

*Saint Louis, MO
June 26-29, 2007*

BRAZIL

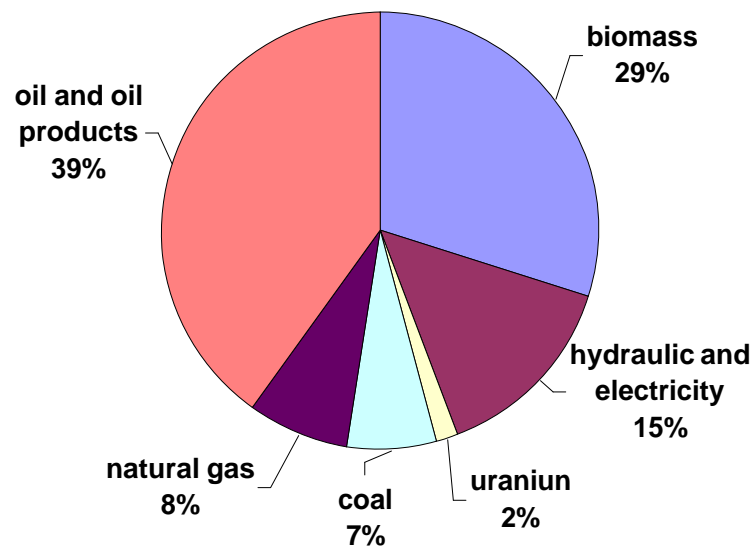
*Sergio C. Trindade
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INTERNATIONAL

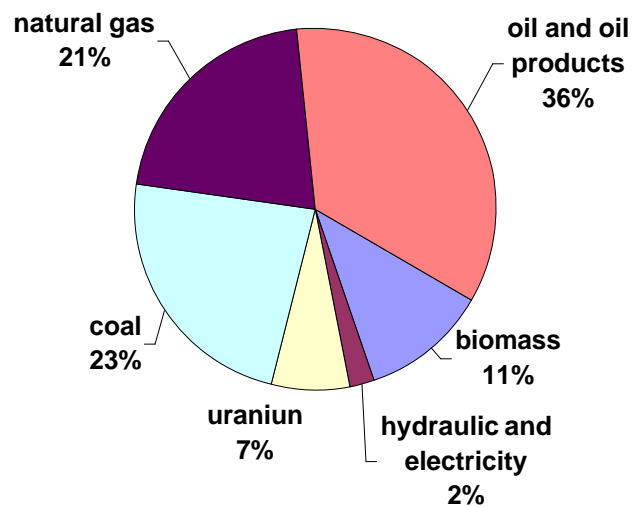
FEW

2007 FUEL ETHANOL
WORKSHOP & EXPO

BRAZILIAN ENERGY MIX



WORLD ENERGY MIX



Fonte: MME/BEN (2005)

Brazil Bioethanol Policy History

- *Sugar cane based ethanol:
displaces 40% gasoline + oil
self-sufficiency (2006)*
- *State of São Paulo initially driving
supply and demand*
- *Up to 1975: Ethanol blending
when convenient*

Brazil Bioethanol Policy History

- *1975: Proalcool*
- *1980s: Neat ethanol introduced*
- *1990s: Moderate oil prices, ethanol set backs, ethanol imports, removal of all incentives, except blend mandate*
- *2000s: Ethanol competitive, expansion, exports, biodiesel, Brazilian FFVs, World trade promotion, NYBoT futures/options*

Brazilian Sugar Cane Industry: Key Stakeholders

Agriculture

- 50 thousand sugar cane growers



Sugar and Ethanol Making

- 400+ mills/distilleries

20 million ethanol m³/yr

Ethanol transportation, storage, distribution and end-use

Gasoline Retail Stations

- 32,000+ Gas Stations sell neat ethanol (92% of the total)
- Free market prices

Exports

- 3.4 Billion liters exported in 2006



Brazilian FFVs



Fuel Distributors

- 160 Operating Distributors
- Only distributors may blend ethanol with gasoline

Biofuels Reality: Fuel Ethanol Costs and Prices of Gasoline, 2004

(Euros per energy-equivalent liter)

	<i>Ethanol</i>	<i>Gasoline</i> <i>(with tax) (w/o tax)</i>	
<i>United States</i>	<i>0.36(corn)</i>	<i>0.45</i>	<i>0.32</i>
<i>Euro Union</i>	<i>0.70(wheat)</i>	<i>1.09</i>	<i>0.34</i>
<i>Brazil</i>	<i>0.27(sugar cane)</i>	<i>0.69</i>	<i>0.33</i>

Note: Bioethanol prices are adjusted for the difference in energy content per liter of ethanol (0.67 the energy of gasoline)

Adapted from: Worldwatch Institute (2006). Biofuels for Transportation, Washington, DC, June.



