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# An Overview of Brazilian Actions Regarding Sustainability of Biofuels

Manoel Regis L.V. Leal  
[regis.leal@bioetanol.org.br](mailto:regis.leal@bioetanol.org.br)



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- Fast growth of biofuels production starting 2003;
- Biofuels under attack: no GHG reduction benefits, negative impacts on food production, biodiversity losses, labor issues;
- Several initiatives on biofuels sustainability criteria, tending to become certification procedures: EU Directive, RFS2 (USA), LCFS (California), RSB (Switzerland), RTFO (UK), GBEP (G8+5), BSI (WWF, other), Cramer Report (Holland)



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# Brazilian Activities

Some very good initiatives taking place but lack a  
National Coordination

- Sugarcane Agroecological Zoning;
- SP Agroenvironmental Zoning;
- Environmental Protocols in SP and MG;
- INMETRO Brazilian Biofuels Certification Program;
- National Agreement to Improve Labor Conditions;
- Participation in GBEP, RSB, BSI;
- Brazil/Germany initiative to propose ISO/PC 248 Sustainability Criteria for Bioenergy (ABNT/INMETRO/DIN)



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# Lessons From Initiatives Abroad

- Main focus strongly on GHG net emission reductions (limits defined);
- Competition with food supply concerns;
- Biodiversity protection;
- Water and soil conservation;
- Waste management;
- Social issues: welfare (labor, human rights, property, social conditions);
- Wealth: impacts on local population



# How To Measure?

- Criteria and indicators
- Types of indicators
  - Process indicator: evidence that of a specific action was taken (qualitative)
  - Performance indicator: quantitative definition of targets



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# Regulations Already in Effect

- EU Directive 2009/28/EC
- Renewable Fuel Standard 2 (EISA of 2007): EPA
- Low Carbon Fuel Standard: CARB



# EU Directive Key Points

- Target for renewable energy share in transport of 10% in 2020;
- Article 17: Sustainability Criteria for Biofuels and Bioliquids; Appendix V LCA procedures and data;
- GHG reduction limits: 35% (2013), 50% (2018) and 60% for new plants (01/01/2017);
- Favor 2G biofuels and feedstocks from degraded land;
- LUC included but ILUC will be suggested by Dec/2010;
- Default values for biofuels LCA.



# EU Directive Default Values

A. Typical and default values for biofuels if produced with no net carbon emissions from land-use change

Biofuel production pathway	Typical greenhouse gas emission saving	Default greenhouse gas emission saving
sugar beet ethanol	61 %	52 %
wheat ethanol (process fuel not specified)	32 %	16 %
wheat ethanol (lignite as process fuel in CHP plant)	32 %	16 %
wheat ethanol (natural gas as process fuel in conventional boiler)	45 %	34 %
wheat ethanol (natural gas as process fuel in CHP plant)	53 %	47 %
wheat ethanol (straw as process fuel in CHP plant)	69 %	69 %
corn (maize) ethanol, Community produced (natural gas as process fuel in CHP plant)	56 %	49 %
sugar cane ethanol	71 %	71 %
the part from renewable sources of ethyl-tertio-butyl-ether (ETBE)	Equal to that of the ethanol production pathway used	
the part from renewable sources of tertiary-amyl-ethyl-ether (TAEE)	Equal to that of the ethanol production pathway used	
rape seed biodiesel	45 %	38 %
sunflower biodiesel	58 %	51 %
soybean biodiesel	40 %	31 %
palm oil biodiesel (process not specified)	36 %	19 %
palm oil biodiesel (process with methane capture at oil mill)	62 %	56 %
waste vegetable or animal (*) oil biodiesel	88 %	83 %
hydrotreated vegetable oil from rape seed	51 %	47 %
hydrotreated vegetable oil from sunflower	65 %	62 %
hydrotreated vegetable oil from palm oil (process not specified)	40 %	26 %
hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)	68 %	65 %
pure vegetable oil from rape seed	58 %	57 %
biogas from municipal organic waste as compressed natural gas	80 %	73 %
biogas from wet manure as compressed natural gas	84 %	81 %
biogas from dry manure as compressed natural gas	86 %	82 %

(\*) Not including animal oil produced from animal by-products classified as category 3 material in accordance with Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules on animal by-products not intended for human consumption<sup>(1)</sup>.



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# Renewable Fuel Standard 2

- Four types of biofuels based on feedstocks and GHG reductions
- Biofuels demand will reach 136 GL (36 Ggalons) in 2022 (market share)
- GHG emission reductions (baseline 2005): 20% for plants built after dec/2007; 50% for advanced biofuels, 60% for 2G biofuels



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## EPA LCA Emission Reduction Values

Type of Biofuel	100 years 2% discount rate (%)	30 years 0% discount rate (%)
Corn ethanol (NG dry mill)	-16	+5
Corn ethanol (NG dry mill best case)	-39	-18
Corn ethanol (coal dry mill)	+13	+34
Corn ethanol (biomass dry mill)	-39	-18
Corn ethanol (biomass dry mill/cogen)	-47	-26
Soybeans biodiesel	-22	+4
Tallow biodiesel	-80	-80
Sugarcane ethanol	-44	-26
Switchgrass ethanol	-128	-124
Corn stover ethanol	-115	-116

Source: EPA, 2009



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## Low Carbon Fuel Standard (CARB)

- Target: reduce GHG emissions in transport in 10% by 2020 (In relation to 1990 levels);
- Reduce oil dependence;
- LCA: consider LUC/ILUC
- Sustainability criteria: to be proposed in 2013
- Default values for GHG emissions in different fuel paths



