

Limiting climate gas emissions from agricultural land. What can the farmer do?

Kristoffer Piil, SEGES Plant Innovation

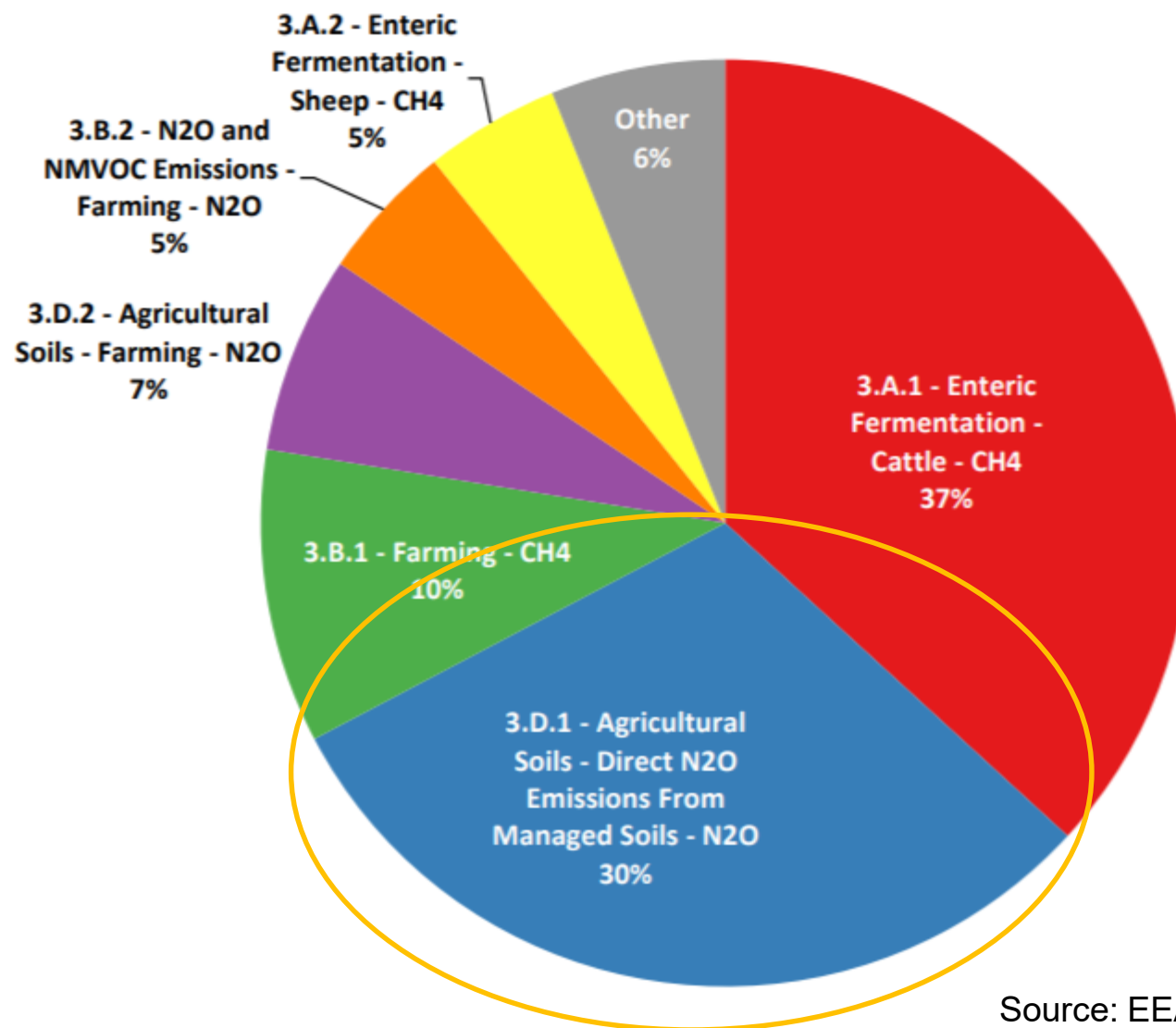
We all know the problem!

- Agriculture contributes 12% of climate gas emissions at the EU level
- Fraction is increasing as energy production, industry and transportation is gradually shifting to renewable energy sources



We all know the problem!

2015



Getting credit for what you do!

- 1% of applied fertiliser N is emitted as N_2O
 - No emission factors for use of nitrification inhibitors
 - No emission factors for any other management factor
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- Only two options on the table → Increase NUE or take land out of production
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- More science needed for differentiated emissions factors!



