

Biobased Economy

Wageningen UR Food & Biobased Research

InHolland 4 December 2013, Ben van den Broek



FOOD & BIOBASED RESEARCH
WAGENINGEN UR

Wageningen UR Food & Biobased Research

- Wageningen UR



University



Research Institutes



Wageningen UR Food & Biobased Research

■ Food & Biobased Research

- Fresh, Food & Chains
- Biobased Products

■ Biobased Products

- Biobased Chemicals
- Biobased Materials
- Biorefinery & Bioenergy



Wageningen UR Food & Biobased Research

■ Biobased Chemicals

- Chemicals that can be used as building blocks for bulk and fine chemicals. These chemicals are derived from biomass (polysaccharides, lipids, proteins lignin etc.)



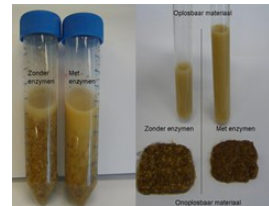
■ Biobased Materials

- Research and development of materials and products like paper, construction material and plastics based on renewable resources



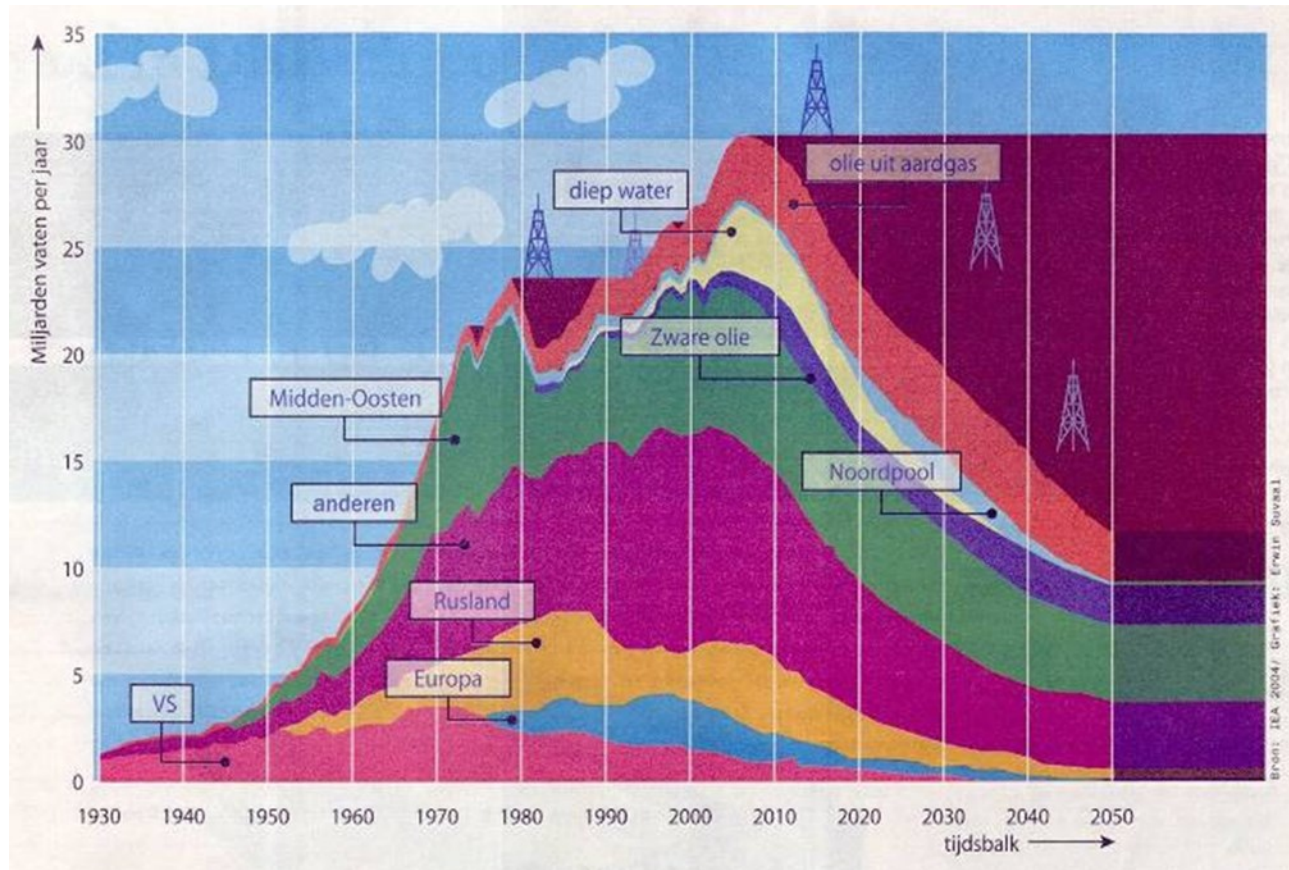
■ Biorefinery & Bioenergy

- Chemical, thermal and enzymatic fractionation of biomass for the production of biobased intermediates
- Production of biofuel and chemicals by fermentation



