



Industrial perspective on expansion of ethanol production capacity for export in Brasil

Eduardo Pereira de Carvalho
Campinas – December 1, 2005



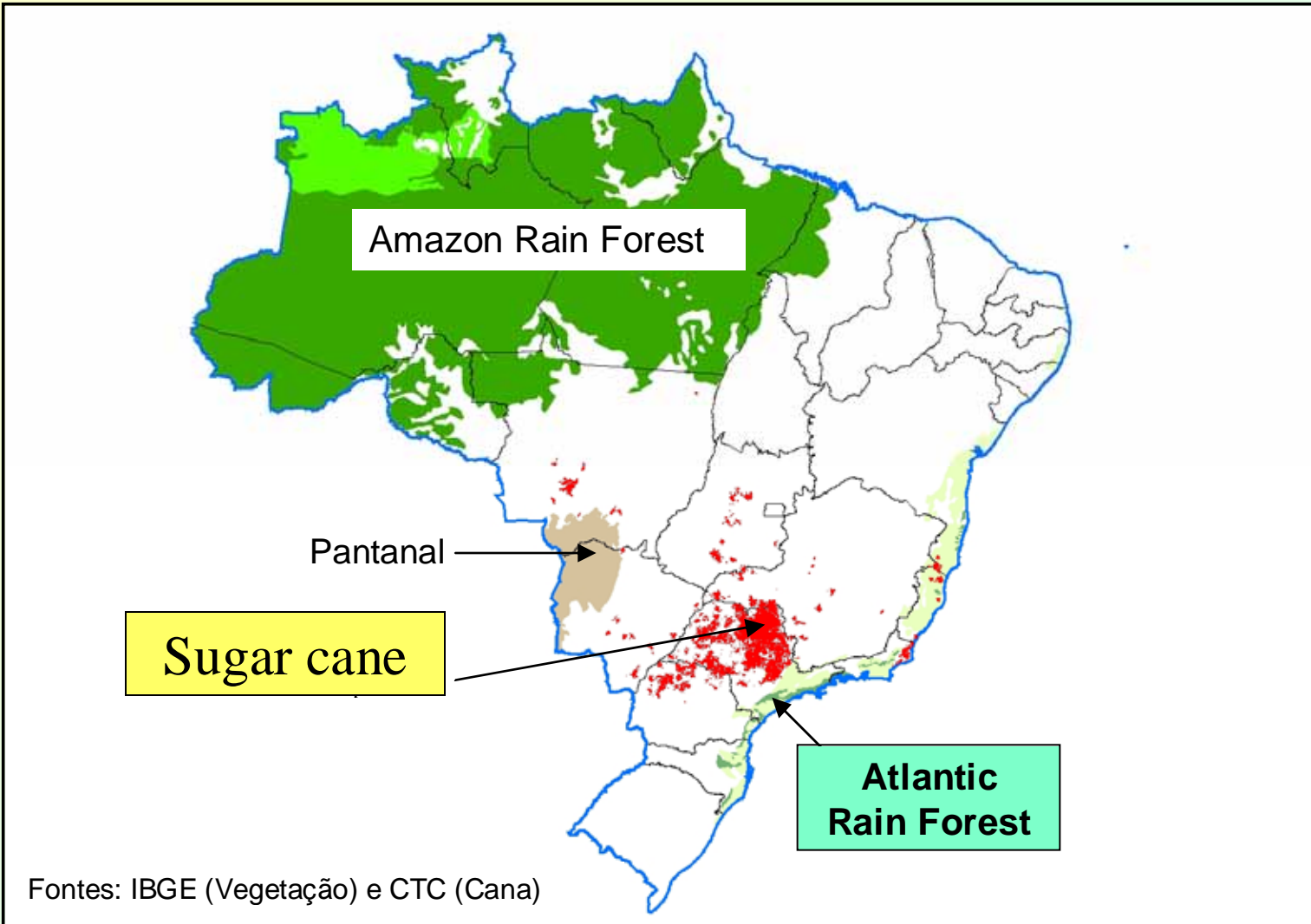
UNICA is the leading Brazilian association of sugar & ethanol producers.

Ethanol-related UNICA's goals:

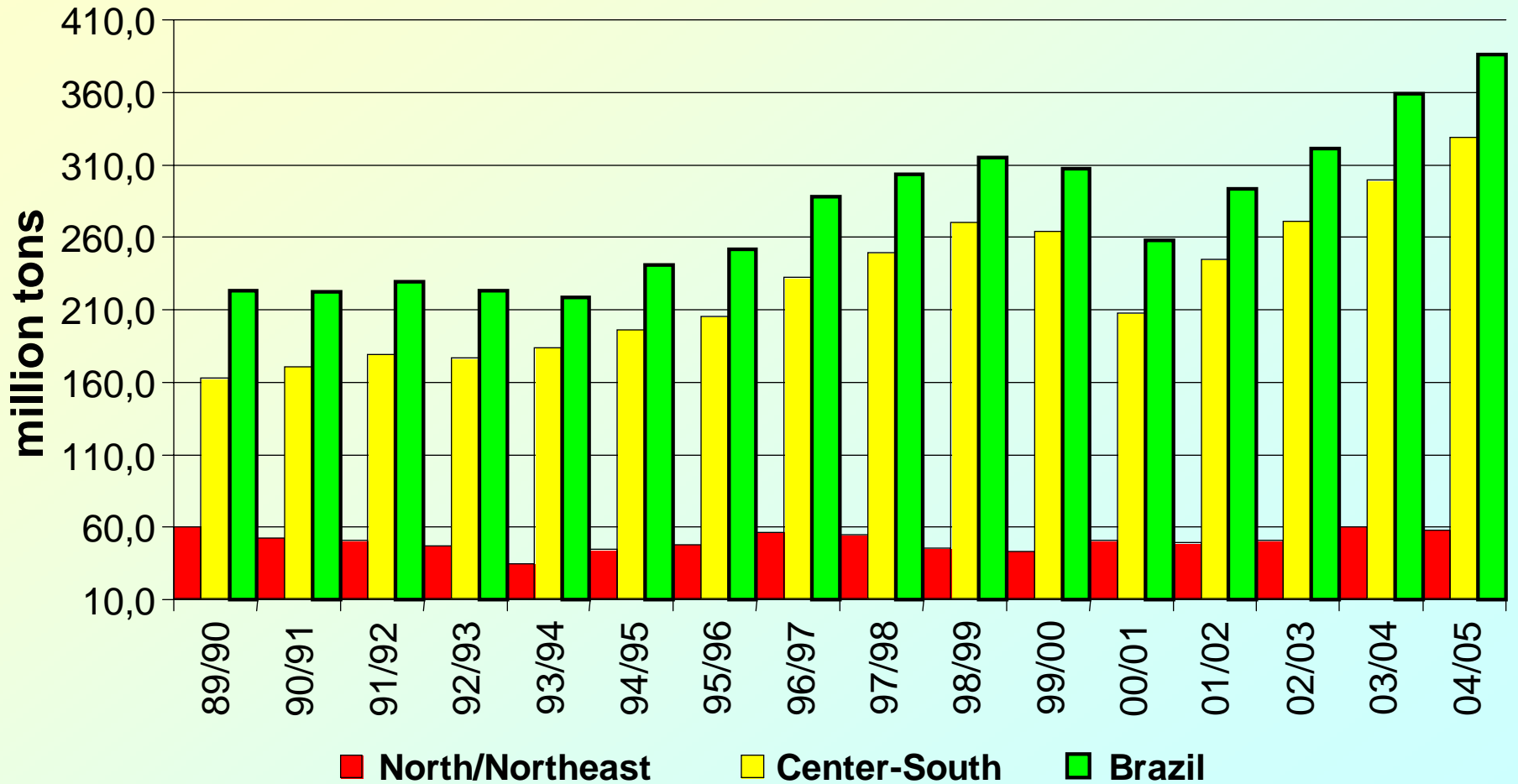
- **ethanol → global energy commodity**
- **structure an international fuel ethanol market**
- **consolidate and expand domestic market**

