

Is it possible to double productivity and halve environmental impact from agriculture?

Senior Scientist Uffe Jørgensen, Department of Agroecology
Head of Aarhus University Centre for Circular Bioeconomy (www.cbio.au.dk)



Green Valleys



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AARHUS UNIVERSITY CENTRE FOR
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EUROPEAN UNION

BIOVALUE SPIR



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European agriculture faces numerous challenges

Productivity

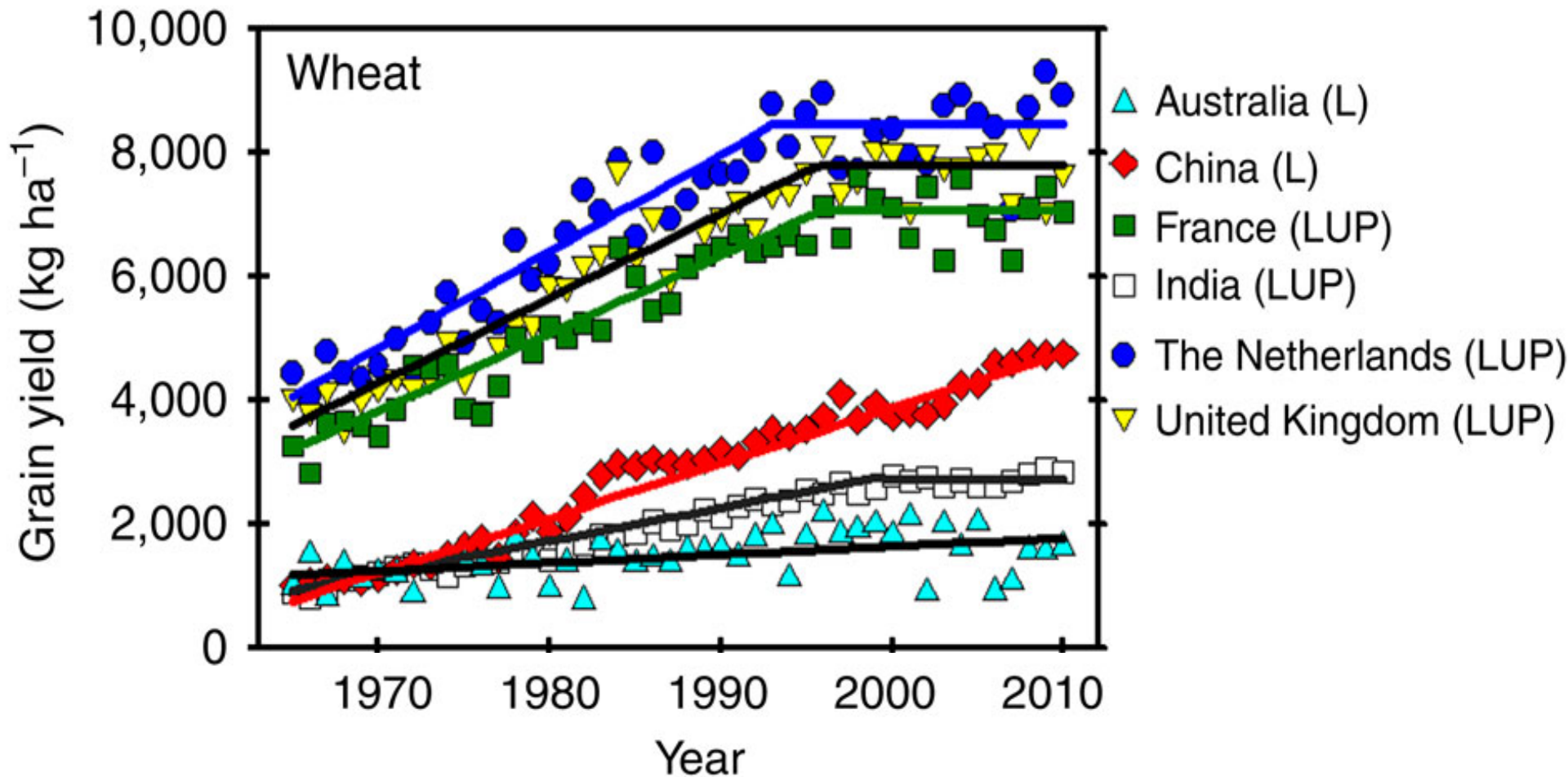
- Biomass for food, feed, material and energy
- Stagnating yields
- Large import of protein feed

