

Agro-energy and International Trade: A sustainable development role for biofuels

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Energy-Environment-Development driving forces for bioenergy development and North-South-South Collaboration

- Rural development - creation of sustainable livelihoods
- Relieving resource pressures and stresses
- Socioeconomics of urbanisation and migration
- Energy security: local – regional – global
- Rural health issues - indoor air
- Urban health issues – lead, air quality
- future competitiveness of agro-industries
- Kyoto Annex 1 countries seeking carbon credits
- Developing countries looking for foreign investment through Clean Development Mechanism (CDM)
- Dependence on fossil fuels in increasingly volatile market
- Reduced vulnerability of poor farmers through diversification

Rapid growth in biofuels production during 2000-2005

Bio-ethanol production by country or region (billion litres)

	2000	2001	2002	2003	2004	2005	Global Share, 2000	Global Share, 2005	Annual Average change
Brazil	10.6	11.5	12.6	14.7	14.7	16.1	55%	45%	8.6%
U.S.A.	7.6	8.1	9.6	12.1	14.3	16.2	40%	46%	16.4%
Other	0.9	1.7	1.9	1.9	2.4	3.3	5%	9%	28.5%
World	19.2	21.3	24.1	28.7	31.4	35.6			13.2%

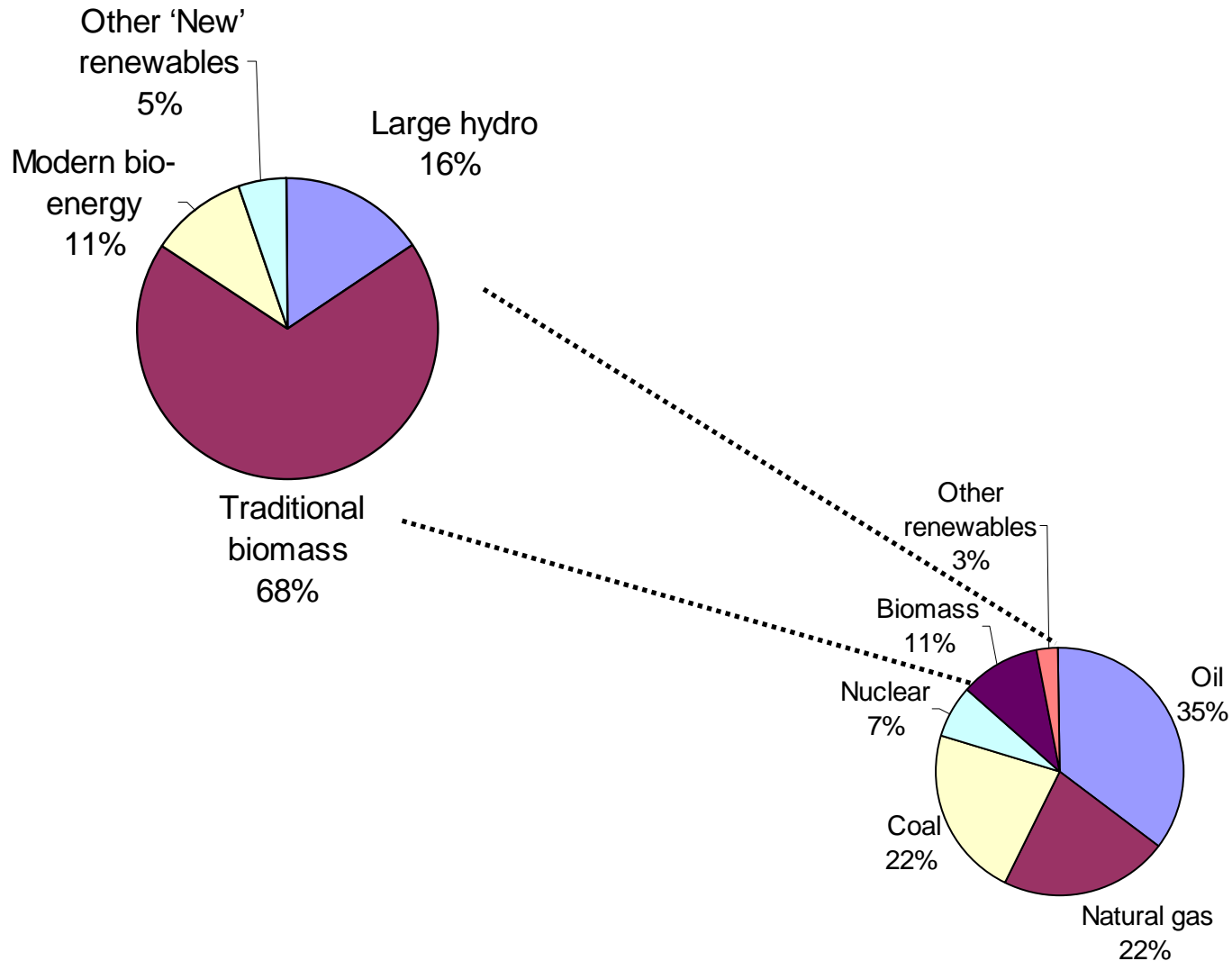
Source: calculations based on F.O.Licht, 2006.

