

BRAZILIAN SUGARCANE INDUSTRY ASSOCIATION
UNIÃO DA INDÚSTRIA DE CANA-DE-AÇÚCAR

unica

Improving Brazil's Sugarcane Ethanol

Sustainable Energy & Climate Change

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OUTLINE

① Introduction

- *Brazil's diversified sugarcane industry*

② Building Blocks of Energy Security

- *Feedstock + Infrastructure + Price*

③ Sugarcane & Climate Change

- *Replacing fossils fuels with something better*

④ Sugarcane & Sustainability

- *Improving on sustainable practices*

⑤ Global Biofuels Market

- *Still a small, highly protected market*

⑥ Sugarcane in the United States

- *Meeting mandates sustainably*



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Brazil's Sugarcane Industry

Food, Fuel & Electricity

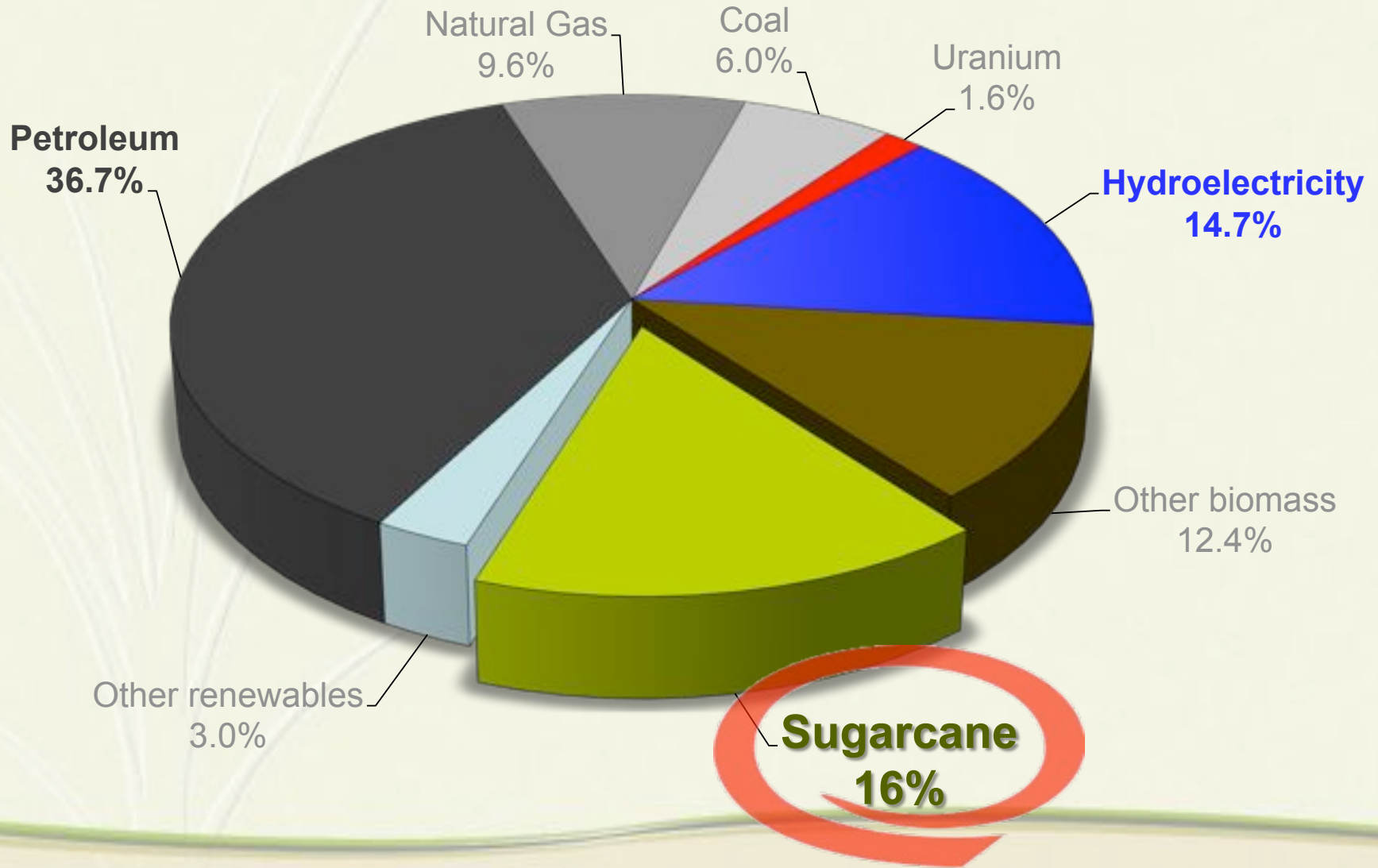
ABOUT UNICA

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- UNICA is the **leading sugarcane industry association**, representing +100 producers and mills in Brazil
- Responsible for **60% of all ethanol and sugar production** in Brazil
- Emerging as a **leader in the generation of bioelectricity** already meeting 3% (and soon 10%) of Brazil's electricity demand
- International presence, now in Washington & Brussels, to engage in **constructive dialogue**



SUGARCANE IS #1 RENEWABLE ENERGY SOURCE



Source: Ministry of Mines and Energy BEN (2008).

CURRENT PRODUCTION



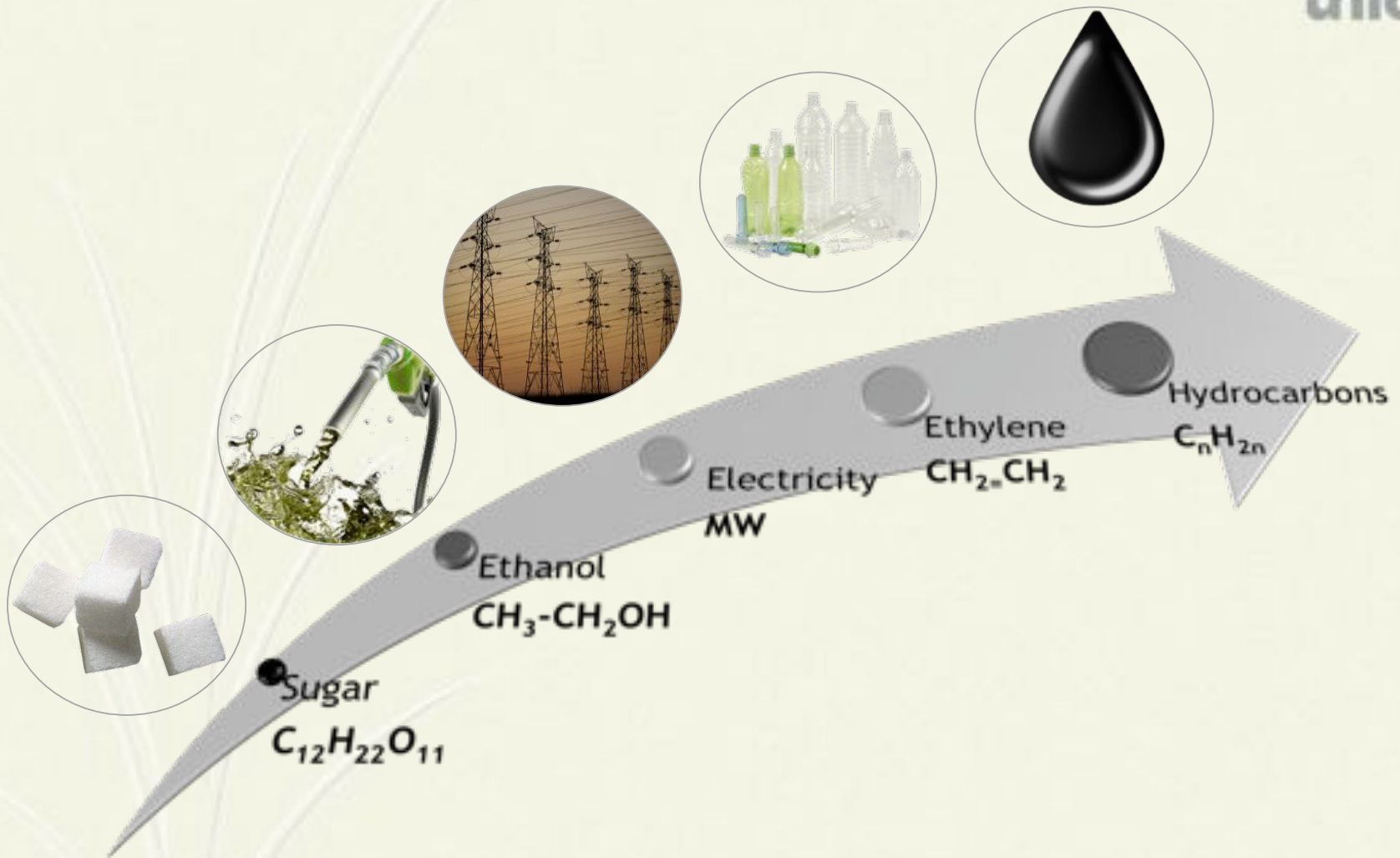
Bagasse



Note: Estimates based on available data projections.

SUGARCANE PRODUCTS

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BRAZILIAN PRODUCTION & ESTIMATES



	2008/09e	2015/16	2020/21
Sugarcane production (million tons)	569	829	1,038
Sugar (million tons)	31	41.3	45.0
Domestic Market and Stocks	10.2	11.4	12.1
Export	20.8	29.9	32.9
Ethanol (billion gallons)	7.2	12.4	17.2
Domestic Market and Stocks	6	9.2	13.1
Export	1.2	3.2	4.1
Bioelectricity (MW average)	1,800	8,158	13,158
Share of electricity demand (%)	3%	11%	14%

Note: e = estimated data due to Northeast harvest; potential generation of surplus electricity has been calculated based on the utilization of 75% of the available bagasse and 50% of the available straw, and considering the sugarcane production during most recent harvest, Sources UNICA.

②

Building Blocks of Energy Security

Fuel + Infrastructure + Prices

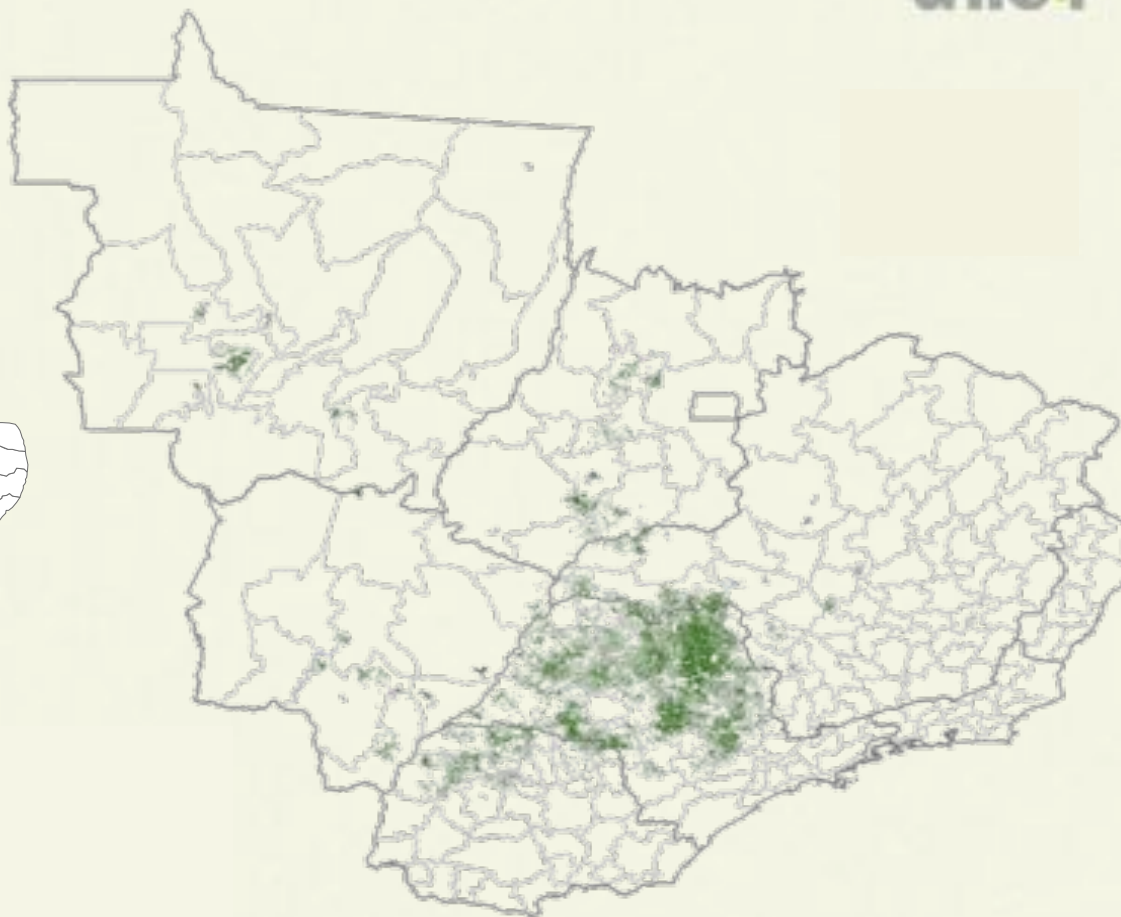
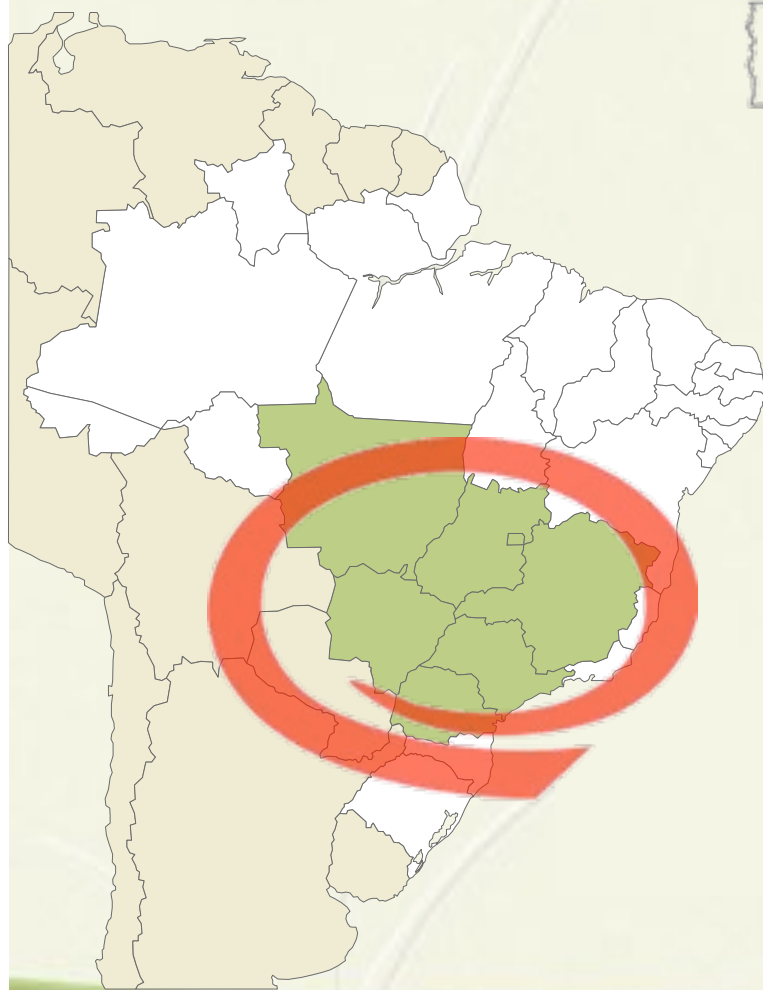
FEEDSTOCK: WHERE SUGARCANE IS GROWN



