LCA of imported food products: Impacts due to deforestation and burning of residues

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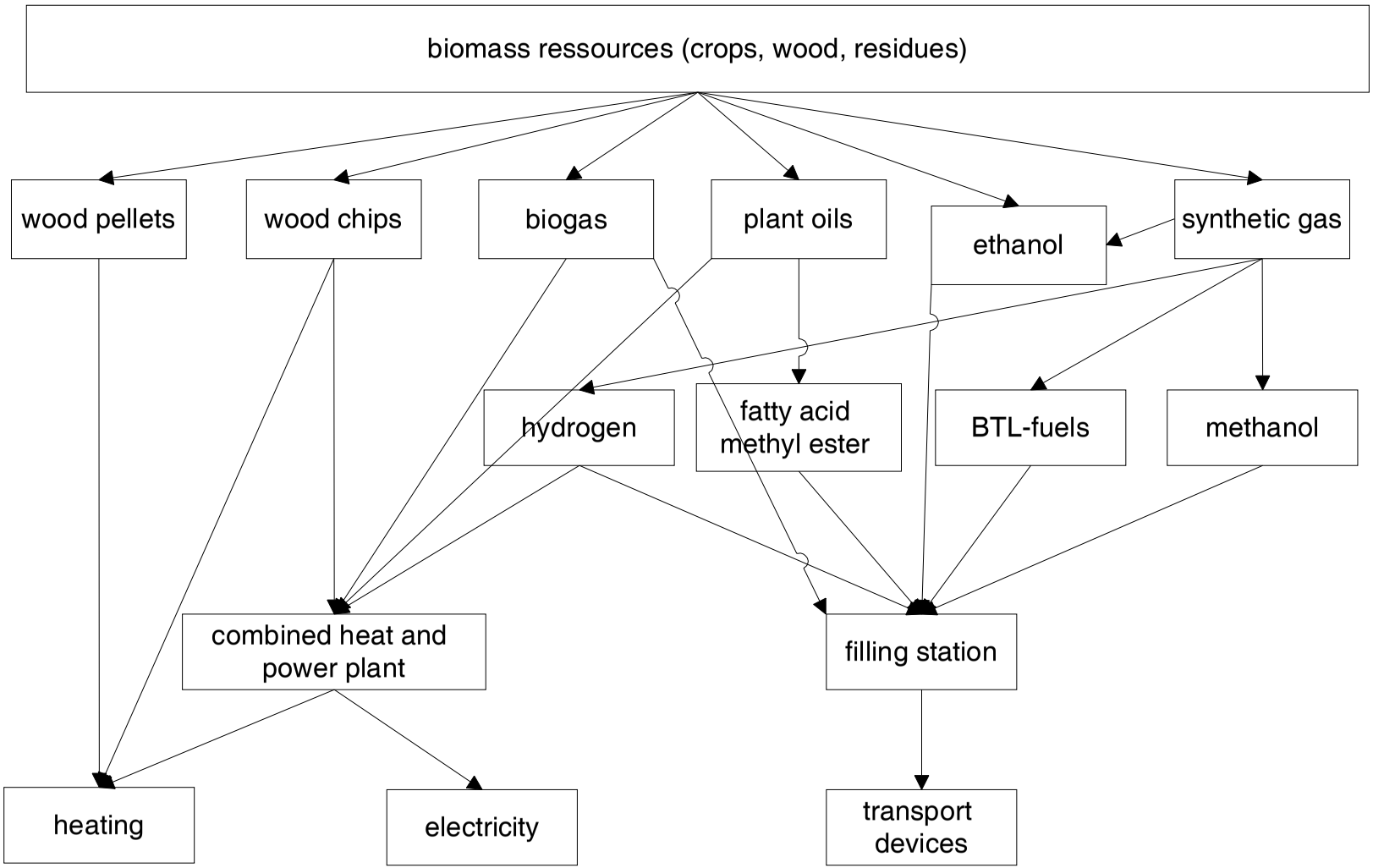
Topics

- Goal and scope of the project “Life cycle inventories of bioenergy”
- Methodology
- Examples
  - Soy beans
  - Plant oils
  - Sugar
- Conclusions

Problem setting for the project "LCI bioenergy"

- Diverging results for bioenergy in separate studies
- ecoinvent data v1.3 cover only a small part of bioenergy chains. No common database
- Aims to fully cover the of most important bioenergy chains
- Support for energy policy
- Examination for GHG reduction potential
- Support for tax regulation
- Investigation of several environmental aspects for biofuels

LCI Biofuels



Goal and Scope

- Time frame 2005 or new future technologies
- Investigation from well to Swiss wheel
- Products from multi-output processes are investigated with allocation factors that can be varied by the data user
- All direct couple products are included in the analysis
- Consistent investigation of energy, food and material products from biomass
- Clear differentiation of fossil and organic carbon
- Publication with ecoinvent data v2.0 summer 2007 (www.ecoinvent.org)

Soybean production

Increase of agricultural area

This area was cleared by soybean farmers in Novo Progreso.
Brazilian Government figures show that the rate of clearing has increased.