Biodiesel production by country or region (million litres)

	2000	2001	2002	2003	2004	2005	Global Share, 2000	Global Share, 2005	Annual Average change
EU Total	813	912	1210	1630	2265	3618	86%	86%	34.8%
U.S.A.	8	19	57	76	95	284	1%	7%	106.4%
other	125	190	256	284	273	307	13%	7%	19.7%
World	945	1121	1523	1989	2633	4209			34.8%

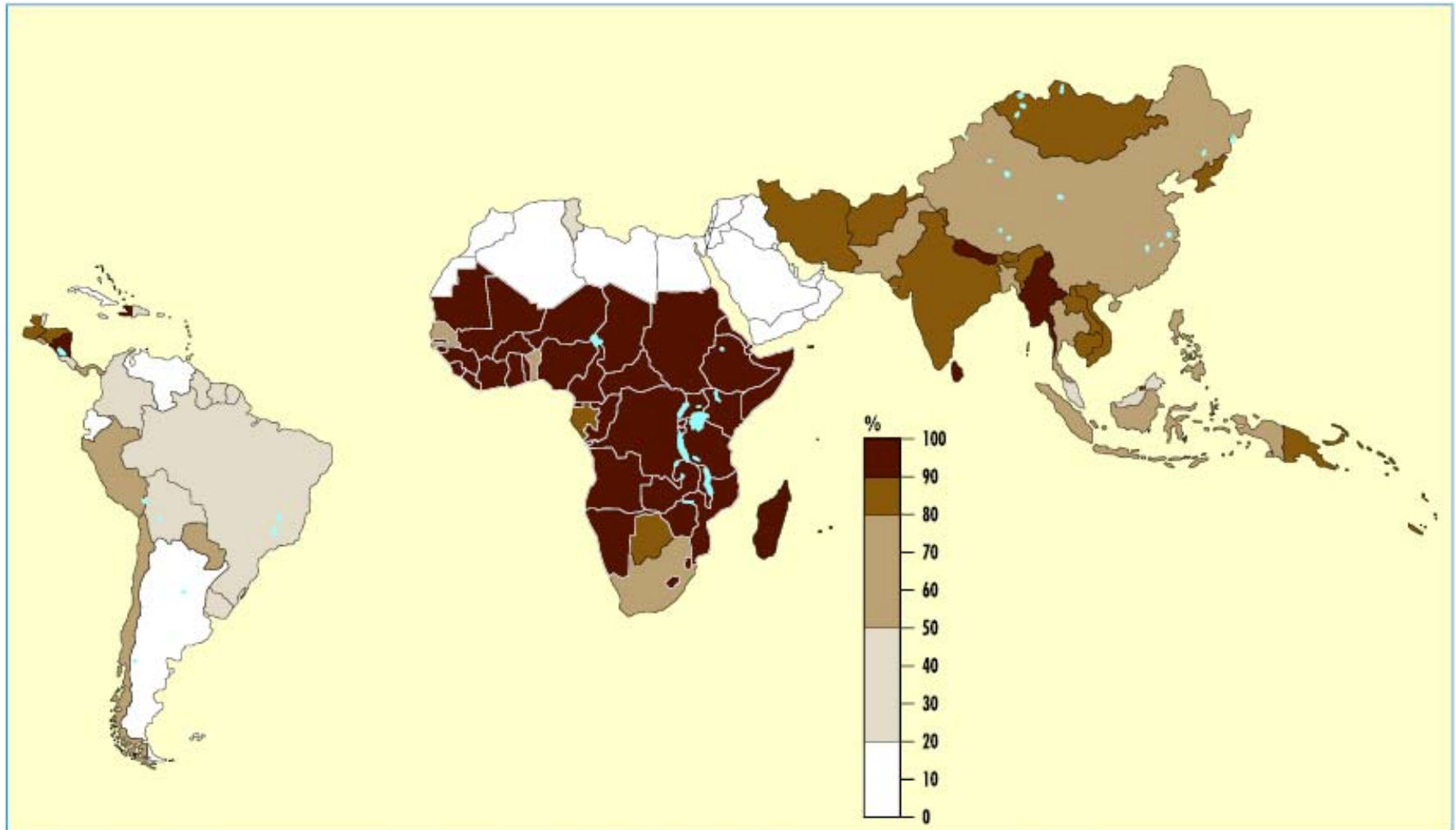
Sources - estimated based on: Euroobserver, 2006; National Biodiesel Board, 2006.