South-Central region represents about 90% of sugarcane harvest

WHERE SUGARCANE IS *REALLY* GROWNING

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INFRASTRUCTURE: FLEX FUEL CARS & DISTRIBUTION

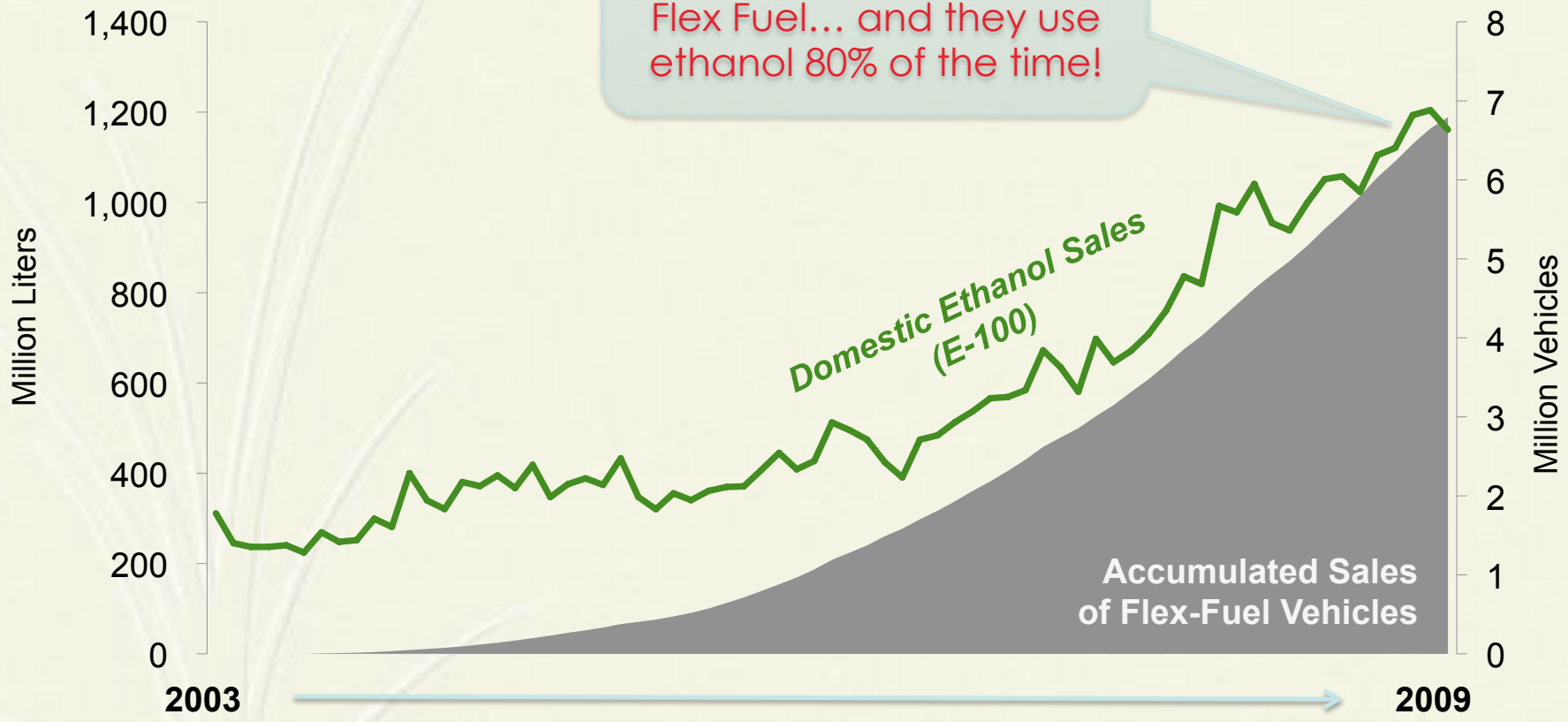
UNICA



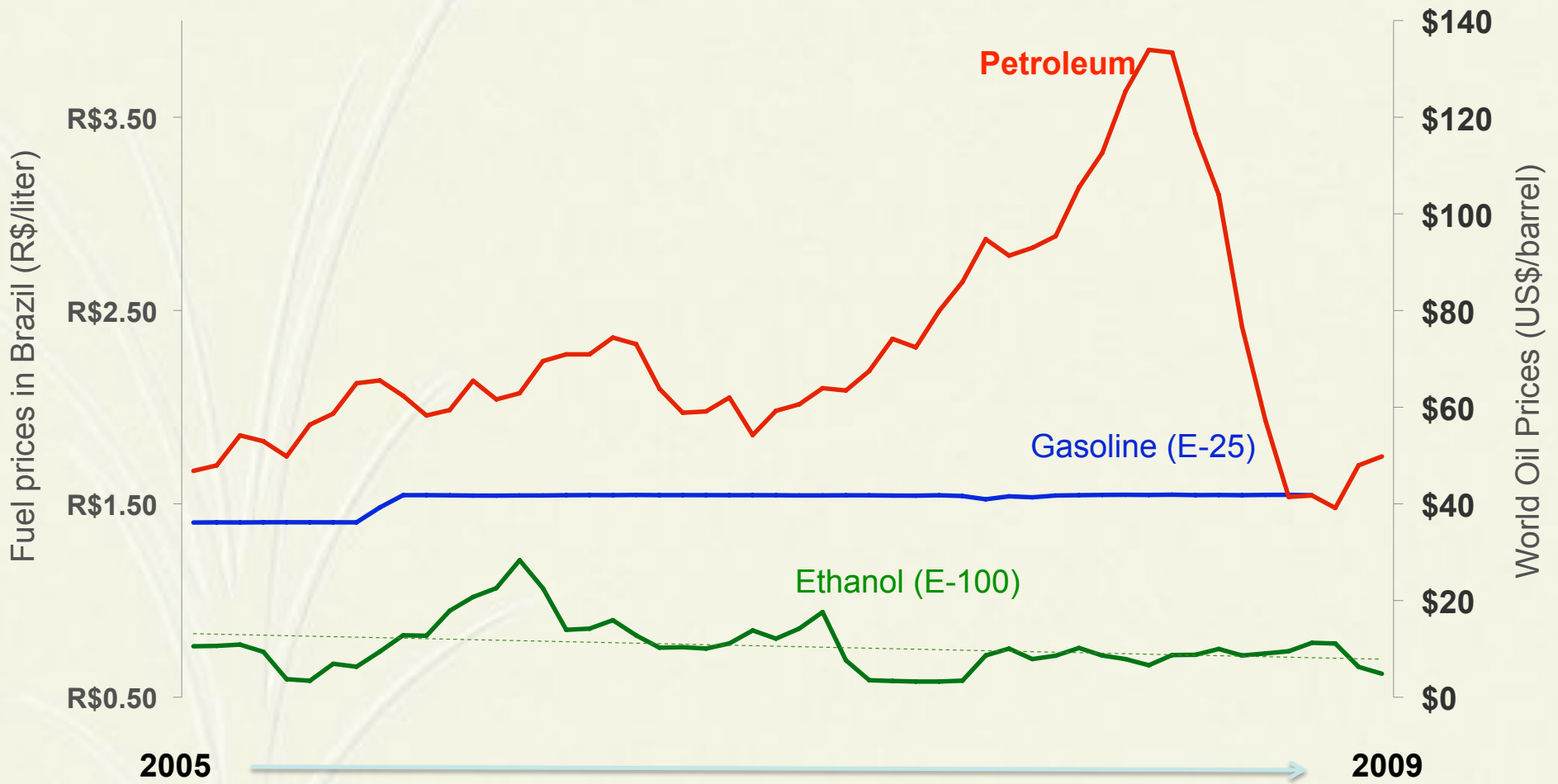
PRICES: FLEX FUEL CARS THAT USE ETHANOL...



92% of new cars sold are Flex Fuel... and they use ethanol 80% of the time!

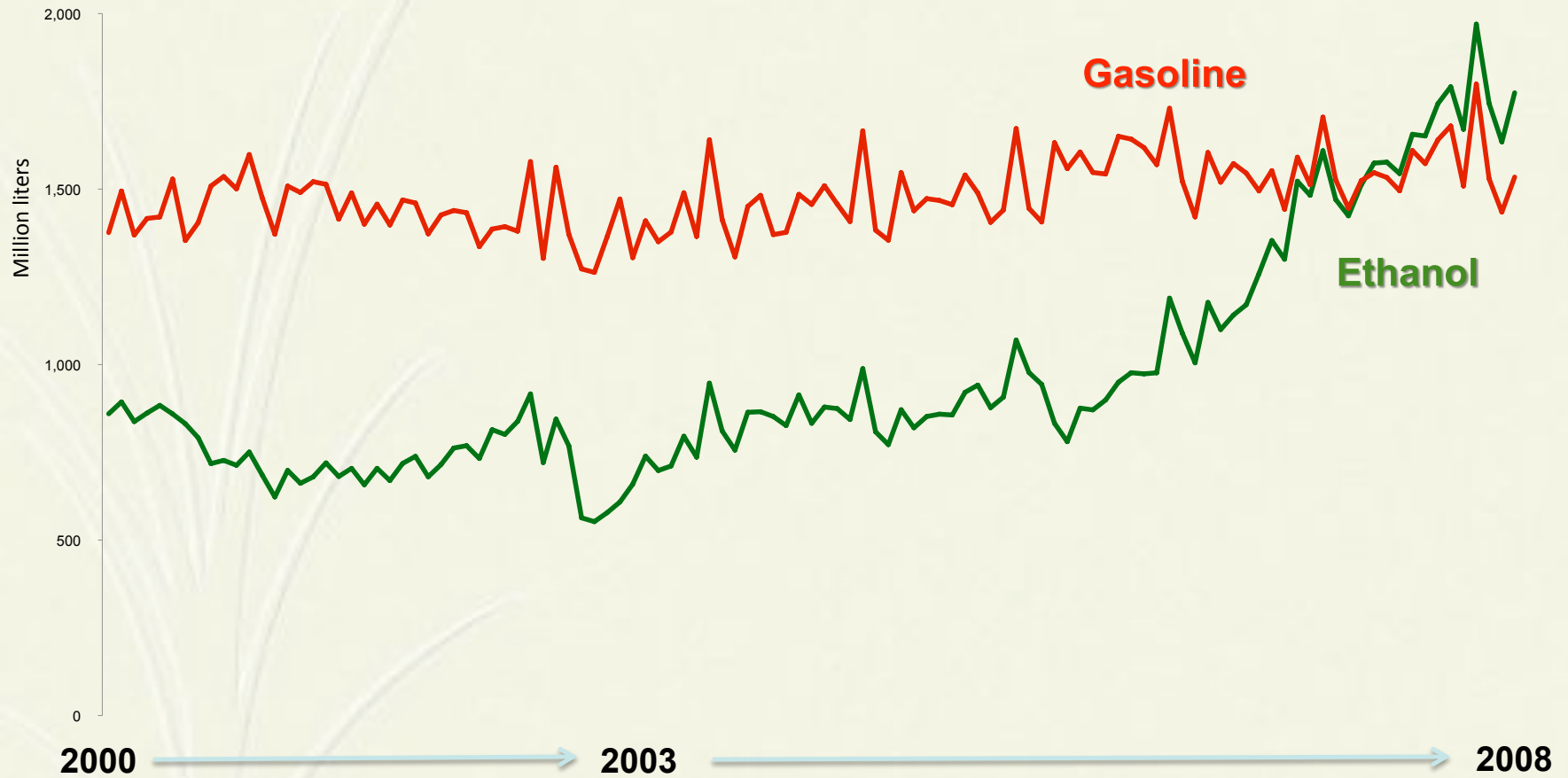


...CONSUMERS LIKE LOW PRICES



Sources: IMF, IPEA, CEPEA/ESALQ, ANP

RESULTS: GASOLINE IS NOW THE ALTERNATIVE FUEL...

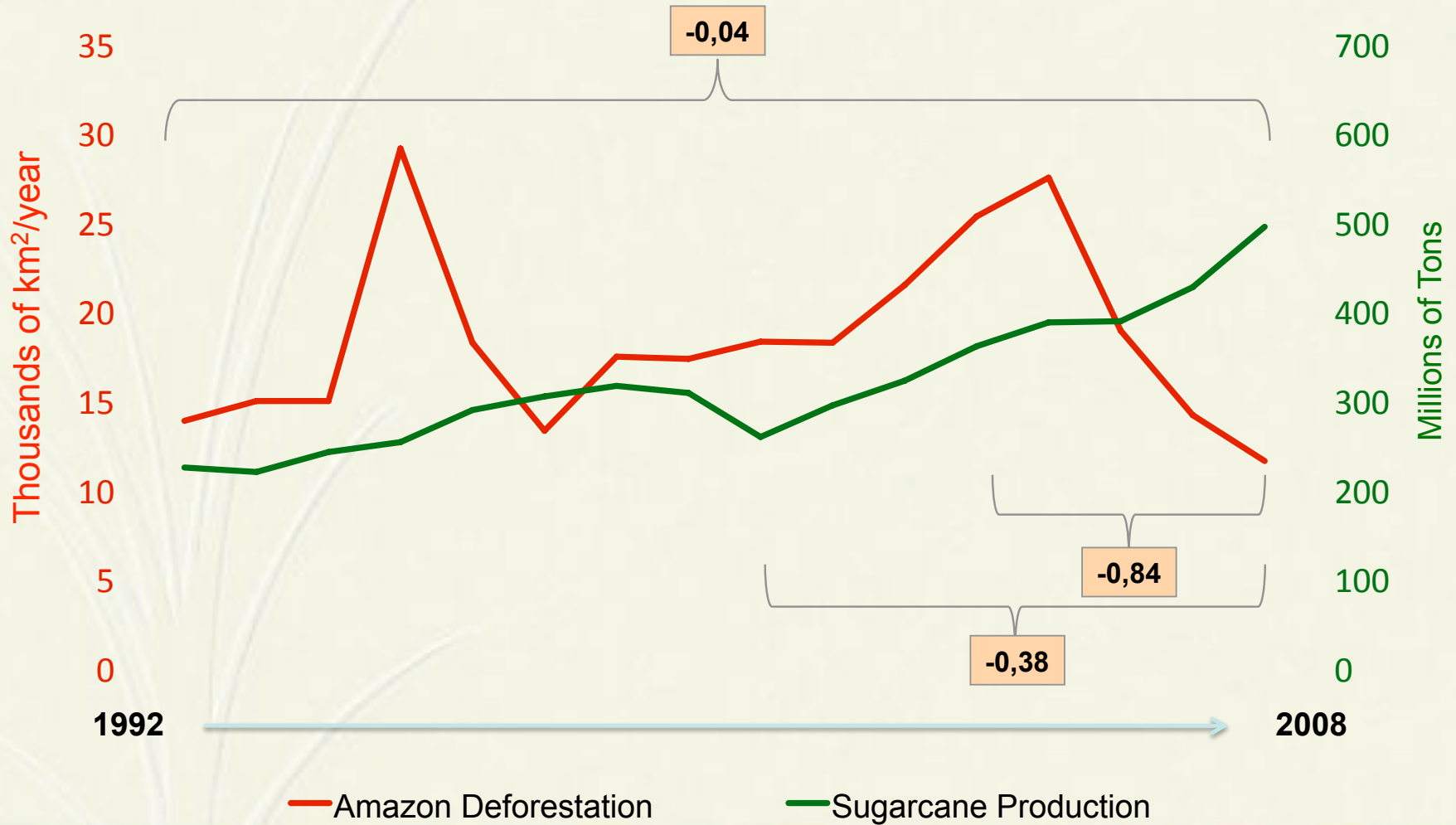


...1% OF ARABLE LAND DISPLACES 50% GASOLINE



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%	0.3%
2. Pastures	172.3	20%	49%
3. Available area	105.8	12%	30%
Total arable land – (crop land + pastures)			

DEFORESTATION UNRELATED TO SUGARCANE



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

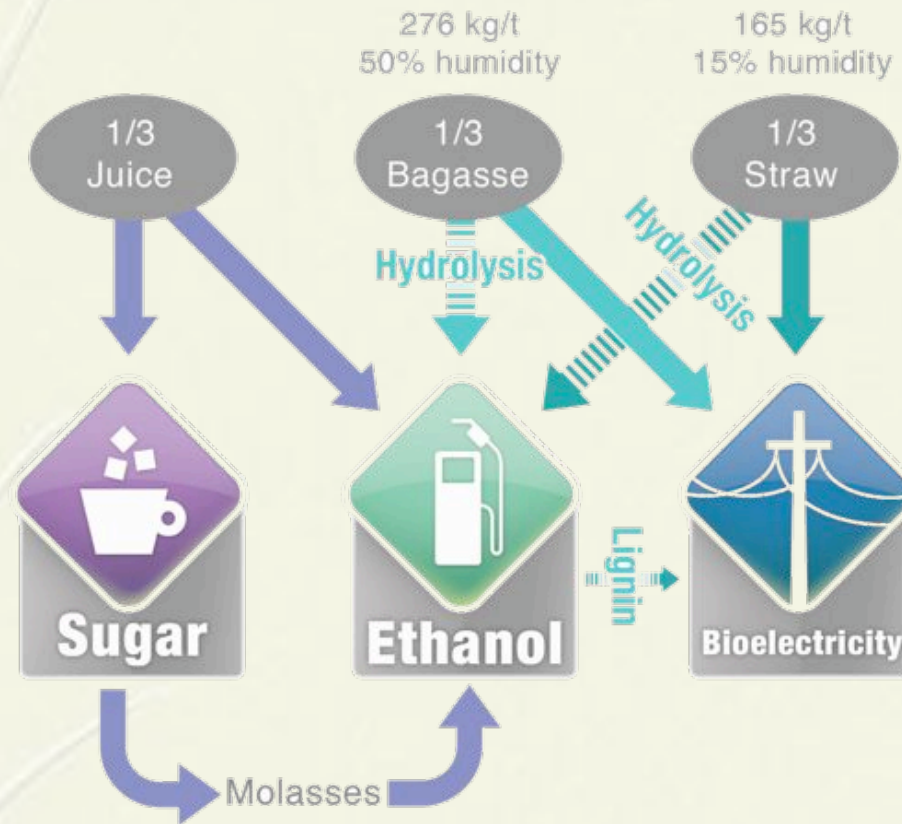
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Sugarcane & Climate Change