Increase of agricultural area

http://rainforests.mongabay.com/amazon/deforestation_calculations.html
http://sitemaker.umich.edu/section2group3/results_and_discussion

Clear cutting of primary forests

- Agricultural area is increased by clear cutting
- Land transformation leads to CO2 emissions. Burning of residues leads to further emissions
- Loss of biodiversity
- CO2 from land transformation accounts for about 90% of Brazil CO2 emissions
- Particles from residue burning are an important problem in South-East Asia

Principle of investigation

- What is the increase in agricultural area for the production in the reference year?
- What is emitted per m^2 of clear cut land?
- Allocation of emissions between wood and stubbed land
- Stubbed land is the main driver
- New elementary flow „CO_2, land transformation“ as used by IPCC for different possibilities of analysis

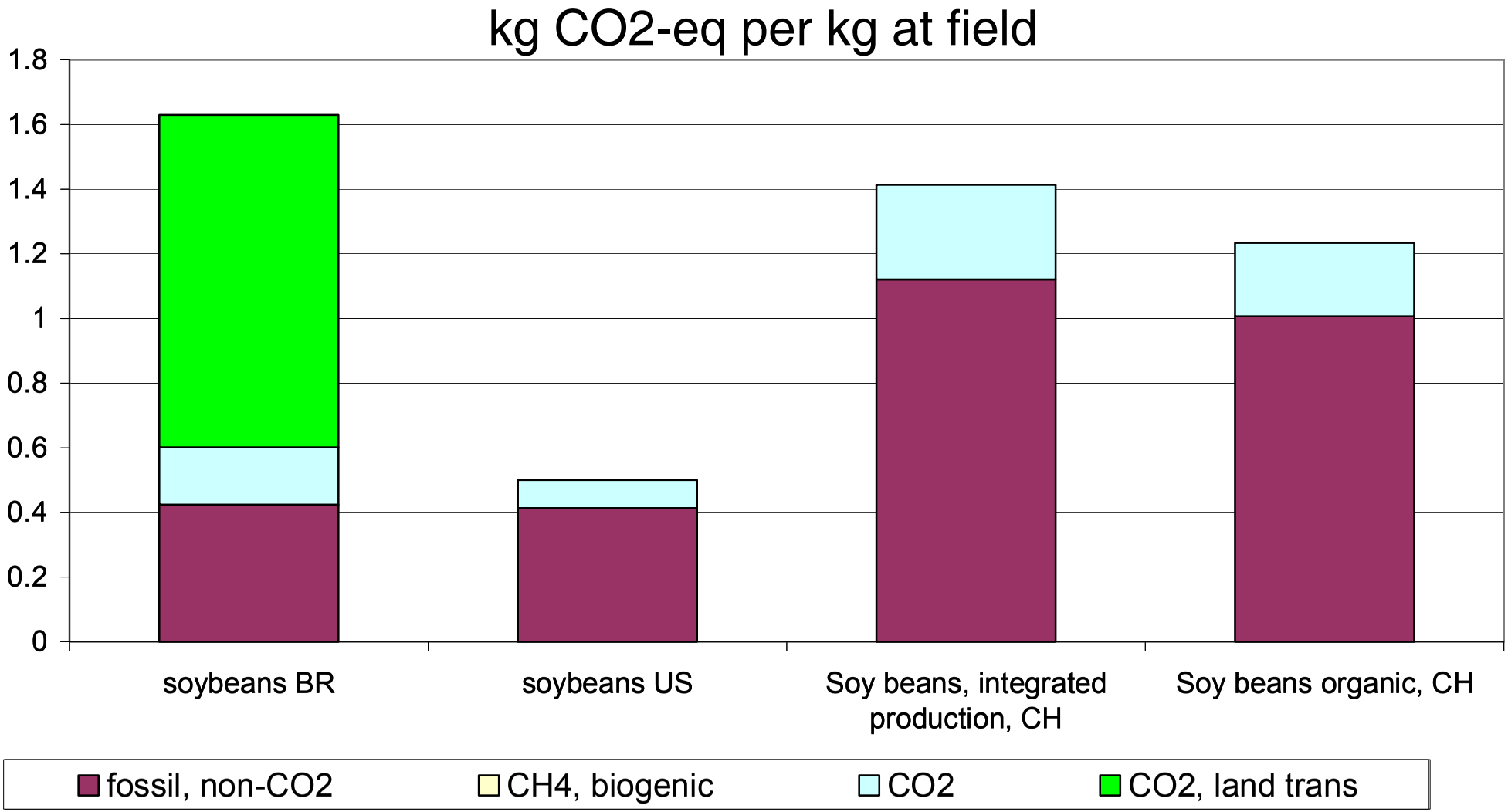
Inventory Clear Cutting

Name	Location	InfrastructureProcess	Unit	clear-cutting, primary forest	round wood, primary forest, clear-cutting, at forest road	provision, stubbed land
Location				BR	BR	BR
InfrastructureProcess				0	0	0
Unit				ha	m3	m2
round wood, primary forest, clear-cutting, at forest road	BR	0	m3	5.21E+1	100	-
provision, stubbed land	BR	0	m2	1.00E+4	-	100
Wood, primary forest, standing	-	-	m3	1.82E+2	29	71
Transformation, from tropical rain forest	-	-	m2	1.00E+4	-	100
Transformation, to forest, intensive, clear-cutting	-	-	m2	1.00E+4	-	100
power sawing, without catalytic converter	RER	0	h	1.24E+1	100	-
Carbon dioxide, land transformation	-	-	kg	1.20E+5	-	100
Carbon monoxide, fossil	-	-	kg	7.84E+3	-	100
Methane, fossil	-	-	kg	5.14E+2	-	100

Inventory agricultural product

Name	Location	Unit	soybeans, at farm
Location			BR
InfrastructureProcess			0
Unit			kg
Occupation, arable, non-irrigated		m2a	1.97E+0
Transformation, to arable, non-irrigated		m2	3.93E+0
Transformation, from forest, intensive, clear-cutting		m2	6.22E-2
Transformation, from arable, non-irrigated		m2	3.77E+0
Transformation, from shrub land, sclerophyllous		m2	1.03E-1
provision, stubbed land	BR	m2	6.22E-2

