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Ressource efficiency and pollution prevention in agriculture and food industry

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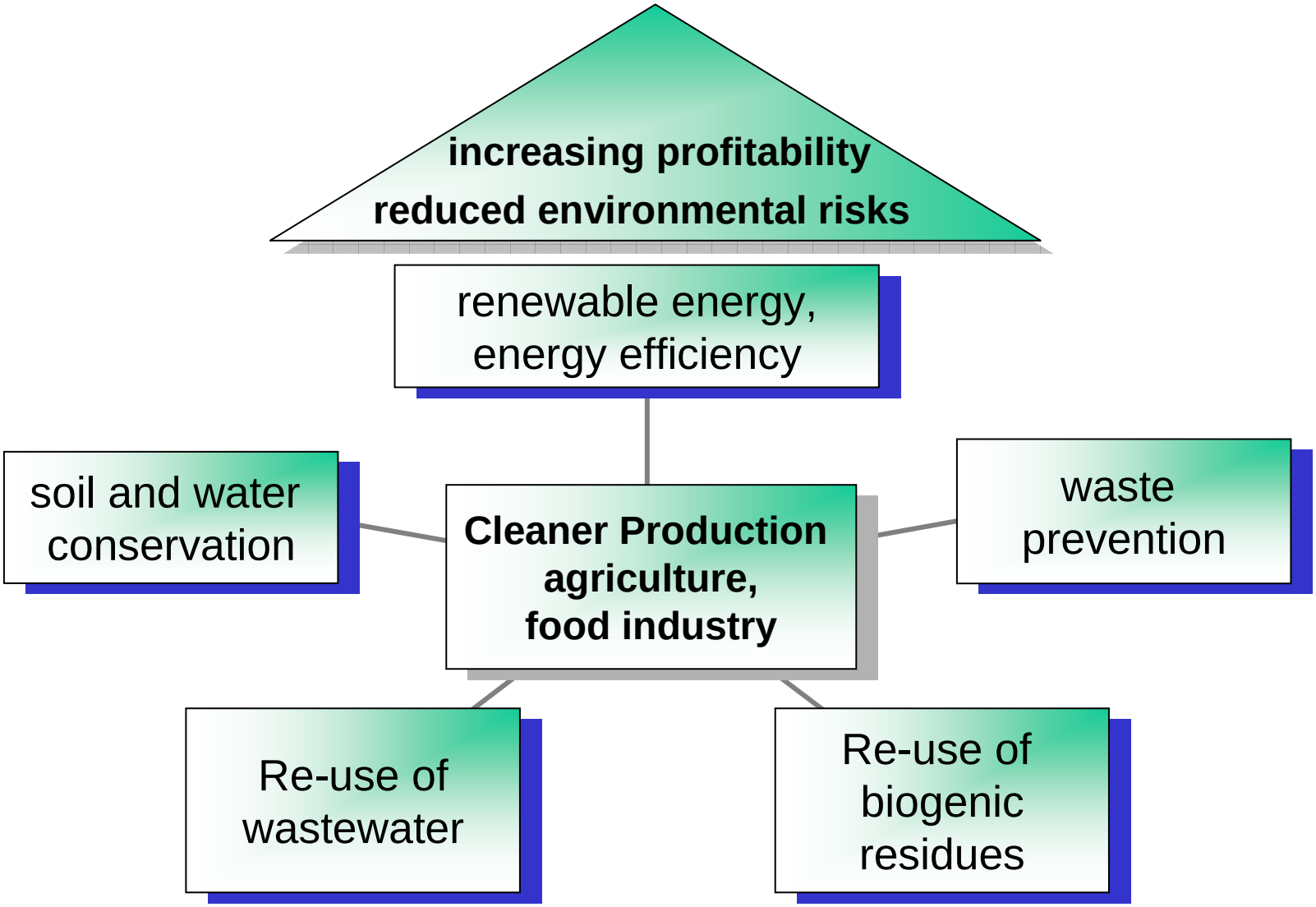
increasing profitability
reduced environmental risks
renewable energy, energy efficiency
soil and water conservation
Cleaner Production agriculture, food industry
waste prevention
Re-use of wastewater
Re-use of biogenic residues