Introduction

- The amount of fossil resources is decreasing



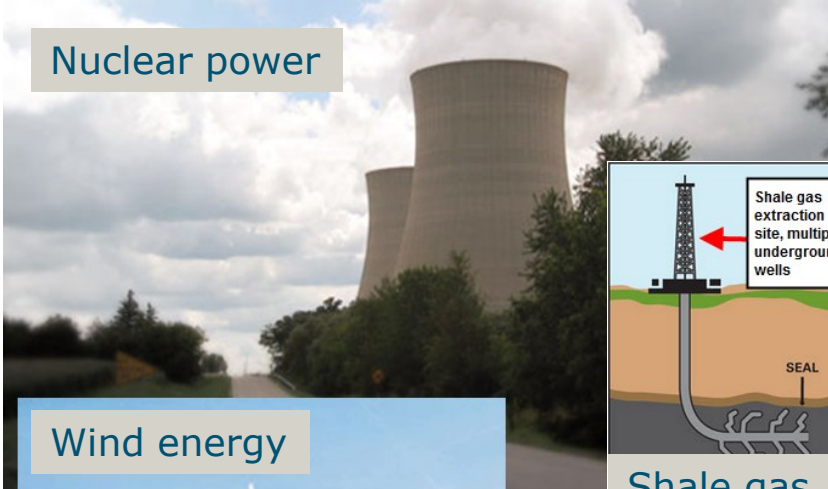
Introduction

Source	Amount available	Depletion
Crude oil	135×10^9 t	~ 2070 5x reserve of 2000 and 2.3 % growth per annum
Gas	120×10^{12} m^3	~ 2070 2.3 % growth per annum
Coal	850×10^9 t	~ 200 year

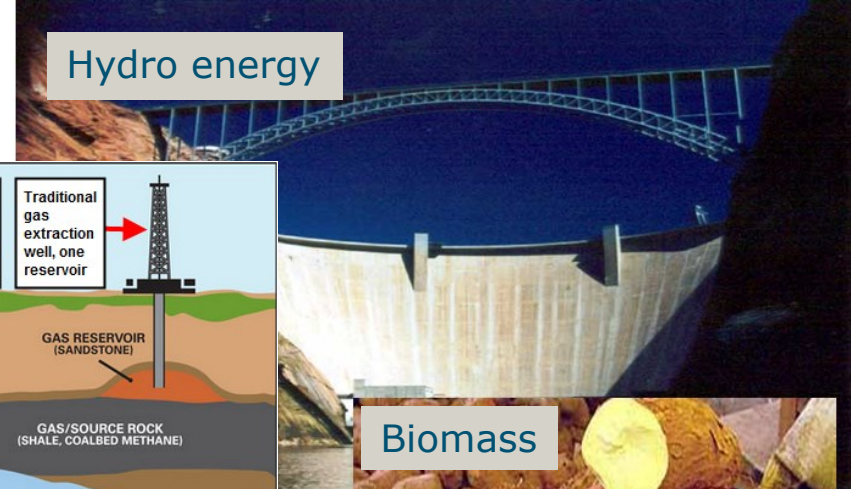


Introduction

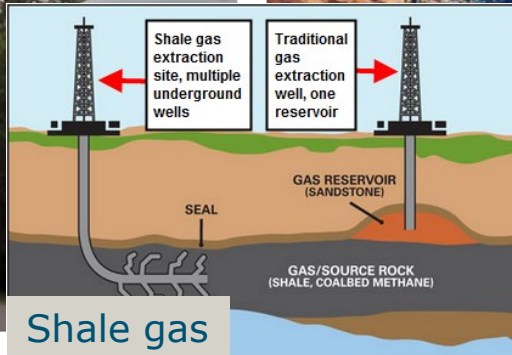
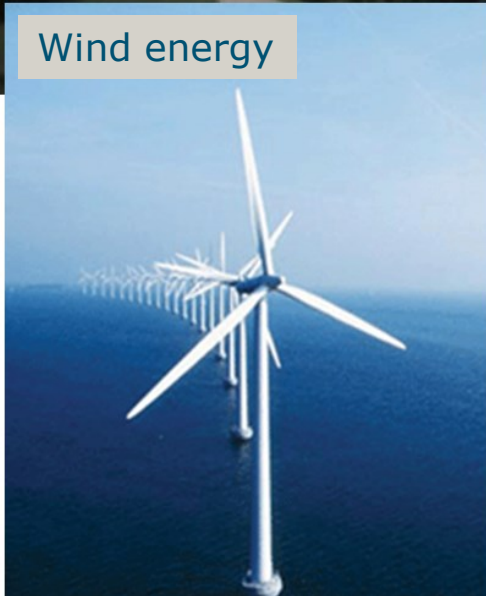
Nuclear power



