

# Circular and innovative protein produced from grass protein residues

Erik Fog, senior researcher

Green Protein Network, Foulum, 06-02-2024



Promilleafgiftsfonden for landbrug

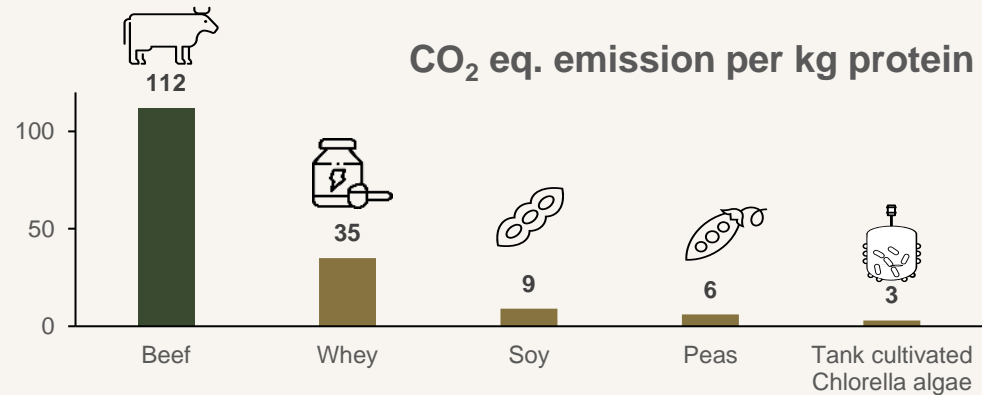
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## The EXTEND project

Sustainable food ingredients from Chlorella micro algae grown on substrate from grass protein side streams.

Huge CO<sub>2</sub> reduction potential in proteins from tank cultivated algae.



