Task 39
Liquid Biofuels from Biomass

FJ BLT WIESELBURG

IEA Bioenergy

Worldwide Development of Biodiesel

Results of the IEA Bioenergy Liquid Biofuels network 2004-06

Manfred.Woergetter@josephinum.at

FJ BLT Wieselburg, http://blt.josephinum.at/

IEA Bioenergy Workshop
27-30 August 2006, Vancouver
Faculty of Forestry, University of British Columbia

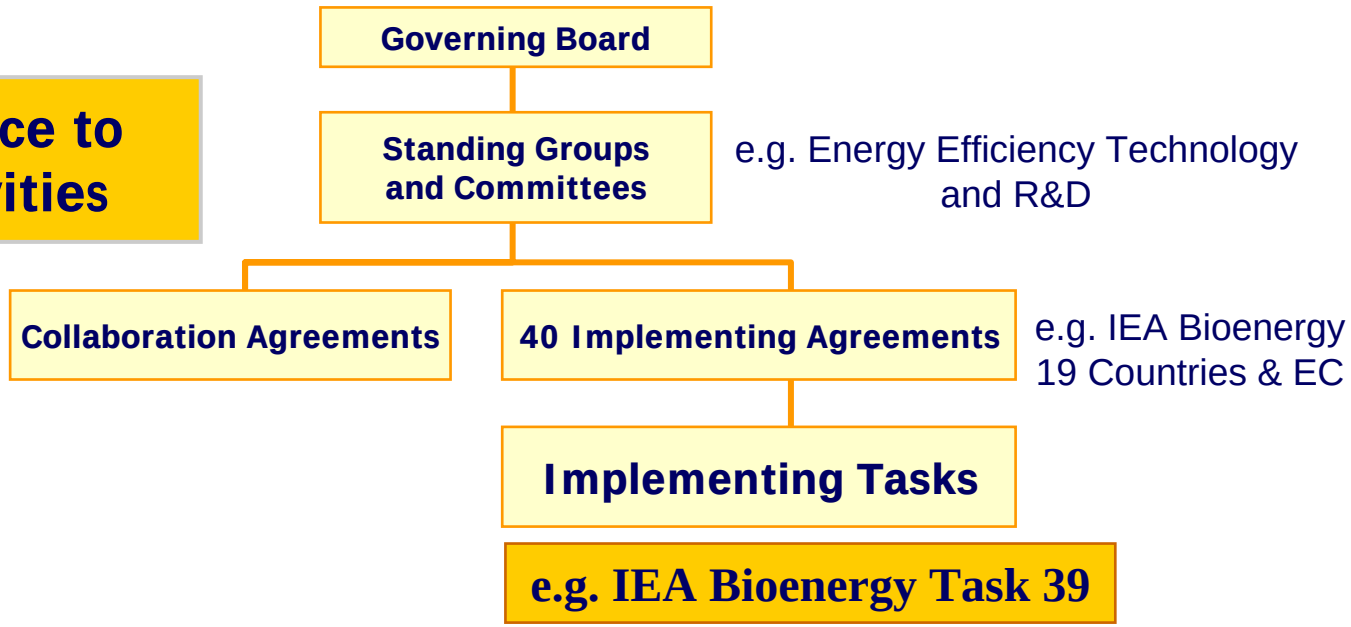
Content

- Introducing ….
  - IEA, IEA Bioenergy and the Liquid Biofuels Task
  - The „Biodiesel Subtask“
  - Biodiesel results of the period 2001-2003
- Work in the current period
  - Process developers catalogue
  - EU monitoring system
  - Workshop in Potsdam
- Lessons learned

International Energy Agency www.iea.org

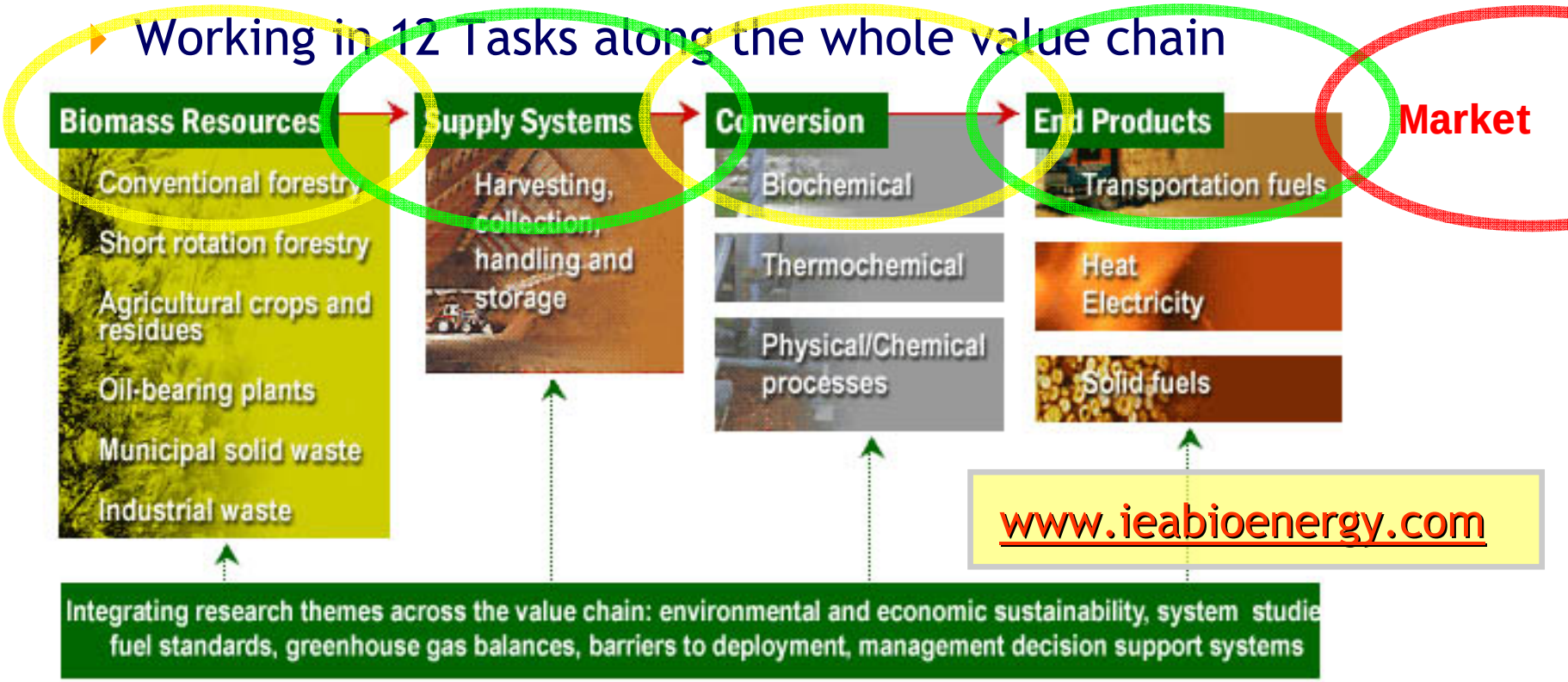
- Autonomous agency linked to the OECD, founded 1974
- Forum for co-operation among 26 Member countries to enhance security of supply, advise on energy policy and regulatory reform and promote energy efficiency and technology