Environment

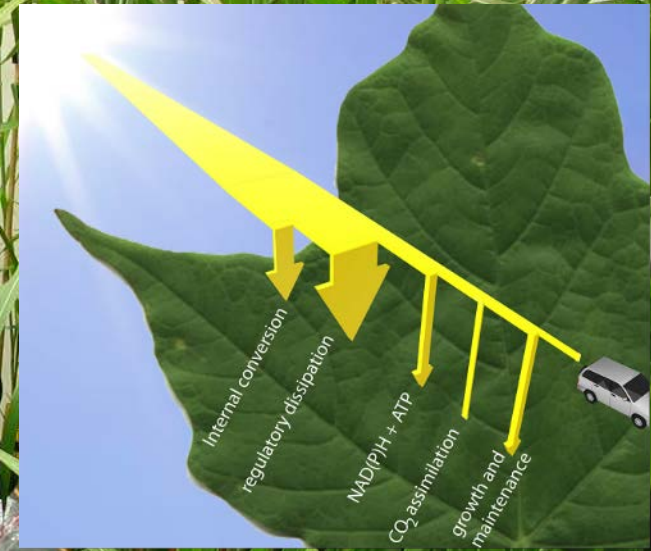
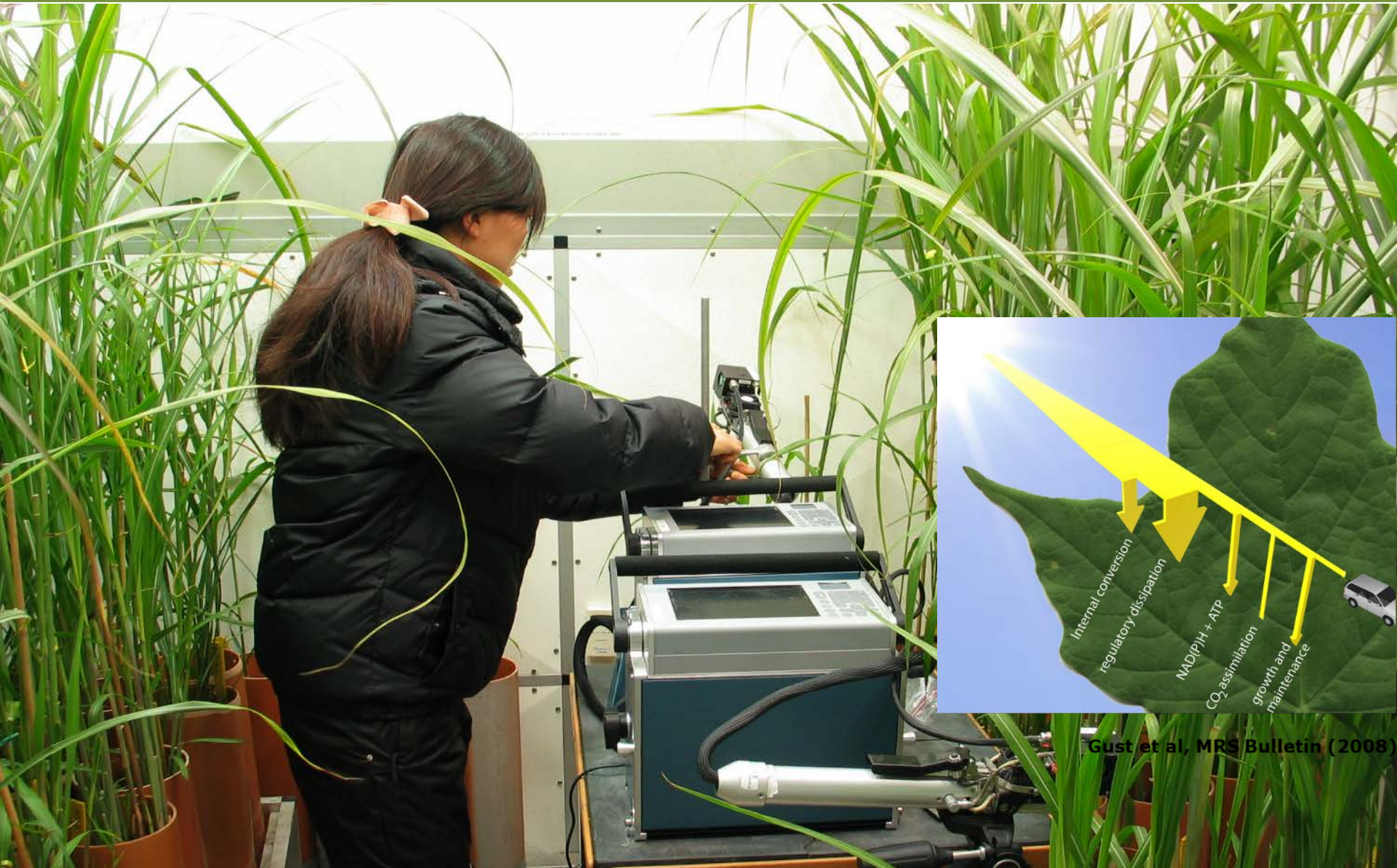
- High nutrient leaching (Nitrate and Water Framework Directives)
- High pesticide use
- Agriculture must contribute to EU climate goals (EU climate policy)

