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GO-GRASS

Green biorefinery as the disruptive agent for carbon storage in cropland and increased EU self-supply of protein

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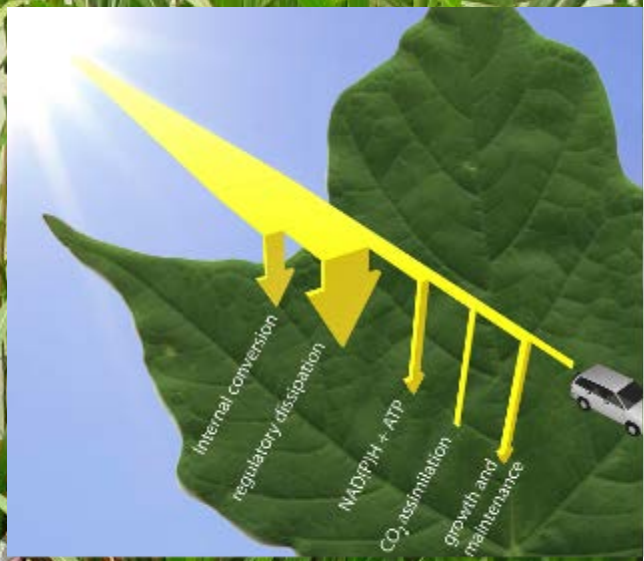
Head of Aarhus University Centre for Circular Bioeconomy (www.cbio.au.dk)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement **N° 862674**

Soil organic carbon origins from photosynthesis



Gust et al, MRS Bulletin (2008)

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

Foto: Colourbox

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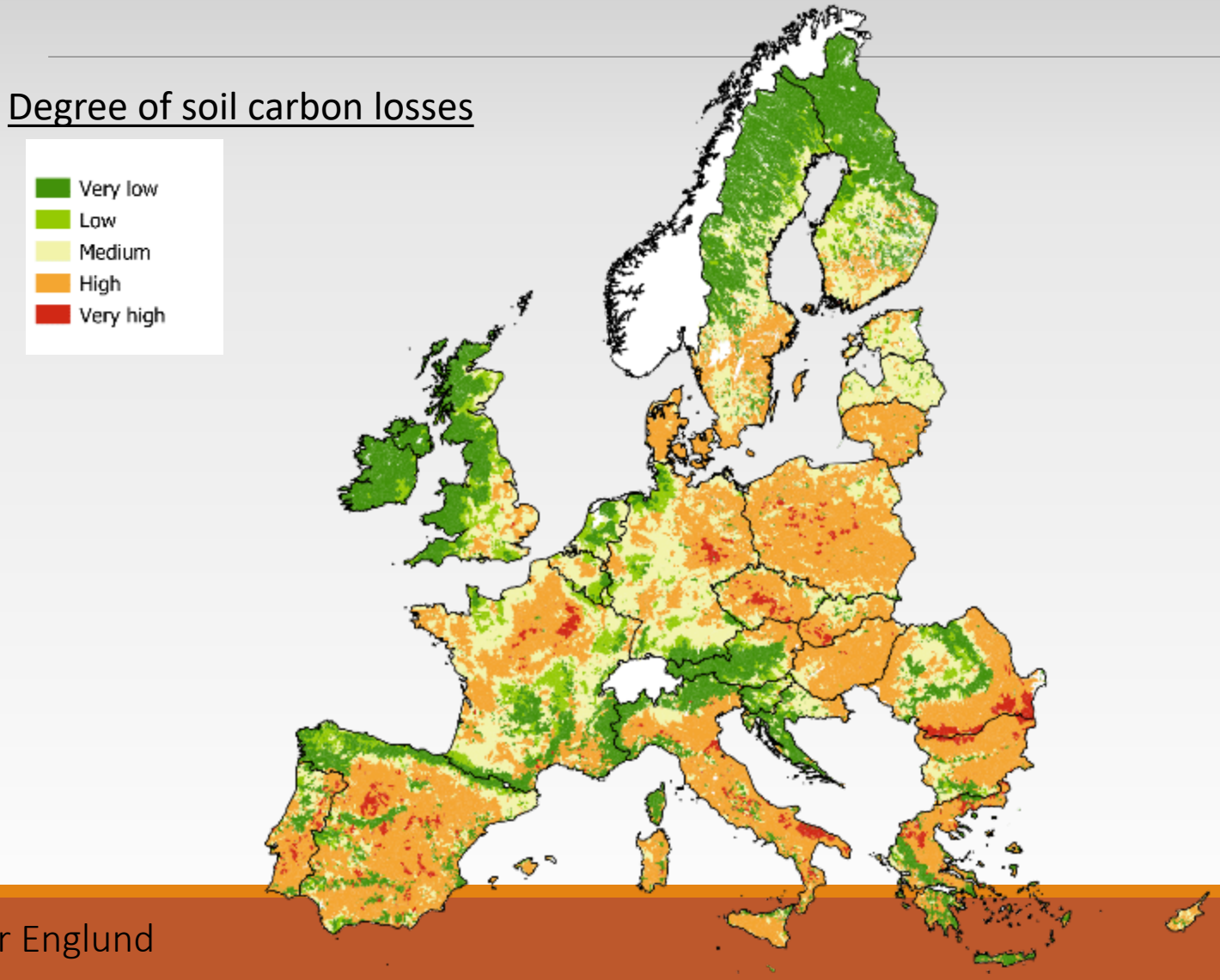
Most European farmland experience loss of soil organic carbon (Englund et al., 2019)



