Sustainability relevance & impacts

Case studies through IEA Bioenergy Task 39

IEA Bioenergy Task 39

Today's talk

- Introduction
- Bioenergy technologies
- Bioenergy and sustainability issues
- The European Union
  - Some national examples
- Existing certification schemes
  - Forest certification
- Summary & conclusions

Bioenergy & sustainability

Small-scale application

Efficiency of energy recovery

Residential heat generation

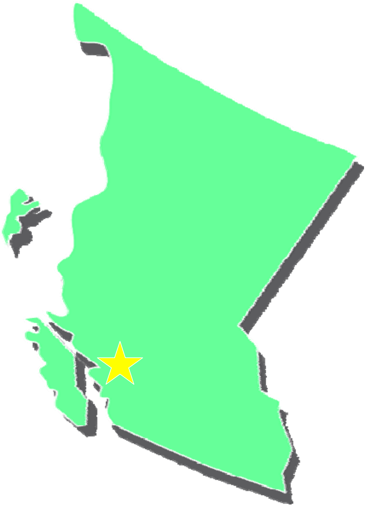
	Conversion efficiency (η_e)	Avg. energy delivered (GJ/bdt wood)
Open fire	0.05	1
Traditional wood stove	0.36	7.2
Charcoal	0.44-0.79	8.8-15.7
Wood pellet stove	0.78-0.81	15.6-16.2

Sources: Karlsson, Gustavsson 2003; Mabee et al. 2001

Average energy in wood, bone-dry basis: 16-25 GJ/bdtonne

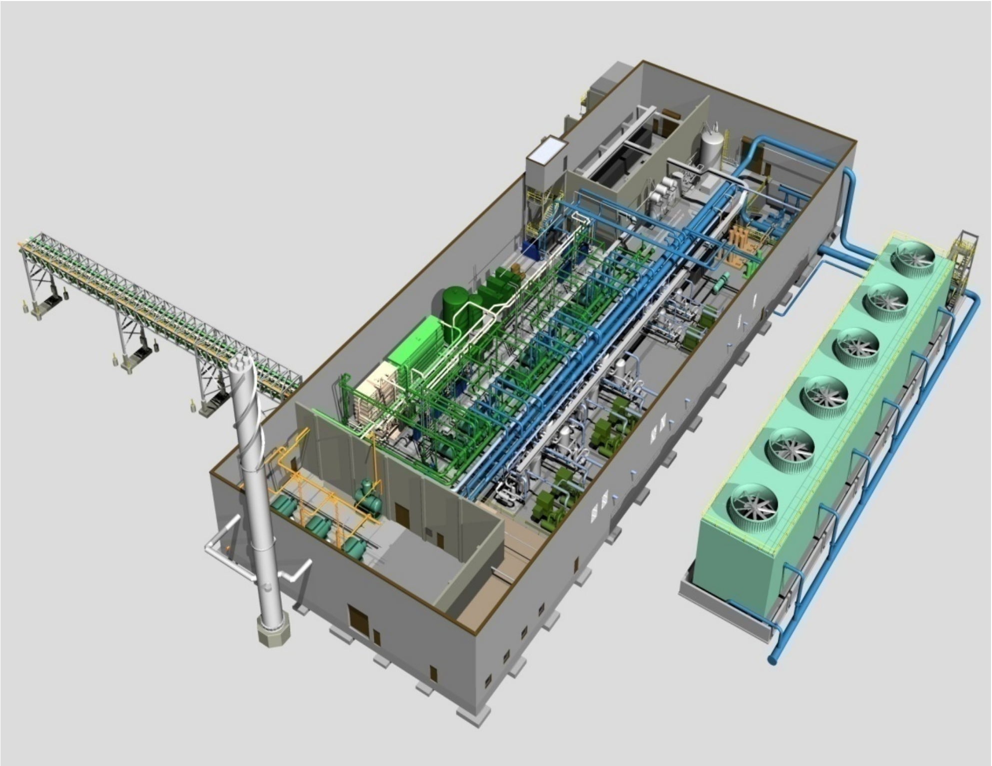
Power generation units

- Combust wood chips or pellets in a power boiler
- Can use mill wastes or hogfuel
- eg: Williams Lake Power Facility, BC (65 MW)



Combined Heat and Power

- Can deliver both heat and power (electricity)
- Can be used in District Heating systems
  - Residential
  - Industrial
  - Institutional
- Allows optimal energy recovery from the feedstock



Efficiency of energy recovery

Industrial heat and power generation

	Conversion efficiency (η_e)	Avg. energy recovered (GJ/bdt wood)
Combined Heat & Power (CHP)	0.30 - 0.44	6 - 8.8
Steam-turbine power boiler	0.40	8
Gasifier/power generator	0.47	9.4
CHP with Flue Gas heat recovery	0.70 - 0.80	14 - 16

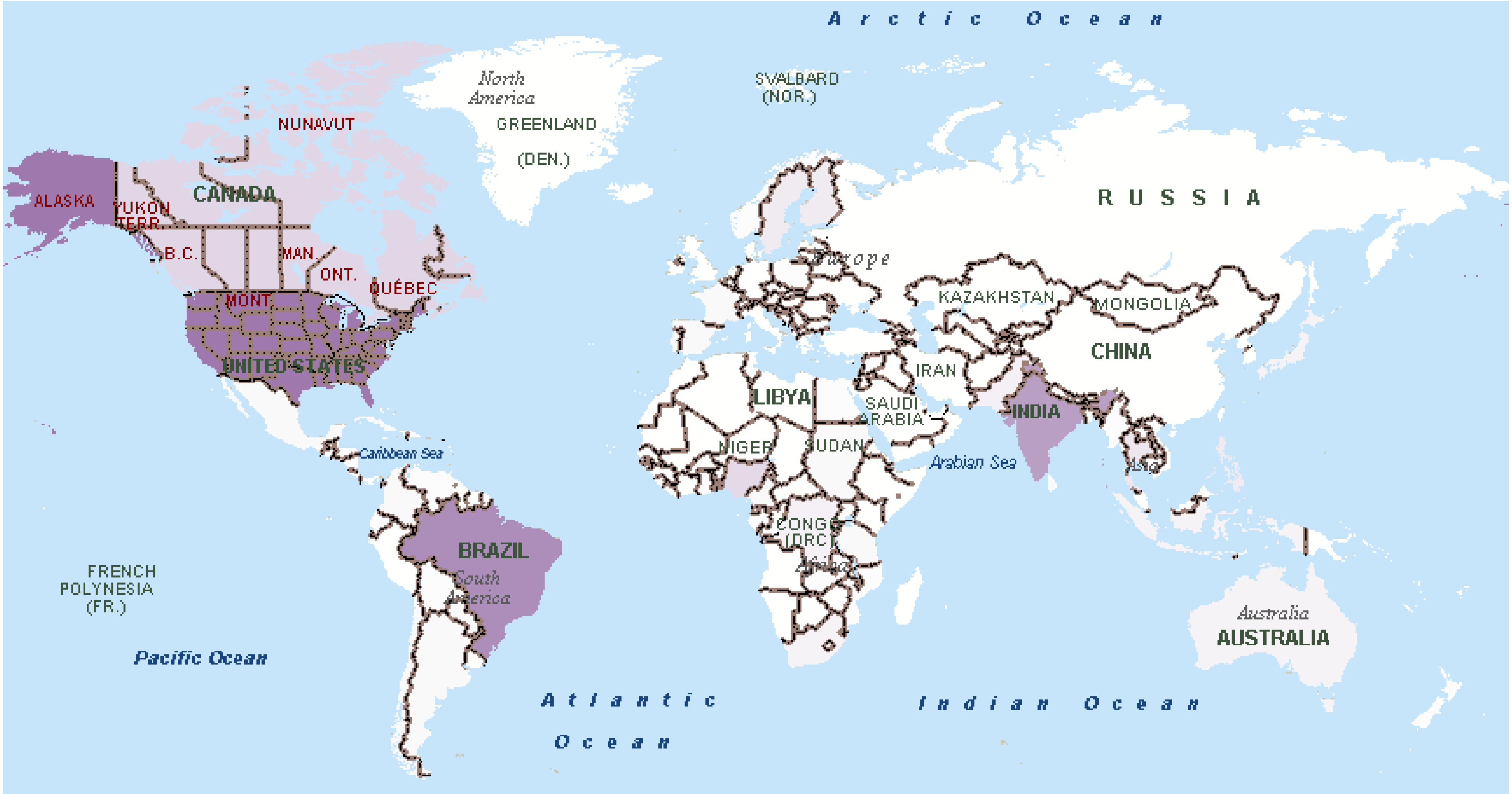
Sources: Karlsson, Gustavsson 2003; Mabee et al. 2001

Wood pellet energy balance

	Energy input
Harvest-to-mill	n.a.
Mill construction	0.043 GJ/tonne
Mill operation (Drying-Milling-Pressing-Cooling-Screening-Bagging)	0.244 GJ/tonne
Pellet transport: •200 km truck •1000 km train •10,000 km ship	 0.230 GJ/tonne 0.630-0.700 GJ/tonne 0.280-0.749 GJ/tonne
Total inputs	1.47-1.97 GJ/tonne
Total outputs	16 GJ/tonne
Net energy efficiency	8.1-10.9