ETHANOL PRODUCTION, SUPPLY & ECONOMICS

Sugar Cane In the Center – South Region



BRAZIL: Sugar Cane Production

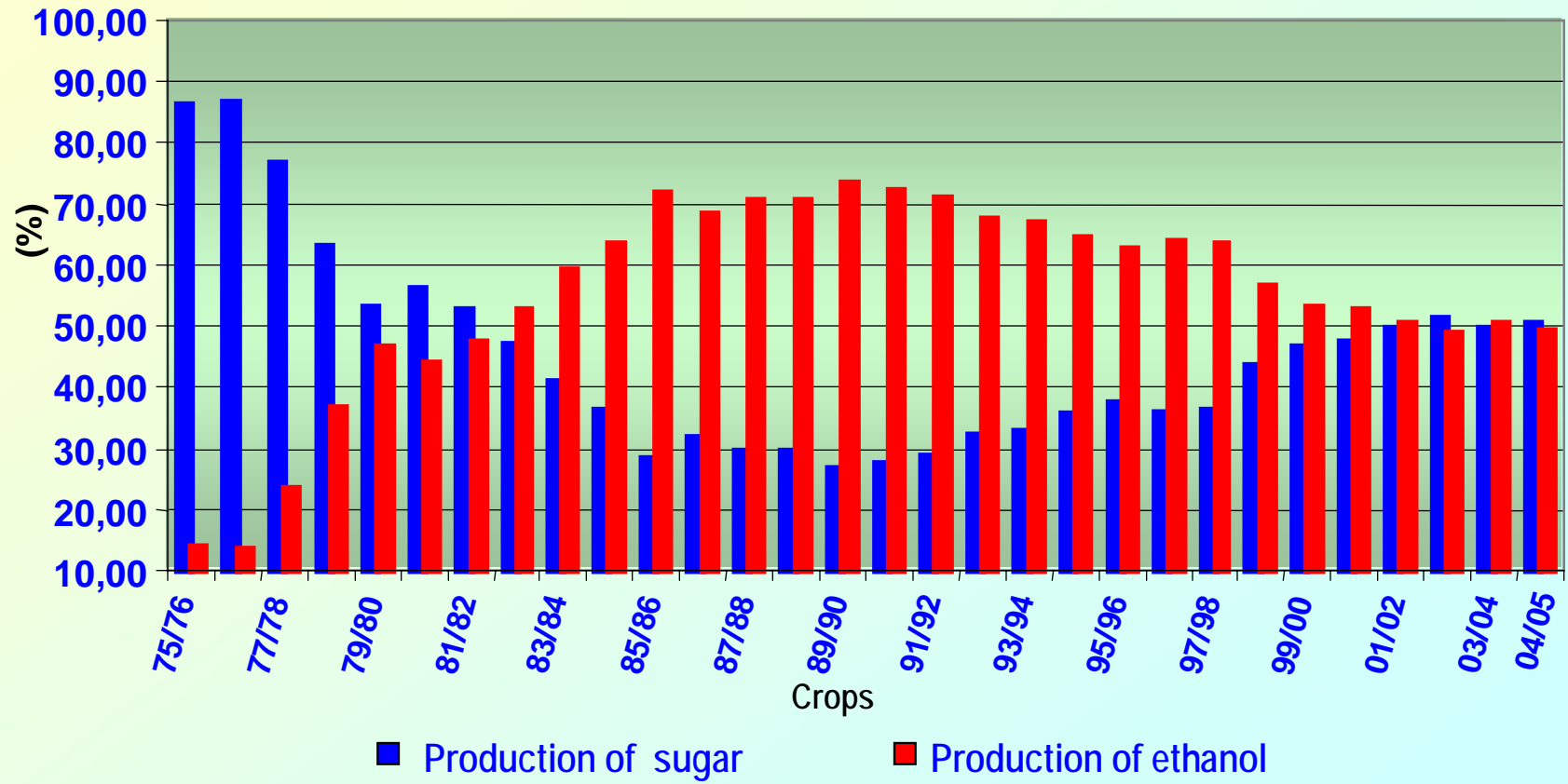


Brazil Has Land To Expand Production



	Million hectares
Brazil	850.0
Total arable land	320.0
Cultivated land:	
all crops	60.40
Sugar cane	5.4
Sugar cane for ethanol	2.7
Available land with potential for agriculture expansion	90.0
Each additional million kl of ethanol requires:	0.15