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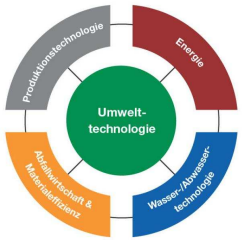
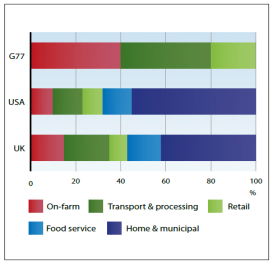


Resource efficiency



Waste re-use

Energy efficiency and renewable energy

Efficient use of resources

efficient use of resources contributes to the rentability of agriculture and food industry and relieves the environment

resources have to be used as efficiently and environmentally friendly as possible so that they are still available for future generations

Optimization of all production related material and energy flows (electricity, heat, raw materials, water/wastewater, waste)

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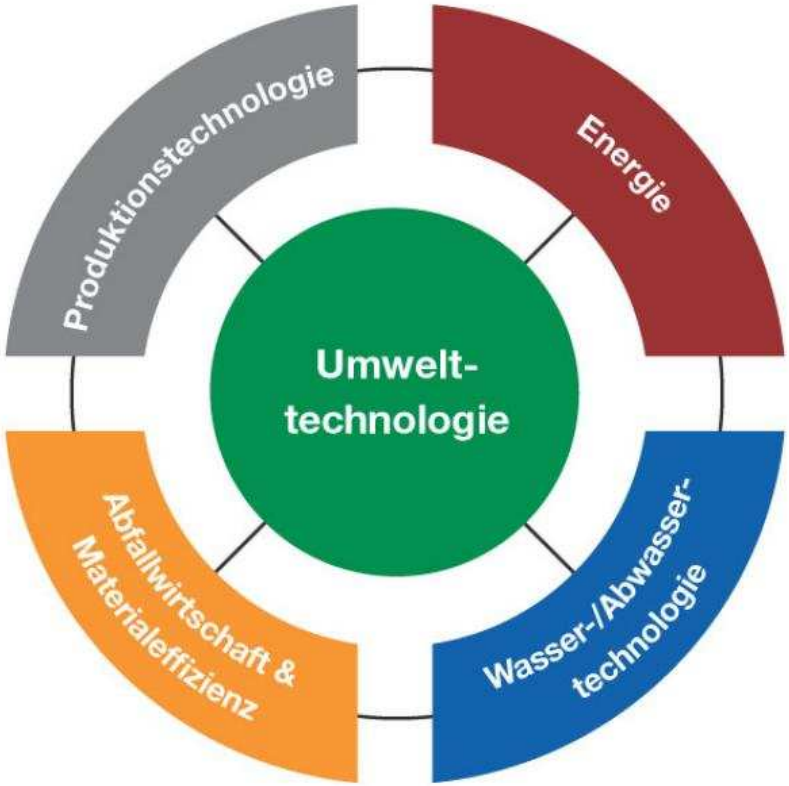
Cost effective, need-based and foresighted operations

identification and evaluation of saving potentials for concrete processes

recommendation of potential suited technologies for increasing the resource efficiency of the processes

integration of identified technologies into production process and exploitation of saving potentials



Goals of process optimization

- cutting demand for raw materials, energy and water
- higher production output without increase of resource consumption (reduction of production costs)
- use of innovative energy- and material-saving technologies
- reduction of environmental pollution (water, soil, air)
- use of recycling potential