Necessary Modifications

(Otto Engines)

Ethanol Content in the Fuel	Carburetor	Fuel Injection	Fuel Pump	Fuel Pressure Device	Fuel Filter	Ignition System	Evaporative System	Fuel Tank	Catalytic Converter	Basic Engine	Motor Oil	Intake Manifold	Exhaust System	Cold Start System
= 5%	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary
5 ~ 10%	Probably Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary
10 ~ 25%	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary	Not Necessary
25 ~ 85%	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Not Necessary
= 85%	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary	Probably Necessary

 - Not Necessary

 - Probably Necessary

FLEX FUEL VEHICLES

- *Flex Fuel Vehicles can run on gasoline or on NEAT ethanol or on any blend of neat ethanol & gasoline*
- *Today over 2,000,000 units sold (operating mostly on NEAT ethanol)*
- *Market share FFV on total new light vehicles sales in the domestic market : 85%*
- *Ethanol is more attractive than gasoline (price 30% lower) in 90% of the Brazilian fuel market.*



NEW MARKETS FOR ETHANOL

AVIATION FUEL

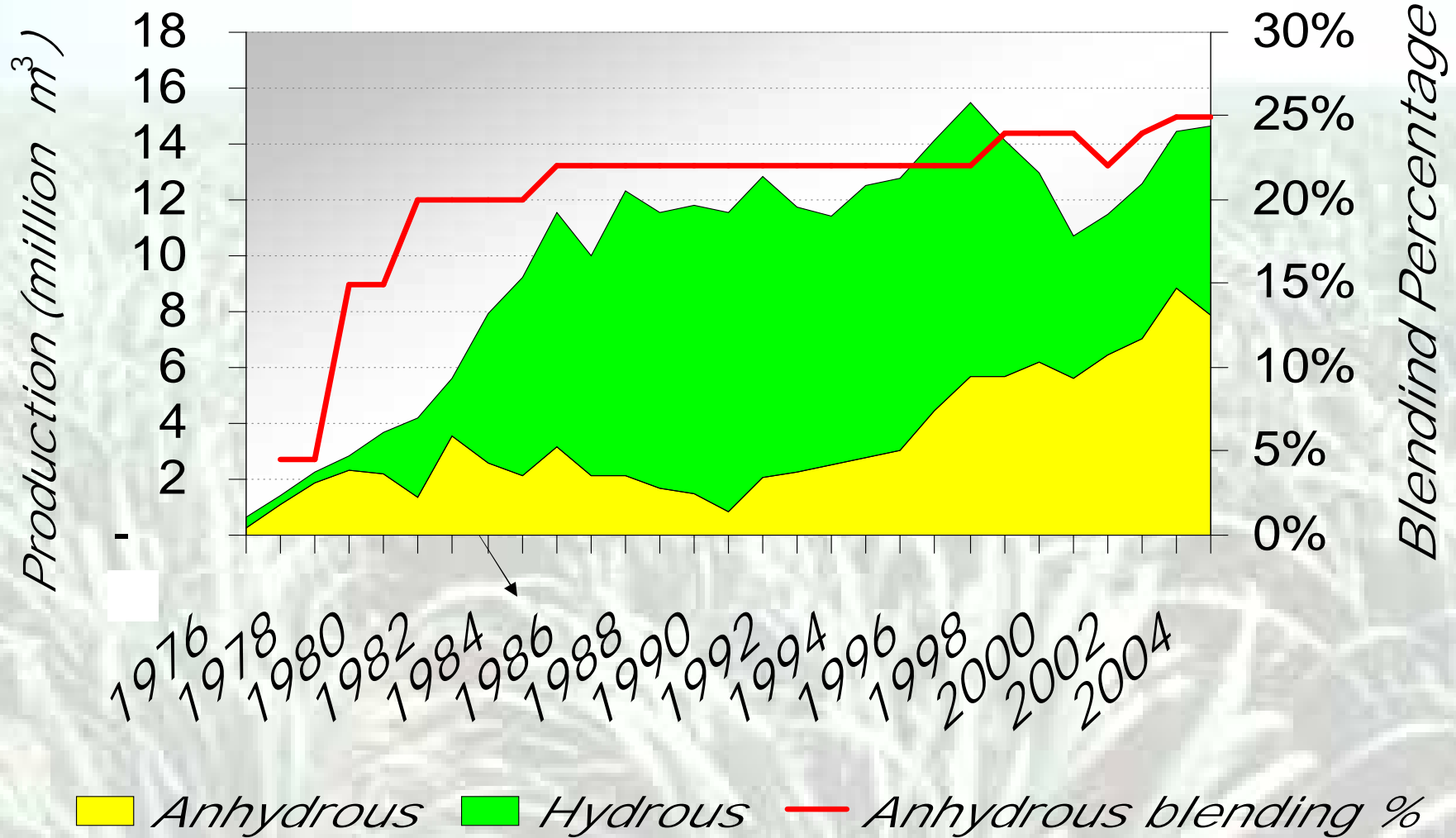
*NEAT ethanol
airplane by Embraer*



ETHANOL FUEL CELL

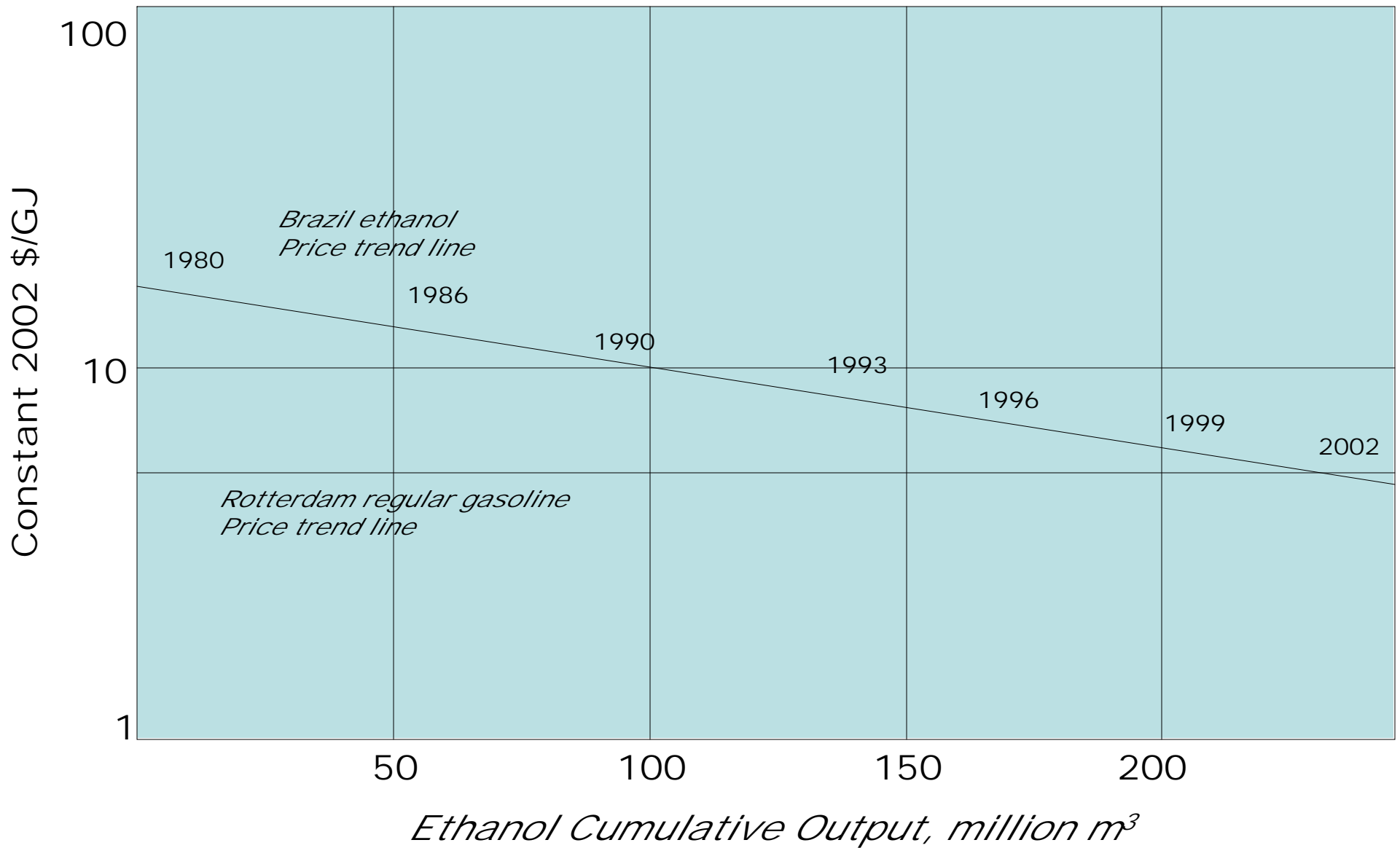
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Ethanol Production in Brazil



