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Sustainable biomass production and use: local use and/or international trade?

**International Conference:
Stakes and Perspectives of biofuels for Africa**

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Sustainable Development and Innovation Management



Introduction (I)

International bio-energy markets developing fast...

- Growing bio-energy demand and international supply chains create unique opportunities for both producer regions and importers.
- Concerns, e.g.:
 - Fierce international debate on sustainability
 - Different perspectives (and interests) on governance, policy and priorities
 - Many trade barriers remain





Introduction (II)

Local uses of biomass could contribute to local development

- Many local uses of biomass possible, e.g.
 - Rural electrification
 - Medium to large scale electricity production
 - Use of traditional biomass
 - Use of ethanol for cooking
 - Use of transportation fuels in private/public transport
- Considerations, e.g.
 - Debate on sustainability
 - Priorities of uses
 - Economic performance (e.g. compared to international trade)
 - Energy security
 - Financing





Current biofuel uses

- 1st generation biofuels are main focus of current uses and trade
- Currently lignocellulosic biomass mainly used for electricity and heat (e.g. co-firing in coal power plants, domestic pellet boilers, etc.)
- However, perennial lignocellulosic crops have many advantages compared to annual crops (sustainability, costs, use of degraded land, etc.)

=> long term development?





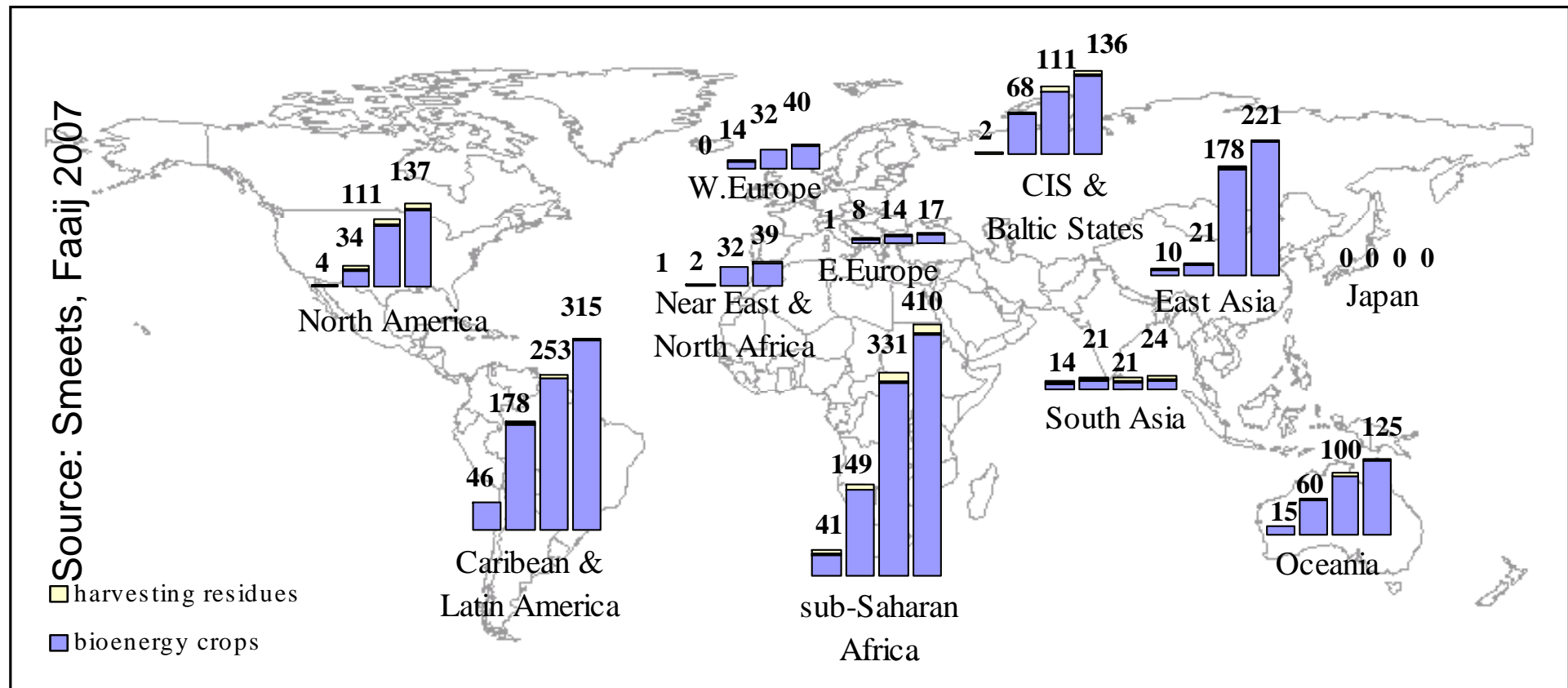
Bio-energy use worldwide

- Global Energy Demand: ~420 EJ
- About 10-15% (or 45 ± 10 EJ) of this demand is covered by biomass resources.
 - Traditional biomass: ~29
 - Commercial non-modern: 9 ± 6 EJ
 - Commercial: ~7 EJ
 - Liquid Biofuels ~0.5 EJ





Bioenergy production potential in 2050 for different levels of change in agriculture and trade (EJ/yr)



Bioenergy production potential based on **system 1** (rain-fed, mixed animal production)

