



SMIBIO

Green biorefineries in Europe – a possibility for Latin America?

2nd SMIBIO workshop
30 May 2017
Manizales - Colombia

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WIP Renewable Energies

- Biorefinery – definition, classification
- Grass – information
- Value pyramid
- Existing GBR in Europe
 - NewFoss
 - Biowert
 - Grassa
 - Biofabrik

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

In general both Energy-driven and Product-driven Biorefineries can be distinguished.

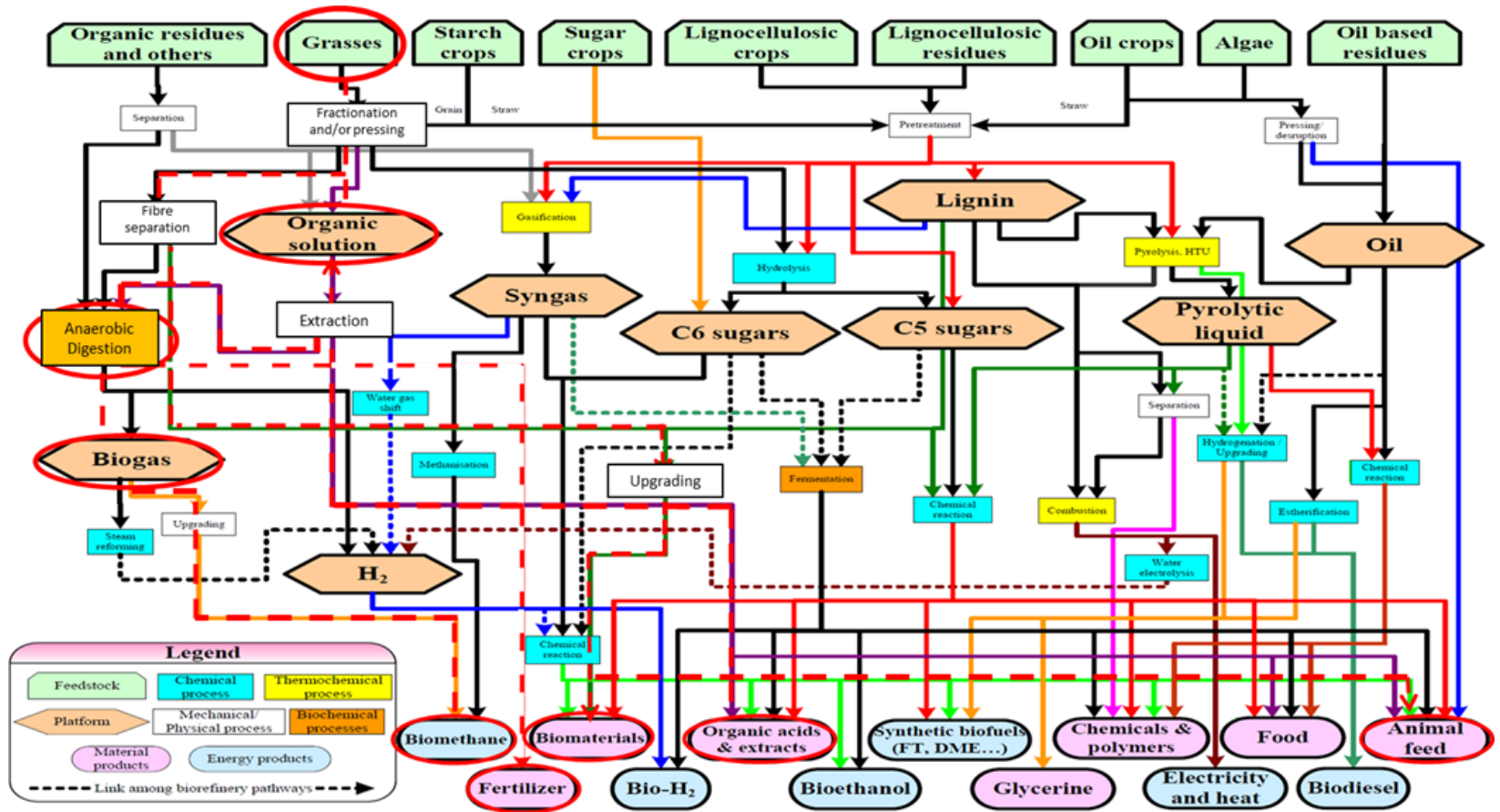
Product-driven Biorefineries

The main goal of PdBs is the production of one or more 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.

