

How can biogas plants support better utilization of nutrients in agriculture?

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SEGES innovation

STØTTET AF

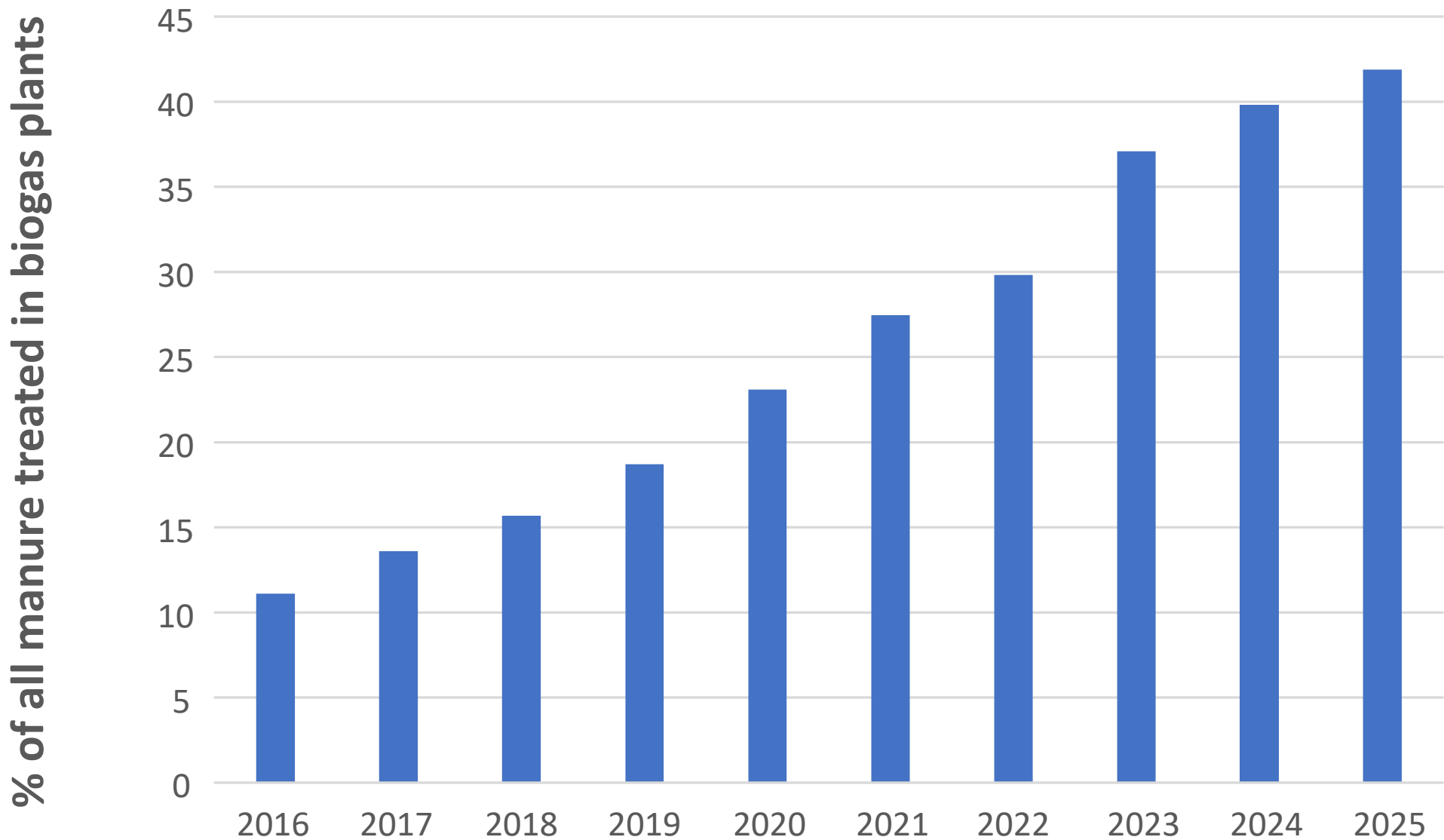
Planteavgiftsfonden

Agenda – very simple!