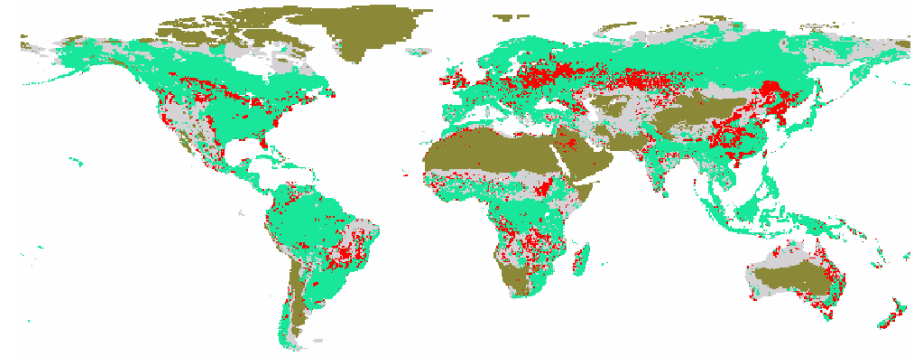
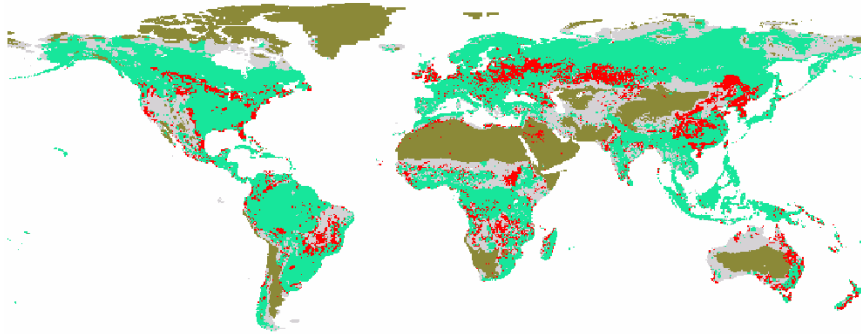
to system 4 (irrigation, very high technology level, landless animal production)

B1 2050

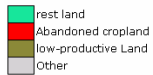
A1 2050



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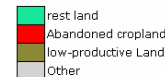
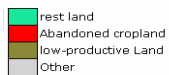
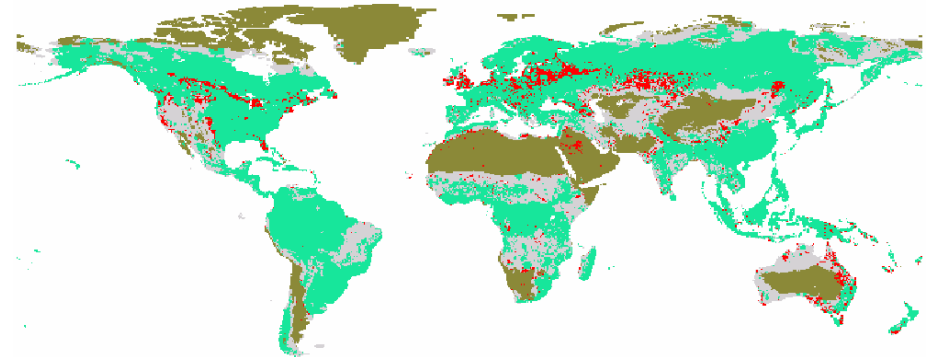
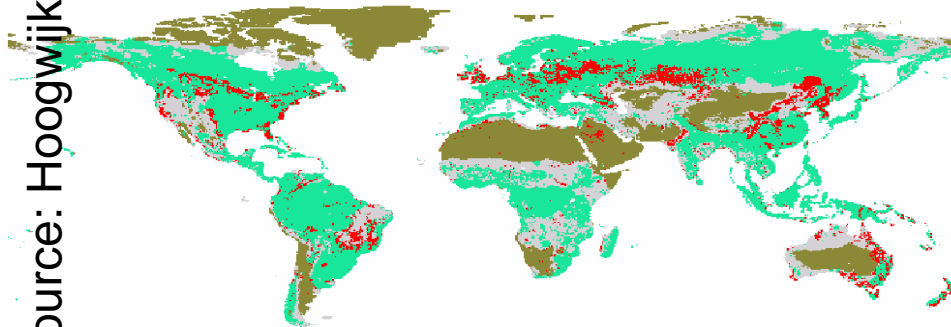


Integrated assessment modelling results (IMAGE)



B2 2050

A2 2050



Source: Hoogwijk, Faaij 2004



Current issues in international bioenergy trade

- Many opportunities for trade (and stabilizing markets).
- Many barriers remain
- Transparency (and thus information) vital to market parties (and govt.).
- Fierce international debate on sustainability; intensive dialogue and interaction
- Different perspectives (and interests) on governance, policy and priorities; overview is needed
- Entrepreneurs and policy makers are now dealing with development of regional or national biomass markets in a rapidly developing international context.





