Biorefinica 2009
Osnabrück 28. Januar 2009

Renewable Resources -
A Contribution toward Sustainability?

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19.4.1946	born in Großen-Linden
1952-1965	school in Duisburg
1965-1973	study of chemistry in Cologne
1973-1975	post-doc in Siegen
1975-2008	Henkel
	staff R&D detergents/cleansers
	„Quality Management / Environment / Sustainability“

Content

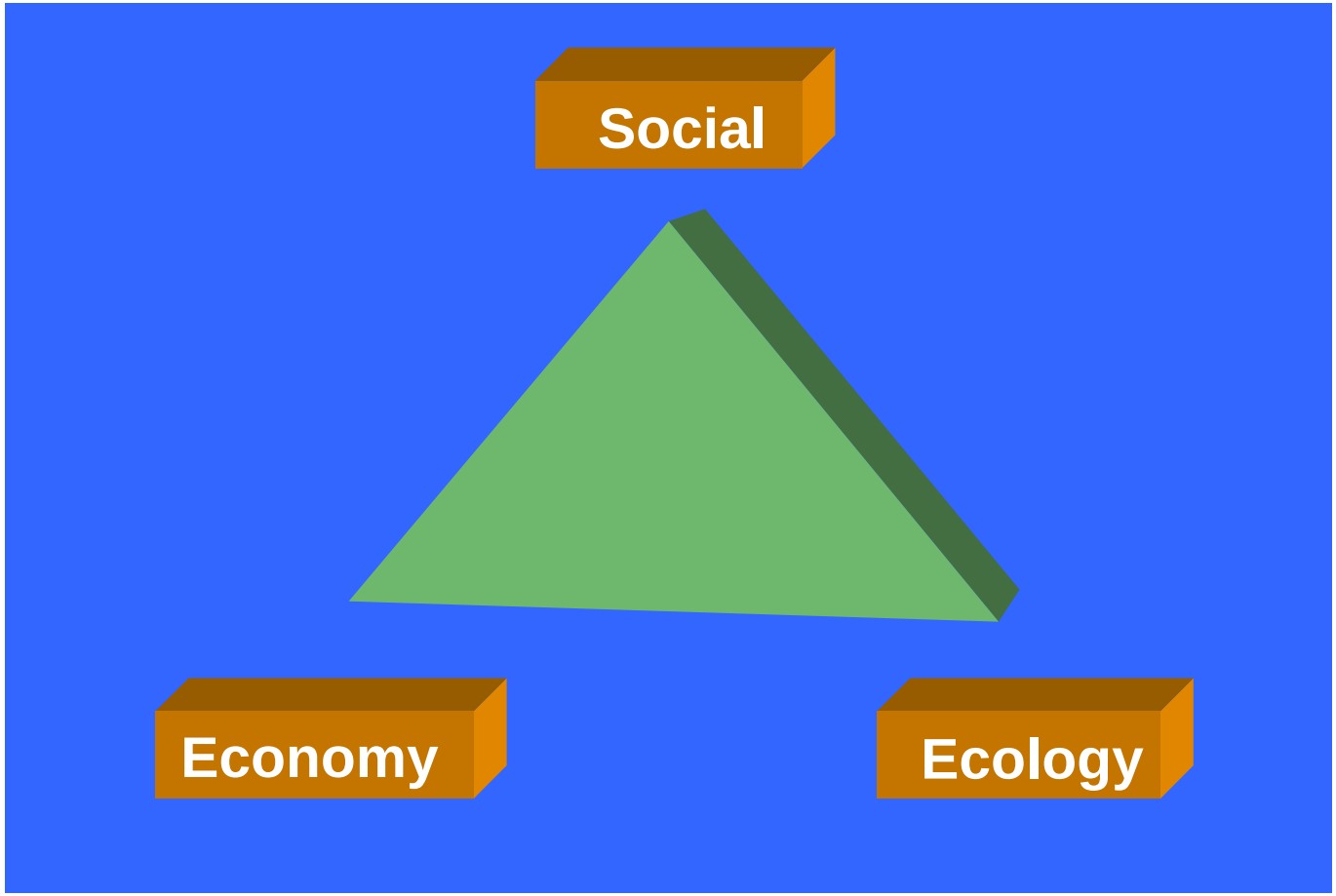
1) Sustainability – a few remarks

What ist Sustainable Development?

