Environmental challenges with intensive dairy production

EAAP, Florence

3 September 2024, Paul Galama, Abele Kuipers

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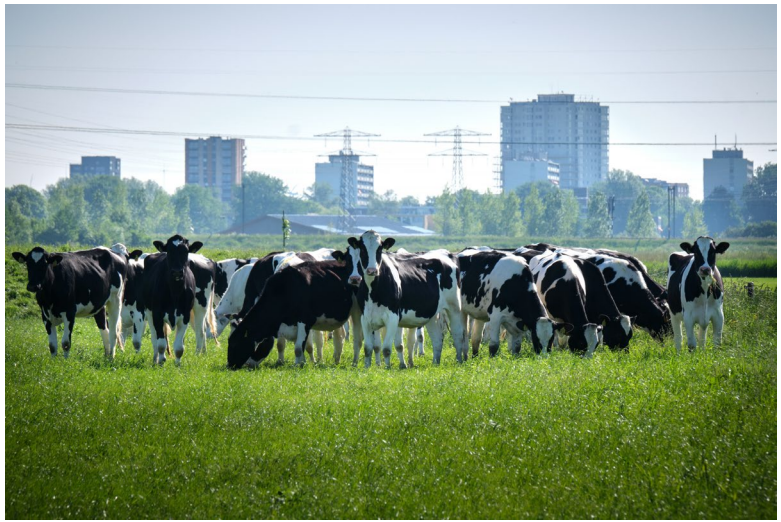
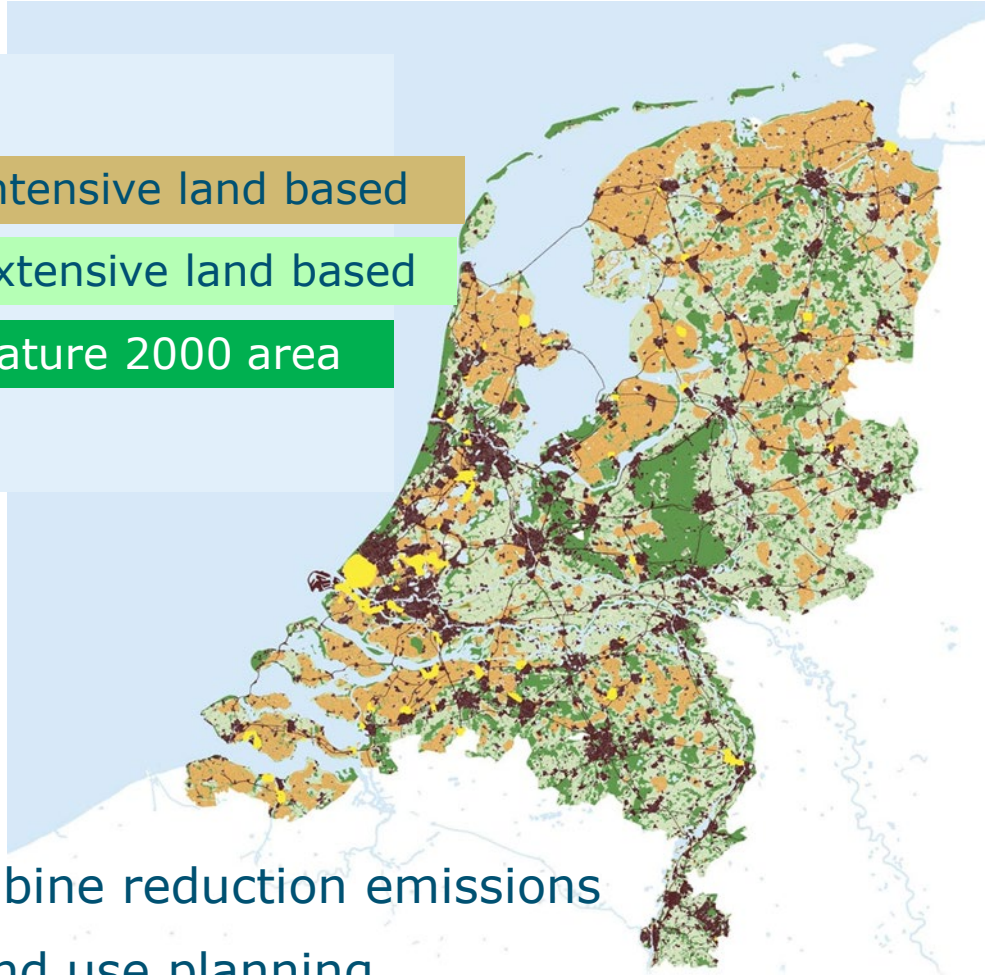
Farming in the backyard of 18 M people



