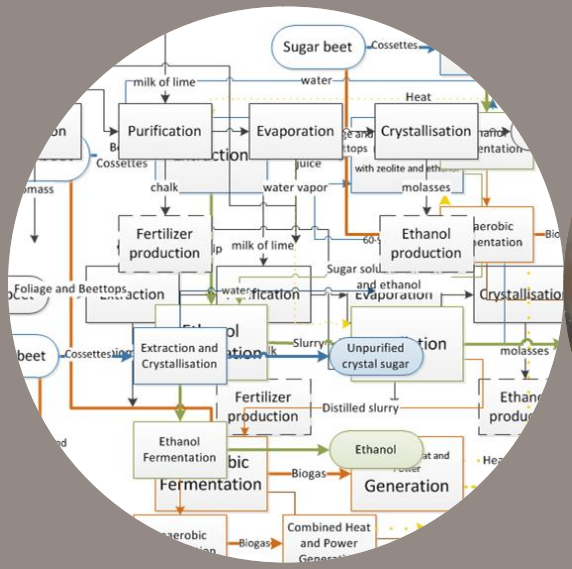
Biorefinery in Wageningen

2013, Marieke Bruins (BCH)

Ton van Boxtel (BRD)

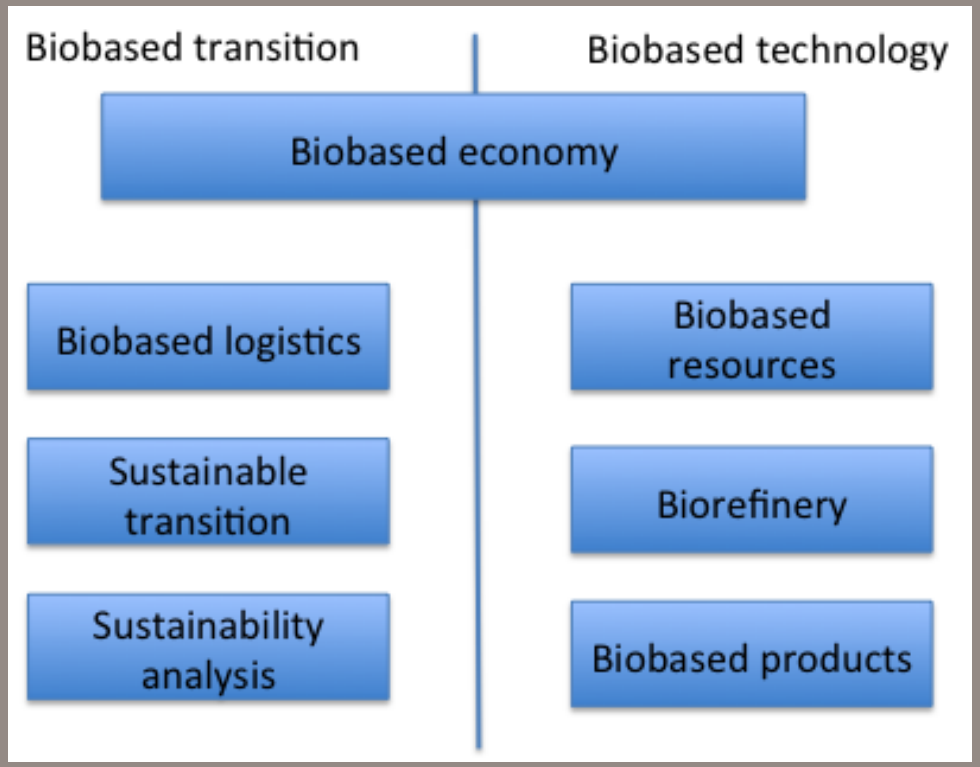
Michel Eppink (BPE)

David Strik (ETE)



