

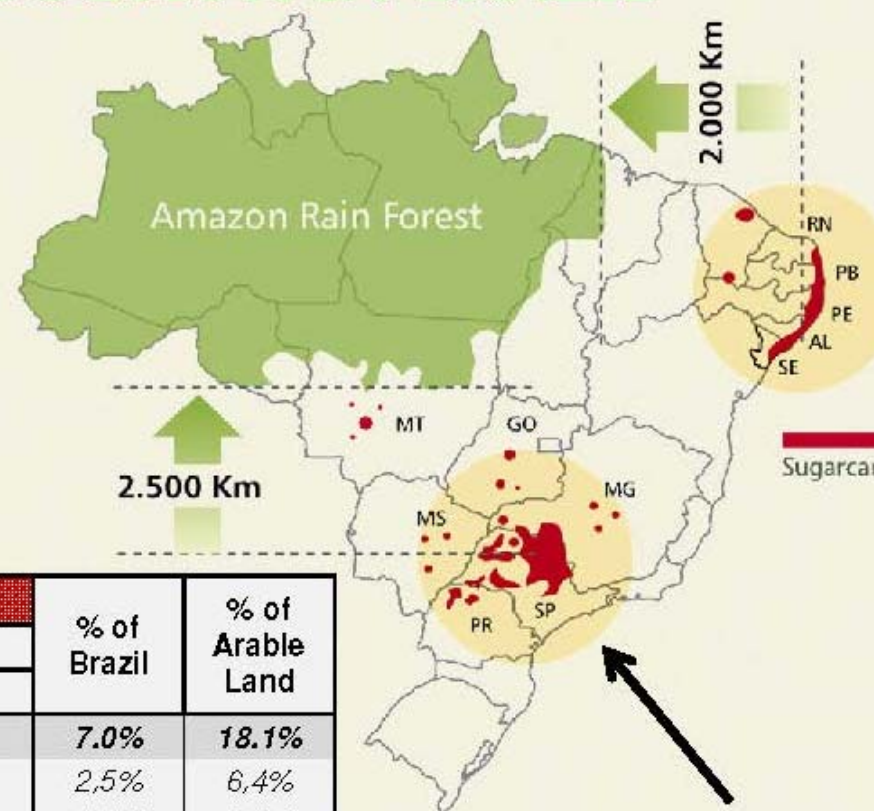
Sustainable Agrofuels, Land Use Change & Certification Schemes

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SUGARCANE PRODUCTION IN BRAZIL

Sugarcane for ethanol production occupies 1.5% of Brazil's arable land



Millions of hectares		% of Brazil	% of Arable Land
BRAZIL	851.4		
TOTAL ARABLE LAND	329.9		
1. Crop Land - Total	59.8	7.0%	18.1%
Soybean	21.6	2,5%	6,4%
Corn	14.4	1,7%	4,4%
Sugarcane	8.1	0,9%	2,5%
Sugarcane for ethanol	4.8	0,6%	1,5%
2. Pasture Land	158.7	18.6%	48.1%
3. Protected Areas and Native Vegetation	495.6	58.2%	-
4. Available Area	137.2	16.1%	-

87% of
sugarcane
production

Note: Arable Land (Censo IBGE 2006) 1) Temporary and Permanent crop land (Censo IBGE 2006); Soybean, Corn and Sugarcane values (IBGE 2008) 2) Pasture land (Censo IBGE 2006) 3) Protected areas and native vegetation (Gerd Spavorek 2009, not published yet) APP = Permanent Preservation Land; UC = Conservation Units and TI = Indigenous land 4) Area available = Arable Land - Crop Land - Pasture Land. Sources: ICONE and UNICA. Prepared by UNICA. Sources (MAP): NIPE-Unicamp, IBGE and CTC