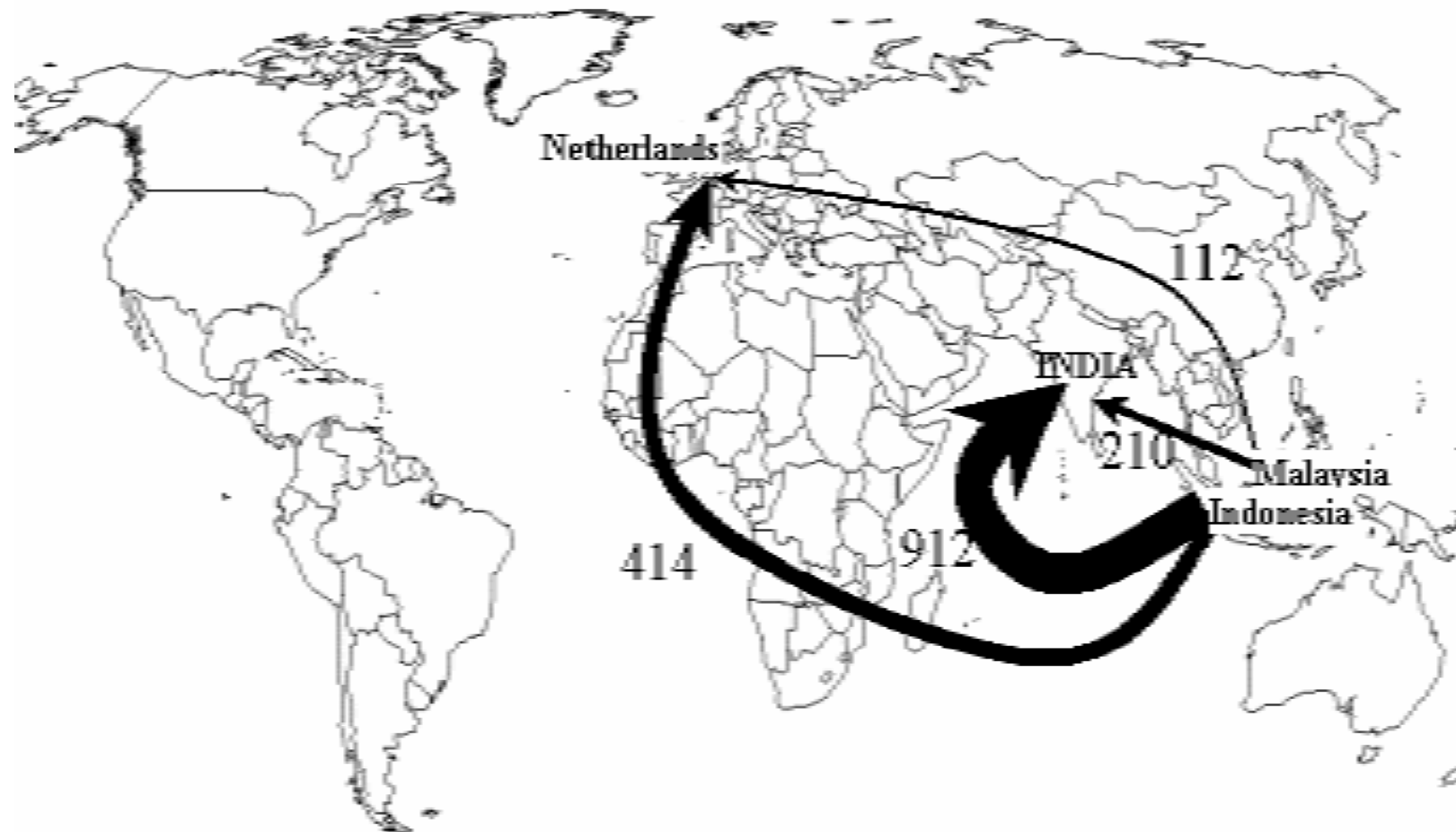
IEA Task 40: Key issues

- Development of *working* biomass markets is crucial for any market initiative.
- Contribute to the development of *sustainable* bioenergy markets on short and on long term and on different scale levels.





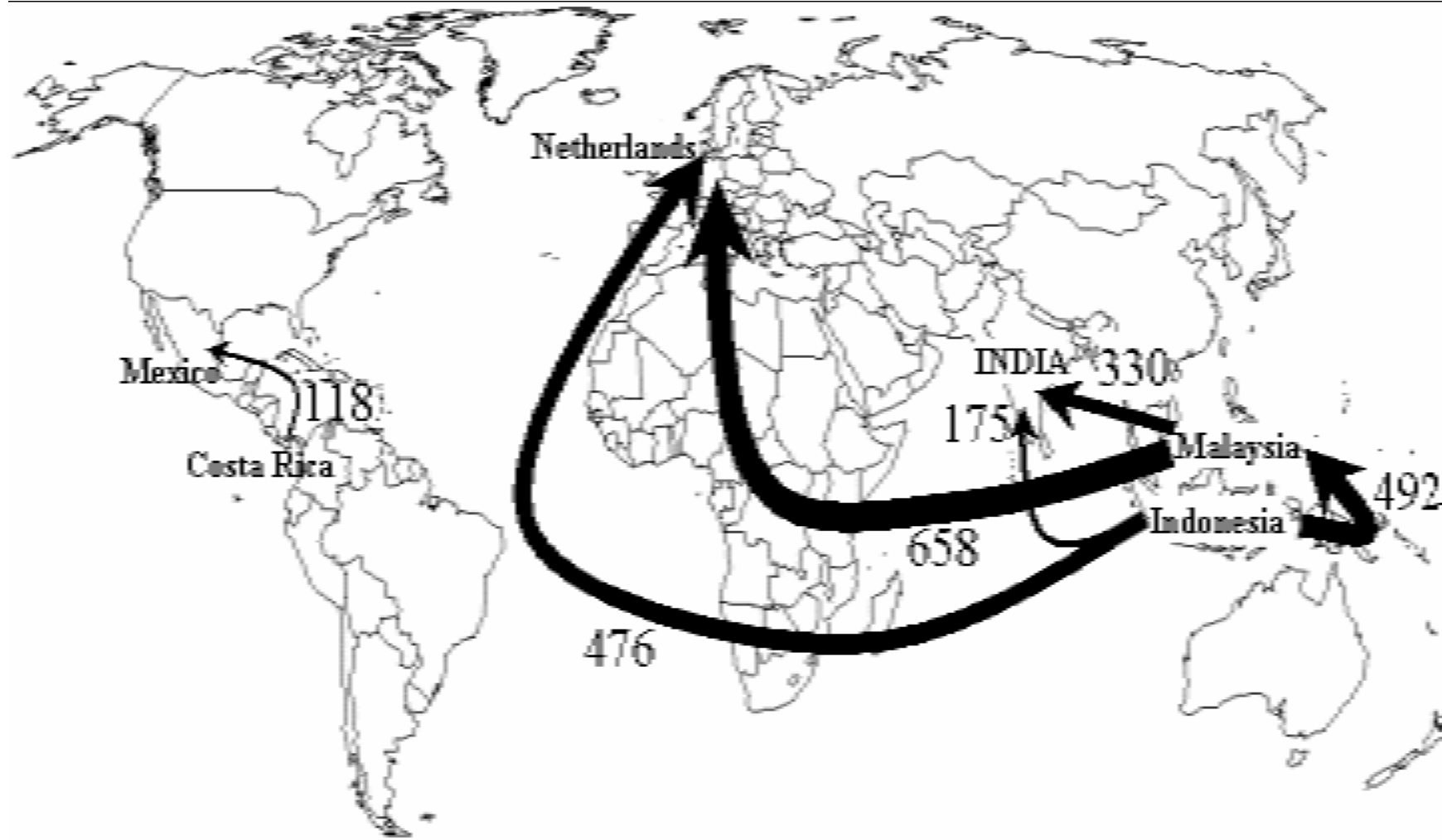
International trade Palm oil flows 2000 (kton)