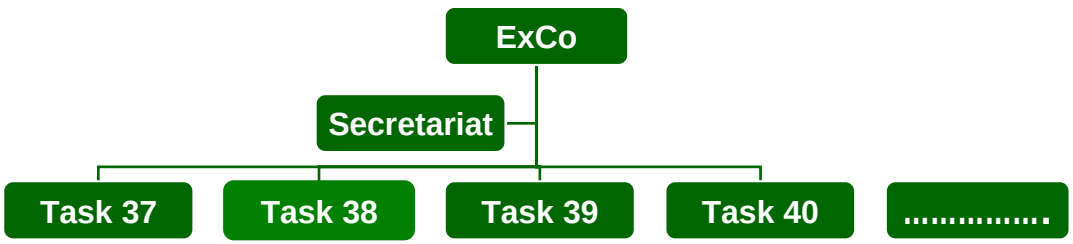
A counterbalance to the OPEC activities



IEA Bioenergy

- 22 member countries
- Working in 12 Tasks along the whole value chain





Task period 3 years
Actual periode 2004 - 2006

Task 39
Liquid Biofuels from Biomass

Since 1995 information exchange on Liquid biofuels

Task 39-I Results (2001-2003)

- Review on Biodiesel Production Worldwide
- European Biodiesel Best Case Study
- Review on Biodiesel Standardization Worldwide
- Pure vegetable oil as fuel for farm tractors

Published: as CD ROM and on

www.task39.org/members.htm

IEA Bioenergy

IEA Bioenergy Task 39
Liquid Biofuels

bmvit Bundesministerium für Verkehr, Innovation und Technologie

Subtask
Biodiesel
Period I
2001-2003

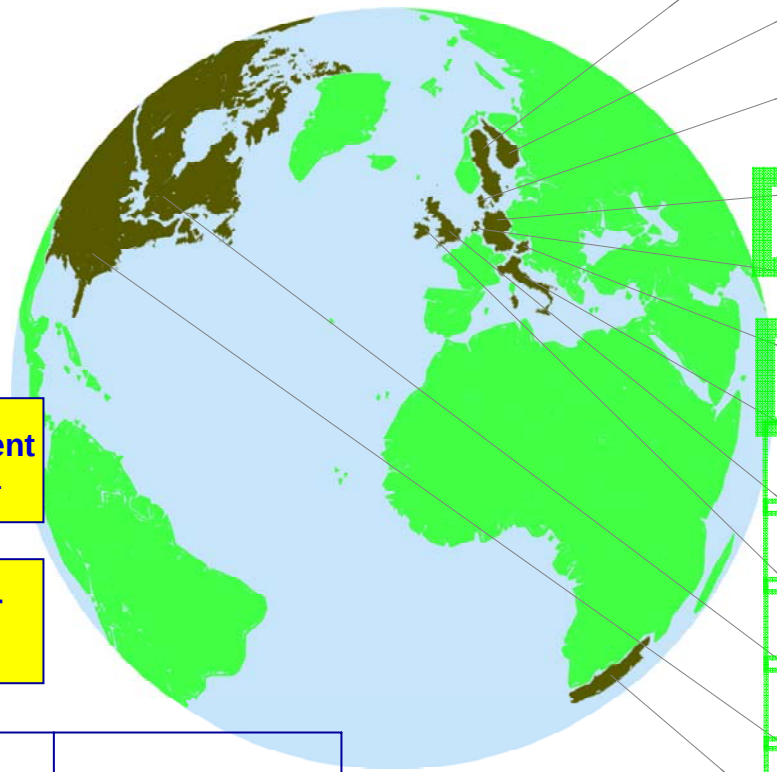
lebensministerium.at

This CD includes the results of the Biodiesel subtask from Task 39 "Liquid Biofuels". The overall report on the Task 39 results is available from the Task Leader Dr. Don Stevens, Pacific Northwest Laboratory, Richland, USA.
Additionally you can find the national final report (in German) to BMVIT, the Austrian contracting body, in Annex I. In Annex II we included a selection of important reports on Biodiesel production and use which are available in the Internet.

Feature Article	Worldwide perspectives of Biodiesel production and utilization
Reports	Best Case Studies on Biodiesel Production Plants in Europe
	Worldwide Review on Biodiesel Production
	Review on Biodiesel Standardization World-wide
	Rapeseed Oil as Fuel for Farm Tractors
	Current State of Fuel Ethanol Commercialization
	North American Fuel Ethanol Industry – Review of Industry Growth 1999-2003
	Biodiesel in North America – Implementation Issues
Annex I	Nationaler Endbericht
Annex II	Stability of Biodiesel
	Multiple Feedstocks and Properties of Biodiesels and Blends
	Effect of Biodiesel Composition on Engine Emissions

Task 39 II: 2004-06

More about:
www.task39.org



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Subtask Ethanol
Jack Saddler, Can.