Brundtland Report (1987)

„Sustainable Development meets the needs of the present without compromising the abilities of the future generations to meet their own needs.“

Sustainable Development / Sustainability



12 Principles of Green Chemistry

- **Prevent waste:** Design chemical syntheses to prevent waste, leaving no waste to treat or clean up.
- **Design safer chemicals and products:** Design chemical products to be fully effective, yet have little or no toxicity.
- **Design less hazardous chemical syntheses:** Design syntheses to use and generate substances with little or no toxicity to humans and the environment.
- **Use renewable feedstocks:** Use raw materials and feedstocks that are renewable rather than depleting. Renewable feedstocks are often made from agricultural products or are the wastes of other processes; depleting feedstocks are made from fossil fuels (petroleum, natural gas, or coal) or are mined.
- **Use catalysts, not stoichiometric reagents:** Minimize waste by using catalytic reactions. Catalysts are used in small amounts and can carry out a single reaction many times. They are preferable to stoichiometric reagents, which are used in excess and work only once.
- **Avoid chemical derivatives:** Avoid using blocking or protecting groups or any temporary modifications if possible. Derivatives use additional reagents and generate waste.
- **Maximize atom economy:** Design syntheses so that the final product contains the maximum proportion of the starting materials. There should be few, if any, wasted atoms.
- **Use safer solvents and reaction conditions:** Avoid using solvents, separation agents, or other auxiliary chemicals. If these chemicals are necessary, use innocuous chemicals.
- **Increase energy efficiency:** Run chemical reactions at ambient temperature and pressure whenever possible.
- **Design chemicals and products to degrade after use:** Design chemical products to break down to innocuous substances after use so that they do not accumulate in the environment.
- **Analyze in real time to prevent pollution:** Include in-process real-time monitoring and control during syntheses to minimize or eliminate the formation of byproducts.
- **Minimize the potential for accidents:** Design chemicals and their forms (solid, liquid, or gas) to minimize the potential for chemical accidents including explosions, fires, and releases to the environment.

Sustainability

1) 3 Pillars

2) Basic problems solved

3) Process

4) Never ending

Content

1) Sustainability – a few remarks

2) Biorefinica 2009 – goals / objectives

Biorefinica 2009

1) Conversion to biomass for chemical industry

2) Use of non food materials

3) Evaluation of sustainability

Biorefinica 2009

1) Conversion to biomass for chemical industry

2) Use of non food materials
   !!! Better: use of waste

3) Evaluation of sustainability
   !!! Methods

Use of renewable resources in the chemical industry (Position paper: DECHEMA, DGMK, GDCh, VCI)*

1) Renewable Resources in the chemical industry
2) Land use as a border for renewables
3) Optimisation of competition in use
4) Reduction of green house gases and energy efficiency as key parameters
5) Life cycle and all green house gases
6) Closed loops
7) Protection of environment and species
8) Consideration of people in rural area