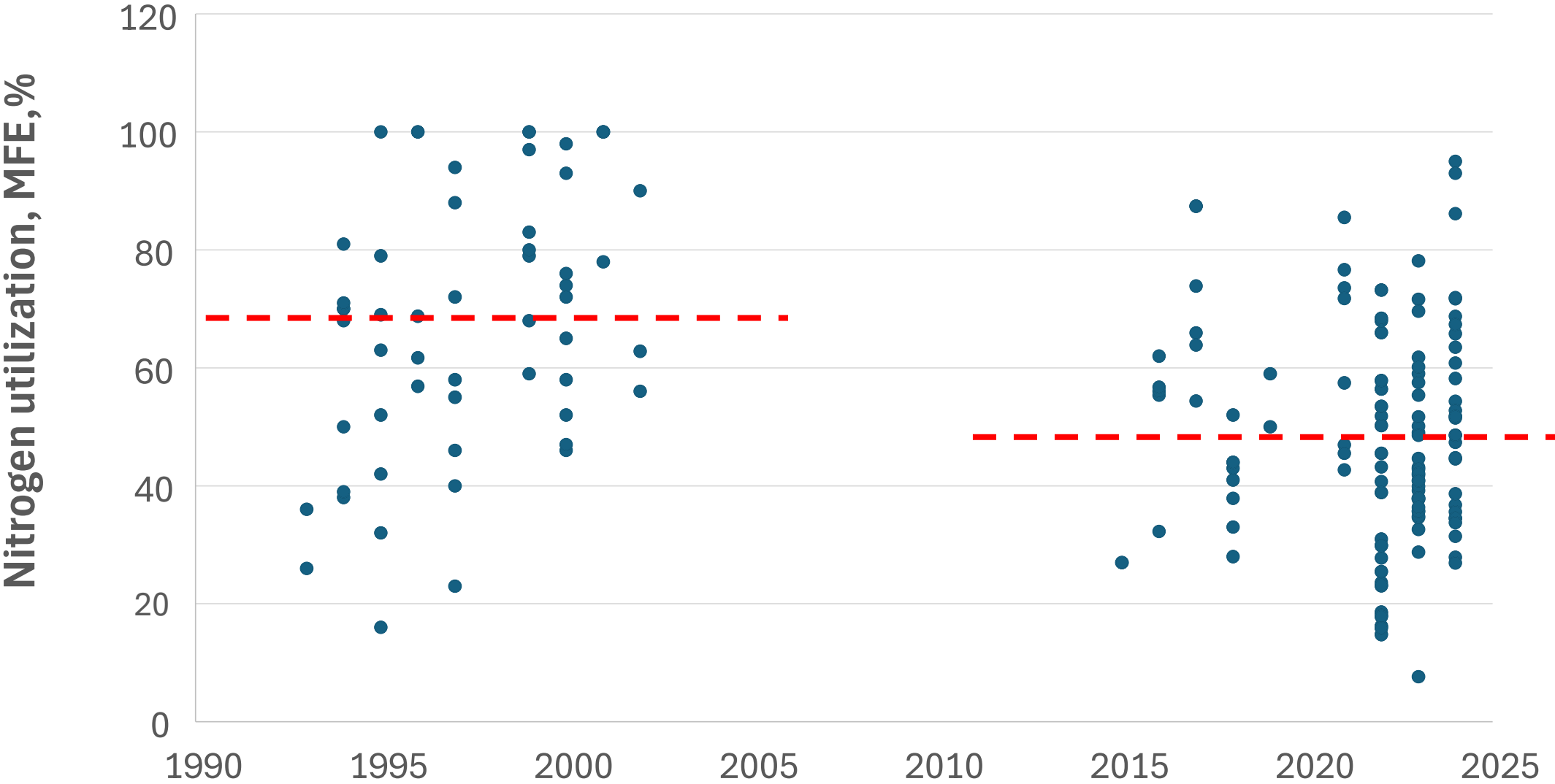
- Biogas in Denmark today vs 25 years ago
 - What has changed?
- What can we do about it?

42% of all manure was treated in biogas plants in 2025!