Subtask Biodiesel
M. Wörgetter, A

Subtask Policy
John Neeft, NL

Subtask News
Warren Mabee, Can

T 39 II: Subtask Biodiesel Work Program

- Projects
  1. Biodiesel Production: Technologies and European Providers ("Process Developers Catalogue")
  2. The European Biofuels Directive Monitoring System
  3. Biodiesel market development in Europe – Lessons learned for North America
  4. Optional: International Biofuels Standardization
- Outreach to Stake Holders

- Workshop in Germany

12 – 14 June 2006, Potsdam, with 50 international biofuel experts

- Biofuels policy
- Biofuels in Developing Countries
- Stakeholder Discussion
- Research & Development
- Production Technologies
- Markets & Qualities
- Biomass Potentials

Process developers catalogue

Process Developers Catalogue

- Companies to be asked
  - BDI
  - ENERGEA
  - Lurgi
  - Westfalia
  - AXENS
  - DeSmet-Ballestra
  - AgrarTechnik
  - Diester
  - Connemann
  - BDT
  - Christof Group
  - BioCetan
  - …

Work in progress

Questionnaire

Report „Process Developers Catalogue“

Commissioned by IEA Bioenergy Task 39

1. General Data

Name of company | Owner

Does your company work in the field of:
- ☐ chemical engineering
- ☐ fuel production technology
- ☐ fuel production
- ☐ fuel transport and logistics
- ☐ trade of agricultural products
- ☐ waste collection

Contact person: First Name | Last Name | Position

Headquarters´ address | Post Code | City | Country

Post Code | City | Country

URL http://

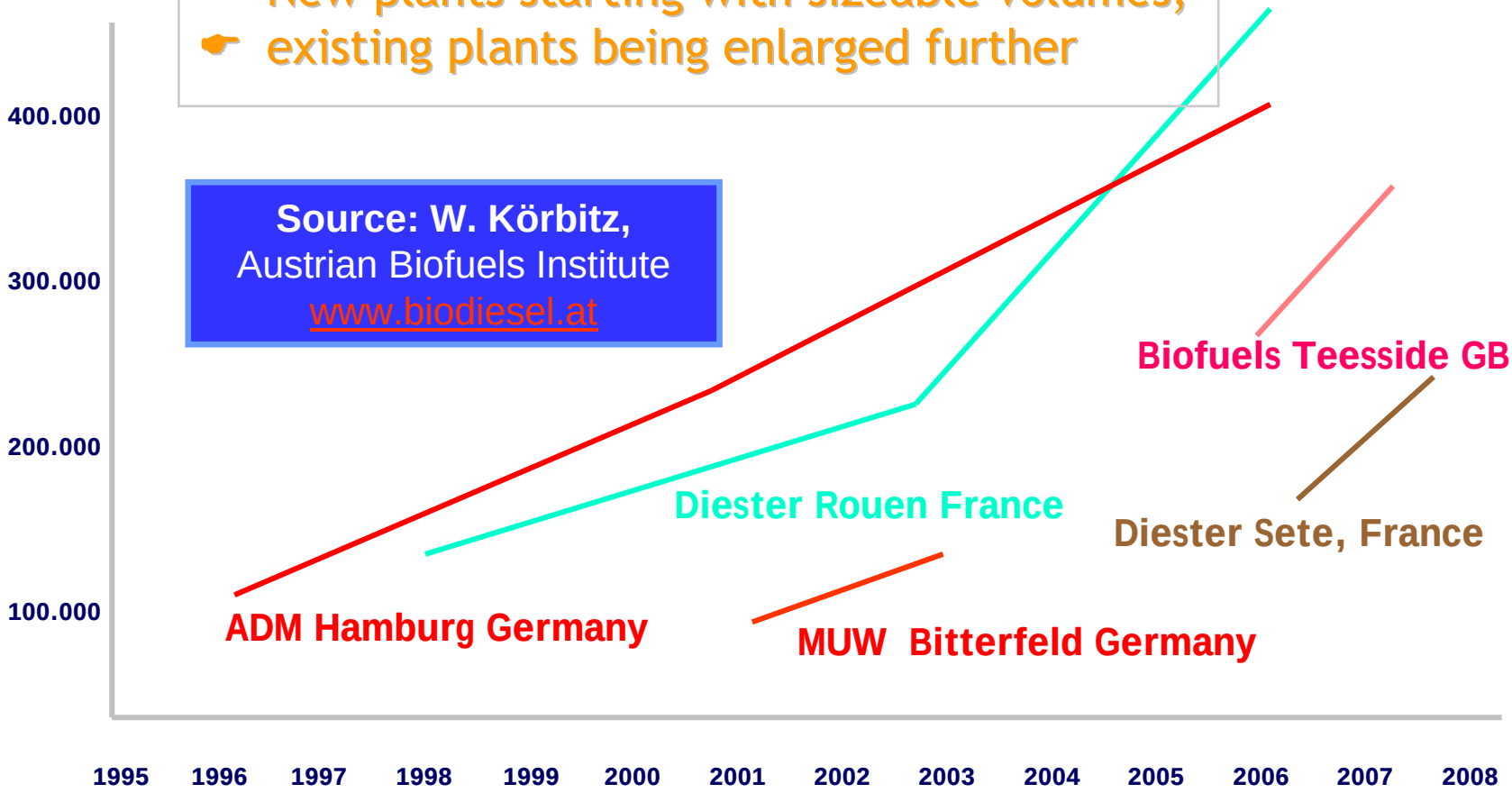
Phone | Fax

The evaluation of this questionnaire will be integrated into the report on “European Biodiesel Production Technologies”, as commissioned by IEA Bioenergy Task 39. If you want us to include up to three pictures in our report, you can send them to pdc@biodiesel.at. Additionally please cite the corresponding captions below:

1
2
3

Capacity development (preliminary results)

- New plants starting with sizeable volumes,
- existing plants being enlarged further



EU biofuels monitoring system

European Biofuels Directive (preliminary results): Fast implementation expected

Germany

- B100, B5, EtOH, FT-Diesel after 2009

Austria

- B5, ETBE
- FT-research based on successful gasification research
- Biogas?

France

- B5, ETBE; successful implementation will be continued; R&D on cellulose EtOH

Czech Repubic?

