



TECHNOECONOMICS OF BIOENERGY TRADE
CHAINS - IEA BIOENERGY TASK 35

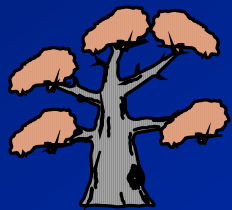
Task Objectives - Bioenergy Trade

- To select the economically promising chains for a detailed study.
- To carry out a comparison for selected alternatives with a rigorous method.
- Overall costs and reducing CO₂ emissions as criteria.
- To identify business opportunities and new concepts in bioenergy utilisations chains.

IEA Bioenergy Task 35 Participants 2002

- David Beckman, Zeton Inc., Canada
- Kevin Craig (Ralph Overend), NREL, USA
- André Faaij, Utrecht University, the Netherlands
- Björn Kjellström, Luleå University of Technology, Sweden
- Paterson McKeough, VTT Processes, Finland
- Erich Podesser (Henrike Bayer), Joanneum Research, Austria
- Yrjö Solantausta, VTT Processes, Finland
- Martijn Wagener (Rob Remmels), Essent Energy, the Netherlands

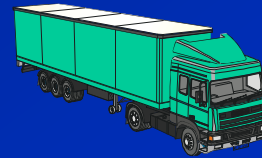
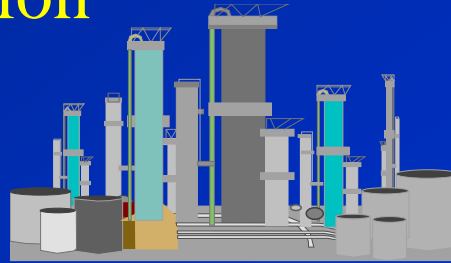
Elements in Assessing Biofuel Trade



Resource supply



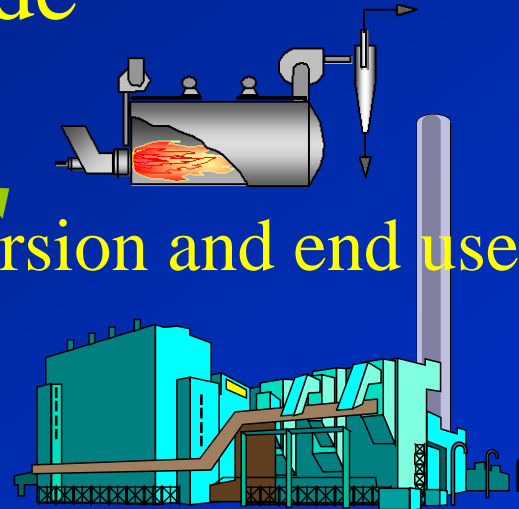
Local conversion



Long distance logistics



Final conversion and end use



Biomass Resources Considered

- Woody biomass
 - Forest industry by-products
 - Forestry residues
 - Other wood fuels
- Agricultural by-products
 - Straw
 - Bagasse
 - Other
- Specifically grown biomass
 - Short rotation forestry
 - Grasses

Local Conversion

- Drying (used in processes below)
- Pellets
- Bio-oil
- Other liquid biofuels
 - Ethanol
 - Methanol
 - Fischer-Tropsch liquids

Transportation Logistics

- Raw biomass, pre-treated biomass, converted biomass
- Water, rail, road

Final Conversion and End-Use

- Conversion to other energy forms
 - Fischer-Tropsch liquids
 - Ethanol, Methanol
 - Bio-oil
- Power and heat
 - Stand-alone
 - Co-fire
- Transportation