* July 2008

Content

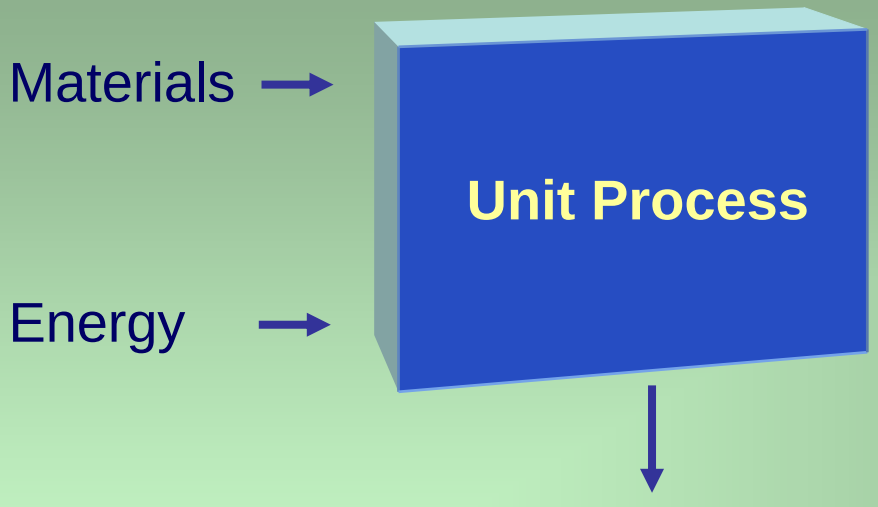
1) Sustainability – a few remarks

2) Biorefinica 2009 – goals / objectives

3) What is waste?

Need for Allocation

Example:



A (needed for the next unit process)

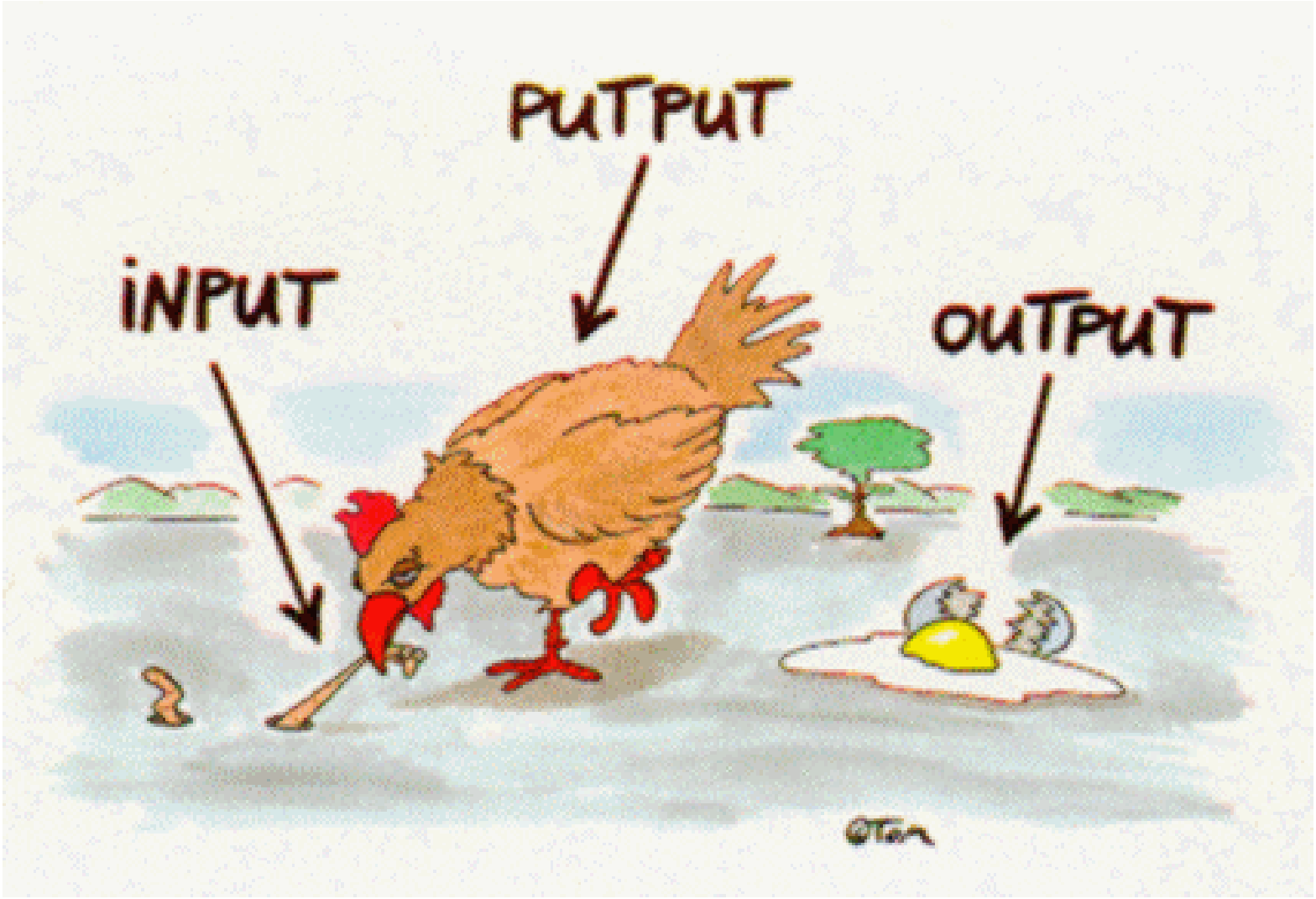
B (leaving the system)