Mitigating Climate Change Impact

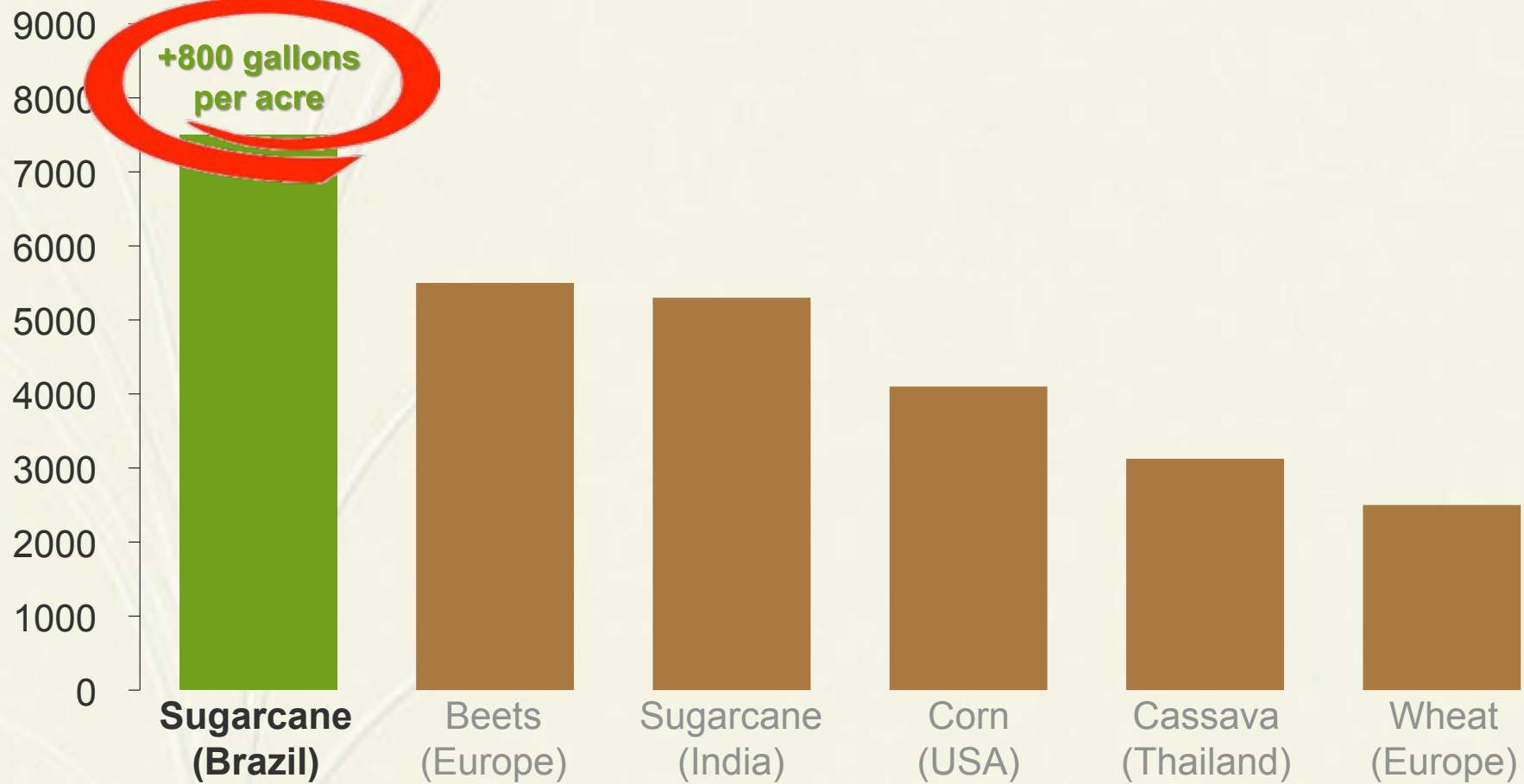
UNDERSTANDING SUGARCANE'S ENERGY

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AVERAGE PRODUCTION YIELDS

Liters per hectare



Source: IEA – International Energy Agency (2005), USDA (2008), MTEC, MAPA, ICONE, UNICA

NET ENERGY BALANCE

Resulting energy for every unit of fossil fuel input

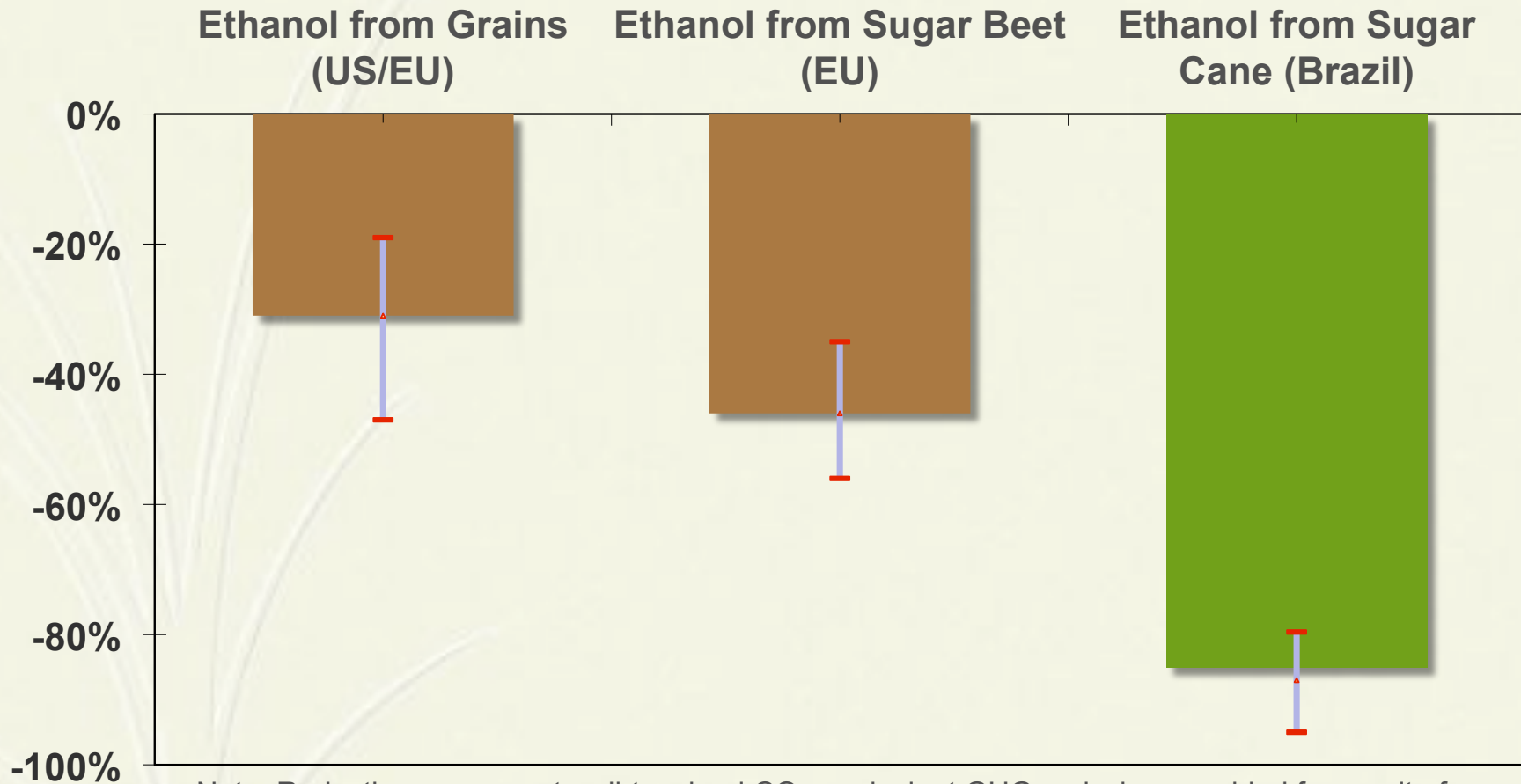
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Source: World Watch Institute, compilation of various sources.

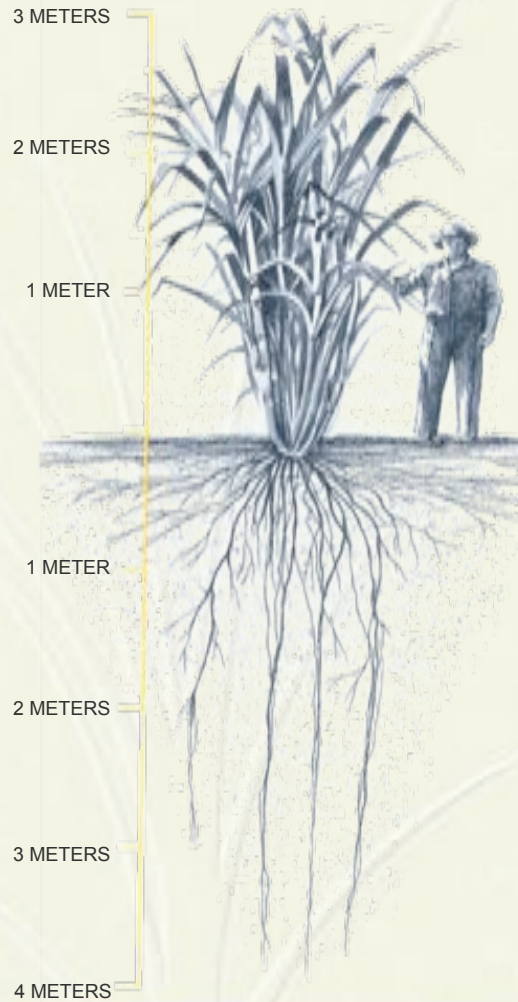
AVOIDED GREENHOUSE GAS EMISSIONS

Compared with "yesterday's" gasoline baseline



Note: Reductions represent well-to-wheel CO₂-equivalent GHG emissions avoided from unit of ethanol compared to gasoline, calculated on a life-cycle basis.

ABOVE & BELOW GROUND CARBON UPTAKE



**22-36
tons C/ha**

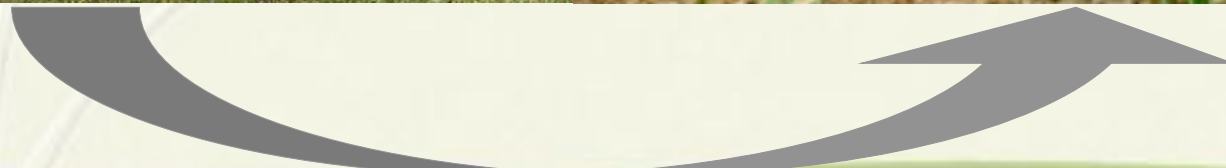
**3-5
tons C/ha**



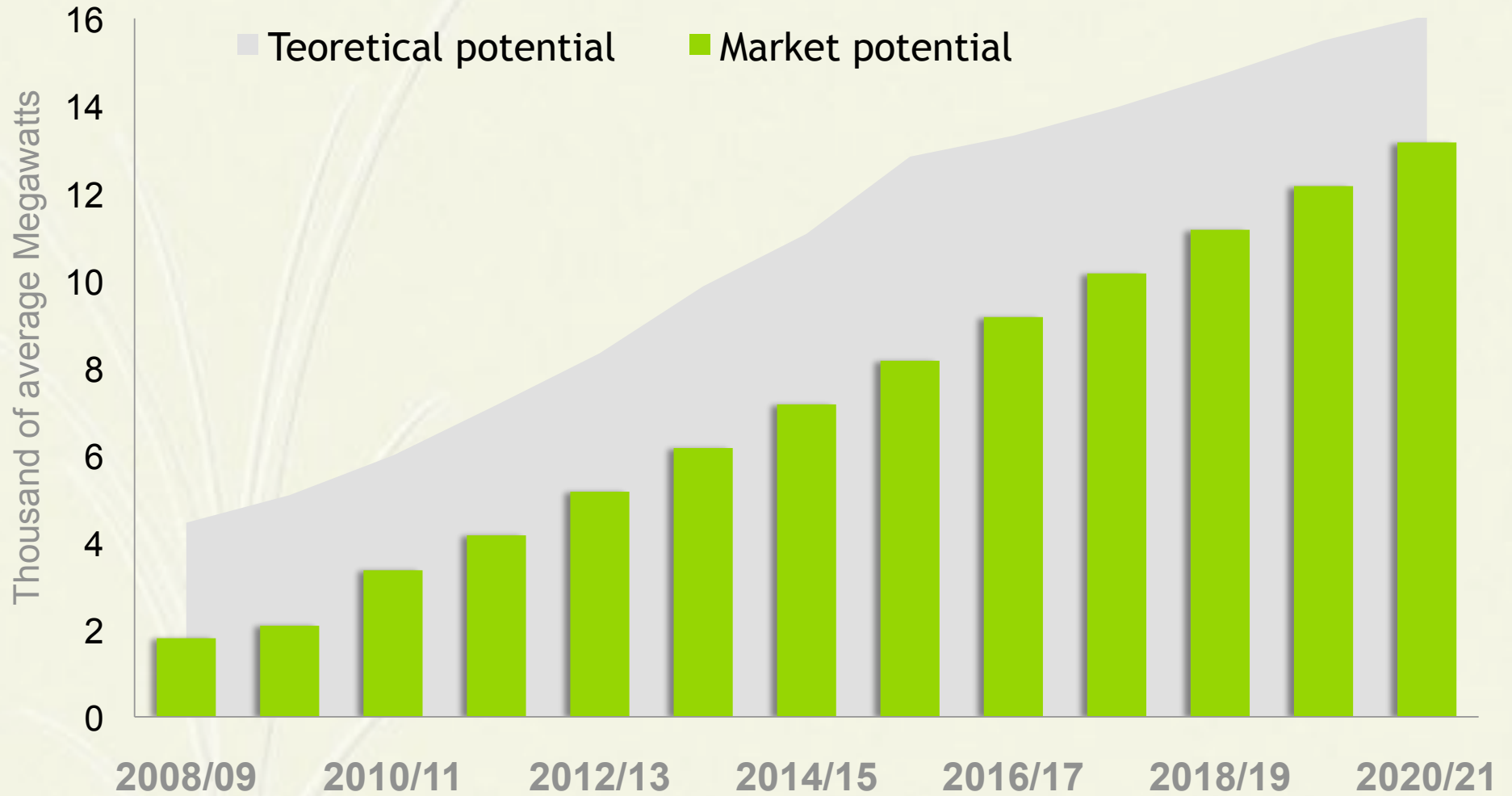
CANE VS. PASTURES: CARBON UPTAKE

Annual tons carbon per hectare

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BIOELECTRICITY: MORE ENERGY FROM SUGARCANE



Source: UNICA, Cogen, Koblitz (2009)