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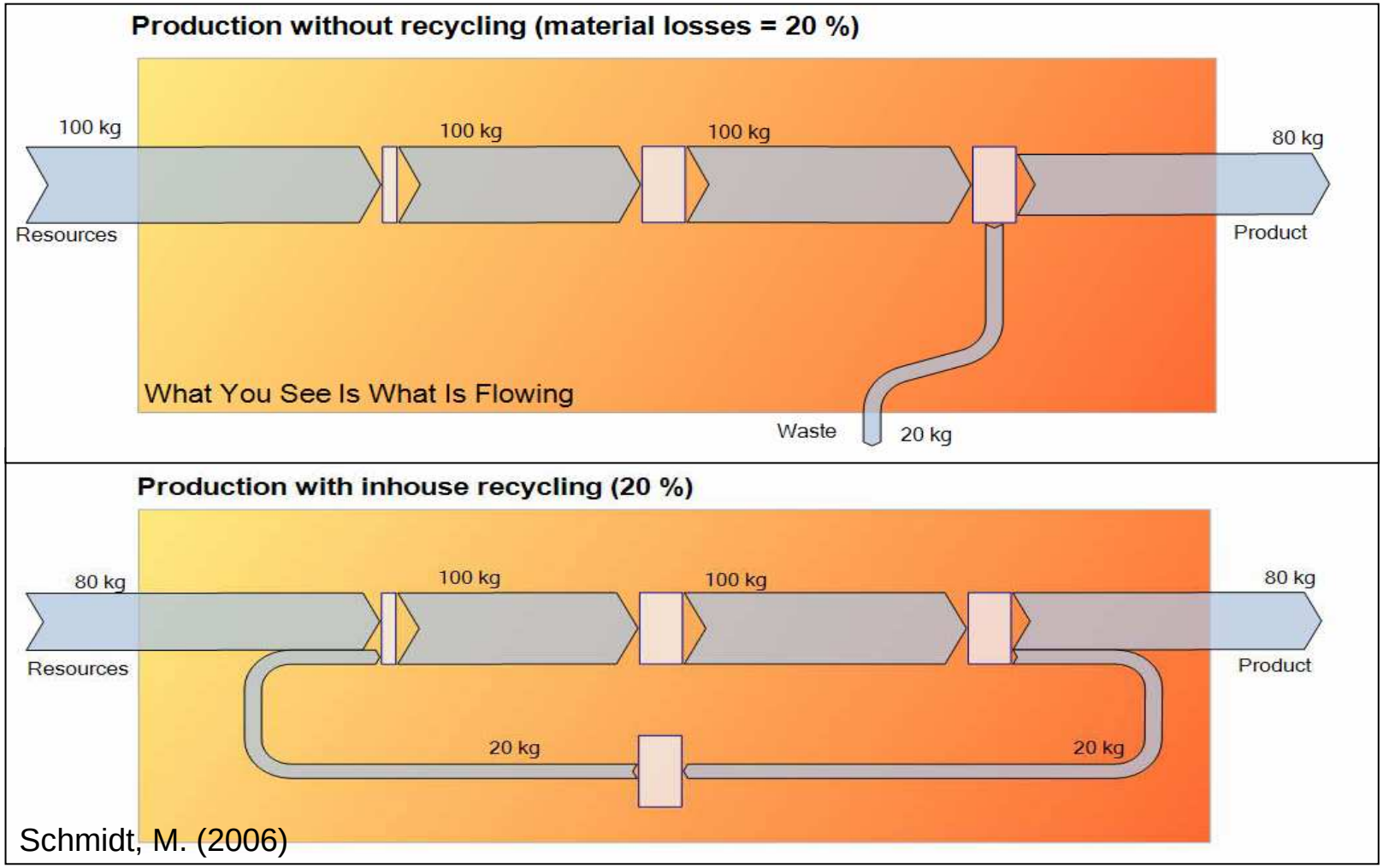
Cutting demand for raw materials through integrated recycling



Schmidt, M. (2006)