Source: Hoque et al. 2006

Industrial bioenergy use



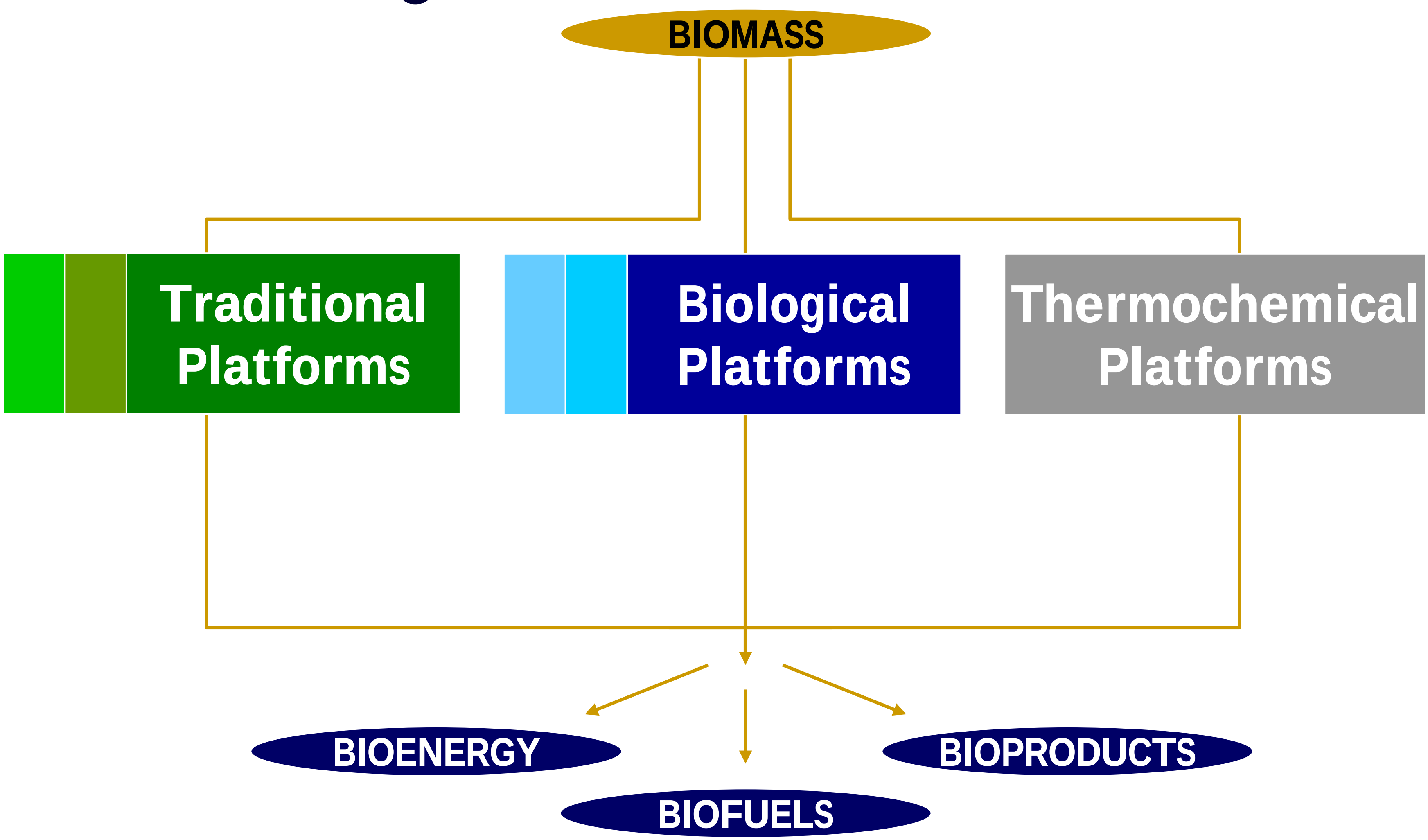
Sources: IEA 2007

>1.2 million TJ
0.8-1.2 million TJ
0.4-0.8 million
<0.4 million TJ

Forest-based Biorefining

- Combining bioenergy generation with the creation of bio-based products:
  - Solid products (lumber, pulp, paper)
  - Biomaterials (nanofibres, etc.)
  - Bioplastics
  - Biochemicals

Biorefining Platforms



Efficiency of energy recovery

Biofuel generation w/o energy recovery

	Biofuel Yield (l/bdt wood)	Avg. energy recovered (GJ/bdt wood)
Fischer-Tropsch fuels	75 - 201	2.9 - 7.6
Syngas-to-ethanol	146	3.1
Wood-to-ethanol	124 - 303	2.6 - 6.4
Straw-to-ethanol	109 - 270	2.3 - 5.7

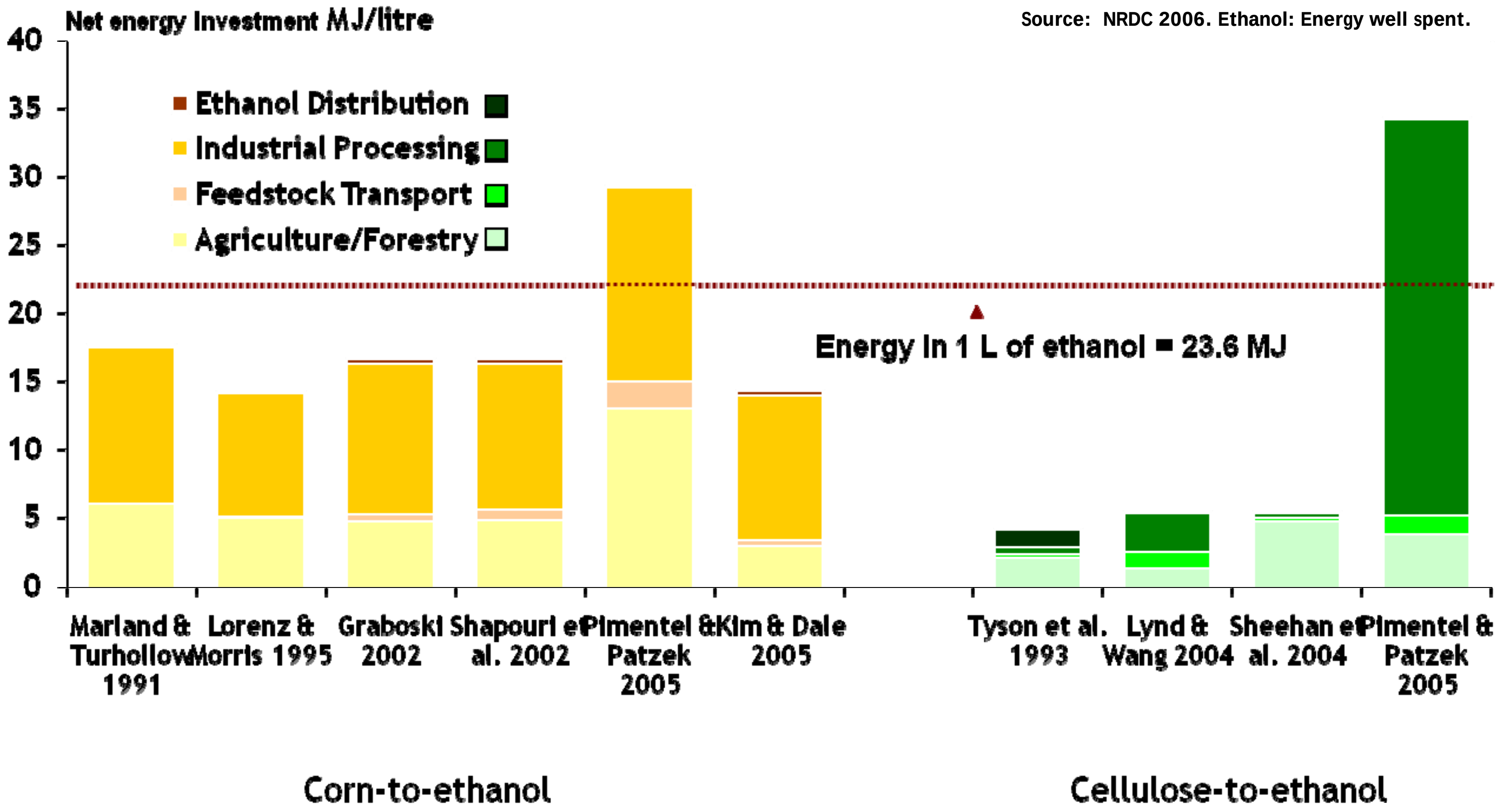
Sources: Mabee et al. 2006; Spath Dayton 2003; Wingren et al. 2003; Tijmensen et al. 2000; NREL 2000; Putsche 1999.

Measuring environmental benefits

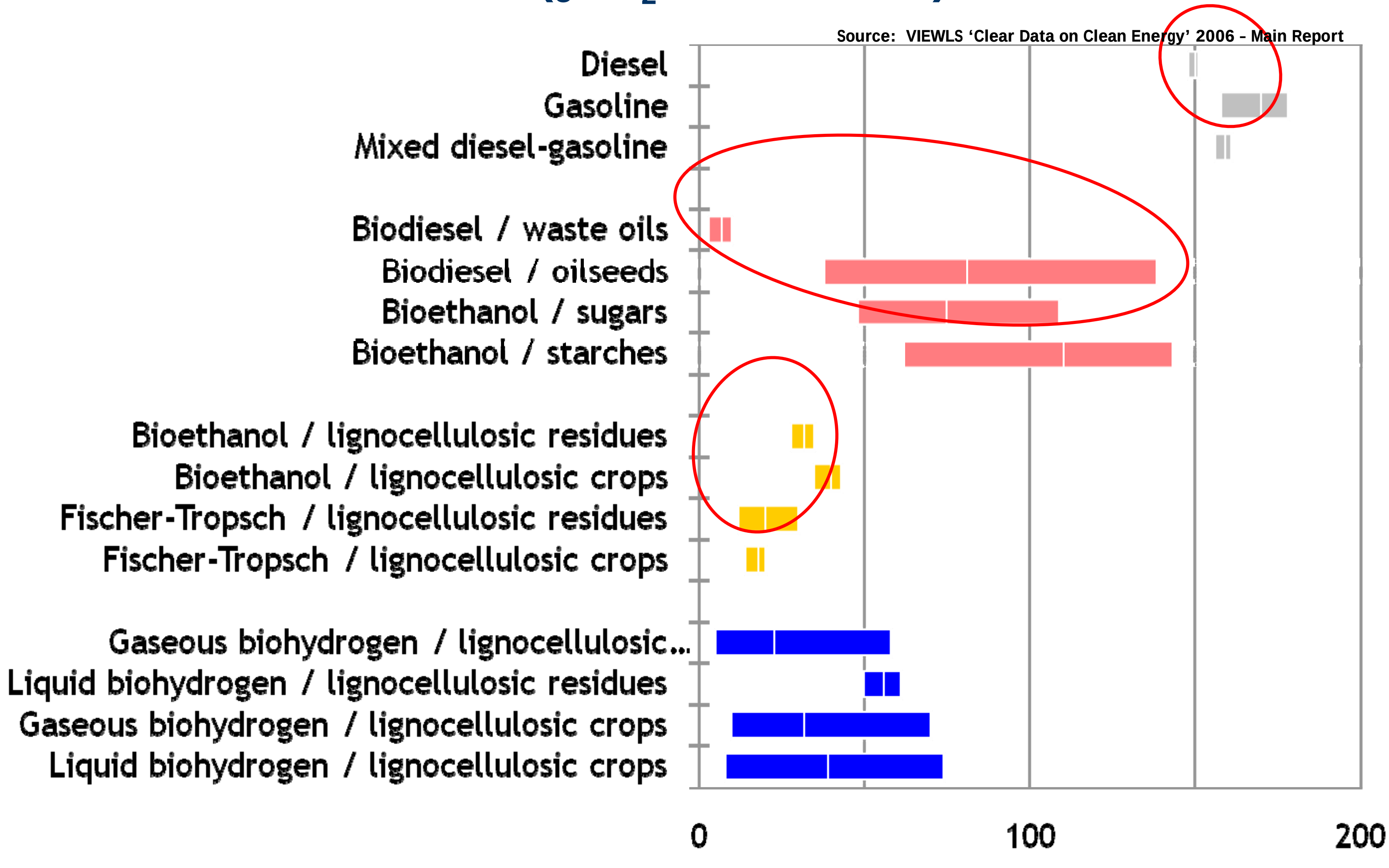
- Environmental performance
  g CO_2 km^{-1}, g CO_2-e km^{-1}, MJ km
- Energy balance (MJ in vs. MJ out)