“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.”

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

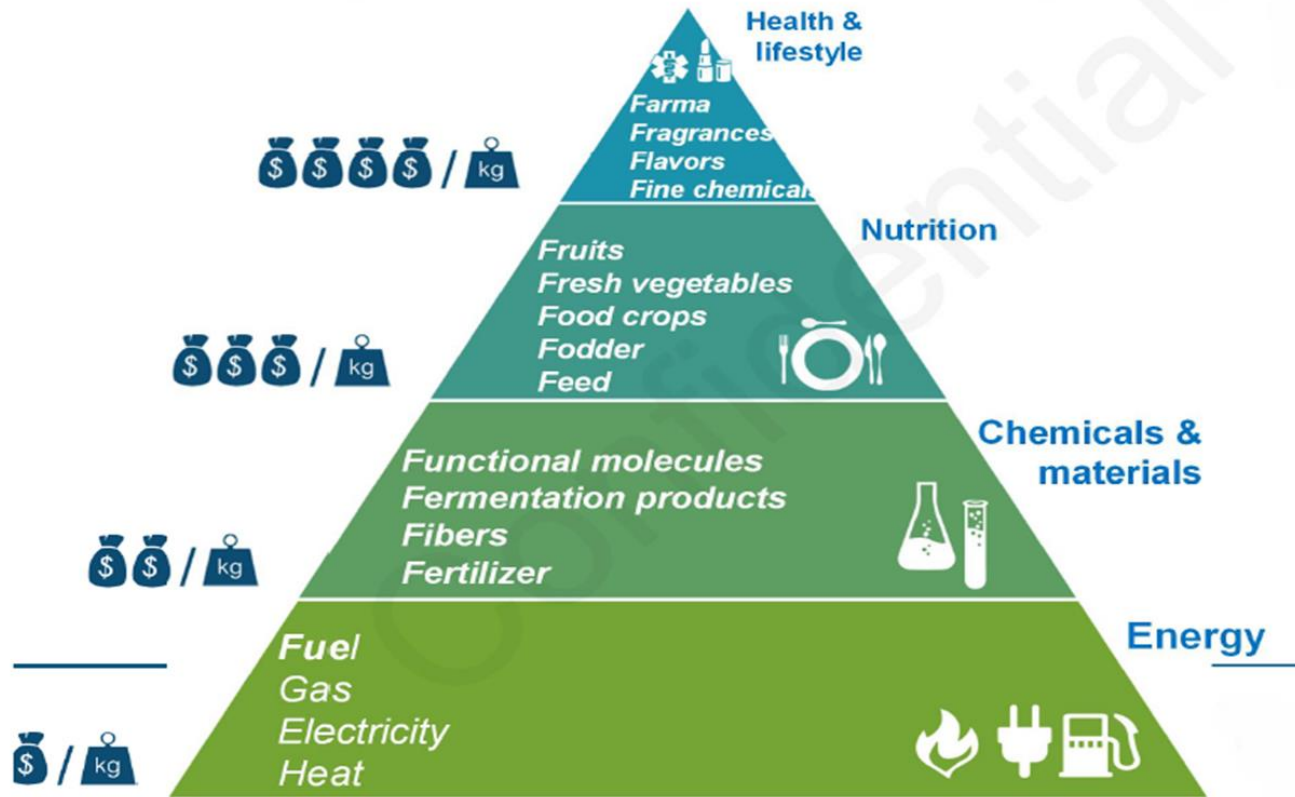
(Kamm et al. (ed.), 2010: 253).