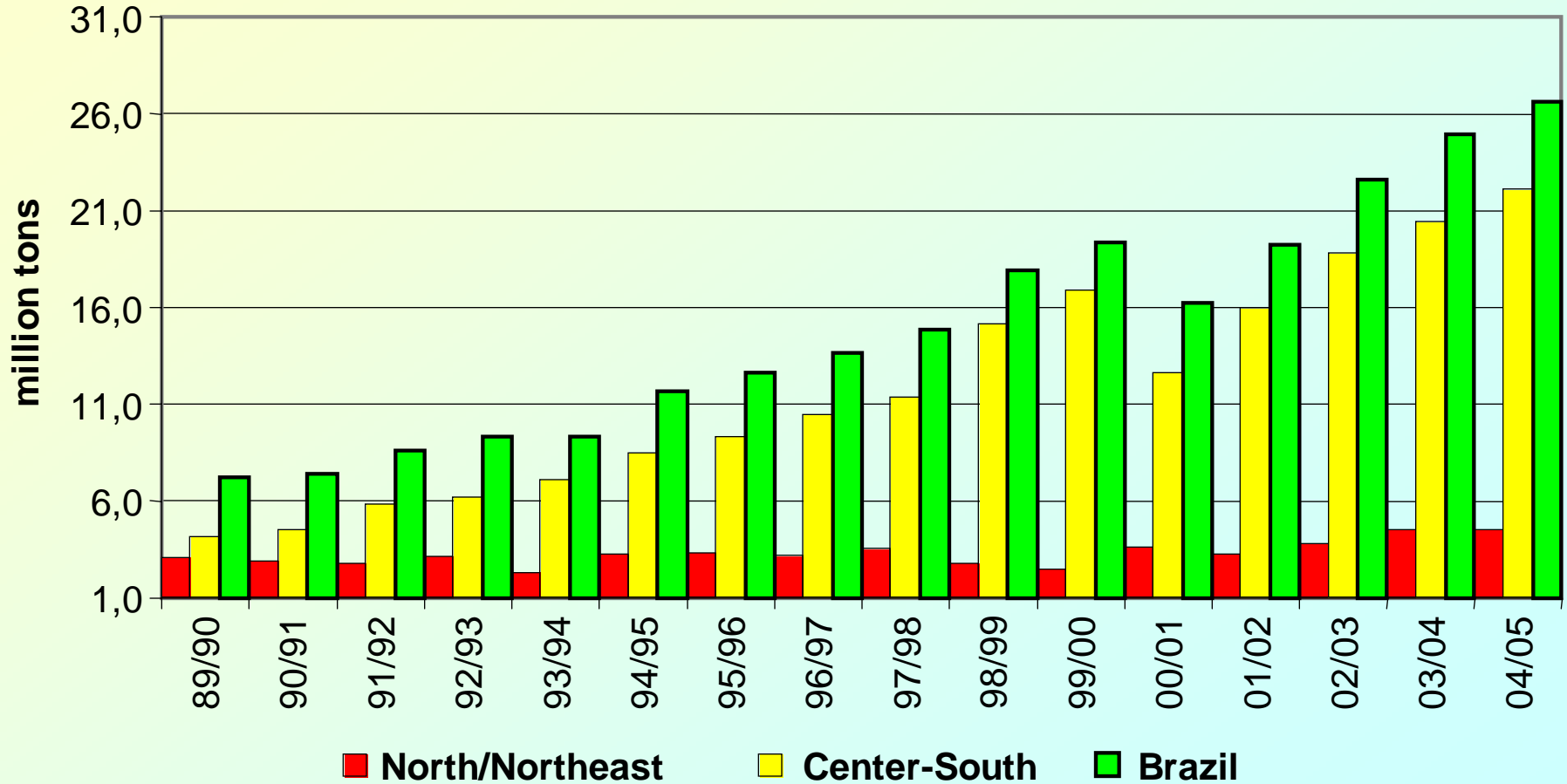
Brazil: Raw Cane for Sugar and Ethanol



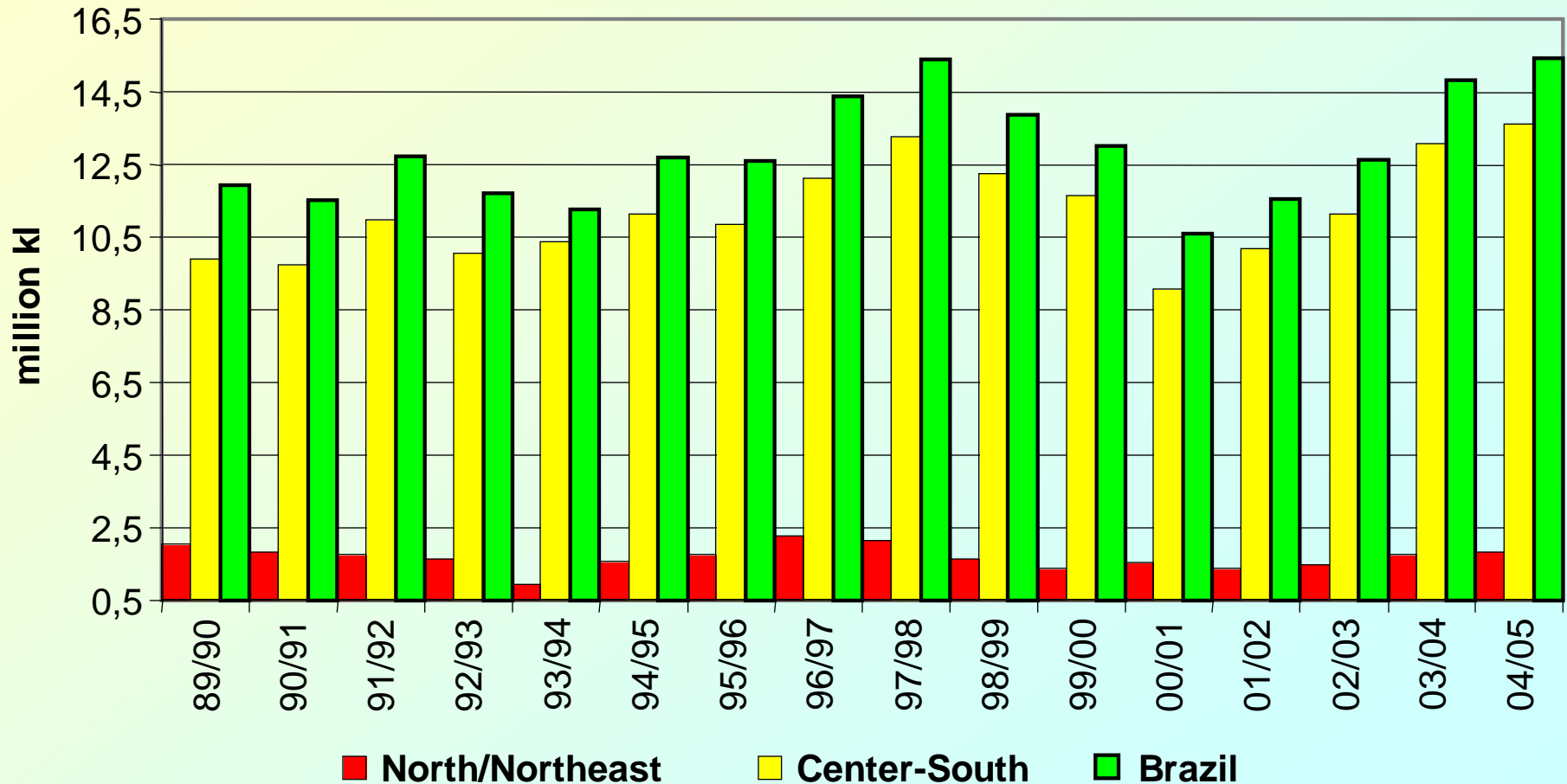
Sugar & Ethanol Plant in Brazil



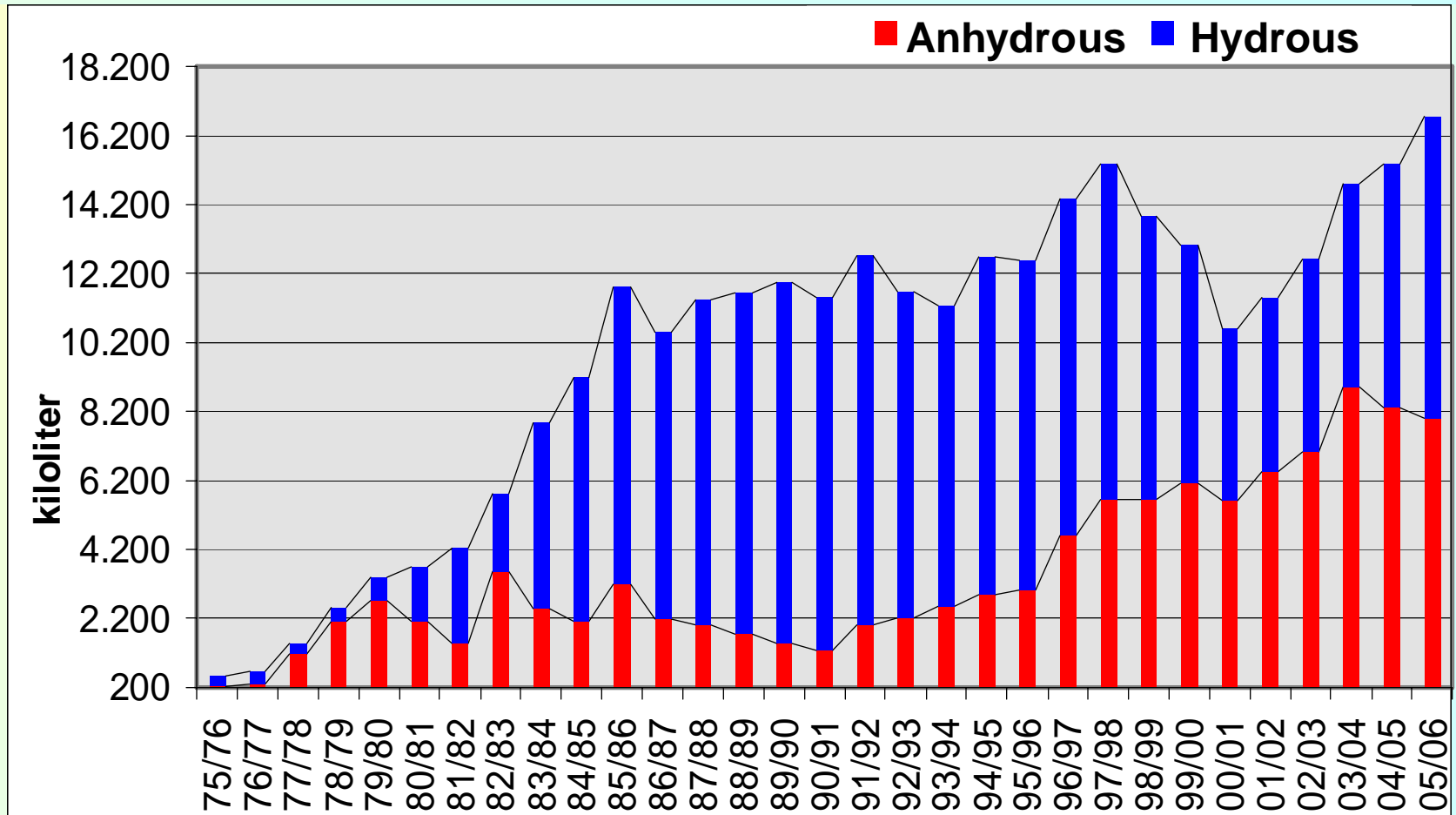
Brazil: Sugar Production



Brazil: Ethanol Production



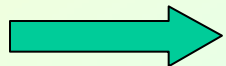
BRAZIL: Etanol Production by Type



Note: Projected values for crop season 05/06

What is the Value of Ethanol ?

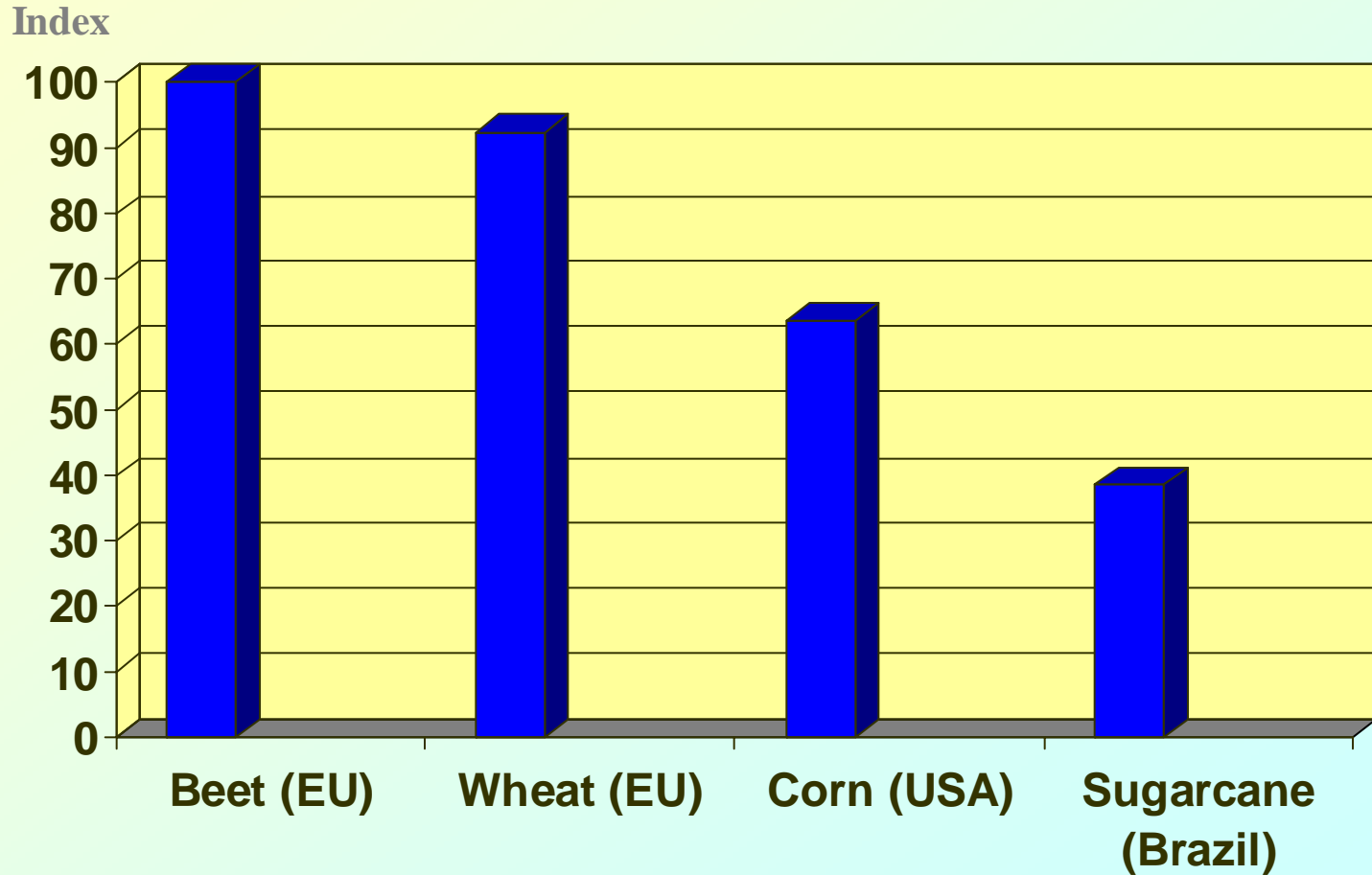
- Octane booster
- Fuel extender
- Fuel substitute
- Renewable source of energy
- Low carbon fuel
- low pollution fuel
- inducer of social development in rural areas