Share of biomass in global energy consumption



Source: IEA and UNDP, 2004-2007

Share of Traditional Biomass in Residential Consumption



The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

Source: IEA databases.

Source: IEA, *World Energy Outlook 2006*, page 423.

➤ **2.5 billion people depend on traditional biomass for cooking**

The Role of modern bioenergy

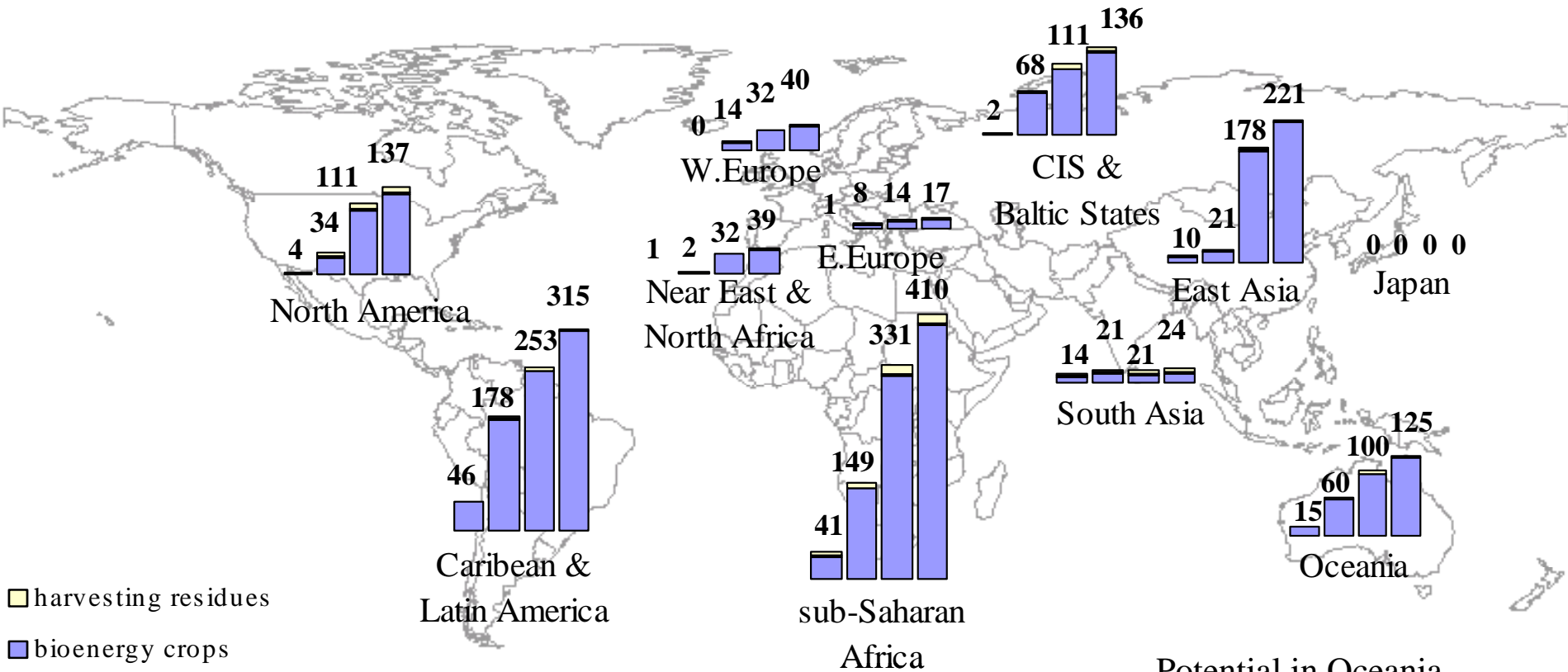
Modern bioenergy will play a leading role in the global transition to clean and sustainable energy due to two decisive advantages over other renewables:

- (1) Biomass is stored energy. Like fossil fuels, it can be drawn on at any time, in sharp contrast to daily or seasonally intermittent solar, wind, and small hydro sources, whose contributions are all constrained by the high costs of energy storage.
- (2) Biomass can produce all forms of energy, i.e. energy carriers, for modern economies: electricity, gas, liquid fuels, and heat. Solar, wind, wave and hydro are limited to electricity and in some cases heat.

Modern bioenergy has several other advantages over other energy resources:

- provides rural jobs and income to people who grow or harvest the bioenergy resources; bioenergy is more labour-intensive than other energy resources;
- increases profitability in the agriculture, food-processing and forestry sectors. Biomass residues and wastes--often with substantial disposal costs--can instead be converted to energy for sale or for internal use to reduce energy bills;
- helps to restore degraded lands. Growing trees, shrubs or grasses can reverse damage to soils, with energy production and sales as a valuable bonus;

Bio-energy production potential in 2050 for different scenarios



Potential in Oceania is 4-6 times projected primary energy use

Source: E. Smeets, A. Faaij, I. Lewandowski – March 2004

A quickscan of global bio-energy potentials to 2050: analysis of the regional availability of biomass resources for export in relation to underlying factors, Copernicus Institute - Utrecht University, NWS-E-2004-109.

Livelihoods – creation of jobs in energy industries

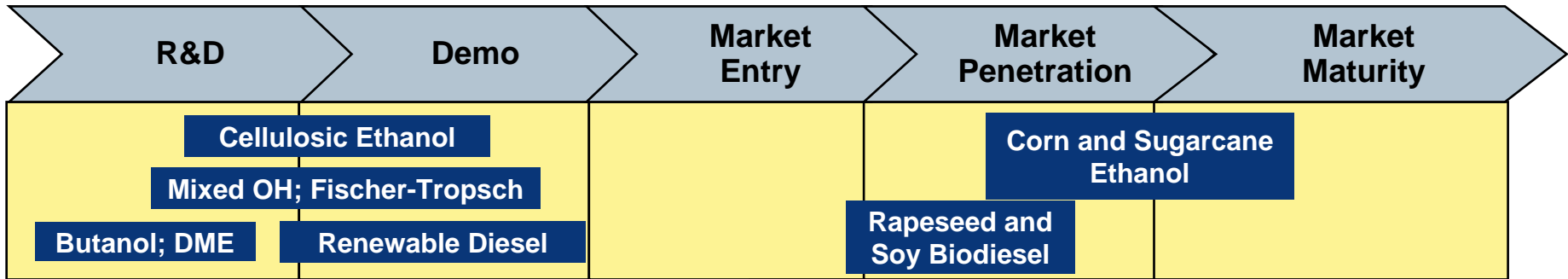
<i>Energy source</i>	<i>Jobs per TWh output</i>
Nuclear	75
Small hydro	120
Natural gas	250
Big hydro	250
Oil	260
Oil offshore	265
Coal	370
Traditional biomass (wood)	733 - 1.067
Wind	918 - 2.400
Ethanol (in Brazil)	3.711 - 5.392
Solar	2.958 – 10.700