# LCFS Default Values

## Adjusted Carbon Intensity Values for Gasoline and Fuels that Substitute for Gasoline

Fuel	Pathway Description	Carbon Intensity Values (gCO <sub>2</sub> e/MJ)		
		Direct Emissions	Land Use or Other Effect	Total
Gasoline	CARBOB – based on the average crude oil delivered to California refineries and average California refinery efficiencies	95.86	0	95.86
	CaRFG-CARBOB and a blend of 100% average Midwestern corn ethanol to meet a 3.5% oxygen content by weight (approximately 10% ethanol)	96.09	---	96.09 <sup>1</sup>
	CaRFG-CARBOB and a blend of an 80% Midwestern corn ethanol and 20% California corn ethanol to meet a 3.5% oxygen content by weight blend (approximately 10% ethanol)	95.85	---	95.85 <sup>1</sup>
Ethanol from Corn	Midwest average; 80% Dry Mill; 20% Wet Mill; Dry DGS	69.40	30	99.40
	California; Dry Mill; Wet DGS; NG	50.70	30	80.70
	California average; 80% Midwest Average; 20% California; Dry Mill; Wet DGS; NG	65.66	30	95.66
	Midwest; Dry Mill; Dry DGS	68.40	30	98.40
	Midwest; Wet Mill	75.10	30	105.10
	Midwest; Dry Mill; Wet DGS	60.10	30	90.10
	California; Dry Mill; Dry DGS; NG	58.90	30	88.90
	Midwest; Dry Mill; Dry DGS; 80% NG; 20% Biomass	63.60	30	93.60
	Midwest; Dry Mill; Wet DGS; 80% NG; 20% Biomass	56.80	30	86.80
	California; Dry Mill; Dry DGS; 80% NG; 20% Biomass	54.20	30	84.20
Ethanol from Sugarcane	Brazilian sugarcane using average production processes	27.40	46	73.40
	California average electricity mix	124.10	0	41.37 <sup>2</sup>
Electricity	California marginal electricity mix of natural gas and renewable energy	104.70	0	34.90 <sup>2</sup>
	Compressed H <sub>2</sub> from central reforming of NG	142.20	0	61.83 <sup>3</sup>
Hydrogen	Liquid H <sub>2</sub> from central reforming of NG	133.00	0	57.83 <sup>3</sup>
	Compressed H <sub>2</sub> from on-site reforming of NG	98.30	0	42.74 <sup>3</sup>
	SB 1505 Scenario; Compressed H <sub>2</sub> from on-site reforming with renewable feedstocks	76.10	0	33.09 <sup>3</sup>

<sup>1</sup> Calculated value; land use part of the value

<sup>2</sup> Adjusted by an EER factor of 3.0 to account for power train efficiency improvements over gasoline engines

<sup>3</sup> Adjusted by an EER factor of 2.3 to account for power train efficiency improvements over gasoline engines



# Suggested Actions for Brazil

- Move toward biofuel sustainability system;
- Develop and certify LCA methodology for our conditions, including LUC/ILUC;
- Create a data base for the critical items, specially concerning LUC/ILUC, soil emissions, water use;
- Make the best use of the sugarcane zoning systems, environmental protocols, labor agreements to show compliance with process indicators for biodiversity, LUC, food safety, etc.;
- Identify areas for GHG and energy balances improvements and invest in technology development for them;
- Move from defense to attack.



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# Important Players

- Private sector
  - UNICA, CTC, Several mills, Icone
- Public institutions
  - Ridesa, Embrapa, Apta, Universities
- Government
  - MRE, MCT, MAPA, MDIC, MMA, SP-SMA
- Worker Organizations
- NGO's

**But coordination is required**



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# Brazilian Biofuels Sustainability Alternatives

- GBEP: Global Bioenergy Partnership
- ISO/PC 248 Project Committee on Sustainability Criteria for Bioenergy
- BSI and RSB



# GBEP

- It is an official initiative;
- Involves G8+5 and others to develop criteria and indicators for sustainability: relevant, practical and science based for voluntary application; geographic scale taken in account;
- Sub-groups: environmental, social, and economic and energy security;



# ISO/PC 248

- Scope: standardization in the field of sustainability criteria for bioenergy;
- Established by the ISO Technical Management Board Resolution 124/2009;
- Six Working Groups (WG's):
  - Inventory of initiatives; Terminology; GHG; Sustainability (environmental, social, economic aspects; Verification and auditing; Indirect effects.



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# BSI and RSB

- Participation in the work groups;
- Learn by doing;
- Influence the decisions;
- Include Brazilian data and culture;
- Avoid inconvenient requirements;
- Organize country information and data.



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# Brazilian Initiatives in LUC Emissions Sugarcane Case

Reference crop	C stock change (tC/ha)	Emissions (kg CO <sub>2</sub> /m <sup>3</sup> )		
		2006	2020 EE	2020 ethanol
Degraded pasture	10	-302	-259	-185
Natural pasture	-5	157	134	96
Cultivated pasture	-1	29	25	18
Soybean	-2	61	52	37
Maize	11	-317	-272	-195
Cotton	13	-384	-329	-236
Cerrado	-21	601	515	369
Campo limpo	-29	859	737	527
Cerradão	-36	1,040	891	638
LUC emissions		-118	-109	-78

Source: Zuurbier and van de Vooren, 2008



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Thank for your attention!

[regis.leal@bioetanol.org.br](mailto:regis.leal@bioetanol.org.br)



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