Source: The Danish Energy Agency



Nitrogen utilization in digested manure applied to winter wheat trials, 1993-2024



Typical biomasses used in biogas plants before and today

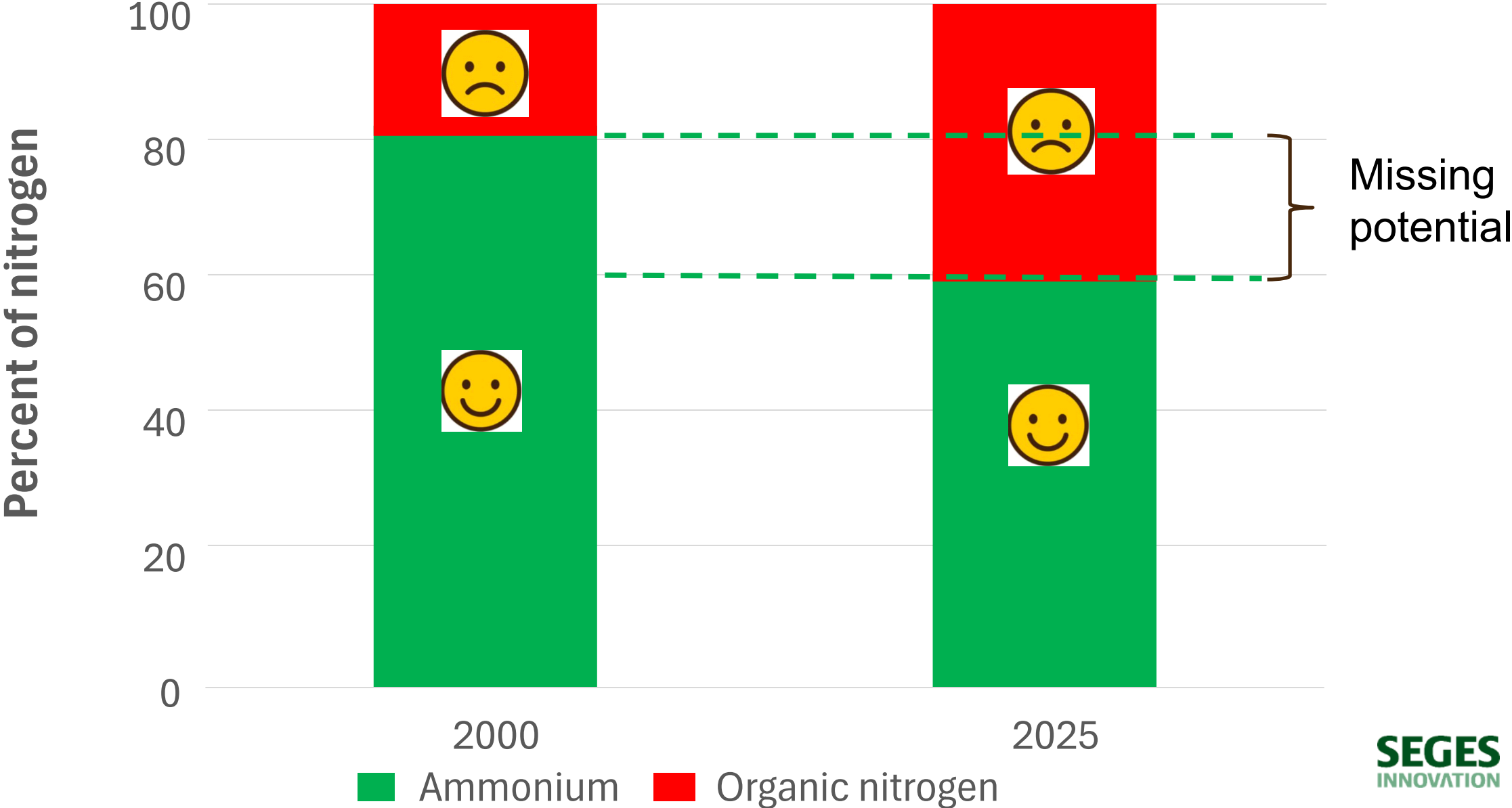
1980-2010	2010-2020	2020 -
• Slurry • Easy digestible waste	• Slurry • Easy digestible waste • Energy crops • Deep litter	• Slurry • Easy digestible waste • (Energy crops) • Deep litter • Straw