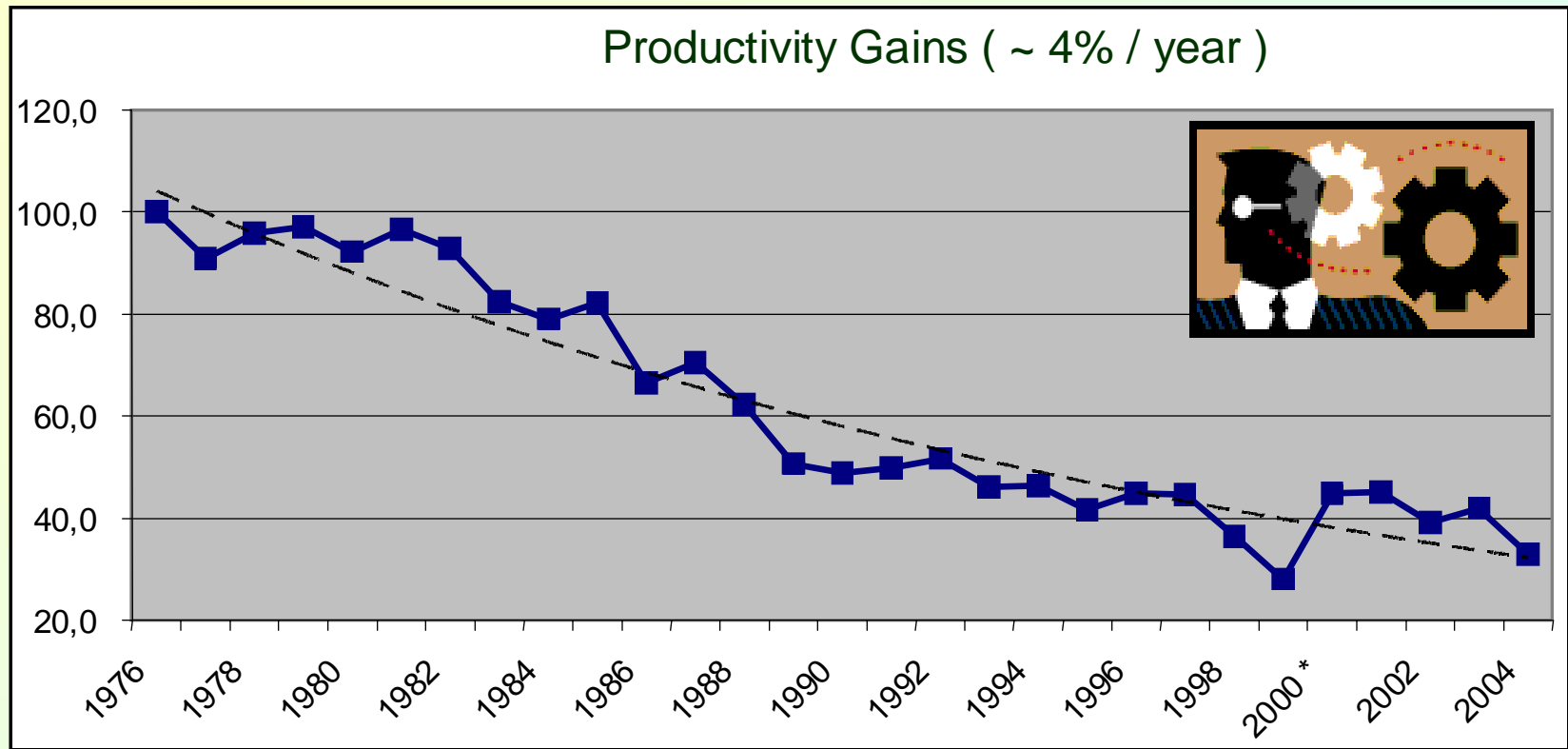
In Line with Kyoto & Sustainable Development

Cost of the product is just one aspect to be considered

Relative Ethanol Production Cost



Ethanol Prices' Learning Curve



DEFLATED BY IGP-DI - prices of December 2004
 - producers' prices excluding taxes
 - 1976 = basis 100
 (*) - oversupply

Source: UNICA

2010/2011 Demand Forecast

- Domestic Ethanol Market: 22,1 million kl
- **Export: 5,2 million kl**
- Domestic Sugar Market: 11 million t
- Export Sugar Market: 24,0 million t

- **Scenario 2010/2011: 560 million t of sugar cane**

New Plants

- **Announced: 51**
- **On stream : 41**
- **Sugar Cane: 70 million t**

Crop	million t	Nº Plants
2006/2007	8,0	12
2007/2008	18,0	25
2008/2009	16,0	4
2009/2010	13,0	0
2010/2011	11,0	0
2011/2012	6,0	0

(States of Center- South: SP, GO, MG, MS and PR)

Expansion & Productivity



- **Expansion of existing plants with milling capacities less than 1 million t/year are expected to raise sugar cane availability in the order of 35 – 40 million t in the next 5 years.**
- **Productivity gains are expected to result in additional 10 million t of sugar cane in the next 5 years.**

Ethanol Export - 2004

Brazil has been supplying ethanol regularly to Japan and other countries

Country	US\$ FOB	Liters
India	92.963.522	478.591.473
USA	80.438.169	424.574.585
South Korea	56.013.401	278.417.355
Japan	44.353.514	223.182.755
Sweden	46.215.310	193.383.978
Netherlands	36.394.414	166.886.803
Jamaica	27.229.014	134.401.155
Costa Rica	23.249.239	116.713.911
Nigeria	23.825.115	108.005.440
Mexico	18.357.307	89.249.230
Singapore	6.034.553	29.595.131
El Salvador	5.923.209	28.862.884
Canada	6.941.216	26.333.526
Turkey	5.757.866	22.949.610
Switzerland	6.185.795	22.400.594
Finland	3.008.988	12.304.266
Ghana	2.128.878	7.770.640
Trinidad & Tobago	1.825.250	7.083.166
France	1.518.048	7.035.218
Angola	2.155.126	5.789.223
Puerto Rico	1.483.979	5.190.729
Belgium	866.090	3.624.569
Chile	796.301	3.131.113
Venezuela	1.157.902	2.874.015
Panama	591.412	2.640.538
Philippines	542.033	2.021.333
Norway	326.639	1.370.670
Paraguay	195.142	979.726
Sierra Leone	373.637	802.756
Togo	194.316	374.973
Spain	154.354	371.001
Cameroon	124.845	317.675
Uruguay	66.115	296.038
South Africa	95.527	241.753
Argentina	88.502	185.745
Gambia	88.627	166.673
Dominican Republic	36.753	93.065
Senegal	29.238	48.943
Honduras	7.871	25.000
Bolivia	2.840	4.406
China	112	208
Colombia	41	125
Portugal	16	19