Source: Delcio, 2007

Intensity of agricultural cultivation remains low in most world regions



**“First generation” biofuels are commercially developed technologies.
 “Second generation” are not yet commercially available**



2nd Generation Biofuels

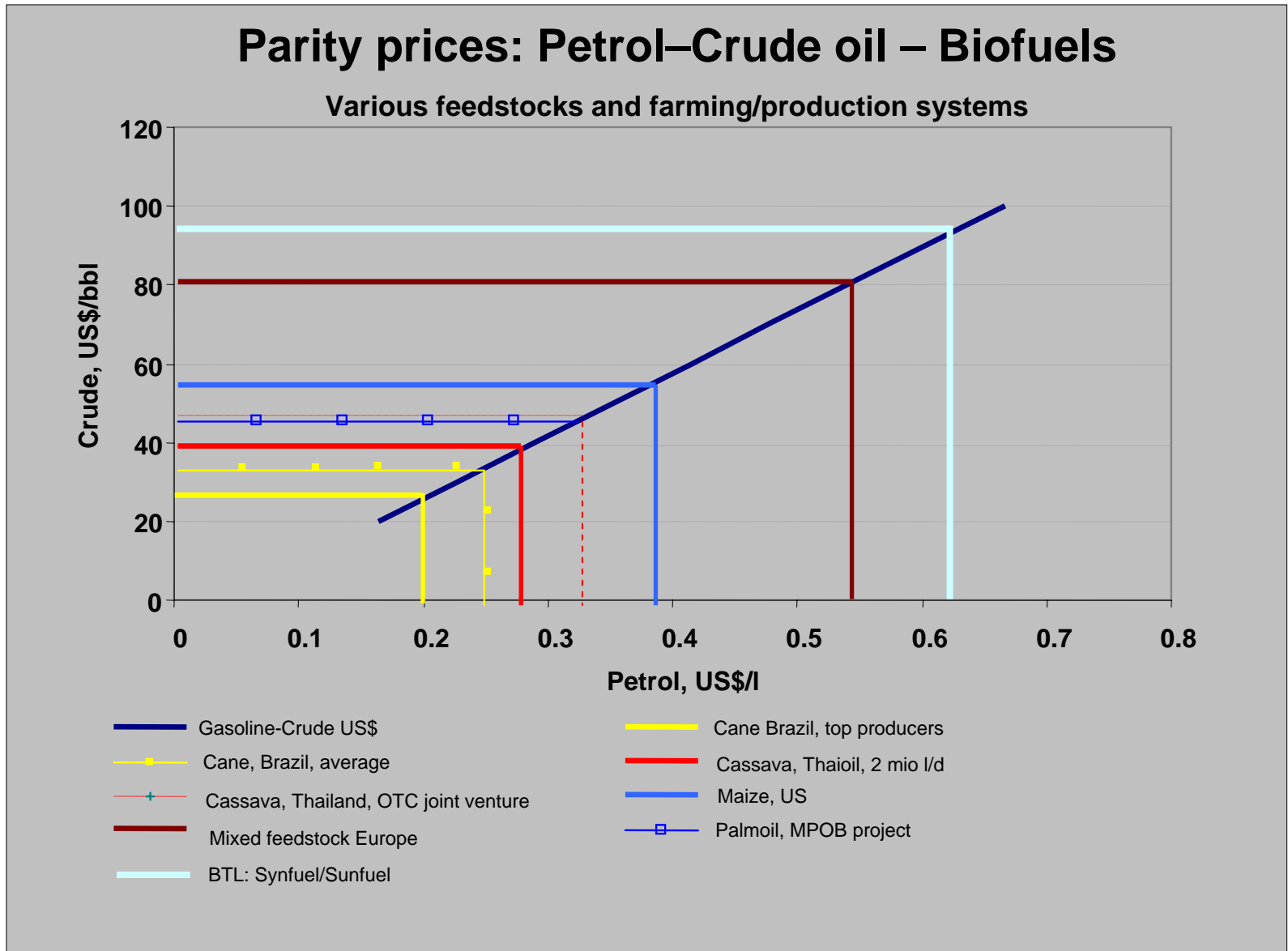
- **R&D efforts are focused on:**
 - Increasing the range of feedstock from which to produce biofuels
 - Reducing biomass-to-liquid conversion costs
- **Two main technology platforms in development:**
 - *Biochemical pathway:* conversion of the cellulose to sugars and fermentation to alcohol fuels
 - *Thermochemical pathway:* gasification of biomass to syngas and synthesis to fuels
- **Commercial renewable diesel plants are under construction**

