Preparatory Meeting International Partnership on Bioenergy
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Consiglio Nazionale delle Ricerche

Bioenergy development and deployment: getting benefits from the use of international cooperation

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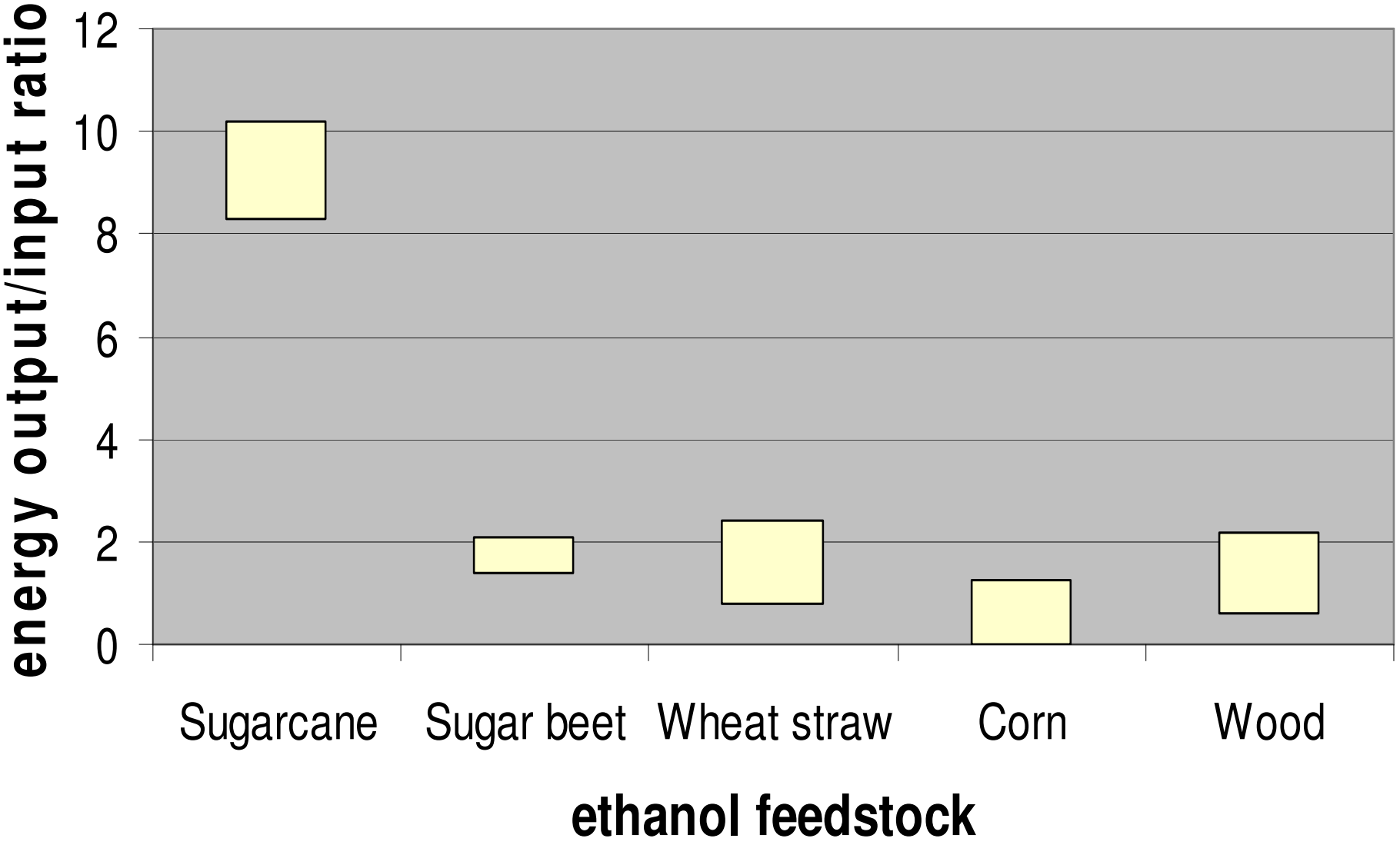
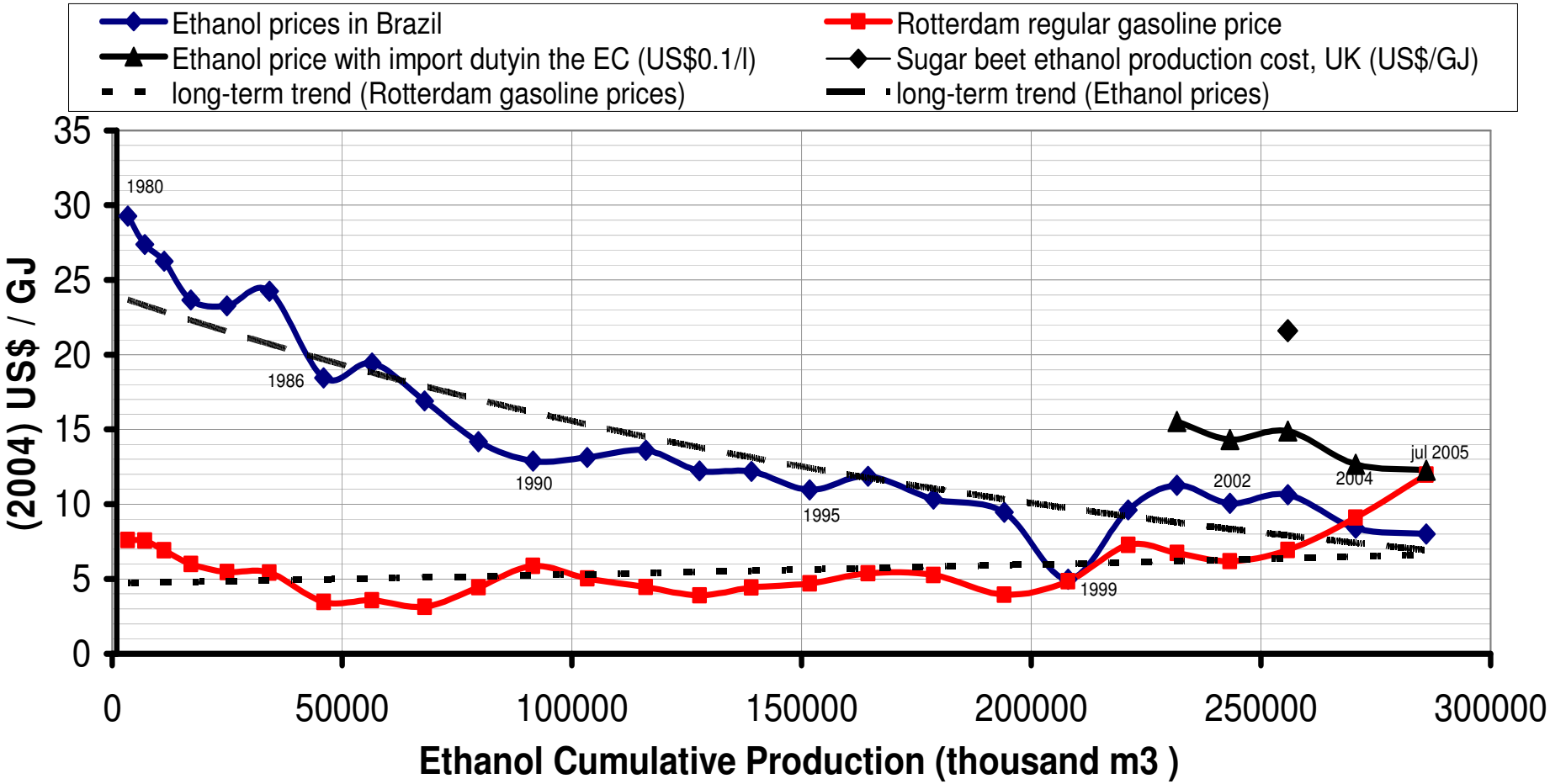
The Brazilian Alcohol Program