- All based on lifecycle analysis (ISO Standard)
- ‘Well-to-wheels’ analysis:
  - Production of biomass
  - Transport of biomass
  - Conversion to transport fuel
  - Distribution of transport fuel
  - Use of transport fuel

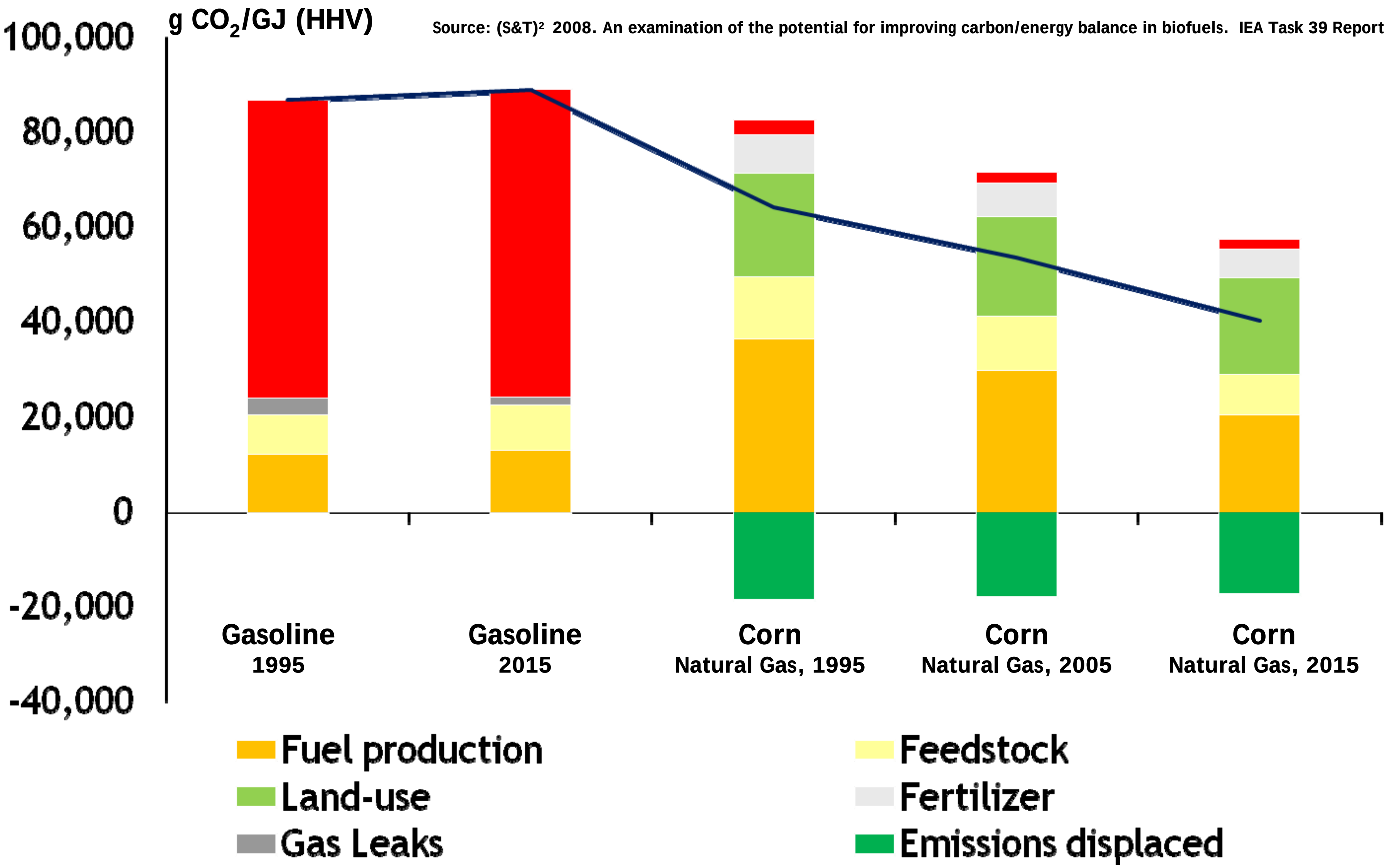
Energy balance



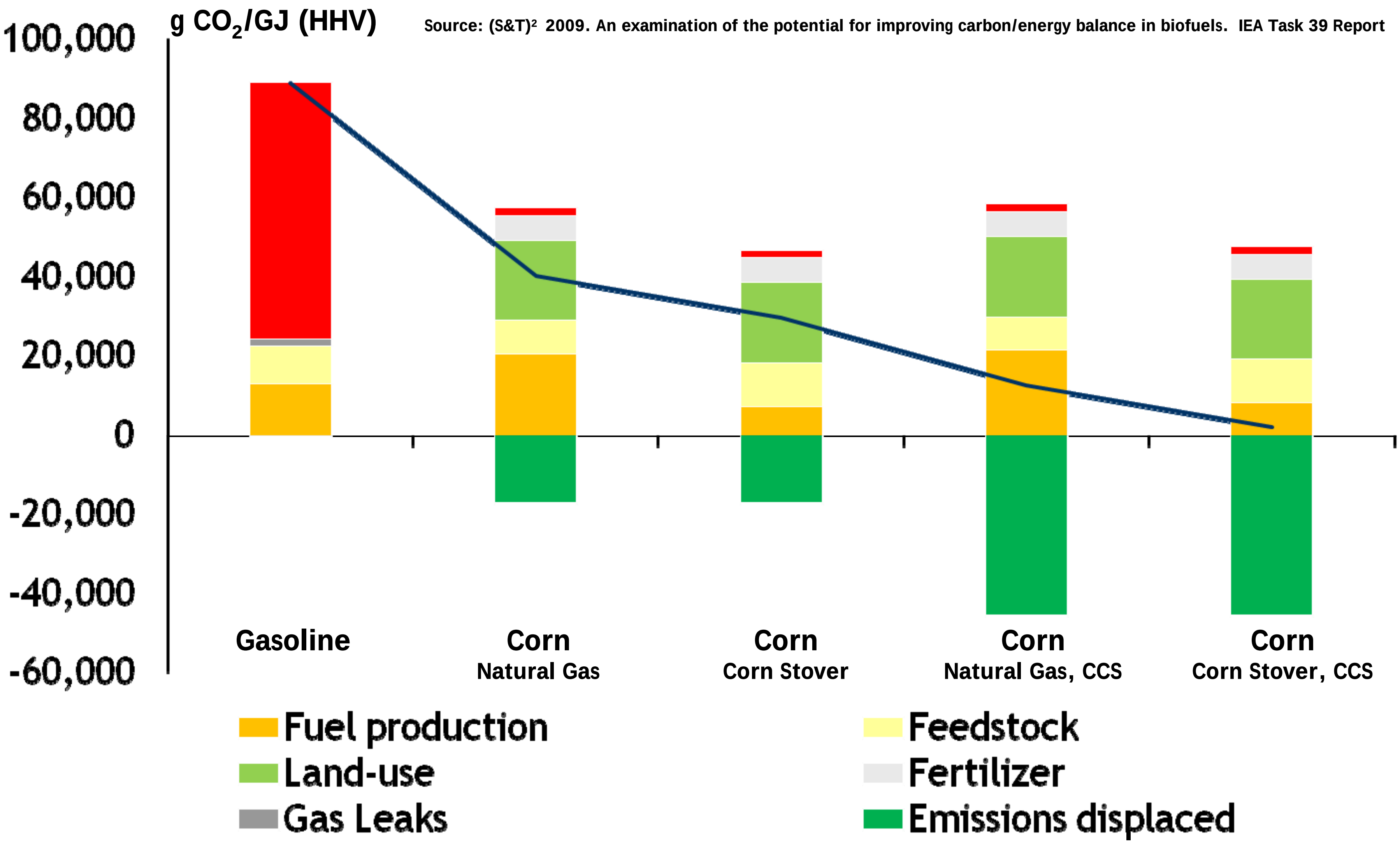
Biofuel emissions (g CO_2-e / km driven)



Corn ethanol emission reductions (to 2015)



Potential emission scenarios (by 2015)



Bioenergy & sustainability issues

Sciencexpress Report

Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land Use Change

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Most prior studies have found that substituting biofuels for gasoline will reduce greenhouse gasses because biofuels sequester carbon through the growth of the feedstock. These analyses have failed to count the carbon emissions that occur as farmers worldwide respond to higher prices and convert forest and grassland to new cropland to replace the grain (or cropland) diverted to biofuels. Using a worldwide agricultural model to estimate emissions from land use change, we found that corn-based ethanol, instead of producing a 20% savings, nearly doubles greenhouse emissions over 30 years and increases greenhouse gasses for 167 years. Biofuels from switchgrass, if grown on U.S. corn lands, increase emissions by 50%. This result raises concerns about large biofuel mandates and highlights the value of using waste products.

Most life-cycle studies have found that replacing gasoline with ethanol modestly reduces greenhouse gasses (GHGs) if made from corn and substantially if made from cellulose or sugarcane.(*1–8*). These studies compare emissions from the separate steps of growing or mining the feedstocks (such as corn or crude oil), refining them into fuel, and burning the fuel in the vehicle. In these stages alone, as shown in Table 1, corn and cellulosic ethanol emissions exceed or match those from fossil fuels, and therefore produce no greenhouse benefits. But because growing biofuel feedstocks removes carbon dioxide from the atmosphere, biofuels can in theory reduce GHGs relative to fossil fuels. Studies assign biofuels a credit for this sequestration effect, which we call the "carbon uptake" credit. It is typically large enough that overall GHG emissions from biofuels are lower than those from fossil fuels, which do not receive such a credit because they take their carbon from the ground.