IEA Bioenergy Task 42 biorefinery classification system (IEA Bioenergy, 2014: 4)

- Grass consists mainly of water.
- approximately 10-20% of the grass is dry matter (DM), with a yearly average of 16.3% dry matter
- the 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 oxidase (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



- All GBR but the Biowert GBR are relatively new
- Viability of new concepts need to be proven first
- Keypoints:
 - Feedstock availability (amounts, logistics)
 - Instant use vs. Conservation
 - Control of decomposition processes

**GBR Biowert**

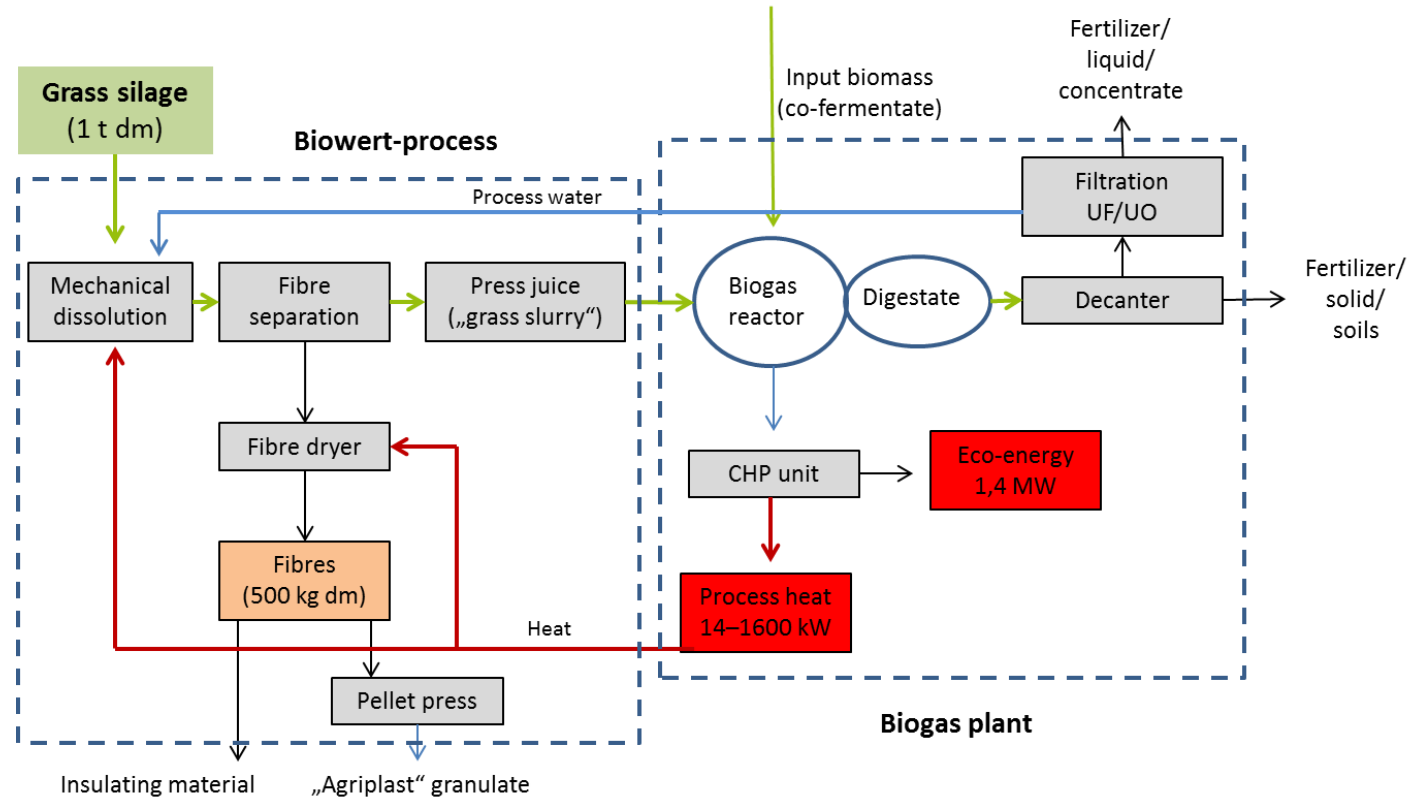
Location: Brensbach, Germany

Founded: 2007

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

Capacity: 5,000 t dm /a (20,000 t grass)

Investment costs: 13 million Euro



Products:**Biocomposites (Agriplast) – 75% grass fibres, 25% recycled plastics****Insulating materials****Fertilizers****AD input**