B: 1. waste
2. coproduct

Allocation of e.g. Land Use

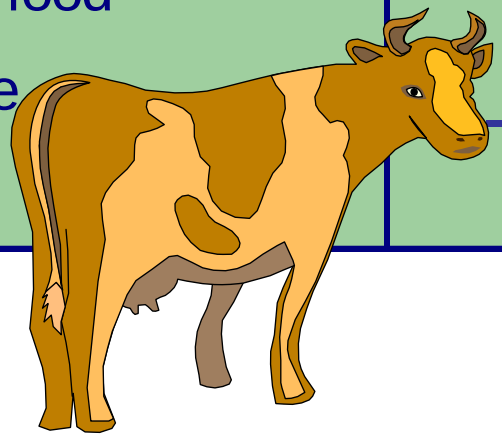
Land Use: major aspect in evaluating renewable resources (competition to food and energy, social aspects)

- Product and Coproduct: the land used has to be shared between all
- Waste: no land use to be allocated


PUTPUT
INPUT
OUTPUT

Products of a Cow
(5 years)

milk	20.000 kg	56,0 %
manure	15.000 kg	42,0 %
human food	250 kg	0,7 %
calves	200 kg	0,6 %
tallow	150 kg	0,4 %
pet food	80 kg	0,2 %
hide	20 kg	<0,1 %
	35.700 kg	



Solutions

1) LCA:
   try to avoid allocation
   allocation based on physical aspects
   allocation based on economic aspects

2) But: no scientific solution possible,
   especially taking into account all aspects of sustainability
   -> need for dialogue processes involving all interested parties

Use of Land: Key Questions (examples)*

- Do we have land for the production of renewables, which is not needed for food production or other important uses?
- How much tropical rain forest has to be protected?
- How much organic food is acceptable?
- How much non used area (forest etc.) is needed by humans / animal / nature?
- Is it principally acceptable to use food for the production of renewable resources?