WAGENINGEN UR
For quality of life

2 new biobased minors



Course schedule Biorefinery 2013

week 35	6-mei	7-mei	8-mei	9-mei	10-mei
	10.30-12.15 C408 Lecture 1, Introduction, M. Bruins	10.30-12.15 C408 Lecture 2, Feedstock properties and products. M. Bruins	10.30-12.15 C406 Lecture 3, Feedstock properties and products. M. Bruins		
week 36	13-mei	14-mei	15-mei	16-mei	17-mei
	10.30-12.15 C408 Lecture 4, Physical separation, M. Eppink 13.30-17.00 Excursion	10.30-12.15 C408 Lecture 5, Physical separation, M. Eppink	8.30-15.30 P8050 Practicals, Bruins, Eppink, Strik	13.30-15.15 C406 Lecture 6, pretreatments+ conversions, M Bruins, D. Strik	8.30-15.30 P8050 practicals, Bruins, Eppink, Strik
week 37	20-mei	21-mei	22-mei	23-mei	24-mei
		10.30-12.15 C408 Lecture 7, pretreatments+ conversions, M Bruins, D. Strik	8.30-15.30 P8050 practicals, Bruins, Eppink, Strik	13.30-15.15 C406 Lecture 8, calculations, T. van Boxtel	8.30-15.30 P8050 practicals, Bruins, Eppink, Strik
week 38	27-mei	28-mei	29-mei	30-mei	31-mei
	13.30-15.15 C408 Lecture 9, calculations, T. van Boxtel	13.30-17.00 PC717 Exercises on calculations, T. van Boxtel	8.30-15.30 P8050 practicals, Bruins, Eppink, Strik	13.30-17.00 PC717 Exercises on calculations, T. van Boxtel	8.30-15.30 P8050 practicals, Bruins, Eppink, Strik
week 39	3-jun	4-jun	5-jun	6-jun	7-jun
	Excursion		10.30-12.15 C406 Questions		9.00-12.00 C317 Examination