Hydro energy



Wind energy



Shale gas

Biomass

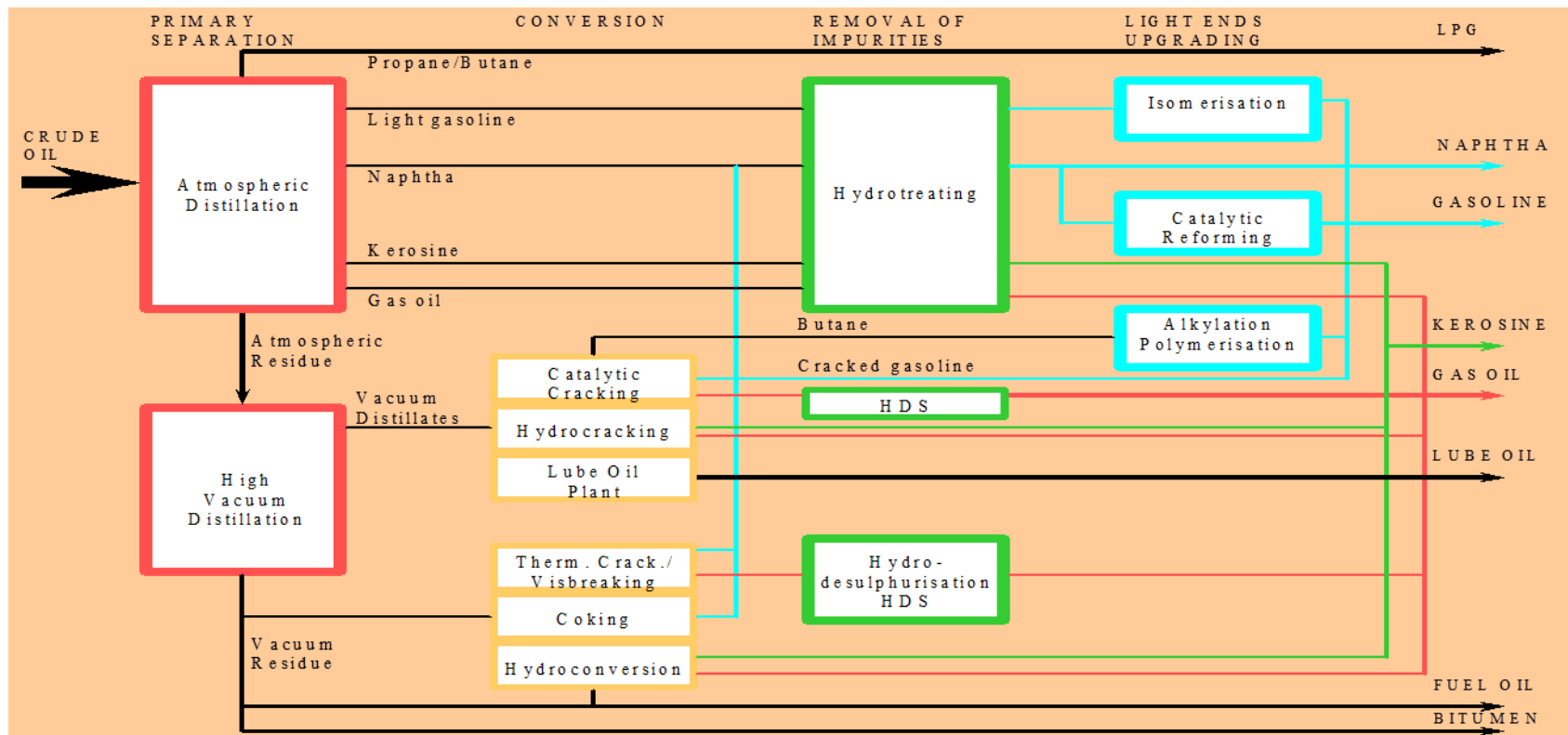


Solar energy

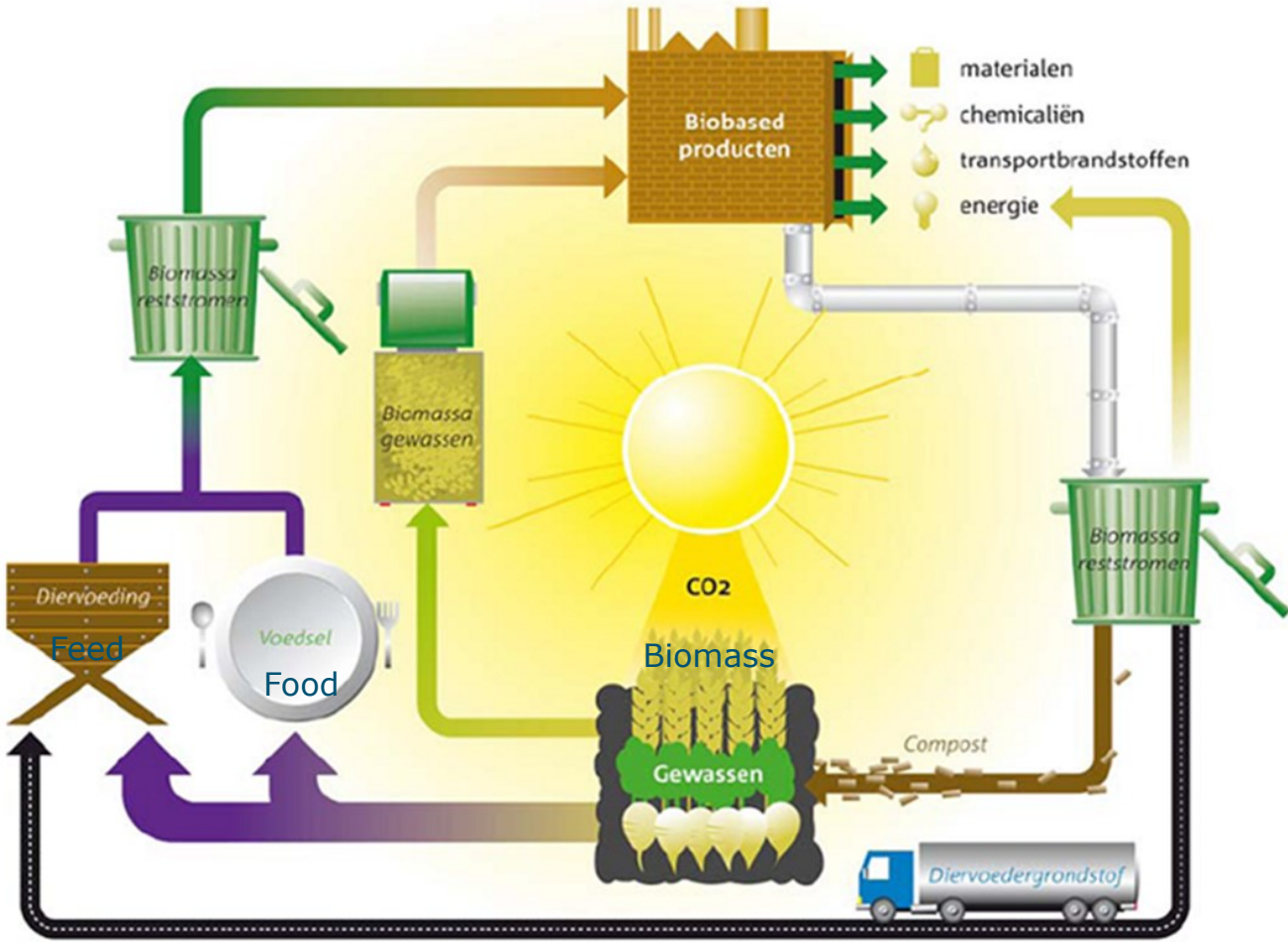


Introduction

- Currently the petrochemical industry is based on fossil resources for the synthesis of not only fuel but also chemicals



Introduction



Visual: Overheidsvisie Biobased economy

