iLUC in the bioenergy sector: A view from Brazil

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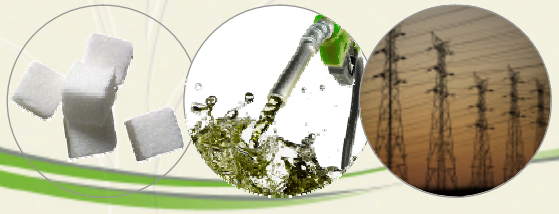
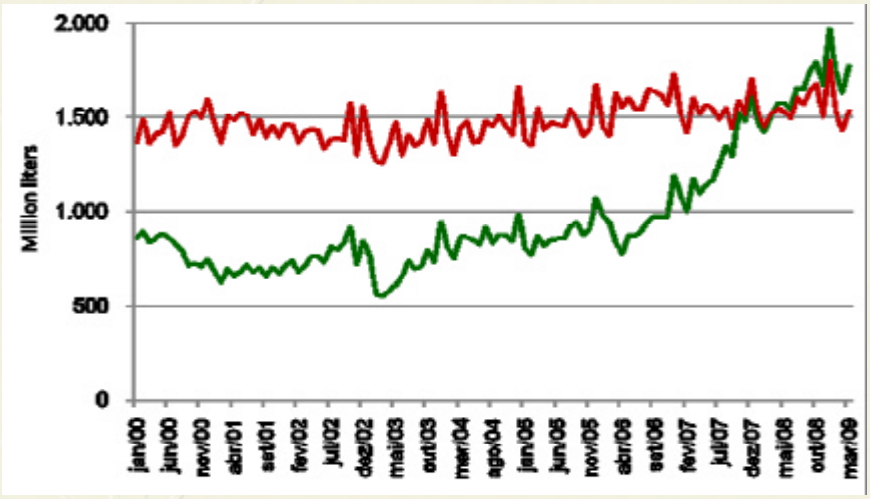
- **Leading sugarcane industry association**, representing 127 producers and mills located in the Center-South of Brazil.
- Responsible for **more than 60% of all ethanol and sugar production** in Brazil.
- Emerging as a **leader in the generation of bioelectricity**
- **International presence**



Petrol is now the alternative fuel in Brazil



Source: ANP & ÚNICA for Brazil

Ethanol: anhydrous and hydrous

Ethanol use: not limited to cars

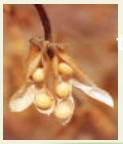
Ethanol-powered buses (E95) - still a pilot project in Brazil

Flex-fuel motorcycles

Bio-plastics (PHB, polyethylene, PVC)

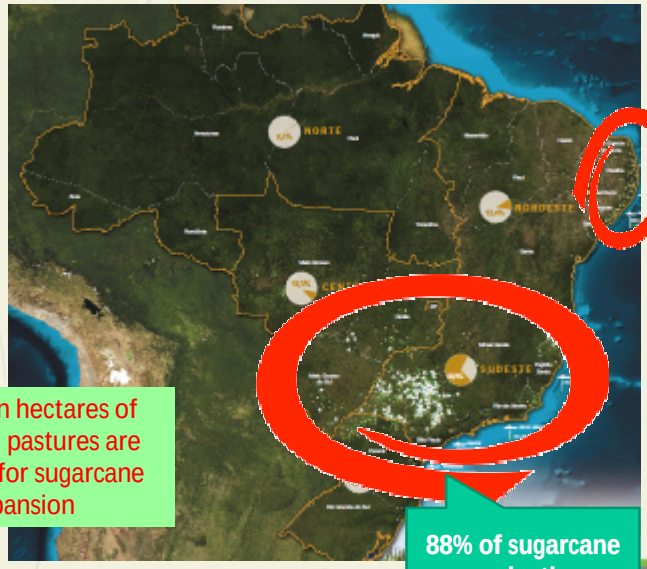
Brazilian-made crop dusting planes running on ethanol

Production of diesel from sugarcane at commercial scale by 2010



Use of ethanol in the biodiesel transesterification process

Where sugarcane is grown



25 million hectares of degraded pastures are available for sugarcane expansion

88% of sugarcane production

Sources: NIPE-Unicamp, IBGE and CTC

Sugarcane for ethanol : 1% of the country total arable land

Millions of Hectares (2007)		% total land	% arable land
BRAZIL	**851**		
TOTAL ARABLE LAND	**354.8**		
1. Total Crop Land	**76.7**	***9.0%***	***21.6%***
Soybean	20.6	*2.4%*	*5.8%*
Corn	14.0	*1.6%*	*3.9%*
Sugarcane	7.8	*0.9%*	*2.2%*
Sugarcane for ethanol	**3.4**	***0.4%***	***1.0%***
Orange	0.9	*0.1%*	
2. Pastures	**172.3**	***20%***	***49%***
3. Available area Total arable land – (crop land + pastures)	**105.8**	***12%***	***30%***