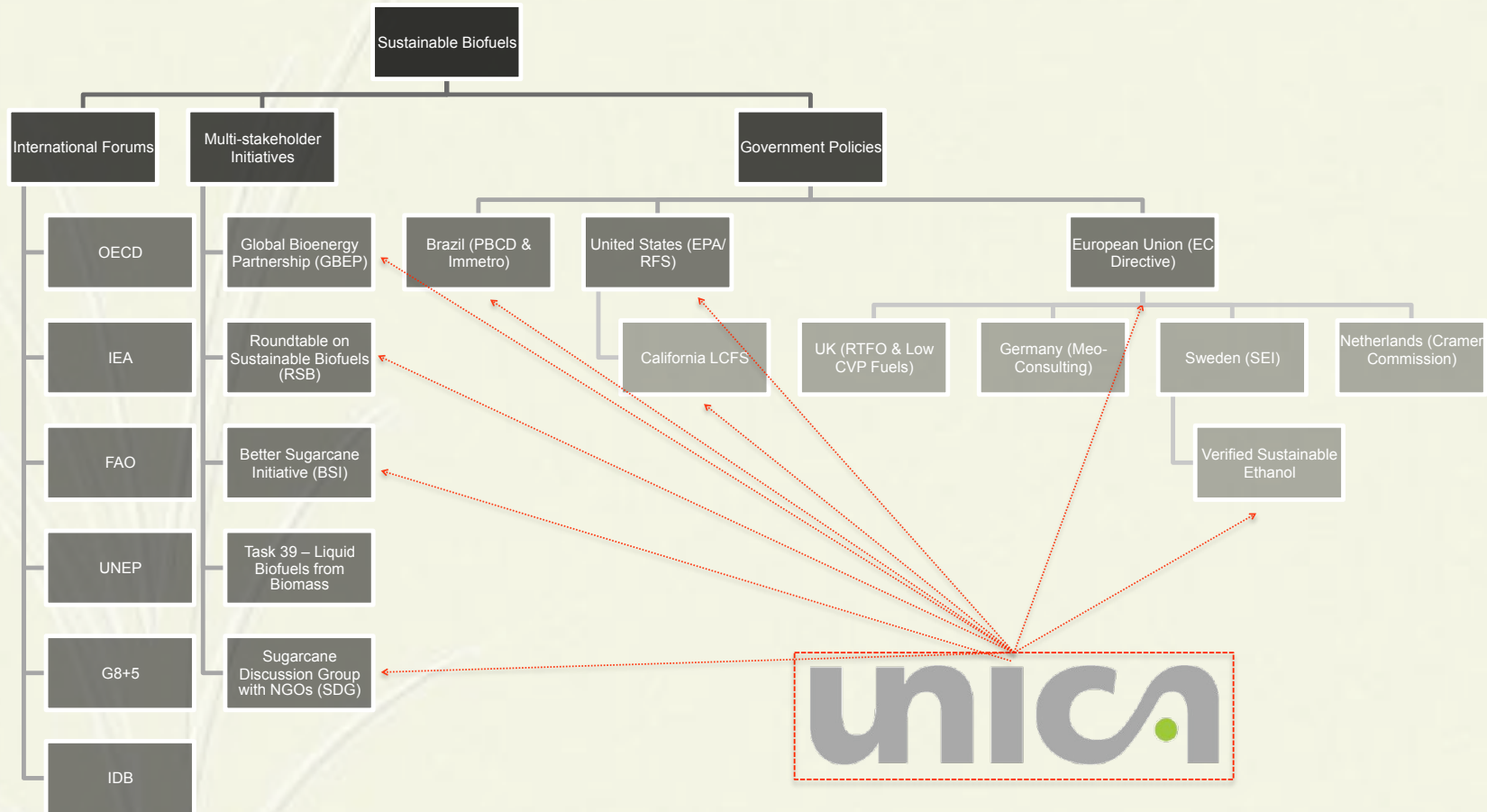
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Sugarcane & Sustainability

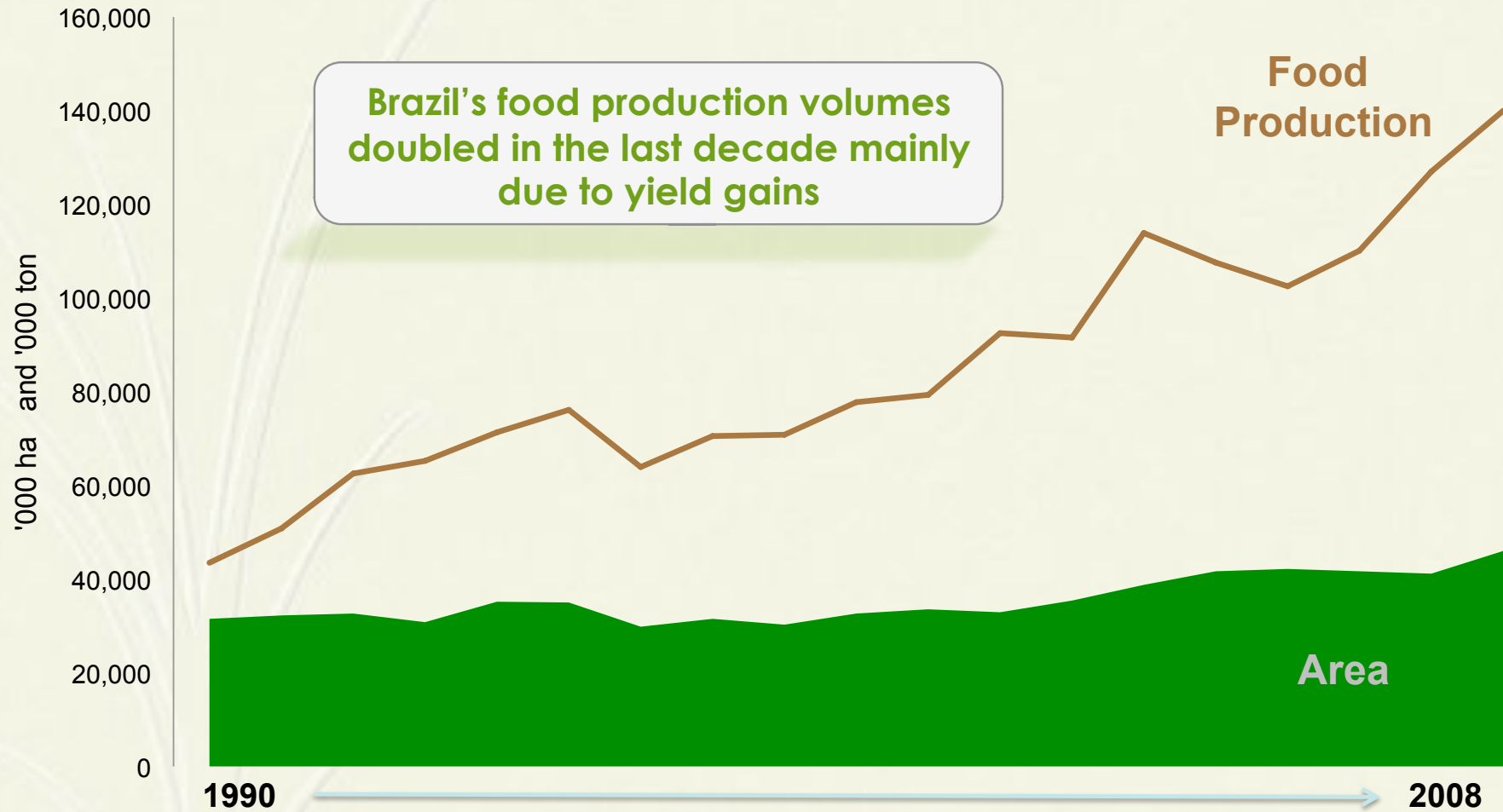
Building on Sustainable Practices

BIOFUEL SUSTAINABILITY FORUMS

Multiple efforts at various levels



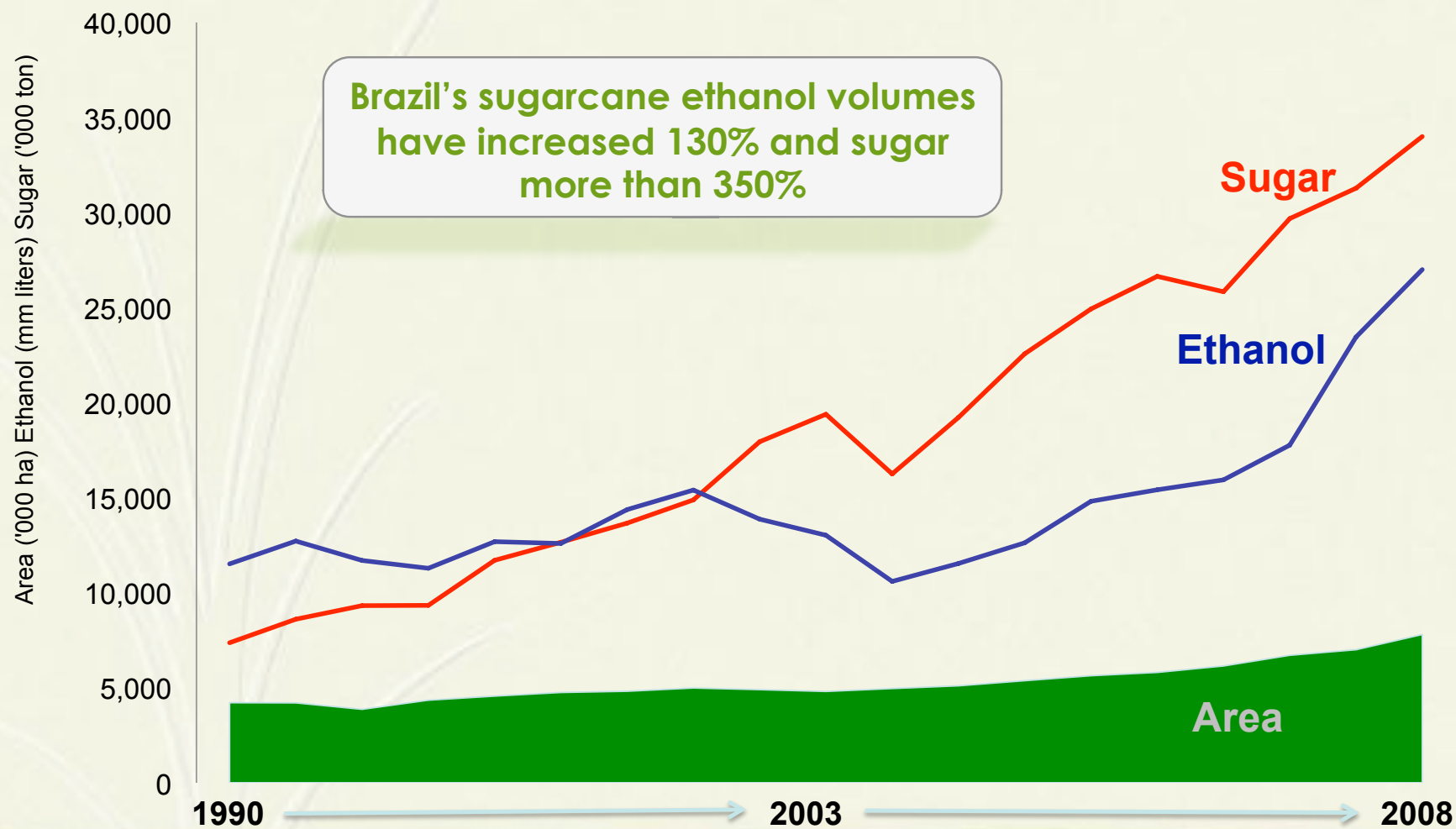
FOOD: BRAZIL FOOD PRODUCTION INCREASING



Sources: IBGE, UNICA

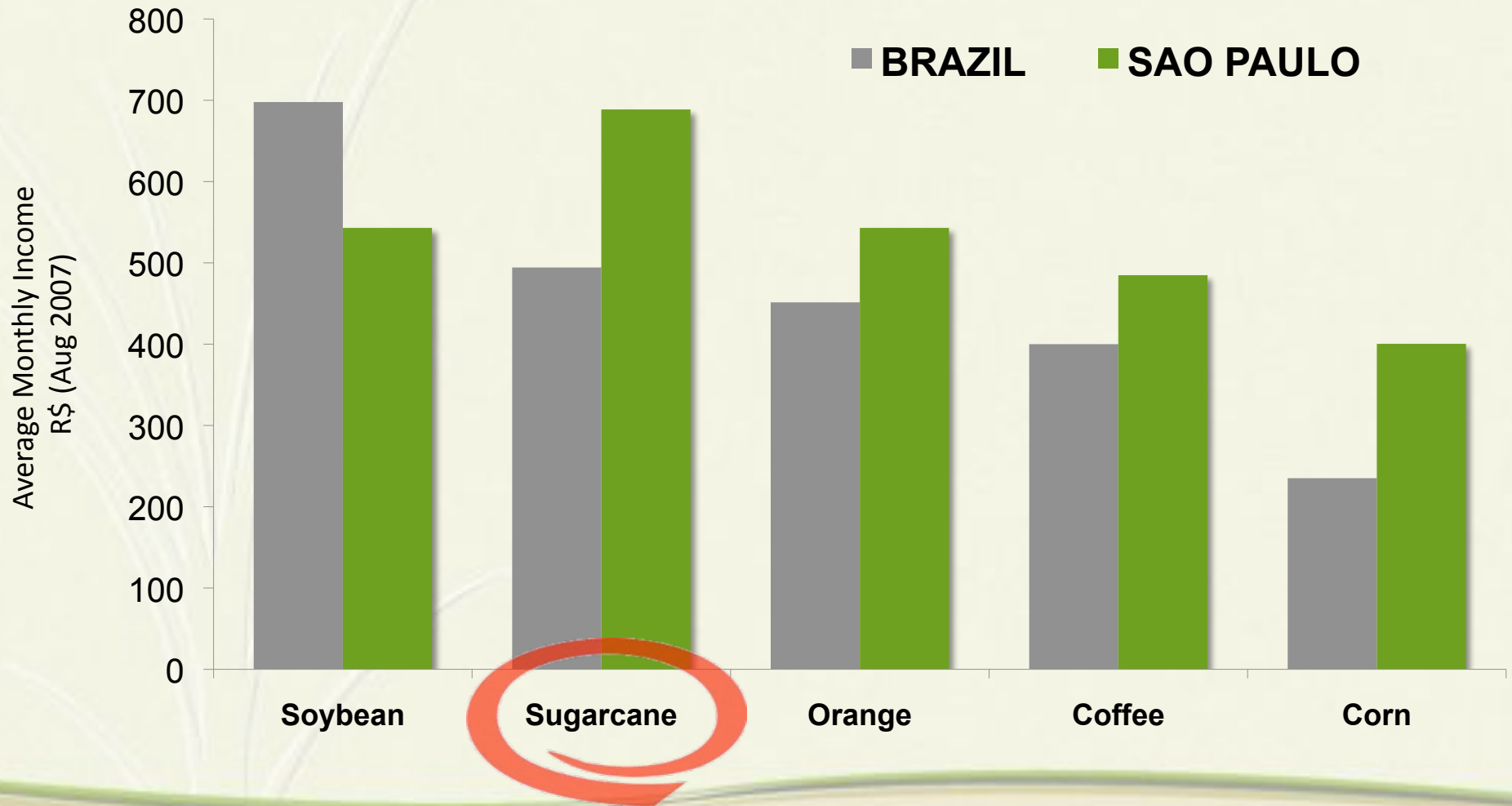
NOTE: Note: 1) 2008 is estimated data; 2) Grains include rice, corn, wheat, soybeans, etc.