Time to look for radical innovation instead of just incremental

It seems hard to increase yields (sustainably) in existing crops in Europe



Photosynthesis is the basic process behind all life



Gust et al, MRS Bulletin (2008)

But grain crops are poor solar collectors

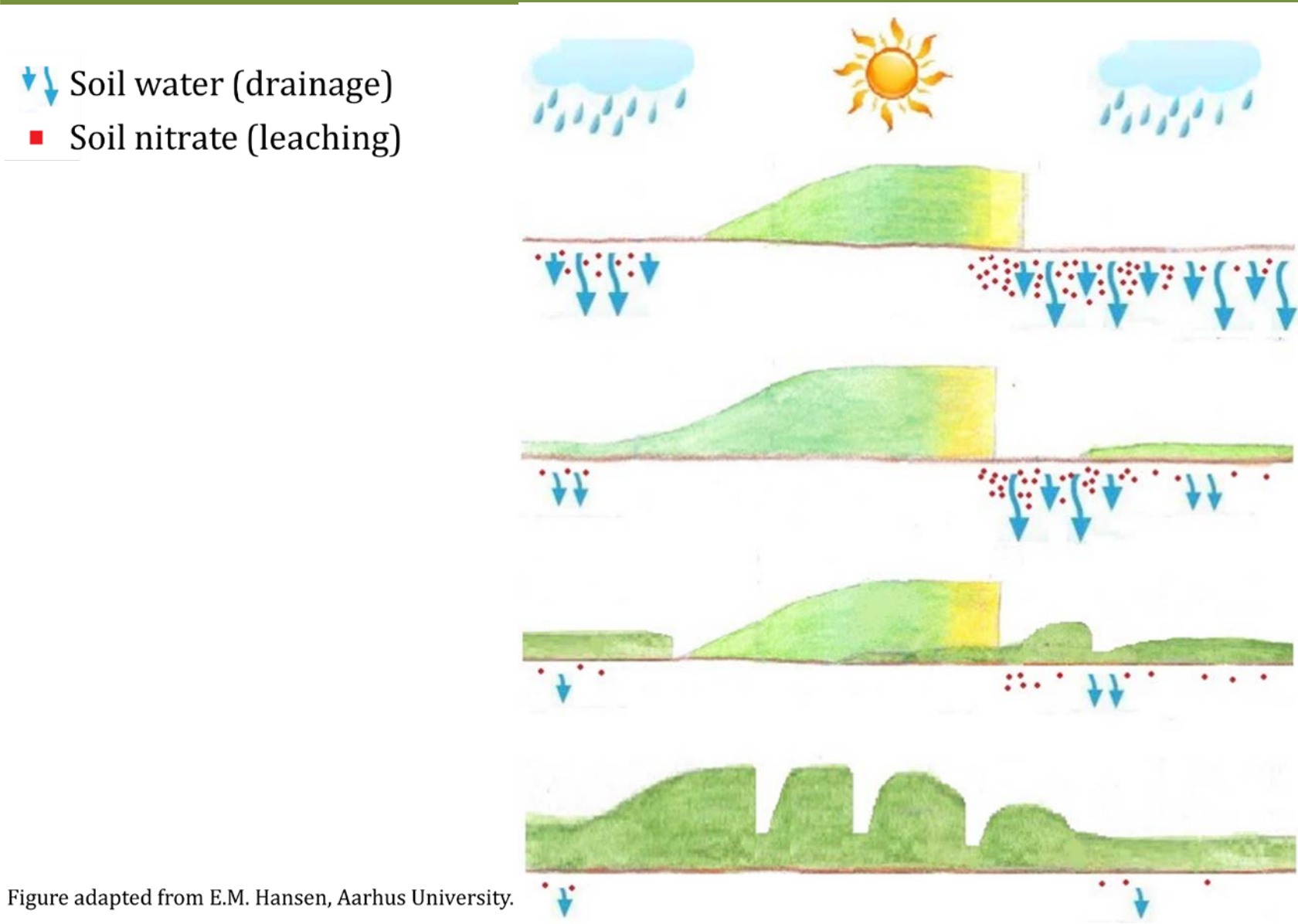


Photo: Colourbox

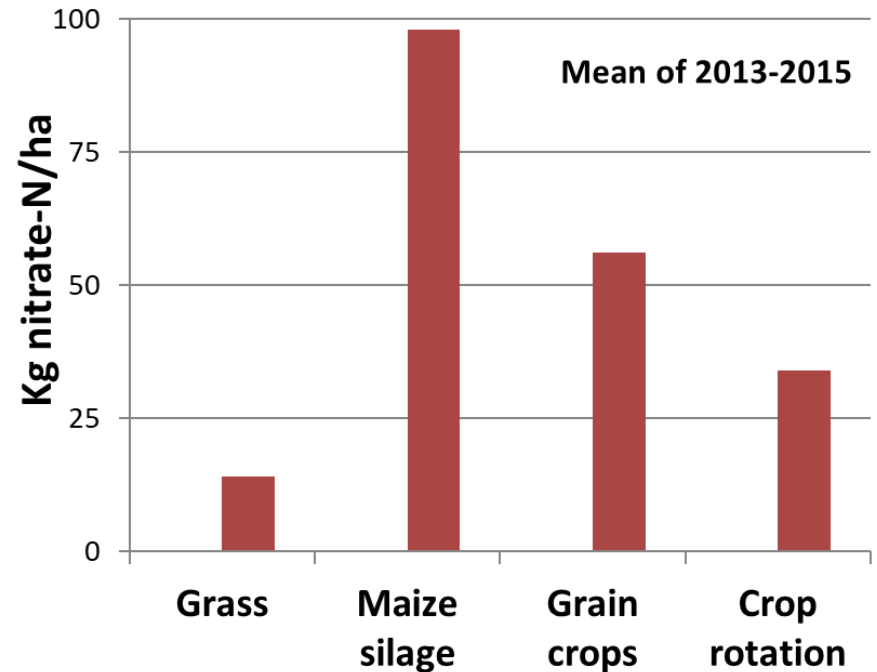
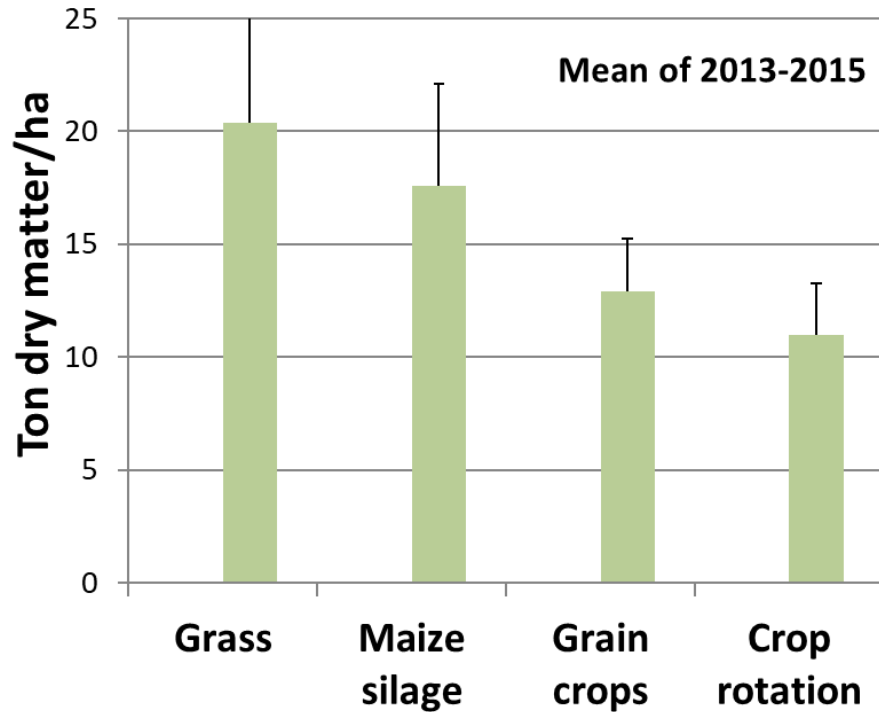
Fields can look this different in autumn – we decide