Biorefinery

Practical BCH-50306

Raw materials | **Processes** | **Products**

seed

leaf

tuber

(Mechanical) Preprocessing → Conversion → Separation

Calculations

NYLON

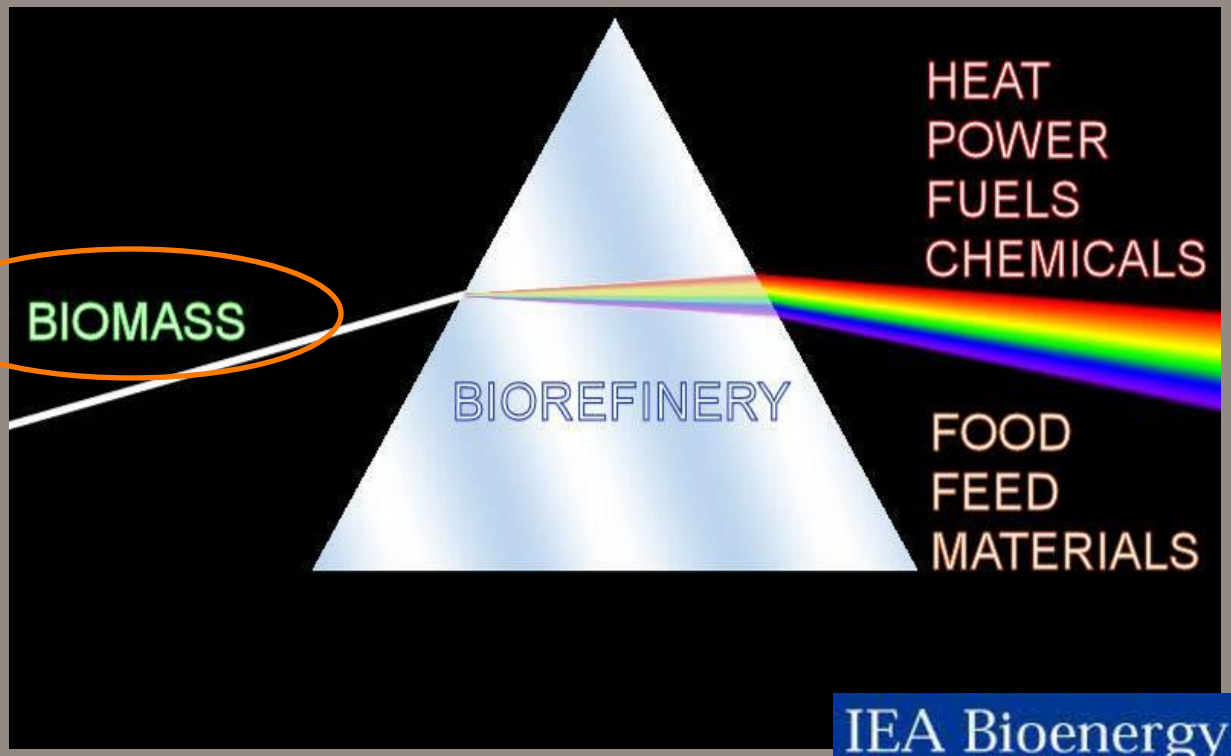
Biodiesel

Bioelectricity

Components

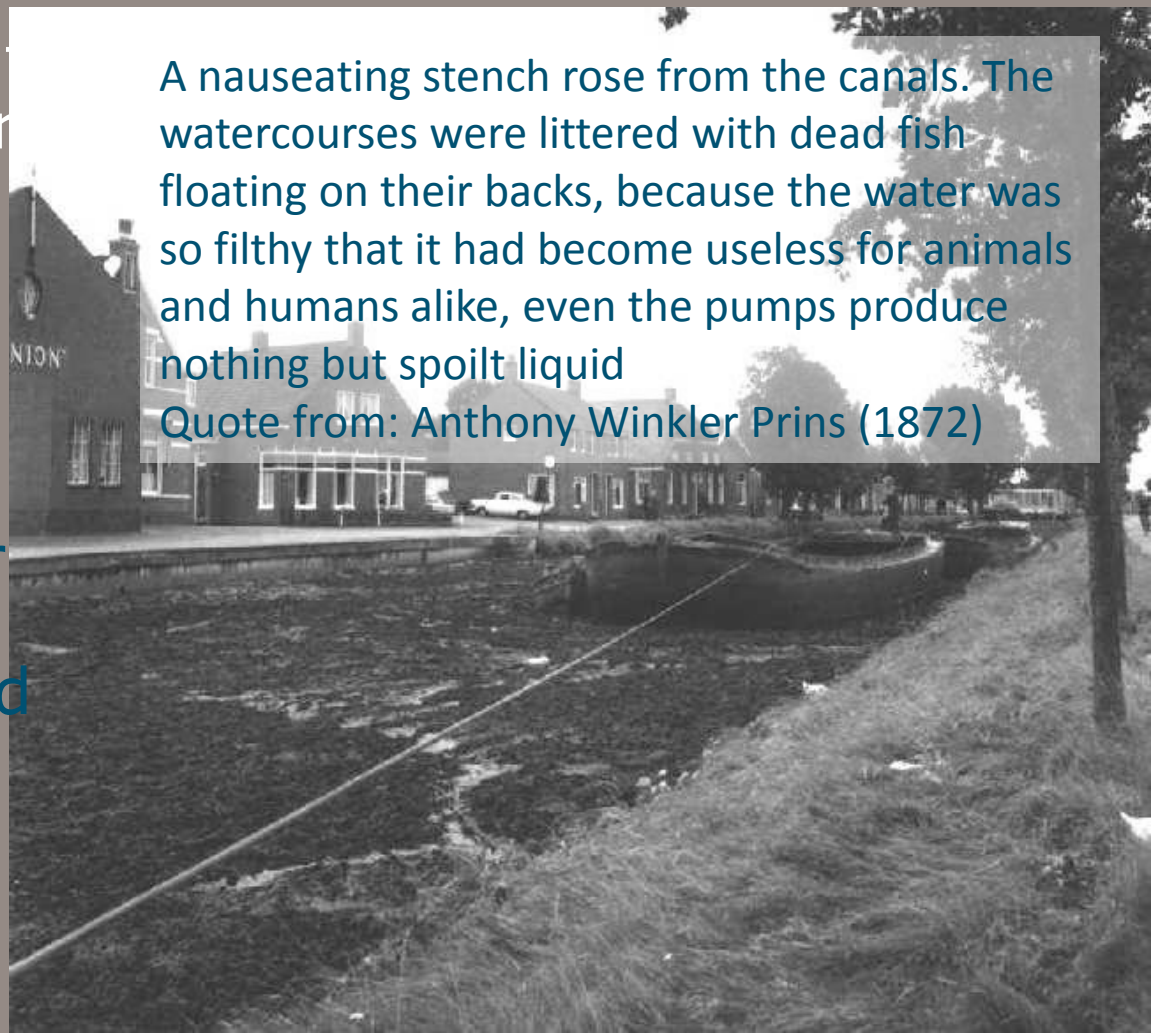
BioRefinery

- Biorefining: Sustainable processing of biomass into a spectrum of bio-based products (food, feed, chemicals, materials) and bioenergy (biofuels, power and/or heat).



Problems with industrialisation

- Serious problem.
- Government and industry tried to put an end to the water pollution, technology was insufficient to be economically feasible.
- 1900-1950: "Water pollution is part of industrialisation and a price that people pay for prosperity"



A nauseating stench rose from the canals. The watercourses were littered with dead fish floating on their backs, because the water was so filthy that it had become useless for animals and humans alike, even the pumps produce nothing but spoilt liquid
Quote from: Anthony Winkler Prins (1872)