- Established Biodiesel plants,
- Know how available

Directive 2003/30/EC:
2 % by 2005, 5.75 % by end of 2010

Data base:
www.europa.eu.int/comm/energy/res/legislation/biofuels_members_states_en.htm
www.ebb-eu.org/legislation.php

EBB
European Biodiesel Board

Member States Reports	Member States updates: 1st and 2nd reports on progress under Directive 2003/30/EC			
	1st Report - 2004		2nd Report - 2005	
Austria	de	en	de	en
Belgium		en		
Cyprus		en		en
Czech Republic	cs	en	cs	en
Denmark	da		da	en

Implementation likely

The Netherlands:

- Interest in Biofuels use and Biofuels trade

Poland:

- Some experience with Biofuels
- Change in the agricultural structure needed

Spain:

- Since 1995 ETBE/ EtOH from grain
- Interest in Biodiesel

Sweden:

- Ethanol from grain
- **Comprehensive R&D in Ethanol from cellulosics, Bio-MeOH and Bio-DME**

Belgium:

- 3 EtOH Plants (80 kt) an one Biodiesel Plant (150 kt) under construction

UK:

- Investment in Biodiesel,
- Unfavourable taxation

Finland:

- Construction of a 170 kt plant for a vegetable oil/ fat based Diesel fuel

Lithuania

- 8 000 t Ethanol plant,
- 10 000 t Biodiesel plant

Workshop in Potsdam, Germany

12 – 14 June 2006

- With contributions on:
  - Biofuel Policies
  - Biofuels in Developing Countries
  - Stakeholder Discussion
  - Research & Development
  - Production Technologies
  - Markets & Qualities
  - Biomass Potentials
- Based on experience of 50 international experts

IEA Task 39 Subtask Biodiesel Workshop

June 12-14, 2006

Potsdam, Germany

www.potsdam.de

Biodiesel in Germany –

Learning from a Success Story

TENTATIVE AGENDA

Preliminary Program

Sponsored by

ufop

http://www.ufop.de/

http://www.agqm-biodiesel.de/

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Hofplatz 1, G 18276 Gülzow, Germany

http://www.fnr.de/

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http://www.seminaris.de/index.htm?tree_id=179

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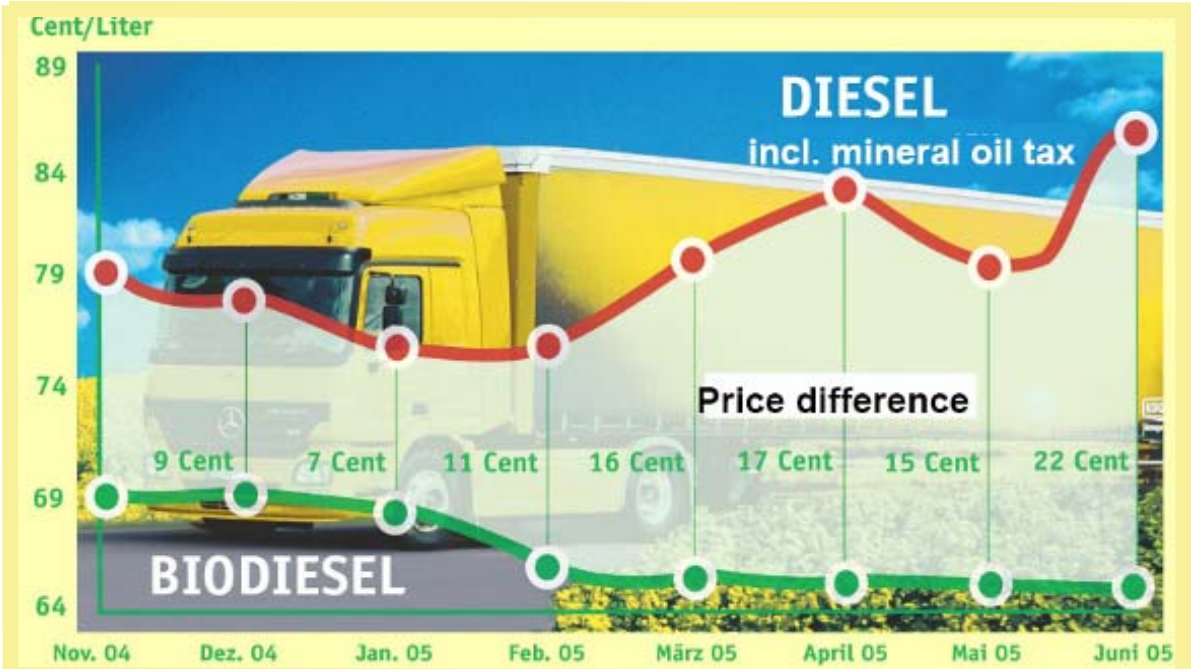
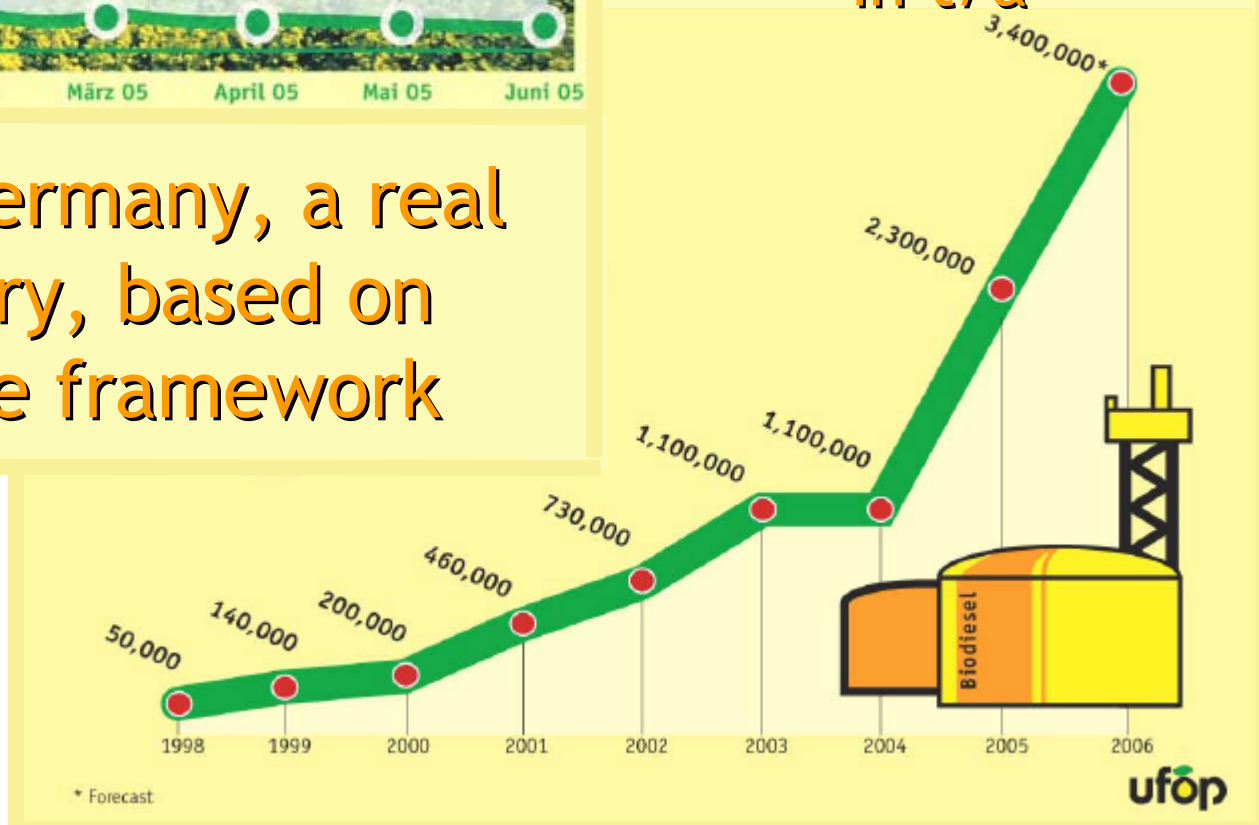