What are the driving pressures that can make farmers implement changes?

- Financial benefit



- Top down regulation



- Demand from consumers (CSR)



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The tool box

- Utilizing applied N efficiently – in particular manure N
- Nitrification inhibitors
- Changing cropping systems
- Biogas
- Abandoning farming of organic soils (or other land)
- Storing carbon in soils



How to motivate the farmer to use these measures?

Utilizing manure

- 1% of N input is emitted as N_2O → increase your NUE
- We know how to increase NUE of manure and have know for 25 years



Slurry and manure is gold:

N-price: 1,2 euro/kg

P-price: 1,9 euro/kg

K-price: 0,9 euro/kg

+C-effect

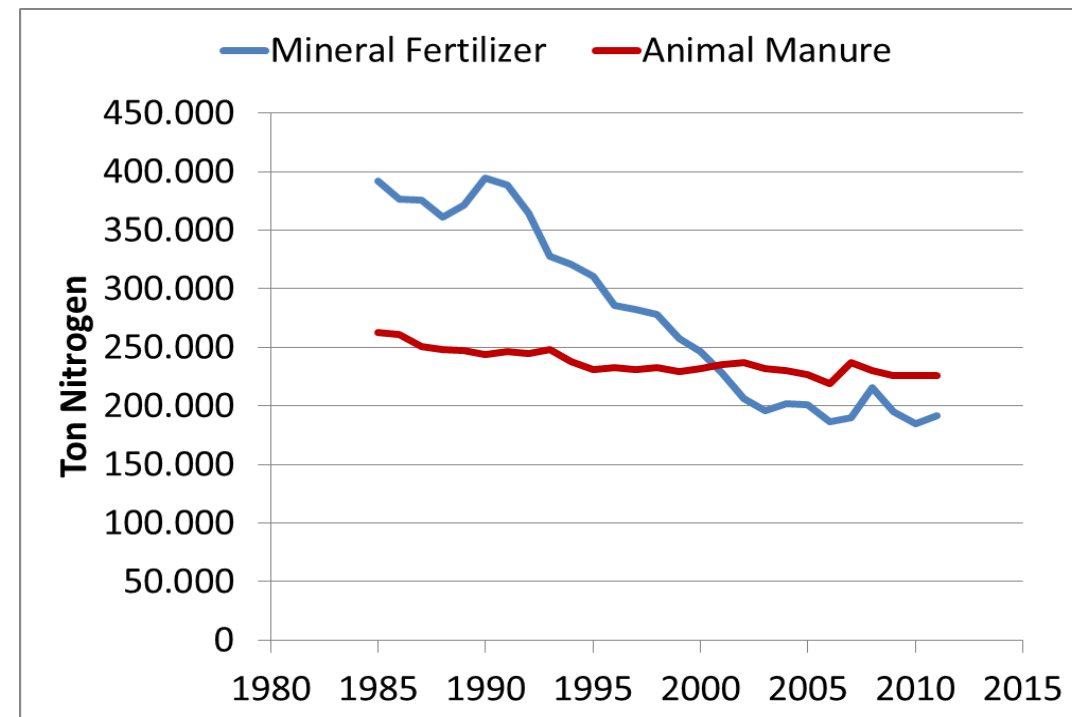
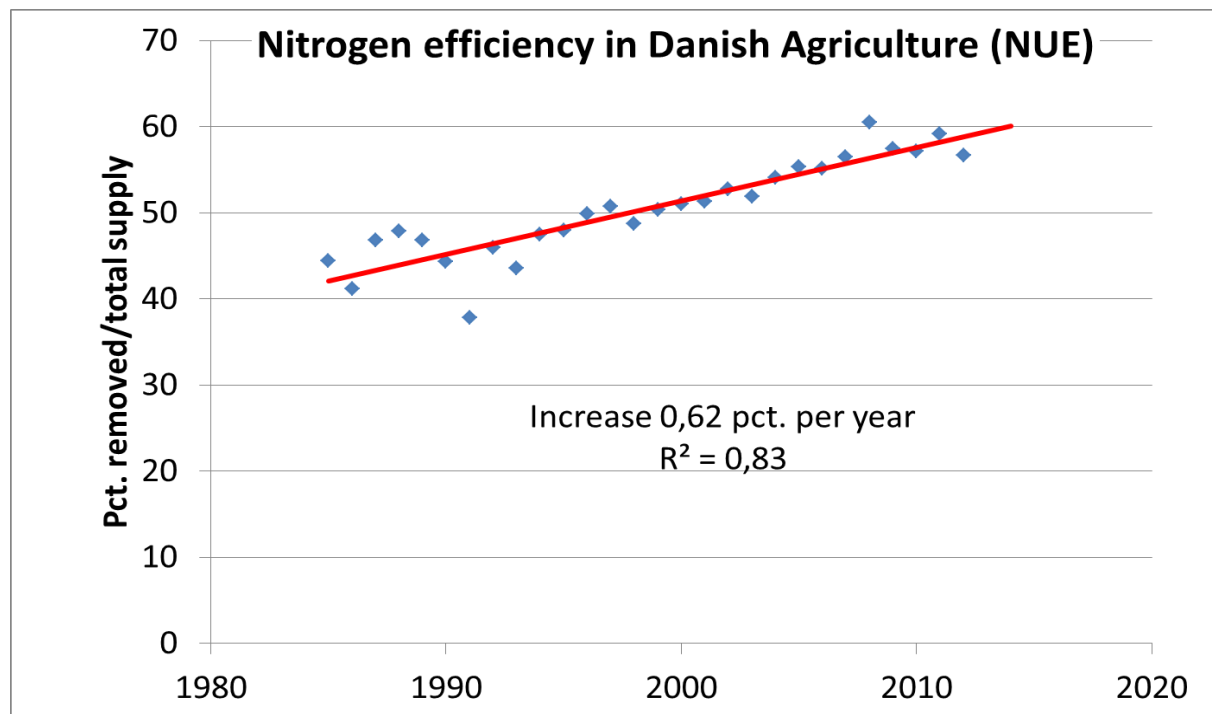
NPK, cattle slurry: 7,7 euro/t