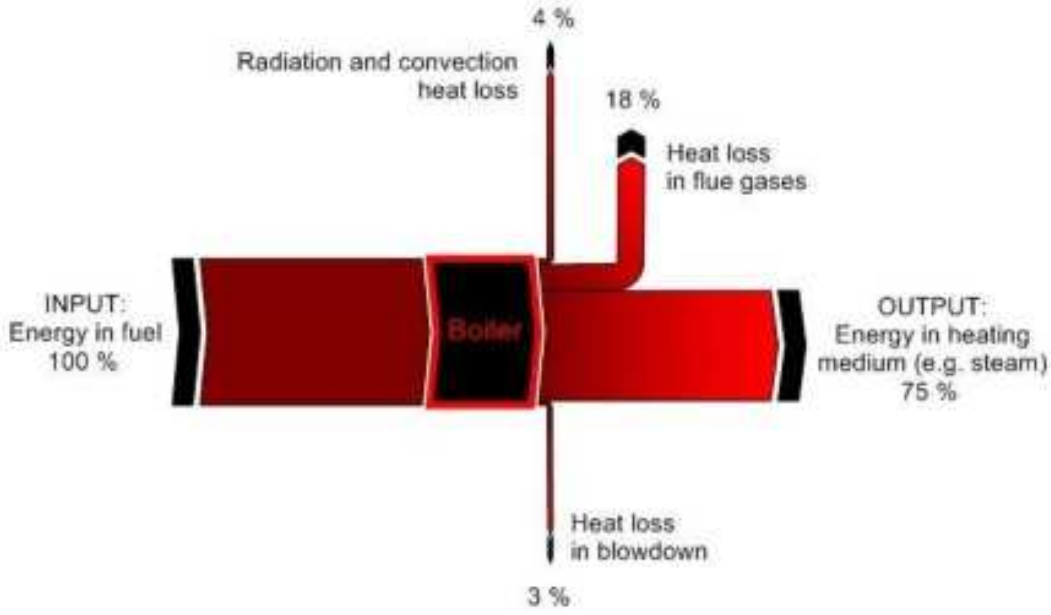
Example: coupling the improvement of wastewater with recycling

- a winery improves its wastewater treatment through better separation of solid grape residues (pomace) after pressing
- now the wastewater is less polluted and treatment is more efficient
- the collected pomace is fermented separately and distilled to liquor: pomace brandy

Less water pollution and new product series

Recommended procedure for process optimization

- detailed analysis of initial situation: which systems and processes are in place and how are they contributing to material and energy consumption
- identification of pollution sourcses
- evaluation and determination of improvement technologies and process optimization for:
  - energy saving,
  - waste reduction and re-use
  - pollution prevention e.g. in wastewater



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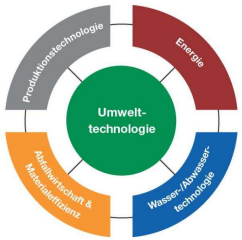
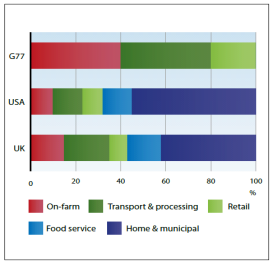


