Grassa
GREEN REFINED SOLUTIONS

‘Biorefining of grass will contribute to a sustainable rural development in Europe’

Johan Sanders, 17 november 2020

Problems to solve

- 2/3 of all agricultural land in the world is used for animal feed; further biodiversity losses should be stopped or better reversed
- In 2050 we have to feed 10 billion people with at least 50 gram protein per day. With actual European protein production efficiency

(for each 1 kg N on our plate we need 7 kg input) we will need 3 times more Nitrogen fertilizer than our world can cope with.

- **We need radical changes:**
  - Inputs of Nitrogen in Agriculture should be reduced
  - Increase protein and nitrogen use efficiency
  - Increase revenues per ha for farmers
  - local for local (no long transports, no import of minerals)

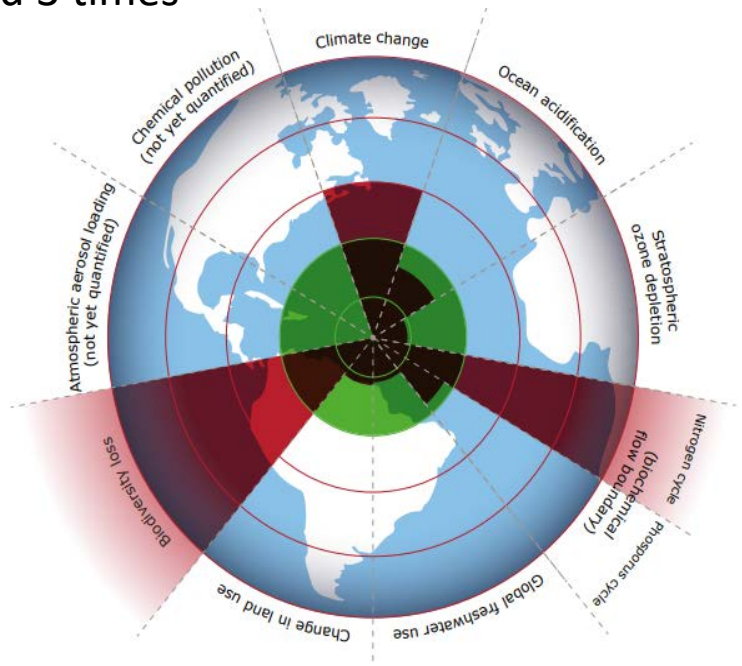


Figure 1: Beyond the boundary. The inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each variable (Rockström et al. (2009)).

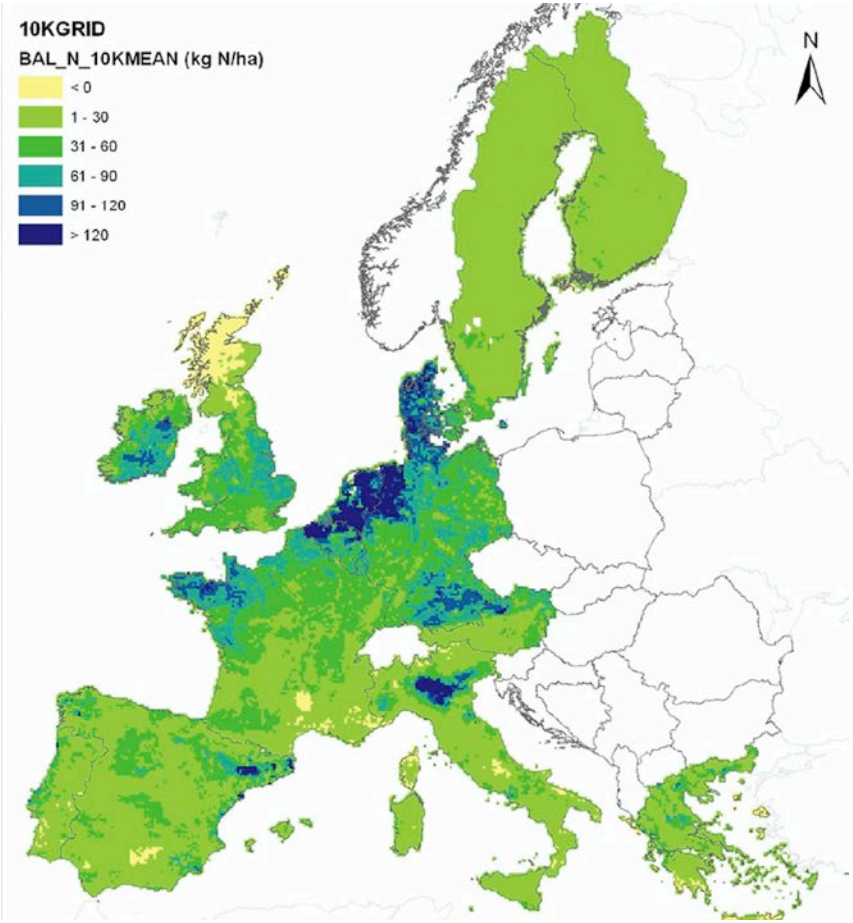
How to optimize nitrogen use efficiency and landuse efficiency at the same time:

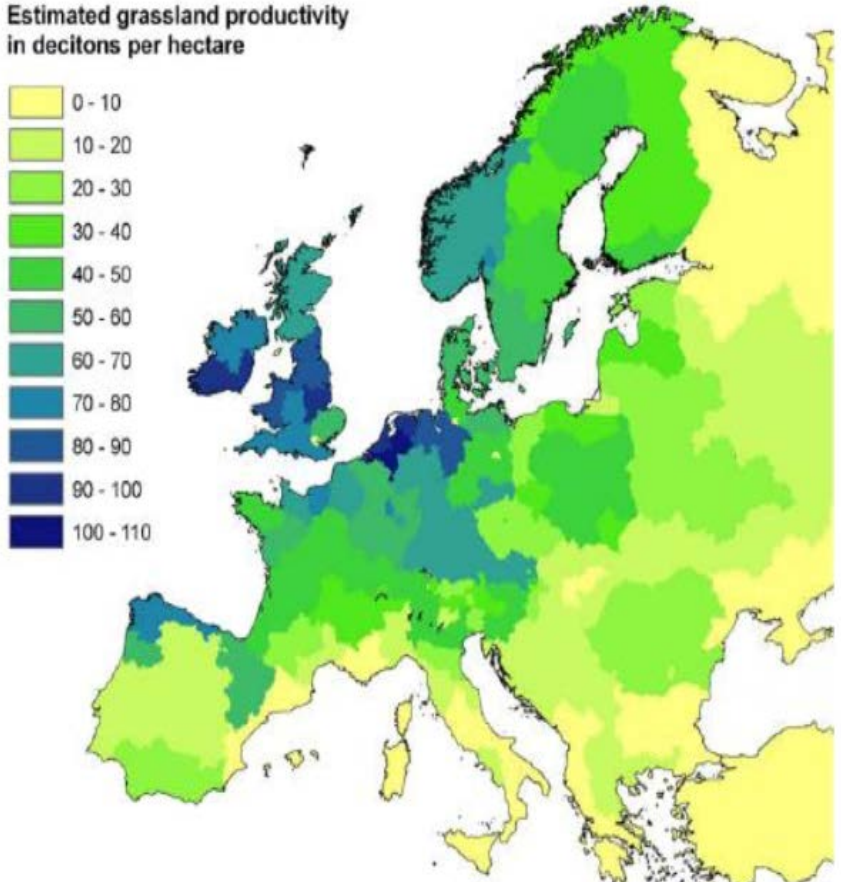
- Can we grow animal feed crops on land unsuitable for food crops?
- fertilization efficiency of the crop, eg by using legumes
- Increase protein yield per ha.year,

- **Biorefinery improves digestability and feed conversion and enables redistribution of proteins (Protein Use Efficiency) over various different animals and will also benefit economically from other crop constituents**