Certification gets more complicated

**Life Cycle Analysis
+ Land Use Change
+ Indirect Land Use Change**

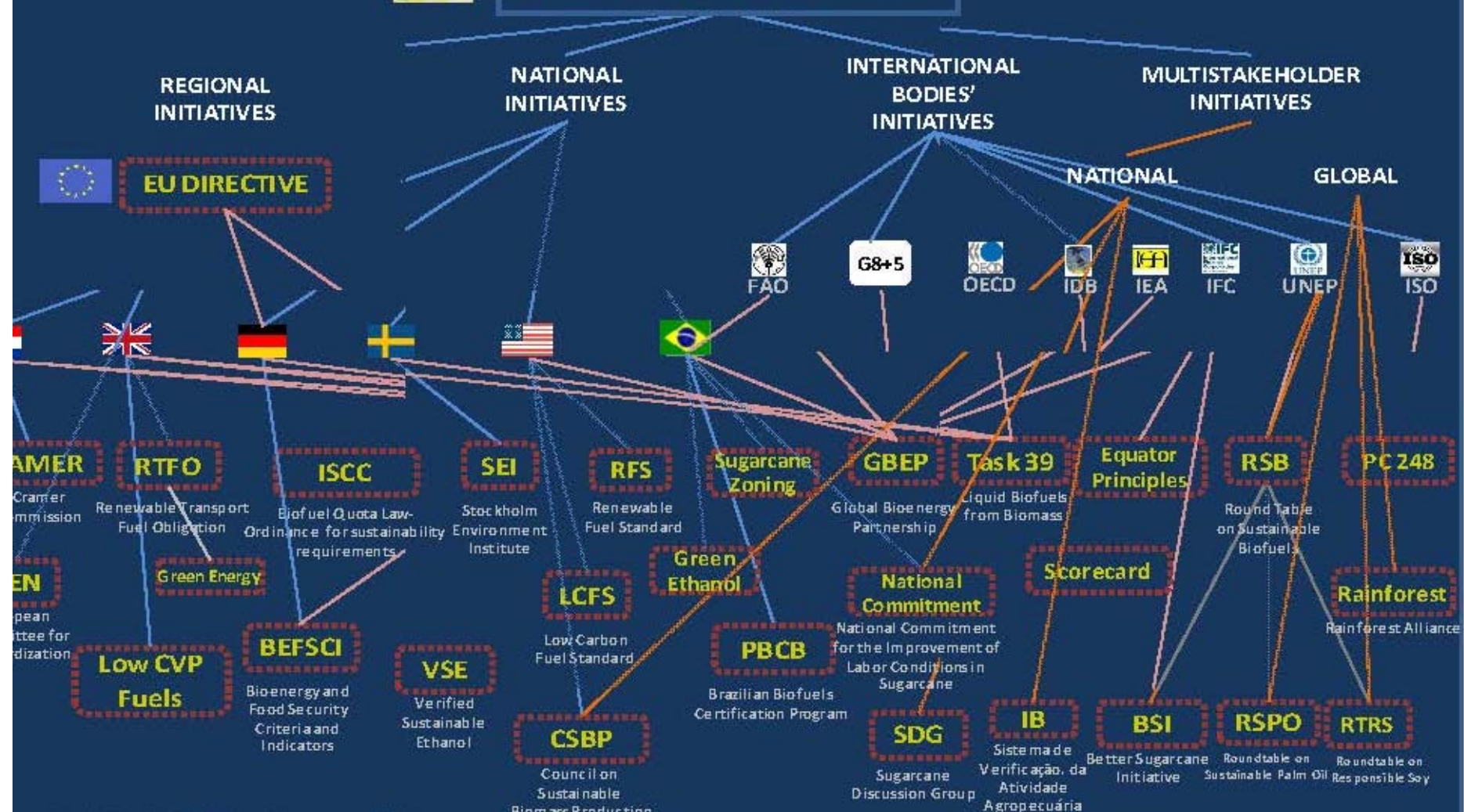


CERTIFICATION

SUSTAINABILITY INITIATIVES FOR BIOFUELS: A "UNIVERSE" IN CONSTANT EXPANSION



SUSTAINABLE BIOFUELS



CO₂ intensity WITH ILUC: We don't know

Factors of difference (according to
EU commission paper)

Corn: 7 times 21-156 gCO₂/MJ

Soybean: 5 times 54-270 gCO₂/MJ



Conclusion Today EU: OFF LIMITS

- Primary forests and other wooded lands
- Areas set aside for nature protection and for the protection of rare, threatened and endangered ecosystems
- Highly biodiverse grasslands
- Wetlands and continuously forested areas with trees higher than five metres and a canopy of more than 30 per cent
- Peatlands



Conclusion today EPA (US) has determined that

- Corn ethanol – 20 % GHG
- Sugarcane – 50 %
- Soybean – 50 %
- Cellulosic – 60 %



Conclusion? BIOFUELS DONE WRIGHT: 2nd generation feedstocks ONLY & direct LUC ONLY → Short list of acceptable biofuels

- perennial plants on degraded lands;
- crop residues;
- wood and forest residues;
- double crops and mixed cropping systems;
and
- municipal and industrial wastes.

Source: Tilman et al 2009.