D. Bockey:
„ Biodiesel in Germany“
Workshop Potsdam 2006

Biodiesel in Germany, a real successs story, based on a favourable framework

Production capacity in t/a

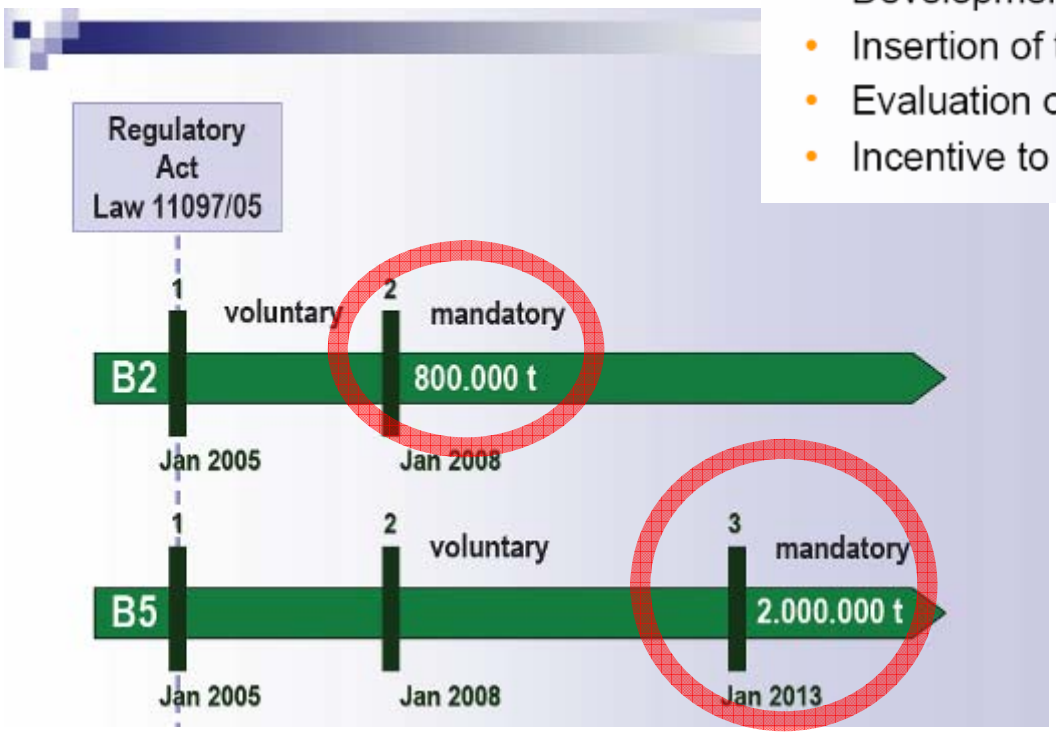


Biodiesel development in Brazil

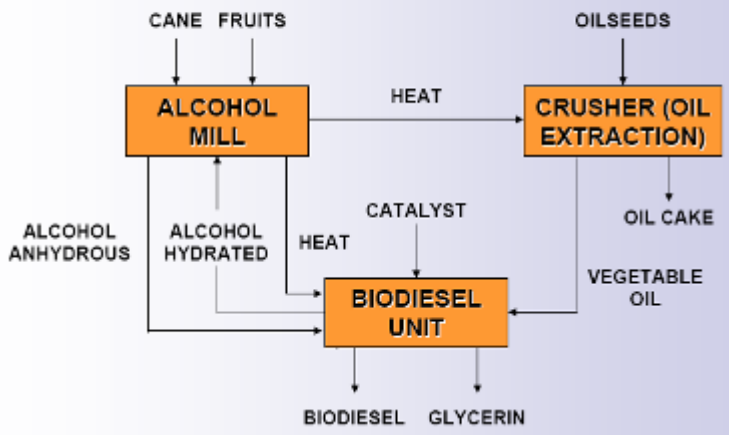
Luiz Pereira Ramos: „Market Oportunities for Biodiesel in Brazil“IEA Bioenergy Workshop Potsdam 2006

Law 11097, January 13, 2005

- Assessment of raw materials available regionally
- Evaluation of their suitability for biodiesel production
- Incentive to cooperative efforts involving small producers
- Identification of potential biodiesel suppliers
- Development of small scale production units
- Insertion of the biodiesel concept in rural settlements
- Evaluation of biodiesel performance in field tests
- Incentive to industrial and/or technological innovation



Process integration



Biodiesel raw materials in Brazil

Luiz Pereira Ramos: „Market Opportunities for Biodiesel in Brazil“
Workshop Potsdam 2006

Babaçu, soybean, palm, dendê and animal fat

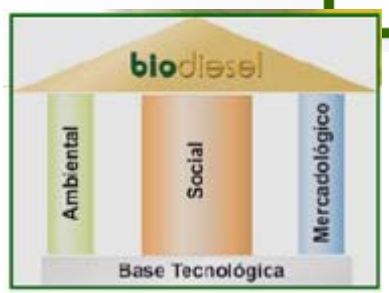
Soybean, castor, cotton, sunflower, palm, *Jatropha* and animal fat

Babaçu, soybean, castor, palm, cotton, coconut, animal fat and fish wastes

Soybean, castor, sunflower, cotton, animal fat and fish wastes

Soybean, canola, sunflower, cotton, animal fat and fish wastes

Ricinus communis (castor)

