



More value from green

27 june 2018

FORBIO Fachtagung
Grüne Bioraffinerien



Personal

- Ad Crommentuijn Director of GRASSA!
- Crommentuijn
 - The year 1476
 - Crommentuijn = Curved garden
 - Lineage Growers
- GRASSA! is a lean and mean organisation but growing
 - Team of 5 people
 - 5 associated specialist

Bio treat center - Brightlands Campus Greenport Venlo

CAMPUS with focus on:

- Healthy Nutrition
- Future Farming
- Biomass



Workspaces in VILLA FLORA



Testcenter in the WATER PAVILJON

Bio Treat Center

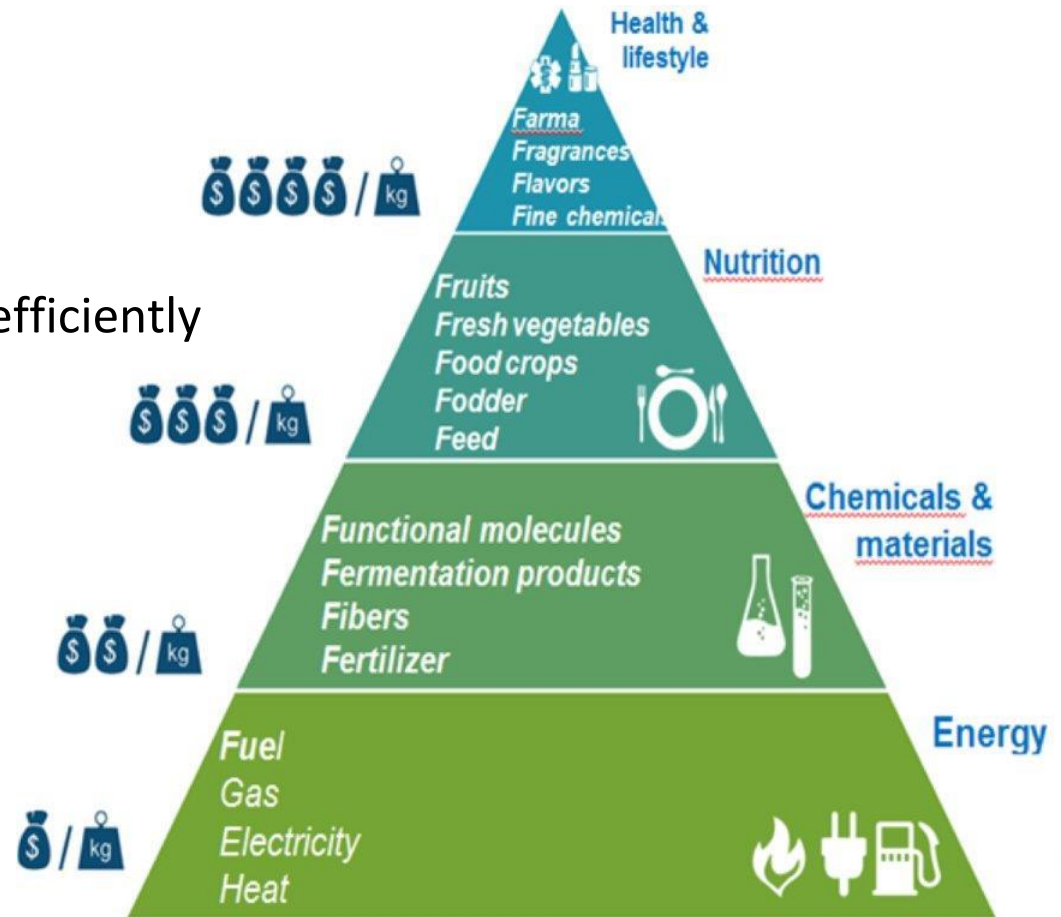
- Half-open innovation center for the processing biomass into products for the bio based economy
- Driven by, for and together with entrepreneurs
Demand-driven development from the market
- Goal: to connect more SME entrepreneurs to the Bio Treat Center and to develop their new bio based business
- Initiative of five entrepreneurs with support from the European Regional Development Fund, Ministry of Economic Affairs and Climate and the Province of Limburg



Transition of biomass and food

- Nutrition for 9 billion people
- Climate change - CO2 emissions
- Renewable energy replaces fossil
- Use phosphate and nitrogen more efficiently
- Balance in soil, air and water

- Need to use Biomass Better



GRASSA!: More value from GREEN

Grassa develops and markets **WORLDWIDE BIOREFINING MACHINES** to **ADD VALUE** to green biomass streams, to create a robust financial model for the **FARMER, GROWER, VEGETABLE PROCESSOR, NATURE AND WATER MANAGEMENT**. By which **LOCALLY** more **FEED and FOOD** is delivered with a reduction of the ecological **FOOTPRINT!**

