

GO-GRASS







The science behind the potentials of green biorefinery

AARHUS UNIVERSITY CENTRE FOR

CIRCULAR BIOECONOMY

CBIO

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Photosynthesis is *the* foundation for the whole bioeconomy



However, grain crops are poor "solar panels" seen across a year





Green Valleys

Oresund-Kattegat-Skagerrak European Regional Development Fund



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Biomass production can be doubled

and nitrate leaching halved



Field experiments at Aarhus University on the effects of cropping systems



Other environmental benefits from conversion of annual crops to grass, clover or alfalfa

- Reduced soil erosion
- Reduced GHG emission (0.5-3.5 ton CO₂-equiv/ha)

Børgesen et al., DCA Report No. 131, 2018

- Reduced pesticide use (by factor 40-50)
- Increased biodiversity

So, what to do with all that grass?



Green biorefineries can be the disruptive agents for new products from rural areas

Colours Flavors Medicin Other chemicals











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Feeding experiment with green protein to pigs, cows, broilers & egg layers – positive results!



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Business evaluation of decentralized green biorefineries in Denmark

Economic assumptions:

- Biorefinery CAPEX : 3.36 mio EUR
- Depreciation time: 15 year
- 5% Interest rate , 5% Maintenance

• Grass price

- Organic: 0.15 EUR/kg
- Conventional: 0.13 EUR/kg
- Protein price (soya)
- Organic: 0.67 EUR/kg
- Conventional: 0.34 EUR/kg
- Fiber pulp price
 - Identical to grass price
- Residue juice is not given any cost or value - It is used for internal energy production at the biogas plant.

Economy		
	Scenario	
	Organic	Conventional
	Mio. EUR	Mio. EUR
Income		
Protein concentrate +	4.70	3.25
Fibre		
Expenses		
Grass	3.33	2.90
Energy and salary	0.19	0.19
Maintenance	0.17	0.17
Depreciation and	0.32	0.32
interest		
Result	0.66	-0.34

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Source: Morten Ambye-Jensen





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Demo-plant for green biorefinery now paving the way for market introduction

Supported by public funding, Arla, Danish Crown, DLG & DLF



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Green biorefineries can disrupt agricultural systems by creating new markets - and ensure



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