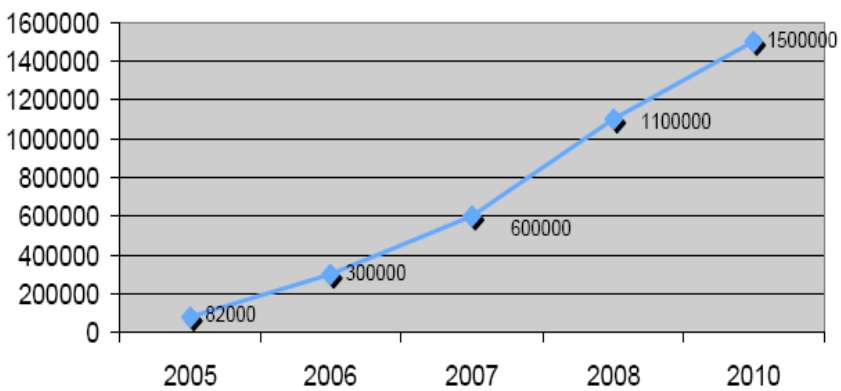


250 000 t/a Biodiesel Plant in China

BIOLUX

Biodiesel Production in Cina

Estimated Potential for Biodiesel Consumption in China



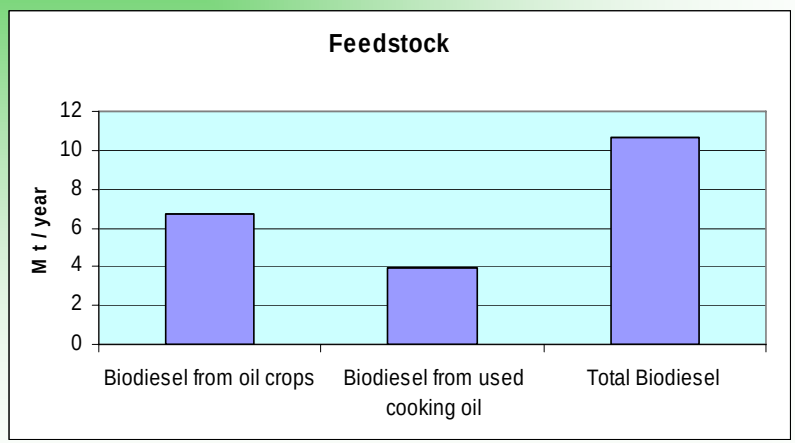
S. Estermann, Biolux

IEA Bioenergy Workshop Potsdam 2006

BIOLUX

Biodiesel Production in Cina

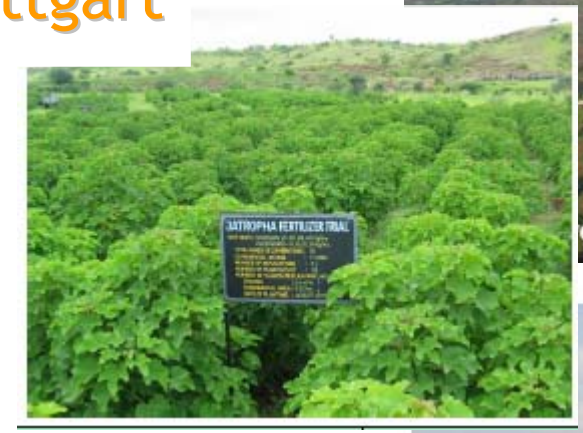
Estimated Potential Feedstock for Biodiesel in China



BMELV, Feb. 2006, Beijing
Chinese Potential and Implications for Sustainable Agriculture and Energy in the 21st Century

Jatropha Biodiesel

George Francis, University Hohenheim, Stuttgart



- A plant with multiple use
  - To reduce land degration
  - Recover degradated land
- Jatropha occurs in many tropical countries
- Jatropha Biodiesel satisfies EU Biodiesel standard
- DaimlerChrysler cars run JME without any problem
- Jatropha can survive under harsh condition

Property	Units	DIN 14214	JME BioDiesel	
Density @ 15°C	kg/m^3	860 - 900	880	☺
Viscosity at 40°C	mm^2/s	3,5 - 5,0	4,34	☺
Cetan number	-	> 51	58,5	☺
Sulfur Content	mg/kg	< 10	< 10	☺
Lubricity HFFR	µm	< 460	197	☺
Flash point	°C	> 101	160	☺
Jodine Number	gJ_2 /100g	< 120	96	☺

Small scale JME Transesterification with simple apparatus

George Francis, University Hohenheim
IEA Bioenergy Workshop Potsdam 2006

View of the pilot biodiesel production facilities at the CSMCRI, Gujarat, India

Jatropha curcas - biodiesel	University of Hohenheim Stuttgart, Germany	

Company presentations Workshop Potsdam 2006

Mature European Biodiesel Technology

Lessons for North America

- **Lessons that can be learned from the European Biodiesel industry:**
  - Eliminating the uncompetitive price is the most important barrier
  - Where independent petroleum sector exists market access barrier can be addressed without government intervention
  - Where the independents are not strong mandates are probably required.
  - The European industry has had few business failures. It may not be possible to duplicate this achievement everywhere.
  - Regulations can enable markets but if done inefficiently they become a barrier.

Don O'Connor, (S&T)2
Biodiesel Market developpment in Europe
Workshop Potsdam 2006

Biomass Potentials in CEEC countries

(I. Lewandowski, A. Faaij, J. Van Dam)

- Biomass potential in the CEEC comes from energy crops and depends on the land available for their production.
- The availability of land increases with the productivity of the agricultural, with increased efficiencies and optimum land.
- Future agricultural production in CEEC will rationalize. Poland and Romania have the highest biomass potentials.
- Sugar beet and rape seed show best potential among conventional annual crops, good quality land & high inputs needed.
- In most CEEC, the bioenergy production potentials are larger than the current energy use in favourable scenario's
- Biomass in CEEC could be produced at costs lower than 2 €/GJ and become available at lower costs than fossil oil.
- This gives export opportunities for the European market.