Intensive land based

Extensive land based

Nature 2000 area



Challenge to combine reduction emissions with land use planning

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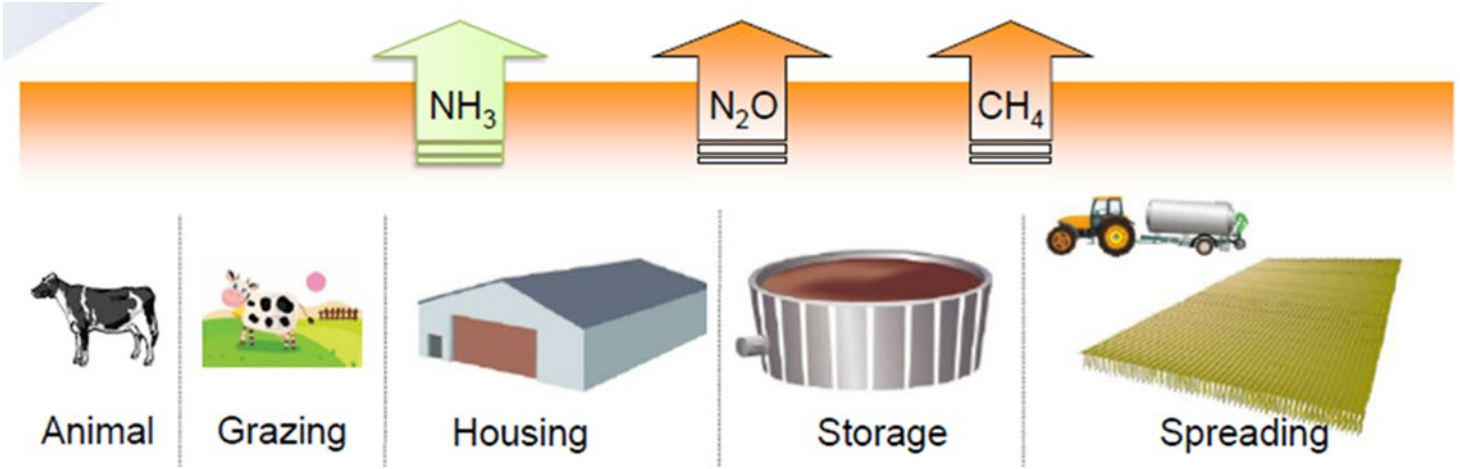
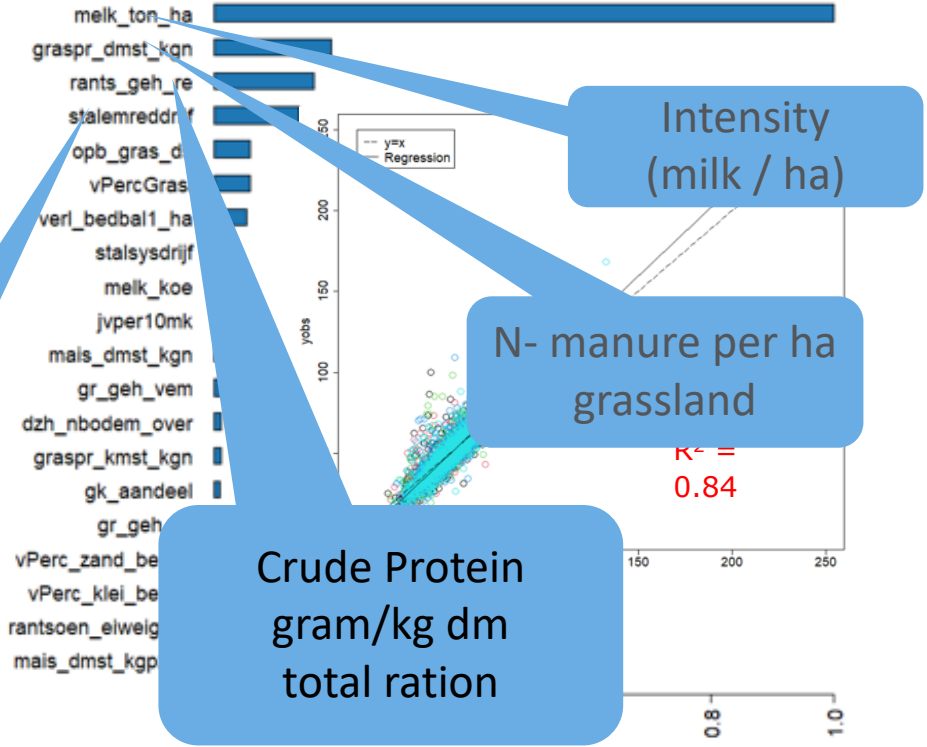
Topics

