SMIBIO

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Green biorefineries in Europe

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WIP Renewable Energies

The SMIBIO project is implemented in the framework of ERANet-LAC, a Network of the European Union (EU), Latin America and the Caribbean Countries (CELAC) co-funded by the European Commission within the 7th Framework Programme for Research and technology Development (FP7).

Biorefineries - definition

Definition :

Biorefining is the sustainable processing of biomass into a spectrum of marketable Biobased Products and Bioenergy.

Biobased Products: chemicals & materials, but also human food & animal feed

Bioenergy: fuels, power and/or heat

Energy-driven and Product-driven Biorefineries can be distinguished.

Product-driven Biorefineries:

Main goal: production of Biobased Products (chemicals, materials, food and/or feed) from biomass.

Process residues are used for the production of Bioenergy for internal/external use to maximise the economic profitability of the full biomass-to-products chain.

IEA Bioenergy Task 42

Green biorefineries

“Green biorefineries (GBR) are seen as integrated technologies and technology systems for production of materials and energy processing of green plants and part of green plants.”

Source: Thumm et al., 2014: 433

The potential of this feedstock is considered to being large, as green plants are an almost inexhaustible raw material source and available worldwide.

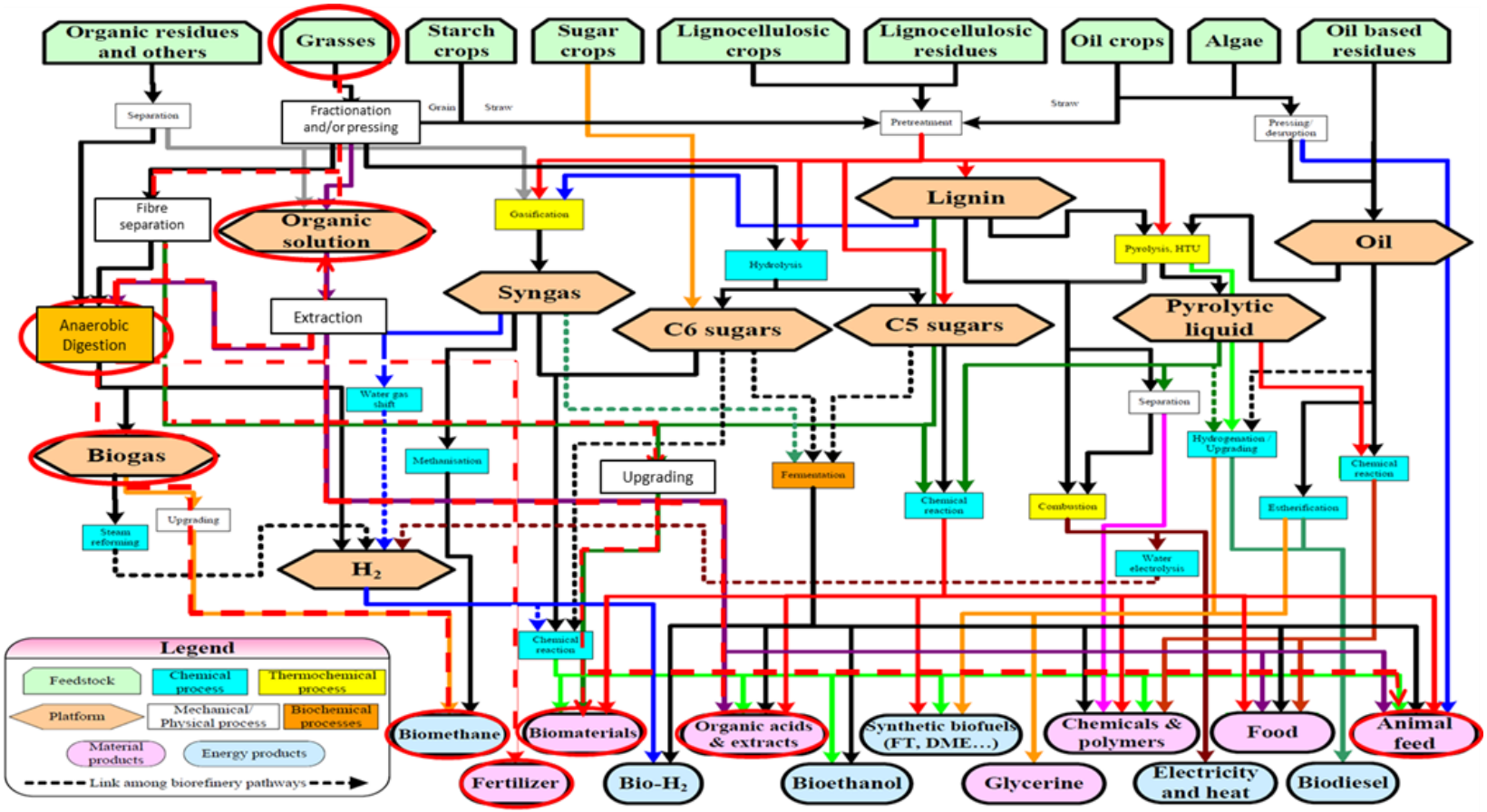
Source: Kamm et al. (ed.), 2010: 253.

Grass - what‘s in it?