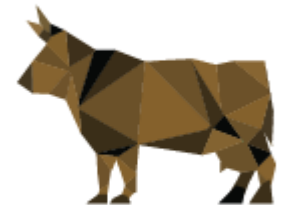
GRASSA! has Dutch and Wageningen University roots

Current Dutch agriculture is highly regarded

GRASSA! aims to bring this to an even higher level

- Dutch agriculture is at an advanced level and leading
- Many new concepts and technologies in agriculture originated in the Netherlands
- Dutch agriculture is strongly international orientated
- The Netherlands is the second largest exporter of agricultural products in the world (value based)
- Dutch agriculture is a testing ground for the latest and best research
- Wageningen University globally belongs to the very best

- GRASSA! Fits in the tradition of Dutch agricultural innovations and finds its roots in the rich traditions of Wageningen University



Agriculture is not sustainable

European livestock farming is protein-inefficient

Contributes greatly to various environmental problems

Is very dependent on feed import and fertilizers

- Agriculture has by nature a low protein efficiency
 - Protein efficiency: The protein in the product (milk and/or meat) divided by protein in the feed
- Agriculture contributes greatly to the emissions of greenhouse gases via
 - Milk and meat production
 - Emission of ammonia among other by means of slurry manure
 - Import of cattle feed
- The Netherlands produces more manure than it exports
- Surplus of minerals and acidification of groundwater
- European agriculture is strongly dependent on
 - The import of cattle feed
 - The use of fertiliser



GRASSA! offers solutions

GRASSA!'s proven bio refining technology increases the protein efficiency of agriculture

Reduces a variety of environmental problems

Ensures less import of cattle feed and less fertiliser

- GRASSA! separates grass and residual streams in a number of high value products (via a patented process)
- Grass refining increases the protein efficiency by 50%-225%
 - Less silage loss
 - Increase of protein efficiency of cattle (ruminants)
 - Proteins for pigs, poultry (one stomach)
- Grass refining reduces
 - The manure, phosphate and nitrogen surplus
 - Greenhouse gas emissions
 - The required space for agricultural land
- Grass refining strengthens the position and independence of farmers
- Gives value to otherwise worthless vegetable residual streams



GRASSA! delivers a more efficient agriculture

Grass refining increases protein efficiency by 50%-225%

Reduced silage loss

Proteins for one-stomach animals (pigs, poultry)

Avoiding loss of grass (15% - 20%)

Traditional

Inefficient conversion of proteins in milk and meat



KOE RENDEMENT 20%:
20 KG EIWIT IN MELK

Conversion 100 kg grass
to **20 kg** milk protein

Refining

Feed selectively (resistant) proteins to cattle and other proteins to pigs, poultry



COW RETURN 27%:
20 KG PROTEIN IN MILK



CHICKEN RETURN 40%:
10 KG PROTEIN IN MEAT / EGG

Conversion 100 kg grass protein
to **30 kg** milk protein and chicken
protein

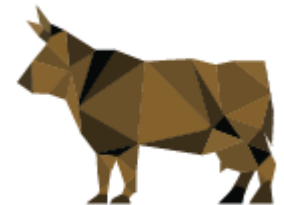
GRASSA! is a solution for agriculture and environmental problems

Grass refining reduces the manure, phosphate- and ammonia surplus

Reduces greenhouse emissions

Reduces need for large areas of agricultural land

- Optimisation Nitrogen
 - Better matched feed with 'suitable' proteins
 - Reduced nitrogen level in manure
 - Less fertiliser
- Optimisation application phosphate
 - Less phosphate: Optimal more animals
 - Optimisation of phosphate levels in cattle feed
- GRASSA! contributes to the reduced emission of CO₂ and methane
 - Less import cattle feed
 - Less slurry manure and less ammonia from manure
- Reduces the required space of agricultural land
 - 1/3 of Dutch agricultural land becomes available for other uses
 - Agricultural land which is currently used for soya for cattle feed



GRASSA! gives farmers independence and a better income

Biorefining strengthens the position and independence of farmers

Gives value to otherwise no-value green waste streams

- Farmers will be more self-sufficient
 - Less purchasing cattle feed
 - Less purchasing fertiliser
- Farmers' income will be higher and more robust
 - Apart from milk they will supply proteins, minerals and sugars
 - Fewer costs for disposal manure and silage
 - Higher protein efficiency of cows: Cost reduction per litre milk!
- Residual waste of horticulture and vegetable cutting turn into high value products
 - New streams proteins and sugars
 - Reduces levels of waste
 - These streams add value to horticulture and vegetable cutting bus