1. Reduction potential ammonia and methane emission
2. Quality manure products of different innovations



Explanation ammonia emission per ha

- Data 2021 ANCA tool
- 12000 farms
- 47 variables
- Select most important



153 dairy farmers and 48 farm guiders 4 years

Goal: 155 gram Crude protein per kg dry matter

Koe Eiwit 155 RE

Crude Protein comparison

Year	Farmers Koe & Eiwit	Farmers Netherlands (2022/23: prediction CBS)
2023	158	165
2022 (Starting K&E)	159	161
2021	162	161
2020	166	167

ANCA data from 146 farms

Netwerk
praktijkbedrijven

Learning networks

Integrated approach:

- Emissions NH3 and GHG
- Water quality
- Biodiversity

Examples low emission floors

- Solid concrete floors

Den Boer Beton Sleufvloer

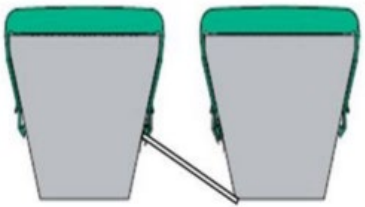
Zeus Beton Agrifloor

Concrelit Profielvloer C7

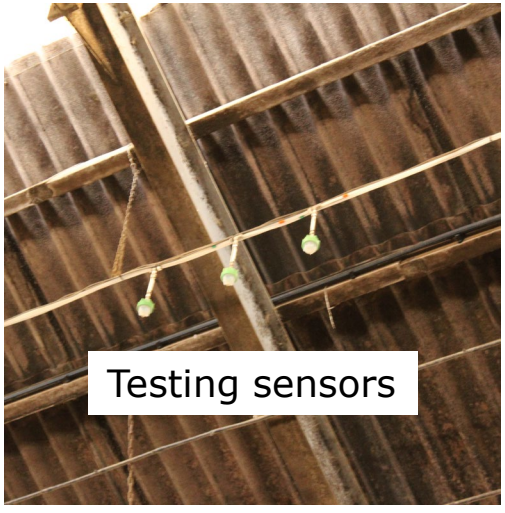
Swaans Patent Comfort sleuvenvloer G5

- Slatted floor with valves

Groene vlag met klep




Year 1
Year 2
Year
Bedr.15
Bedr.14
Bedr.13
Bedr.12
Bedr.11
Bedr.10
Bedr.9
Bedr.8
Bedr.7
Bedr.6
Bedr.5
Bedr.4
Bedr.3
Bedr.2
Bedr.1
0
5
10
15
20
25
NH3 emissie [kg dpl−1jr−1]
RAV (expected) emission value
+ + + measures
Average
Worse than expected
Better than expected



Less ammonia emission due to low emission floor,

adding extra water (30 liter/cow/day) and

low crude protein diet (150 gram/ kg DM)

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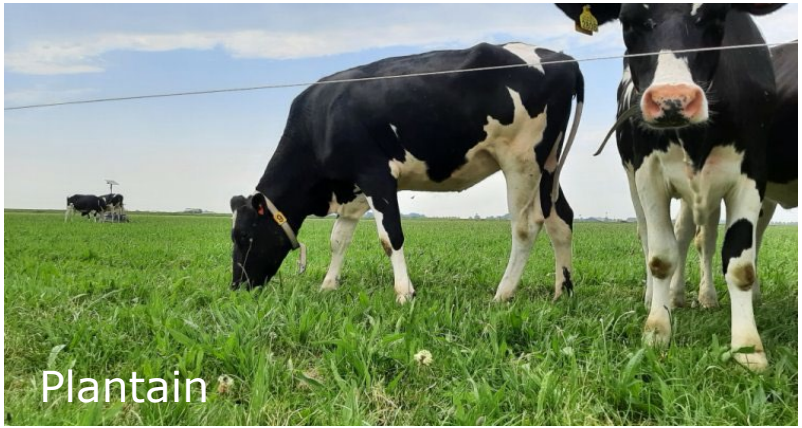
Reduction potential Ammonia emission