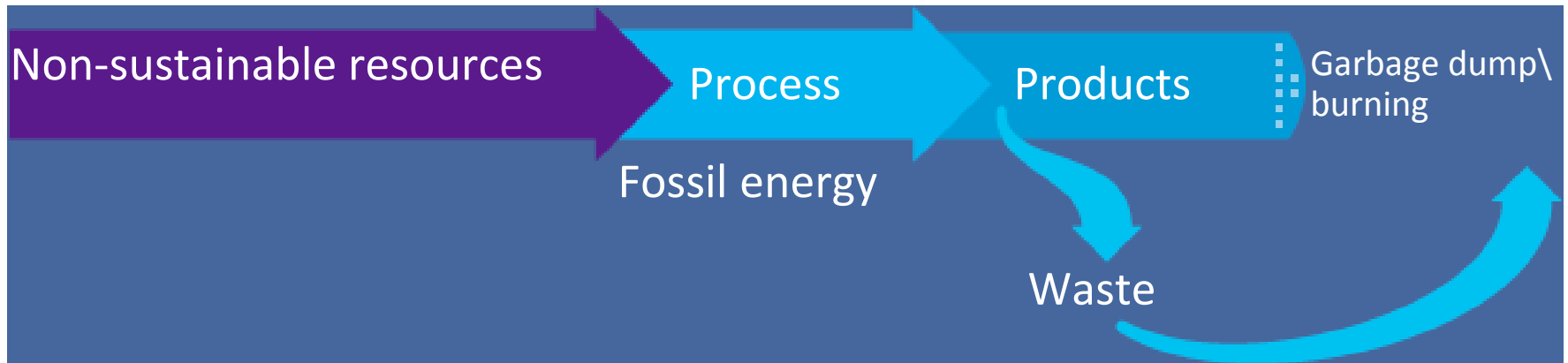
Biobased Economy

- Before 1850 biobased energy carriers and materials were used
- > 1800 steam engines were developed fired by coal
 - >1850: Development of coal based chemistry
- > 1900 development of fossil oil based engines
 - >1920: development of the petrochemical industry