**GBR NewFoss**

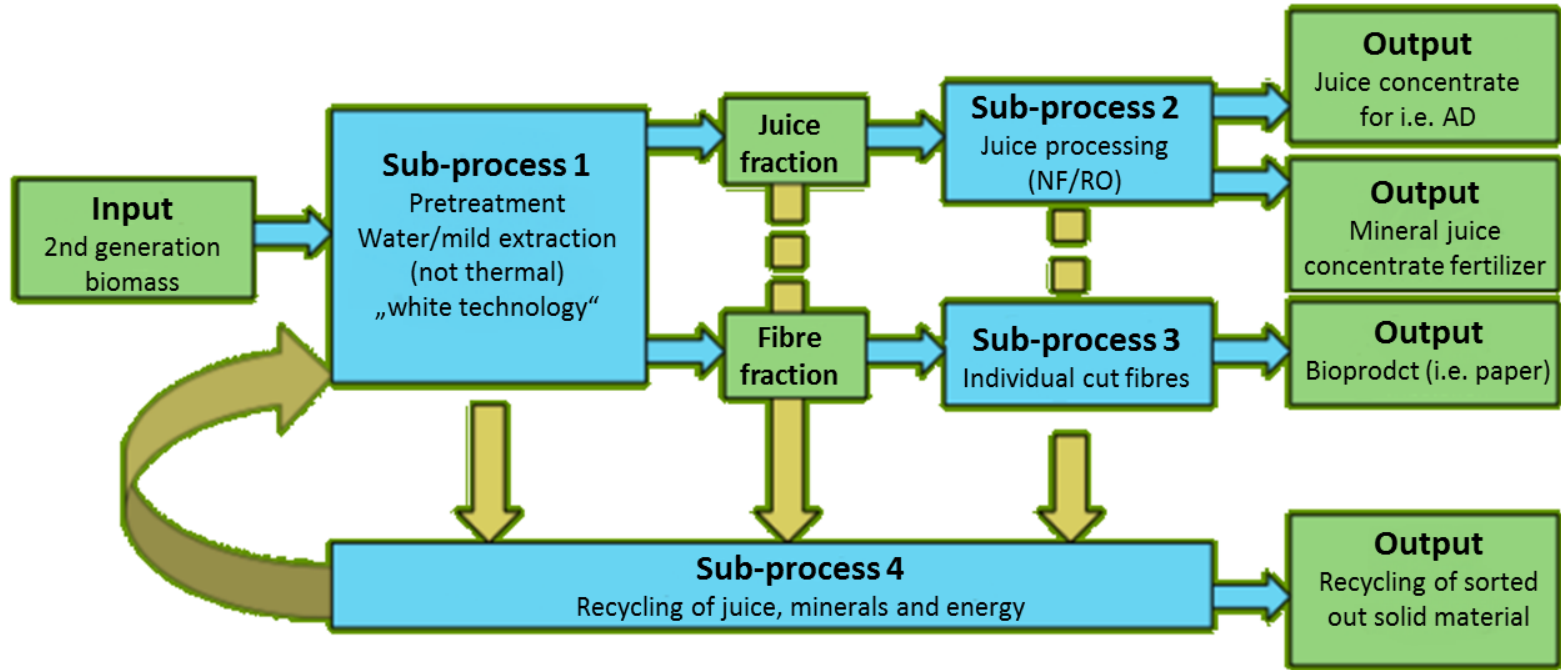
Location: Uden, the Netherlands

Founded: 2016

Feedstock: silage grass (grass is provided by Staatsbosbeheer)

Capacity: 10,000 t dm /a (40,000 t grass)

Investment costs: n.a.



NF = nanofiltration / RO = reverse osmose

Huhtamaki egg boxes & Co.



Egg boxes



Grass paper



Lactic acid, amino acids, sugars etc.