Soybean greenhouse gasses



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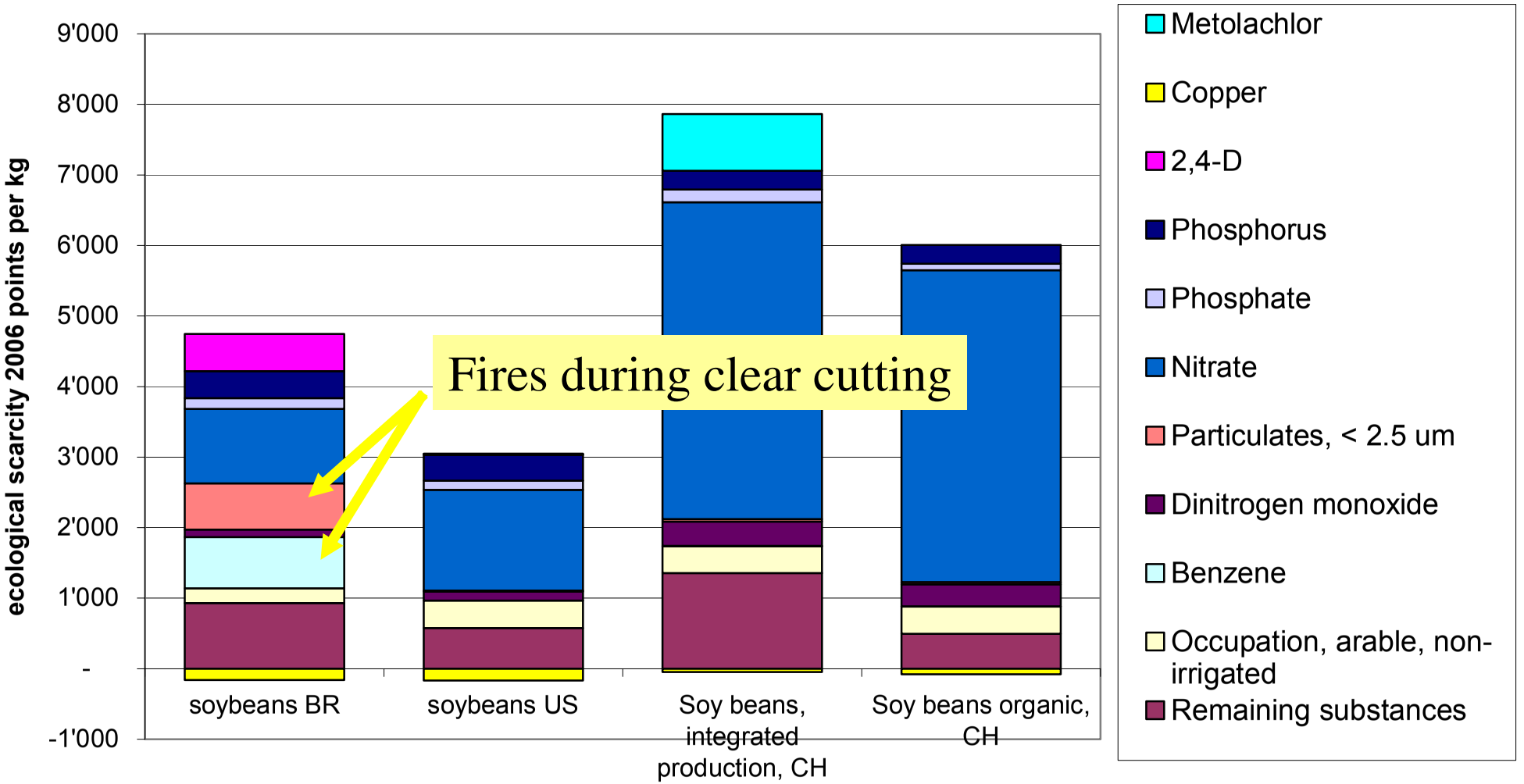
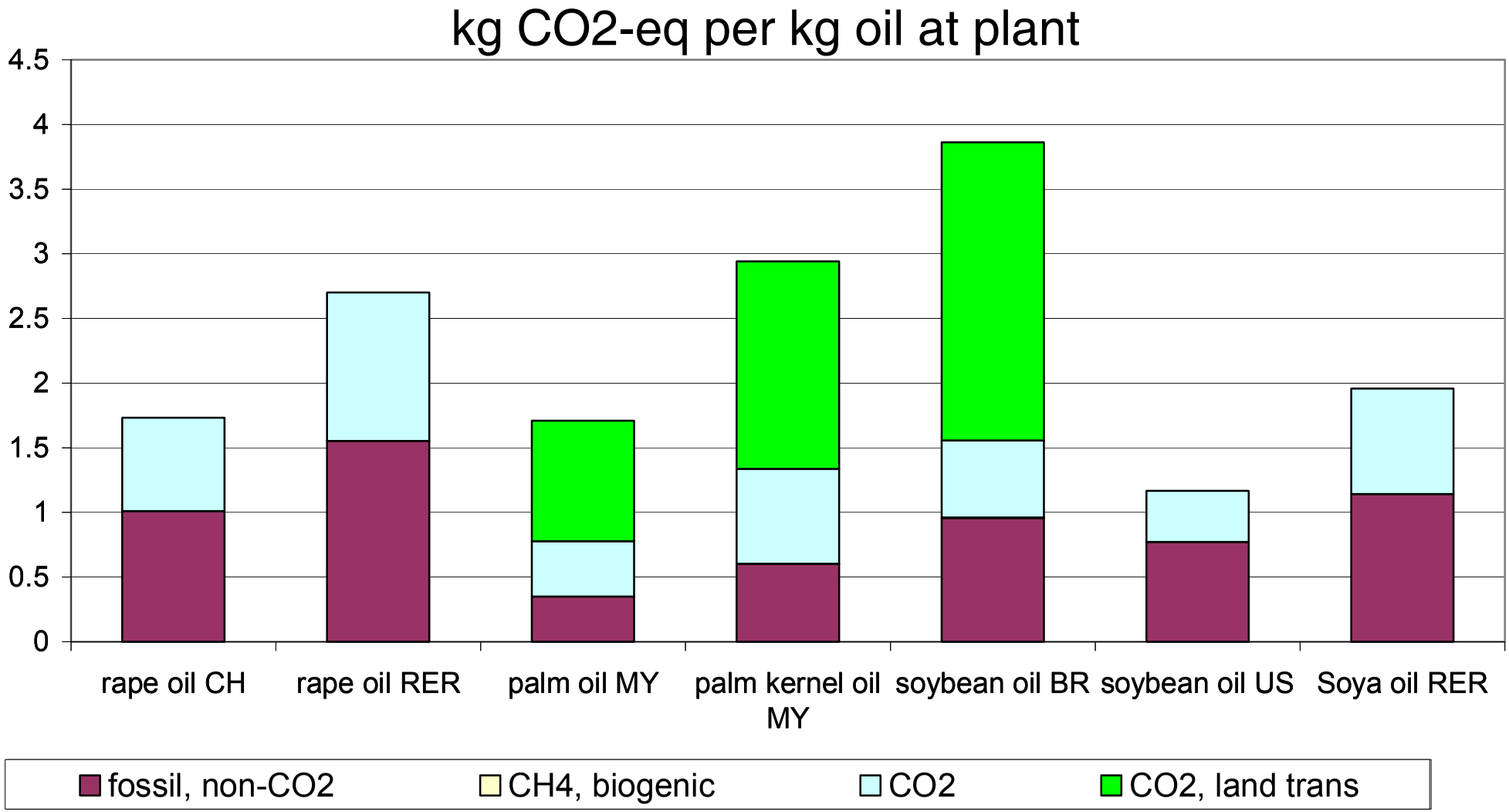
Soybean (ecological scarcity 2006)