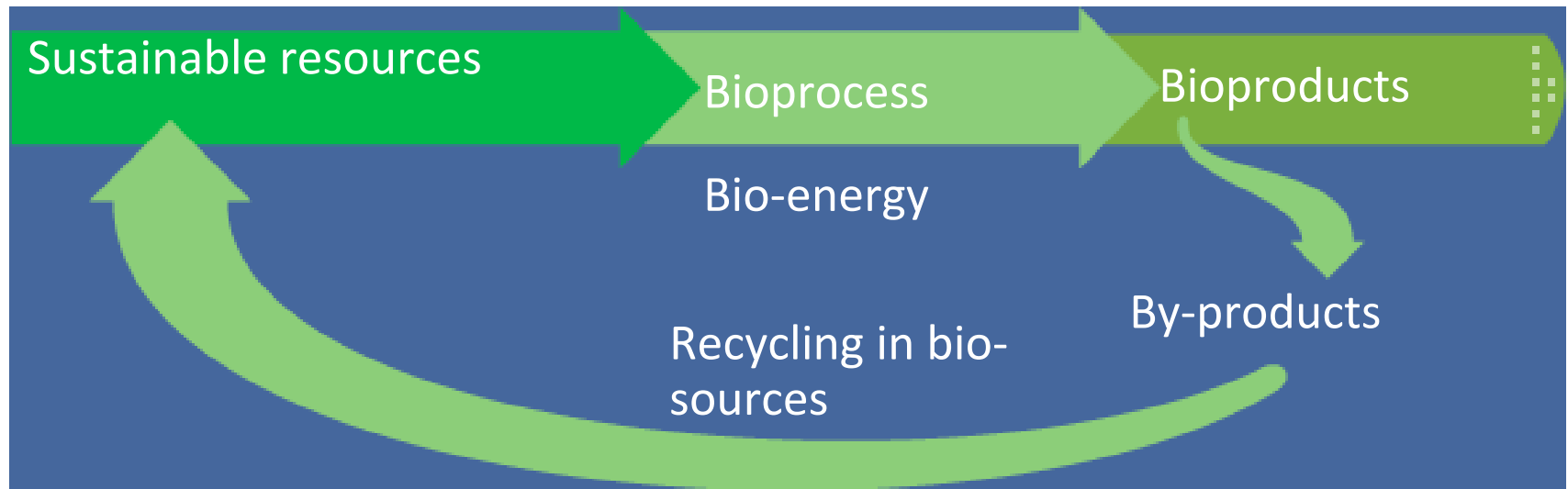
Biobased Economy

- Conclusion: The world economy is during the ages changed from a biobased economy into a petrochemical based (especially hydrocarbons) economy



Biobased Economy

- At this moment biobased economy is defined as an economy which is based on biotechnology that makes use of renewable resources for the production of materials and energy



Biobased Economy

- What are the drivers of a biobased economy?
 - Sustainable prosperity and employment: strong and green economy
 - Positioning of our (Dutch) position in the world market
 - Geo-politics, independent of other countries
 - Reduction of energy, global warming, green house effect
 - Innovation for a strong (sustainable) competitive position
 - Flexibility of biomass resources and cost reduction in the future
 - Efficient use of biomass resources