Easy digestible biomasses



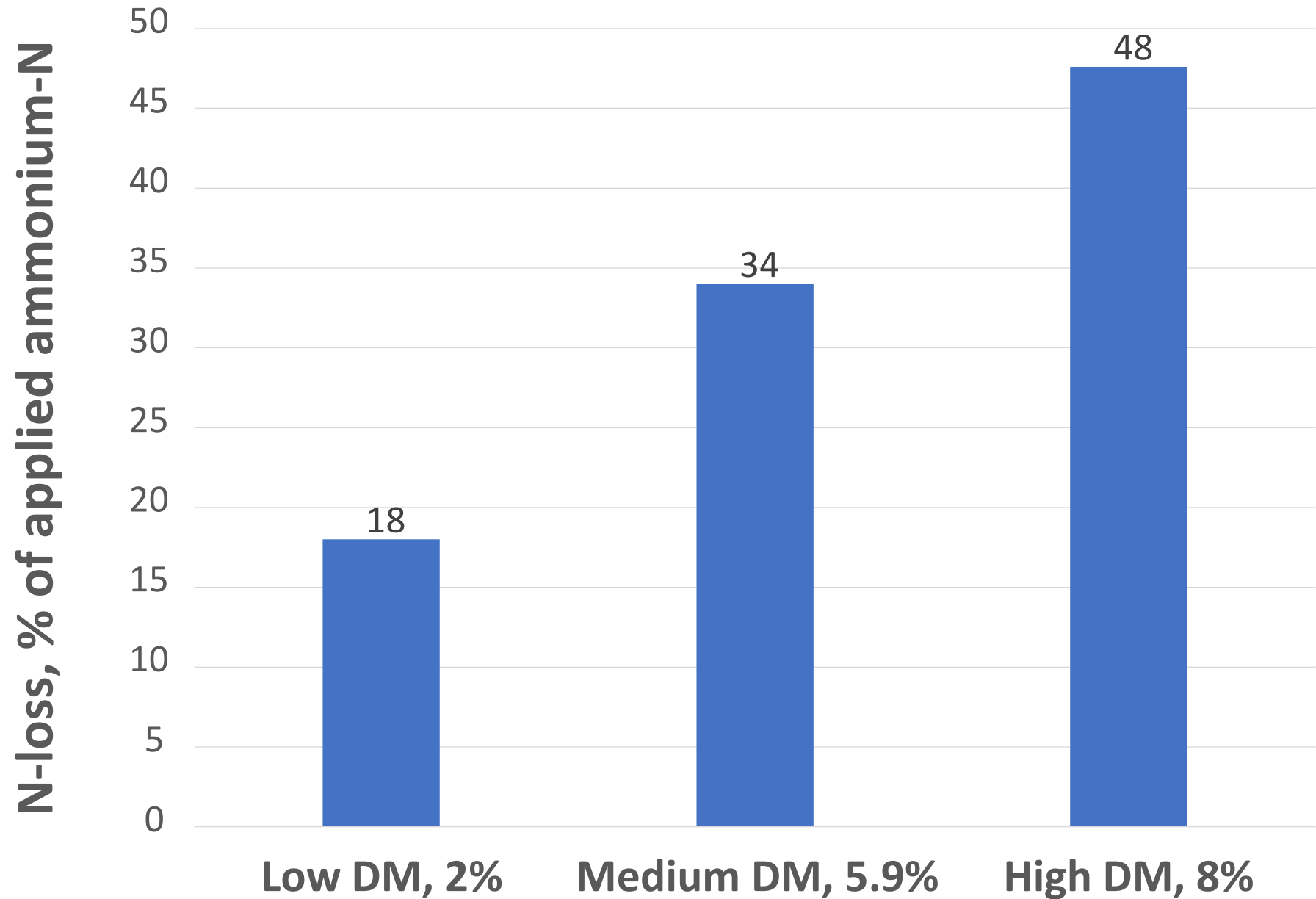
Harder digestible biomasses

Composition of nitrogen before and now – lower fertilizer potential