For most biofuels, growing the feedstock requires land, so the credit represents the carbon benefit of devoting land to biofuels. Unfortunately, by excluding emissions from land use change, most previous accountings were one-sided because they counted the carbon benefits of using land for biofuels but not the carbon costs – the carbon storage and sequestration sacrificed by diverting land from its existing uses. Without biofuels, the extent of cropland reflects the demand for food and fiber. To produce biofuels, farmers can directly plow up more forest or grassland, which releases to the atmosphere much of the carbon previously stored in plants and soils through decomposition or fire. The loss of maturing forests and grasslands also forgoes ongoing carbon sequestration as plants grow each year, and this foregone sequestration is the equivalent of additional emissions. Alternatively, farmers can divert existing crops or croplands into biofuels, which causes similar emissions indirectly. The diversion triggers higher crop prices, and farmers around the world respond by clearing more forest and grassland to replace crops for feed and food. Studies have confirmed that higher soybean prices accelerate clearing of Brazilian rainforest. (*9*) Projected corn ethanol in 2016 would use 43% of the U.S. corn land harvested for grain in 2004 (*1*)—overwhelmingly for livestock (*10*)—requiring big land use changes to replace that grain.

Because existing land uses *already* provide carbon benefits in storage and sequestration (or, in the case of cropland, carbohydrates, proteins and fats), dedicating land to biofuels can potentially reduce greenhouse gasses only if doing so *increases* the carbon benefit of land. Proper accountings must reflect the net impact on the carbon benefit of land, not merely count the gross benefit of using land for biofuels. Technically, as shown in Table 1, to generate greenhouse benefits, the carbon generated on land to displace fossil fuels (the carbon uptake credit) must exceed the carbon storage and sequestration given up directly or indirectly by changing land uses (the emissions from land use change).

Many prior studies have acknowledged but failed to count emissions from land use change because they are difficult to quantify. (*1*) One prior quantification lacked formal agricultural modeling and other features of our analysis. (*11*, *1*) To estimate land use changes, we used a worldwide model

Sciencexpress Report

Land Clearing and the Biofuel Carbon Debt

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Increasing energy use, climate change, and carbon dioxide (CO_2) emissions from fossil fuels make switching to low-carbon fuels a high priority. Biofuels are a potential low-carbon energy source, but whether biofuels offer carbon savings depends on how they are produced. Converting rainforests, peatlands, savannas, or grasslands to produce food-based biofuels in Brazil, Southeast Asia, and the United States creates a 'biofuel carbon debt' by releasing 17 to 420 times more CO_2 than the annual greenhouse gas (GHG) reductions these biofuels provide by displacing fossil fuels. In contrast, biofuels made from waste biomass or from biomass grown on abandoned agricultural lands planted with perennials incur little or no carbon debt and offer immediate and sustained GHG advantages.

Demand for alternatives to petroleum is increasing the production of biofuels from food crops such as corn, sugarcane, soybeans and palms. As a result, land in undisturbed ecosystems, especially in the Americas and Southeast Asia, is being converted to biofuel production and to crop production when agricultural land is diverted to biofuel production. Such land clearing may be further accelerated by lignocellulosic biofuels, which will add to the agricultural land base needed for biofuels unless biofuels are produced from crops grown on abandoned agricultural lands or from waste biomass.

Soils and plant biomass are the two largest biologically active stores of terrestrial carbon, together containing ~2.7 times more carbon than the atmosphere (*1*). Converting native habitats to cropland releases CO_2 due to burning or microbial decomposition of organic carbon stored in plant biomass and soils. After a rapid release from fire used to clear land or from decomposition of leaves and fine roots, there is a prolonged period of GHG release as coarse roots and branches decay and as wood products decay or burn (*2–4*).

We call the amount of CO_2 released during the first 50 years of this process the 'carbon debt' of land conversion. Over time, biofuels from converted land can repay this carbon debt if their production and combustion has net GHG emissions that are less than the life-cycle emissions of the fossil fuels they displace. Until the carbon debt is repaid, biofuels from converted lands have greater GHG impacts than the fossil fuels they displace. For crops with non-biofuel co-products (e.g., palm kernel oil and meal, soybean meal, or distillers' dry grains), we partition the carbon debt into a 'biofuel carbon debt' and a 'co-product carbon debt' based on the market values of the biofuel and its co-products (*5*).

Here we calculate how large biofuel carbon debts are, and how many years are required to repay them, for six different cases of native habitat conversion: Brazilian Amazon to soybean biodiesel, Brazilian Cerrado to soybean biodiesel, Brazilian Cerrado to sugarcane ethanol, Indonesian or Malaysian lowland tropical rainforest to palm biodiesel, Indonesian or Malaysian peatland tropical rainforest to palm biodiesel, and US Central grassland to corn ethanol (*5*) (table S1). These cases illustrate some of the greater current impacts of biofuels on habitat conversion. Indonesia and Malaysia account for 86% of global palm oil production (*6*). Accelerating demand for palm oil is contributing to the 1.5% annual rate of deforestation of tropical rainforests in these nations (*7*). An estimated 27% of concessions for new palm oil plantations are on peatland tropical rainforests, totaling 2.8×10^6 ha in Indonesia (*7*). Brazilian Cerrado is being converted to sugarcane and soybeans, and the Brazilian Amazon is being converted to soybeans (*8–10*). Grassland in the US, primarily rangeland or land currently retired in conservation programs, is being converted to corn production. Rising prices for corn, wheat, and soybeans could cause a substantial portion of the 1.5×10^7 ha of land currently in the US Conservation Reserve Program to be converted to cropland (*11*).

We estimated carbon debts by calculating the amount of CO_2 released from ecosystem biomass and soils. Our analyses account for the amount of plant carbon released as CO_2 through decomposition and combustion, the amount converted to charcoal (charcoal is not part of the carbon debt because it is recalcitrant to decomposition), and the amount incorporated into merchantable timber and other long-lived forestry products, which have a half-life of about 30 years (*3*, *12*). Changes in carbon stores caused by land conversion and biofuel production, mainly from accelerated decomposition,

Key issues

- Both papers address land use change – from 'natural' to managed
- Searchinger et al. – focus on transformation from food to fuel uses and downstream impacts, using US data
- Fargione et al. – focus on transformation from forest or grassland to cropland/plantation, using international data

- Both papers estimate 'biofuel carbon debt'
- Common scenario – 'grassland' to corn

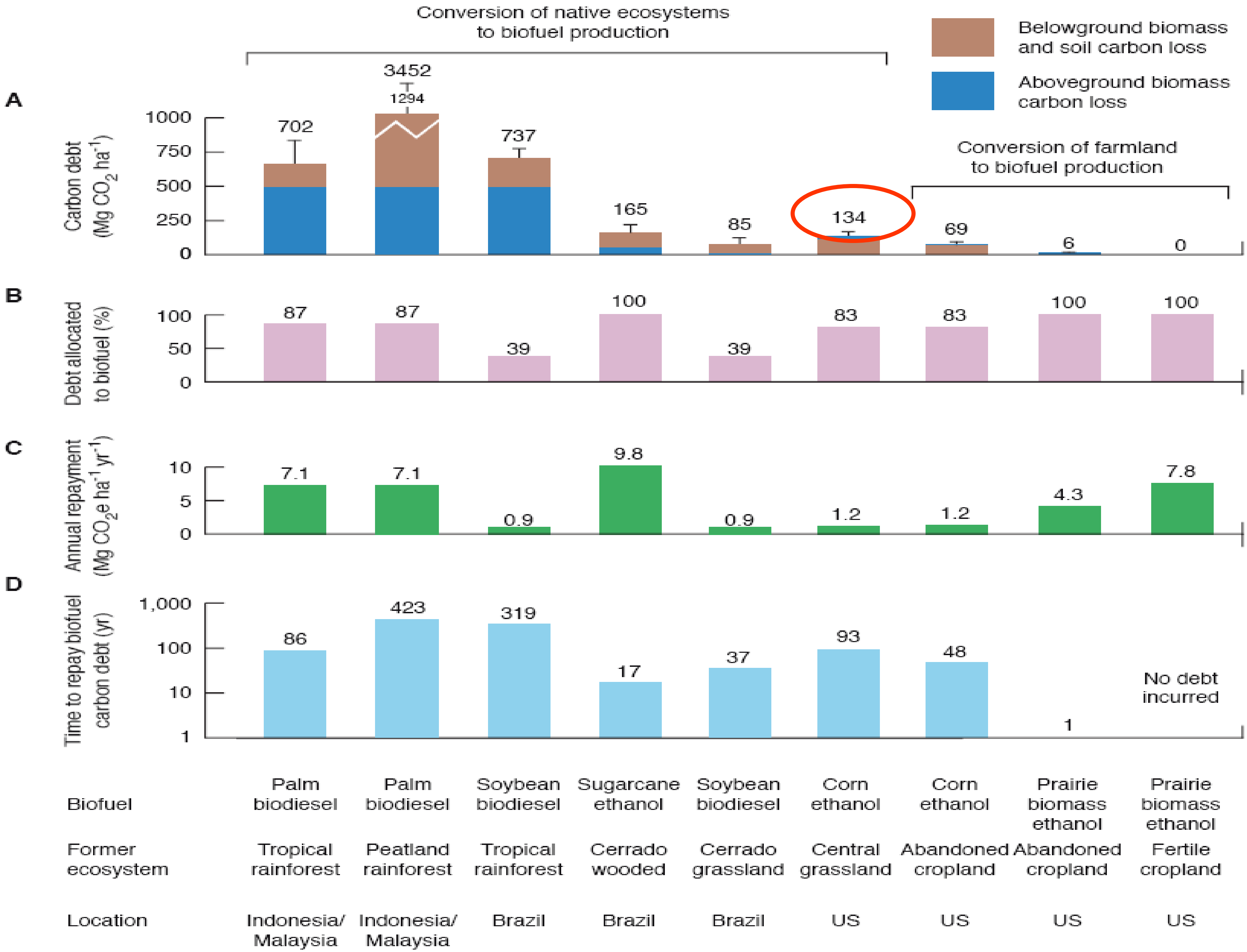
Searchinger et al.