Certification issues

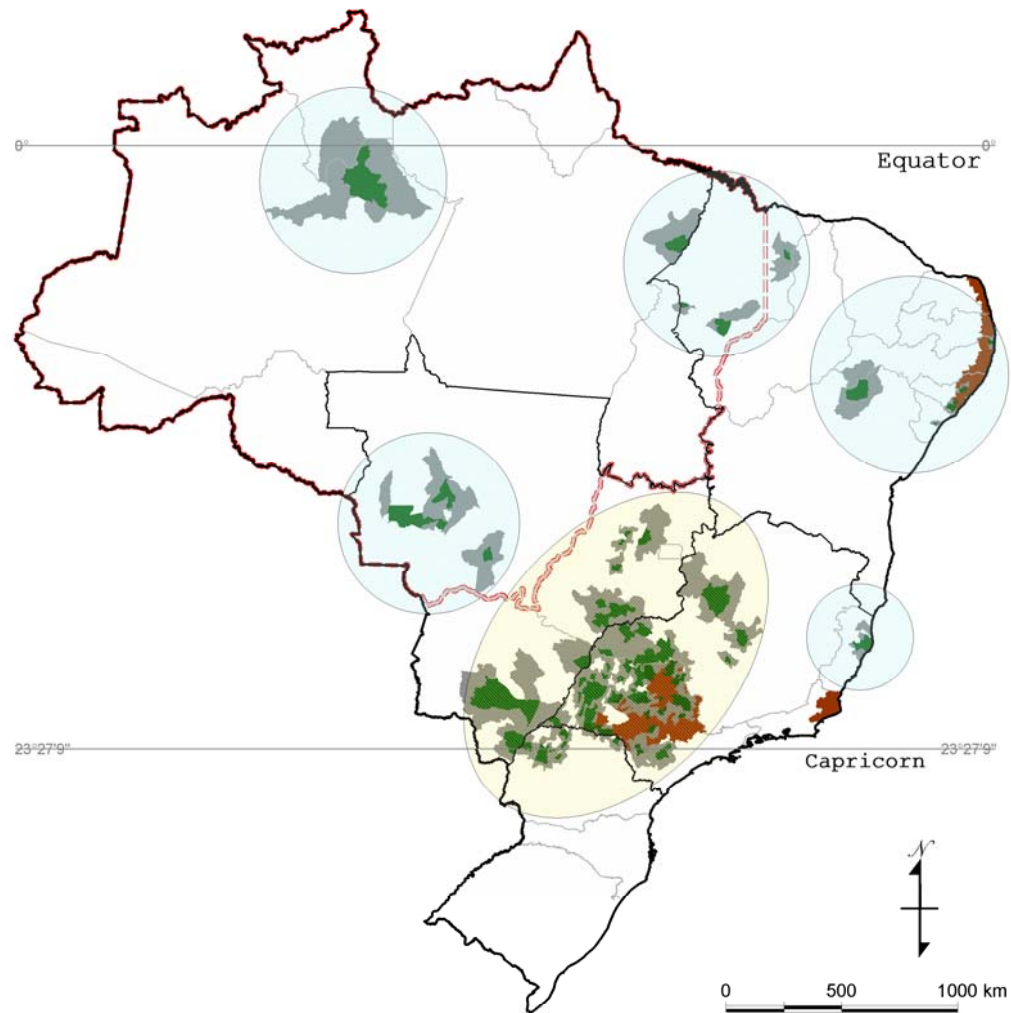
- How rule when some conditions are OK and some are not?

(eg. EU accepts Bonsucro's certification in spite of no restriction for high biodiversity areas)

(eg. when social and human rights are OK but ecological are not)

- Biodiversity ALWAYS a problem with monocultures? ONLY 2nd generation ok?





- Sugarcane expansion 1996-2006 (ScEx-Municipalities)
- No significant sugarcane expansion 1996-2006 (ScNoEx-Municipalities)
- Traditional sugarcane regions in 1995
- Central Expansion Area (CEA)
- Peripheral Expansion Area (PEA)
- Amazon administrative region (Legal Amazon)