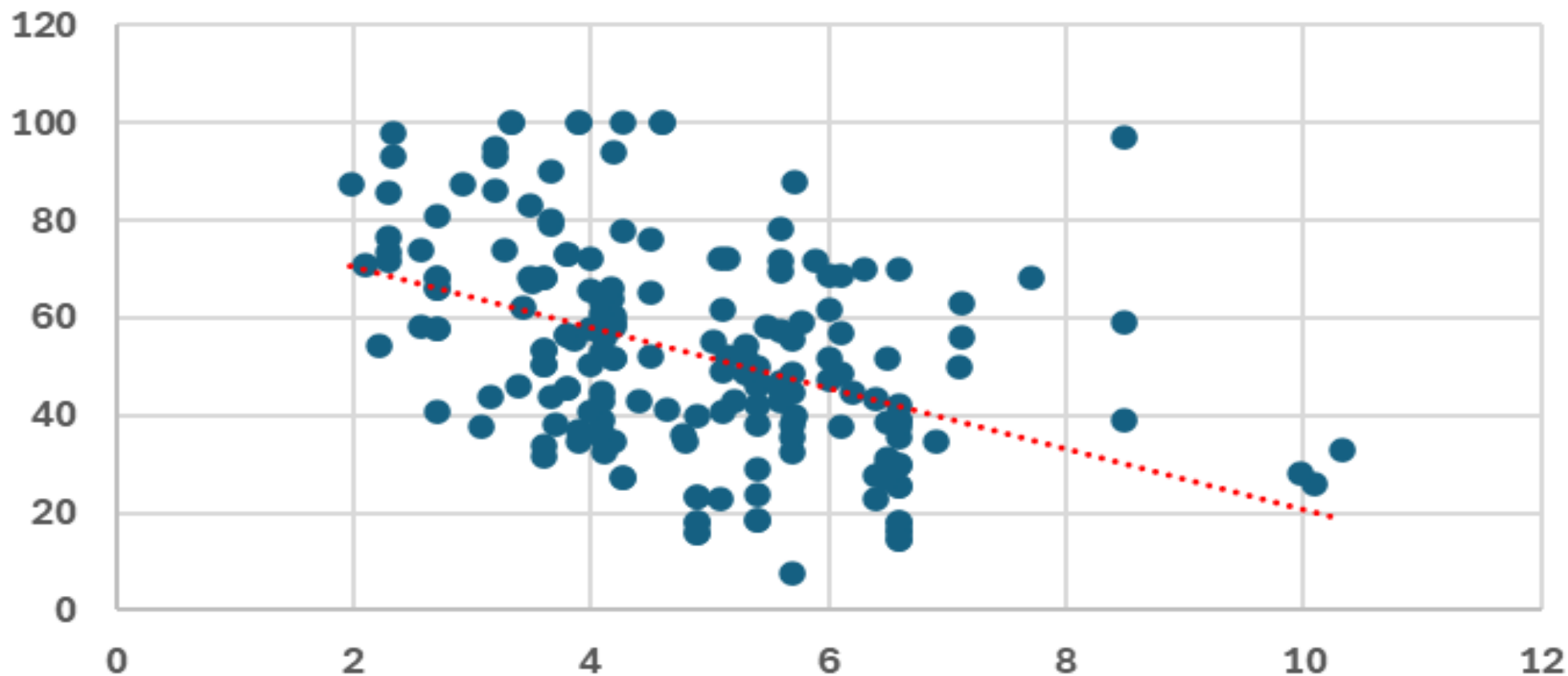
High dry matter content also results in high ammonia volatilization when surface applied