Benefits of NewFoss product (50% grass fibres, 50% recycled paper)

- **10% less CO₂ emissions (per ton paper produced)**
- **50% less water needed in paper production**
- **No feed competition (used grass is made up of 100 different plants > not suitable for feed production)**

**GBR Grassa**

Location: mobile concept, the Netherlands

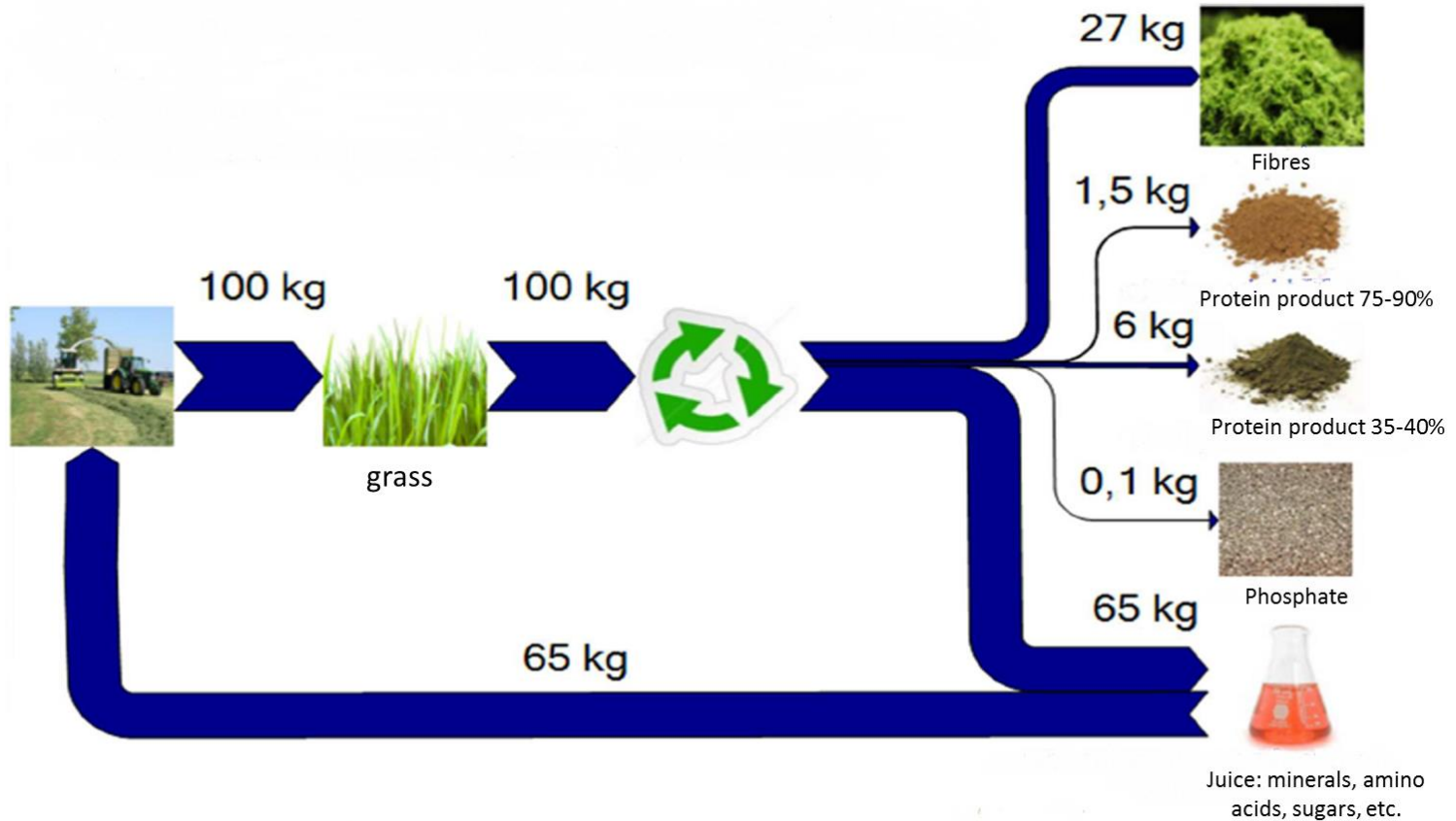
Founded: 2014

Feedstock: fresh grass or green feedstock (e.g. tomato stems, waterplants)