Resource efficiency



Waste re-use

Energy efficiency and renewable energy

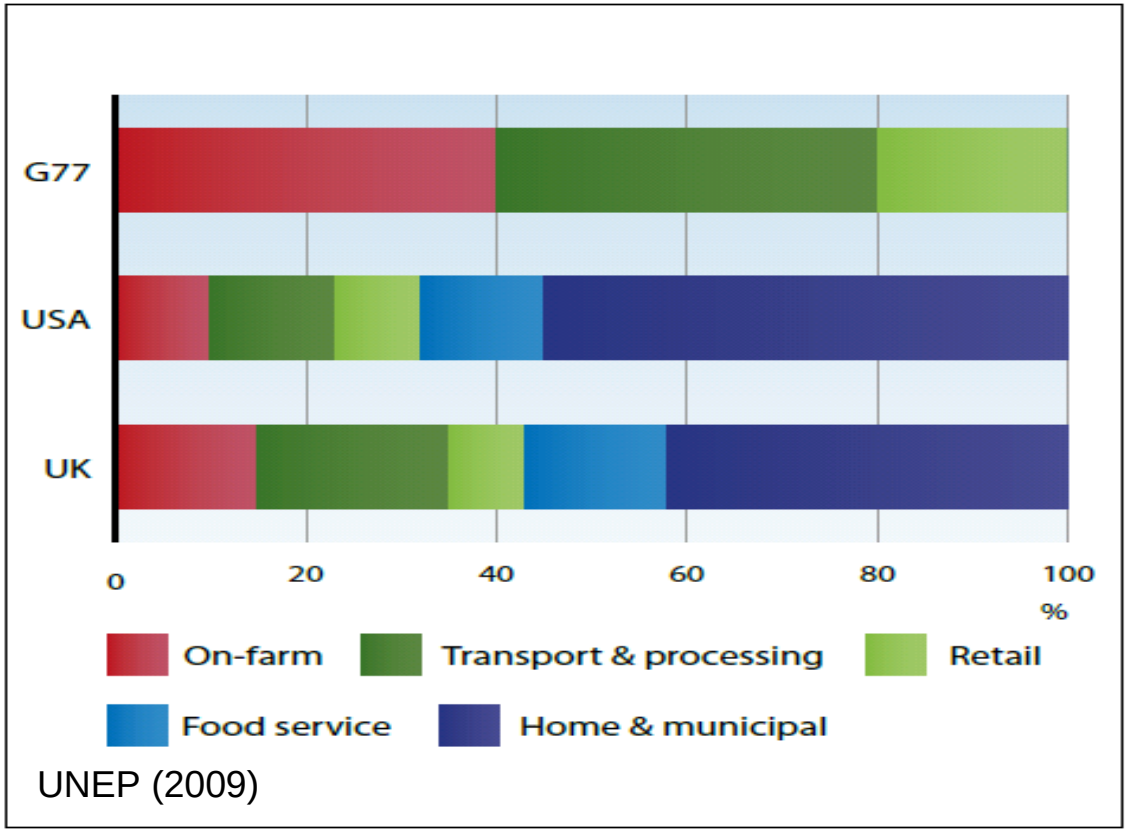
The make-up of total food waste

Poor income countries:

- losses from a lack of storage facilities, on-farm pest infestations, poor food handling and inadequate transportation infrastructure

High income countries

- throw away mentality
- In the US for example, 40% of food worth US$ 48.3 billion is wasted every year



UNEP (2009)

Reducing waste during production and manufacturing

- Higher productivity at same demand for raw material

Re-use of biogenic residues

- waste can be turned into marketable products and/or energy
- all biomass waste could be composted or recovered for energy
- agricultural residues possess an energy potential more than needed to cover entire fossil oil demand