1st Generation Biofuels

- **Ethanol** is a clean burning, high-octane alcohol fuel used as a replacement and extender for gasoline
 - Has been commercially produced since the 70s in the US and Brazil, still the market leaders
 - Corn ethanol is cost competitive (with no subsidies) with gasoline when crude oil is above \$50/barrel (\$30/brl from sugar cane)
- **Biodiesel** is a high-cetane, sulfur-free alternative to (or extender of) diesel fuel and heating oil
 - Commercialized in Europe in the 90’s
 - Worse economics and smaller market than ethanol

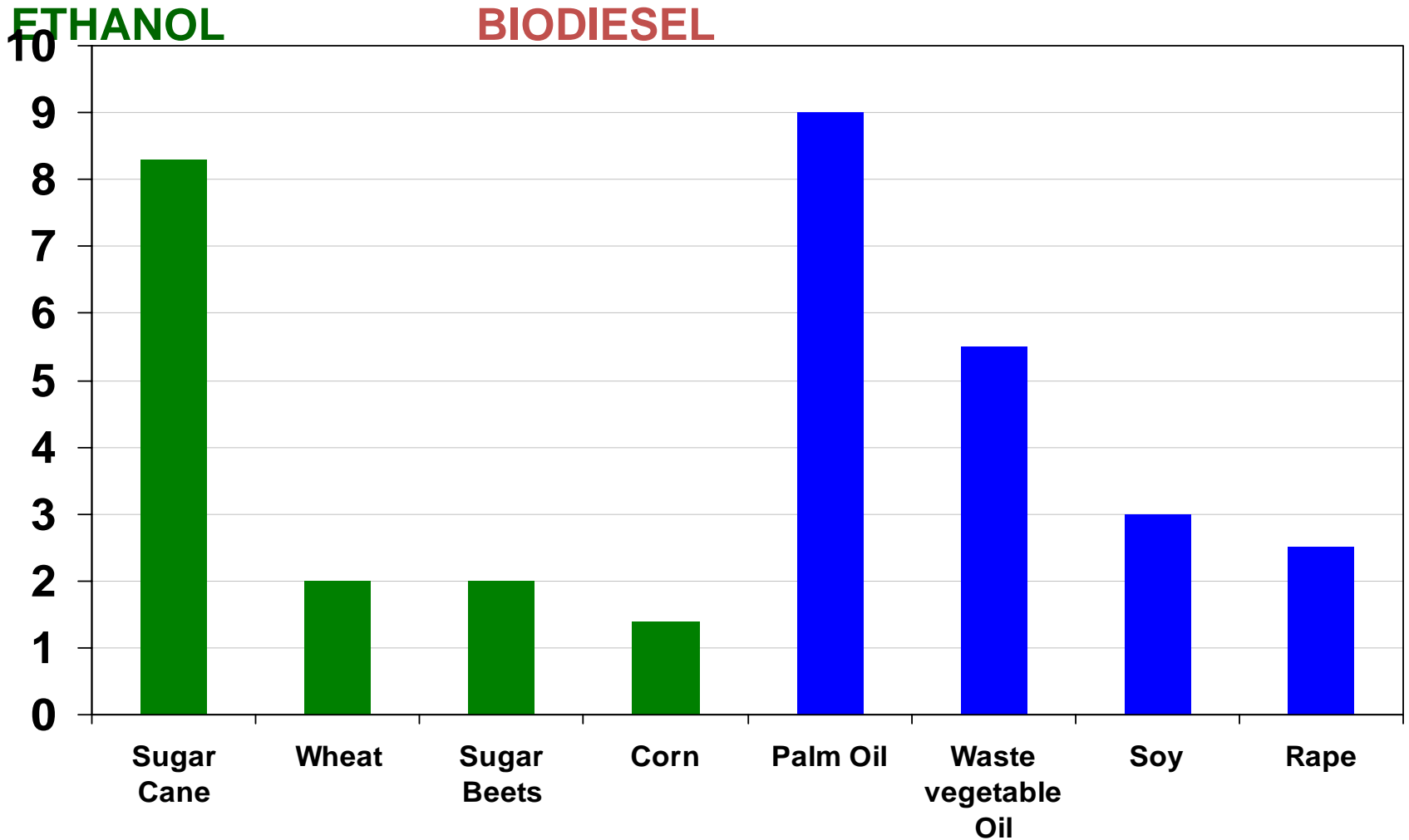
Vested industry interests (e.g. petroleum) emphasise “more efficient” 2nd generation technologies to preserve their markets