Source: Catchment sensitive farming



Utilizing manure – The Danish case



- Harmony between amount of land and number of animals – nitrate directive
- Ban on autumn and winter application
- Application in growing crops – timing and splitting application
- Application technology
- Accounting for it correctly in nutrient management plans

What is holding NUE back at EU level?

Why are we not doing it already:

- Storage capacity and equipment is expensive – eats up the financial benefit of better utilization
- Lack of regulation (technology and close periods)
- Not enough awareness – lack of advice and good nutrient management plans

Help the farmer comply:

- Financial support for building storage capacity
- Slurry close periods in northern climates
- Nutrient management plans (possibly mandatory)
- Consumer pressure for sustainable production
- Smart and easy decision support tools

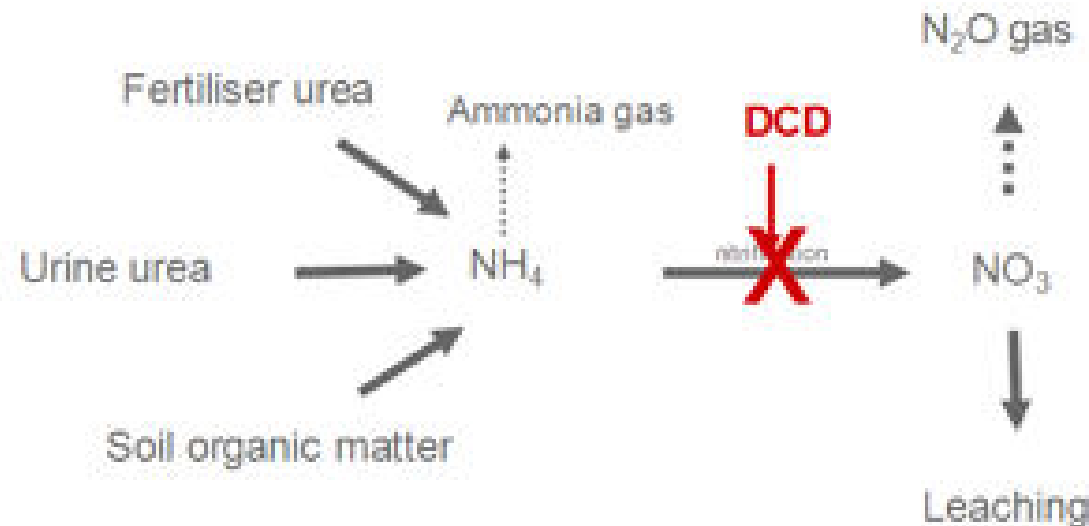


Nitrification inhibitors

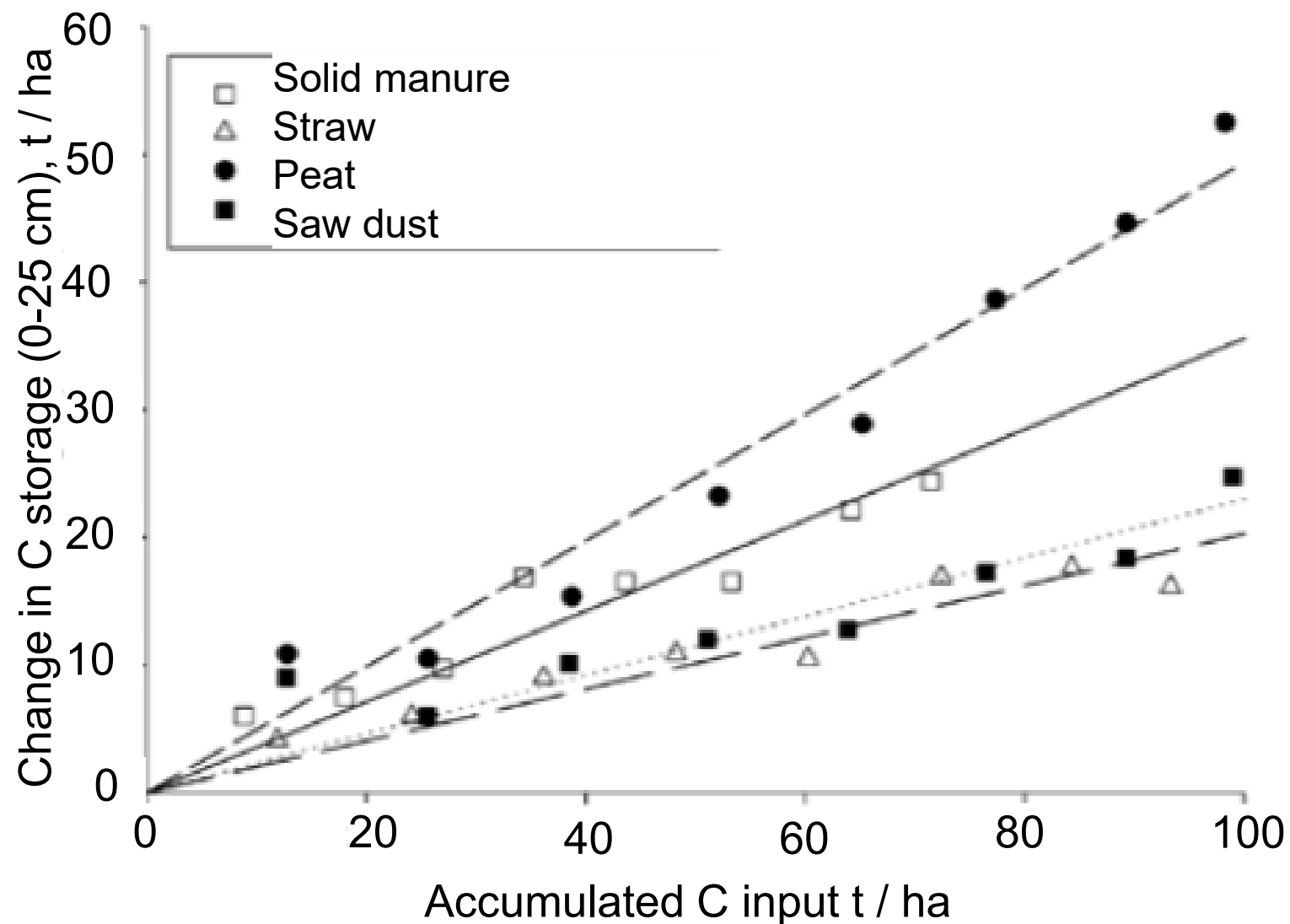
- Reduces N_2O emissions by 30-50%
- Increases yield on sandy soils, in particular in row crops – but only enough to pay for itself or give slight financial benefit
- No yield effect on heavier soils → cost for the farmer
- Concerns about residues in groundwater and surface water bodies

How to implement:

- Financial support schemes, making it mandatory in mineral ammonia fertiliser and manure
- Effect will not show up in national emissions budget!