Grassland is known to be one of the most efficient tools to increase soil carbon

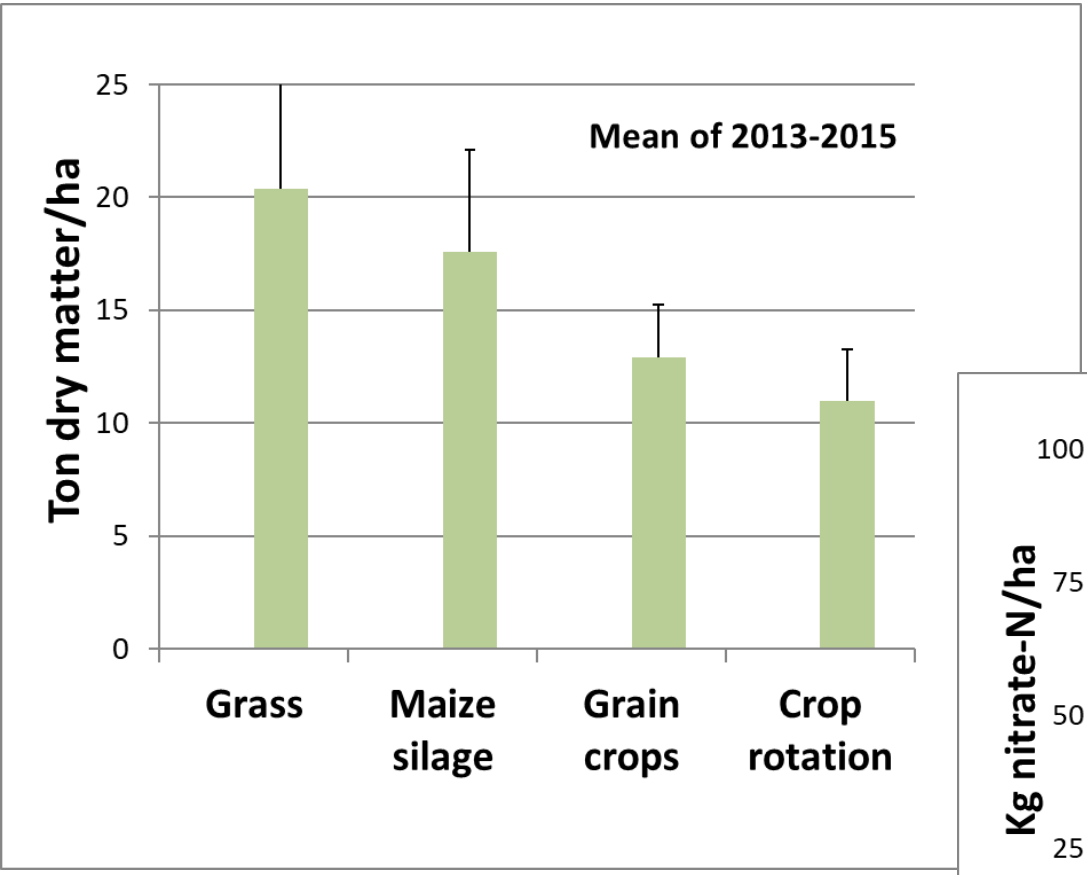
(Taghizadeh-Toosi et al., 2014)