Sources: IBGE, UNICA

Net growth of agriculture land uses area and cattle herd 2002-2006

State	Sugarcane (ha)	Other crops (ha)	Pasture (ha)	Total used area (ha)	Cattle Herd (hd)
São Paulo	622	-224	-882	-484	-909
Minas Gerais	153	389	-625	-82	1,644
Paraná	74	850	-1	287	-284
Mato Grosso do Sul	41	1	-985	-210	558
Goiás	34	576	-2,041	-1,431	545
Bahia	26	492	143	661	912
Mato Grosso	25	1,634	-1,437	0	3,881
Maranhão	16	298	-463	-148	1.835
Pará	3	115	2,502	2,620	5,311
Piauí	3	206	-112	97	34
Rondônia	1	124	-363	-239	3,444
Tocantins	1	0	-595	-355	1
Acre	1	13	109	123	635
South-Centre	949	3,226	-5,971	-1,920	5,435
Total	1,000	5,446	-5,385	1,061	18,383

(1,000 ha and heads) Source: PAM/IBGE, Agricultural Census/IBGE and PPM/IBGE. Extracted from Nassar et al: 'prospects of the sugarcane expansion in Brazil, in Sugarcane Ethanol; contributions to climate change and mitigation and the environment, Wageningen university, 2008

Projections 2008-2018: Expected Land Allocation for Sugarcane, Grains and Pastures

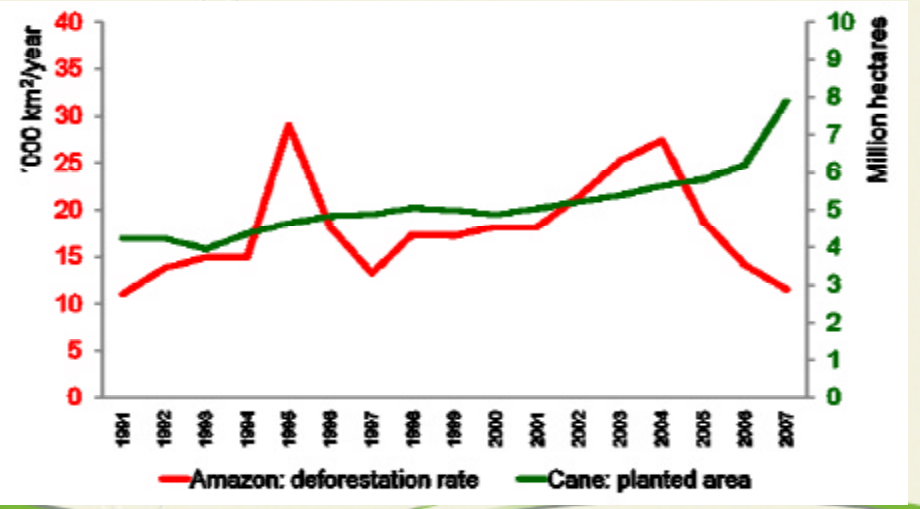
	2008	2018	Absolute growth
Sugarcane (ha)	6,359	9,654	3,295
Grains (ha)	26,332	29,529	3,198
Pasture (ha)	92,328	86,215	-6,113
Total (ha)	125,018	125,398	380
Cattle Herd (hd)	119,399	125,501	6,102

1,000 ha and heads
Grains: soybean, corn, cotton, rice and dry beans.

Source: PAM/IBGE, Agricultural Census/IBGE and PPM/IBGE. Extracted from Nassar et al: 'prospects of the sugarcane expansion in Brazil, in Sugarcane Ethanol; contributions to climate change and mitigation and the environment, Wageningen university, 2008

Deforestation unrelated to sugarcane

Cane area in Brazil vs. annual deforestation rate in the Legal Amazon



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Sources: INPE and UNICA. Deforestation data is calendar year while sugarcane production is based on harvest.