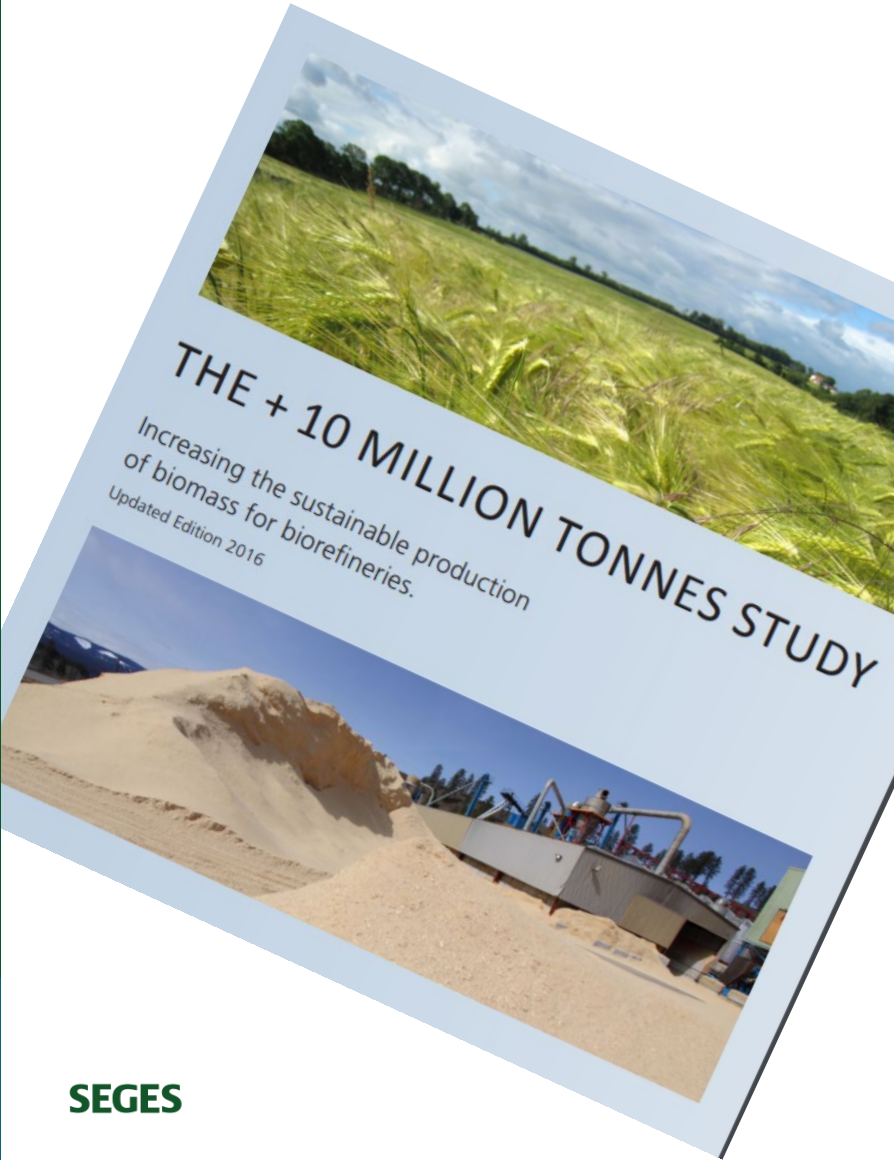


Change in cropping system

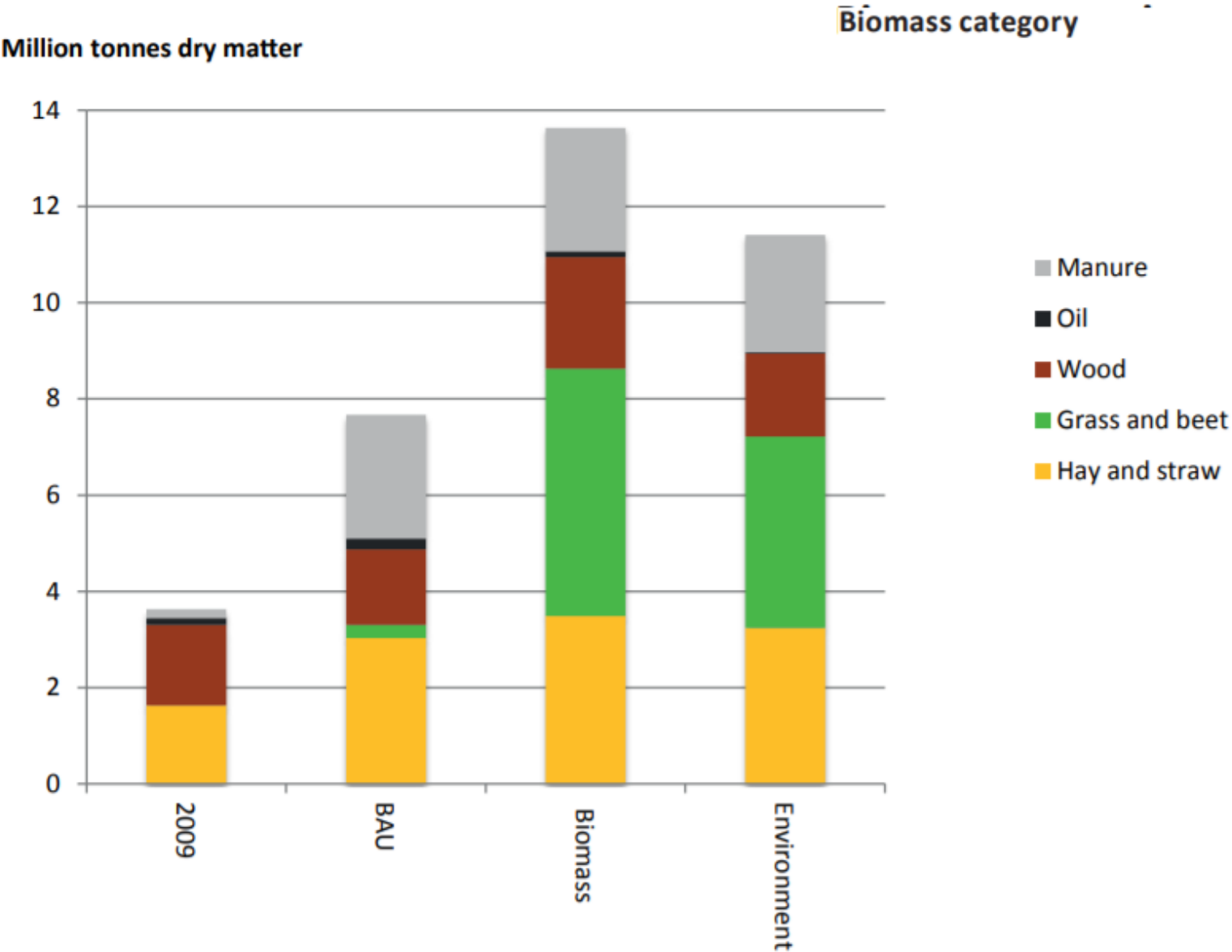


- Change to systems with high org C input to soil
- Must be with low N input to offset the effect of high N input
- High C:N ratio crops with low N input