Sustainable Strategies for Biomass Use

Daniela Thrän

- The majority of European countries can afford a significant biomass contribution to the energy supply. For EU-28 a bioenergy share of 30% is possible in 2020.
- To realise the use of the available biomass, greater efforts in the promotion of biomass on European and national level and better harmonisation of the policies are necessary.
- The **parallel expansion of the use of electricity, heat and fuels from biomass** can help to promote energy crop production geared towards variety.
- Depending on the frame condition an additional demand for biomass imports might occur. For all trade flows (domestic and imports) sustainable production should be defined (and certified)

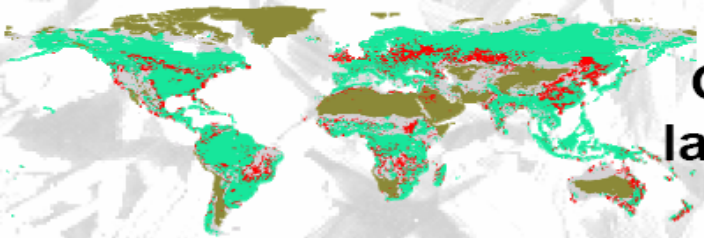
www.ie-leipzig.de/Biomassenutzung/downloads.htm

U. Fritsche, IEA BA T 40
Sustainable international Biofuels Trade
Workshop Potsdam 2006

International Bioenergy Markets develop fast…

- Excitement:
  - Solid biofuels trading develops in bilateral setting (Canada, Russia, agricultural residues); bio-ethanol entered first phases of commodity market trading; *"wild west phase"*
  - Growing bio-energy demand and international supply chains create opportunities for biomass producing regions.
  - Ultimately, a real alternative for mineral oil…
- Concerns:
  - Overexploitation (water, land competition) should be avoided and fair trade principles implemented
  - Biodiversity and GHG emission impacts
  - Will rural areas/small farms really benefit?

IEA Bioenergy



Global potentials are large…; but need to be developed

The environmentalist´s concerns

Uwe Fritsche, Ökoinstitut Darmstadt
Sustainable Biofuels Workshop Potsdam 2006

Öko-Institut e.V.

Environmental Issues

- Bio-residues & wastes are robust options for (2nd generation) biofuels
- for nature conservation + biodiversity, perennials often better than annual crops
- high net yield of whole-plant conversion (SRC + perennials) → lower impacts
- promising biofuels: lignocellulose EtOH + BtL, (some) perennial oil plants; biogas
- 1st generation biodiesel (incl. palmoil) not promising; castor, jatropha potentially sustainable, but mainly rural markets

Summary of the dicussion on the need for a CO_2 reduction calculation tool

- On the development of a tool to calculate the reduction of CO2_eq using biofuels compared to fossil fuels, participants agree that an international tool should be developed but also emphasize that this is a very complicated matter.
- Developing a worldwide tool is considered to be impossible by some participants. Developing a European tool is considered to be challenging, however, this should be done as it is needed. The work should be done by scientists but stakeholders will have to be included.

John Neeft, SenterNovem (Session chair)

Lessons learned

- The European Industry has developed a mature Biodiesel technology
- Some European countries have implemented an appropriate economic framework
- Biodiesel industry need security for their investment
- Worldwide growing interest on Biodiesel
- Feedstock supply is crucial
- Sustainability should be certified

Thank you for your attention

Bild: K. Payer

Thank you for
your attention!

Biodiesel in Germany – Learning from a Success Story
Summary of result

Presented by M. Wörgetter,
Workshop chairman

Main topis and results of the workshop

- Biofuels Policies
- Biofuels in developing countries
- Stake holders position
- Biodiesel R&D
- Biodiesel production technologies
- Markets and qualities
- Biomass potential
- General discussion

Presentations and dicussions gave a deep insight into Biofuels policies, showed the position of stake holders, and the need for coherent policies and strategies

Important questions were answered, the need for additional work was pointed out

Questiones raised

- Is enough feedstock available?
- Electricity, heat or transport fuels from biomass?
- Biodiesel, Ethanol, PPO or even Biogas?
- Rapeseed or exotic plants?
- Imports and exports? Biodiesel from China for Europe?
- Do we understand the market? Is „Free parking“ a solution?
- Detaxtion plus obligation – is the Austrian taxation model best practice?
- Overcapacity in Germany? Will Germany maintain the favorable framework?
- Is Europe a model for North America?
- Optimized Biodiesel – how looks it like, what can be reached?
- Biodiesel stability?
- Methyl or ethyl ester?

Questiones raised II

- Small scale or industrial scale Biodiesel Production?
- Biodiesel technology – which one fits best?
- Low quality feedstock, high quality product?
- Are increased quality requirements needed?
- B 100 for EURO V engines?
- Biodiesel sensors in Diesel Engines?
- Quality and quality assurance is a must!
- Added value from agricultural bio-products:
  - Straw
  - Protein feed
- Sunflower oil as feedstock?
- Can we improof the environmental balance?
- Which R&D is needed for Biodiesel?
- How can we manage the transition from 1st to 2nd generation Biofuels?

Summary of the stake holders dicussion on the need for a CO_2 reduction calculation tool

1. On the development of a tool to calculate the reduction of CO2_eq using biofuels compared to fossil fuels, the workshop participants agree that an international tool should be developed but also emphasize that this is a very complicated matter.
2. Developing a worldwide tool is considered to be impossible by some participants. Developing a European tool is considered to be very challenging, however, this should be done as it is needed. A step-by-step approach has the highest chance for success. The work should be done by scientists but it is clear that stakeholders will have to be included.

John Neeft, SenterNovem (Session chair)

CO2 reduction calculation tool

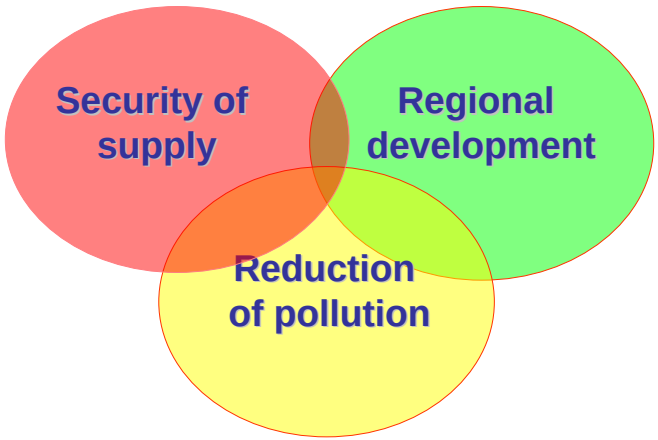
3. Specific comments that were made underline that this is a very complicated matter, for instance:
   - LCA's for fossil fuels should also be reconsidered as the current ones are based on date for the cleanest and easiest accessible (and therefore best performing) crude oils
   - Who gets the CO2 credits, the country producing the feedstock or the country using the biofuel?
   - Regional differences (e.g. in yields of biomass) should be included.
4. Some publications on LCA's are probably insufficient as they do not mention all data on which the LCA is based.