TOTAL

497.740.226

2.408.292.010

Source: SECEX/CAMEX



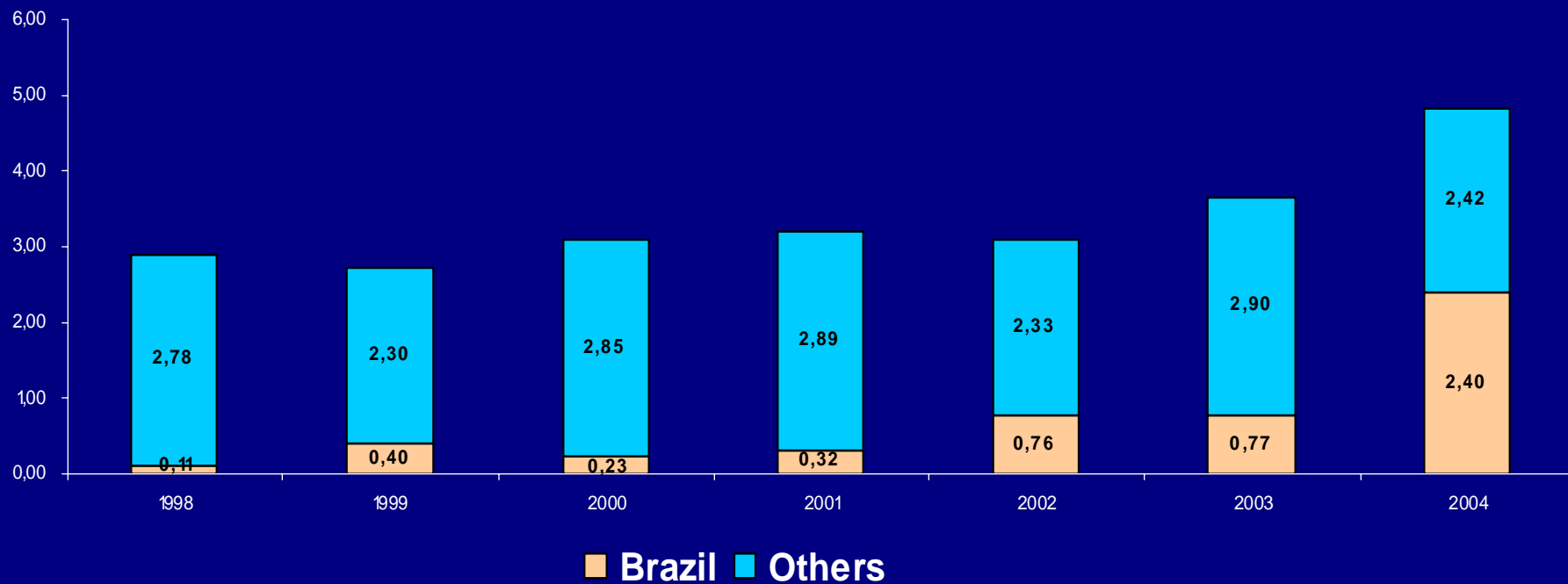
Ethanol Traded Worldwide



ALL TYPES OF ETHANOL

World Ethanol Exports

million kl



Source: F.O. Licht

ENVIRONMENT

Greenhouse Effect Mitigation



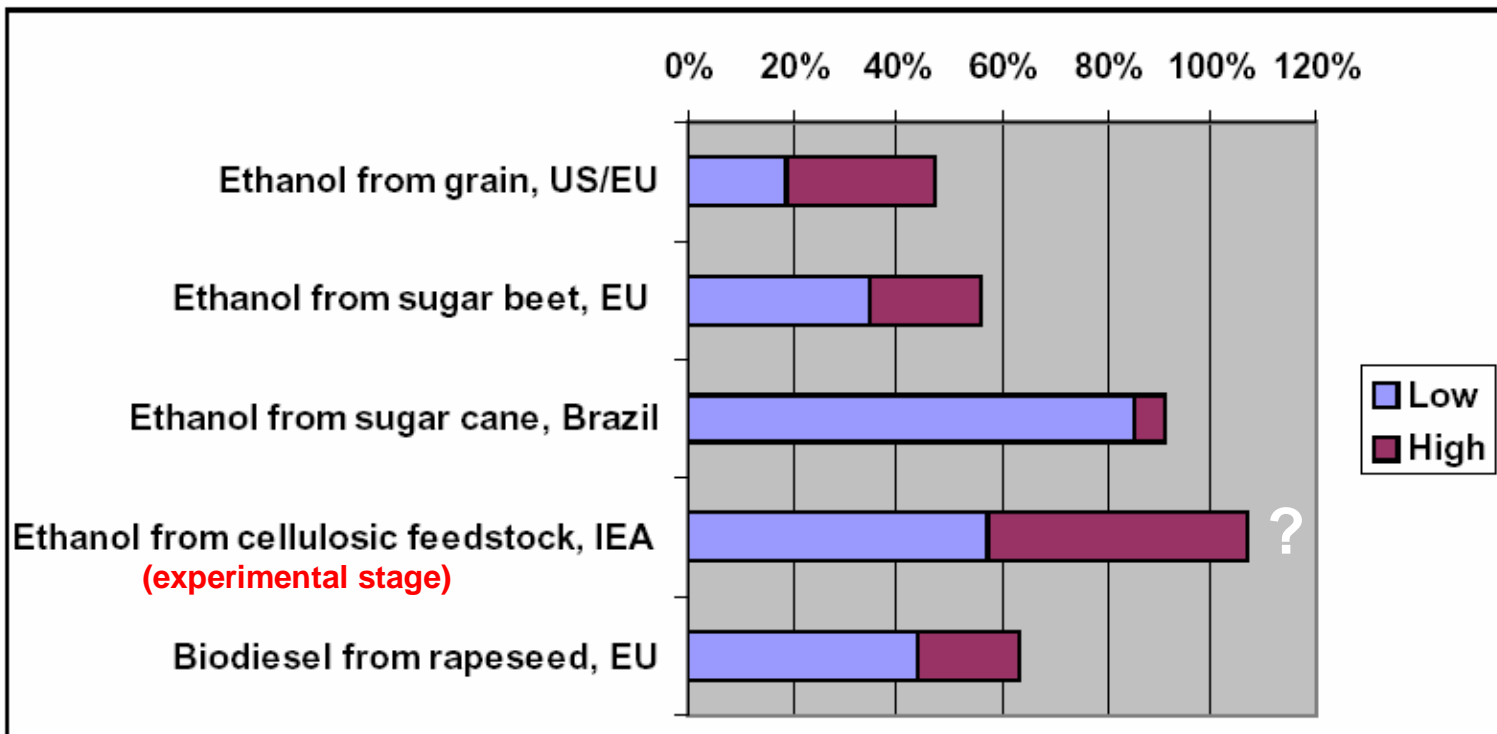
Avoided GHG emissions in 2003 by the Brazilian sugar cane industry are of *the same magnitude as those emitted by Norway:*

- ethanol substituting for gasoline: 27,5 M t CO₂ eq
- bagasse in sugar production: 5,7 M t CO₂ eq.

Each additional 100 million t cane will avoid 12,6 million t CO₂ eq. (ethanol, bagasse and surplus electricity)

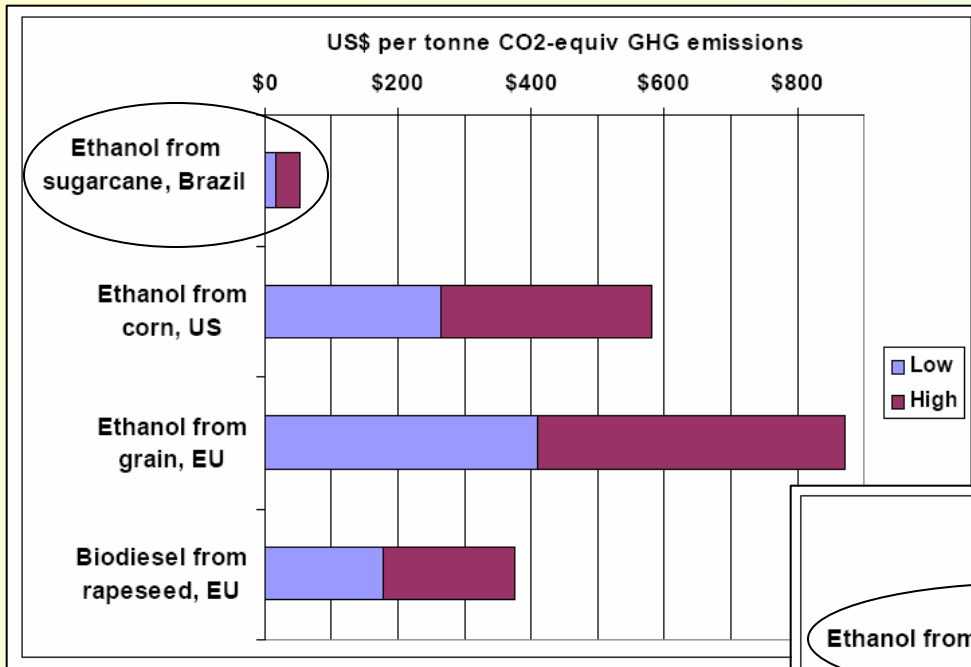
GHG Reductions Significant, but Vary by Feedstock and Technology

Reductions in well-to-wheel CO₂-equivalent GHG emissions per km, from biofuels, compared to gasoline (for ethanol) and diesel fuel (for biodiesel)