- Grass consists mainly of water.
- ca. 10-20% of the grass is dry matter (DM), with a yearly average of 16.3% DM
- DM mainly consists of protein, amino acids, carbohydrates, minerals and fats [g/kg DM]
- the average crude protein content is 23% of the dry matter.
- most abundant protein is called ribulose-1,5-bisphosphate carboxylase oxygenase, or simply Rubisco
- presence of polyphenol oxidases (PPO) and proteases in grass (enzymes that break down other proteins)
- essential that after cutting, the grass is either processed rapidly or preserved well enough to prevent degradation
- largest component of DM of grass is the fibre fraction. It includes cellulose, hemicellulose and lignin molecules
- annual production of 10.4 t DM per hectare (Europe, the Netherlands)

Source: Paping et al. 2014

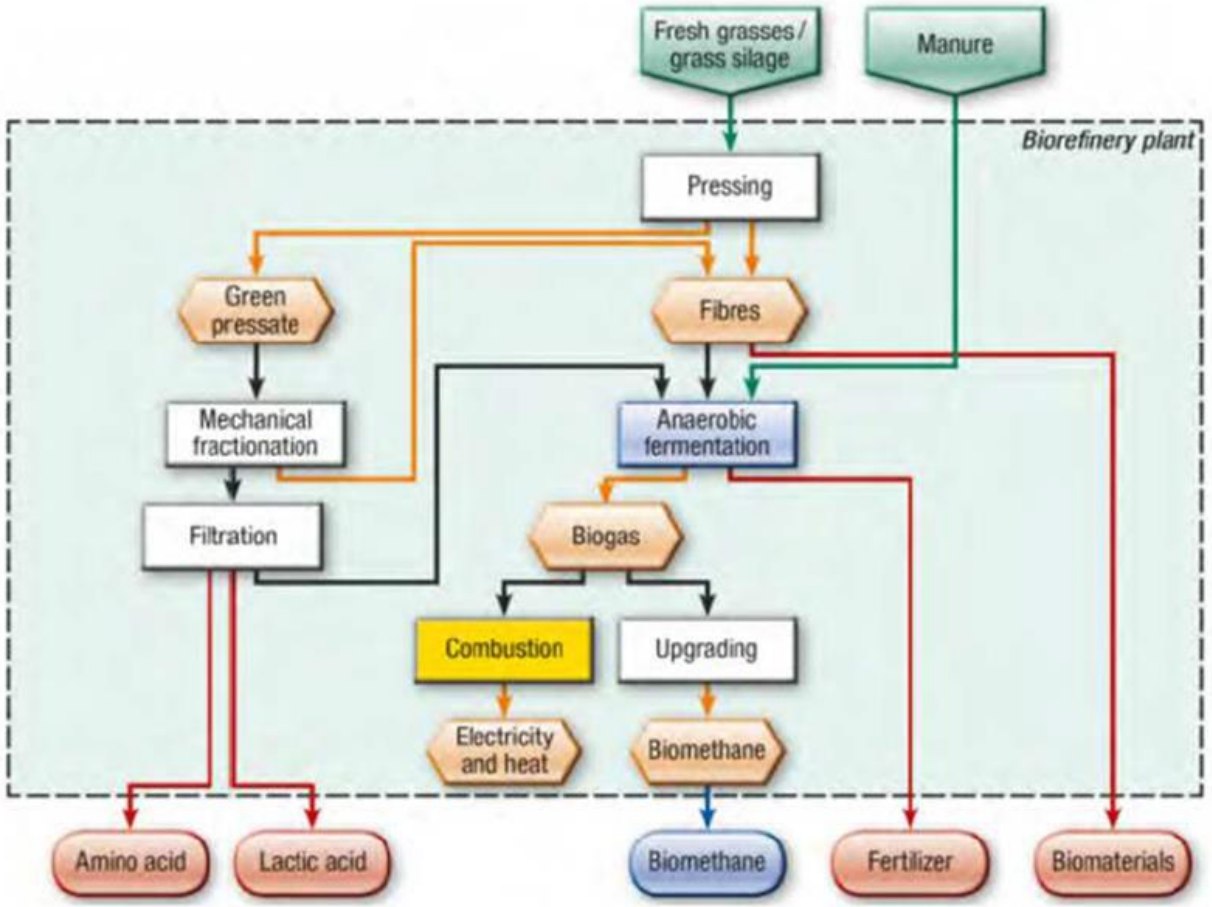
Biorefinery classification



IEA Bioenergy Task 42 biorefinery classification system

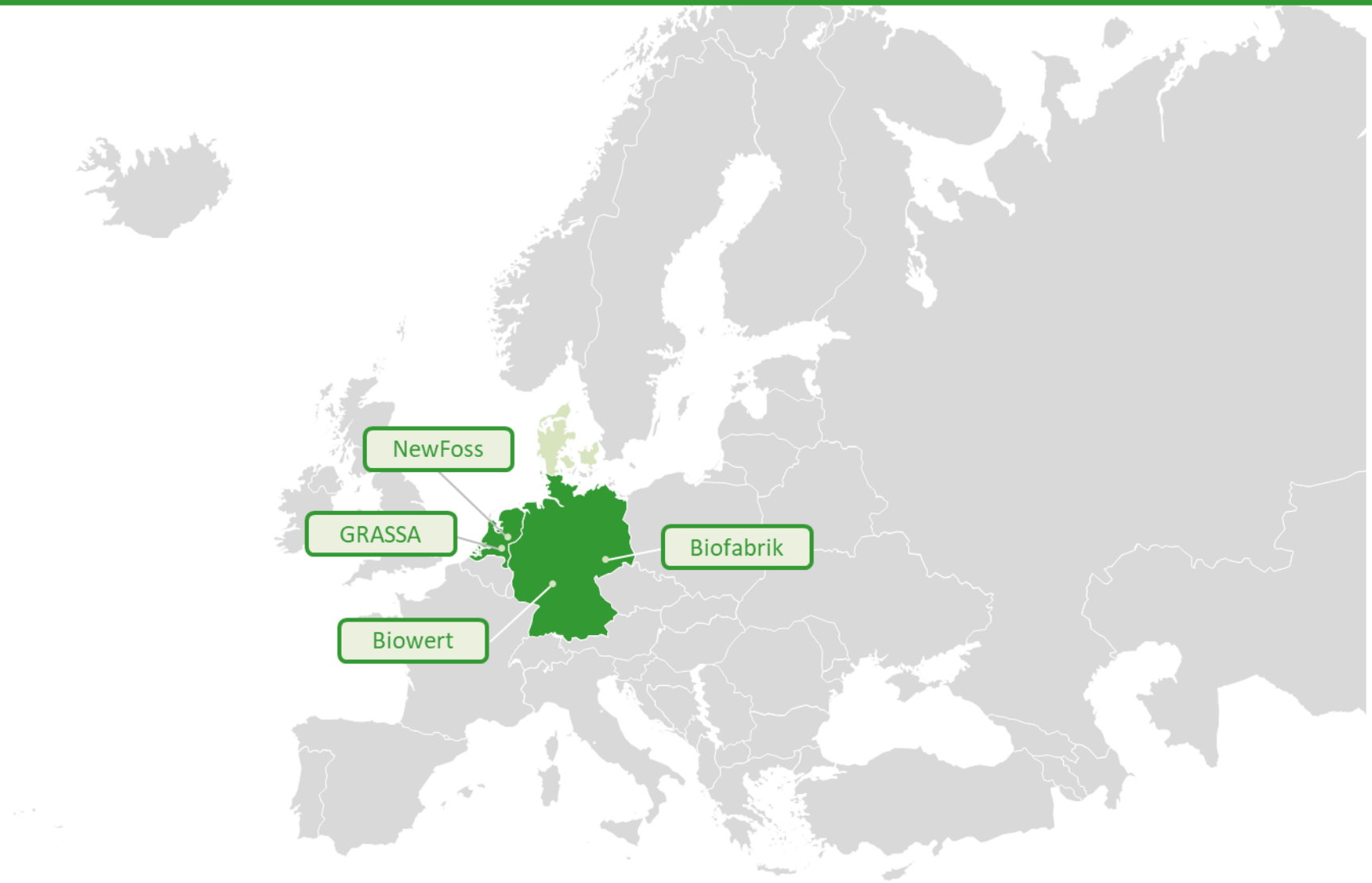
Source: IEA Bioenergy, 2014: 4

Green biorefineries - basic processes



Source: EUBIA, 2013

General information - GBR in Europe



Biowert

GBR Biowert

Location: Brensbach, Germany (18,000 m^2 large)

Founded: 2007

Feedstock: silage grass (grass is provided by contracted farmers nearby)

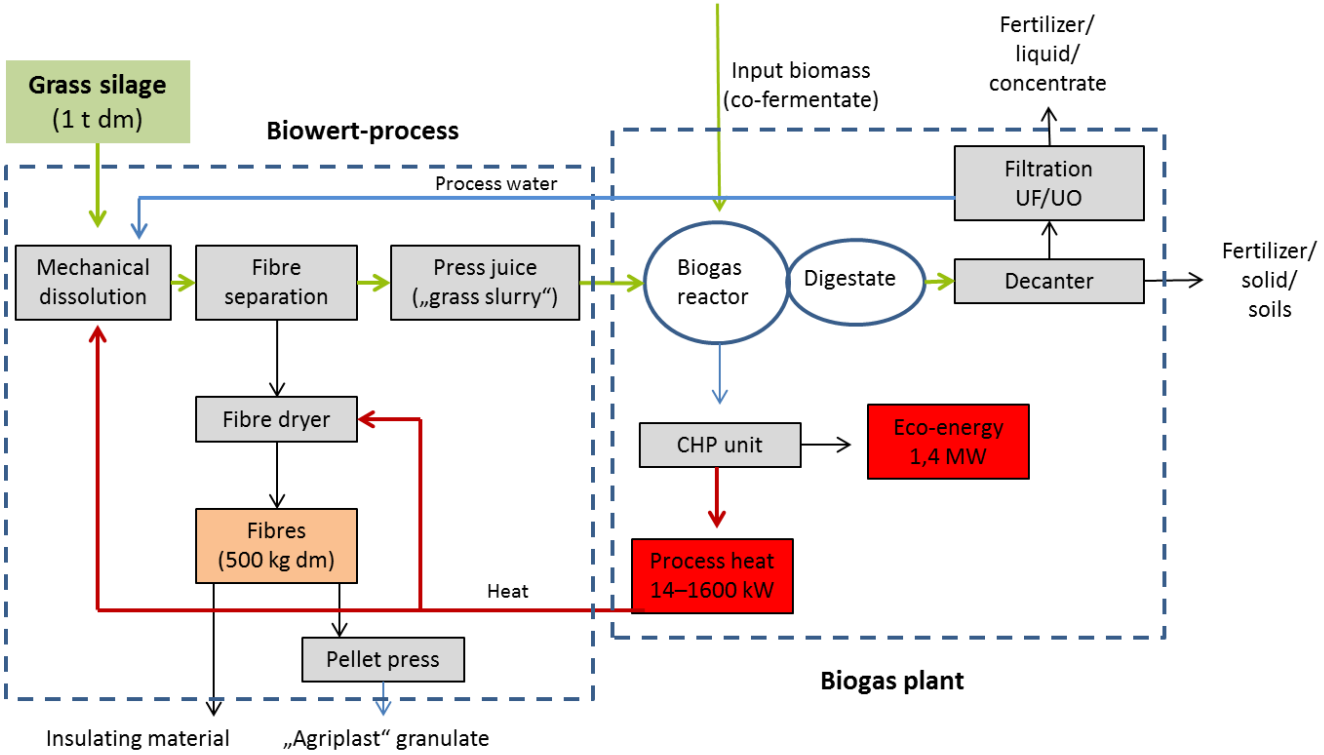
Capacity: 5,000 t_{dm} /a (20,000 t grass supply per year)

Investment costs: 13 million Euro

Source: Biowert Industrie GmbH, 2018

Biowert – process & products

Process:

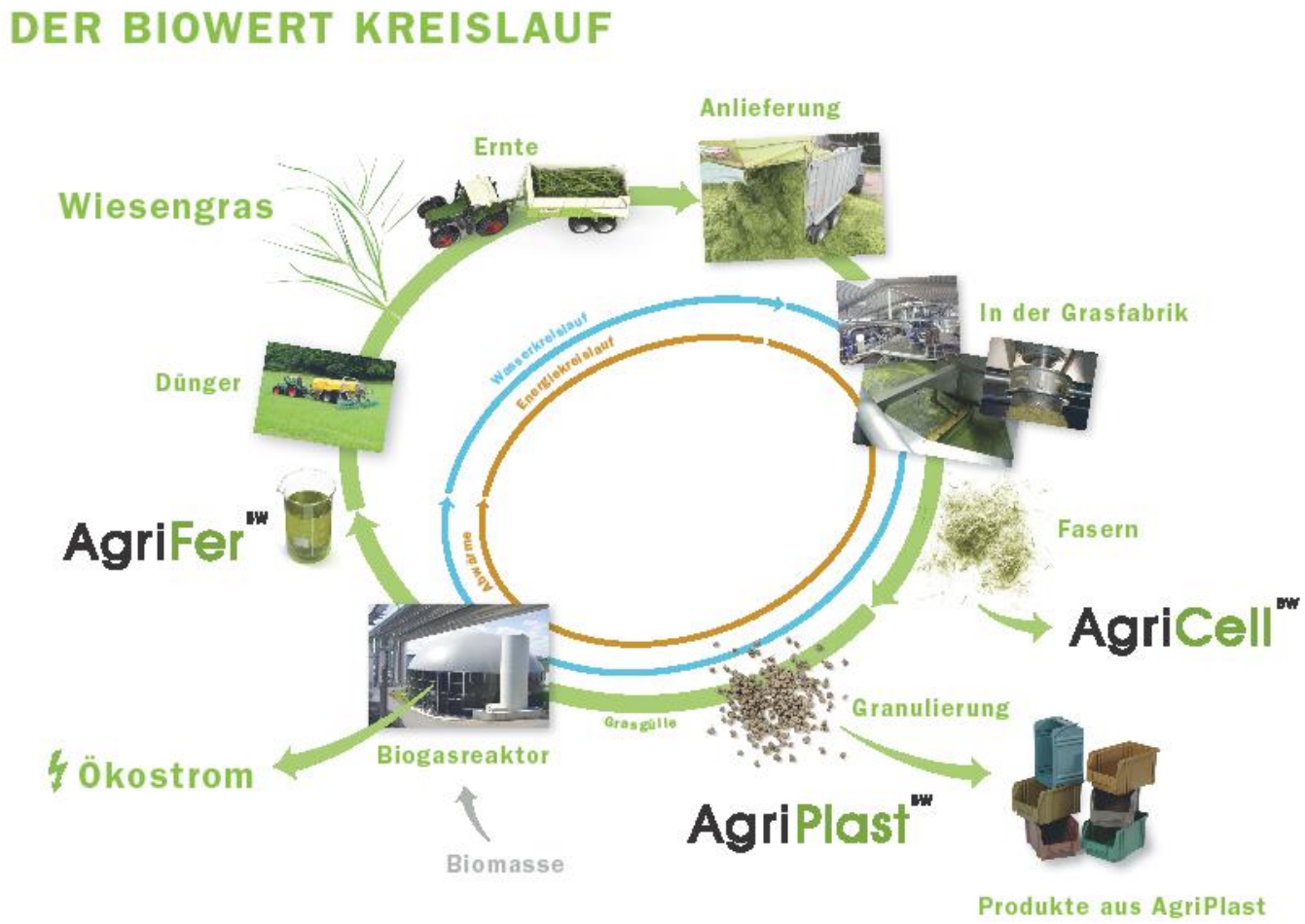


Products:

Biocomposites (Agriplast – 75% grass fibres, 25% recycled plastics), insulating materials, fertilizers & AD input

Source: Biowert Industrie GmbH, 2018

Biowert – circular economy approach



Source: Biowert Industrie GmbH, 2018 - © 2013 Biowert Industrie GmbH

NewFoss

GBR NewFoss

Location: Uden, the Netherlands

Founded: 2016

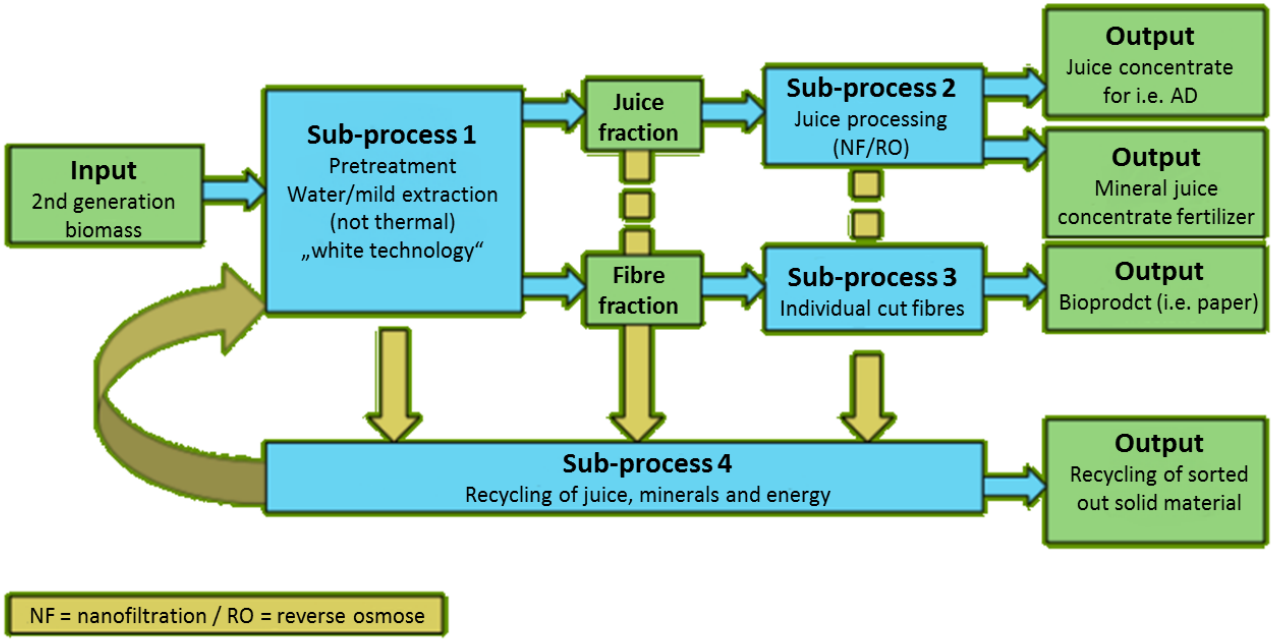
Feedstock: silage grass (grass is provided by Staatsbosbeheer)