Tightening the nitrogen cycle is a major policy focus in Denmark



Biomass production can be doubled and nitrate leaching halved



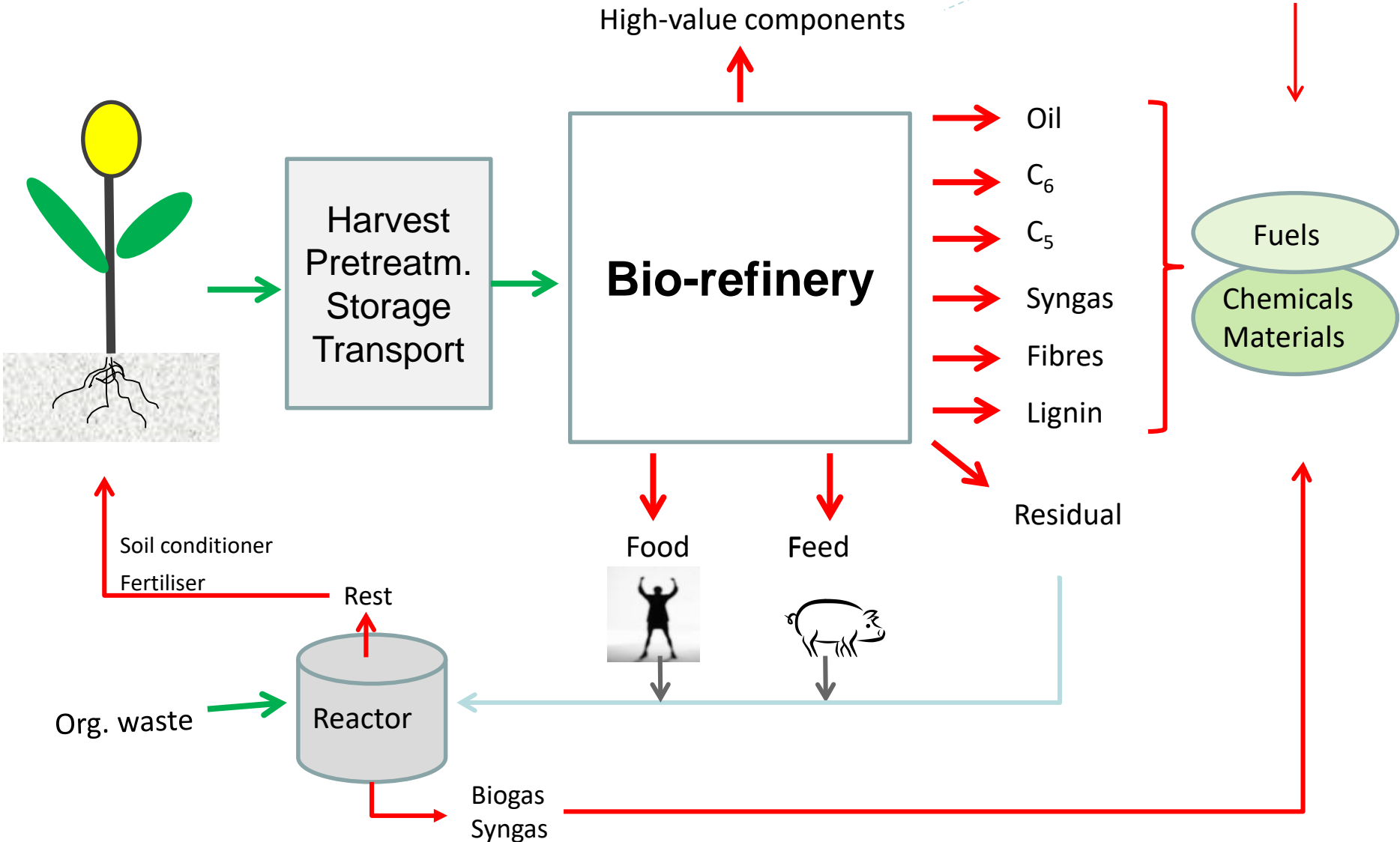
Manevski et al., 2017; 2018

So, what to do with all that grass?