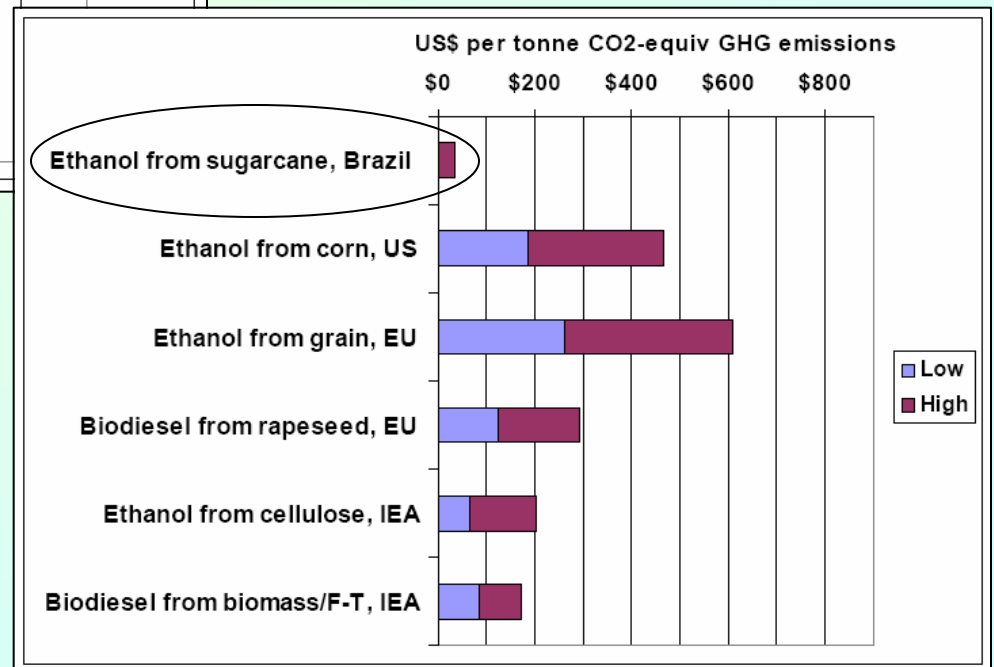
Source: IEA estimates based on a review of recent studies

Cost per Ton of CO2 Reduction



2002

Post - 2010



Ethanol Plants Produce Thermal & Electric Energy



bagasse

Sugar & Ethanol plants produce their own thermal & electric energy using bagasse as a fuel in co-generation systems and sell excess electricity to the public grid (presently ~ 600 MW)



**Ethanol from
Bagasse**



electricity

NO₂ Ambient Concentrations in California (ppm)



Year	Monitoring sites – San Diego Air Basin		
	Overland Ave.	Chula Vista	Escondido-E. Valley Parkway
1999	0.023	0.019	0.023
2000	0.021	0.017	0.021
2001	0.019	0.017	0.020
2002	0.019	0.018	0.021
2003	0.018	0.018	0.020
2004	0.017	0.016	0.018

Year	Monitoring sites – South Coast Air Basin		
	Azusa.	Pasadena – S. Wilson St	Riverside - Rubidoux
1999	0.039	0.037	0.025
2000	0.036	0.029	0.022
2001	0.033	0.034	0.024
2002	0.033	0.033	0.023
2003	0.029	0.032	0.021
2004	0.020	0.027	0.017

Source: California Air Resources Board, Annual Average concentrations, Annual Std: 0.053 ppm (100 µg/m³)

NO₂ Ambient Concentrations in California (ppm)



Year	Monitoring sites – San Joaquin Valley Air Basin		
	Modesto – 14th St	Edison	Fresno – Drumond St
1999	0.022	0.013	0.024
2000	0.019	0.013	0.020
2001	0.018	0.013	0.020
2002	0.017	0.014	0.020
2003	0.017	0.013	0.020
2004	0.015	0.013	0.018

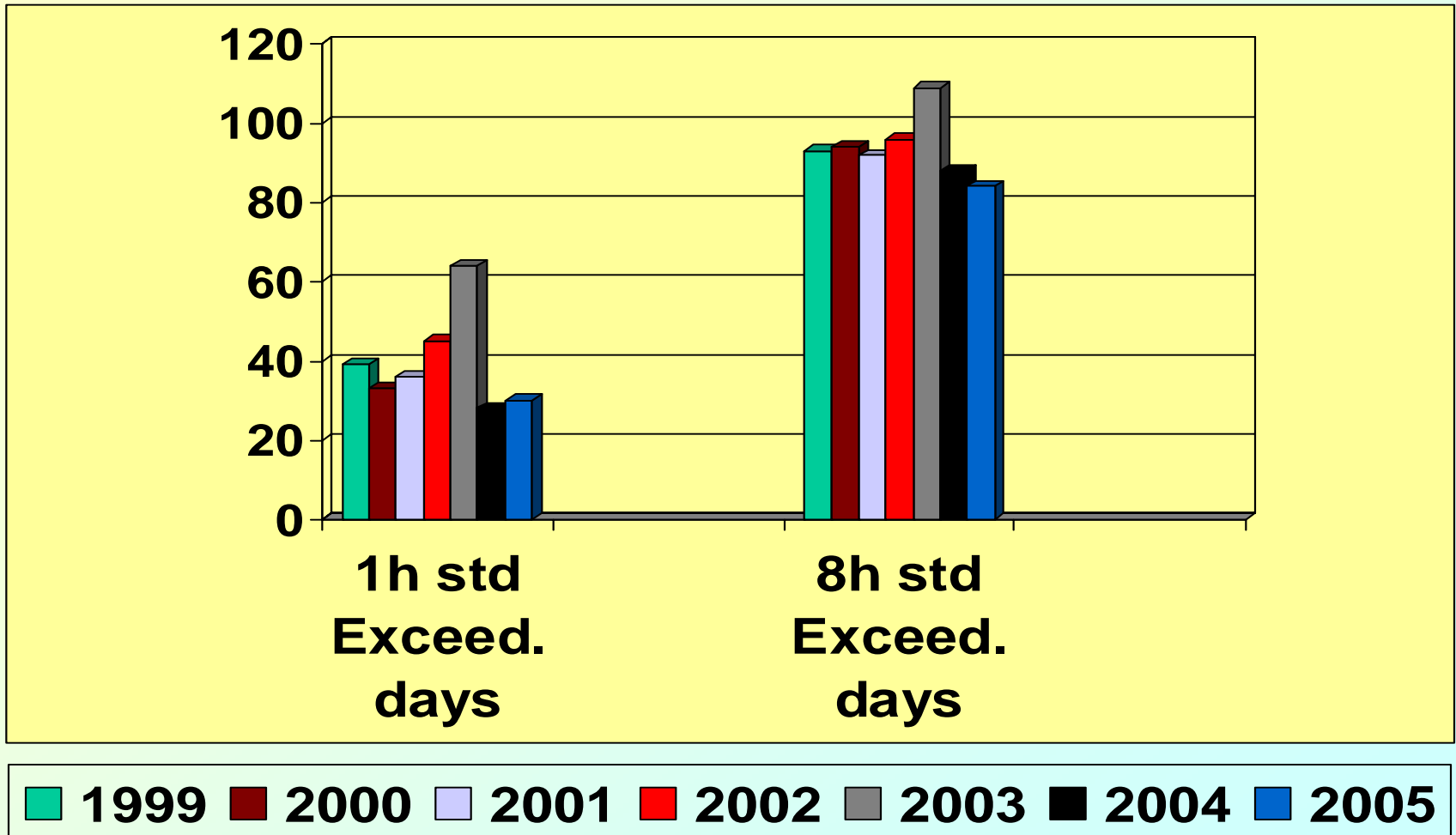
Ethanol content in California’s gasoline is 5.7% and ambient NO₂ did not increase. Actually it has been decreasing...

Source: California Air Resources Board, Annual Average concentrations, Annual Std: 0.053 ppm (100 µg/m³)