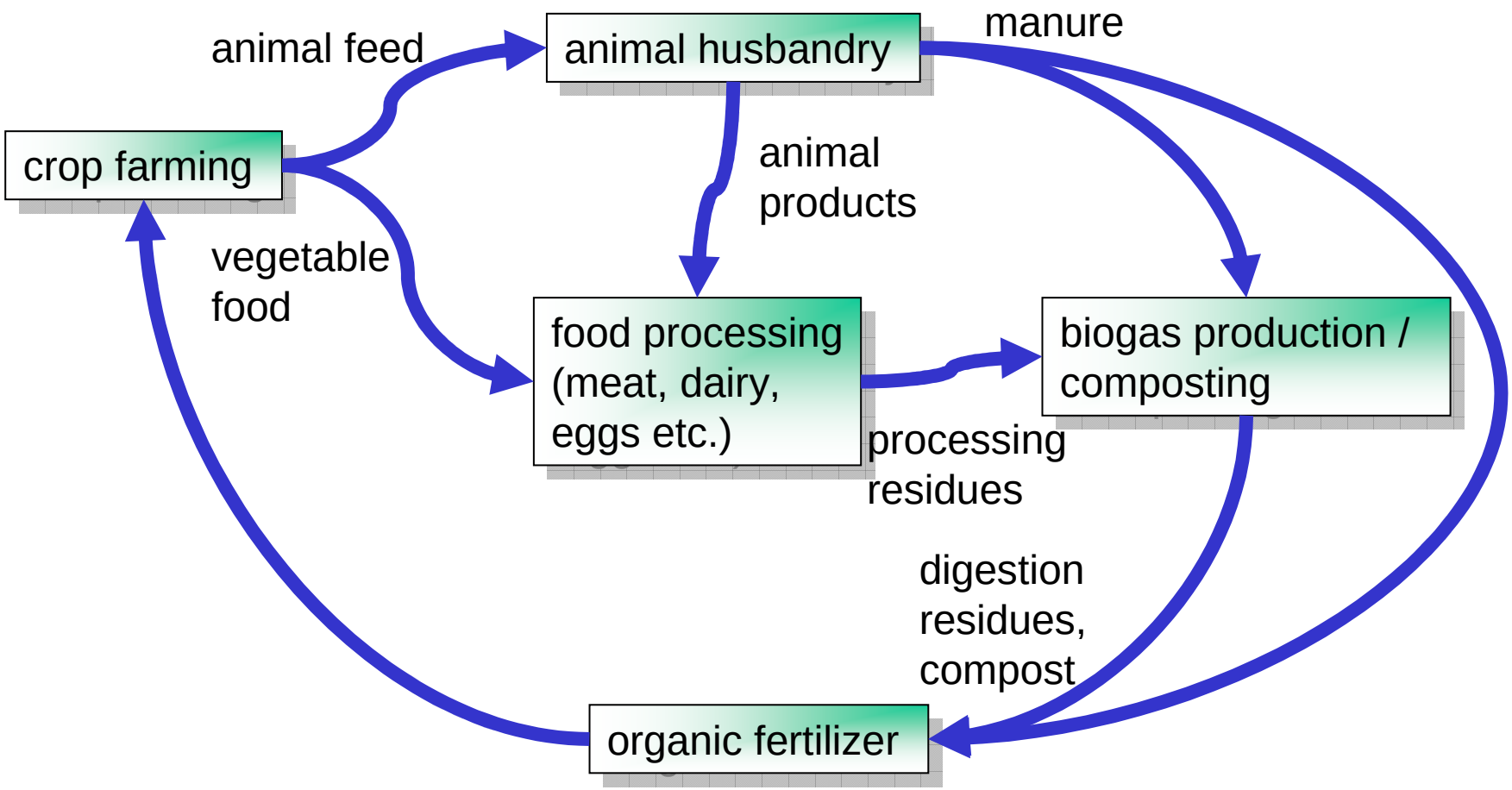
	material re-utilization	energetic re-utilization
examples:	- press cake for animal feed - wood chips for card boards - biomass for compost	- digestion to biogas - biofuel: ethanol - solid fuels

Organic wastes as fertilizers

- Manure, composted organic waste and residues from biogas production contain mix of all relevant plant nutrients
- Composting is an old technique for transferring organic waste into soil fertilizer
- Modern applications use multi-step, closely monitored processes with measured inputs of water, air and catalysts
- used in gardens, landscaping, horti-culture, and agriculture

plant supported composting of manure

Nutrient cycle



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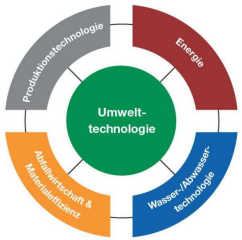
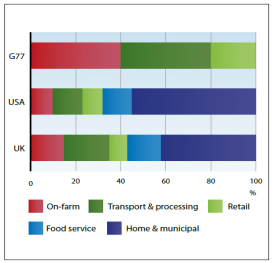