* Discussion on biofuels: Lokale Agenda Düsseldorf, Aug. 2008

Content

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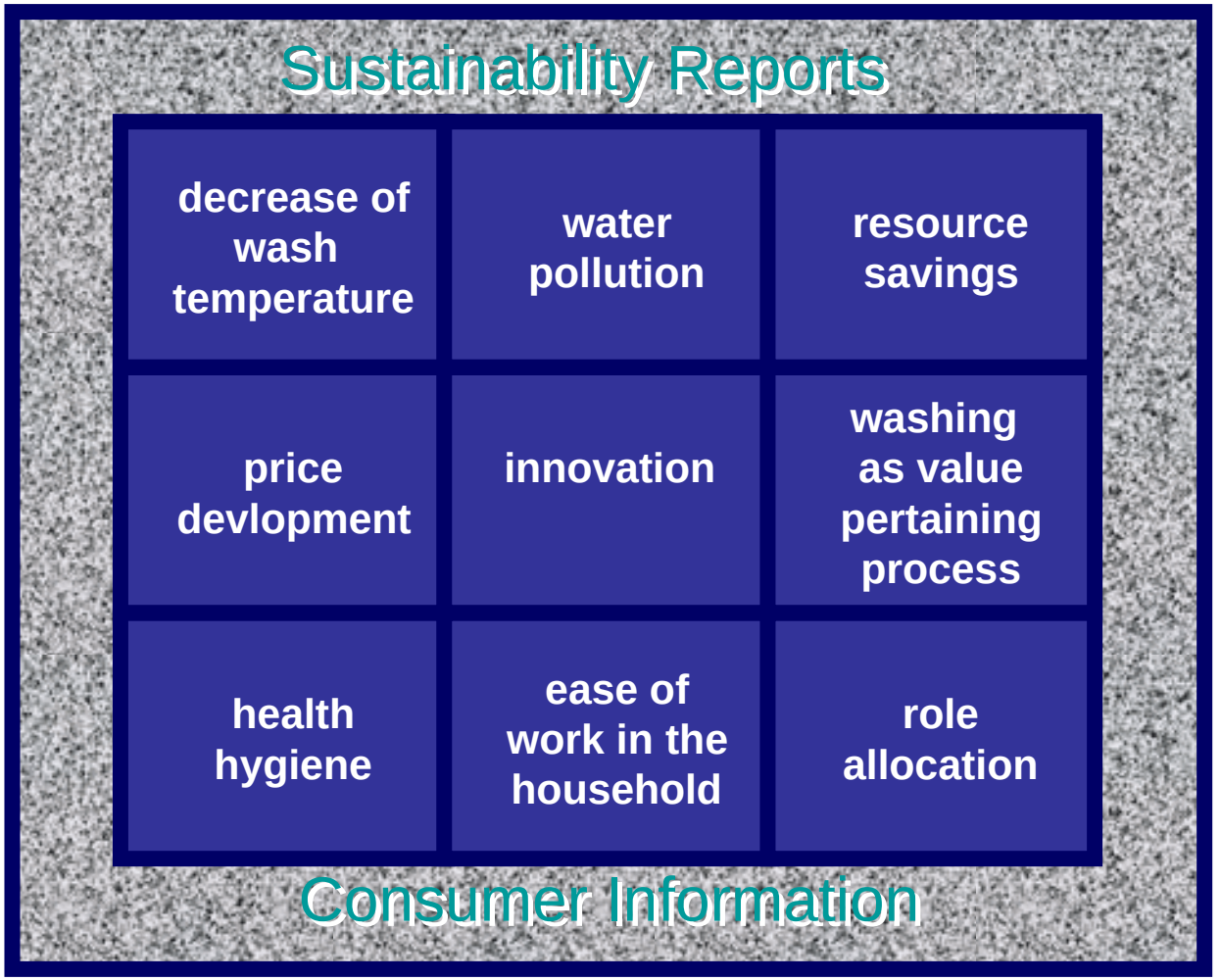
3) What is waste?

4) Dialogue processes

Sustainability and IKW



Roundtable on Sustainable Palmoil Members

- Oil palm growers
- Palm oil processors and/or traders
- Consumer goods manufacturers
- Retailers
- Banks and investors
- Environmental/Nature conservation NGOs
- Social/Development NGOs

Roundtable on Sustainable Palmoil Principles and Criteria

- Commitment to transparency
- Compliance with applicable laws and regulations
- Commitment to long-term economic and financial viability
- Use of best practice by growers and millers
- Environmental responsibility and conservation of natural resources and biodiversity
- Responsible consideration of employees and of individuals and communities affected growers and mills
- Responsible development of new plantings
- Commitment to continuous improvement in key areas of activity

Roundtable on Sustainable Palmoil Supply Chain Mechanisms

- Independent verification
- No misleading claims and labels
- Practical mechanism
- Credibility
- Costs and other burdens shared
- No discrimination of small holders etc.
- More than one mechanism

Content

1) Sustainability – a few remarks
2) Biorefinica 2009 – goals
3) What is waste?
4) Dialogue processes
5) **Conclusion: yes or no**

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1) Sustainability – a few remarks
2) Biorefinica 2009 – goals
3) What is waste?
4) Dialogue processes
5) Conclusion: yes or no
6) **Thank you for your attention**