Changing to a different cropping system

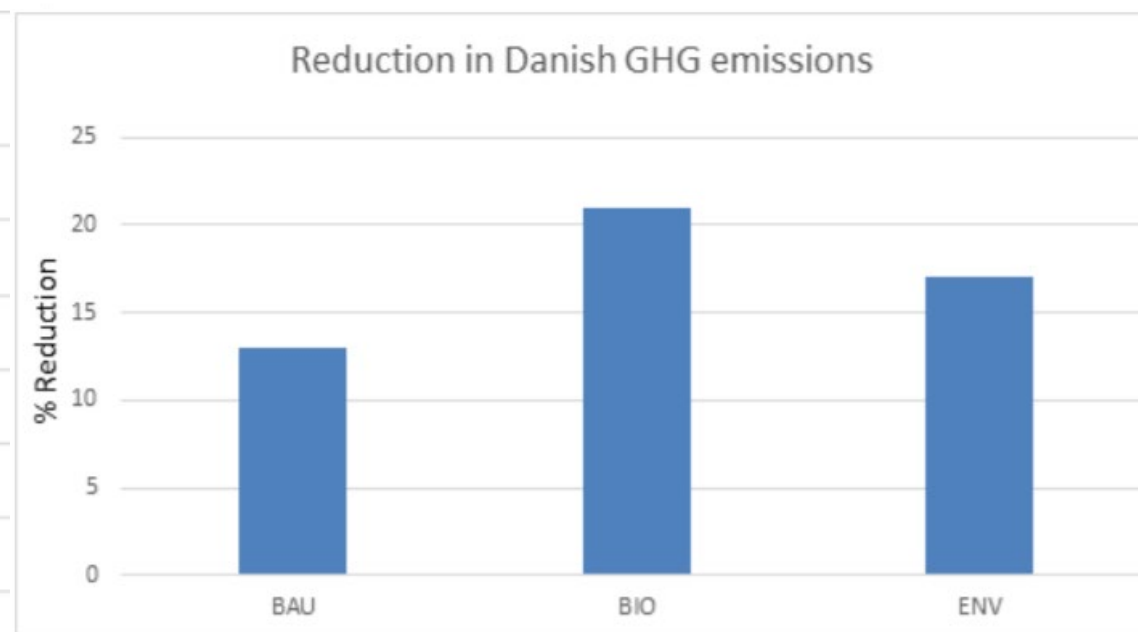
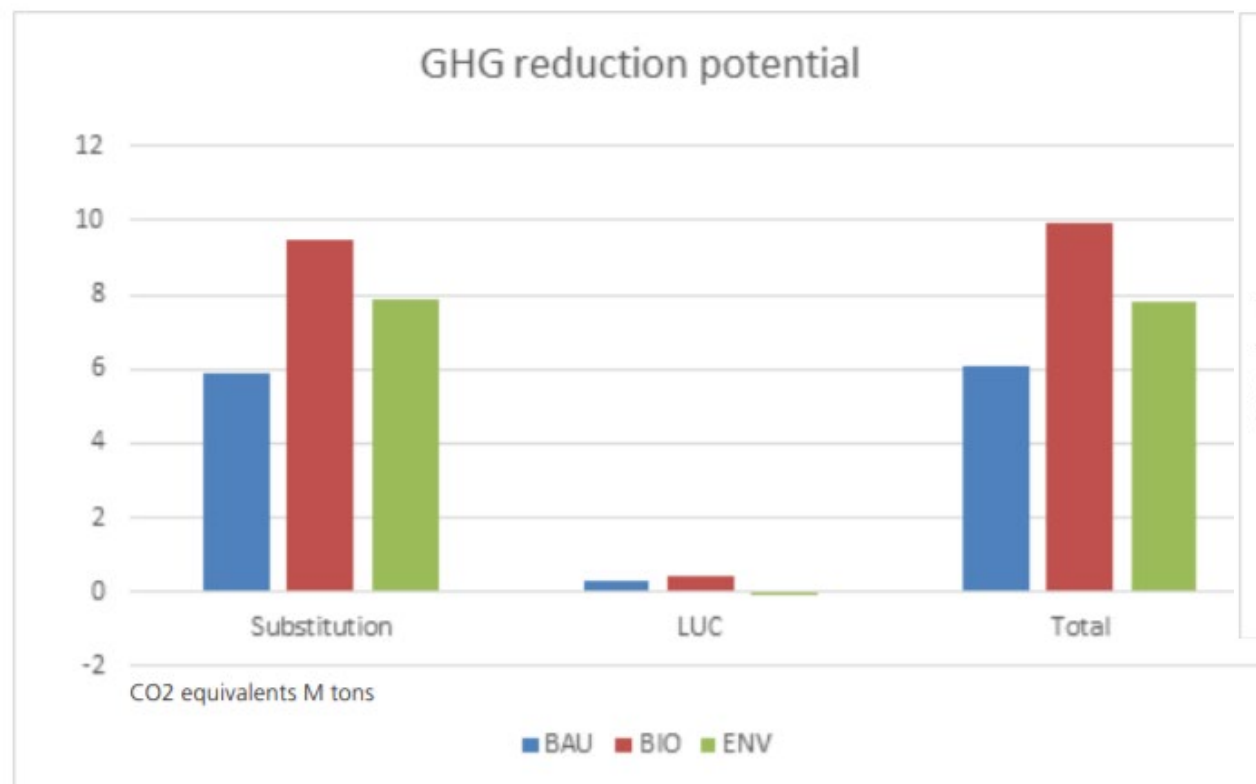