Resource efficiency



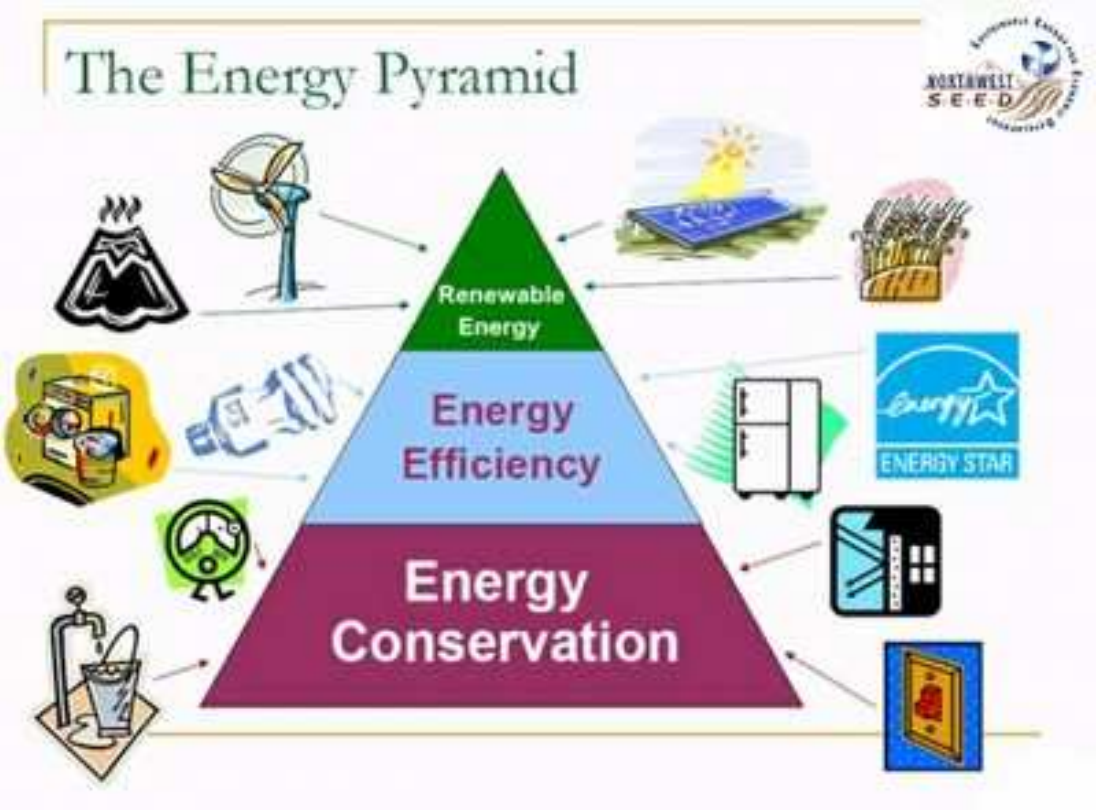
Waste re-use

Energy efficiency and renewable energy

The energy pyramid

- the largest opportunities for improvement in energy use are energy conservation and higher efficiency

- companies should always focus first on solutions to cut energy demand and second on use of renewable energy



Biogas

- biogas: a gas produced by the biological breakdown of organic matter in the absence of oxygen
- biodegradable materials: biomass, manure, sewage, municipal waste, green waste, plant material, paper mill waste and energy crops
- digestion into methane containing gas
- can be used for heating, electricity generation, combustion engine