NATUREM BIOSCIENCE

# Pictures from Ausumgaard



Harvest



Loading



Refining



Screw press separation



Heating of green juice



Decanter separation



Grass pulp

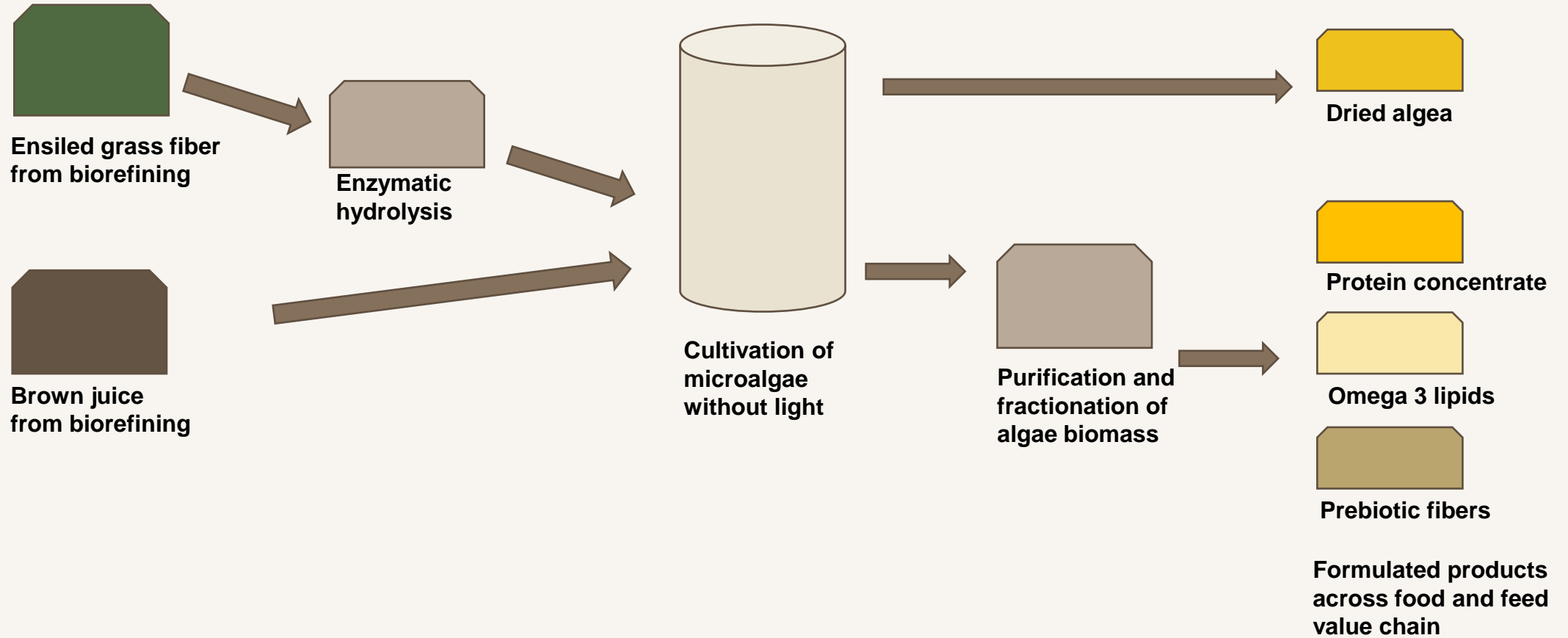


Protein concentrate



Brown juice

# The EXTEND process



## Nutritional value of *Chlorella vulgaris* – composition and fatty acids

### Composition

Dry matter (g/100 g fw)	93.25
Ash (g/100 g dm)	7.85
Carbohydrate (g/100 g dm)	28.25
Protein (g/100 g dm)	38.85
Fat (g/100 g dm)	24.50
Energy (kcal/100 g)	489.30
Digestibility (g/100 g)	55.50

### Fatty acids

UFA/SFA	2.52
PUFA/MUFA	2.24
Omega-6/Omega-3	1.12
Atherogenicity index (AI)	0.38
Thrombogenicity index (TI)	0.27
Hypocholesterolemic index (HI)	2.04
Peroxidizability index (PI)	98.40
Nutritive value index (NVI)	0.84

## Nutritional value of *Chlorella vulgaris* – Amino acids

**Protein content:** 53 % of dry matter.

### Essential amino acids:

(as g to 100 g protein and % of the daily requirement)

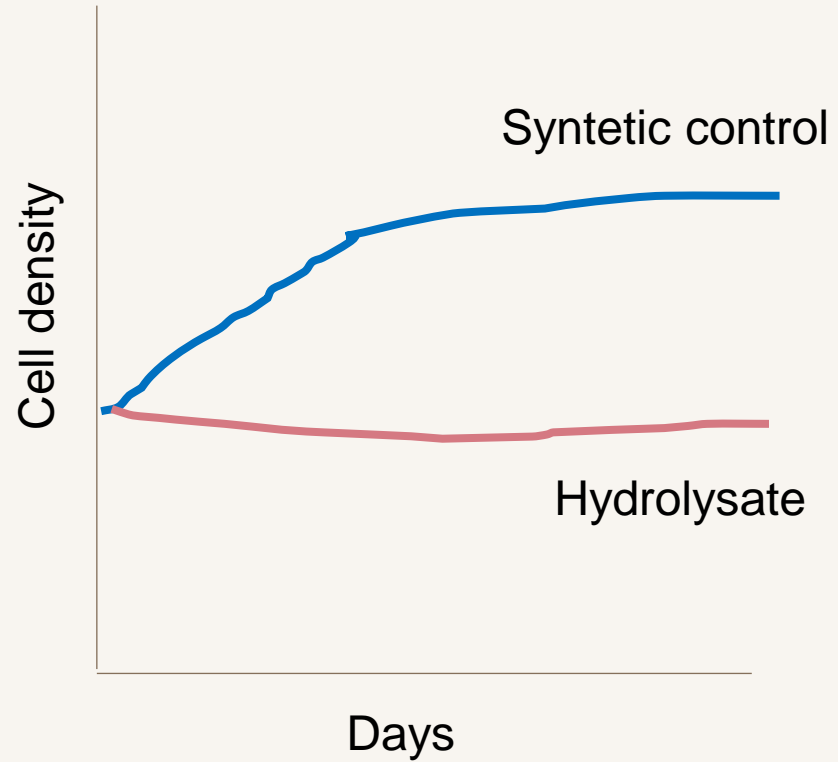
	<b><i>Chlorella vulgaris</i></b>	<b>Soy-bean</b>	<b>Egg</b>
Threonine	5,5 g (239%)	4,0 g (173%)	3,2 g (139%)
Valine	6,7 (171%)	5,3 g (135%)	4,5 g (115%)
Methionine + cysteine	2,6 g (118%)	1,3 g (59%)	3,5 g (159%)
Isoleucine	3,4 g (113%)	5,3 g (176%)	4,2 g (140%)
Leucine	8,2 g (138%)	7,7 g (130%)	5,5 g (93 %)
Phenylalanine + Tyrosine	6,0 g (158%)	5,0 g (131%)	6,3 g (165%)
Lysine	5,4 g (120%)	6,4 g (142%)	4,0 g (89%)
Tryptophan	0,2 g (33%)	1,2 g (233 %)	1,0 g (166 %)