Courtesy of UNCTAD

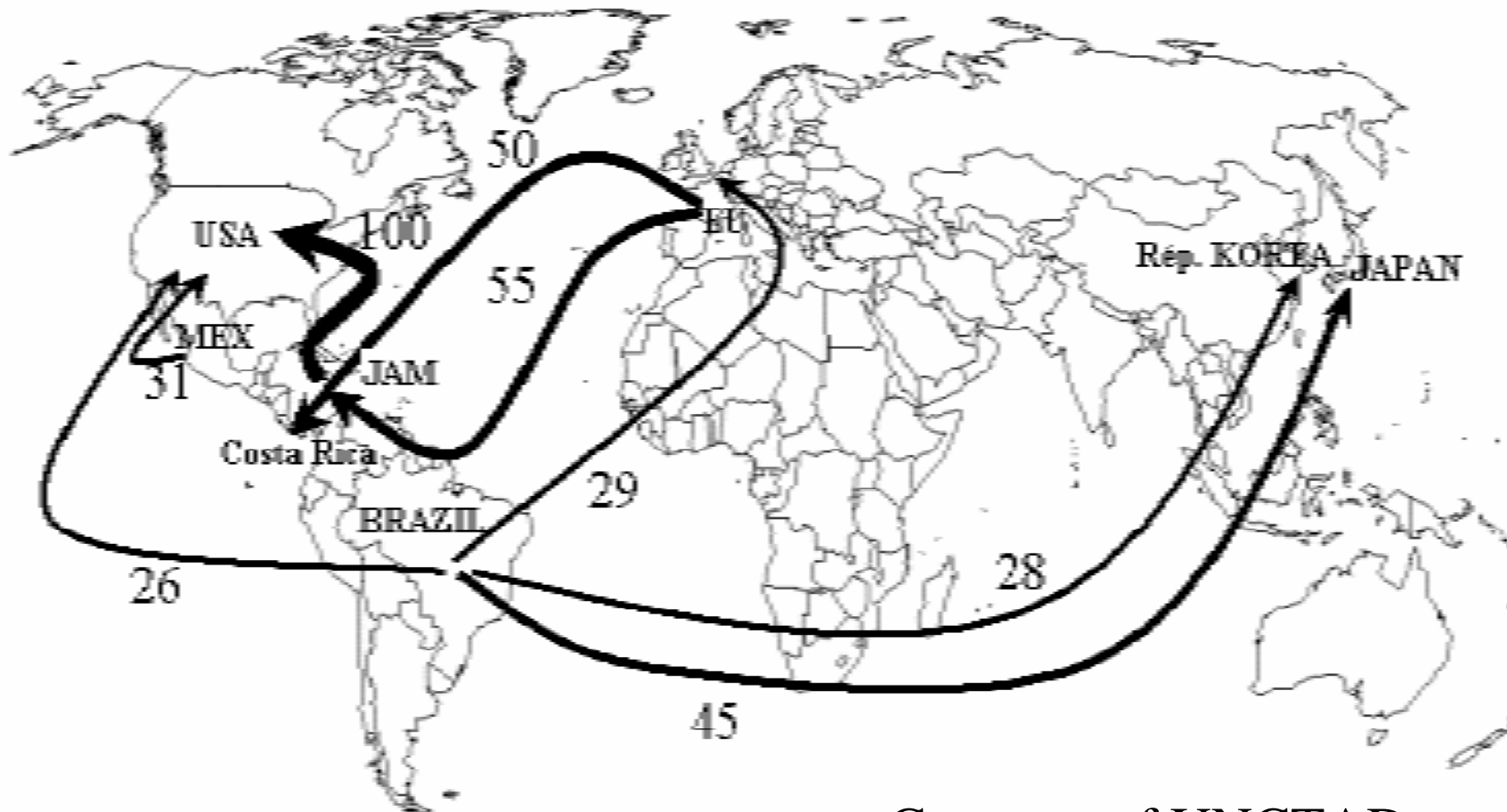


Palm oil flows 2004 (kton)





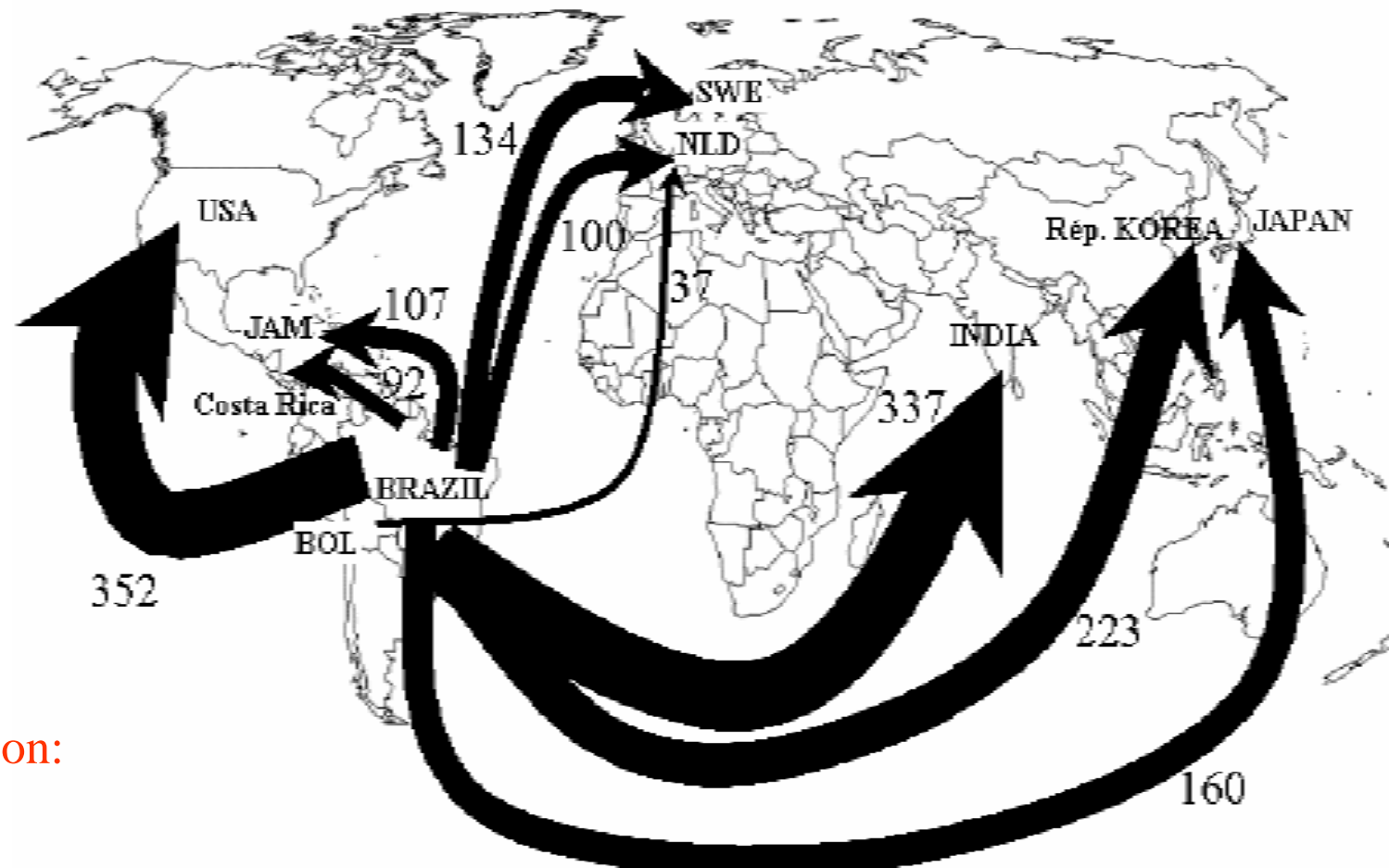
Bio-ethanol flows 2000 (kton)