Capacity: 300 – 600 kg per hour

Investment costs: ca. 600,000 Euro

Runtime: 5 months of year (3,000 hours, diversification of feedstocks to lengthen season)



www.grassa.nl

**GBR Biofabrik**

Location: Blizevedly, Czech Republic, and Dresden, Germany

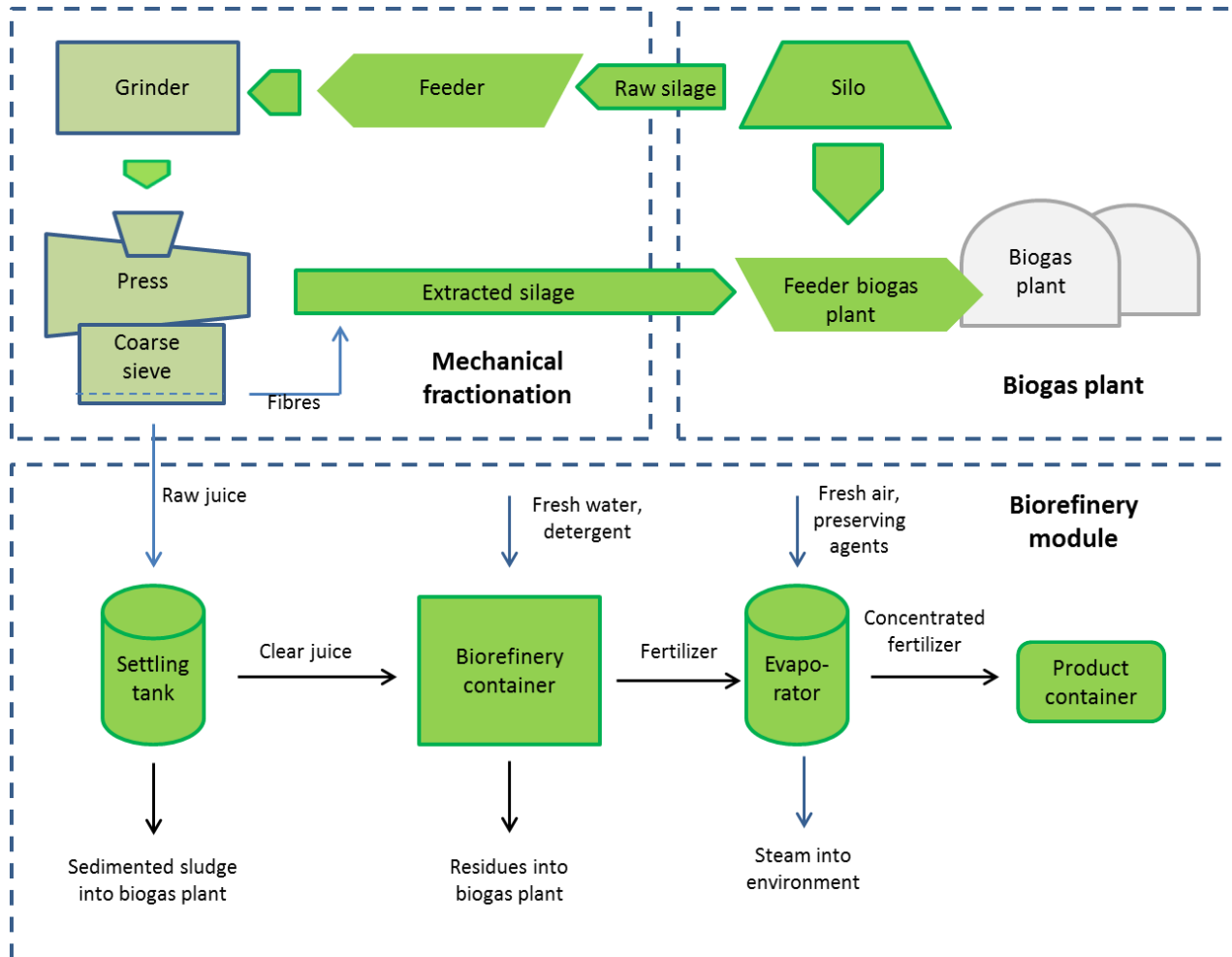
Founded: 2014

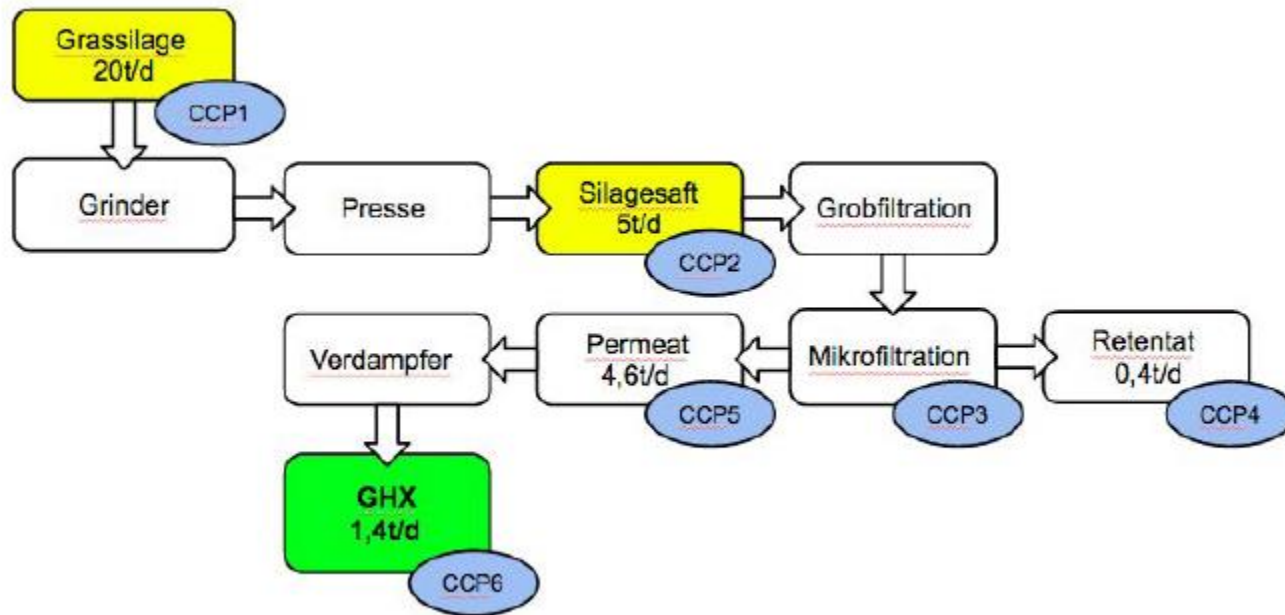
Feedstock: silage grass

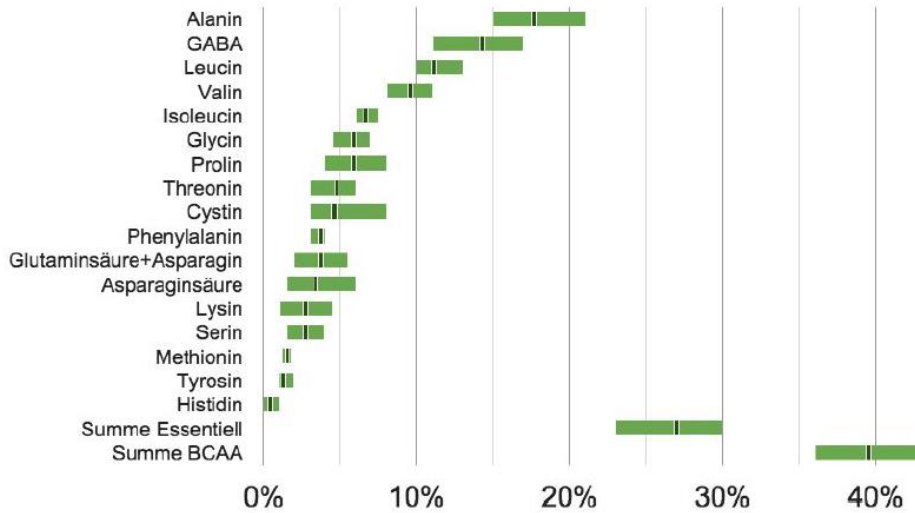
Capacity: 20 t/day

Investment costs: ca. 700,000 Euro

Based on Austrian study (2003-2006)