- **I will show that biorefining of grass supplies such opportunities**

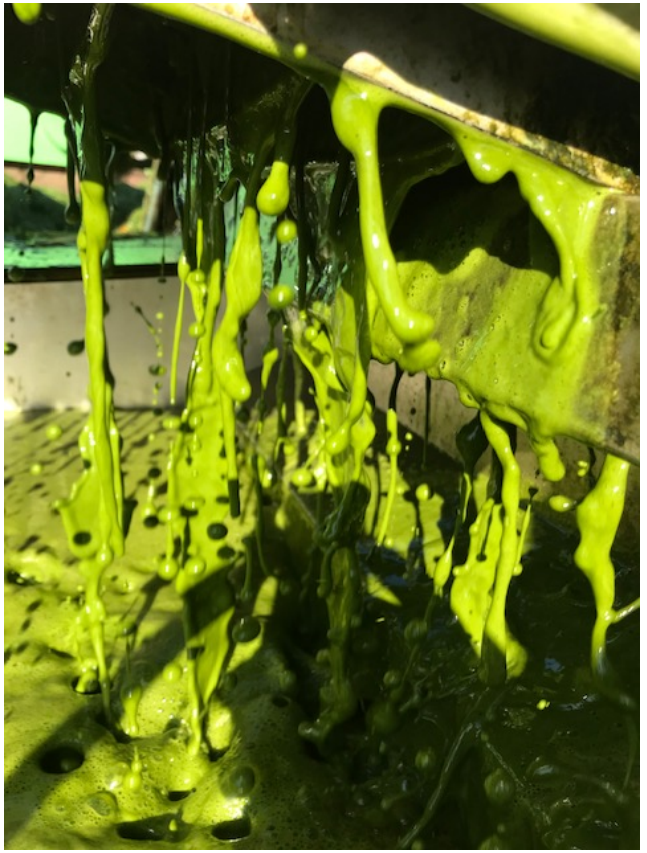
Nitrogen Balance and grass production in Europe