Capacity: 10,000 t_{dm} /a (40,000 t grass per year)

Investment costs: n.a.

NewFoss – process & products

Process:



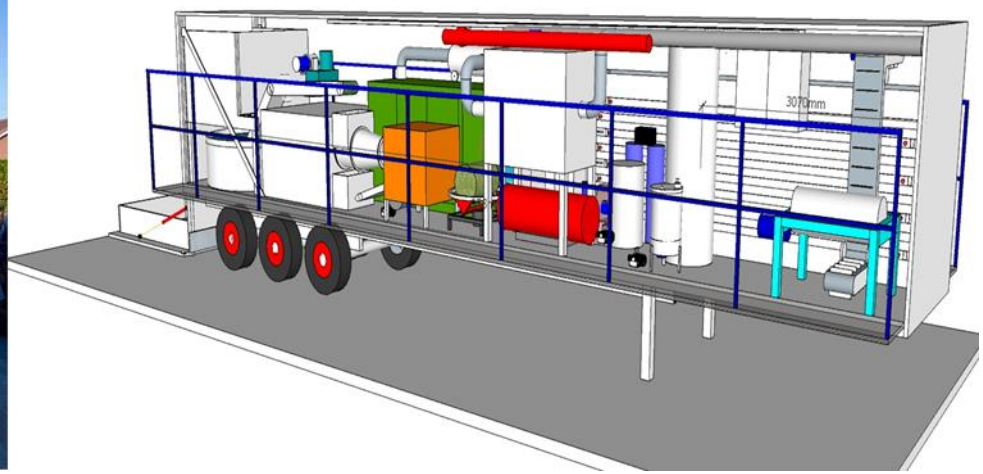
Products:

Egg boxes

Grass paper

Lactic acid, amino acids, sugars etc.