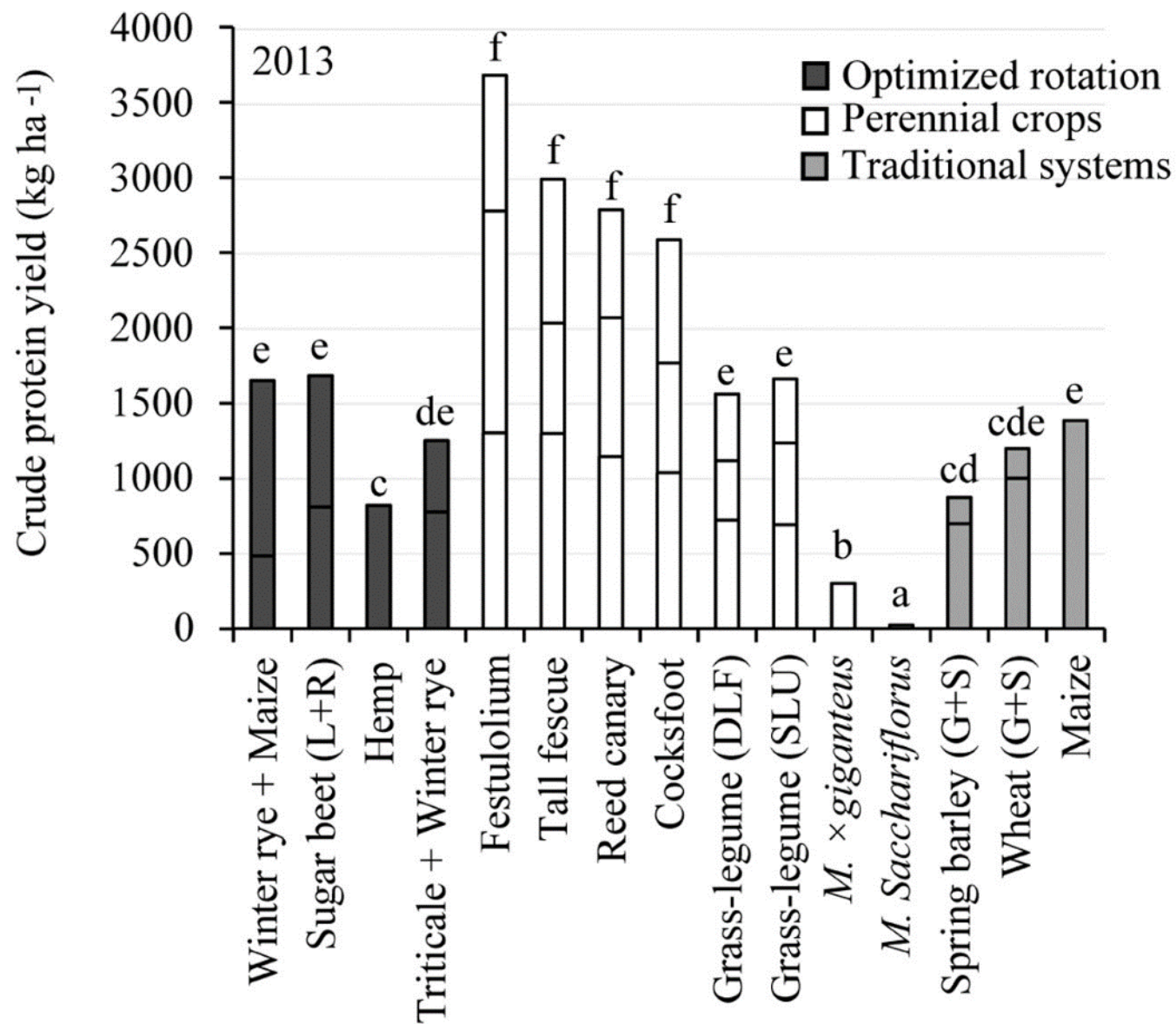


We can convert the grass in green biorefineries

Colours
Flavors
Medicin
Other chemicals



Crude protein yield higher in grasses than in other crops



PILOT FACILITY INPUT AND MACERATION







Digestibility experiments with green protein for pigs, poultry and dairy cows