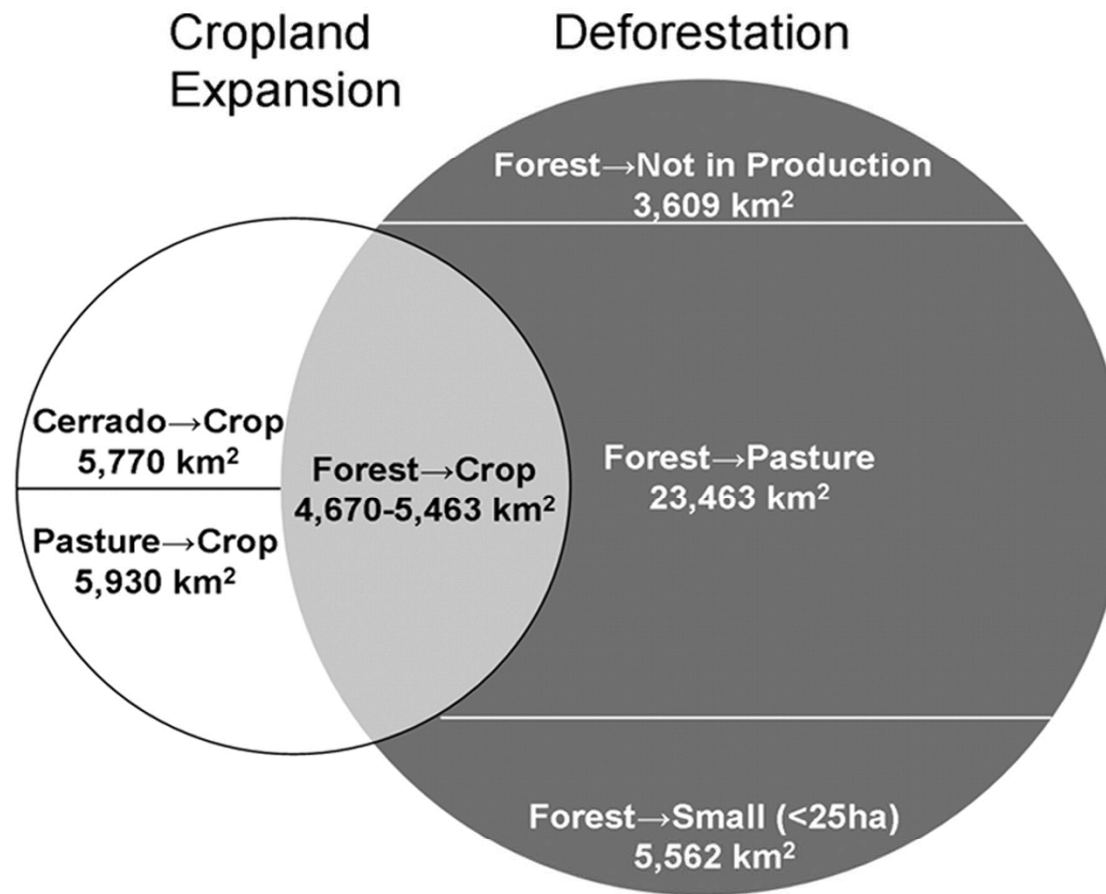
Years to CO2 neutrality

Source Fargione et al 2008

Feedstock	Former land use	Years
Palmoil	Peatland/Malaysia	423
Soybean	Tropical rainforest/Brazil	319
Maize	Grassland/USA	93
Palmoil	Tropical rainforest/Malaysia	86
Maize	Abandoned cropland/USA	48
Soybean	Cerrado/Brazil	37
Sugarcane	Cerrado/Brazil	17
Prairie biomass	Abandoned cropland/USA	1
Prairie biomass	Marginal cropland/USA	0



Relationship between cropland expansion and deforestation in Mato Grosso, Brazil, during 2001–2004



Total = 16,370 km²

38,097 km²

Morton D C et al. PNAS 2006;103:14637-14641



Difference with and without ILUC: change in GHG compared with gasoline

	Without ILUC	With ILUC
Corn USA	- 20 %	+ 93 %
Switch-grass USA	- 70 %	- 50 %
Source: Searchinger et al 2008		



Biodiversity and LUC for agrofuels

Good impact	Bad impact
Abandoned land after intensive use	
Abandoned land after extensive use after 100 yrs	Abandoned land after extensive use immediately
	Abandoned partly restored lands
	Grasslands extensively used
Source UNEP 2009	Natural grasslands and forests



Conclusion Today: WWF OFF LIMITS

- Current forested, protected, and agricultural cropland
- Areas not suitable for rain-fed agriculture
- Land with high biodiversity value
- Land for human development
- Land for meeting food demand



Conclusion Today: Brazil's ZAE for sugarcane OFF LIMITS

- The Amazon and the Pantanal
- The reserves set aside by legal obligations by private land owners (Reserva Legal and APP)
- Areas with high inclinations (to secure mechanization)
- Other reserves (indigenous peoples' lands, natural reserves)
- Areas not suitable for sugarcane



A factory without workers