- 1975 PROALCOOL:
  - sugarcane ethanol for the oil shock
  - mandatory blend to gasoline (20 - 26% vol.)
  - high-octane fuel in vehicles, replacing lead and/or MTBE
- 2005:
  - fully competitive to gasoline: 2.5 bln liters exports (2004)
  - 14.8 Mm3 consumed
  - saving 35.1 Mt CO2 eq (~ 14% of national CO2 emissions from fossil fuels)
  - increased mechanical harvesting and productivity high industrial (70 - 100 l/tc) and agricultural productivity (60 - 100 tc/ha).
  - 3.5 mln pure ethanol cars and 0.35 mln FFVs
- perspectives to 2010:
  - increased production to 17.3 million m3 of ethanol
  - avoiding 46.7 Mt CO2 eq

Sugarcane *vs.* other feedstocks



Ethanol international competitiveness



Sugarcane in the world today

2001	Agri-cultural Area (million ha)	Sugarcane area harvested (million ha)	Area ratio Sugarcane/ Agricultural	Sugarcane production (million t)	Sugarcane production (t/ha)
World	5022	19,7	0,4%	1271	65
Brazil	263	5,0	1,9%	346	70
64 Low-Income Countries	1421	7,2	0,5%	437	61

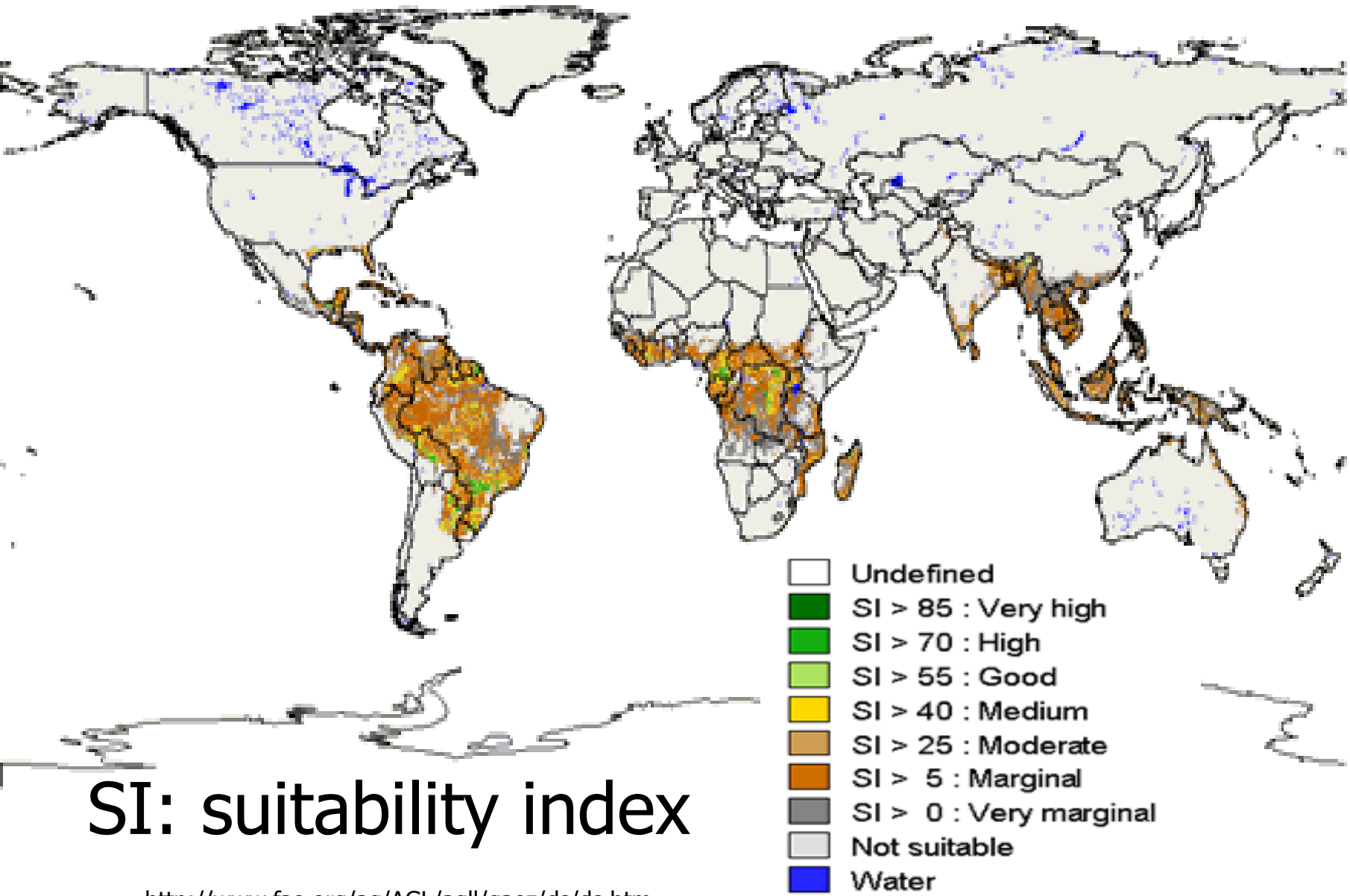
Source: www.fao.org

Sugarcane in the world today

Year		2003	2015	2030
Planted area (Mha)	(1)	2.6	45	144
Sugarcane yield (t/ha)	(2)	70	100	140
Ethanol production (billion l)	(3)	16	432	2070
Gasoline equivalent production (Million bbl/day)		0,21	5,75	27,53
Electricity Generation (TWh/yr)	(4)	9	1039	4624

Notes: (1) Annual area increase = 8%; (2) Annual productivity increase = 3% (3) Annual ethanol yield increase per tonne of sugarcane = 0.5%; (4) Electricity generation based in high pressure steam turbine Uses all bagasse and 60% of tops and leaves. Yield is 230 kWh/tonne of sugar cane after the tenth year and grows linearly from 50kWh in 2003 to 230kWh.