Source: Anders Peter Adamsen, Aarhus University

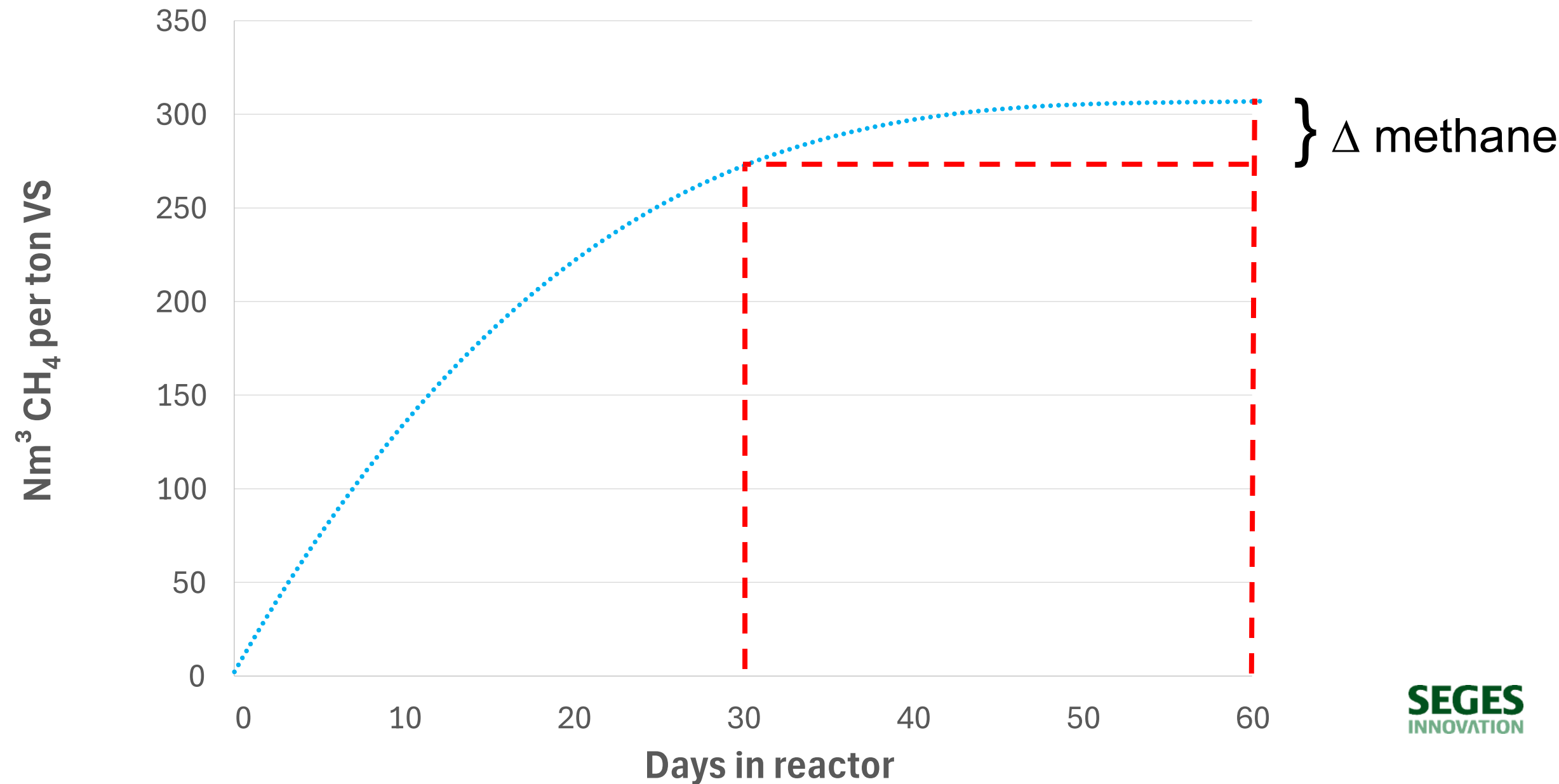


High dry matter content results in low nitrogen utilization

Nitrogen utilization (MFE), percent



Longer retention time in biogas plants helps – a little...



Can't we just get rid of the dry matter?