- **Important differences in environmental profile**

Plant oil production



Sugar production of sugar cane

agriculture



Harvest manual/ machinery

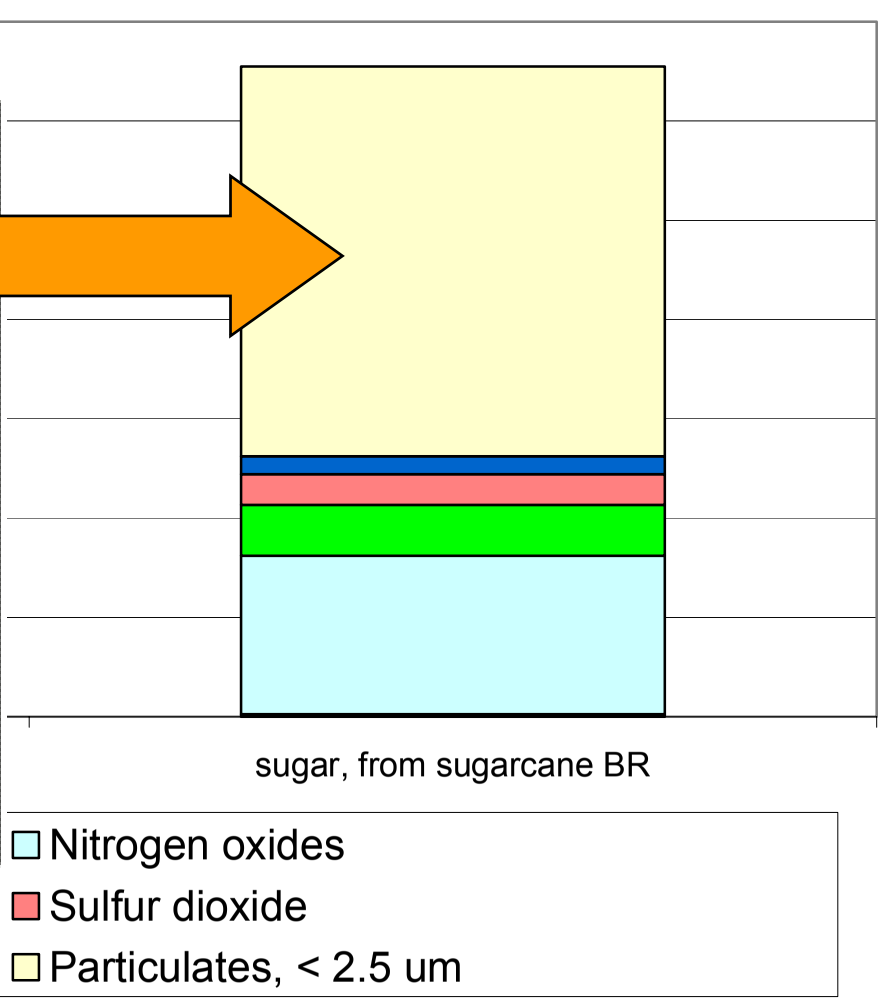


Sugar /Ethanol production



Sugar production

Figure 2 - The pre-harvesting burn in sugar cane field to eliminate most of the trash.