GRASSA! Technology makes the world a better place

GRASSA! Biorefining delivers only advantages

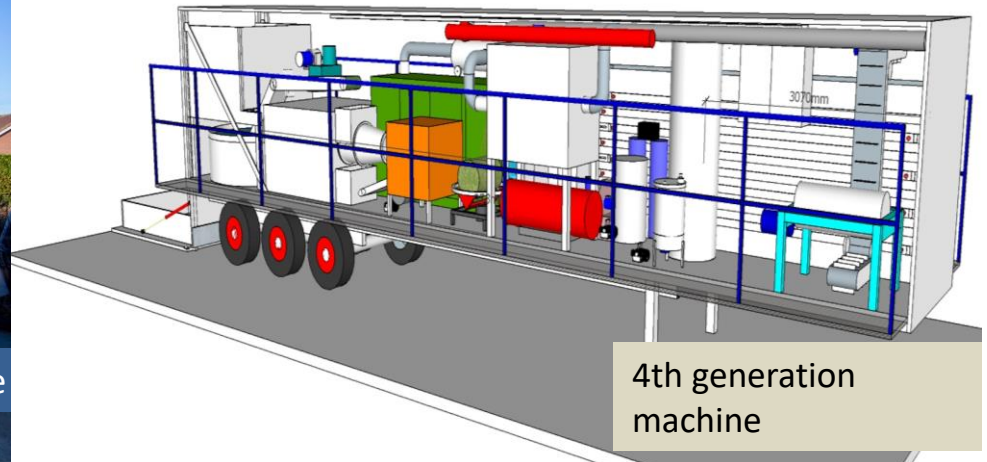
- Local production of feed and food
- Reduced greenhouse gas emissions
- No GMO (Genetically Modified Organism) required
 - *VLOG (Verband Lebensmittel Ohne Gentechnik)*
- Release of ingredients of difficult crops for feed (eg Miscanthus)
- Refining allows possibilities for phosphate management
- Less nitrogen in manure
- Less 'feed' surface
- Small local feed cycle