FOOD: SUGAR & ETHANOL PRODUCTION INCREASING



JOBS: AVERAGE INCOME IN AGRICULTURE

Sugarcane worker second highest income

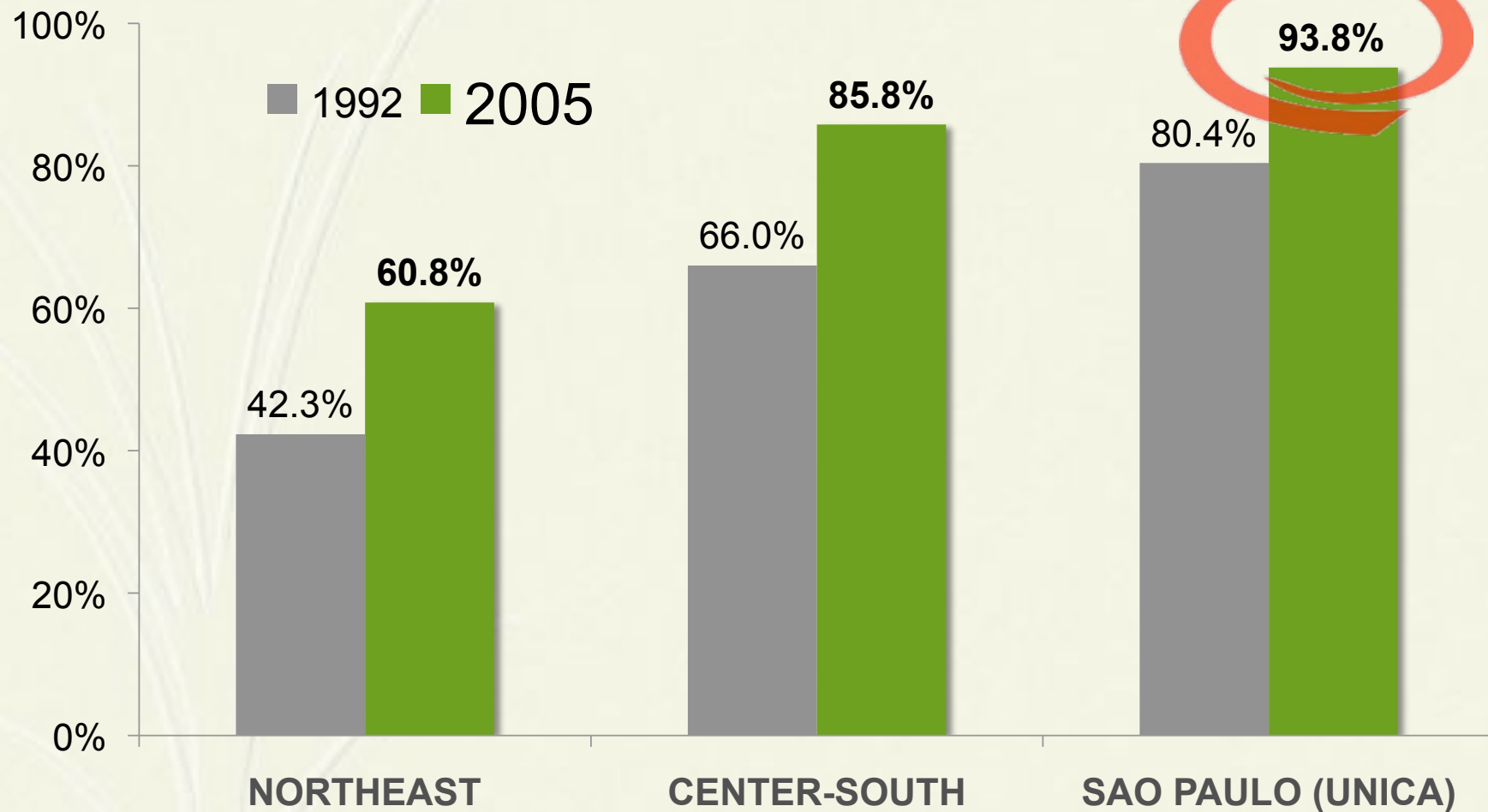


Source: HOFFMANN, R & OLIVEIRA, F. C. R. *Evolução da remuneração das pessoas empregadas na cana-de-açúcar e em outras lavouras, no Brasil e em São Paulo. Piracicaba: ESALQ. 2008.* Note: Amounts in Brazilian currency (August 2007, INPC Deflator)

JOBS: IMPROVING FORMAL EMPLOYMENT

Industry workers receive full benefits

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Source: PNAD (1992, 2003, 2004 and 2005); MORAES, Márcia A.F. de. Número e qualidade dos empregos na agroindústria da cana-de-açúcar. In: A energia da cana-de-açúcar, 2007.

GRI: SOCIAL-ENVIRONMENTAL INVESTMENTS

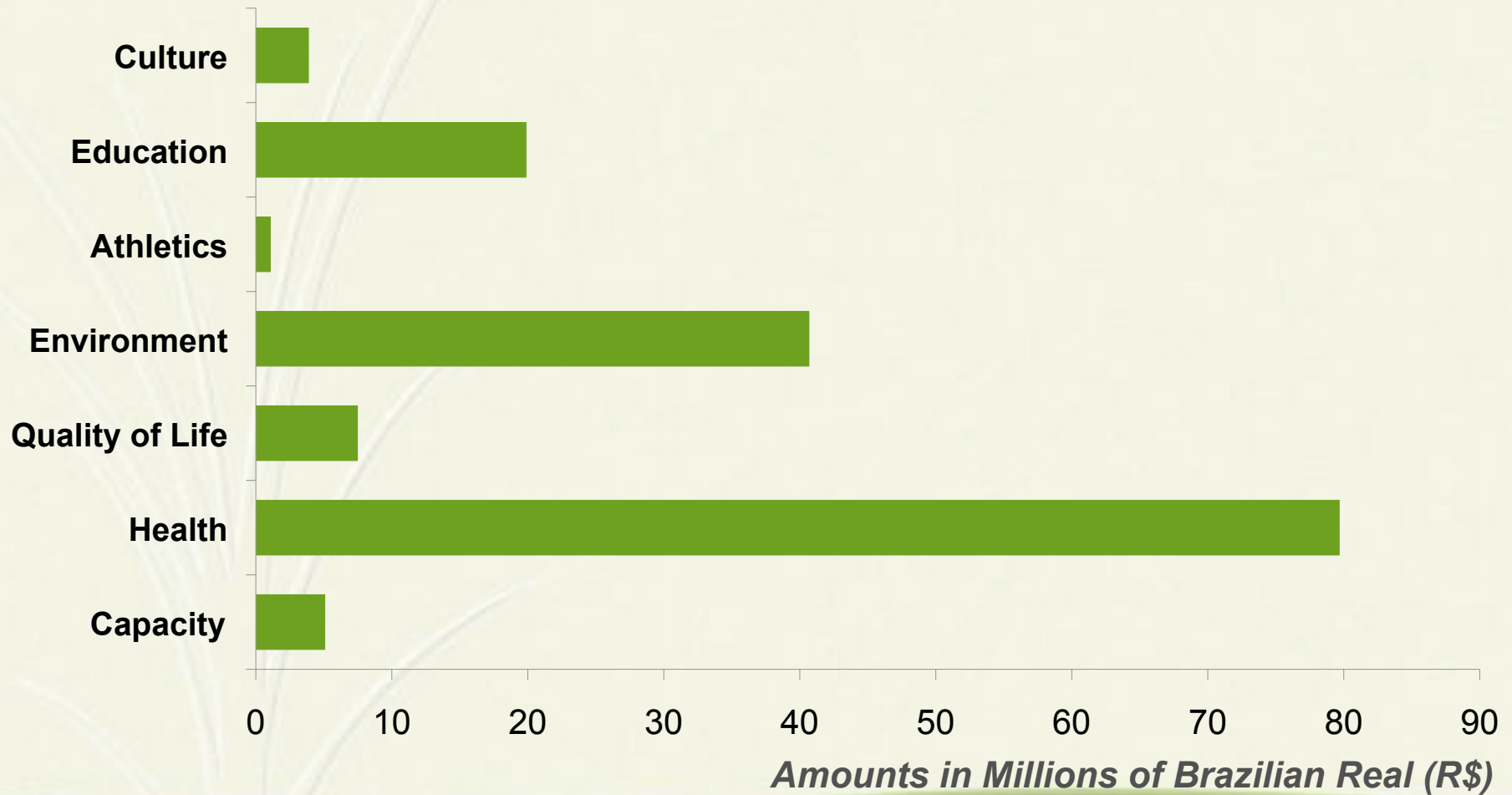
First trade association to undertake this effort



Source: UNICA's GRI Report (2008)

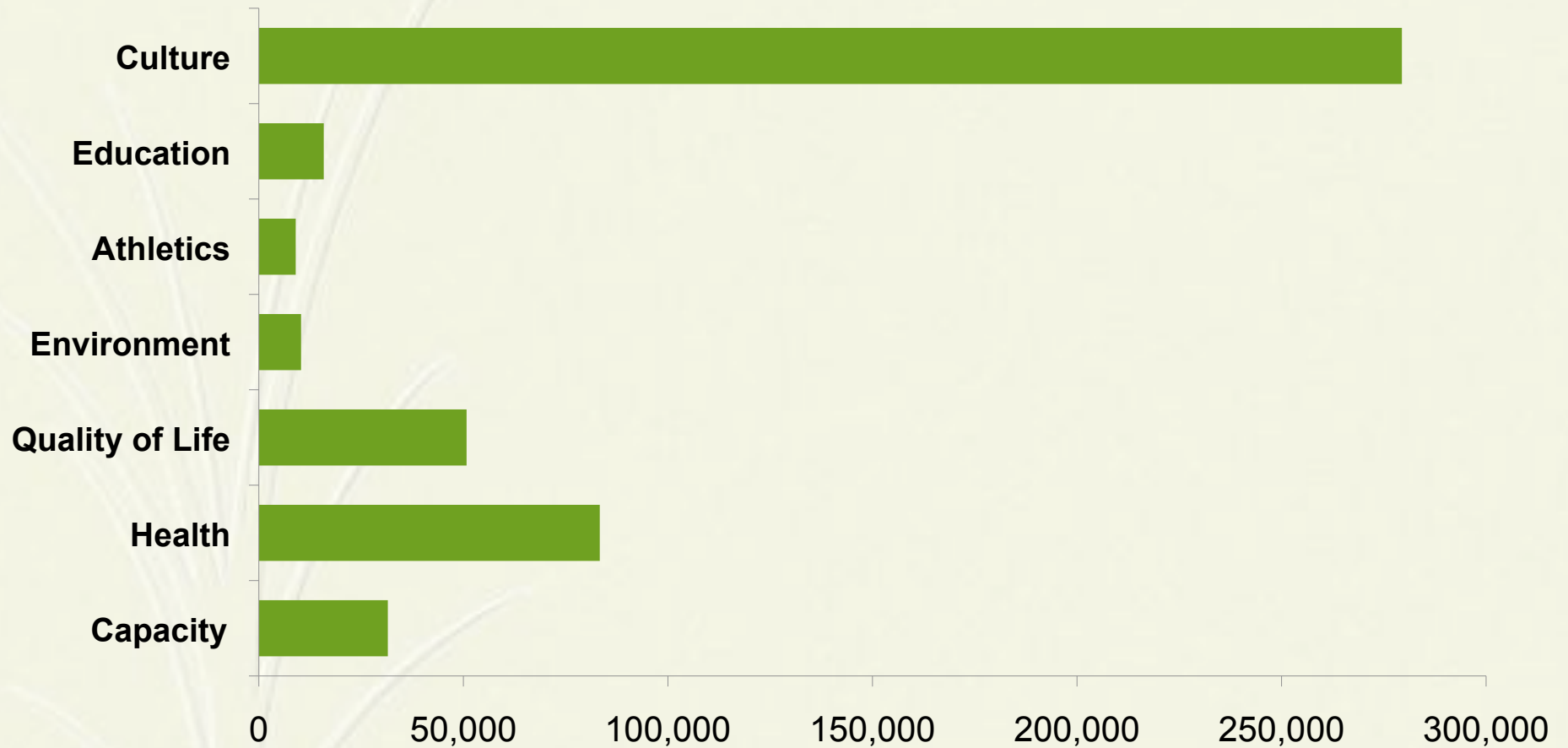
GRI: SOCIAL-ENVIRONMENTAL INVESTMENTS

US\$75 million (R\$160 million) invested



GRI: SOCIAL-ENVIRONMENTAL INVESTMENTS

Nearly half a million served



Source: UNICA's GRI Report (2008)

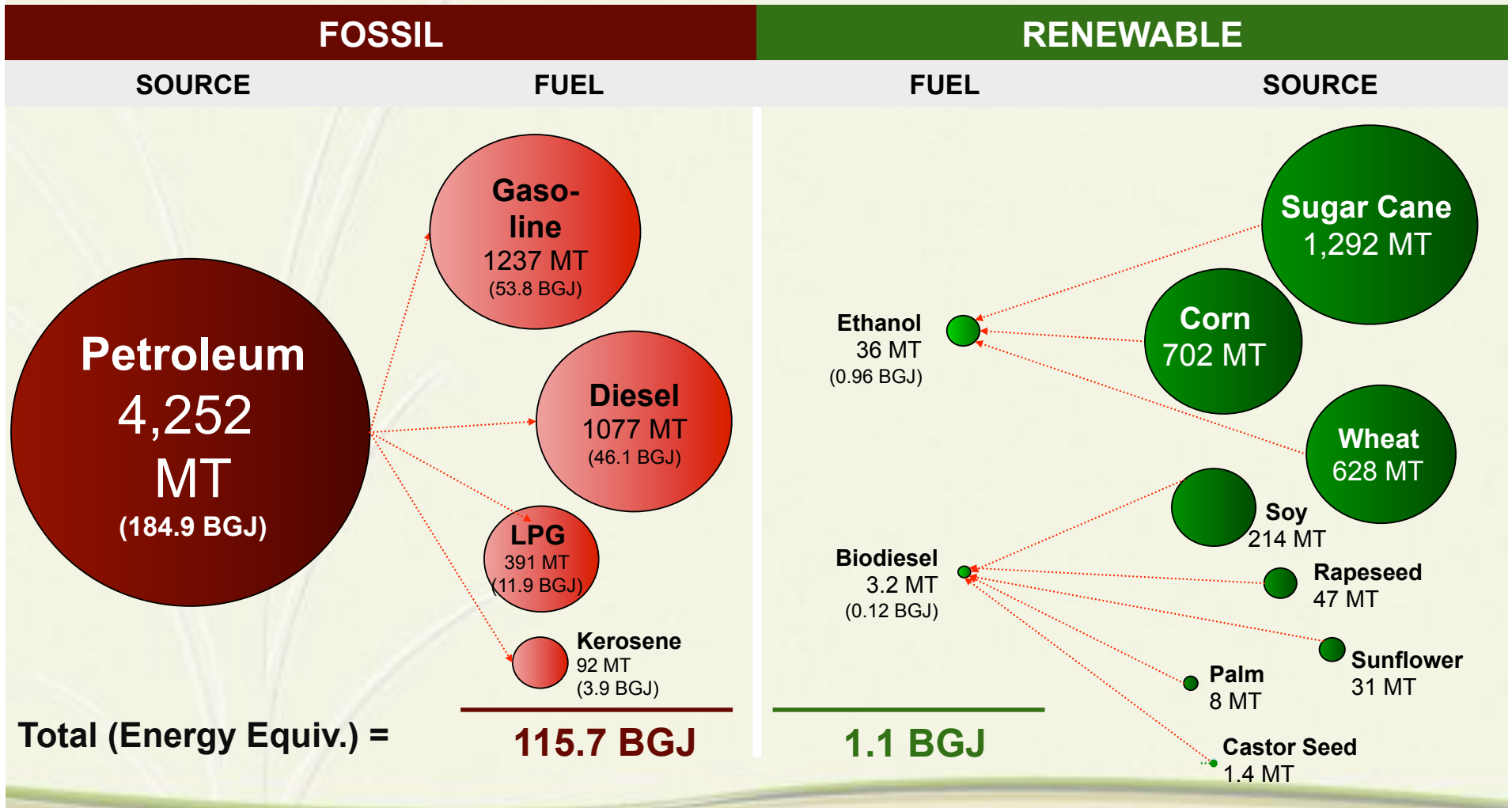
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Global Biofuels Market

Fueling emerging markets sustainably

WORLD FUELS PRODUCTION

Renewable energy represent less than 1%



Notes: Million tons, 2005. Data for palm, gasoline, diesel, LPG and Kerosene is from 2003. BGJ = Billions of Giga Joules
 Sources: FAO, Oil World, F.O. Licht, LCM, EIA. Elaboration: Icone and UNICA.