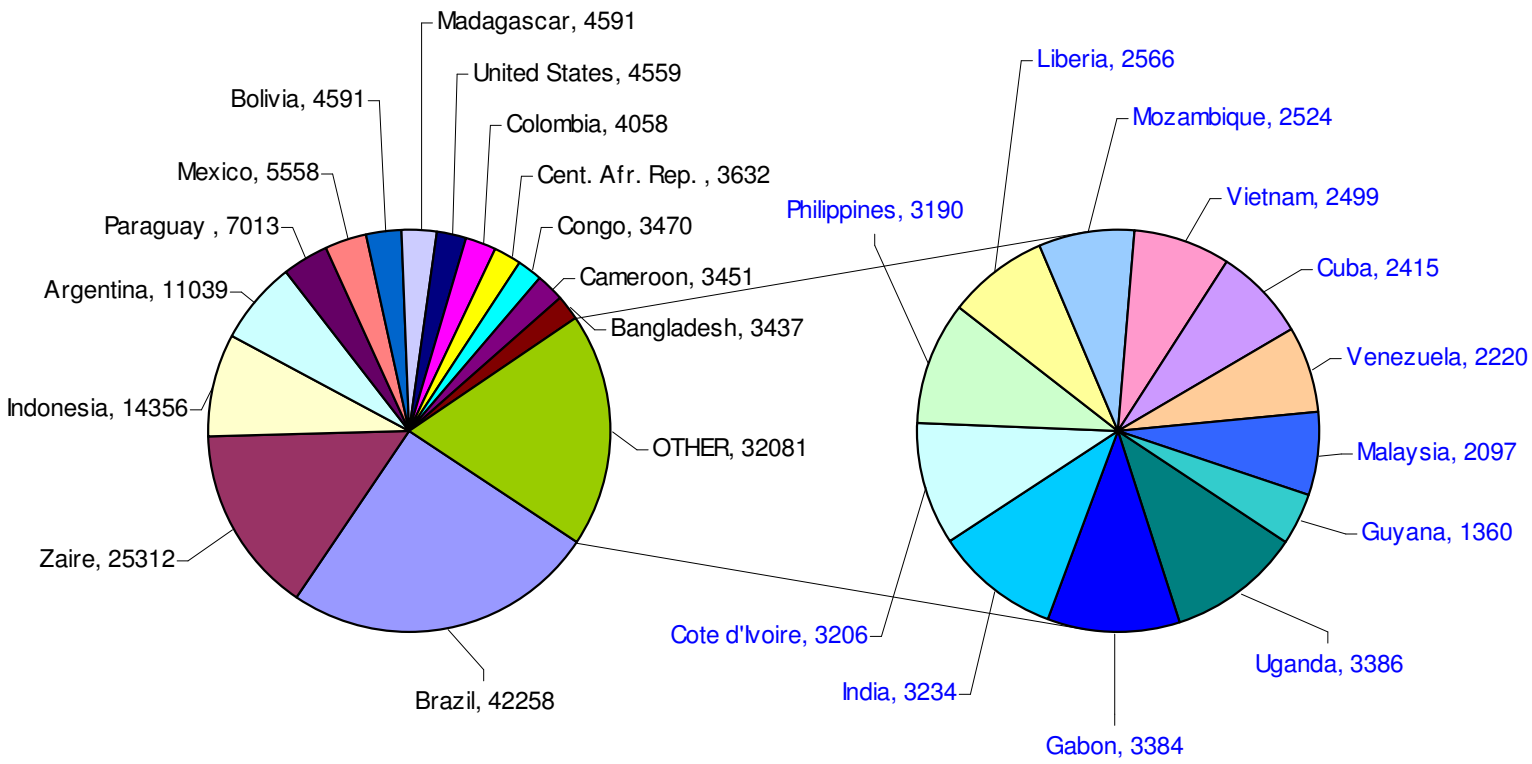
FAO´s sugarcane potentials



SI: suitability index

http://www.fao.org/ag/AGL/agll/gaez/ds/ds.htm

VERY SUITABLE AND SUITABLE POTENTIAL LAND AREA FOR SUGARCANE CROPS IN MAJOR 26 COUNTRIES PRODUCERS- HIGH, MEDIUM AND LOW INPUT EFFORT - FOREST AREA EXCLUDED - Thousand Ha



Total area in the largest 26 producers = 169 Million ha
Total area in all producers = 191 Million ha; equiv 1.46% of all land area ; 51% of toal potential sugarcane area

SOURCE: FAOSTAT

Source: FAO (2005) http://www.fao.org/ag/AGL/agll/gaez/ds/ds.htm

Potential ethanoL production (@ 6000 l/ha.yr): 1146 billion liters/ year
Equivalent to 611 Mtoe (62% of OECD´s petroleum products consumption in road transport, 2000)

Ambitious hypotetical scenarios

		World	OECD	Non-OECD
Gasoline consumption	bln litres/yr	1165	838	327
Ethanol 10% blend	bln litres/yr	175	126	49
E100	bln litres/yr	1748	1257	491
Sugarcane area for E10	mln ha*	29	21	8
Sugarcane area for E100	mln ha*	291	210	82
"Suitable" and "very suitable" sugar crops (FAO)	mln ha	383	116	217
All sugar crops (all cultures, FAO)	mln ha	1455	496	959

* @ 6000 l ethanol/ha.yr; gasoline 33MJ/liter, ethanol 22 MJ/liter