Ozone Std Exceedance Days in California



South Coast Air Basin

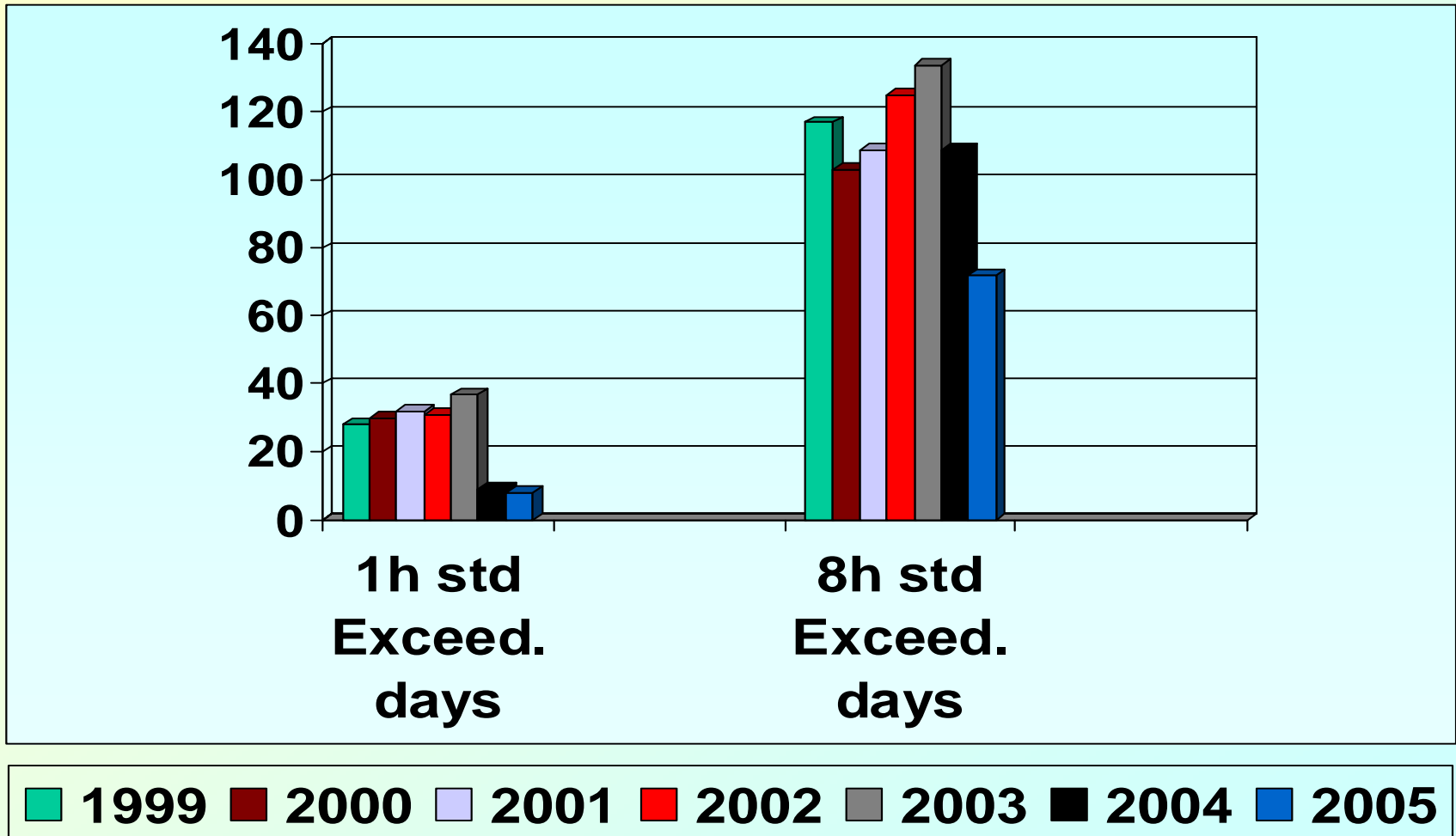


Source: CARB (1h std: 0.12 ppm/ 235 $\mu\text{g}/\text{m}^3$ 8h std: 0.08 ppm/ 157 $\mu\text{g}/\text{m}^3$)

Ozone Std Exceedance Days in California



San Joaquin Valley Air Basin

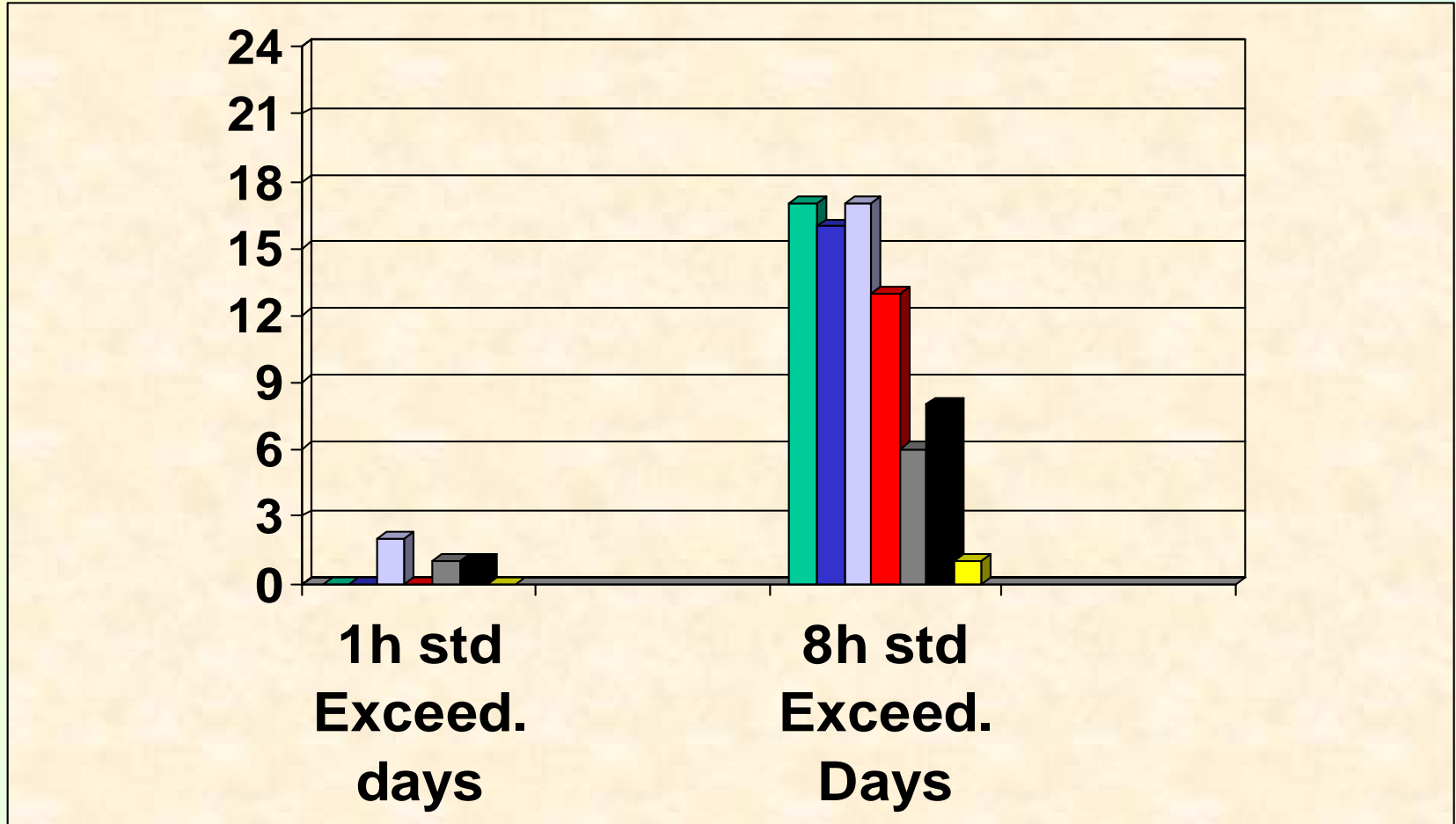


Source: CARB (1h std: 0.12 ppm/ 235 $\mu\text{g}/\text{m}^3$ 8h std: 0.08 ppm/ 157 $\mu\text{g}/\text{m}^3$)

Ozone Std Exceedance in California



San Diego Air Basin

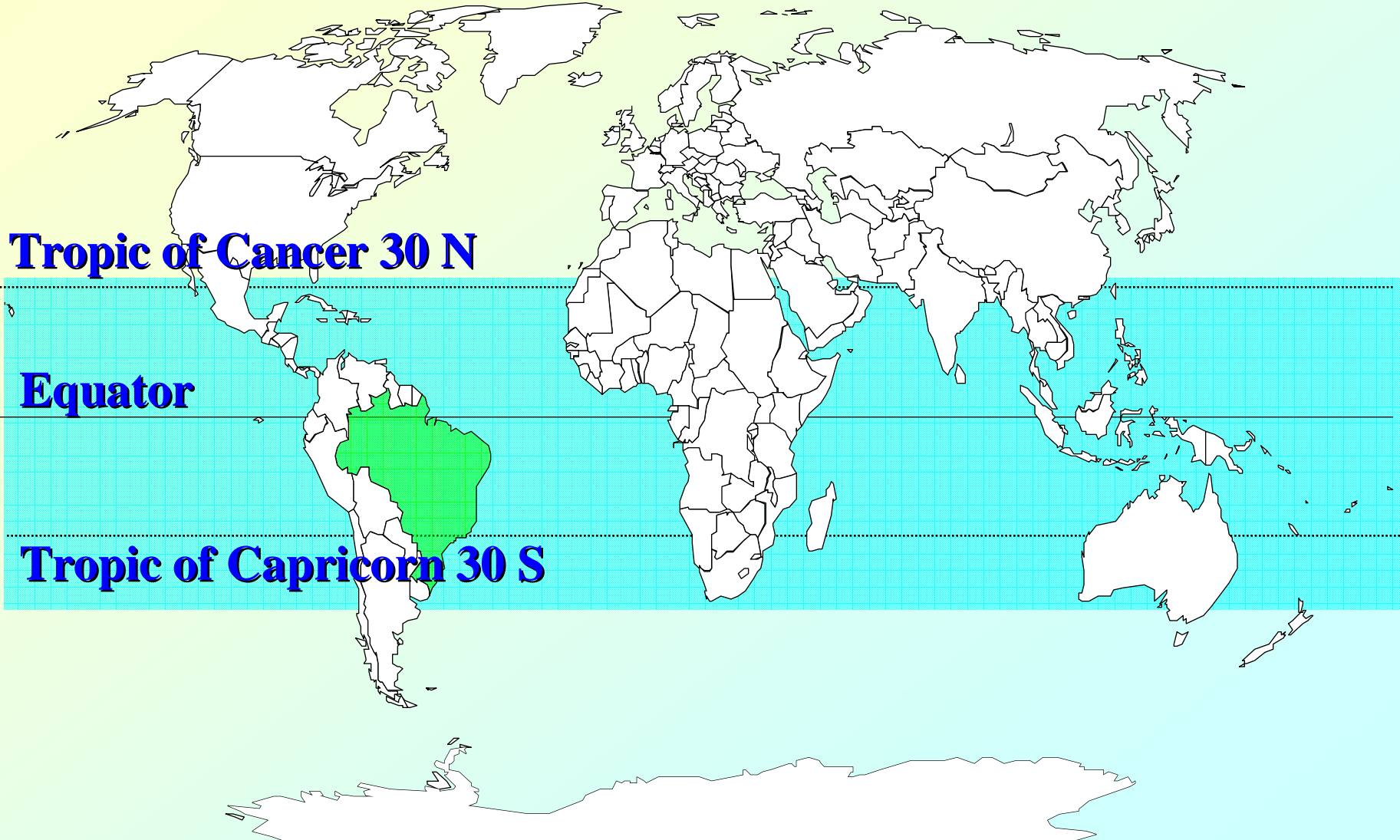


1999 2000 2001 2002 2003 2004 2005

Source: CARB (1h std: 0.12 ppm/ 235 $\mu\text{g}/\text{m}^3$ 8h std: 0.08 ppm/ 157 $\mu\text{g}/\text{m}^3$)