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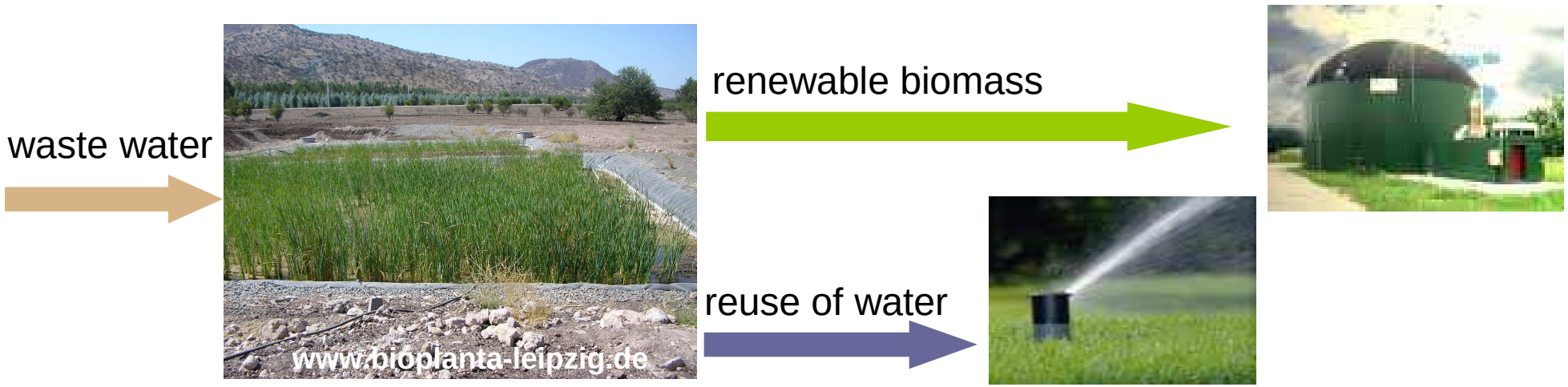
Combination of passive water treatment and biomass generation

- use of constructed wetlands to treat industrial wastewater
- combination of biological water treatment with recovery of usable water and energy



Biogas storage

Facilities for biogas storage in agriculture (left) and waste treatment (right)

Double effect for climate protection

1) Avoidance of green house gas emission

- If manure and other biodegradable residues are left to decompose, they release two main gases that cause global climate change:
  - Nitrous dioxide warms the atmosphere 310 times more than carbon dioxide
  - and methane 21 times more than carbon dioxide

2) Replacement of fossil fuel

- one cubic meter of biogas has the same energy content as 0.6 liters of oil fuel

Further advantages

- saving money
- residues of biogas production can be composted to high-quality fertilizer
- enabling local mechanization and electricity production

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Case study Biozentrum Dessau AG I

efficient circuit concept for the overall energy use of biomass waste

- aim of increasing independence of energy supply in the city Dessau
- biogas production from biomass waste and refinement of biogas to natural gas (methane> 96% CH4)
- production / distribution of high-purity CO_2 (99%), (Bottling / dry ice)
- 100% use of waste heat for drying wood
- firewood sales
- composting and sale as soil amendments

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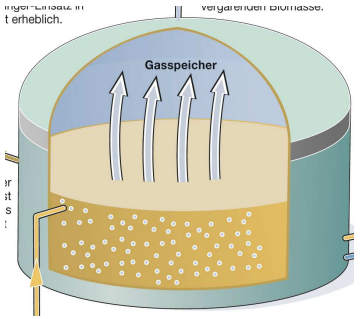
Case study Biozentrum Dessau AG II

biomass waste



fermenter

biogas

refinement

CO_2 (35%)

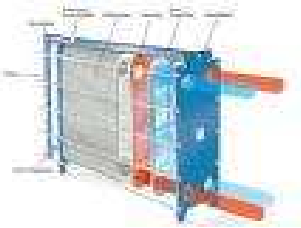
Methane (60%)

heat/electricity

natural gas

fuel

cooling/
heating/
drying



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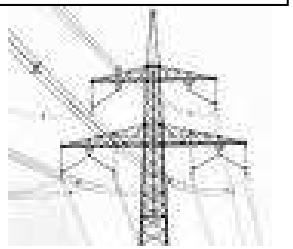

Muchas gracias por su atención!

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