Cost competitiveness



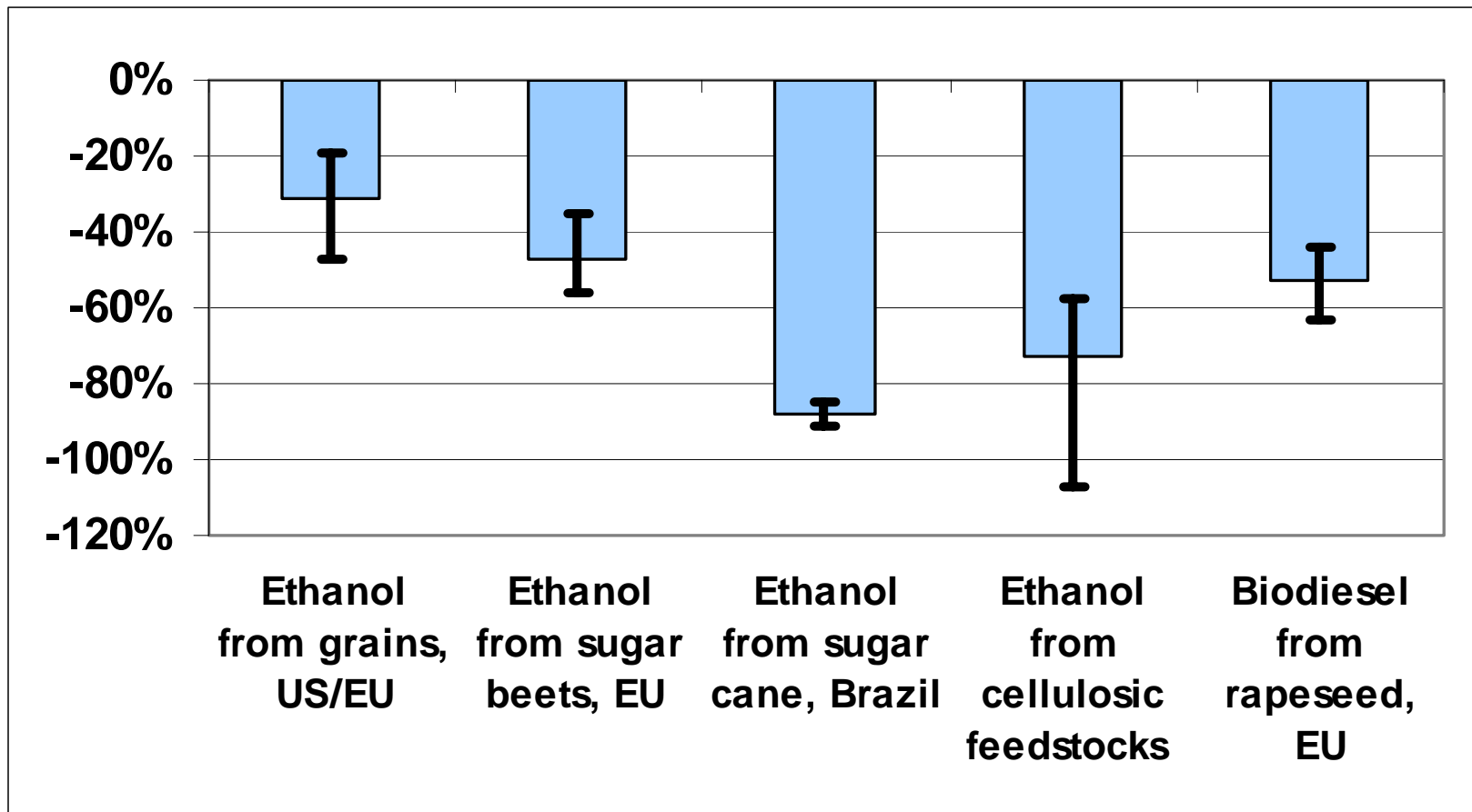
FOSSIL ENERGY BALANCE

Energy output per unit of fossil fuel input



GHG Emissions Impacts of Biofuels

Well-to-wheel CO₂-equivalent GHG emissions from biofuels, per km, relative to base fuel



Bioenergy market development

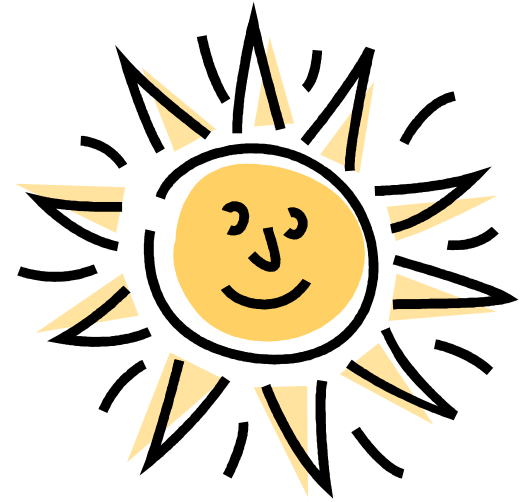
1. Local use of forest and agricultural residues
2. Assuring proper waste treatment, processing of residues, and energy efficiency
3. Infrastructure development
4. National market development through supportive policies and incentives