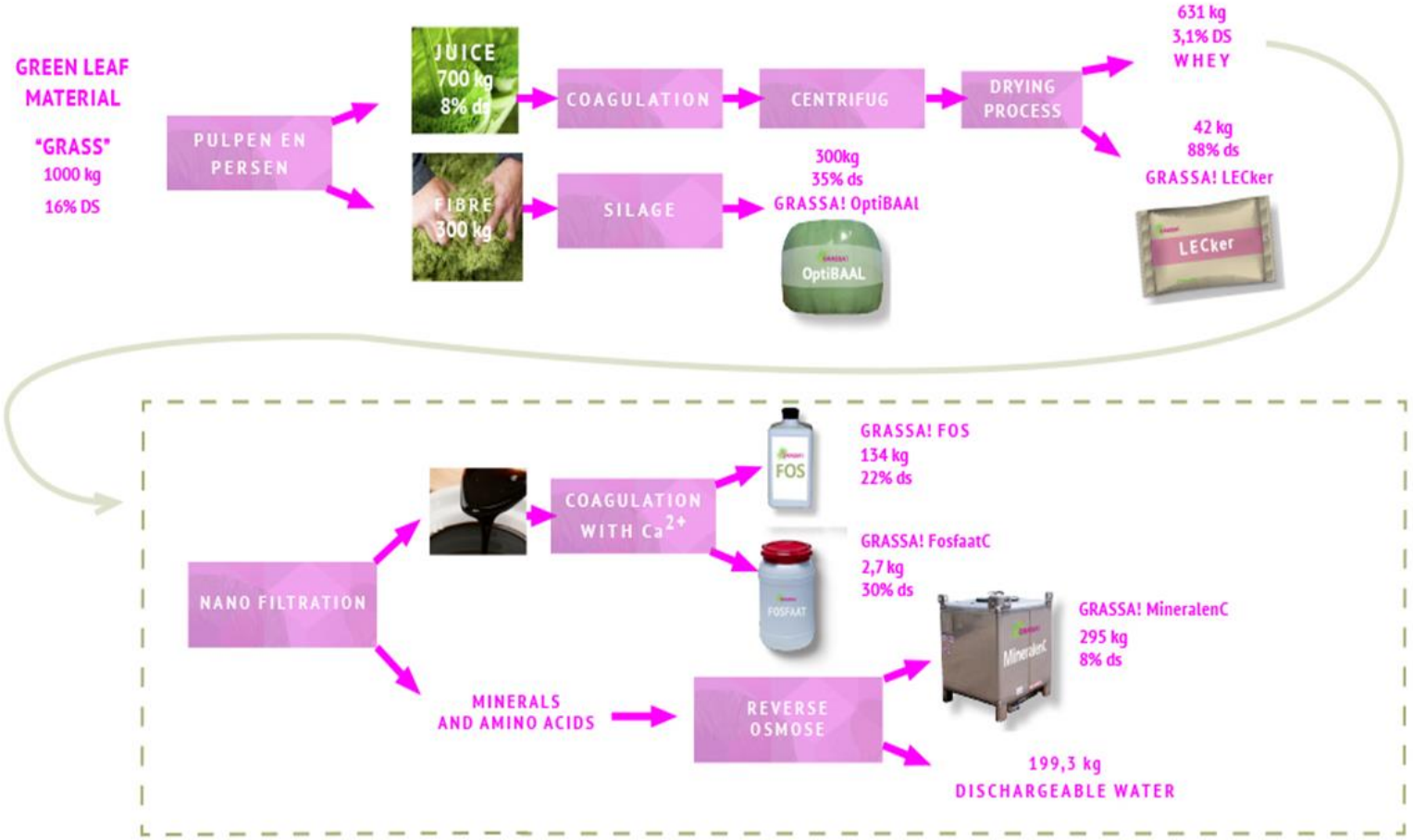
Grassa



GBR Grassa
Location: mobile concept, hq in Venlo, the Netherlands
Founded: 2014
Feedstock: fresh grass or green feedstock (e.g. tomato stems, waterplants)
Capacity: 2 t per hour
Investment costs: ca. 600,000 Euro
Runtime: 5 months of year (3,000 hours, diversification of feedstocks to lengthen season)

Source: Grassa, 2018

Grassa – process & products



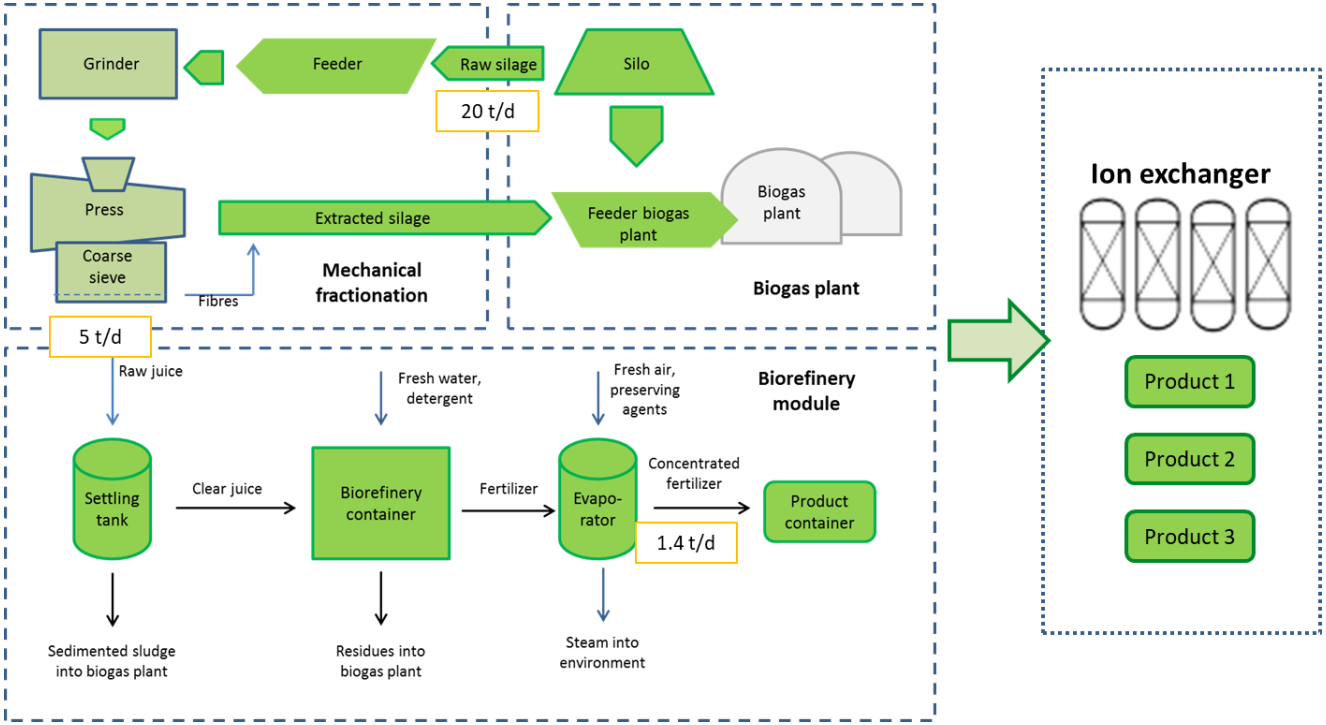
Source: Grassa, 2018

Biofabrik

GBR Biofabrik
Location: Blizevedly, Czech Republic, and Dresden, Germany
Founded: 2014
Feedstock: silage grass
Capacity: 20 t/day (30% dm)
Investment costs: ca. 700,000 Euro
Based on Austrian study (2003-2006)

Biofabrik – process & products

Process:

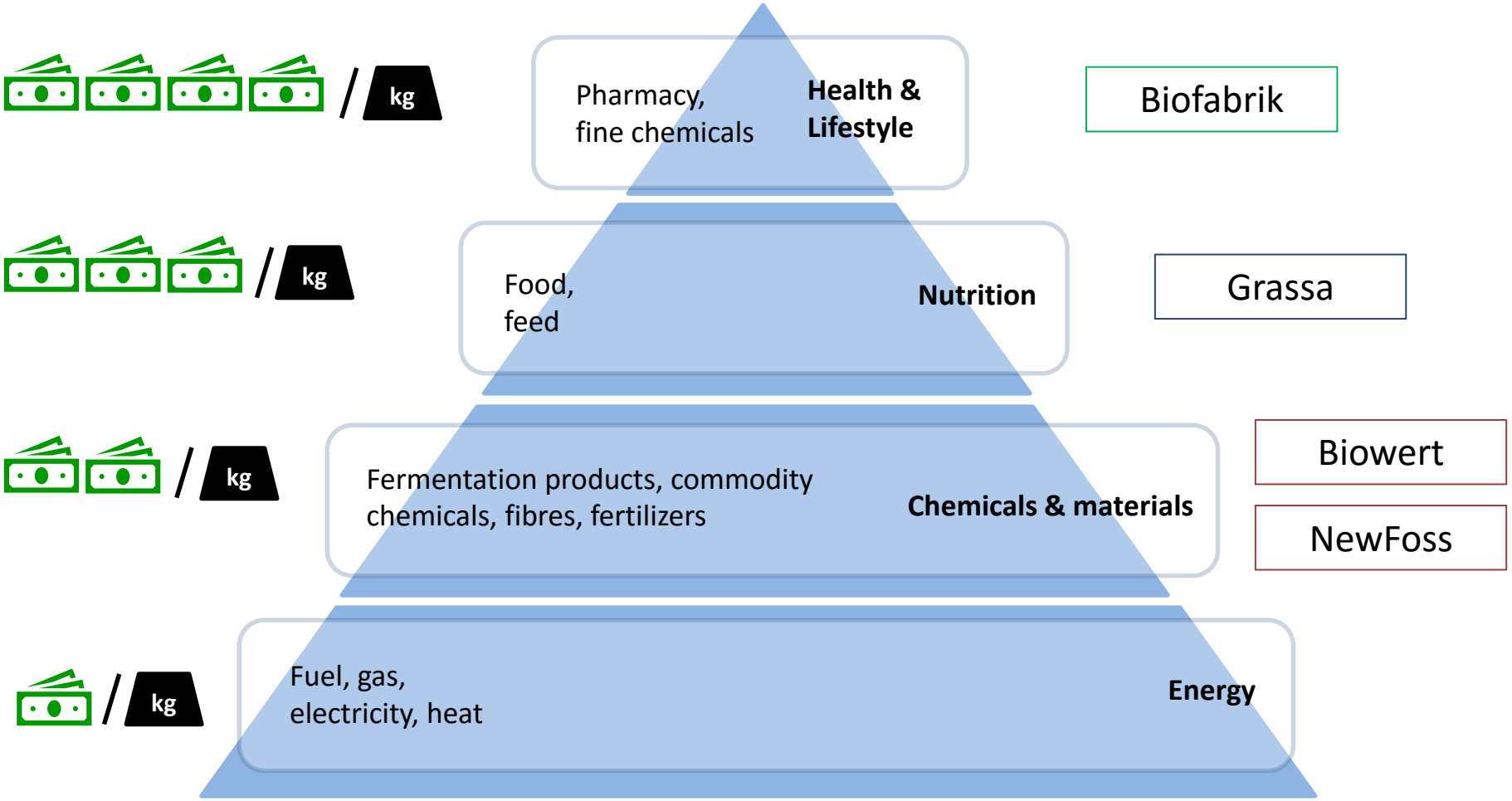


Products:

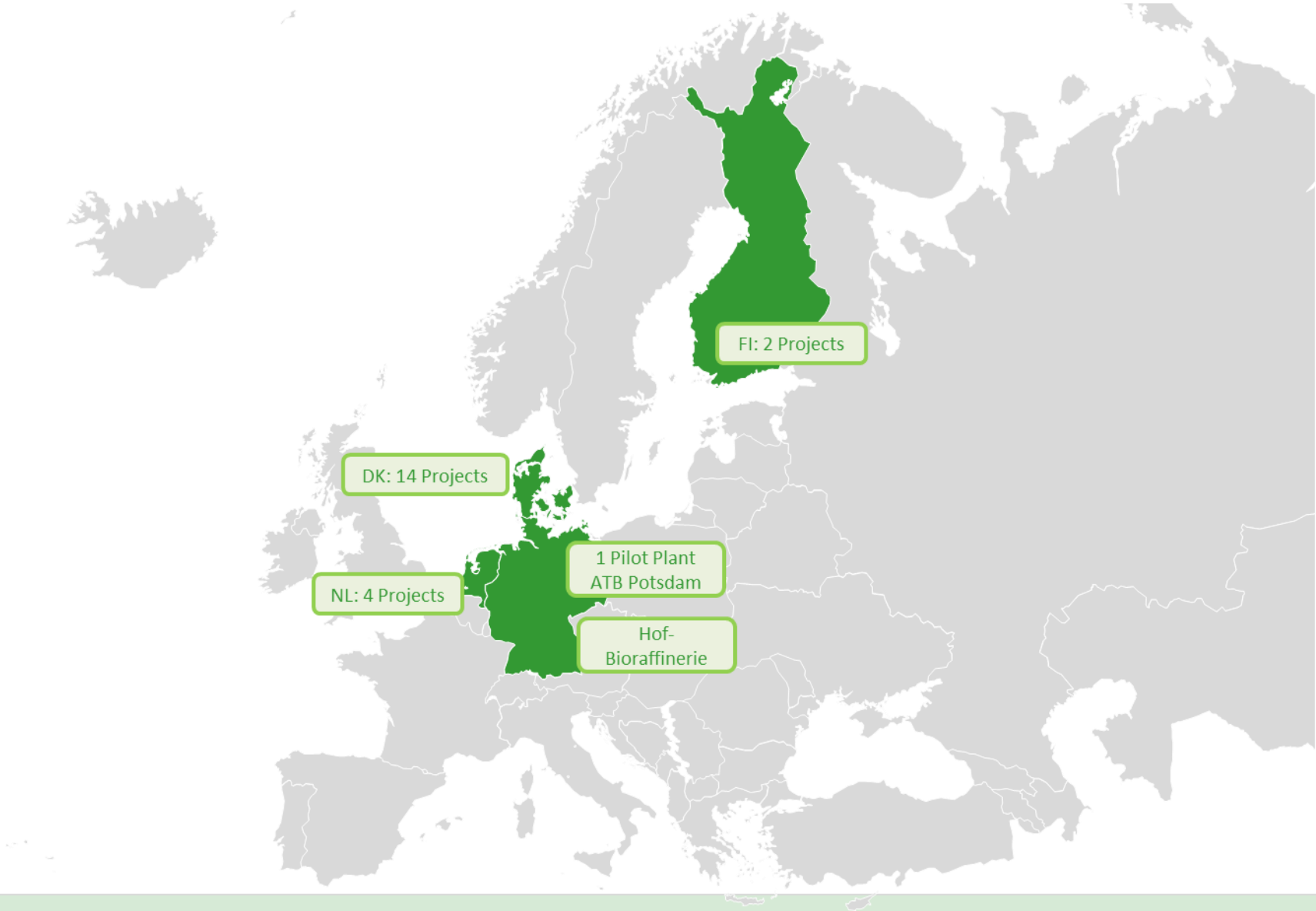
Fertilizer product Blattwerk (GHX)