- **Respiratory effects, inorganic,Eco-indicator 99, (H,A) due to burning of residues**

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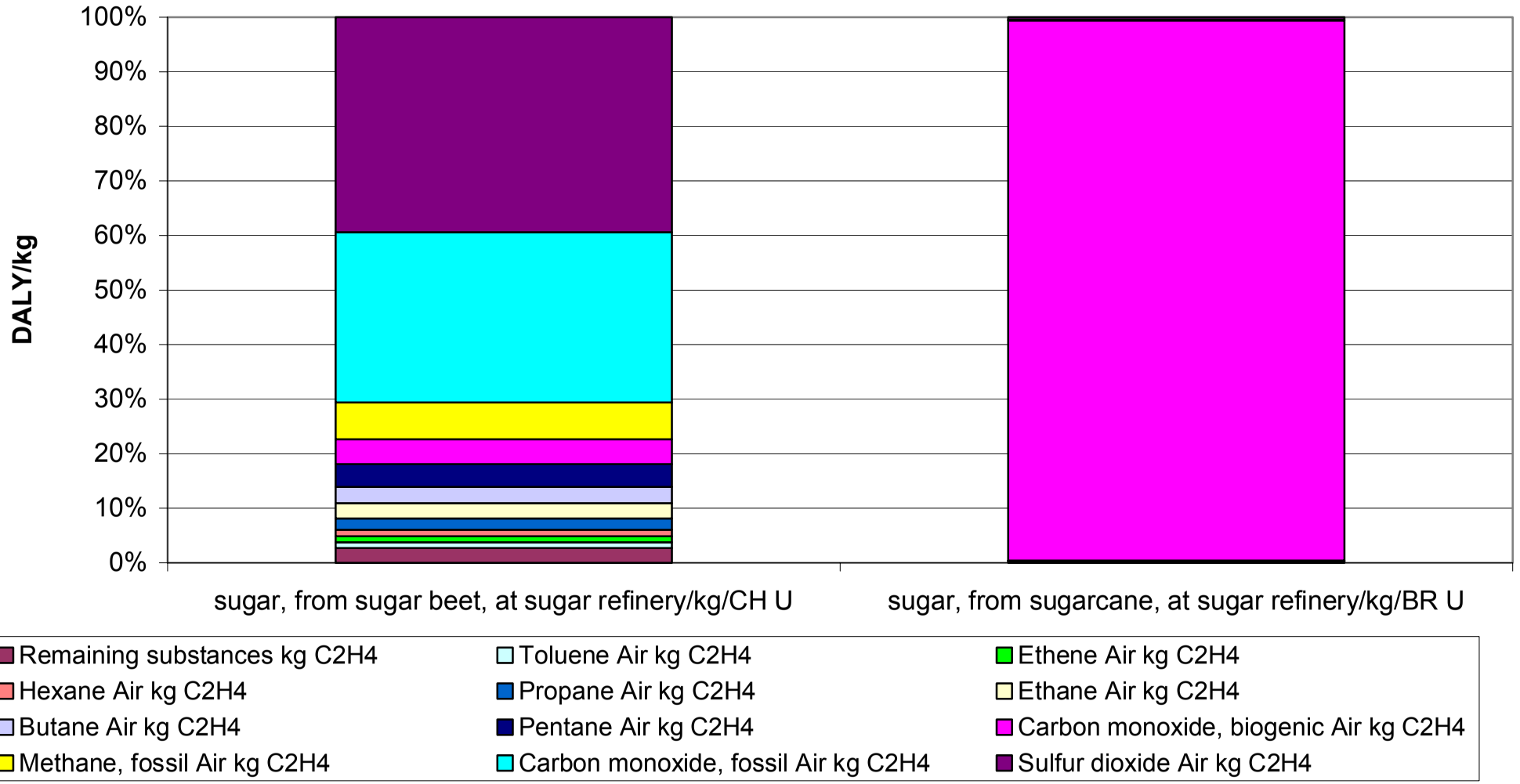
Sugar production



➢ **Respiratory effects, organic, Eco-indicator 99, (H,A) due to burning of residues**

Conclusions

- Agricultural products must be investigated on a regional level
- Specific problems must be included
- Preparation of fields, e.g. burning of residues is important
- CO2 emissions due to land transformation must be considered as a contributor to global warming
- ecoinvent data provide the necessary information

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Swiss Centre for Life Cycle Inventories

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