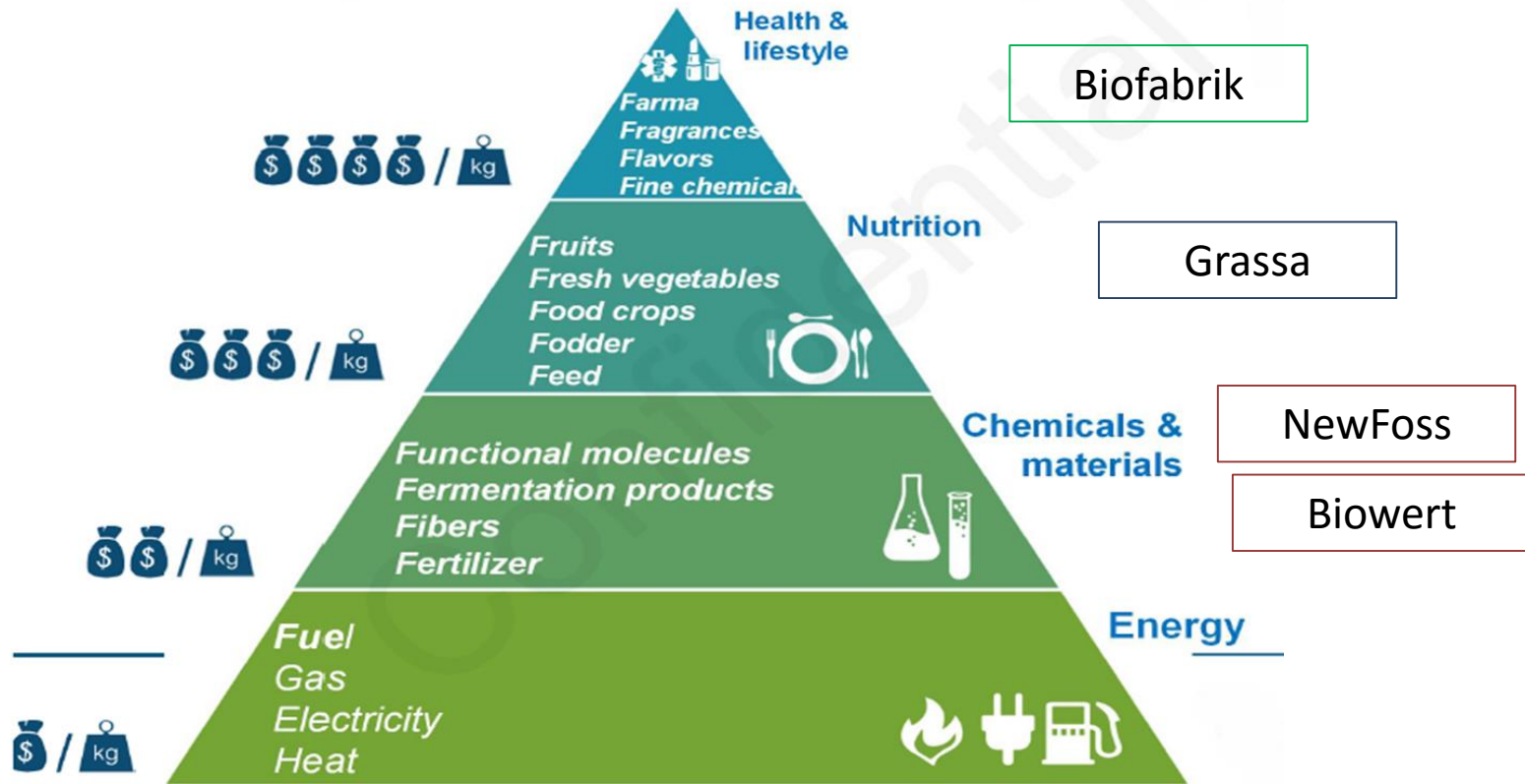






Amino acids

Fertilizer product (GHX)



Caravajal Pulp & Paper

EARTH PACT production makes a special paper:

- 100% from sugar cane (a natural resource, pure, biodegradable and renewable)
- 0% bleaching chemicals

<https://www.youtube.com/watch?v=e80aec5O6ls>



Gracias por su atención

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