- Method – use of the GREET model
- Assumptions:
  - Increasing biofuel use according to mandates in Energy Act
  - Current demand for grain does not change…

> farmers will replace most of the grain diverted from food and feed by ethanol because the demand for overall food and feed – as opposed to any particular grain -- is inelastic. (*19*)

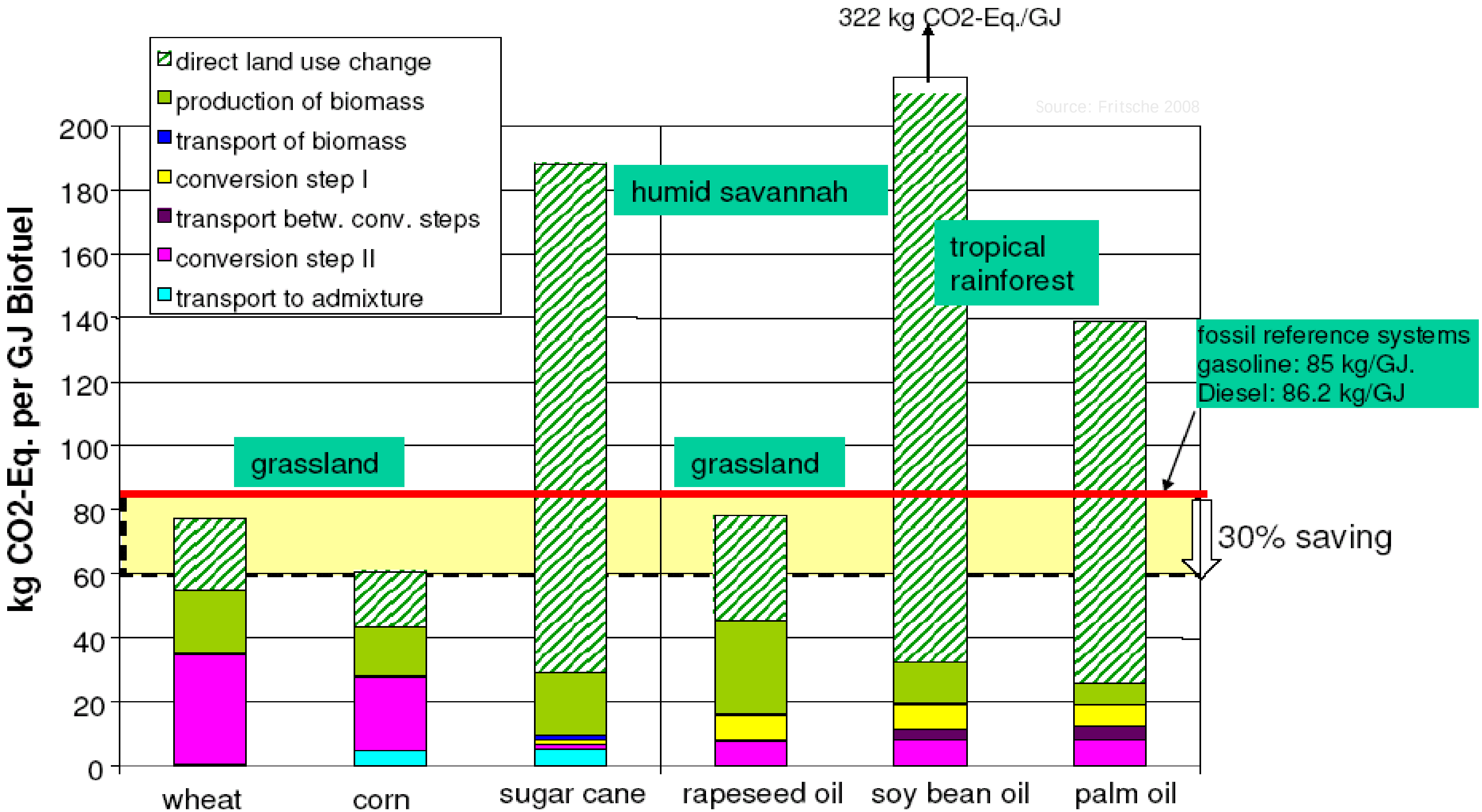
  - … and replacing grain production will require about .85 ha per ha lost to ethanol production

> We calculated that an ethanol increase of 56 billion liters, diverting corn from 12.8 million hectares of U.S. cropland, would in turn bring 10.8 million hectares of additional land into cultivation. Locations would include 2.8 million hectares in Brazil, 2.3 million hectares in China and India, and 2.2 million hectares in the U.S.



Conversion of native ecosystems to biofuel production
Belowground biomass and soil carbon loss
Aboveground biomass carbon loss
Conversion of farmland to biofuel production
A
Carbon debt (Mg CO_2 ha^{-1})
1000
750
500
250
0
702
3452
1294
737
165
85
134
69
6
0
B
Debt allocated to biofuel (%)
100
50
0
87
87
39
100
39
83
83
100
100
C
Annual repayment (Mg CO_2e ha^{-1} yr^{-1})
10
5
0
7.1
7.1
0.9
9.8
0.9
1.2
1.2
4.3
7.8
D
Time to repay biofuel carbon debt (yr)
1,000
100
10
1
86
423
319
17
37
93
48
1
No debt incurred
Biofuel
Palm biodiesel
Palm biodiesel
Soybean biodiesel
Sugarcane ethanol
Soybean biodiesel
Corn ethanol
Corn ethanol
Prairie biomass ethanol
Prairie biomass ethanol
Former ecosystem
Tropical rainforest
Peatland rainforest
Tropical rainforest
Cerrado wooded
Cerrado grassland
Central grassland
Abandoned cropland
Abandoned cropland
Fertile cropland
Location
Indonesia/ Malaysia
Indonesia/ Malaysia
Brazil
Brazil
Brazil
US
US
US
US

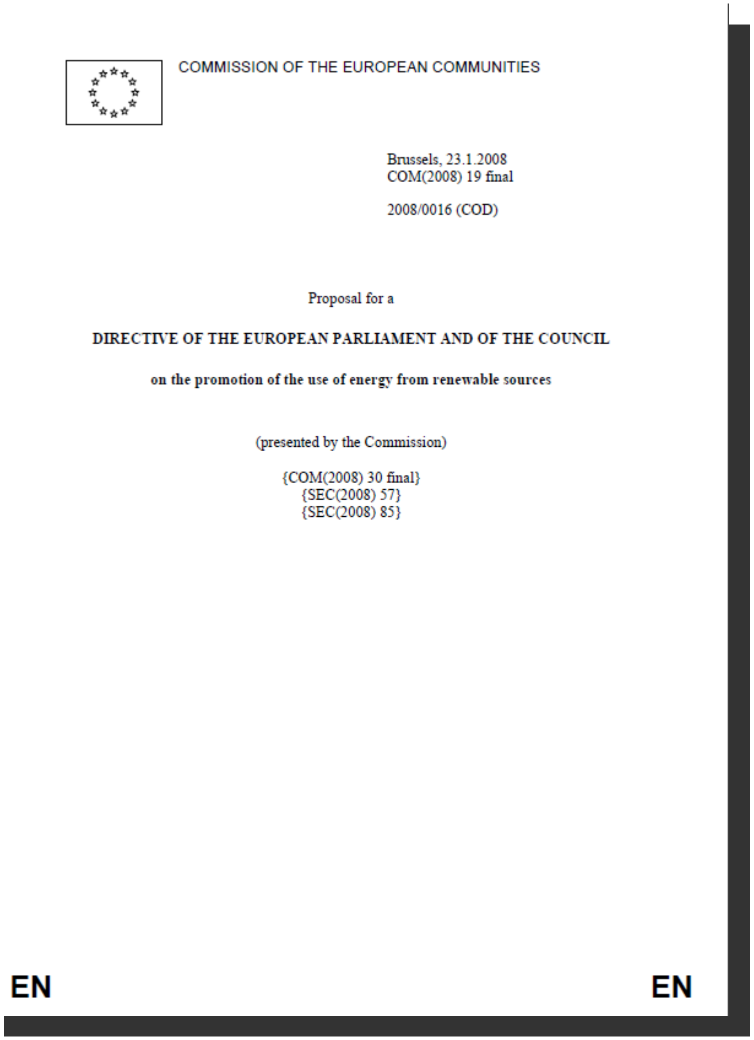
GHG impact including LUC



funded by FAO, Umwelt Bundes Amt

EU perspective on sustainability

EU Directive



COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 23.1.2008
COM(2008) 19 final

2008/0016 (COD)

Proposal for a

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on the promotion of the use of energy from renewable sources

(presented by the Commission)

{COM(2008) 30 final}
{SEC(2008) 57}
{SEC(2008) 85}

EN EN

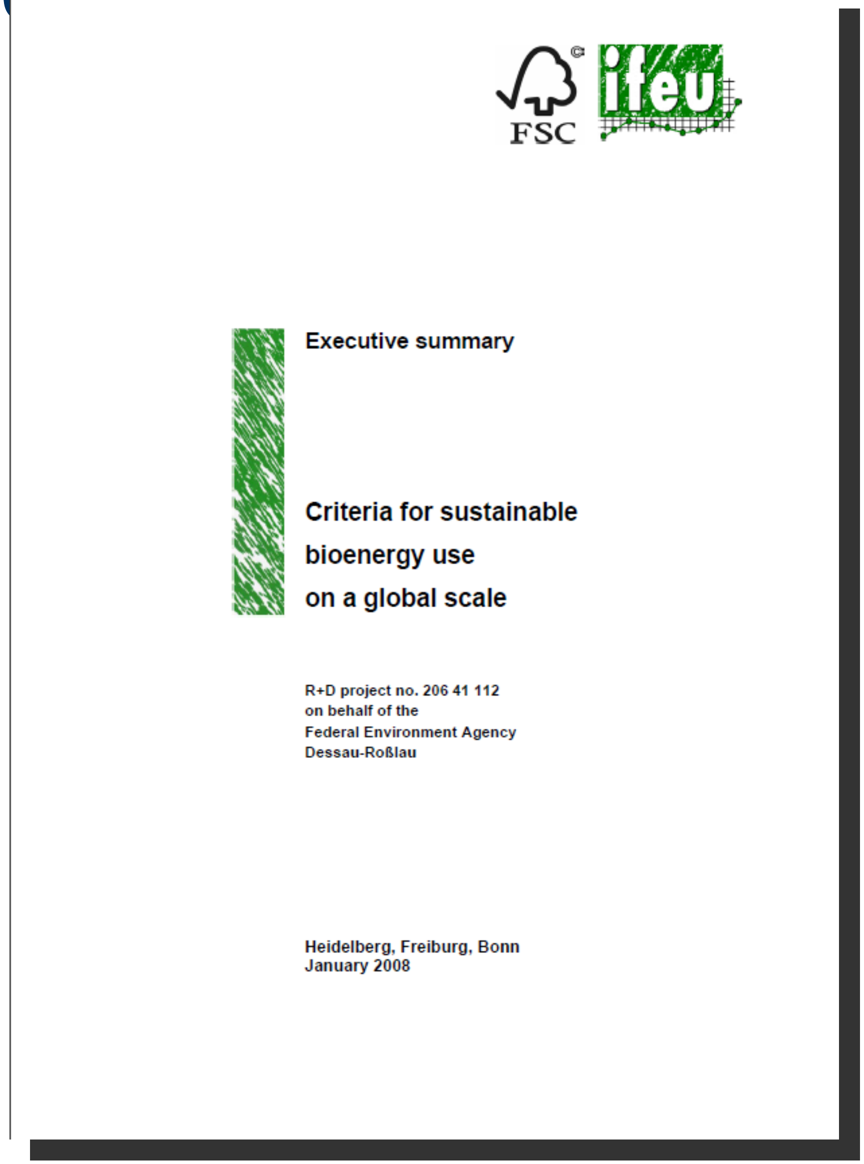
- January 2008 – New bioenergy directive proposal
- 20% target for renewable energy by 2020
- 10% target for renewable fuels in transportation fuel mix
- Many felt it did not emphasize sustainability in adequate detail