Main drivers for deforestation in Brazil

- Lack of structured and consistent national policy to control deforestation
- Institutional confusion and fragility - no clear rules, alphabet soup of federal, state and municipal legislation
- Lack of clear land titles
- Lack of resources to enforce legislation
- High value of free land – large scale agribusiness
- Informal and illegal market for timber - unfair competition to sustainable models
- Poverty and lack of environmental education. The forest is a cash-crop for local communities
- Poor value added to forest products (environmental services, wood and non-wood products)
- Precarious governance structure of human settlements in Amazon

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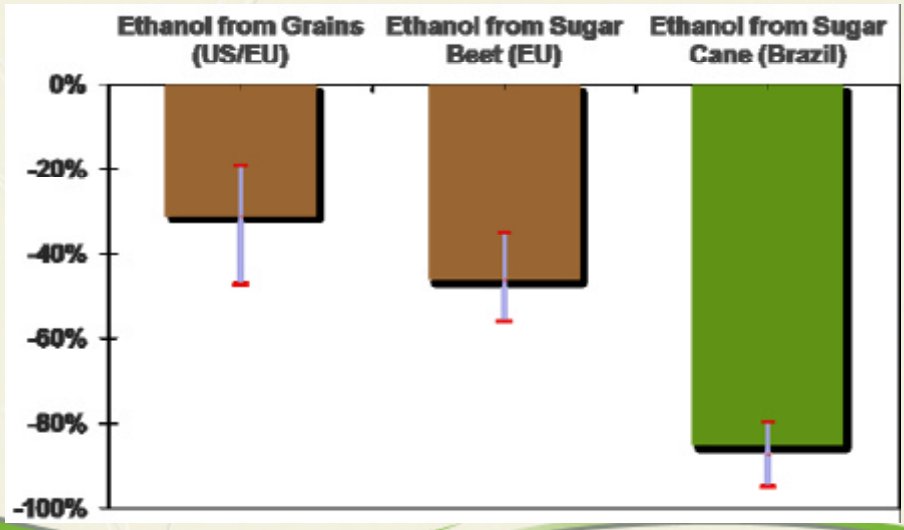
Sugarcane is today the best available feedstock

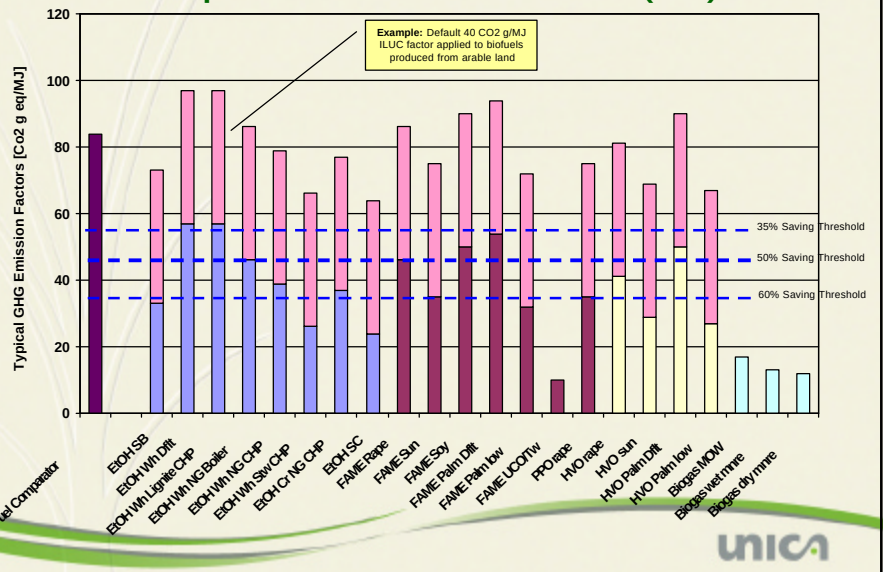


Note: Reductions represent well-to-wheel CO_2-equivalent GHG emissions avoided from unit of ethanol compared to gasoline, calculated on a life-cycle basis. Source: IEA, 2004

Indirect Land Use Change (iLUC)

- **In the public debate and being introduced in regulatory initiatives**
  - CARB LCFS
  - EPA RFS2
  - EU RES Directive
- **What are the best regulatory responses to tackle a phenomenon whose importance and magnitude is unknown today?**

GHG implications of a random iLUC penalty independent of feedstock (EU)



The case of Sugarcane iLUC in Californian LCFS

Scenario	A	B	C	D	E	Mean
Economic Inputs						
EtOH production increase (bill. gal.)	2.00	2.00	2.00	2.00	2.00	
Elasticity of crop yields w/r area expansion	0.50	0.75	0.60	0.90	*	
Crop yield elasticity	0.25	0.25	0.25	0.25	0.25	
Elasticity of land transformation	0.20	0.20	0.30	0.10	0.20	
Elasticity of harvested acreage response	0.50	0.50	0.50	0.50	0.50	
Trade elasticity of crops	See Appendix C					
Model Results						
Total land converted (million ha)	1.28	0.85	1.46	0.94	0.94	**1.09**
• Forest land (million ha)	0.43	0.22	0.36	0.40	0.26	**0.33**
• Pasture land (million ha)	0.85	0.63	1.10	0.54	0.68	**0.76**
Brazil land converted (million ha)	0.89	0.59	1.06	0.60	0.65	**0.74**
• Brazil forest land (million ha)	0.30	0.15	0.25	0.26	0.13	**0.22**
• Brazil pasture land (million ha)	0.59	0.44	0.81	0.34	0.42	**0.52**
ILUC carbon intensity (gCO_2e/MJ)	56.7	32.3	64.6	48.3	38.3	**48**

