



Nordic methane genetic evaluation

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Ministeriet for Fødevarer,
Landbrug og Fiskeri
gudp

STØTTET AF

Mælkeafgiftsfonden

SEGES
INNOVATION

Is a methane index more than hot air?

- Climate discussion gets more intense
- Auction on highest climate goal around the world
- Climate tax on farming in Denmark

- Methane production from cows is in the eye of the hurricane

- Can breeding for lower methane production be one of the solutions?



The ONIMIT project

- ONIMIT = On-farm monitoring of methane from dairy cows is a prerequisite for implementation of mitigation strategies on animal, farm and national level
- 1-1-2022 → 31-12-2026
- AP 1: New method for methane measurement
 - Develop a new method for individual methane measurements on dairy cattle
- AP 2: Data collection, database development and data validation
 - Record methane emission of minimum 10,000 dairy cows
- AP 3: Genomic analyzes
 - Estimate variance components and developing genomic breeding values for methane production
- AP 4: Methane emission on herd level
 - Identify means and farm characteristics that influence the variation in methane emissions between lactating cows and between herds.
- AP 5: National reporting to IPCC
 - Expand the national IPCC model to also include data from production herds and based on thousands of cows rather than a few hundred cows



Methane observations are hard to collect

- It sounds easy – just collect air from the cow's exhale
- But - many things can affect methane collection
 - The head position of the cow
 - Wind in the barn
 - Other cows close to the robot
 - Break down of the equipment

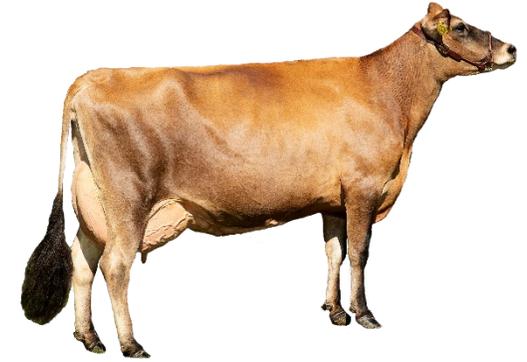


How much data is available?

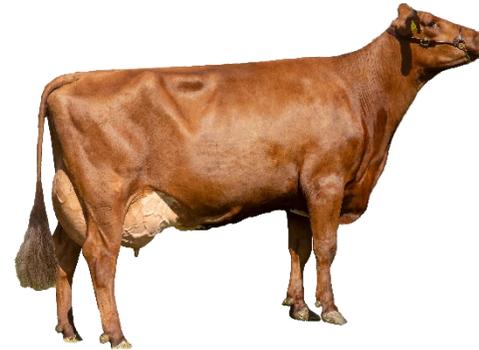
- 40 herds in total
- 15 herds today
 - 38 sniffer in 69 robot
 - Seven CFIT herds
- 16,000 cows in total
- Around 90% of cows give useful data