Past actions & current feelings

- March 2007 – EC called for criteria and provisions to ensure sustainable production and use of bioenergy
- Spring 2007 – EU biofuel consultations sought feedback on the question 'how should a biofuel sustainability system be designed'
- National level – UK, Germany, and the Netherlands have each been active in formulating sustainability criteria for biofuels
- NGO community – in part supportive of a certification program, but still many who want to see the EU biofuel target cut

Some national examples...

Germany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Executive summary

Criteria for sustainable bioenergy use on a global scale

R+D project no. 206 41 112
on behalf of the
Federal Environment Agency
Dessau-Roßlau

Heidelberg, Freiburg, Bonn
January 2008

- December 5, 2007 – German Federal Cabinet passed a draft of BioNachV (Biomass Sustainability Ordinance)
- Ordinance designed to ensure that:
  - Minimum requirements of sustainable cultivation
  - Protection of natural ecosystems is ensured
  - Biofuels provide a specific potential for reducing greenhouse gas emissions with regard to the entire production chain

The Netherlands

- Background
  - Debate on use of palm oil dates back to 2005
  - Power producer Essent used palm oil for large-scale co-firing in gas-fired power plant
  - NGO’s claimed this to cause rainforest destruction
  - Pressure caused Essent to stop co-firing palm oil
  - Subsidy for green electricity was put on hold
- Dutch Ministry of Economic Affairs, Ministry of Environment
  - Announced to aim for incentives for better GHG performance
  - Started development of a method for GHG calculation
    - Methodology part of ‘Commission Cramer’
    - Both for biofuels and bio-electricity

Netherlands approach

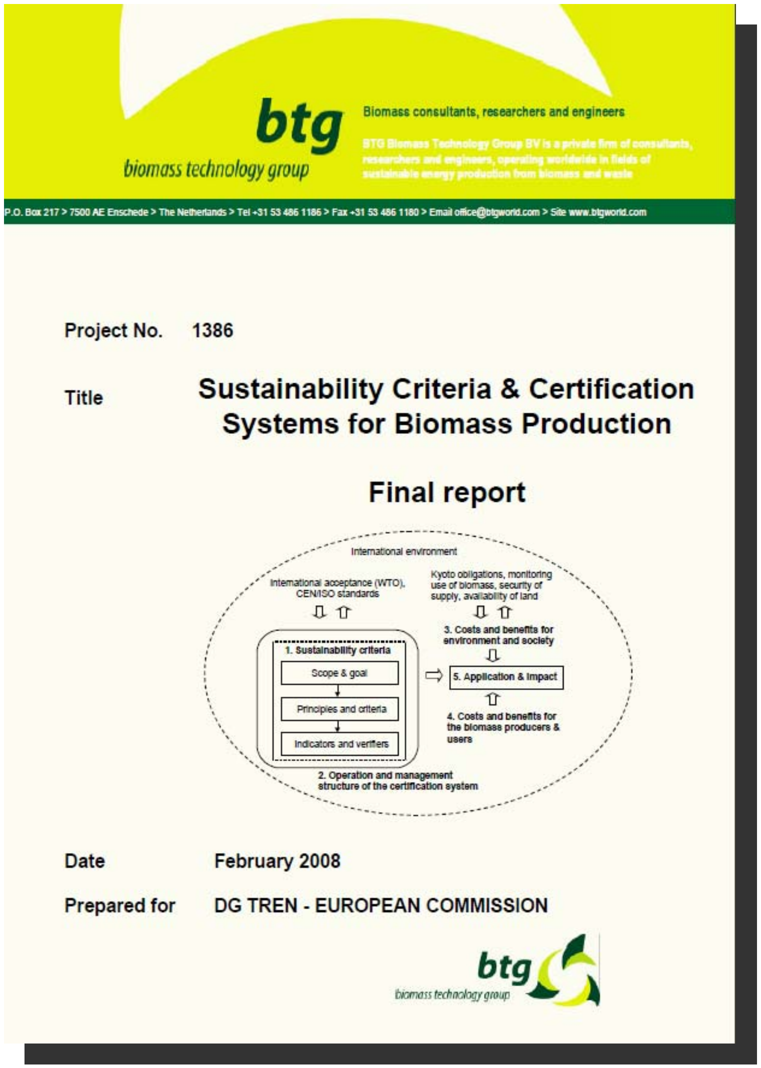
- Direct land use change is included
  - Based on IPCC data, including both above- and below-ground carbon
- Indirect land use **not** included
- N_2O emissions from fields included: IPCC data, not taking soil carbon content into consideration
- Emissions from waste streams with positive market value included (such as wood, sawdust, used cooking oils)

Decision on indirect land use change

- Indirect land use change was heavily debated
- Conclusion: communicate the results with a disclaimer, which includes:
  - GHG performance is not the only indicator for sustainability
  - Indirect LUC is not included and as a consequence
    - Tool is suitable to identify possibilities to improve GHG performance
    - Tool gives a maximum estimation of GHG emission reduction of biofuels produced on prior agricultural land
    - Tool is suitable to compare GHG performance of biofuels produced on non-agricultural land
    - Tool is less suitable to compare biofuels produced from residues or produced on marginal land to biofuels produced on agricultural land – no inclusion of potential LUC associated with such a move

...and back to the EU

Background reports prepared...


btg biomass technology group

Biomass consultants, researchers and engineers

BTG Biomass Technology Group BV is a private firm of consultants, researchers and engineers, operating worldwide in fields of sustainable energy production from biomass and waste

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Project No. 1386

Title: Sustainability Criteria & Certification Systems for Biomass Production

Final report

Date: February 2008

Prepared for: DG TREN - EUROPEAN COMMISSION

btg biomass technology group

- February 2008
- Summary of all sustainability criteria, certification systems for biomass production
- Prepared for DG-TREN (responsible for the Bioenergy Directive)

Source: http://ec.europa.eu/energy/renewables/bioenergy/doc/sustainability_criteria_and_certification_systems.pdf

...and then...

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Commission launches consultation on requirements for a sustainability scheme for biomass for energy purposes

Reference: IP/08/1160 Date: 16/07/2008

HTML: EN FR DE
PDF: EN FR DE
DOC: EN FR DE

IP/08/1160

Brussels, 16 July 2008

Commission launches consultation on requirements for a sustainability scheme for biomass for energy purposes

The European Commission is inviting all stakeholders, including energy companies, project developers, equipment manufacturers, government services, agricultural and forest industry, environmental NGOs and all other interested stakeholders, including from outside the EU, to help identify the need to develop at EU level sustainability criteria for biomass for energy purposes.

On 23 January 2008 the Commission made a far-reaching package of energy and climate change related proposals including a draft directive to promote renewable energy and increase its share to 20% by 2020[1]. As part of the proposal for a Directive on the promotion of energy from renewable sources, the Commission developed a scheme to ensure that only sustainable produced biofuels and bioliquids would count towards the EU's renewable energy targets.

The Commission also undertook to report on requirements for a sustainability scheme for energy uses of biomass other than biofuels and bioliquids by 31 December 2010. The on-line consultation is aimed at providing the Commission with stakeholder views on the need for a biomass sustainability scheme and specific key principles and criteria to be developed at EU level to ensure that the use of biomass for energy purposes avoids environmental risks. The consultation will be open until 30 September 2008.

More information on the consultation and the questionnaire itself is available here.

[1] http://ec.europa.eu/energy/climate_actions/index_en.htm

…a consultation period…

- The objective of the consultation is to seek views on key principles and criteria/indicators to be developed at EU level to ensure that the biomass for energy purposes comes from sustainable sources.
- The Commission has undertaken to report on such requirements by 2010 in its proposal for a Directive on the promotion of the use of energy from renewable sources [COM(2008)19].

…leading to this:

- **17 Dec. 2008**: EU Parliament voted in favour of a directive on the promotion of the use of energy from renewable sources.

- **31 March 2010**: Deadline for EU states to present National Action Plans (NAPs) on renewables.

What does this mean for Germany...?

- Some aspects of national law may have to change

- For example, in Germany:
- The "*Draft Law on the Amendment of the Promotion of Biofuels*" is put on hold until 19 October 2009, because:
  - Sustainability criteria are included in the EU directive on the use of energy from renewable resources (RES directive);
  - Some of the provisions in the German draft stand in contradiction with the RES;
  - The WTO/GATT compatibility of singling out soybean oil and palm oil compared to other feedstock with regards to sustainability requirements was questioned;
  - The draft law lacked clarity especially regarding the entry into force of sustainability criteria which would have negative effects for planning purposes of the industry.

...and the Netherlands?

- Late 2008 - Dutch Ministry of Environment announced that:
  - Obligatory reporting for biofuels per 1-1-2009 is cancelled
    - Draft EU directory proposal contains sustainability criteria
    - NL position towards this proposal: additional criteria should be added
    - Following EU procedures, NL will not introduce own legislation pending formulation of EU legislation
  - Stakeholder meetings are organised to investigate steps before 2010, such as pilots, voluntary reporting on sustainability of biofuels

Certification schemes

What is certification?