## Selecting the best *Chlorella* mutant

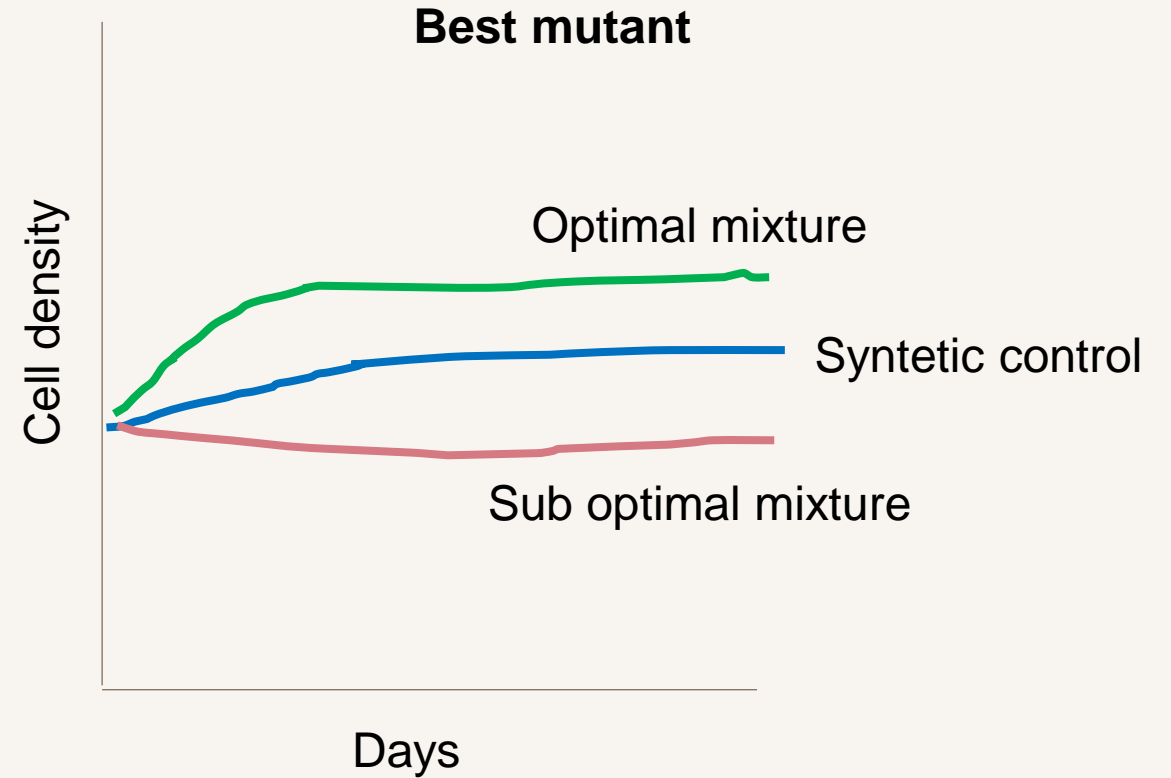


# Growth experiments (DTU)

Hydrolysate medium



Combined hydrolysate and brown juice medium





## Next step: Upscaling at FermHub Zealand



Photo: FermHub Zealand, Christian Kjølby

## Needed approvals

# Novel Food



Organic certification