1.	Shock size	*1.5 billion gallons*
2.	Elasticity of substitution among primary factors in livestock production	*0.2 everywhere but 0.4 in Brazil*
3.	Crop yield elasticity w/ area expansion	*0.9*
4.	Adjustment for sugarcane and TRS yields	*16.66%*

Total land converted (million ha)	0.60
Forest land (million ha)	0.01
Pasture land (million ha)	0.59
Brazil land converted (million ha)	0.35
Brazil forest land (million ha)	-0.07
Brazil pasture land (million ha)	0.42
ILUC carbon intensity (gCO_2e/MJ)	**25.3**

Alternative Scenarios	ILUC carbon intensity (gCO_2e/MJ)
1. Departing Scenario (Table 9)	25.3
2. Departing Scenario + Carbon Uptake of Forest Gained (array EMISSCTR) + Carbon Uptake of Crops from GTAP Efs-ef_tables.xls (18Mg CO2e/ha)	12.4
3. Departing Scenario + Carbon Uptake of Forest Gained (array EMISSCTR) + Carbon Uptake of Crops Rest of World from GTAP Efs-ef_tables.xls (18Mg CO2e/ha) + Carbon Uptake for Sugarcane Brazil from Table 8 (244Mg CO2e/ha).	-9.4
4. Departing Scenario + Carbon Uptake Forest Gained (array EMISSCTR) + Carbon Uptake Crops from Table 8 (160Mg CO2e/ha)	-10.7

Source: UNICA, California Air Resources Board's Low Carbon Fuel Standard, March 2009.

The case of Sugarcane iLUC in Californian LCFS

- Systematic Sensitivity Analysis should be performed
- Unrealistic size of the demand shock
- Pasture land and cattle intensification
- Elasticities and Scenarios
- Elasticity of crop yields with respect to area expansion
- Yield improvement

- **UNICA's letter to CARB available upon request**

Environmental Protection Agency: RFS 2

- 5 May 2009: proposed rules to implement the new RFS, sugarcane ethanol scores 44% emissions reduction compared to petrol
- However, contains inacurrate data and unrealistic assumptions
- Integrating the Brazilian extension of FAPRI model, based on the analysis of recent research, even including indirect land use effects, EPA stated that Brazilian sugarcane ethanol saves 64% lifecycle GHG emissions compared to petrol.
- This is only the first run of the model.
- 60 day period for comments – UNICA to contribute

Limits of current predictive models

- **CGE models take given world economic conditions shocked with a volume of biofuels to create the perceived land conversion results**
  - Unfit for world changing economic conditions, not for shifts in policies, weather, social variables, assume zero innovation, etc.
  - Do not compute use of degraded, marginal, or idle land
  - Unable to integrate recent and evolving science
- **Predictive modeling has high degree of uncertainty**
  - Small biais in input parameters lead to large errors: the more complex the model is, the less accurate results are
  - Need for accurate data vs today's use of unrealistic macrodata
  - Models gives indications of changes from simulated scenarios. Modelers avoid putting too much weigh or credence on precise numbers
- **Do not define responsibilities:**
  - Impossible for industry to use as management practices
  - Uncertain for policy makers

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Conclusions

- **Current models are complex, subject to numerous assumptions, and not fit for policy recommendations**
- Assessments should be based on sound and empirical science, to ensure proper integration in policy ruling
- International co-operation, incl. with producing countries scientists, is absolutely necessary
- Need of globally harmonised methodologies to assess iLUC
- A penalty based policy, based on currently available methodologies would not reduce iLUC but simply run the risk to disqualify existing biofuels based on immature science. This while the scope of the problem goes well beyond the competences of the industry.
- **Recommendations (because ILUC can only be tackled by public policies)**
- Consistent policies to fight deforestation
- Encourage land use planning (e.g. agro-ecological zoning in Brazil) and use of land which is available and suitable and does not displace other crops, e.g. degraded lands
- Promote biofuels with high environmental (GHG) performances and high productivity
- **Don't sacrifice biofuels which have a real potential to mitigate climate change and enhance energy security on the basis of unproven hypothesis that are legally questionable !**

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Thank you !

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