- An initiative that encourages landowners to practice sustainable forestry
- Designed to give consumers assurance that forest products come from sustainable forests
- Can be forest certification (management-focused) and chain-of-custody (product-focused)

How does it work?

- Process by which a forest owner voluntarily requests an inspection of a forest, in order to determine if pre-defined management standards are being met
- Process for assessing if a forest is managed sustainably
- A way to communicate environmental information about forests to consumers

Certification schemes

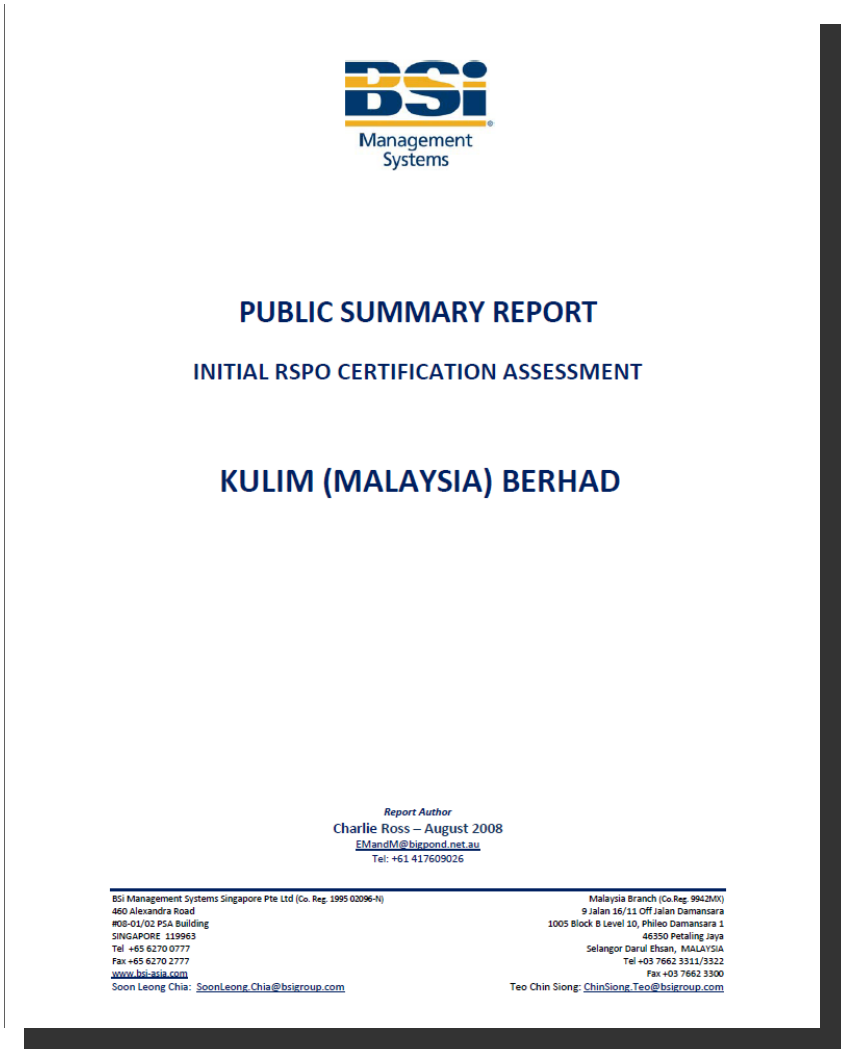
- Biomass energy crops
  - Roundtable for Sustainable Palm Oil (RSPO)
    - Developed a set of criteria and indicators, certification system
- Power sector
  - Developed certification standards for internal use (i.e. Essent Green Gold Label)
  - Green electricity labels are usually national level
- Forest-based systems
  - Forest Stewardship Council
  - Programme for the Endorsement of Forest Certification Schemes
  - Others
  - Note: most forest-based systems are guided by International Standards Organisation (ISO) guidelines
- Clean Development Mechanism
  - Promotes sustainable development in host country

Mandatory certification and the WTO

Principle	Voluntary certification	Mandatory certification
1. Greenhouse gas balance & carbon sinks	+	+
2. Competition with food / other indirect land use change	-	-
3. Biodiversity	+	+/-
4. Local environmental effects	+	+/-
5. Local economic effects	+/-	-
6. Social well-being of employees	+	-
7. Indigenous peoples' rights	+/-	-

Sources: BTG 2008, Bronckers Verberne et al. 2007; http://ec.europa.eu/energy/renewables/bioenergy/doc/sustainability_criteria_and_certification_systems.pdf

RSPO



Management Systems

PUBLIC SUMMARY REPORT

INITIAL RSPO CERTIFICATION ASSESSMENT

KULIM (MALAYSIA) BERHAD

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- Launched in 2003 after initial discussions (circa 2001)
- Based in Malaysia
- First plantations certified in 2008

Source: http://www.rspo.org/resource_centre/Kulim%20RSPO%20Public%20Summary%20Report%20120109.pdf

Forest certification

Sustainable management

- Forest managed to meet all regulations
  - Environmental
  - Social
  - Economic
- Balance each factor to meet the needs of the present without compromising the ability of future generations to meet their needs
- Read: ecosystem management!

Certification vs. ecosystem management

- Forest certification isn't necessary to guarantee sustainable ecosystem management
- On its own, certification may not be sufficient to do so

- Certification is best viewed as:
  - An important policy driver for improving forest management standards and practices
  - A means of satisfying buyer groups (i.e. intermediary companies) and consumers (i.e. end-users) of forest products

Two general approaches

1. Performance-based
   - Use criteria, performance measures and indicators to monitor performance over time (on the ground)

2. Management system-based
   - Generic guidelines and standards (ISO 14001)
   - Forestry specific guidelines (SFI, CSA)

- Certification is evolving to be a mixture of both approaches

Who sets the guidelines

- Governments
  - United Nations Commission on Sustainable Development (UNCSD)
    - Examples include the Helsinki, ITTO, Montreal Processes
    - Help to establish criteria and indicators
- Private organizations
  - American Forest and Paper Association (AF&PA)
    - US focused initiative
    - Sustainable Forestry Initiative (1994)
  - Programme for the Endorsement of Forest Certification schemes (1999)
    - Primarily European countries
- Non-governmental organizations (NGOs)
  - Forest Stewardship Council (1993)
  - Canadian Standards Association (CSA-Z 809) (1995)
  - International Standards Association (ISO 14001) (1996)

Who certifies?

- First party – the land owner or firm
- Second party – an industry or association
- Third party – an independent certifier
  - Rainforest Alliance (SmartWood, FSC)
  - Scientific Certification Systems (FSC)
  - Voluntary Verification (SFI, PEFC)

Is certification necessary?

- Many believe that sustainable forestry is already being practiced in the developed countries, where about 75% of the certified forests are now found
- Forest practice regulations in Canada and elsewhere guide forest operations on both public and private lands
- Demand being driven by large buyer groups who are being pressured to sell certified products
- Small owners may be forced to comply – non-voluntary

- But…shifting product requirements (i.e. from merchantable timber to *biofibre*) could increase the need for certification systems

Two certification examples

- SFI standard
  - US-based
  - 152 member companies & licensees
  - 84% of paper products (in USA)
  - 50% of solid wood (in USA)

- FSC Principles and Criteria
  - Presently most favoured by buyer groups (i.e. Home Depot, Lowes, IKEA)

Comparing the two systems

SFI Principles

- Practice sustainable forestry
- Engage in responsible practices
- Protect forest health and productivity
- Continually improve forest management practices
- Protect special sites

FSC Principles

- Compliance with laws and FSC principles
- Tenure and use rights and responsibilities
- Indigenous people's rights
- Community relations and worker's rights
- Benefits from the forest
- Environmental impact
- Management plan
- Monitoring & assessment
- High conservation value forests
- Plantations