Biomass

- Green resources in non-food applications have always been used during mankind



Linen

String

Cane

Glues

Wool

Jute

Cocos

Textile

Putty

Paper

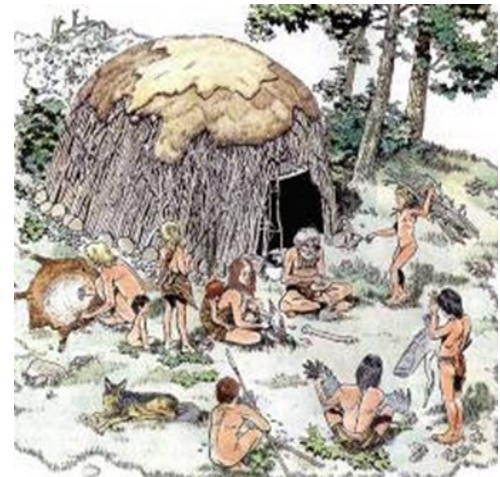
Leather

Cotton

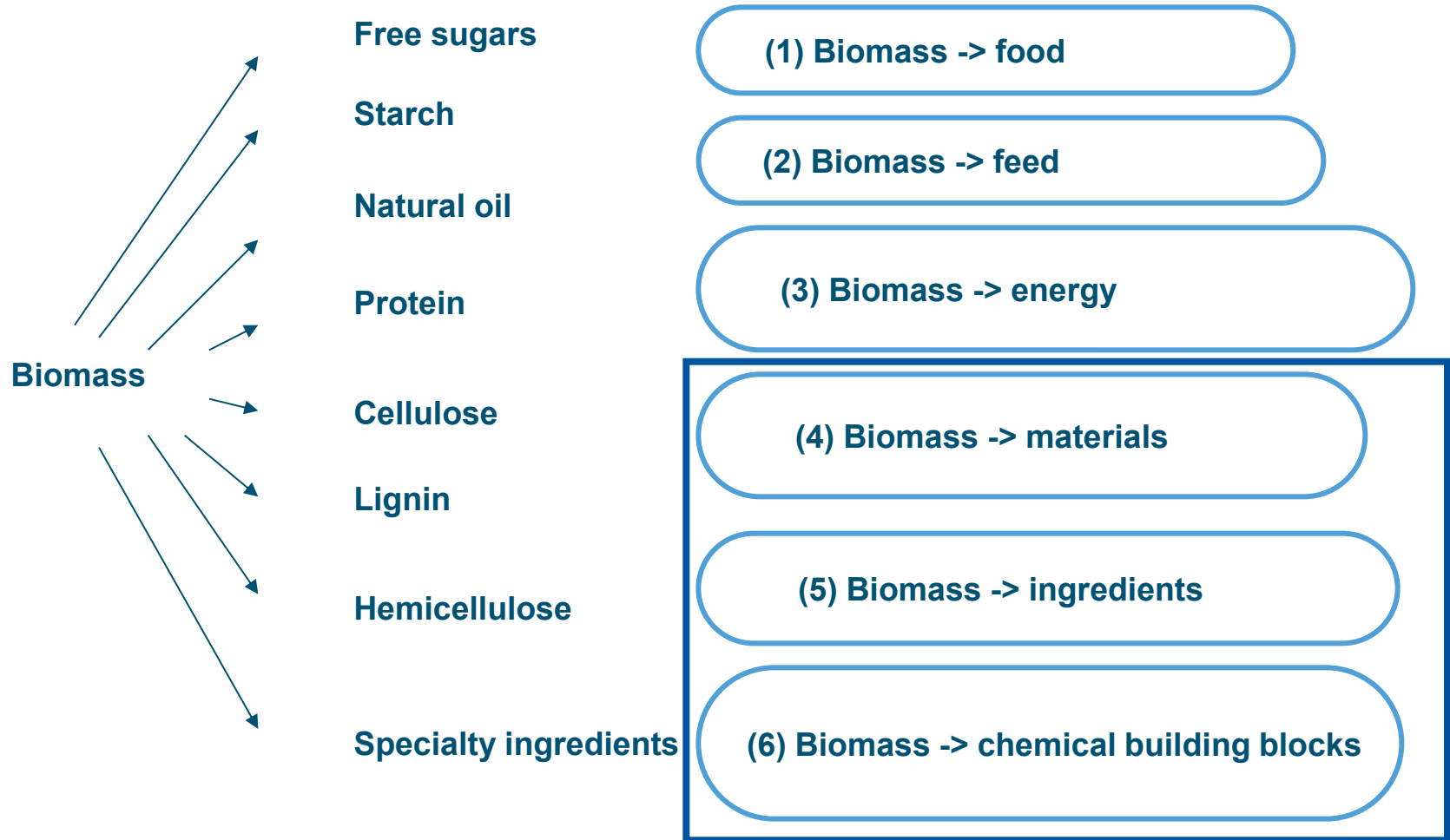
Rubber

Linoleum

Paints



Biomass



Biomass

■ Materials from biomass

■ Applications

- Composite materials for cars and packaging
- Board material for construction
- Insulating materials for sound and heat



■ Crops

- Flax
- Hemp
- Exotisch: jute, sisal, kokos
- Hout (bijv. Spar)



Biomass

■ Substances from biomass



■ Application of starch

- Starch plastic for molding (e.g. flower pots)
- Starch plastic for foils and bags (Packaging material)
- Toys for pets
- Glues



■ Crops

- Potato (Potato steam peels)
- Maize
- Wheat

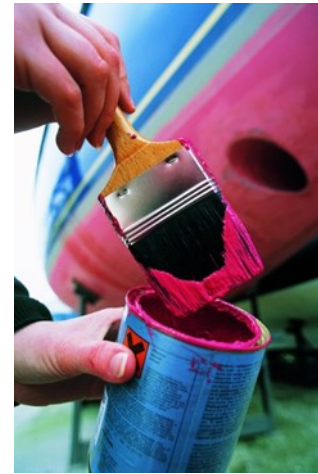


Biomass

■ Substances from biomass

■ Application of oils

- Glues and paints
- Plastics and rubbers
- Biodiesel
- Pure vegetable oils



■ Crops

- Rapeseed
- Algae
- Marigold

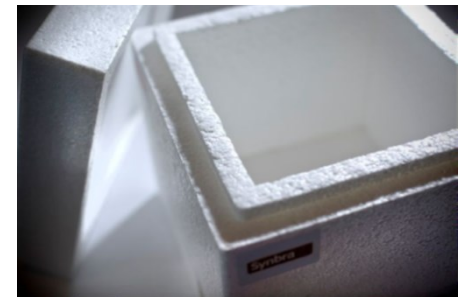


Biomass

■ Chemical building blocks from biomass

■ Bioplastics for molding and fibers

- Sorona from Dupont (deels bio)
- Polylactic acid from Natureworks, Synbra
- Green PE from Braskem
- Green PVC from Solvay