Feeding less Crude Protein

More grazing

Dilution with water

Low emissions floors



Total around 50% reduction

(farm level)

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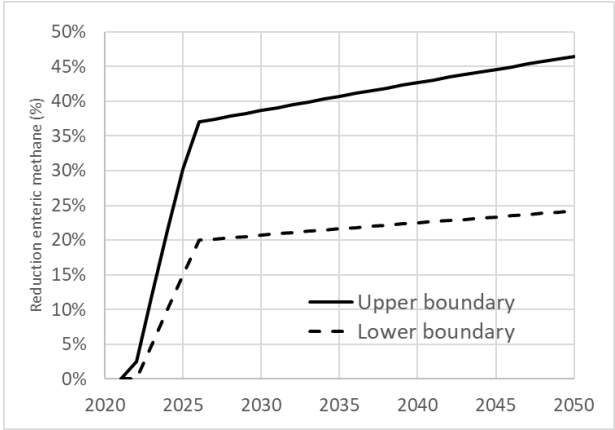
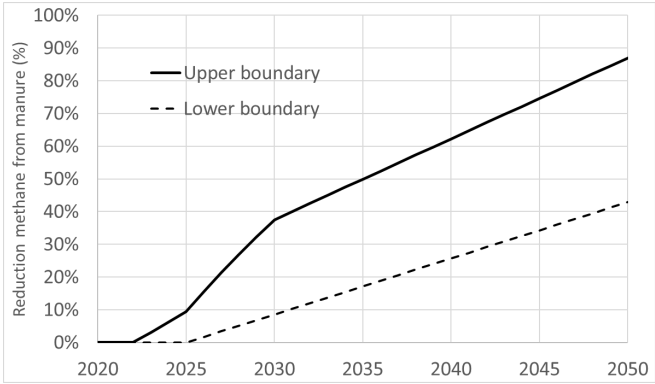
Reduction potential methane to 2050

- Enteric fermentation: (reduction 24 – 46 %)
  - Breeding
  - Ration changes
  - Feed additives
- Manure storage: (reduction 42 – 86 %)
  - Water tight floors, air tight external storage
  - Cooling/Oxidation/Monodigestion





Source: Theun Vellinga (WUR)

Topics

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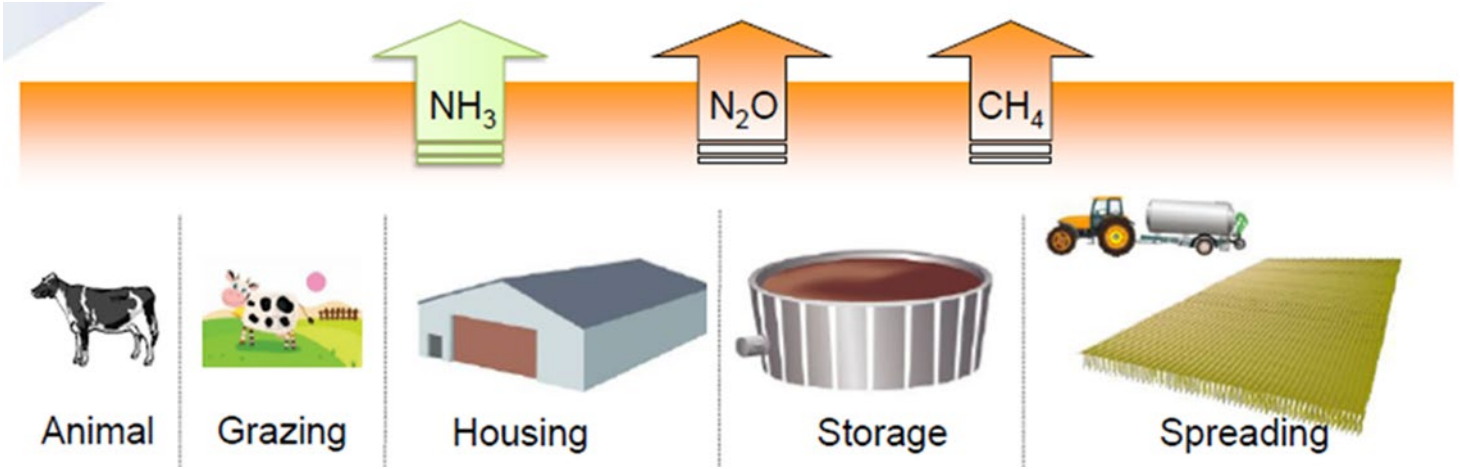
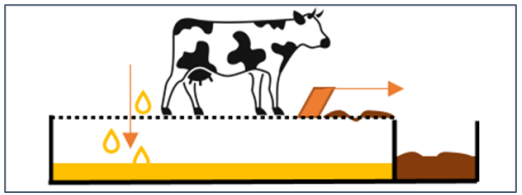
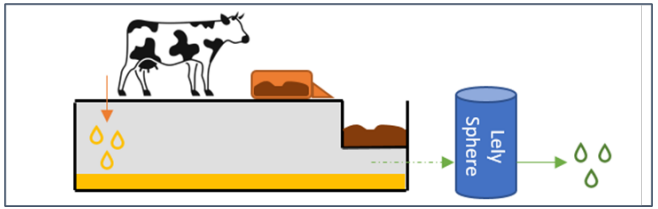
2. Quality manure products of different innovations