Courtesy of UNCTAD



Bio-ethanol flows 2004 (kton)



Traded:

3 billion litres

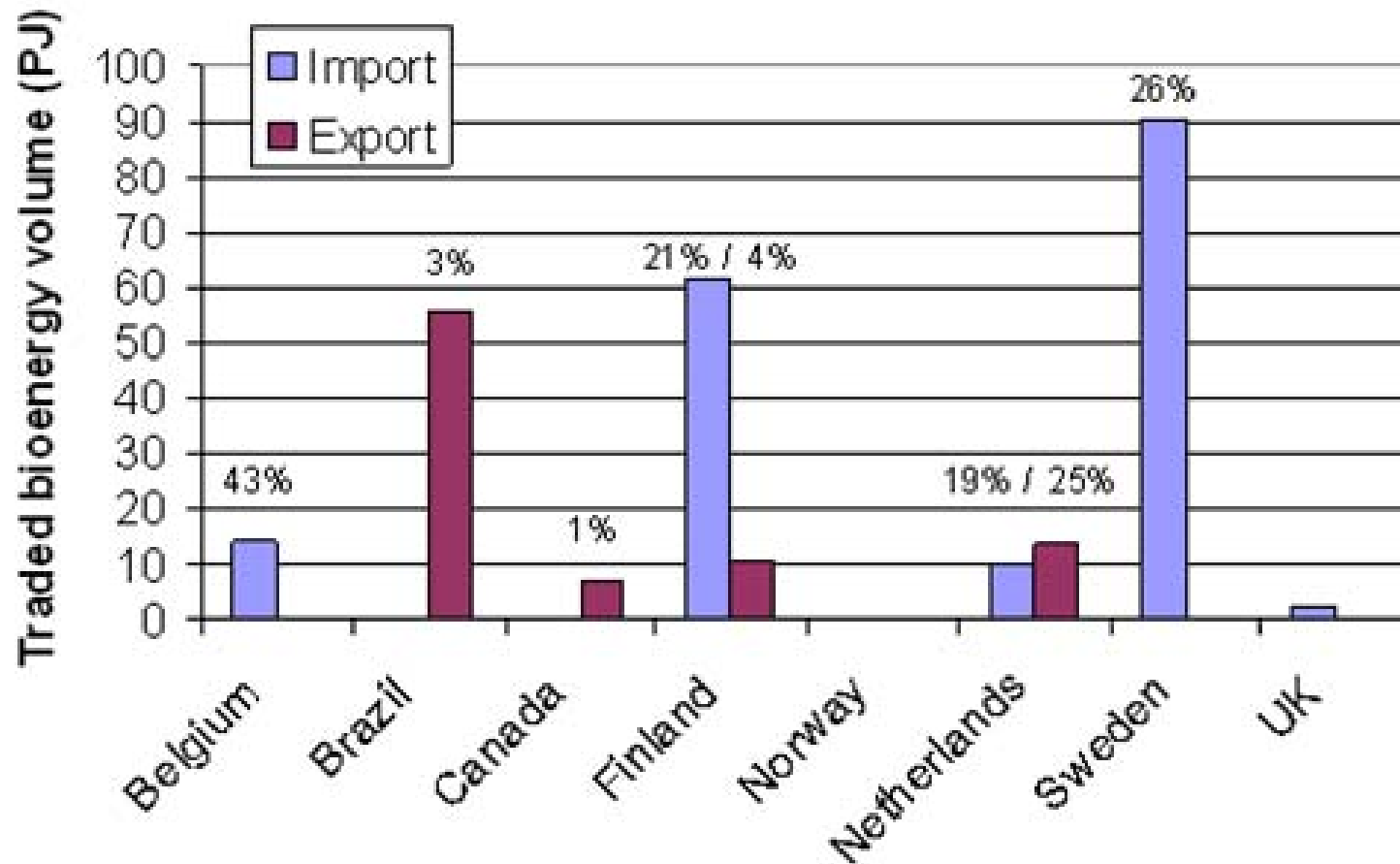
Global production:

32 billion litres



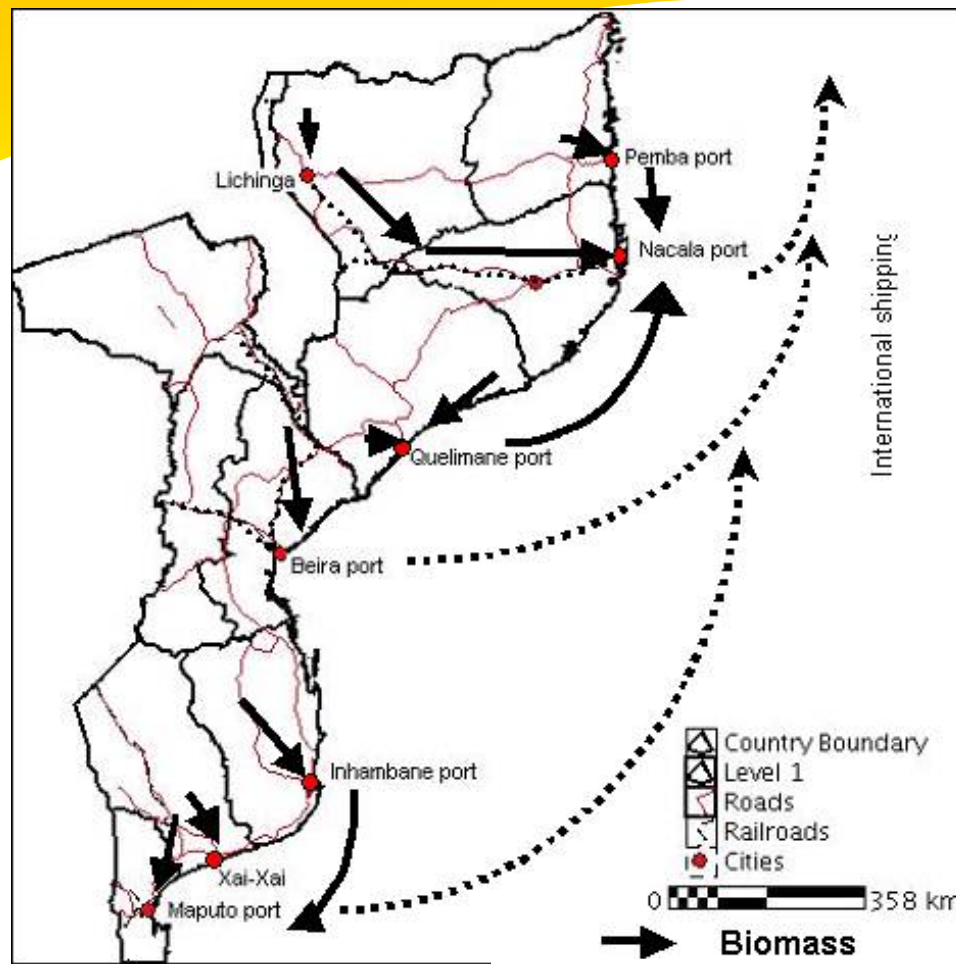


Overview of bioenergy imports and exports of example countries in 2004





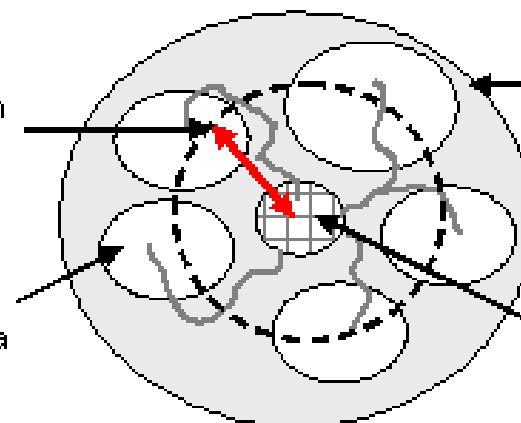
Logistics for export....



[Batidzirai & Faaij, 2005]

Radius is average transport distance from field to processing unit based on 1/2 area

Field farmers are spread in delivery area



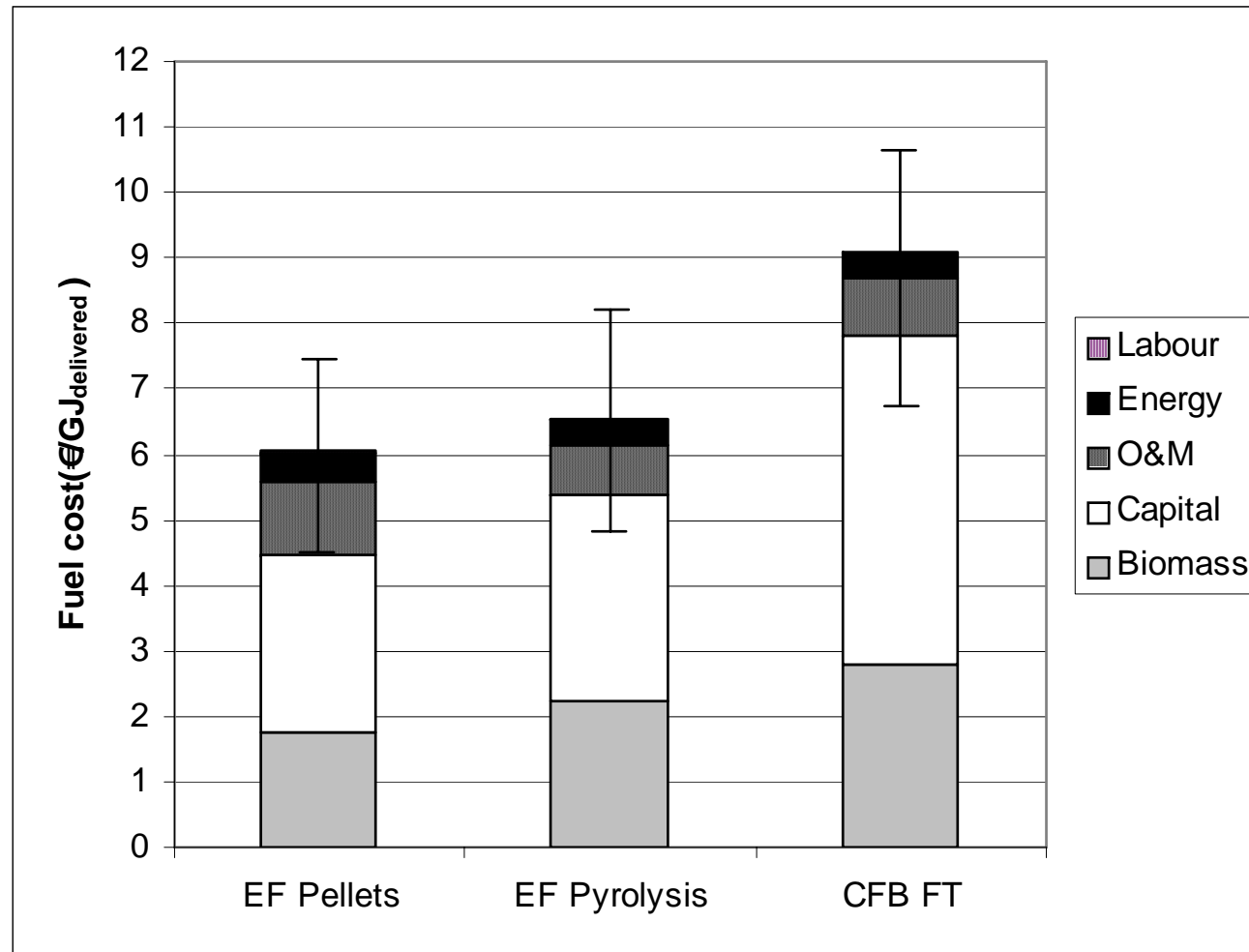
Delivery area based on biomass distribution density and % area under energy crops