The Scale Factor: Brazil Ethanol Learning Curve

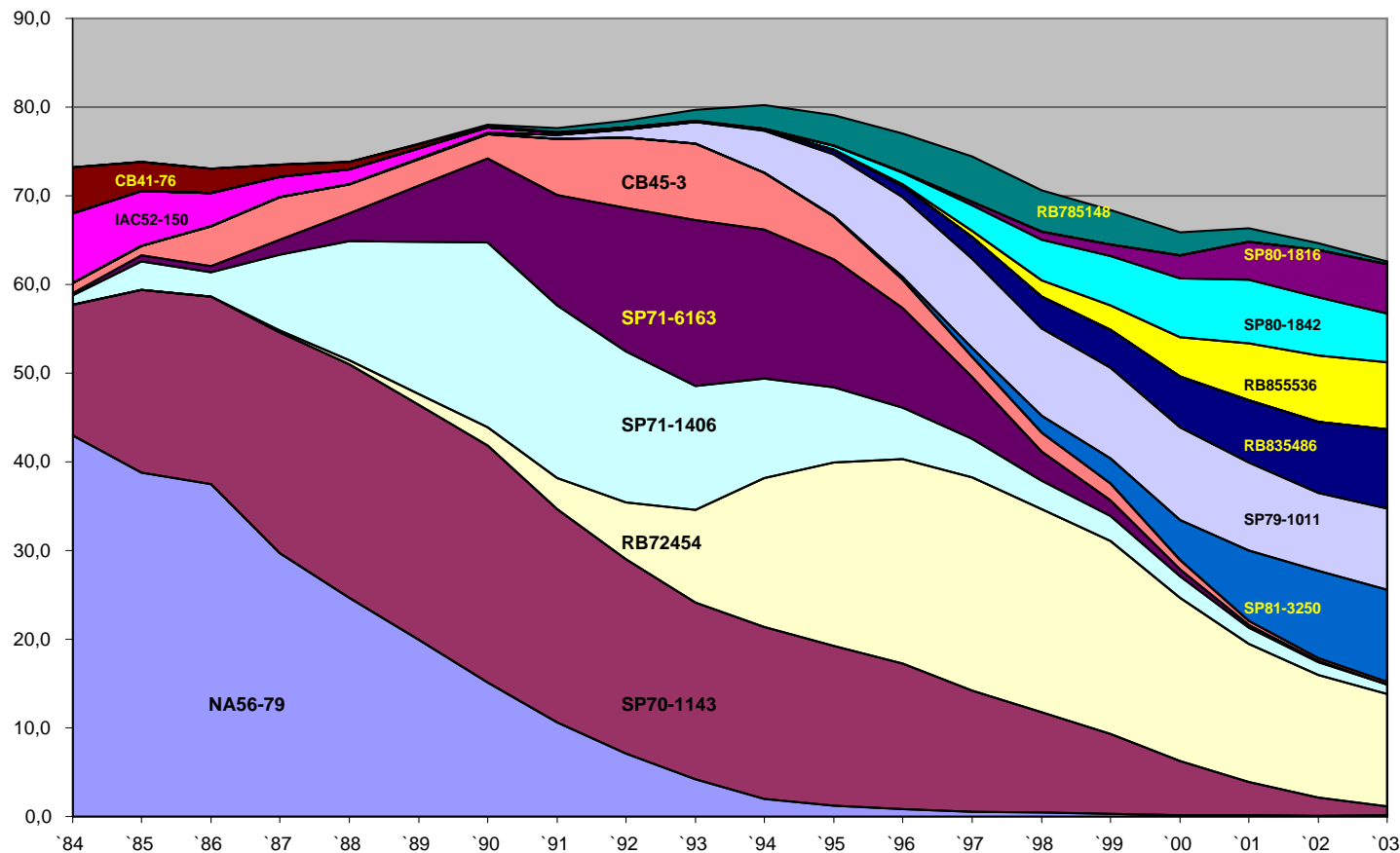
Source: Adapted from Goldemberg, et alii, Ethanol learning curve - The Brazilian experience, Biomass and Bioenergy 26 (2004) 301-304



Policy Lessons

- *Consensus among the key stakeholders: oil industry, auto industry and ethanol/sugar makers*
- *Cooperation between cane growers and mill/distillery owners*
- *National innovation system in place*
- *Agricultural research, extension, and application by farmers: critical for lowering production costs*

Area utilization (%) for the most planted sugar cane varieties in Brazil, 1984 - 2003



Source: Macedo, Isaias Carvalho (2006). Factibilidad del Etanol Derivado de Biomasa Como Combustible Para el Transporte en México, Informe BID, Proyecto ME-T1007 - ATN/DO-9375-ME

Policy Lessons

- *Comprehensive utilization: surplus bagasse, cogeneration*
 - *Waste reduction in harvest (stopping field burning of tops and leaves) and ethanol production (proper stillage disposal)*
 - *Supportive government policies*
- ⇒ *Replication of Brazil's ethanol experience requires assessing risks and the factors necessary for success over the long term*