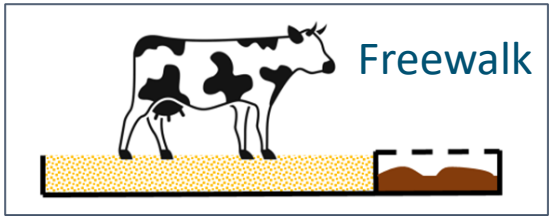


Manure products from housing system and manure processing

1. Cubicle barn
    1. Separation feces and urine
    2. Separation and sucking air form urine storage
2. Freewalk barn
    1. Composting bedding
    2. Separation feces and urine







Permeable floor, adding straw

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Cowtoilet, on Dairy Campus

Collects about 35% of urine

Freewalk barn with bedding composting wood chips

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30% less ammonia, but 30% more methane emission

Freewalk housing with bedding cleaner

Sand bedding to separate urine

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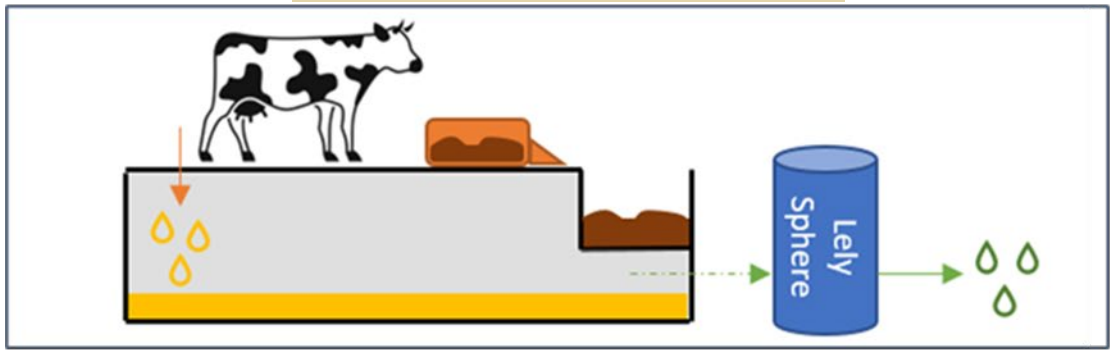
Lely sphere
Network of farmers in preparation

Lely Sphere: more than 75% reduction ammonia barn

3 manure products



Liquid (K) Solid (P) Ammonium Sulphate (N)

Conclusions, Dairy housing and manure quality

Housing system	Renure	Organic fertiliser	Soil improver
Cowtoilet: urine / slurry	++	+	
Permeable floor: urine / feces- straw	+ 0		+
Concrete floor: urine / feces	-	+	
Lely sphere: 3 products	+ -	+	
Freewalk wood chips composting			++
Freewalk sand bedding: urine / feces+sand	++	+	

C:N < 3 or N-min/N-total > 90%

N-org./N-total > 70%

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Take home messages

1. Reduction potential ammonia around 50%, start with good management (feeding and manure management)
2. Reduction potential methane: enteric 24 to 46% and manure storage 42 to 86% depending on effect and participation
3. Separation of faeces and urine can reduce ammonia emission and optimize fertilizing.
4. Renure is a good (chemical) fertilizer, faeces good organic fertilizer and composted manure is a good soil improver

Thanks

Paul.galama@wur.nl

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