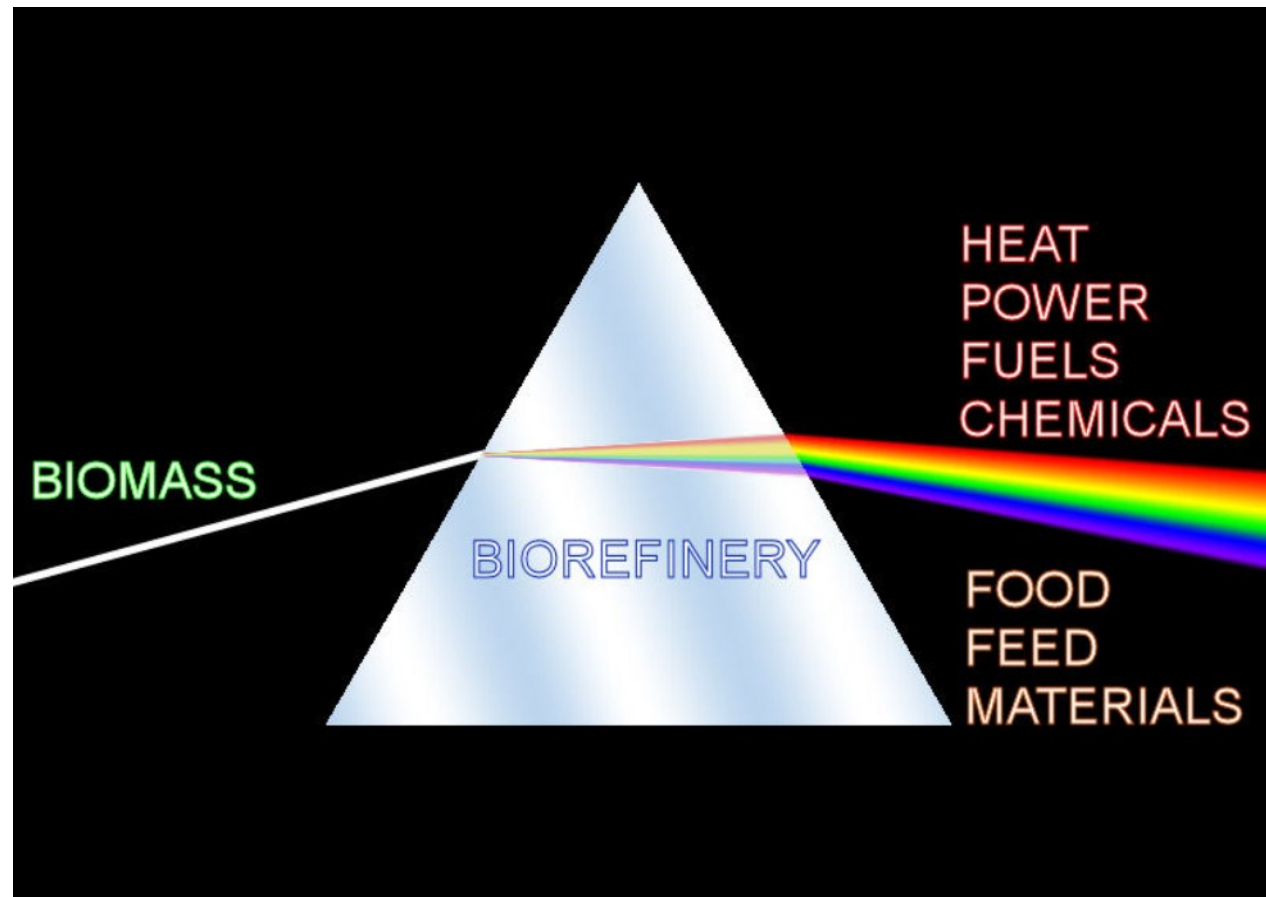
■ Crops

- Maize
- Wheat
- Sugar beet or sugar cane

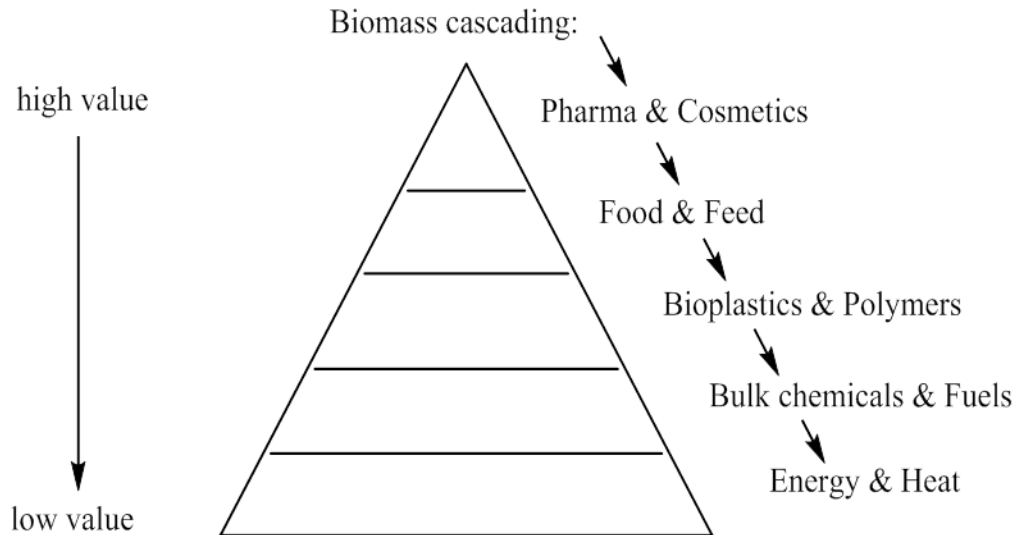


Biorefinery

- Idea of biorefinery



Biorefinery



Value of glycerol:

	€/GJ
•Epichlorohydrin	30 – 40
•Transportfuel	10
•Electricity	3

€/ ton	FFFFF
High	Farma
High	Fun
5-20 000	Food ingredients
100-500	Food nutritional
100-500	Feed young
100-300	Feed pigs
50-250	Feed cattle
500- 800	Functional chemical
500	Fibre
150-400	Fermentation
100-300	Fermentation bulk
100-300	Fuel
-/- 200- 100	Fertilizer
50-150	Fire
0	Flare
-/- 300	Fill

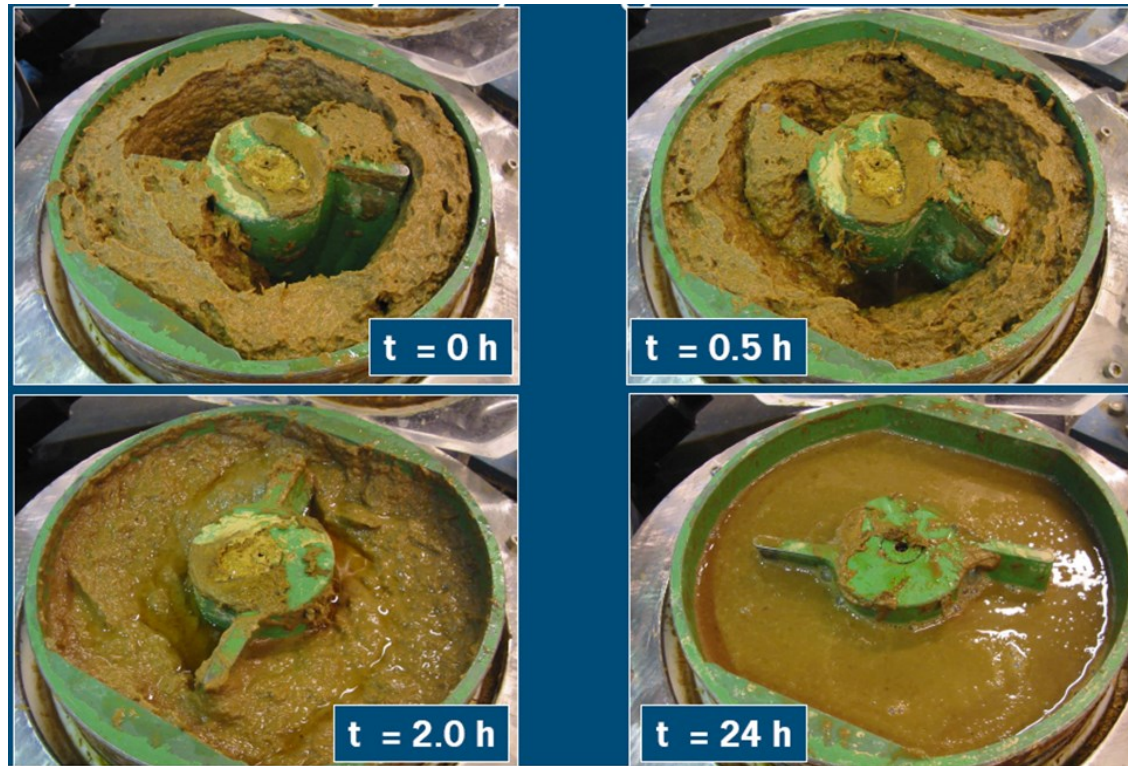


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Biorefinery

- Degradation of plant cell walls by chemicals and/or enzymes



Biorefinery

■ Biorefinery of maize(Zeafuels)



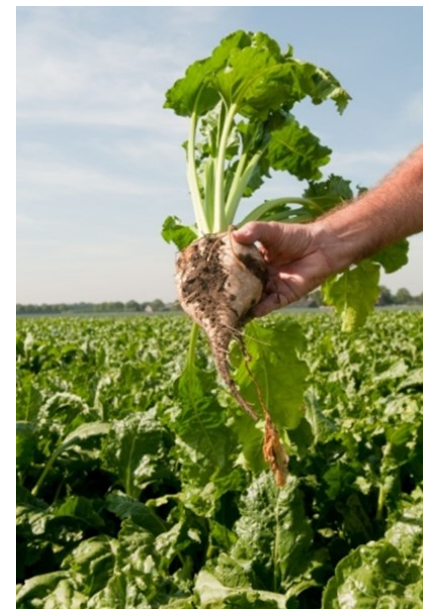
Biorefinery

■ New crops:

- Seaweed
- *Calendula*
- Algae
- *Miscanthus*
- Gras

■ Waste streams:

- Empty fruit bunches
- Beet pulp



Biorefinery



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End part 1



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Top Chemie Δ
TOEGELIJDIG VOOR INNOVATIE