Amino acids for food supplements

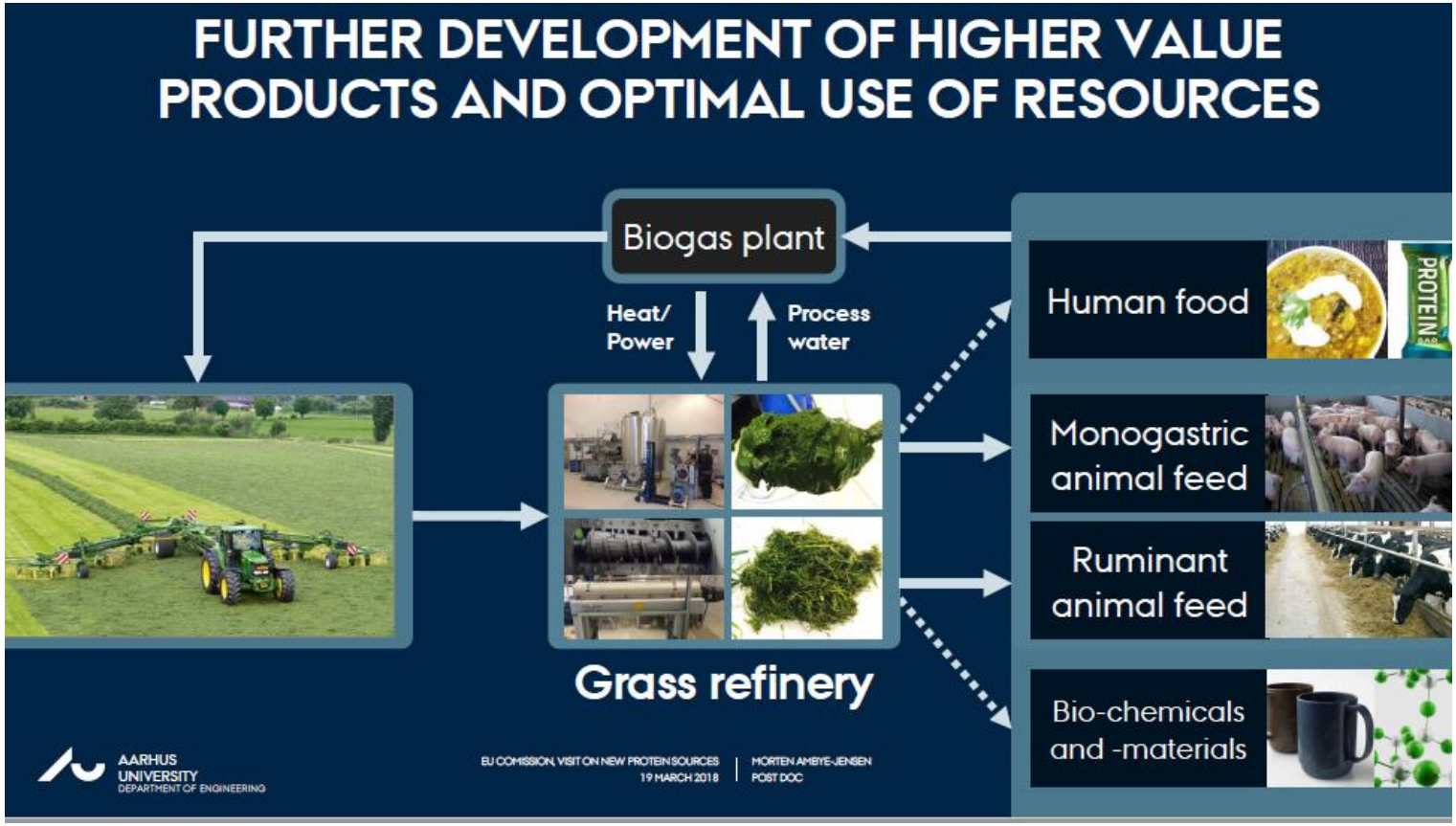
Value pyramid



Green biorefineries in EU - perspectives



Next GBR in Denmark?



Input capacity: 1-2 ton fresh biomass per hour

- Protein concentrate yield: 5-15 % af input TS (Goal 15-20%)
- Protein concentration: 30-55% af TS (Goal 45-55%)

> Upscaled and optimized demo-platform to 10-20 t/hr

Source: Ambye-Jensen, Aarhus University, 2018

Next GBR in Denmark?

Source: Ambye-Jensen, Aarhus University, 2018

Vielen Dank für die Aufmerksamkeit!

WIP RENEWABLE ENERGIES

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