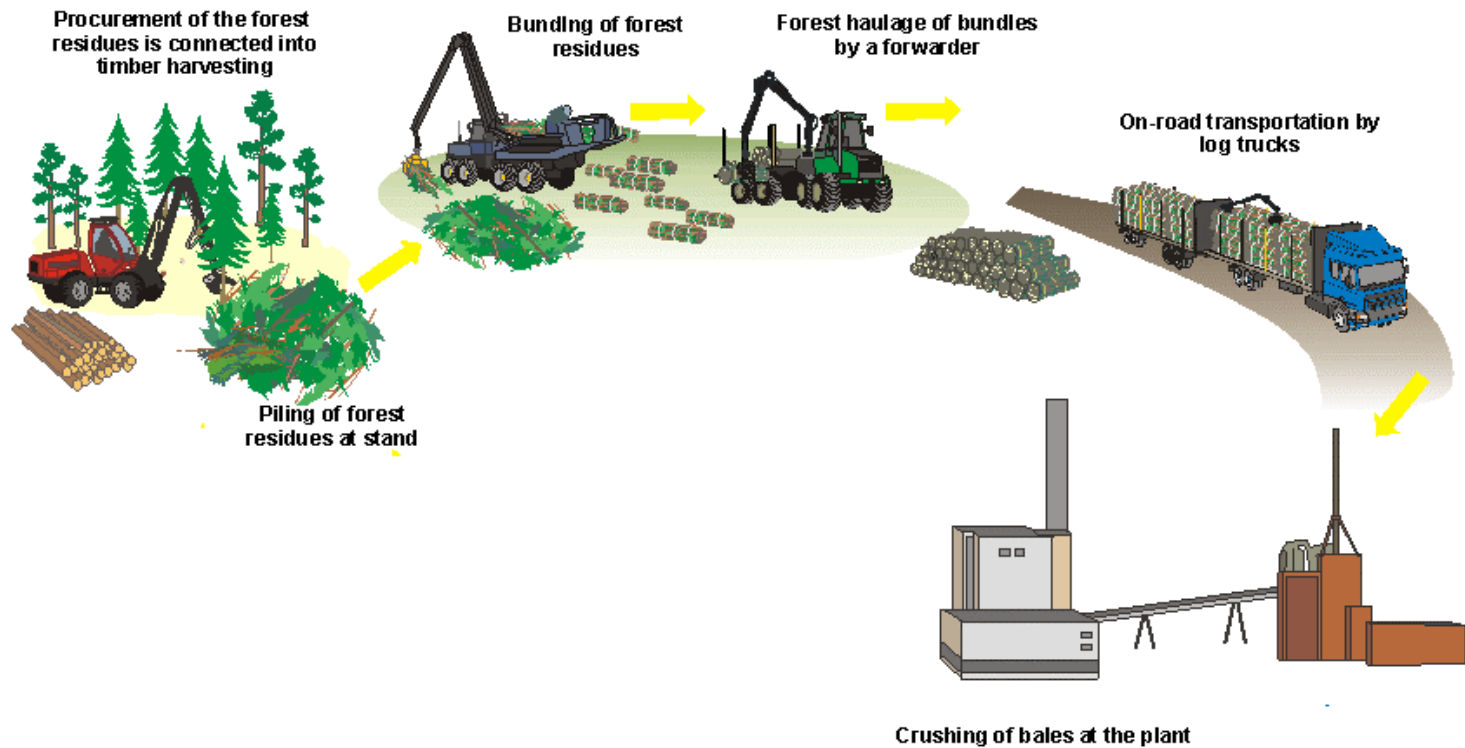
An Example of Data Collection, Resources Supply

Context	Geography, system, pattern over year, typical alternative uses
Amounts	(Gross-net) + distribution (ton/km ²)
Collection methods	Machinery (€, O&M, energy use/ton) Storage (time, O.M., losses) Local transport (€/ton*km) Local transfer (€/ton) Fuel properties (moisture, ash, HHV, particle size, bulk density), change over time Sustainable level given above as net (+ criteria) Emissions: SO ₂ , NO _x , Dust, VOC

An Example of a Biofuel Trade Chain

- Primary fuel: forestry residues (FR) available in connection to wood industry in Northern Europe
- Used industrially in Finland and Sweden (CHP and heat production)
- Utilisation of FR is increasing, and a considerable potential exists
- Conversion of FR in an integrated plant to heat and bio-oil
- Transportation of bio-oil to remote users
- Use in replacing coal (or mineral oils in the future)

Current Industrial Use of Forestry Residues



Cost of Wood Fuels for Large Users