ETHANOL: VALUES & GROWTH DRIVERS

Values

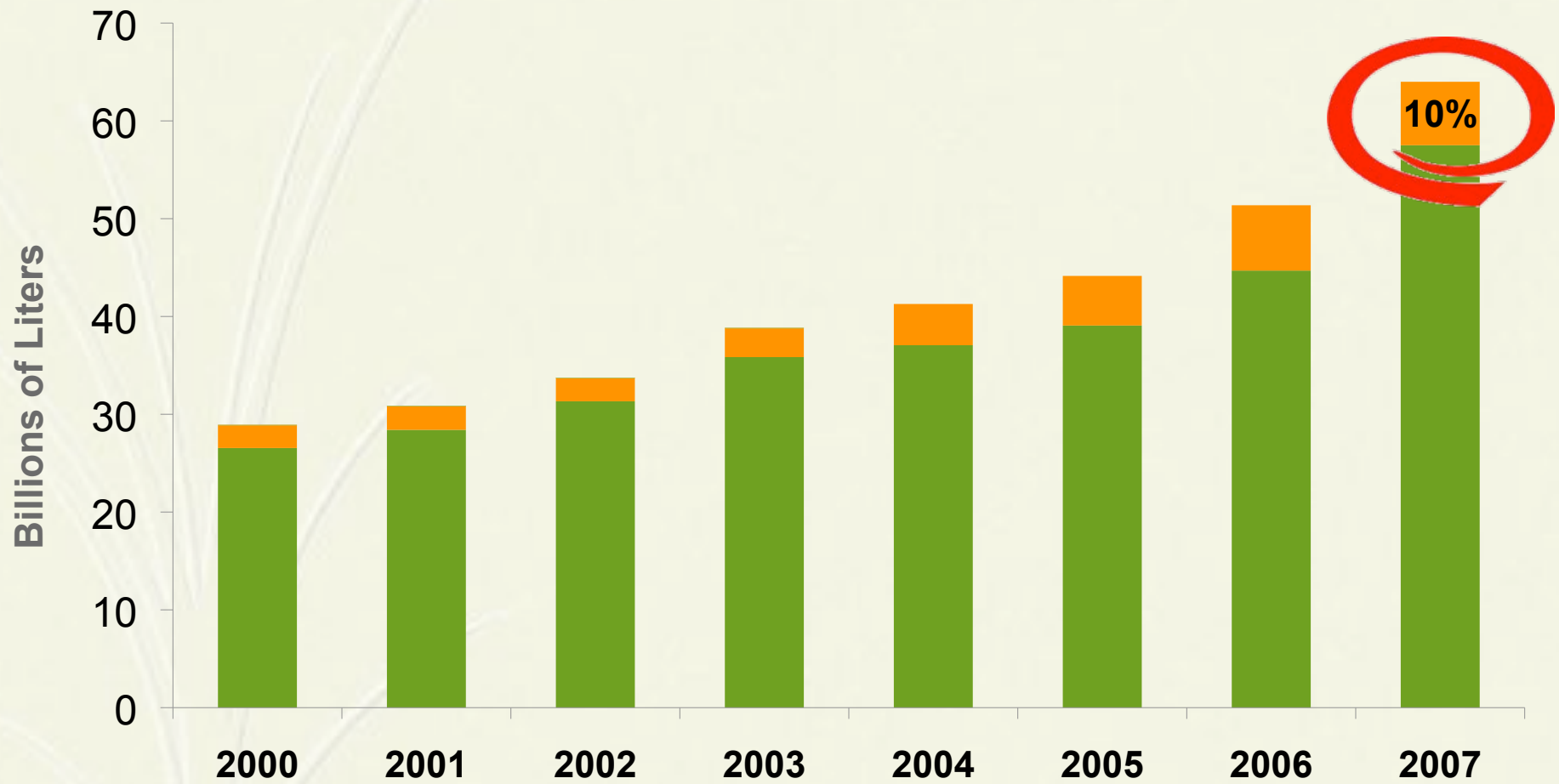
- ✓ Renewable source of energy
- ✓ Octane booster
- ✓ Fuel extender
- ✓ Fuel substitute
- ✓ Low pollution fuel (reduce GHG emissions)
- ✓ Social development inducer in rural areas
- ✓ In line with Kyoto & Sustainable Development

Drivers

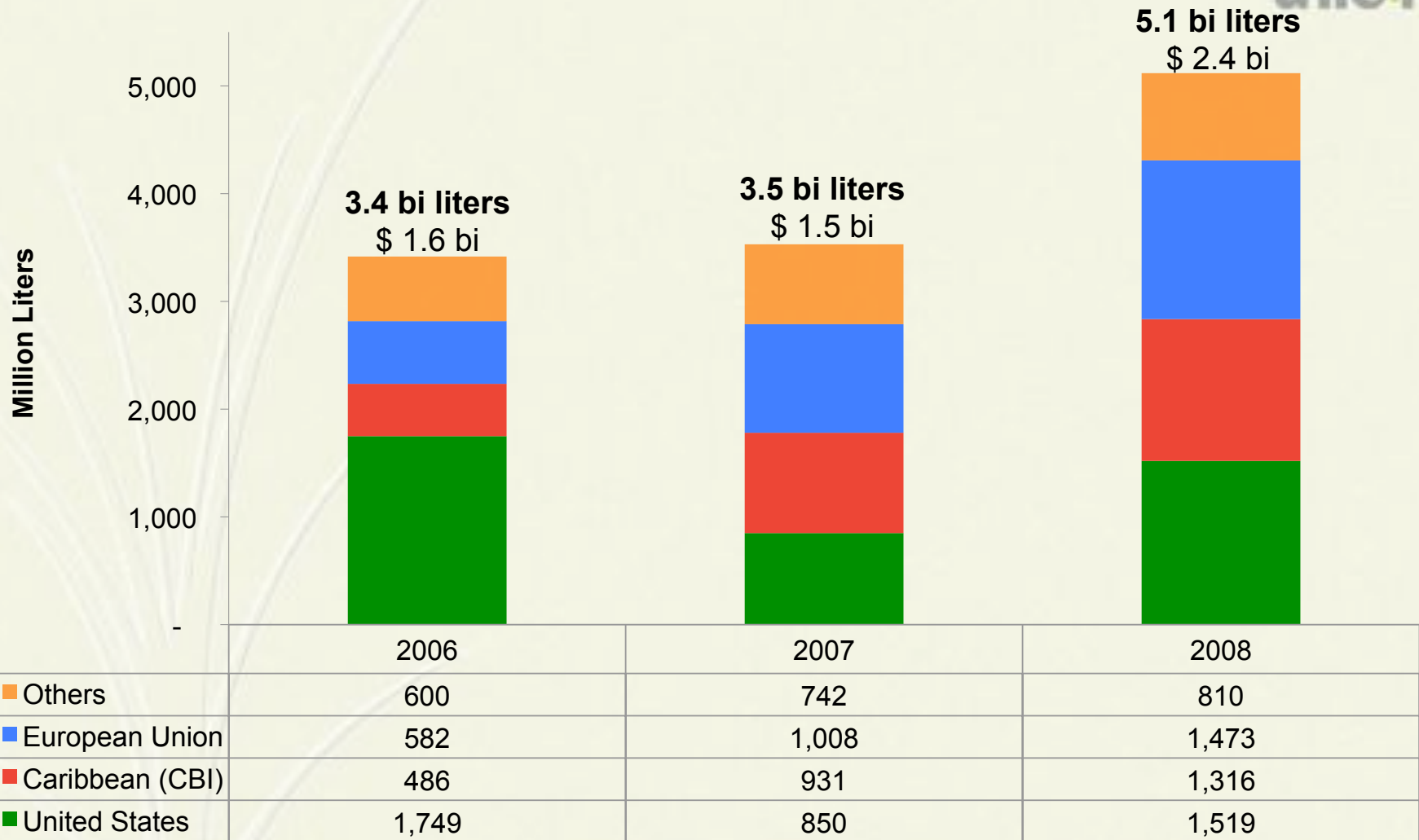
- ✓ Environmental concerns (climate change)
- ✓ Energy security ⇔ high oil prices
- ✓ Support to farm incomes

ETHANOL TRADE VS. PRODUCTION

Only about 10% of total production



BRAZILIAN ETHANOL EXPORTS BY DESTINATION

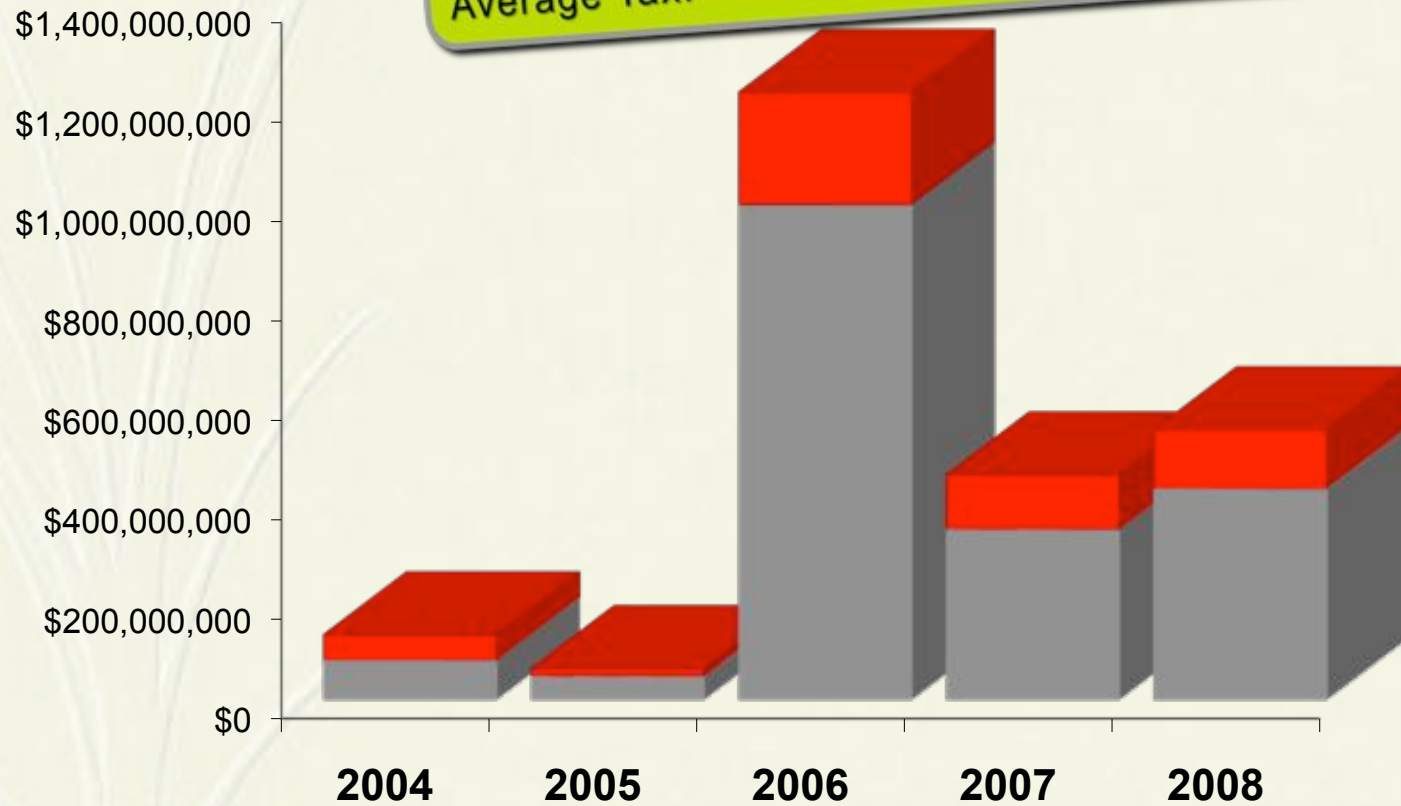


Source: Brazilian Ministry of Trade & Development (SECEX)

COST OF U.S. ETHANOL TARIFF SINCE IRAQ WAR...



54 ¢ per gallon + 2.5 % Ad Valorem
Total Duties Paid: US\$524,776,342
Average Tax: 28%

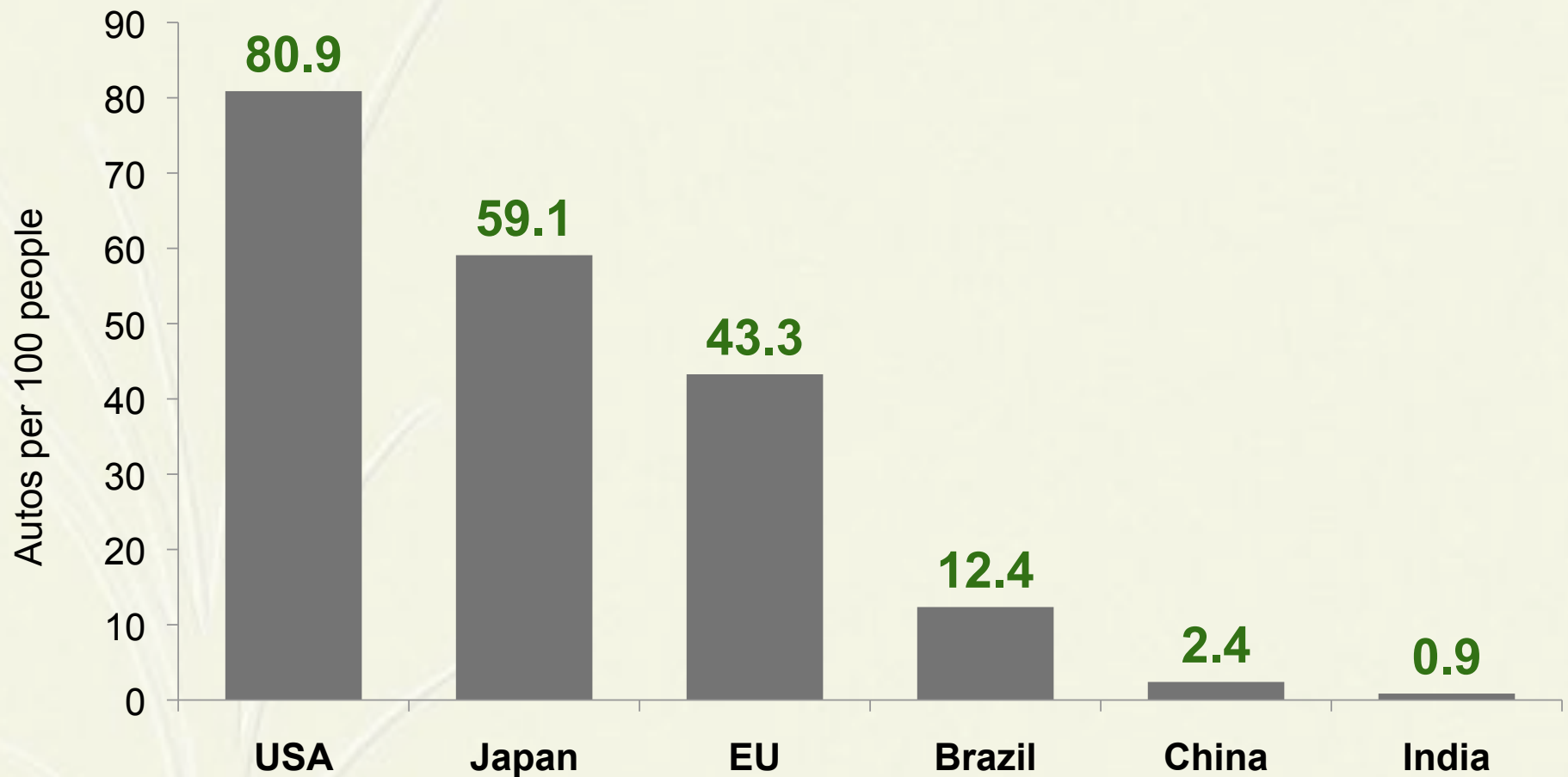


Source: U.S. International Trade Commission.

USE OF AUTOMOBILES

What fuel will emerging economies use?

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Fonte: ANFAVEA, ONU, JAMA, ACEA. Developed by UNICA. Data from 2005 except for India (2004).

A WORLD OF SUGARCANE

UNICA



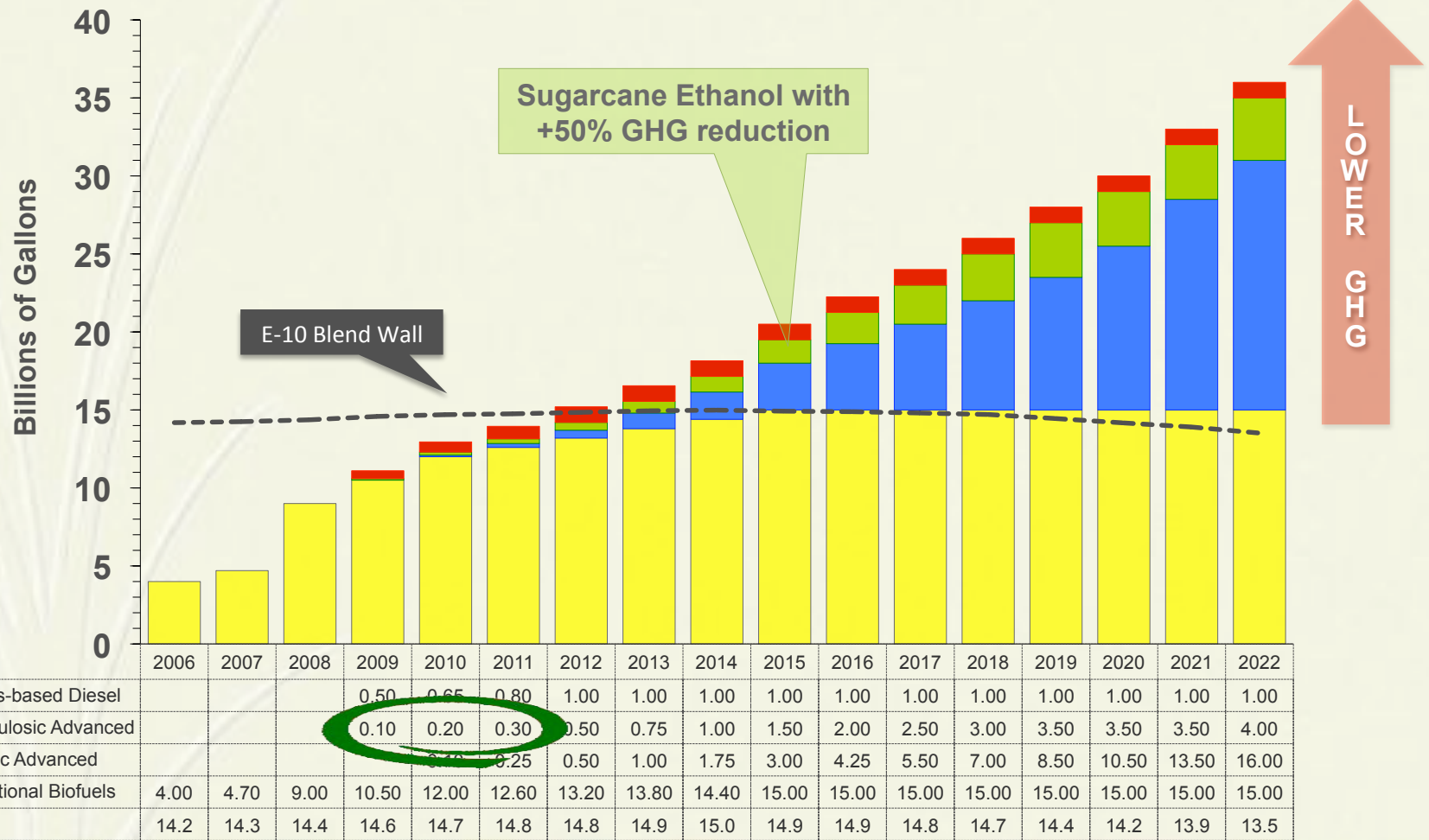
100 countries could supply *sustainable* biofuels to 200 nations, while currently **20 oil producers** provide *unsustainable* fossil fuels today.