Digested biomass



Liquid fraction after separation

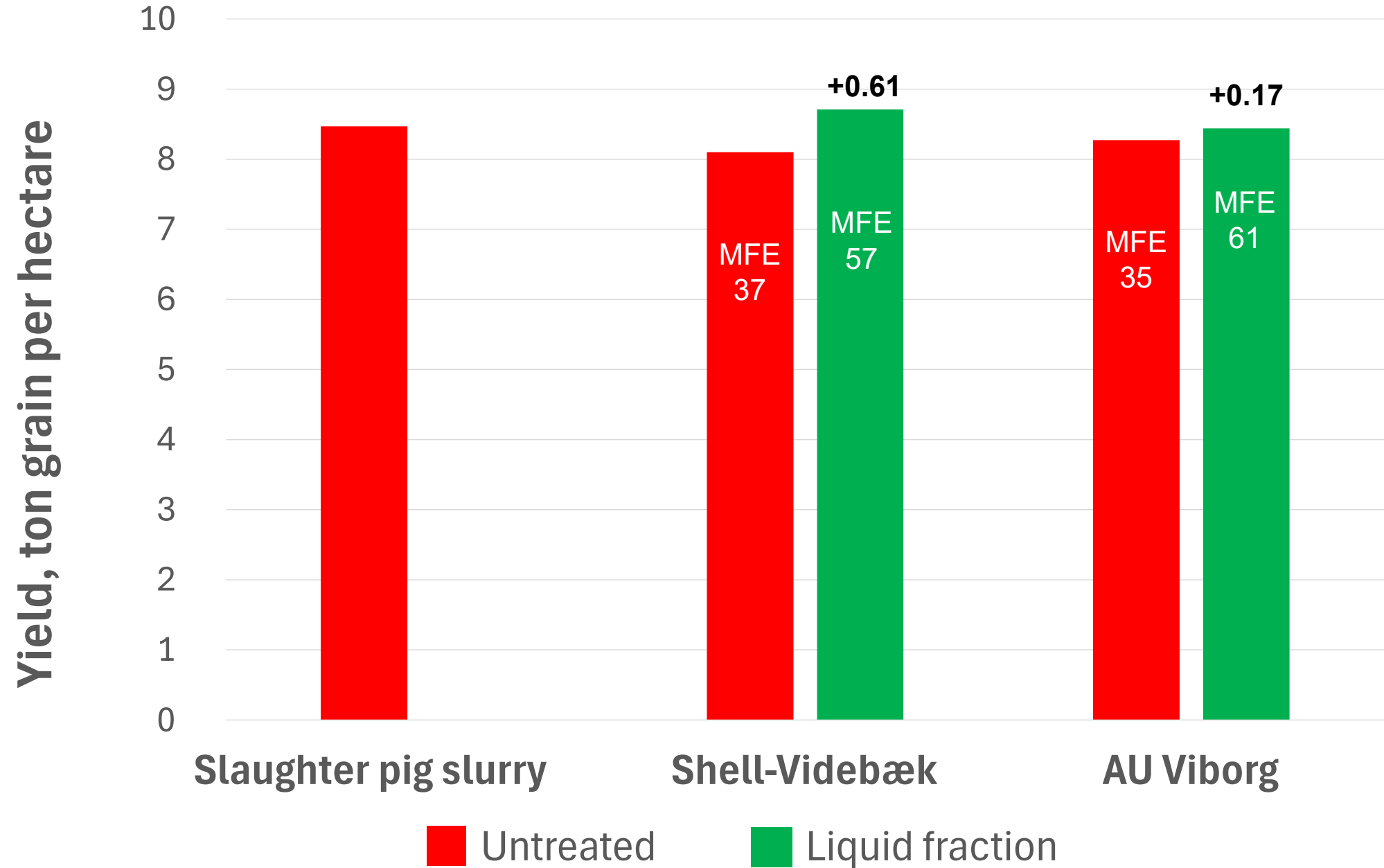


Separation
can remove
some of the
dry matter



Effect of separation with decanter centrifuge, 9 field trials in winter wheat, 2022-24