Solanic

Previous attempts were not successful

New driver for innovation

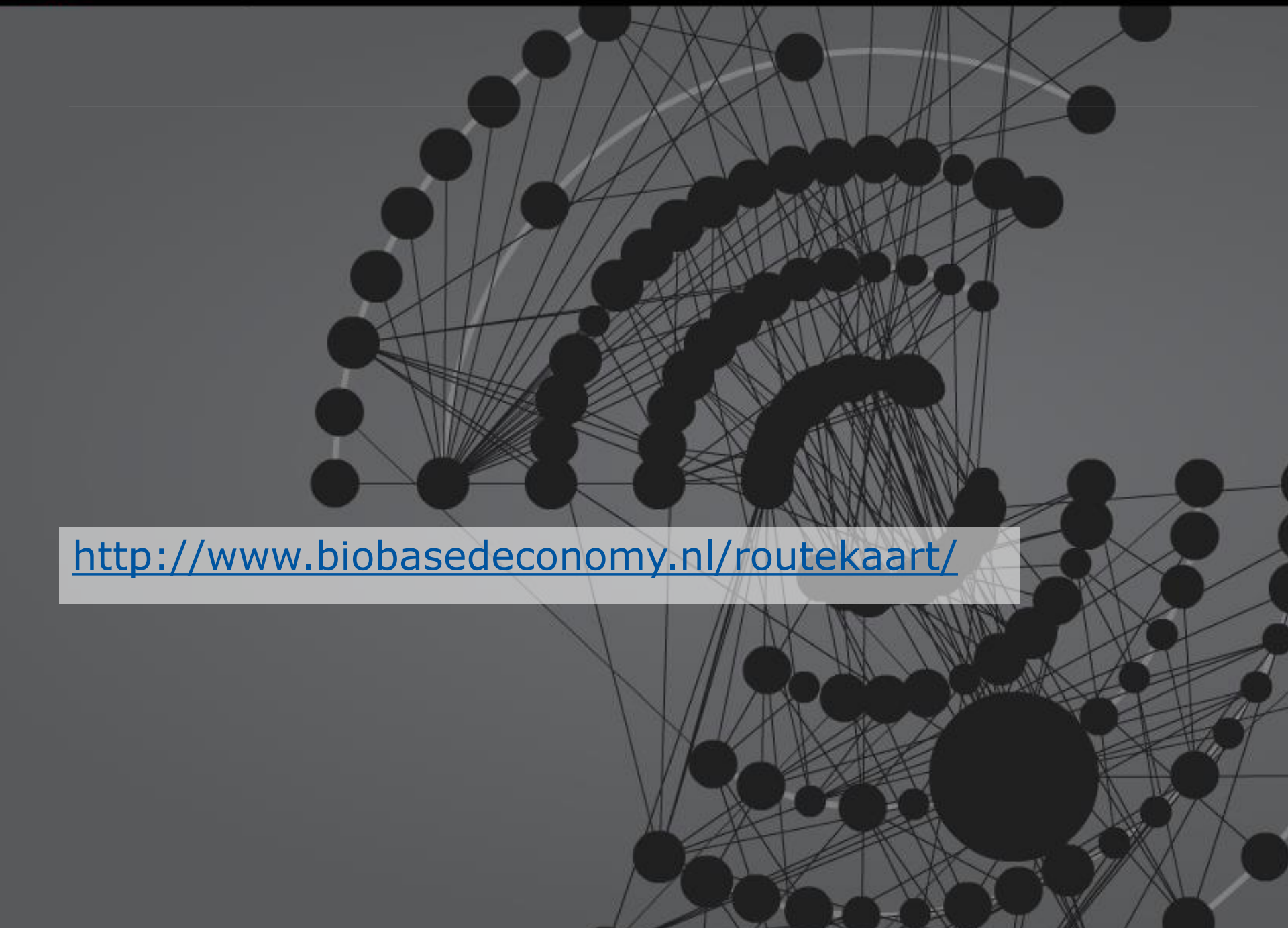
- After World War II environmental awareness increased.
  - New laws: 1969: “de vervuiler betaald”
  - Financial aid for research and reorganisation

- Now: Separation of proteins at an industrial scale for biorefinery.

Biobased Economy Chains

Cultivation/harvest	pretreatment	Transport/Storage export harbour as:	Processing Rotterdam	Application
Lignocellulose	densification	Pyrolysis oil Torrefaction pellets HTU biocrude	FT diesel	Transportation fuels Electricity heat
Oil crops	-	Seed, beans	Refinery/conversion	Transportation fuels Animal feed Fertilizer Chemical Industry
Seeds	-	Cereal grains	Refinery/conversion	Transportation fuels Animal feed fertilizer Chemical industry
Sugar/Starch	Refinery/conversion	(hydrous) ethanol		Transportation fuels fermentation
Leaf	Refinery/conversion	(hydrous) ethanol protein (hydrolysates)		Transportation fuels Chemical industry
Algae	Refinery/conversion	Biocrude HTU protein (hydrolysates)	HTU upgrading	Transportation fuels
Manure	Refinery/conversion	protein (hydrolysates)		Transportation fuels Chemical industry

HTU: Hydro Thermal Upgrading



http://www.biobasedeconomy.nl/routekaart/

Practical

- Computer Practical
- Algae biorefinery
- Microbial Fuel Cell
- Biorefinery of plant seeds