6

Sugarcane Ethanol & U.S. Market

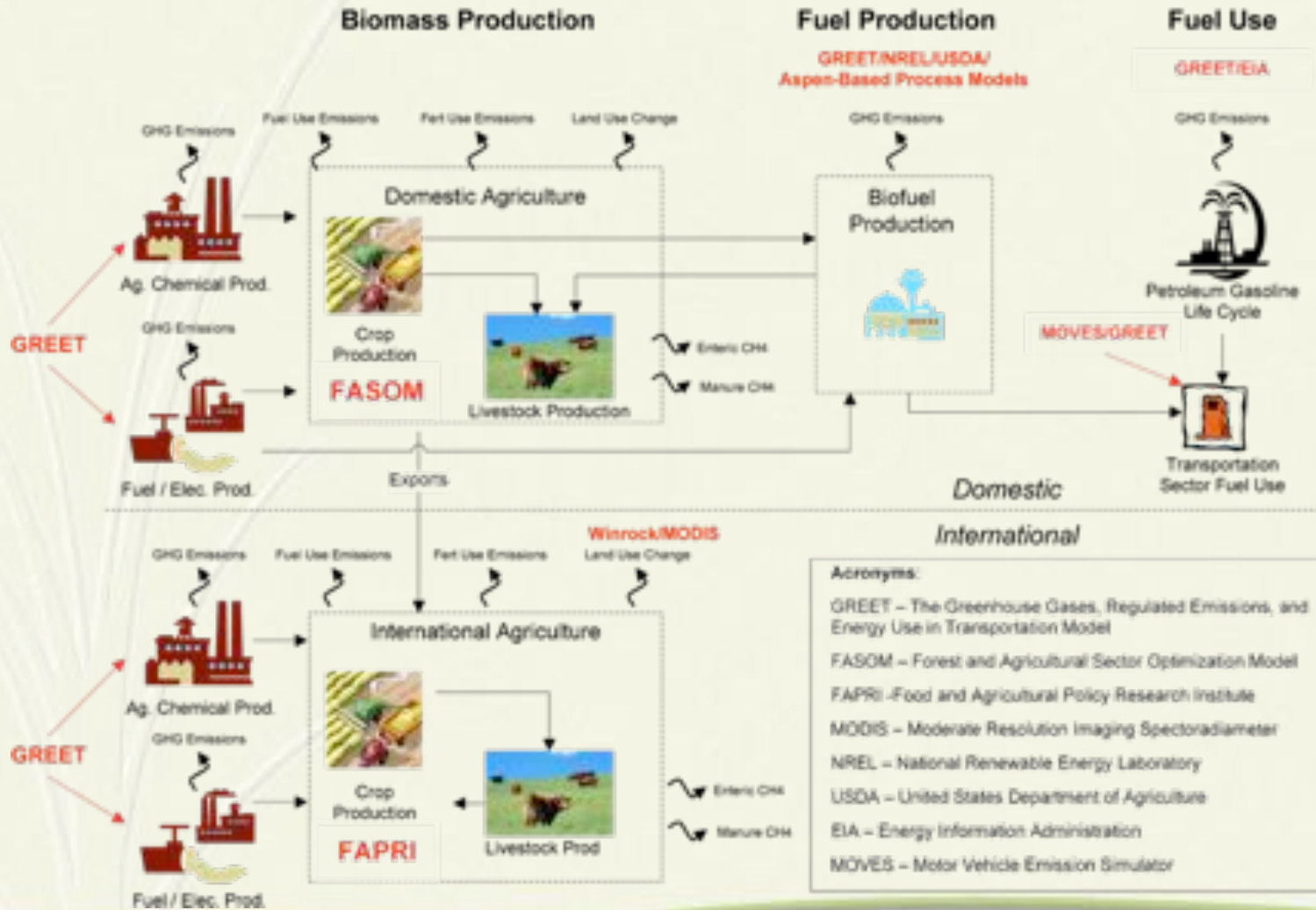
Meeting the RFS and the LCFS

U.S. RENEWABLE FUELS STANDARD (RFS)



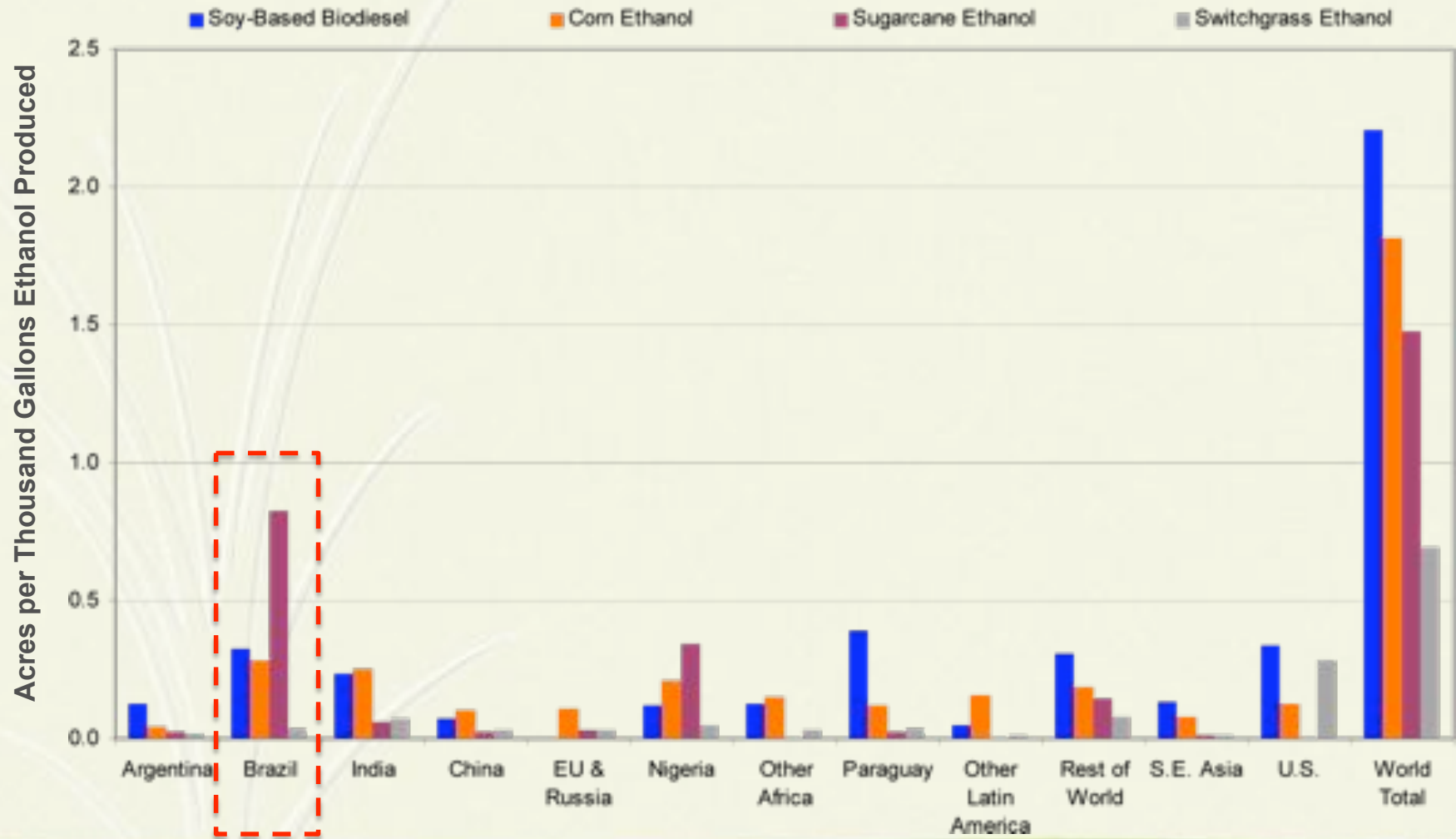
Source: EISA of 2008, Dept of Energy, ITC; E-10 Blend Wall Limit based on EIA's projections of gasoline consumption and do not include bottleneck and other infrastructure concerns.

EPA'S LAND USE MODEL



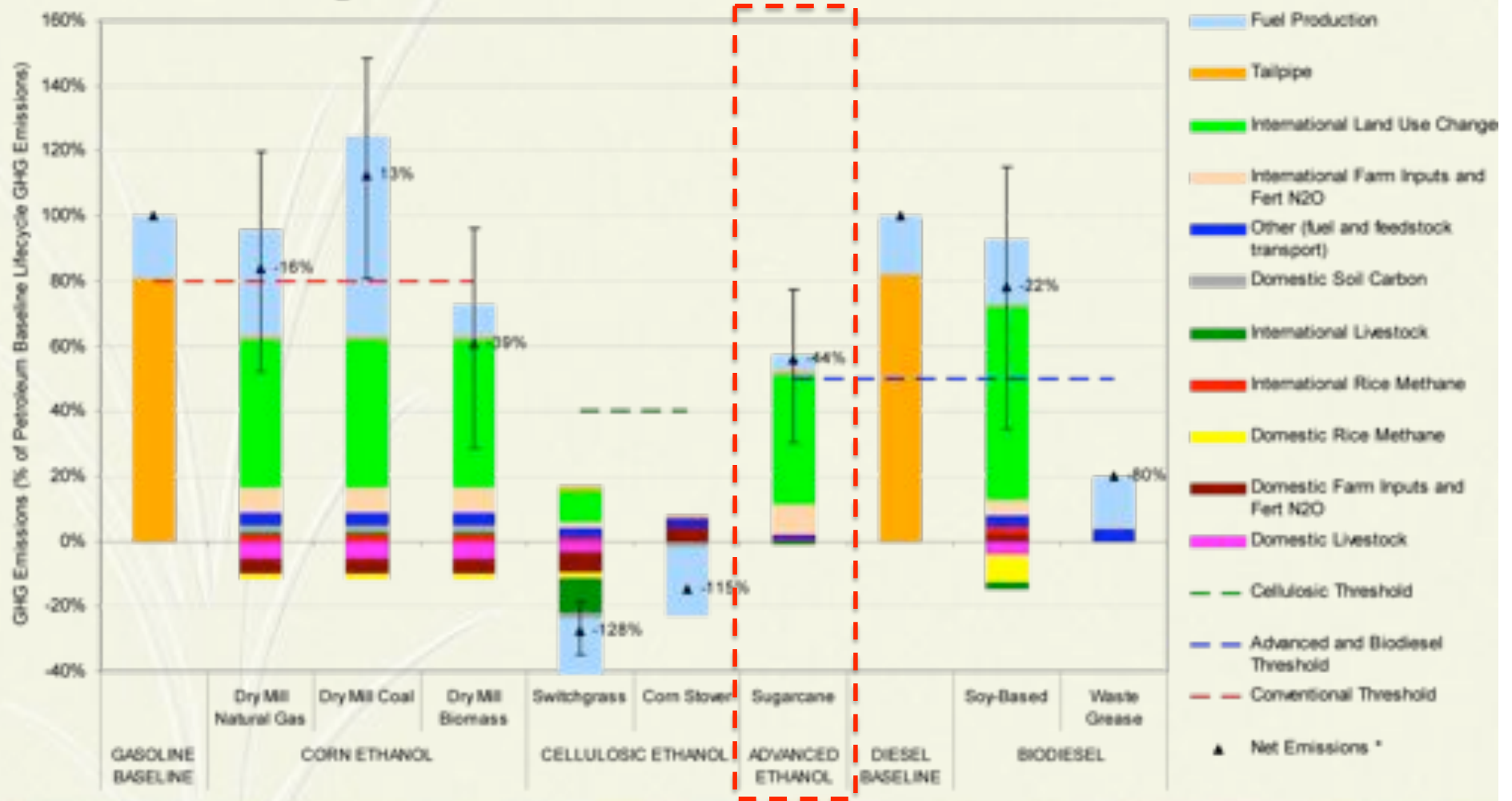
Source: Environmental Protection Agency (EPA), May 2009.

EPA: "INDIRECT LAND USE" EFFECT



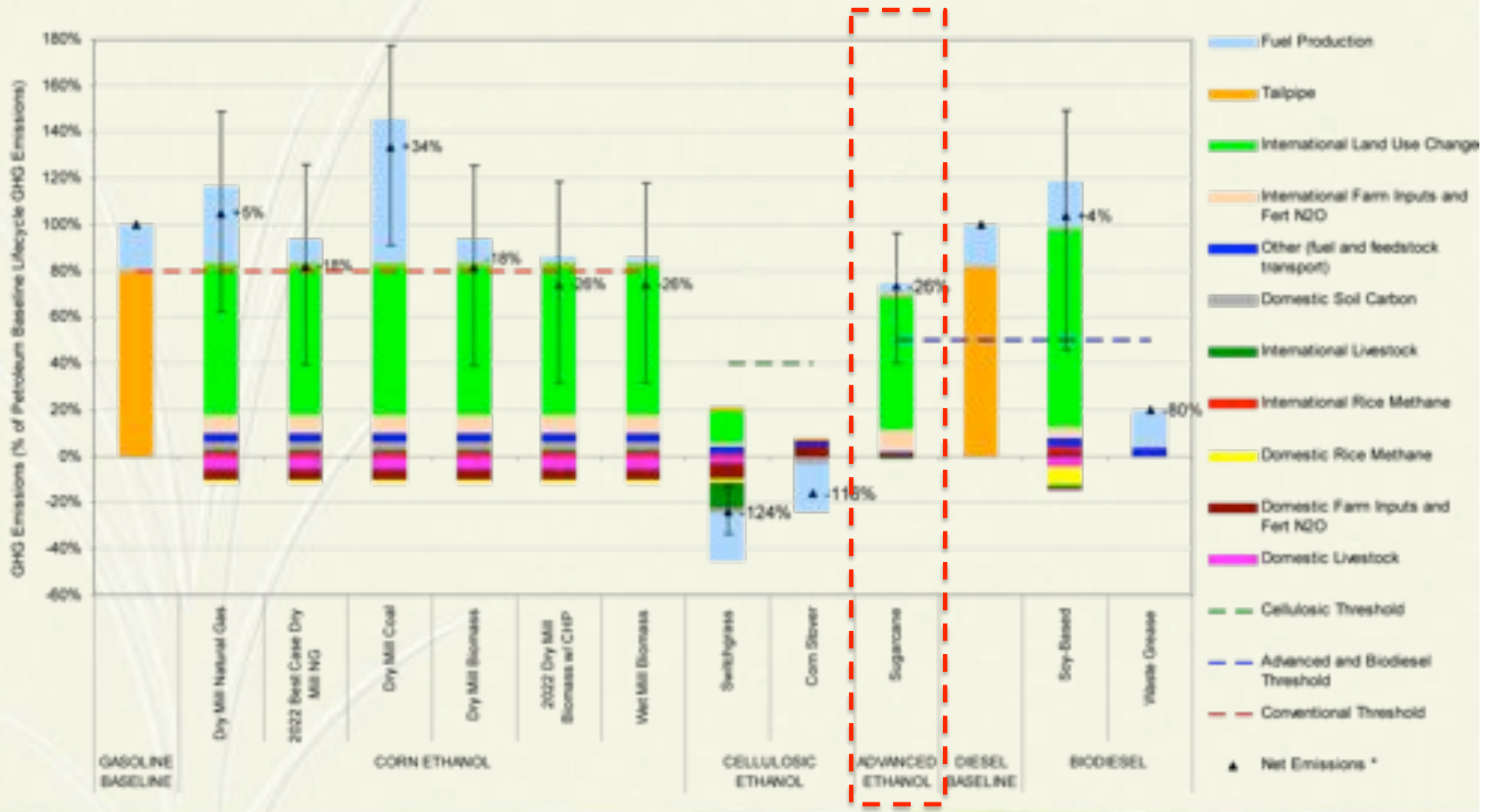
Source: See Figure 2.1-4. "Regional Crop Expansion by Renewable Fuel, 2022 (acres per thousand ethanol equivalent gallons of biofuel production) in page 284 of Discussion Draft of Environmental Protection Agency (EPA) Regulatory Impact Analysis, May 2009.