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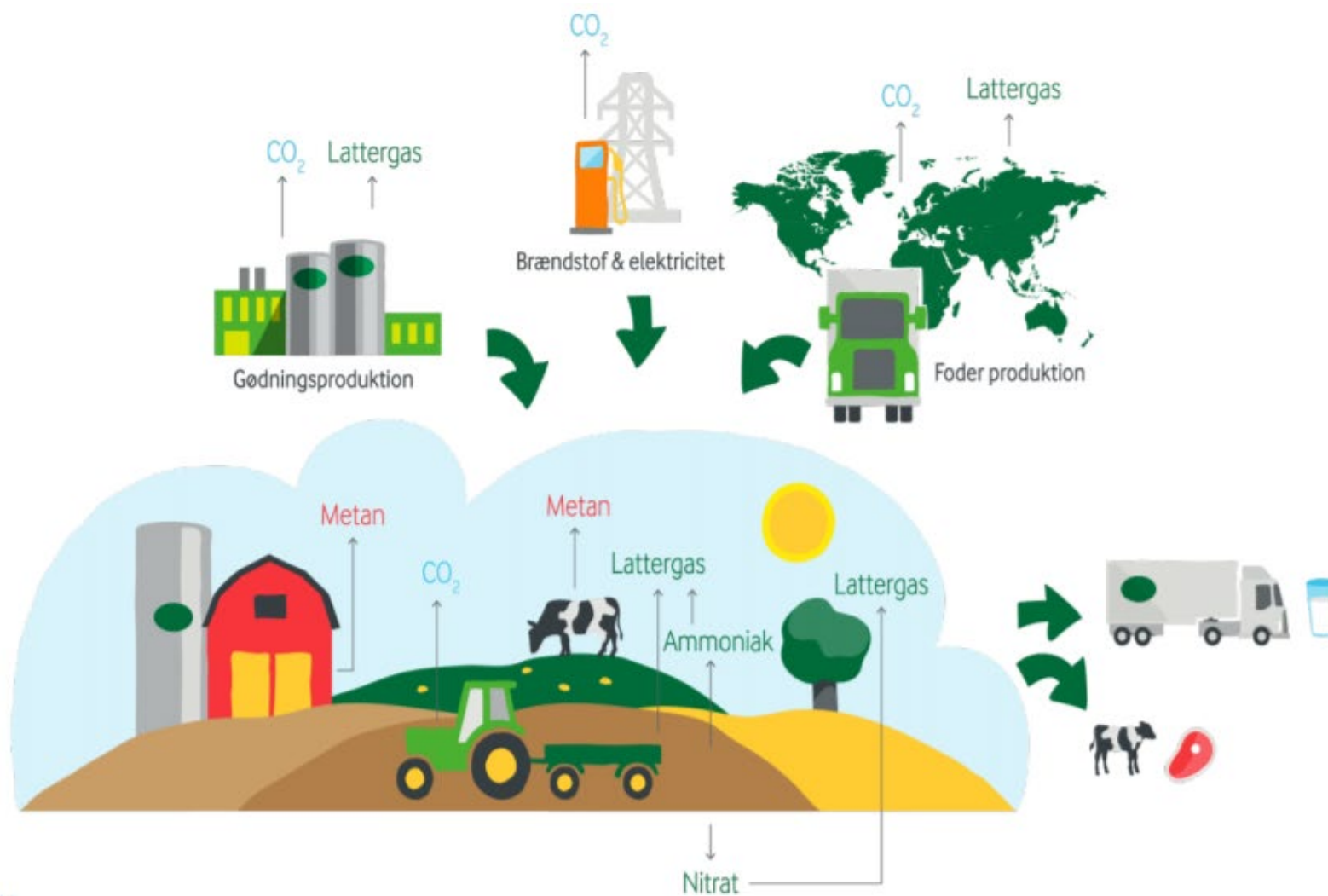


Reduction potential from changing cropping system

- The GHG emissions reductions are mainly due to substitution of fossil fuels. Hence they are not ascribed to the agricultural sector!



Consumer pressure – Arla climate check



Arla Climate check visualizes where the farmer can save money and decrease climate gas emissions

Key figures	Your farm, earlier	Your farm, Now	Arla, SDM		
			10-90% percentile	By a change of in key figure	Climate foot print is changed by
Fodder use, kg DM/kg ECM	0,9	0,82	0,82-1,05	-0,1	-0,08
Fodder utilization, %	30	23	23-30	+1	-0,01
Weight gain kg/ cow	193	242	213-378	+100	-0,05
% Roughage	74	64	51-74	+10	-0,02
Weight gain kg/ cow	6,4	14,2	4,9-10,0	+1	-0,004
Area use, m ² /kg ECM	0,53	0,43	0,52-1,14	-0,1	-0,004
Electricity, kWh/kg ECM	0,066	0,053	0,056-0,129	-0,01	-0,004
Diesel, l/kg ECM	0,023	0,024	0,015-0,029	-0,01	-0,02
N fertilizer, kg N pr. ha	174	220	100-250	-10	-0,08

Conclusions

- NUE can be increased and this will lower climate gas emissions – but it will only happen if the farmer has an incentive
- Changing cropping systems can contribute
- Incentives can be financial or through consumer or buyer focus on climate effectiveness – in some cases an alternative could be top down regulation
- It is an obstacle for changing land management, that only N input is counted in emissions → detailed emissions factors are needed if agriculture is to achieve reduction goals