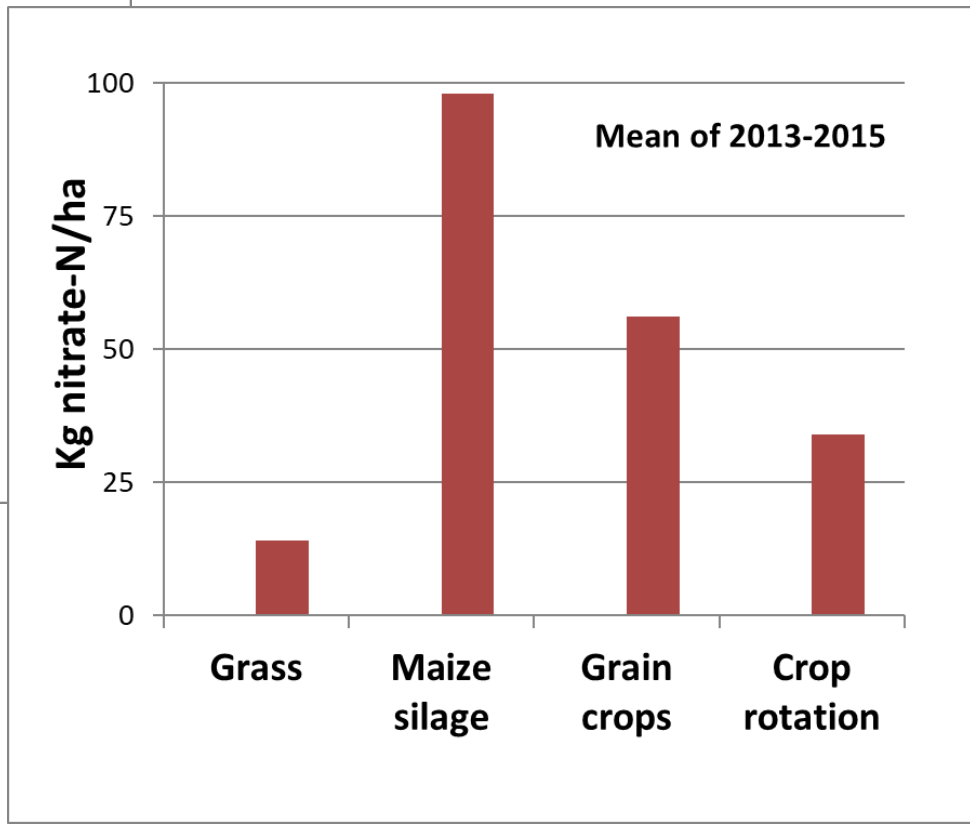
Strategic perennialization

Example

Field experiments at Aarhus University on effects of cropping systems

Biomass production can be doubled and nitrate leaching halved





Manevski et al., 2017; 2018

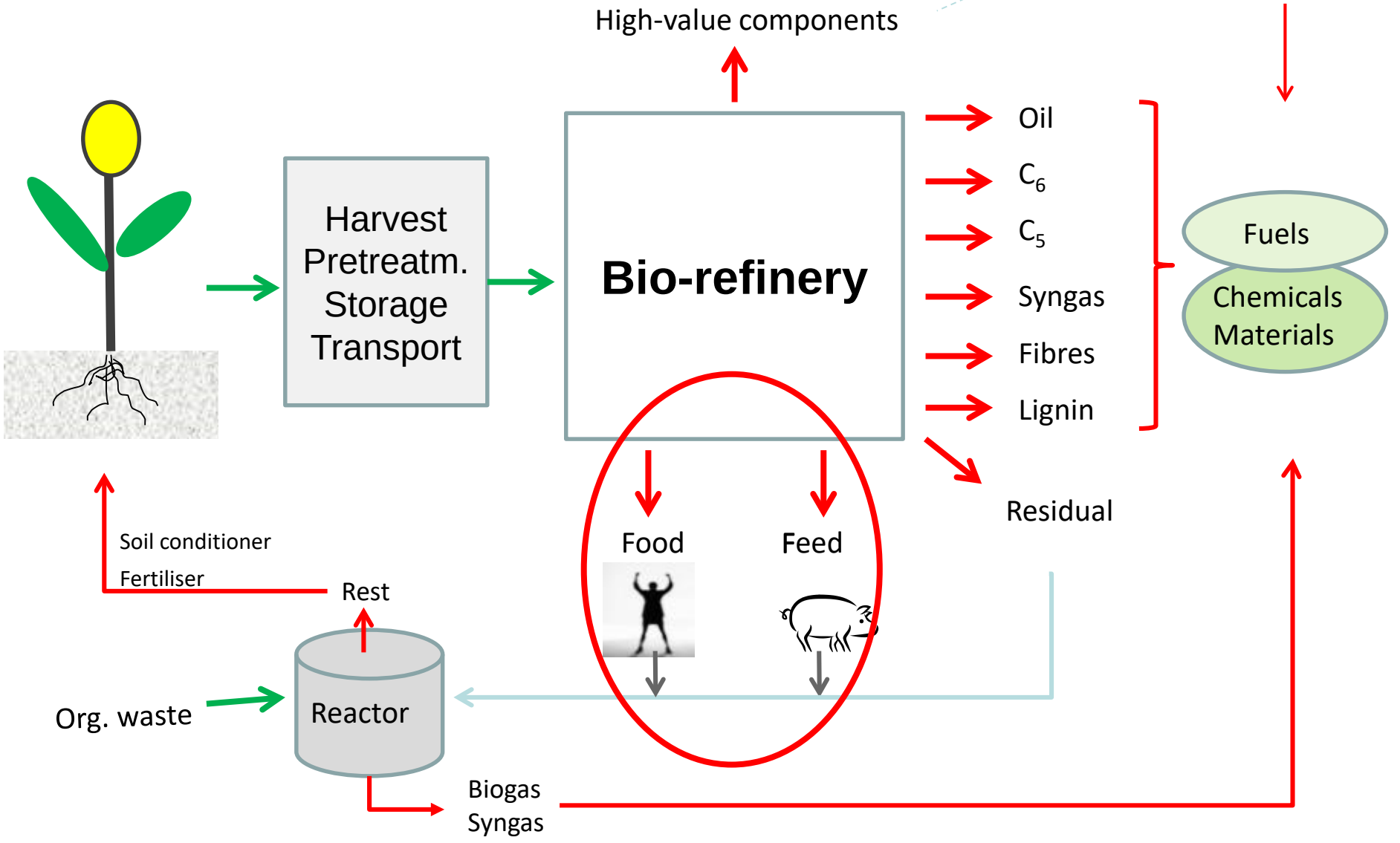
Other environmental benefits from conversion of annual crops to grass

- Reduced soil erosion
- Reduced GHG emission (0.5-3.5 ton CO_2-equiv/ha)
- Reduced pesticide use (by factor 40-50)
- Increased biodiversity

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

So, what to do with all that grass?

Green biorefineries can be the disruptive agents producing a suite of products



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

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 + Fibre	4.70	3.25
Expenses		
Grass	3.33	2.90
Energy and salary	0.19	0.19
Maintenance	0.17	0.17
Depreciation and interest	0.32	0.32
Result	**0.66**	**-0.34**

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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