5. Regional biomass markets, medium-to-large scale utilization, transport logistics
6. Increasing scale, followed by decreasing costs
7. Global commodity market

What is one buying when importing biofuels?

Is it
technology?

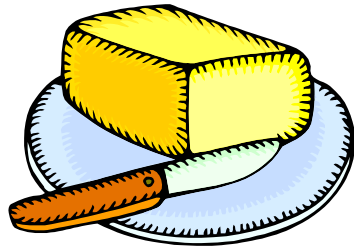


Or is
it the
Sun?

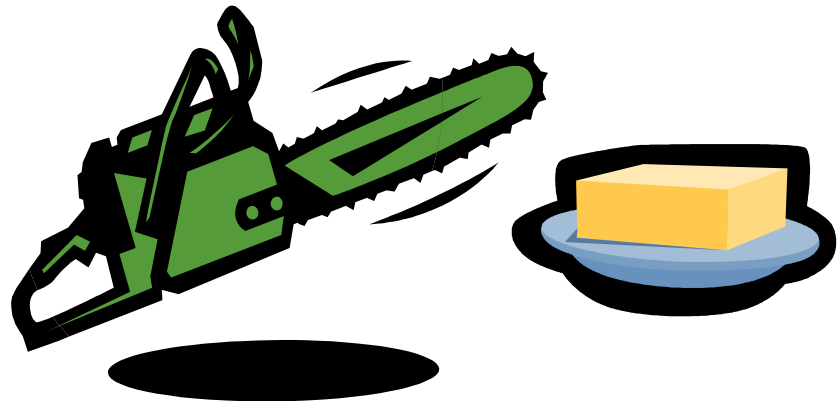


What is the preferred way to cut butter?

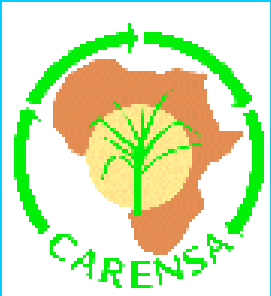
With a knife?



Or with a chainsaw?



*Thanks for your
attention!*



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