CGP - conversion facility



Range of costs for FT fuel

from Mozambique delivered at Rotterdam Harbour

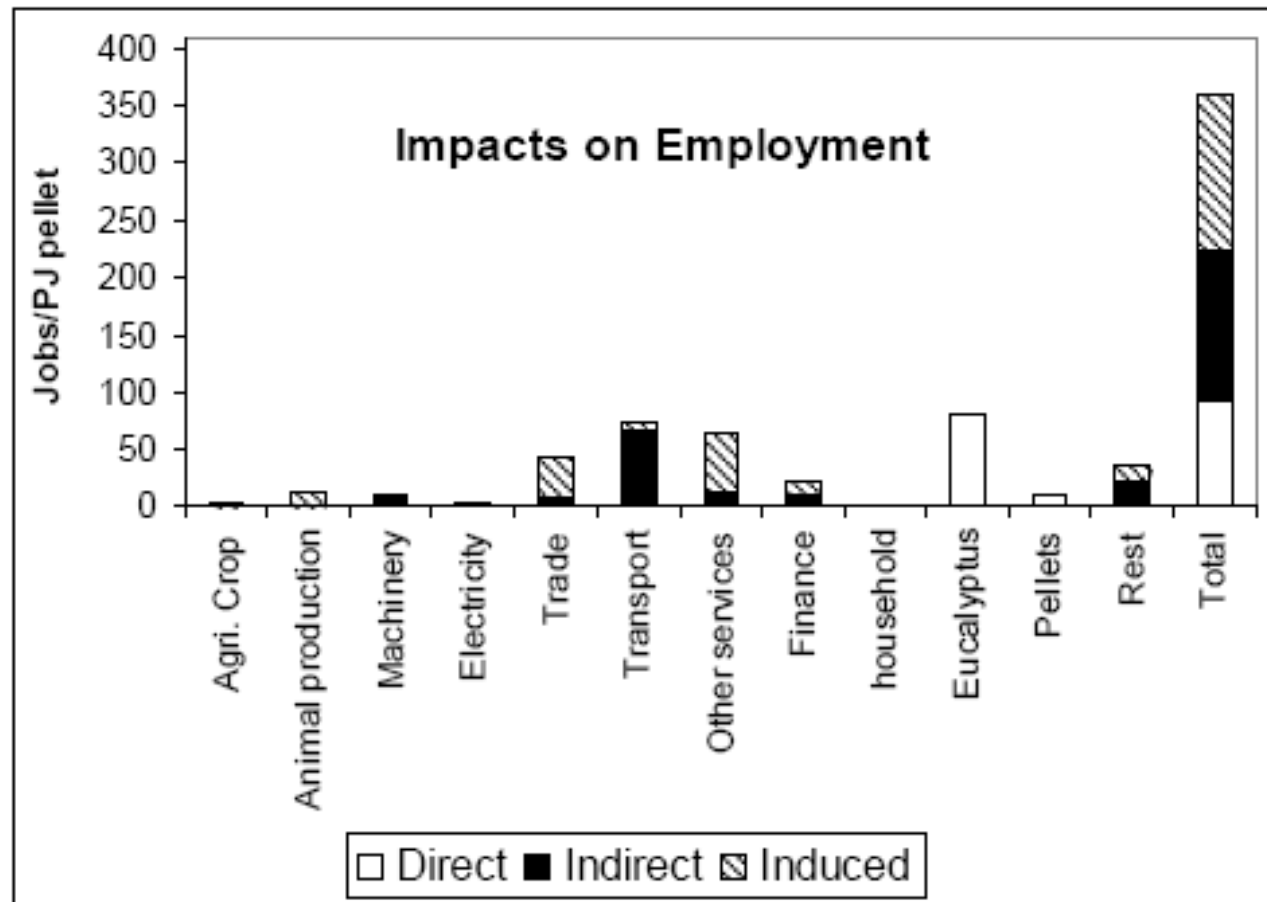


Processing can lead to local benefit creation





Employment impacts of eucalyptus pellet production in Argentina





Sustainable biomass production and certification

Background

- Negative side-effects of rapidly expanding commodities such as palm oil in Malaysia and Indonesia, or soy cultivation in Argentina, also ethanol from sugarcane under investigation
- Overexploitation should be avoided and sustainability criteria implemented
- Sustainability criteria will have a direct impact on international bioenergy trade