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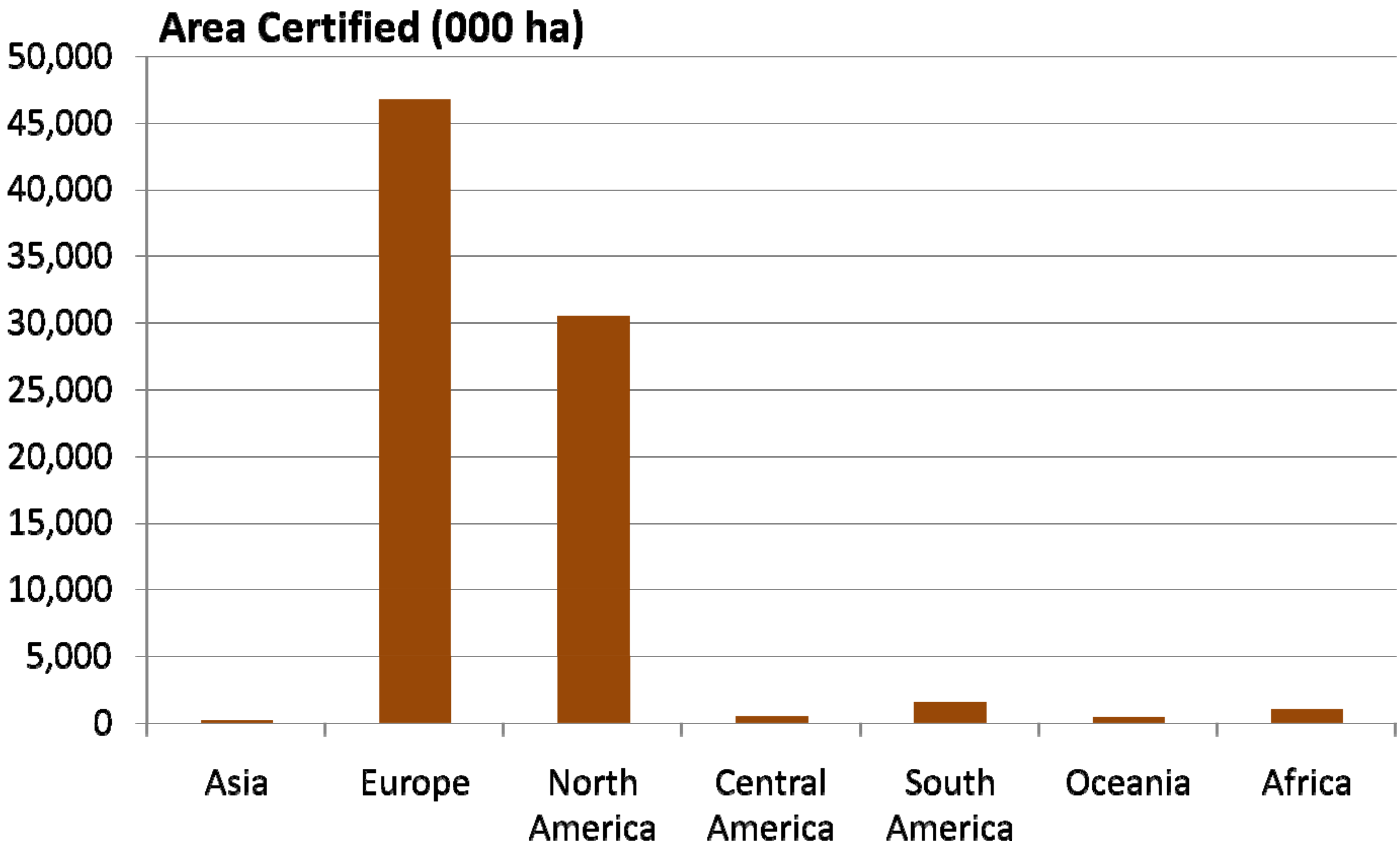
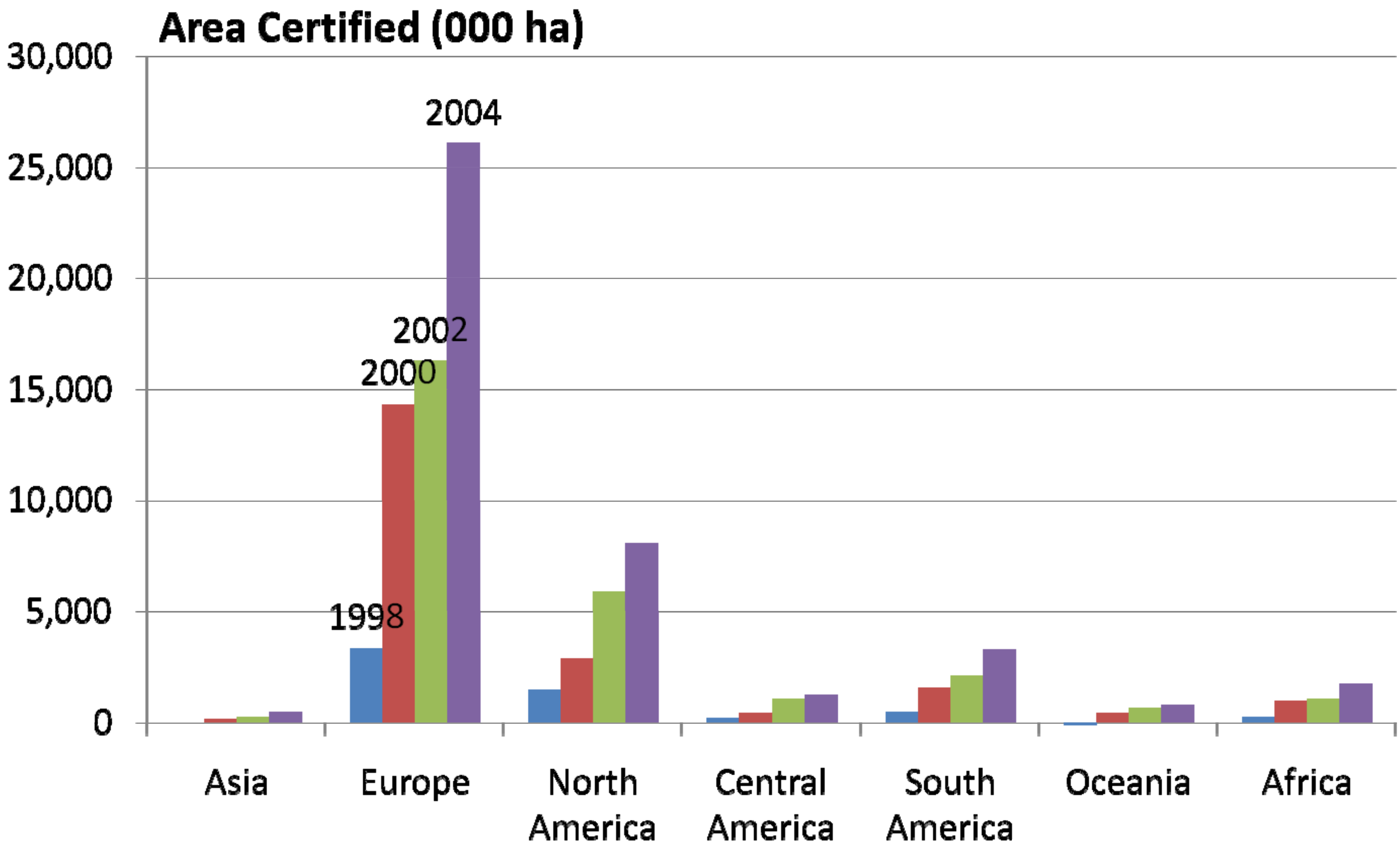
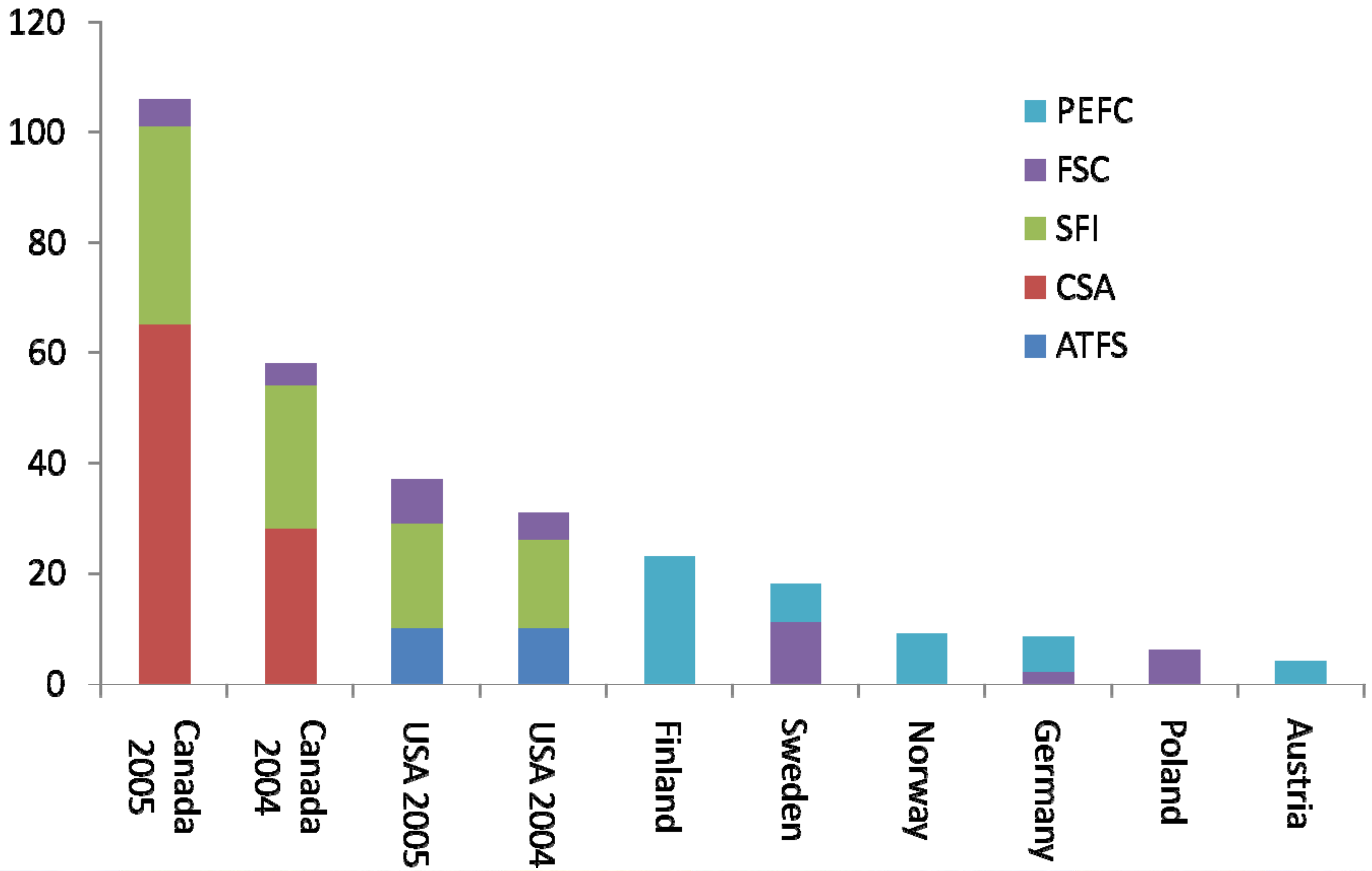
Areas Certified (all schemes, 2000)



Areas Certified (FSC, 1998-2004)



Area certified by Country Certification



What are the benefits?

- Objectives of forest certification are to:
  - Gain or keep access to markets that desire environmentally sensitive products
  - Promote sustainable forest management

- Producers may or may not gain market share, and may or may not receive a price premium for certified wood products
- One study shows that purchasers of certified wood products paid an average price premium of 6-7%; 35% of respondants paid <3%, and 55% paid <5%

Costs, benefits of forest certification

Main benefits	Main costs
Society	
•Mapping and protection of key areas of ecological significance •Increase in deadwood levels •Species diversity •Restoration of threatened forest types •Increased attention to worker safety •Better awareness and handling of stakeholders	•Loss of income from forestry sector •Potential loss of jobs
Users	
•Increased access to eco-sensitive markets •Price premium •Efficiency improvement by better management	•Costs of measures that lead to reduced harvest volumes •Direct costs of auditing

Conclusions

Conclusions

- Bioenergy alternatives are highly varied
- Sustainability issues for forest biomass largely related to indirect land use change, not so much food-vs.-fuel
- EU experiences:
  - Considerable demand for sustainability criteria – an ongoing debate
  - Individual country efforts have helped shape this debate
  - Highlights the need for additional certification outside the forest system
- Forest certification is widely practiced in the USA, Canada
  - Different approaches dominate in each country
  - Certification could keep bioenergy development in check until the science catches up to the new biofibre demand
  - Agricultural fibre not necessarily covered by any system!

Acknowledgements

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