Indhold af grøn protein
0% 8% 16%



From S.K. Jensen, L. Stødkilde-Jensen og V.K. Damborg, AU
ANIS

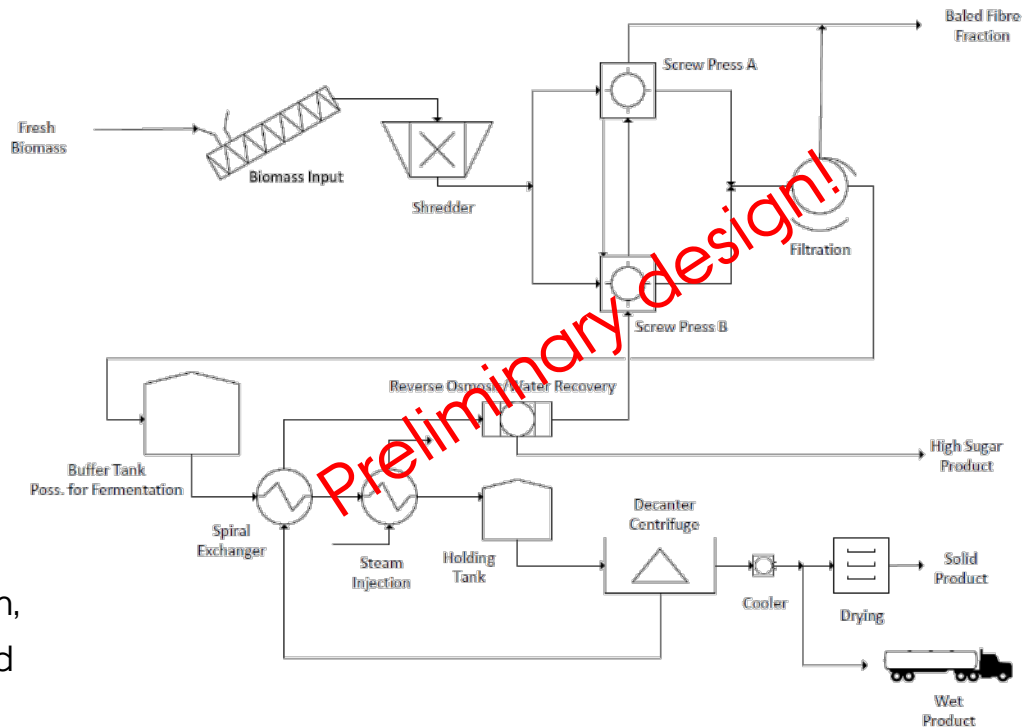


NEW DEMONSTRATION SCALE FACILITY UNDER CONSTRUCTION

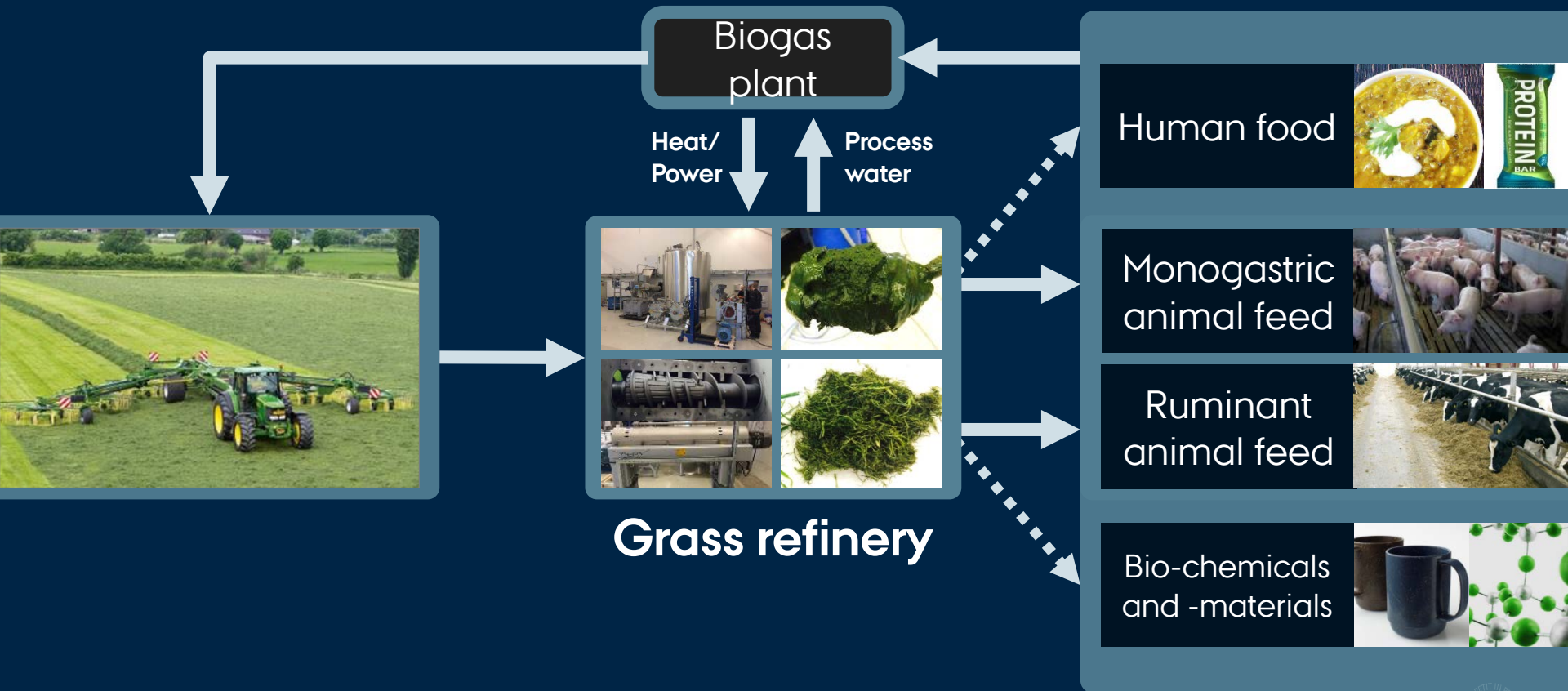
Supported by public funding and Arla, Danish Crown, DLG & DLF