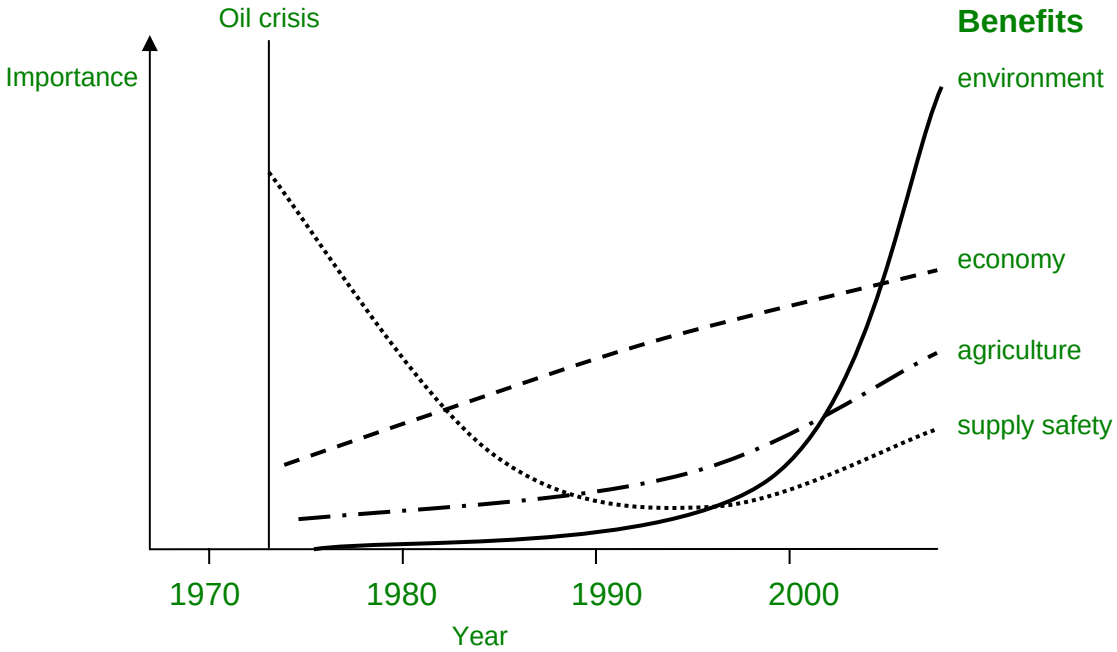
John Neeft, SenterNovem (Session chair)

… or will we need a new evaluation method like the sustainable process index?

Conclusions of the workshop chairman

Balance the benefits

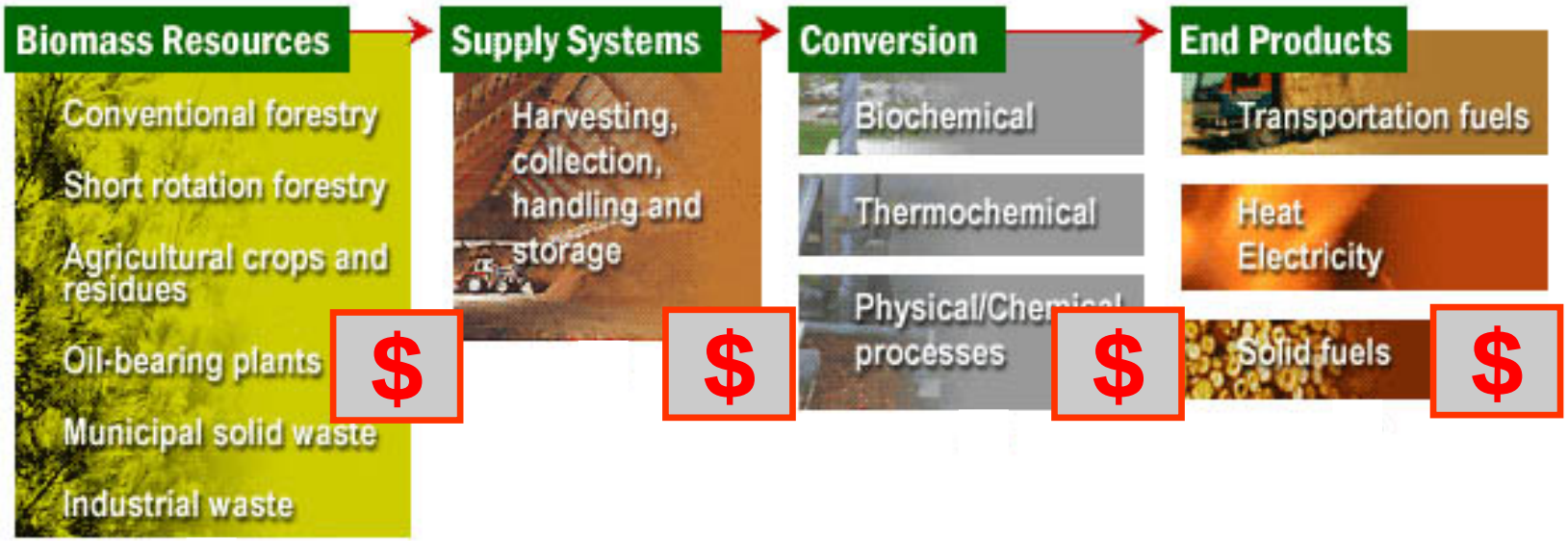




Interest differ from country to country and time to time

Source: Biodiesel in Europe - System Analysis
F. Eibensteiner, sYsan, 2000; www.liquid-biofuels.com

Look at the value chain



2/3 of biofuels costs are feedstock costs
→ Agriculture will play a central role

… and finally

- Biofuel on the market is a complex process
- Driven by society

And a worldewide Challange

Thanks to the sponsors

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Dieter Bockey

ARBEITSGEMEINSCHAFT QUALITÄTSMANAGEMENT BIODIESEL e. V.

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Birger Kerckow

... and to Stephen Dahle from the Chamber for Industry and Commerce of the province of Brandenburg

Thanks to the staff behind:

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Sylvia Biese

Germany

Overall Organizer:

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Austria