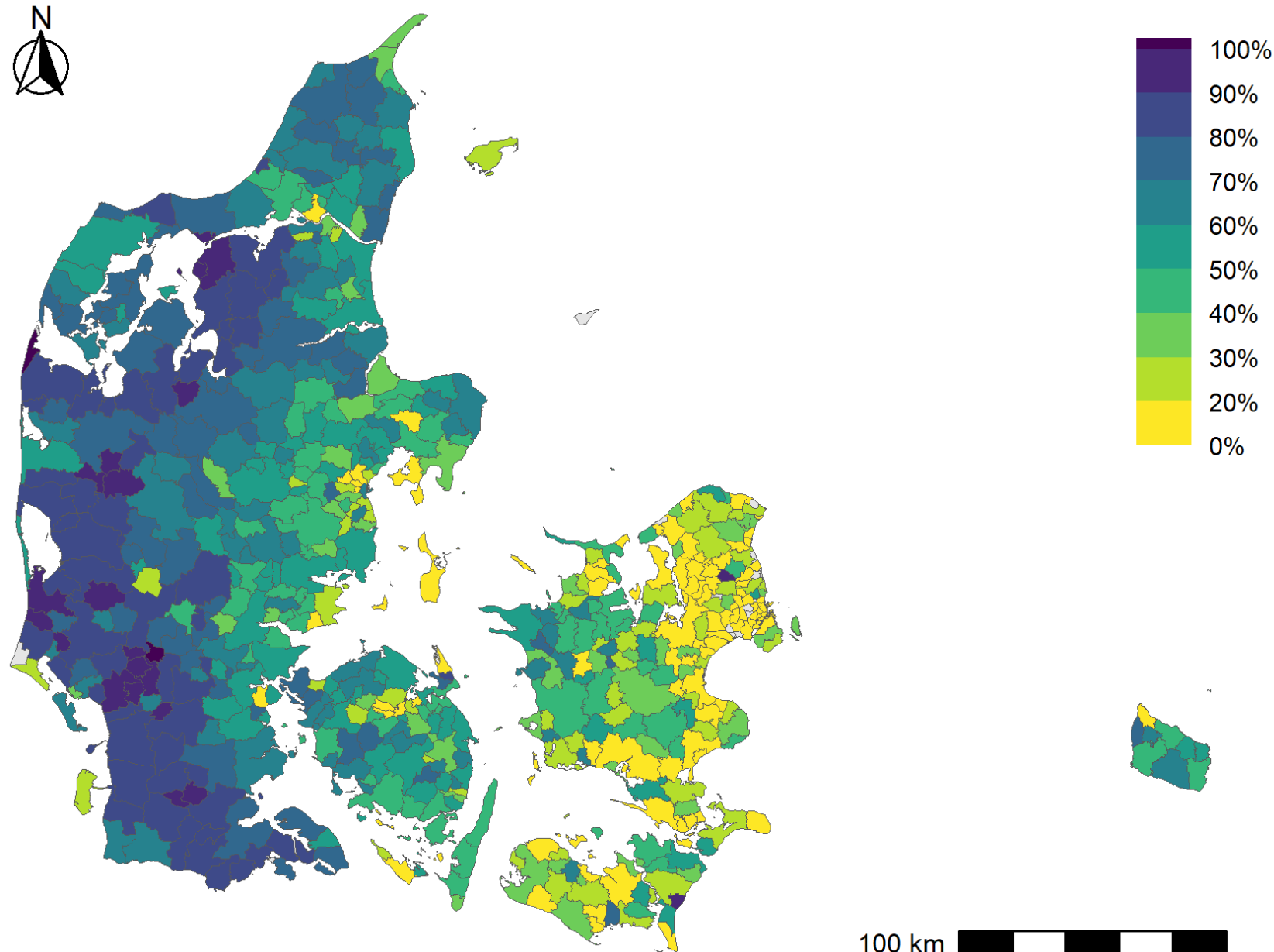
Source: SEGES Innovation



Effect of separation with screw press and decanter centrifuge

	Dry matter, %	NH ₄ /total -N, %	N/P ratio
Unseparated digestate biomass	7,1	60	5,3
Liquid fraction, screw press	4,9	64	5,8
Liquid fraction, decanter centrifuge	4,1	68	7,7

Farm area utilized for application of manure



Source: SEGES Innovation

More technology – fx pyrolysis and production of biochar



Examples of other benefits of biogas plants

- Transport of slurry – optimizing farmers logistics
- Storage capacity
- Odor reduction
- Safe utilization of waste products
- Adaption to new Danish CO₂-tax

Biogas plants can be a Kinder Egg for farmers...



Take home...

- Biogas is booming in Denmark!
- Digested biomass has changes considerably during the last 25 years, and the fertilizer quality has decreased significantly
- Intelligent use of biomasses, optimizing of biogas processes, separation and pyrolyzes may be parts of the solution
- Biogas plants and farmers are depending on each other
=> collaboration is the only way forward!

Thanks for your attention...