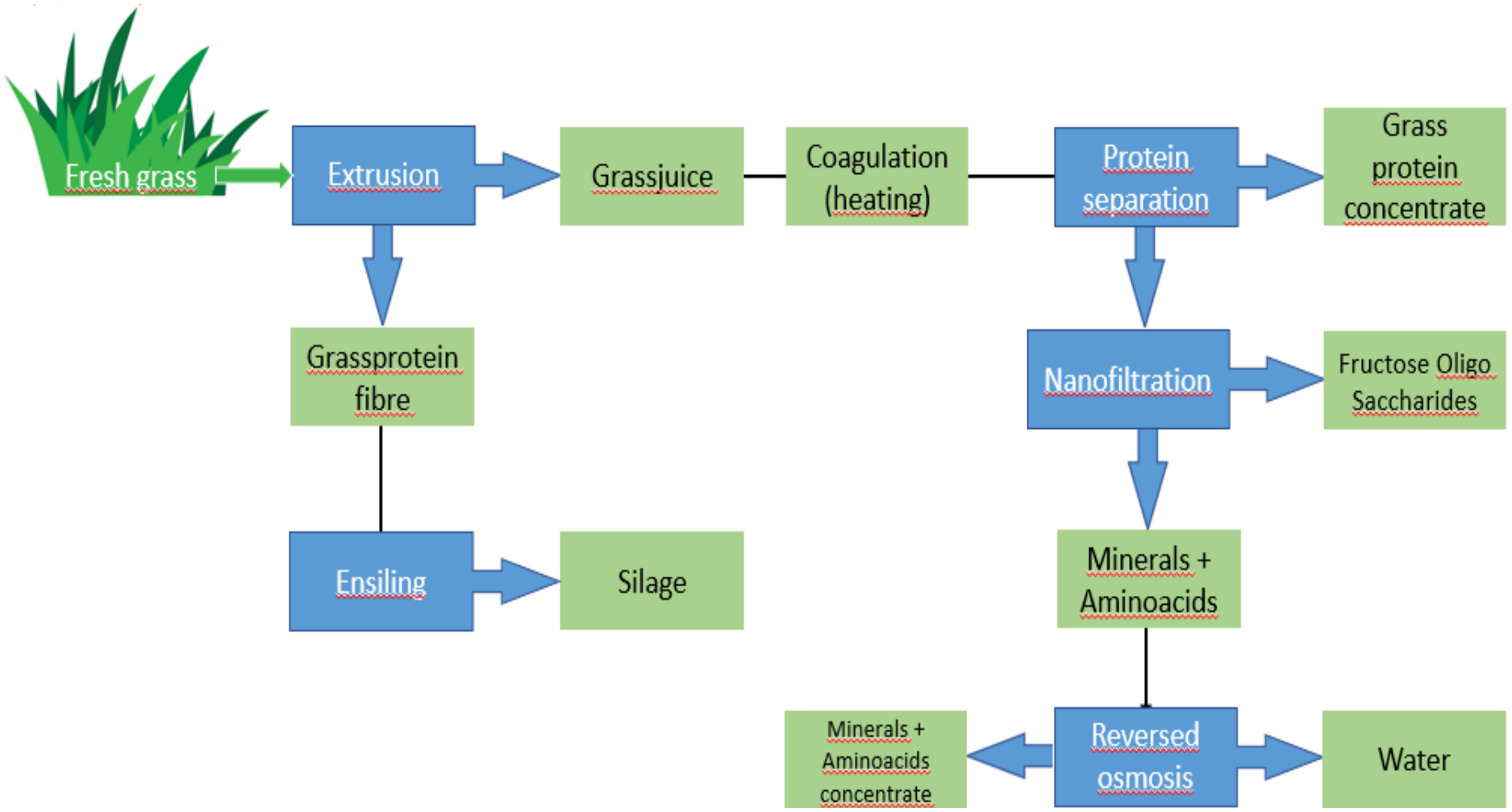


Grass is split into four products

- Fiber/ protein with optimal protein level for ruminants (dairy cattle, horses)
- Non GMO digestible protein to replace GMO soyprotein for poultry, pigs and fish
- Prebiotic fibre for digestive health in young animals & pets
- Organic plant-based fertilizer



Biorefining process for grass and leaves



4 ton/ hour process snapshots

Grassa
GREEN REFINED SOLUTIONS

LCA: Biorefining of grass vs soymeal

- Less land use: **33%**
- Less ammonia and phosphate emission: **30% and 50%**
- Less GHG emissions **75%**

- No longer imports are required of 20 M ton soy protein in EU and no import of minerals
- Biorefining 25 Mha EU grassland (35%) compensates for all soy import
- Non-GMO
- Pay Back Time of investment: 3 years depending on local conditions at 8 tons/hour
- Increases EU rural employability with 75.000-125.000 fte
- Production on marginal land can substitute good agricultural land for protein production and no deforestation

Future Grassa developments

- Machine development (>8 ton/hour)
  - 2021: TRL 8
  - 2022: TRL 9 → scaling up the numbers of machines

- Operating time will be between 2500-4500 hours/year
  - 8 ton/hour would mean 330-600 ha whole harvest (short distances)

- Development of 4 Product-Market Combinations from 2021 onwards

Outlook: increase of NUE by grass biorefinery combined with mixed species swards and NH_3 stripping by Byosis technology

- Legumes in swards containing 6-9 different plant species do not require N fertilizers because these plants can fixate N from the air at even higher protein yields per ha

- Biorefining of these leaves increases the protein efficiency for cows so that some 40% of the protein can be fed to pigs at equal milk yields per hectare

- 50% of the nitrogen in the cow and pig manure can be recovered by stripping of ammonia; the other 50% goes back to the swards. **Instead of buying N fertilizer, the farmer can sell N fertilizer to crop farms and protein to pig farms and produce the same amount of milk**

Nitrogen Use Efficiency	Traditional grazing	Traditional grazing Including pig feed	Grass biorefinery	Biorefinery and Mixed species swards
No stripping	0,16	0,18	0,29	0,39
NH_3 stripping		0,23	0,33	0,45

Conclusions

- Biorefining of grass will increase animal protein production per ha by 50%;
- From the Irish GLAS project we conclude: milk quantity and quality stays equal, Rumen methane emission reduced by 15% when 2/3 of traditional silage is substituted by our product

- Biorefinery improves NUE threefold if combined with legumes and ammonia stripping offering conditions to stay within our Planetary boundaries

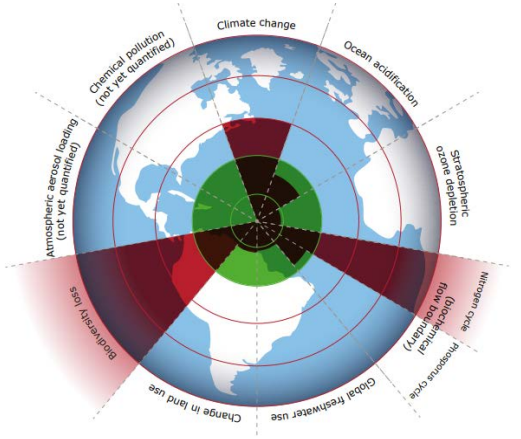


Figure 1: Beyond the boundary. The inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each variable (Rockström et al. (2009)).

- Biorefinery of leaves will substitute all soy and undesired mineral imports into EU

- Biorefinery will lead to increased rural employability and increased agricultural incomes

Johan Sanders - johan@grassa.nl - www.grassa.nl