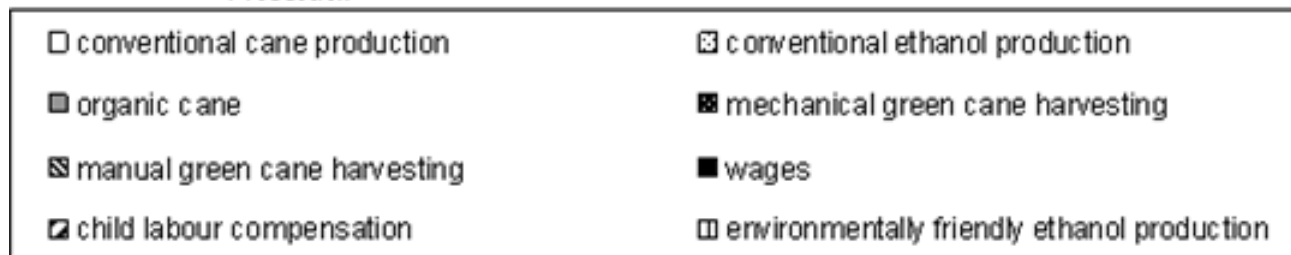
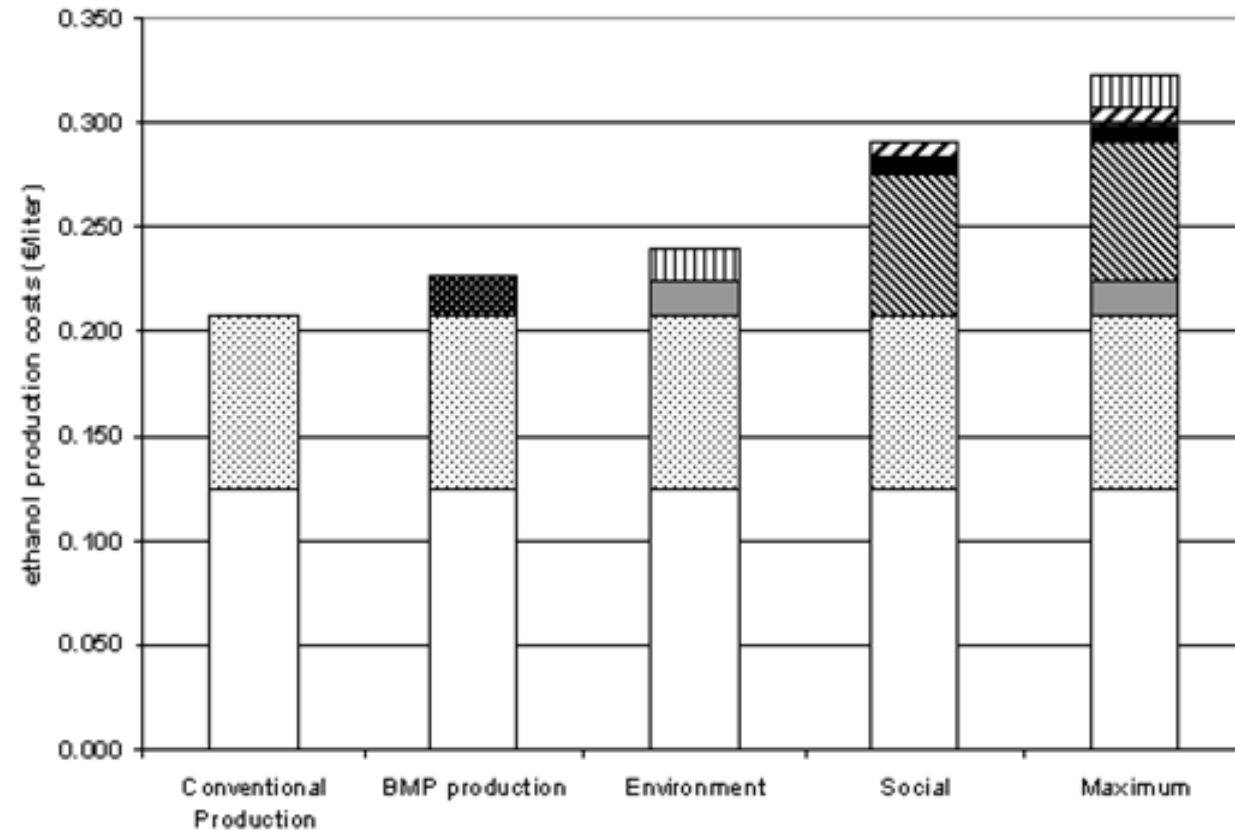
NL proposal: minimum safeguard-> stabilisation-> improvement...

1. **GHG balance** -> Chain performance (30-80%+..)
2. **Land-use/competition with food**: reporting
3. **Biodiversity** -> reporting/FSC/RSPO
4. **Welfare** -> Reporting EPI
5. **Well being** -> ILO, Social accountability standards, etc.
6. **Environment**
 - Waste; law, GPG's
 - Agrochemicals; law, GPG's
 - Soil quality; reporting/monitoring
 - Water quality & quantity; law, reporting/monitoring





Ethanol in Brazil; the costs of compliance with various sustainability criteria compared to the reference situation



[Smeets, Junginger, Faaij, Walter, Dolzan, 2006]



Rural development by bioenergy production

- Increased income and employment, but
 - Expectations of bioenergy projects can be too high
 - Land tenure can be problematic
 - Distribution of income not equal
- Rural energy supply
- Use (and restoration) of degraded land
 - e.g. agroforestry on saline land, degraded land from deforestation, etc.





Food security (I)

- Bioenergy competes with food markets
 - Direct if food crops are used (1st generation)
 - Indirect via land (2nd generation)
 - Food markets depend on global! developments



Food security (II)



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- Important aspects:
 - Food production (exports, imports, shifts)
 - Food prices (global and local)
 - Income changes (GDP, population groups, distribution, changes)
 - Employment
 - Land used for food and energy production
 - Crops used for food/energy applications
 - Use of water

⇒ Food prices are increasing, could be compensated by:

- income change
- efficiency increase in agriculture



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Closing remarks (I)

- Agriculture the key for bio-energy...
- Bio-energy could be the key lever for rural development.
- Bio-energy is (and will be) propelled by sound economics; market almost unlimited (and uncontrolled)
- Bio-energy (used locally or traded internationally) could also be unsustainable (food security, biodiversity, human rights, etc.)
- Sustainability to be secured in a global setting and implemented at a local level





Closing remarks (II)

- Promising future; but policy needs to choose and coordinate (agriculture, trade, climate, energy and development are interlinked here).
- Sense of urgency is needed; market forces are already steering development of international bio-energy markets.
- Diversity in ecological and socio-economic conditions to be recognized (asking for regional approaches in a global setting; stakeholder approaches).



Competence Platform on Energy Crop and Agroforestry Systems for Arid and Semi-arid Ecosystems – Africa



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COMPETE will establish a platform for policy dialogue and capacity building and identify pathways for the sustainable provision of bioenergy

- to improve the quality of life and create **alternative means of income** for the rural population in Africa
- to aid the **preservation of intact ecosystems** in arid and semi-arid regions in Africa
- to enhance the equitable **exchange of knowledge** between EU and developing countries



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IEA Task 40: www.bioenergytrade.org

COMPETE: www.compete-bioafrica.net