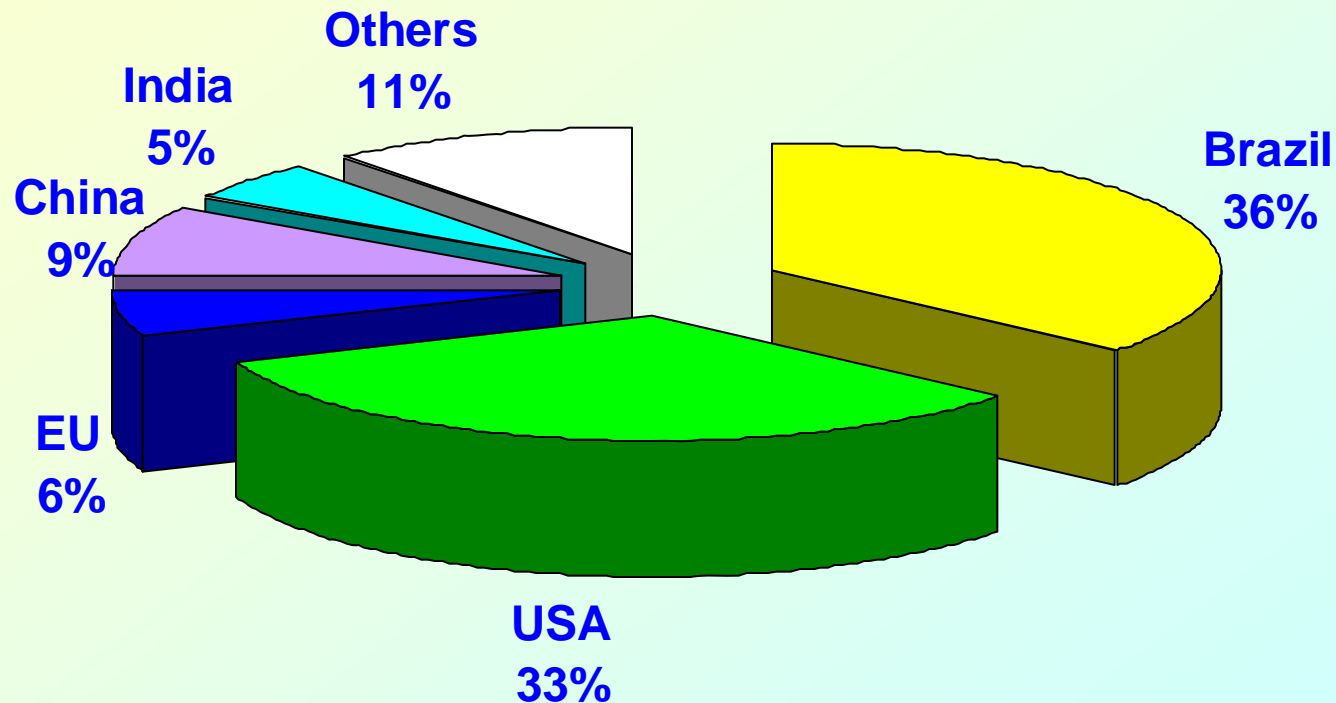
INTERNATIONAL SCENARIO

Approximately 100 Countries Grow Sugar Cane



Ethanol World Production

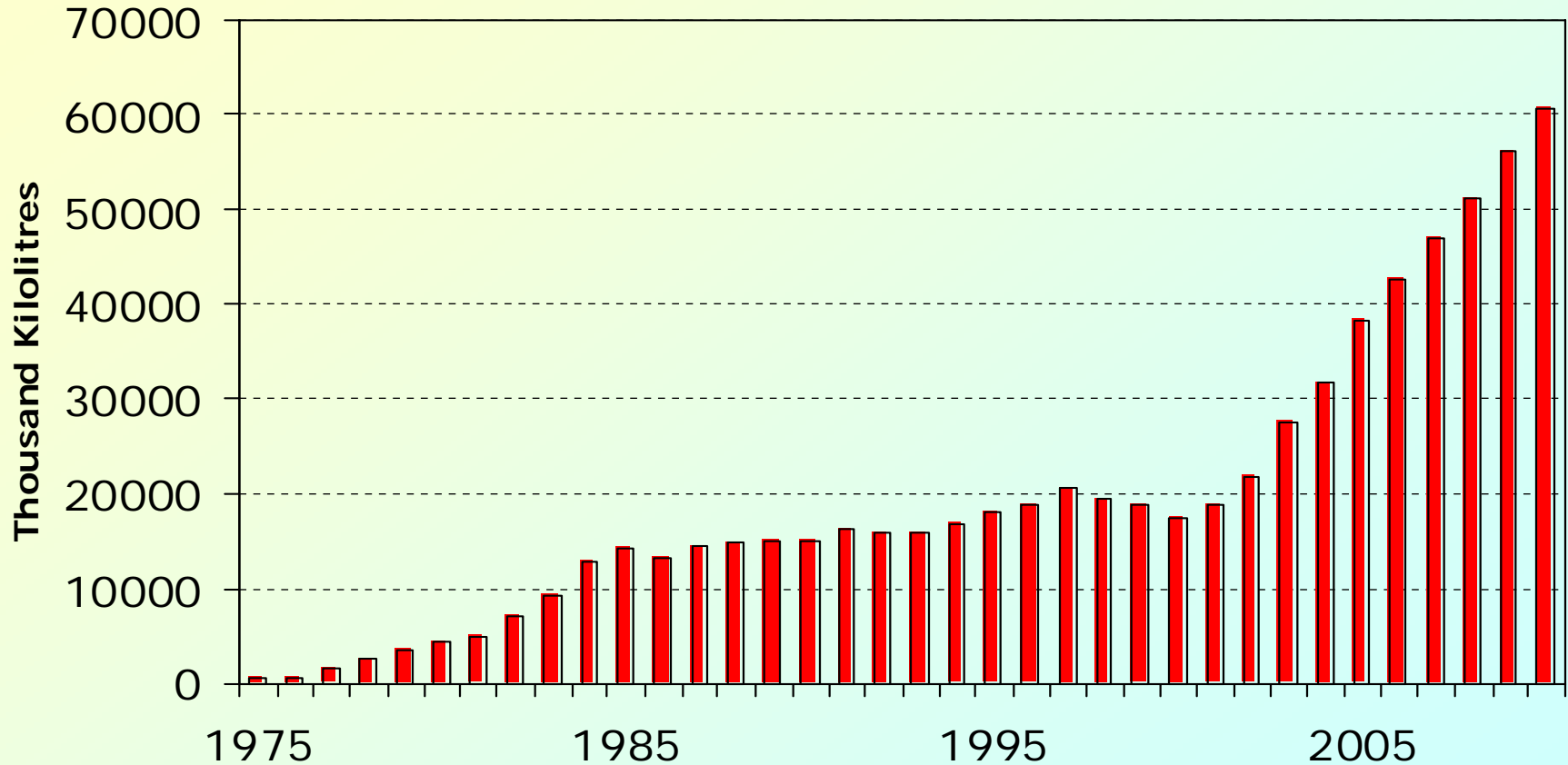
42.2 billion liters (2004)



Fonte: FO Licht

Includes all types of Ethanol: potable, synthetic, from biomass, of different values qualities and end usage;

World Fuel Ethanol Production



Source: F.O.Licht

Ethanol from cellulose will add significant volumes

Brazil's Contribution to New Fuel Ethanol Programs

- China
- India
- Thailand
- Australia
- Colombia
- Peru
- Paraguay
- Bolivia
- Guatemala
- Dominican Republic, African countries etc



technology,
know-how,
supply,
partnership

World Biofuels 2015



Key Issues



- **Sugar cane is considered a low risk crop due to development & application of advanced techniques**
- **Industrial technology is also well advanced**
- **Production: ~ 200 days/year**
- **Brazil has been a reliable supplier of both sugar & ethanol as well as other commodities**
- **Investments are being made and production is increasing**
- **Production of ethanol from cellulose feedstocks will increase yield/hectare**
- **Ethanol → domestic production & decentralized suppliers**

Thank You

www.unica.com.br