EPA: "INDIRECT LAND USE" EFFECT (100 Year)



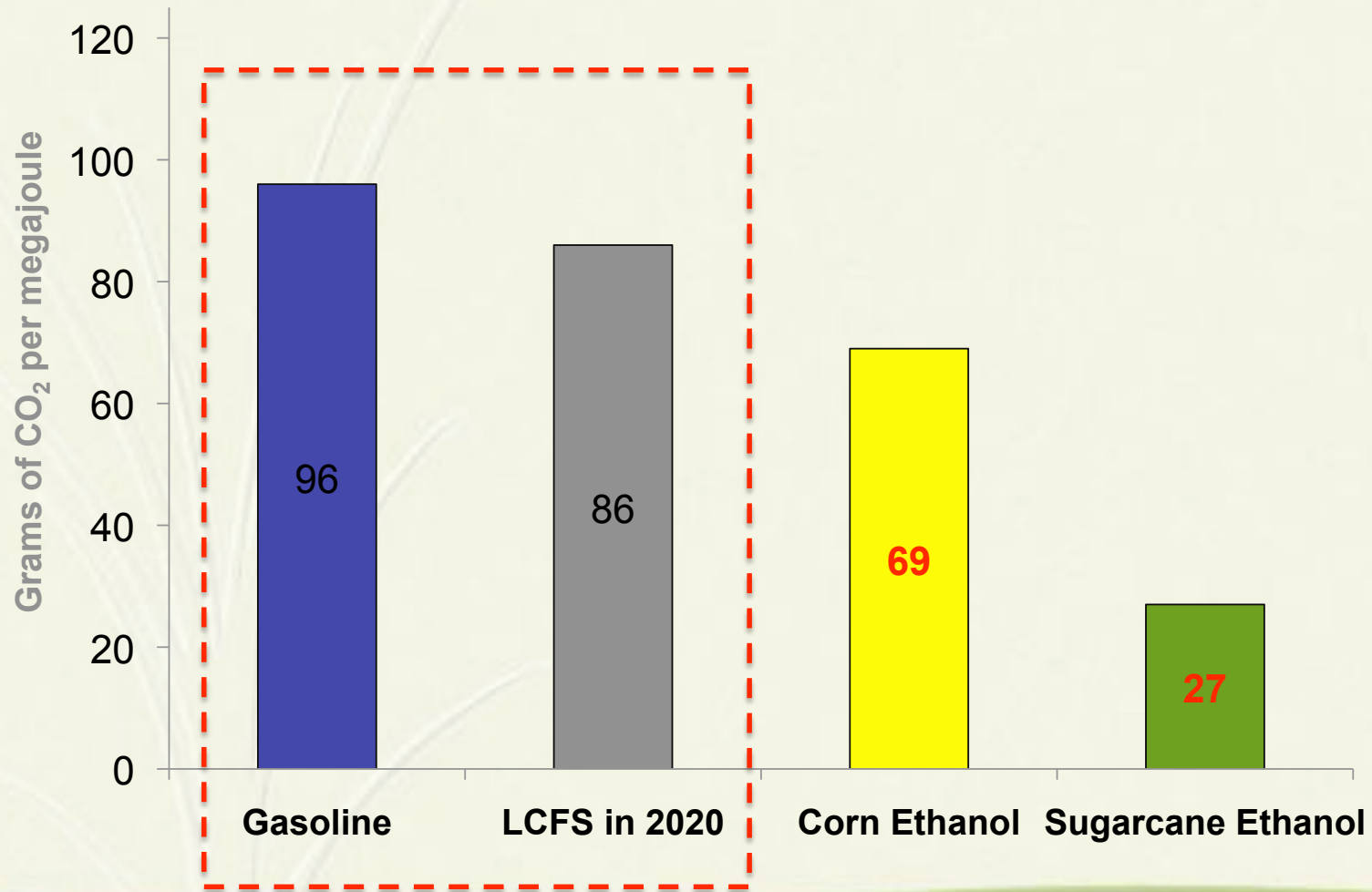
Source: See Figure 2.1-2. "Lifecycle GHG Results Using 100-Year Net Present Value with 2% Discount Rate" in page 282 of Discussion Draft of Environmental Protection Agency (EPA) Regulatory Impact Analysis, May 2009. Range shows net emissions if EPA assumes all land conversion from forest (upper bound) and all from grassland (lower bound).

EPA: "INDIRECT LAND USE" EFFECT (30 YEAR)



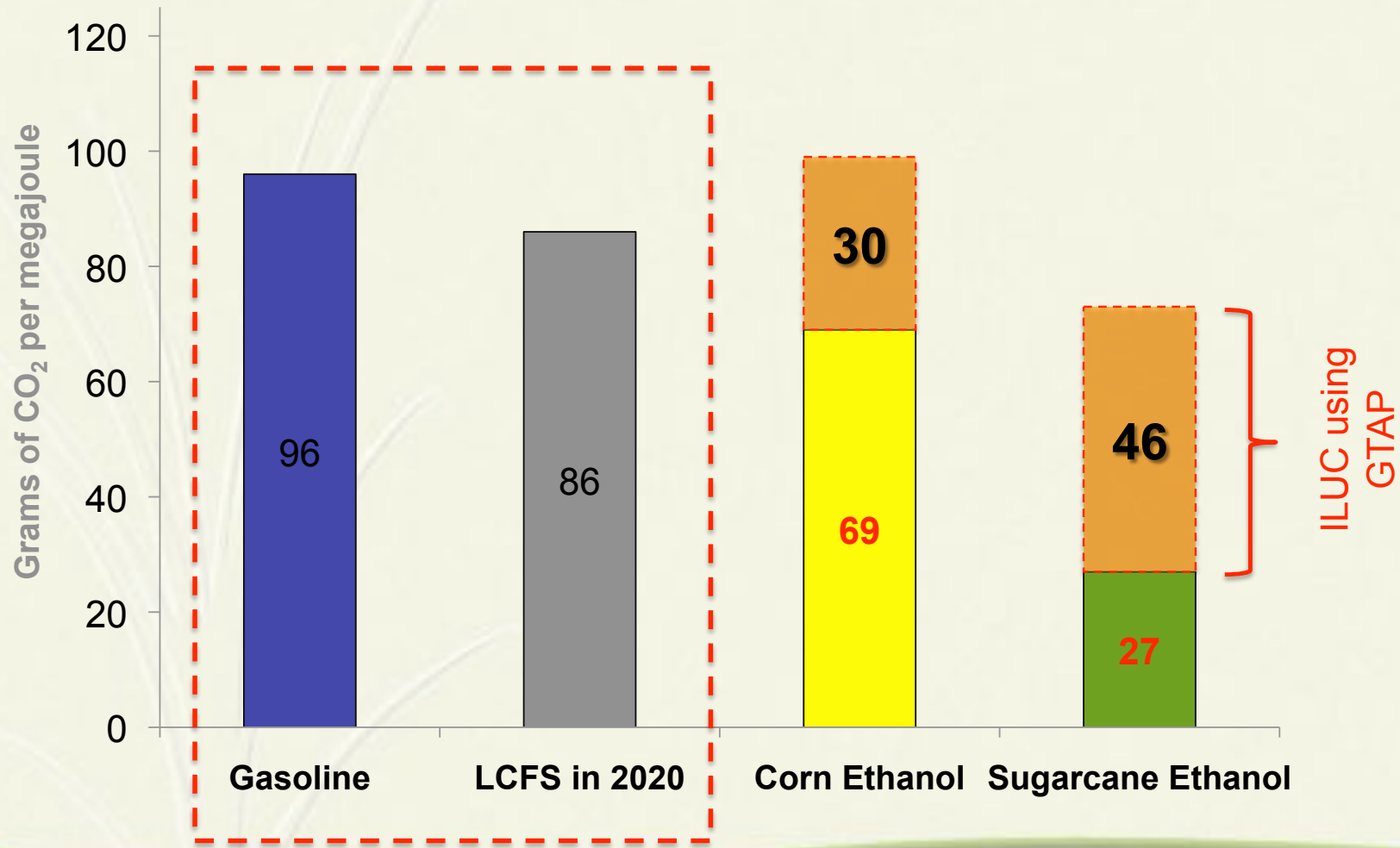
Source: See Figure 2.1-2. "Lifecycle GHG Results Using 100-Year Net Present Value with 2% Discount Rate" in page 282 of Discussion Draft of Environmental Protection Agency (EPA) Regulatory Impact Analysis, May 2009. Range shows net emissions if EPA assumes all land conversion from forest (upper bound) and all from grassland (lower bound).

CALIFORNIA'S LOW CARBON FUELS STANDARD (LCFS)



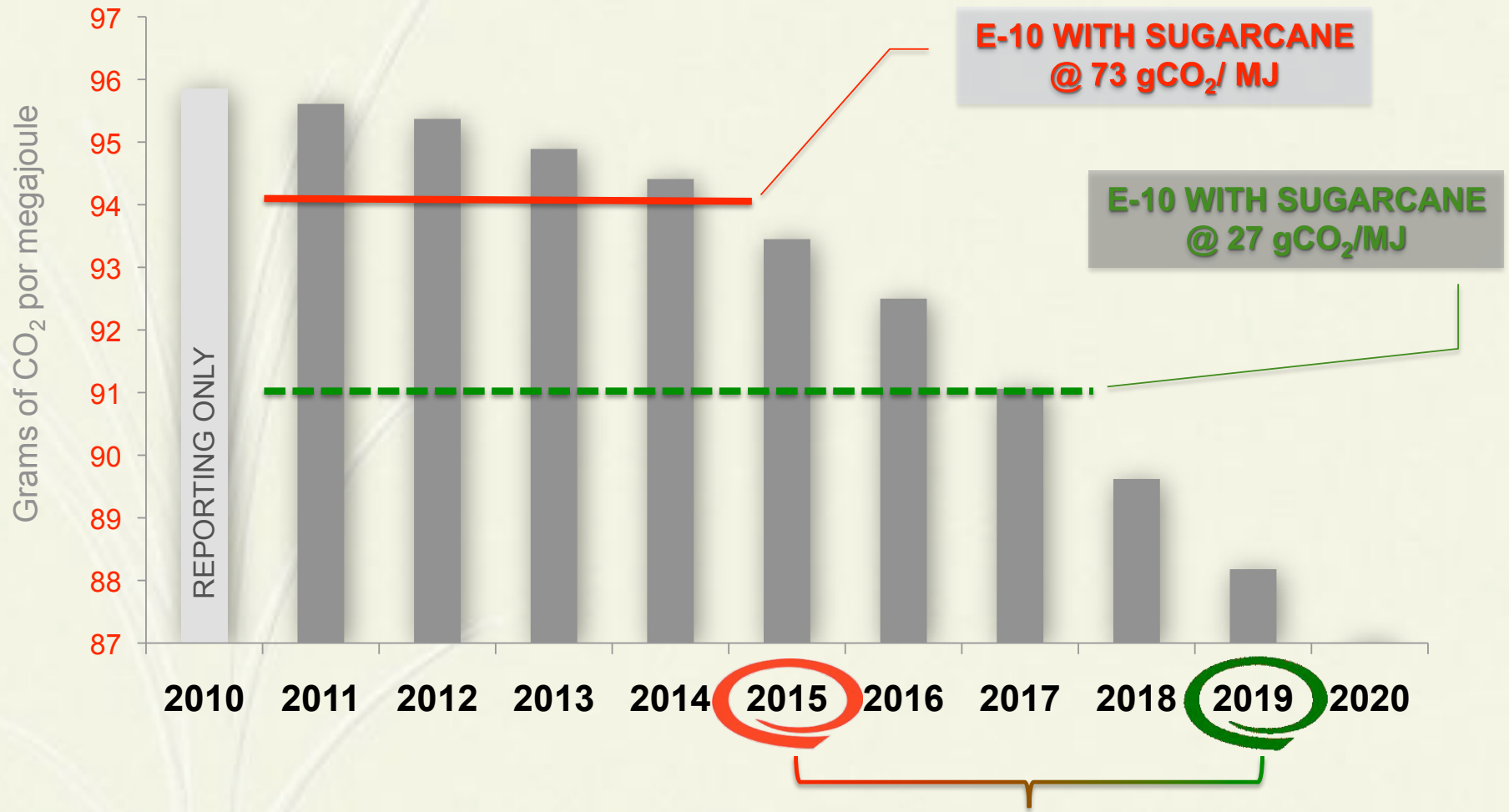
Source: California Air Resources Board's Low Carbon Fuel Standard, March 2009.

LCFS WITH “INDIRECT LAND USE” PENALTY



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

LCFS & SUGARCANE SIMULATION



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

SUGARCANE “INDIRECT LAND USE” EFFECT

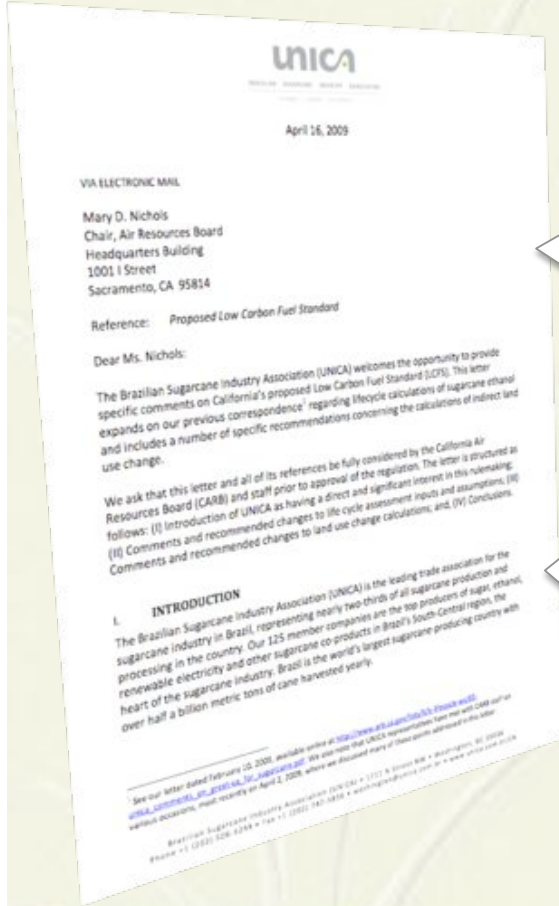



Table 9: GTAP Modeling Results for Sugarcane Ethanol Land Use Change with Alternative Scenarios

1. Shock size	2.5 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	26.66%
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

Table 10: Carbon Intensity Using Land Use Change from Table 9 and Alternative Scenarios for Carbon Uptake

Alternative Scenarios	ILUC carbon intensity (gCO _{2e} /MJ)
1. Departing Scenario (Table 9)	25.3
2. Departing Scenario + Carbon Uptake of Forest Gained (array EMISSCTK) + Carbon Uptake of Crops from GTAP Efs-ef_tables.xls (18Mg CO _{2e} /ha)	12.4
3. Departing Scenario + Carbon Uptake of Forest Gained (array EMISSCTK) + Carbon Uptake of Crops Rest of World from GTAP Efs-ef_tables.xls (18Mg CO _{2e} /ha) + Carbon Uptake for Sugarcane Brazil from Table 8 (244Mg CO _{2e} /ha).	-9.6
4. Departing Scenario + Carbon Uptake Forest Gained (array EMISSCTK) + Carbon Uptake Crops from Table 8 (160Mg CO _{2e} /ha)	-10.7

The background of the slide is a close-up photograph of green leaves, likely from a plant like corn or sorghum, showing their characteristic parallel veins. The lighting is soft, creating a natural, organic feel.

Thank You
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