- **More value from Green**



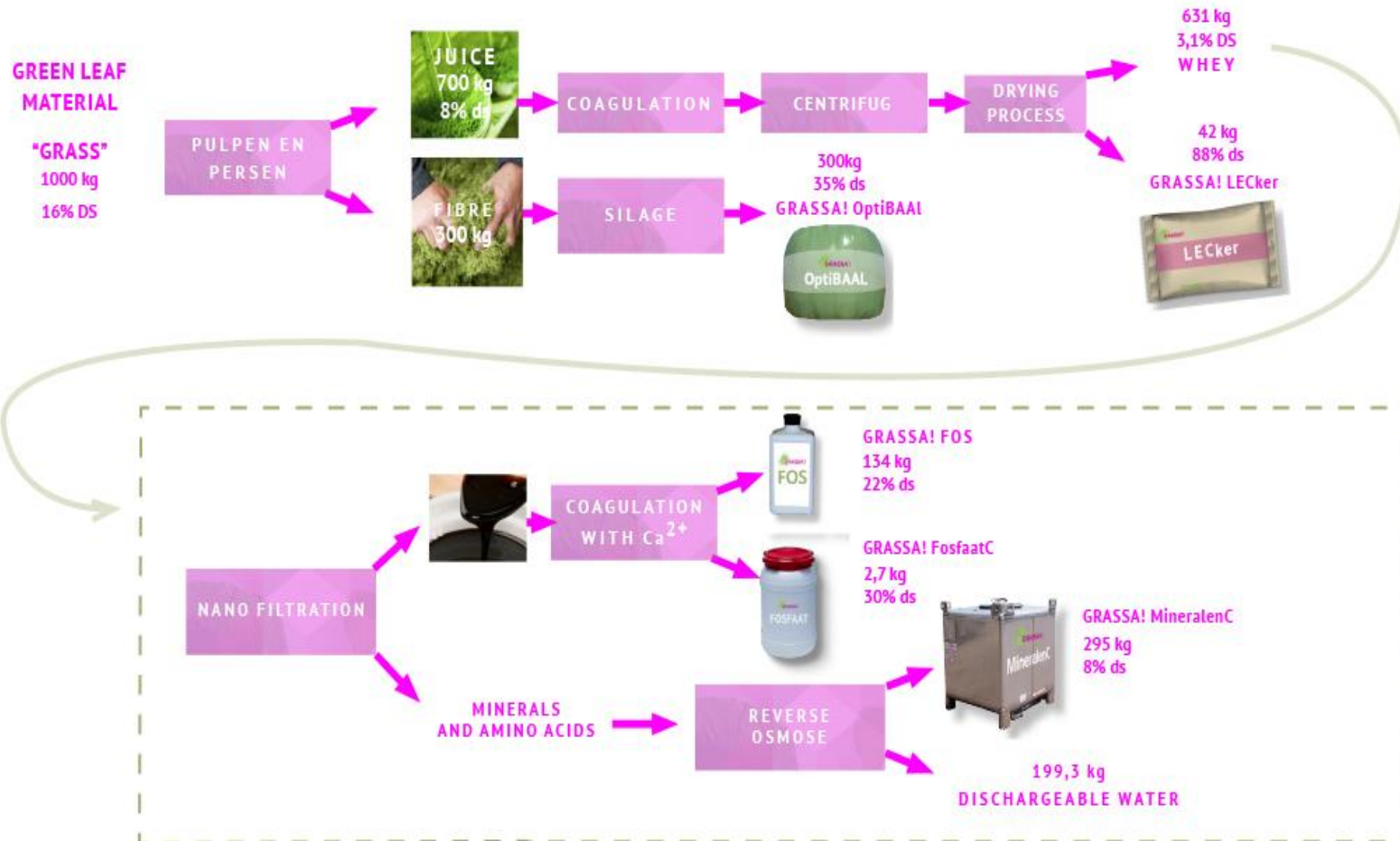
GRASSA! Technology has been developed

GRASSA! currently produces a fourth generation biorefining machine



The GRASSA! process is unique and proven

GRASSA! is breaking apart green streams by means of its machine
Via a patented process



The GRASSA! process is unique and proven

GRASSA! is breaking apart green streams by means of this machine

Via a patented process

- Baled fibres including the resistant proteins (OptiBAAL)
- Protein (LECKER) can be separated from one-stomach animals (pigs, poultry and humans)
- GRASSA! is capable of extracting fructo-oligosacharides (**FOS**, indigestible sugars). This is a **prebiotic** which can supply extra feed to good bacteria of the intestinal flora.



The GRASSA! process is unique and proven

By means of this machine GRASSA! breaks apart green residual waste streams into a variety of high value products such as protein, via a partly patented process

Fibre / Protein combination Rich in 'well usable' proteins	GRASSA! OptiBAAL
Juice Soya replacement in liquid feed with pigs. Contains prebiotic: FOS	GRASSA! SAP
<i>After further processing the juice produces:</i>	
Proteins Replaces soya. More favourable amino acid profile and a higher protein level	GRASSA! LECKER
Whey Replacement for water. Nutritional value and tasty. Contains prebiotics	GRASSA! Whey
<i>The whey can be further processed:</i>	
Sugars and edible fibres including FOS Prebiotic for improved animal health care	GRASSA! FOS
Mineral concentrate Fertiliser	GRASSA! MineralenC

GRASSA! 'Mobile' and 'Stand alone', 'Grass' en 'Vegetable residual streams'

By means of a mobile and stand alone technology the refining of different kinds of feedstock is accessible

- Mobile:
 - Capacity in 2018 to 2 T/h
 - Suitable for residual waste from nature and water management
 - Demo for culture grass
 - With capacity of 4 T/h suitable for pasture grass
- Stand alone:
 - Vegetables: The scale has been proven small machine
 - High number of running hours > 6000 h/annum
 - Food grade!
 - Proof of Concept in 2018



GRASSA! delivers machines for a variety of markets (feed, petfood, food)

Biorefining technology and products for the sustainable part of feed, petfood and food market

GRASSA!

- Building and marketing of machines
- Marketing of refining products
- Focus on the 'sustainable' part of feed & petfood
- Food (Vegetable nugget)

Examples:

- LECKER of grass and natural grass: To a 'sustainable' poultry sector: Kipster (outlet LIDL with a approval of animal activists)
- LECKER vegetable-residual streams: To pet food and food (Vegetable Nugget)
- OptiBAAL BIO: to the organic dairy industry
- OptiBAAL: Vegetable-residual streams: To pet food and food (Vegetable Nugget)
- MineralenC BIO: To organic agriculture

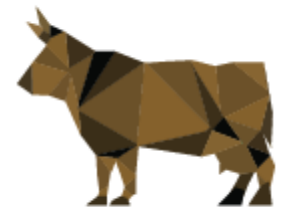


GRASSA! is expanding

Commercial

GRASSA!

- Organisational development
- Upscaling in capacity
- Demonstration projects
- Launching (International) customers



GRASSA! thank you for your attention



More value from green

www.grassa.nl

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