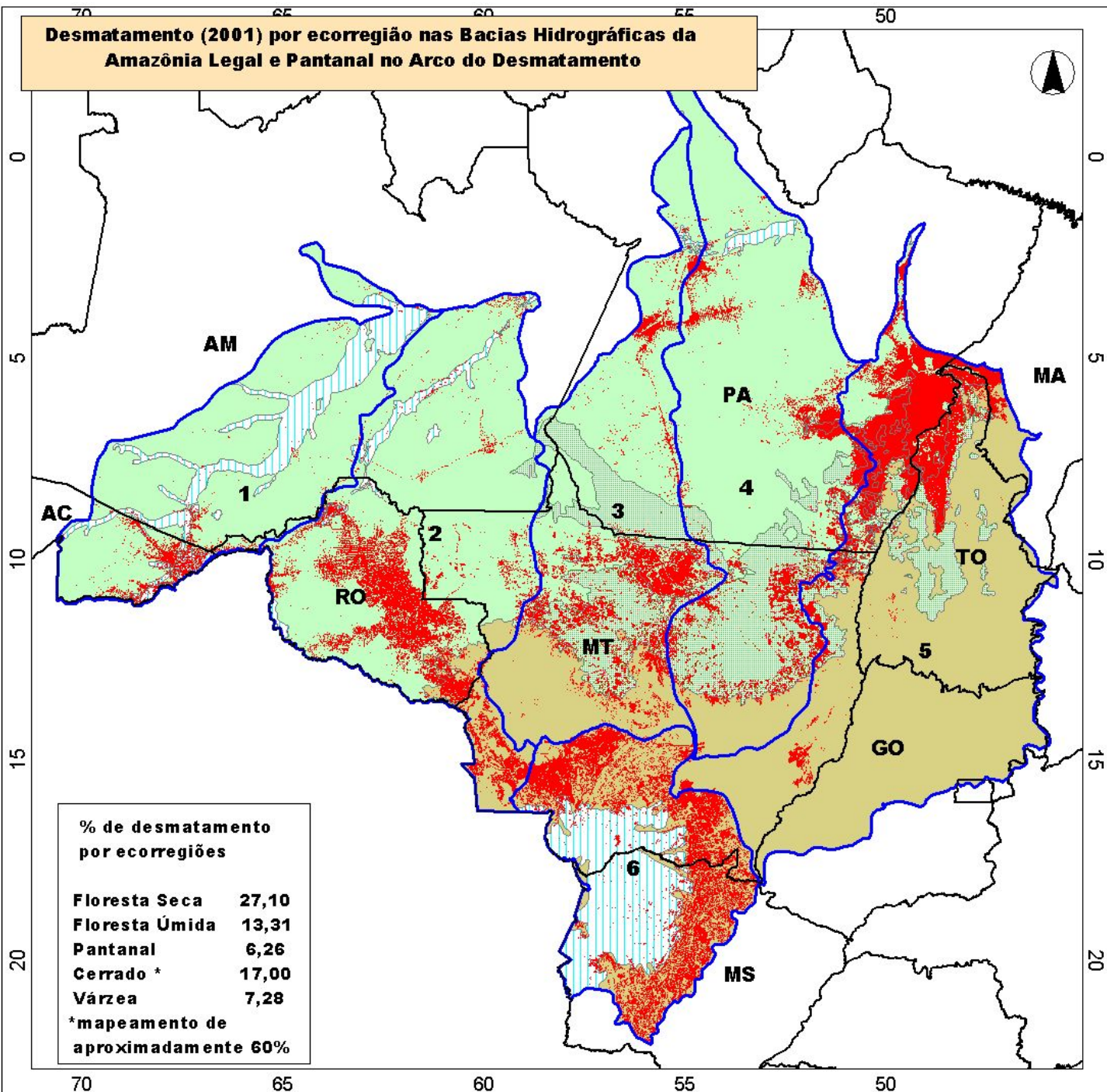


CONCLUSIONS

- Over the next 10 years, Brazil will double its ethanol and significantly develop biodiesel production to meet domestic and export demand
- Without environmental and social safeguards, biofuels expansion will increase environmental and social impacts (in the Cerrado and the Amazon)
- Exports will play a role and could offer an opportunity for sustainability improvements
- GHGs and sustainability certification should be a key component of a national climate and development policy



Desmatamento (2001) por ecorregião nas Bacias Hidrográficas da Amazônia Legal e Pantanal no Arco do Desmatamento



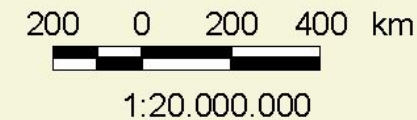
Localização das bacias hidrográficas nos Estados do Brasil



LEGENDA

Ecorregiões

- Florestas Secas
- Florestas Úmidas
- Várzea/Pantanal
- Cerrado
- Desmatamento
- Bacias Hidrográficas
- Limites estaduais



% de desmatamento por ecorregiões

Floresta Seca	27,10
Floresta Úmida	13,31
Pantanal	6,26
Cerrado *	17,00
Várzea	7,28

*mapeamento de aproximadamente 60%



Brasília, setembro/2004

Fonte: PRODES/INPE 2003 e Ecorregiões - WWF US (Olson, 2002 - Dinerstein, 1995)