Up-scaled and optimized demo-platform

- Input capacity: 10-20 t/hr
- Flexible design
- Automated control
- Improved unit operations
 - biomass washing,
 - improved maceration,
 - double pressing,
 - filtration and recirculation,
 - efficient heat precipitation with steam,
 - separation with both decantation and membrane filtration.



FURTHER DEVELOPMENT OF HIGHER VALUE PRODUCTS AND OPTIMAL USE OF RESOURCES



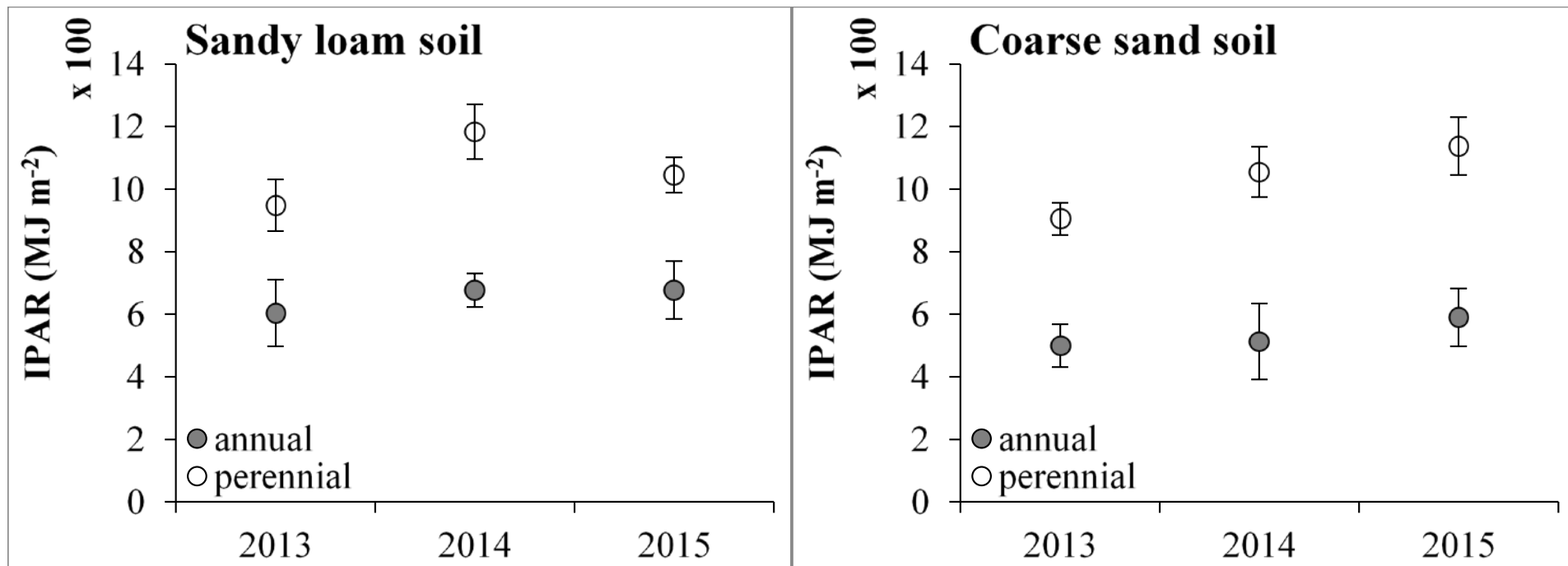
Future grass and legume fields for biorefinery may be harvested by robots



We can produce a better environment by combining the best from agriculture with the best from the industry



Intercepted PAR almost doubled in grasses



RapidSCAN CS-45

USB ●

CHRG ●

0.6754

M/E

OK



OFF

CLR



Jyndevad

Holland Scientific