8,000 Holstein



5,000 Jersey



2,300 RDC



700 Crossbred

Work with Holstein data

Work done by Helen Schneider from AU

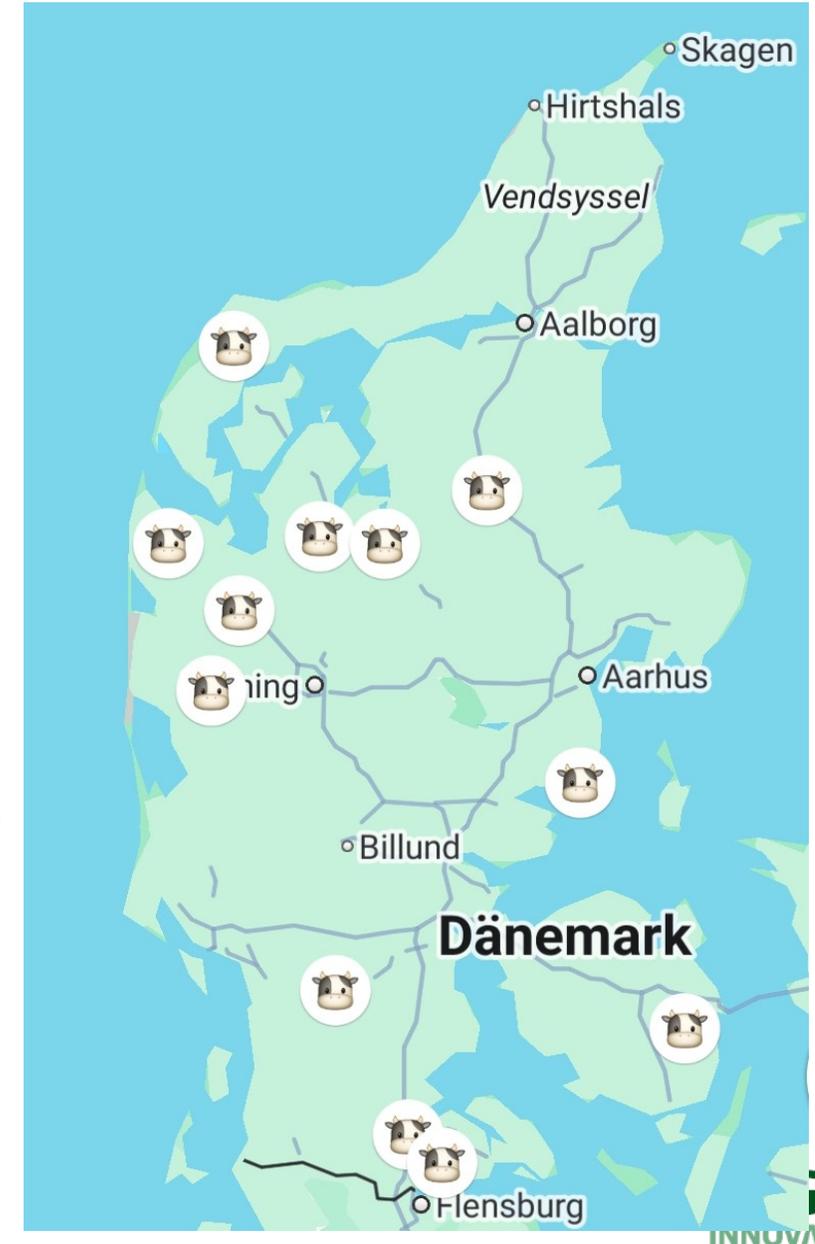


14 farms



5,065 cows (659,121 daily records)

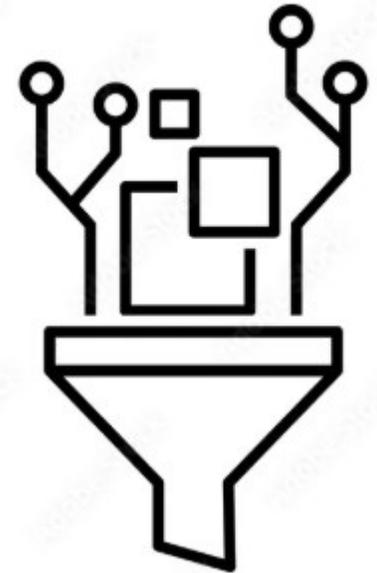
- Gas emission traits are recorded using sniffers
 - CH₄ concentration (**CH₄_C**)
 - CO₂ concentration (**CO₂_C**)
 - CH₄:CO₂ ratio (**CH₄:CO₂**)



Cleaning of data

Data filtering steps – records were kept if they were

- Between 0 and 365 days in milk
- Concentration of gas
 - Between 0 and 10,000 ppm for CH₄
 - Between 0 and 30,000 ppm for CO₂
 - Between 0 and 1 for CH₄:CO₂
- Outlier detection and removed based on individual z-scores
- Minimum 5 records per cow in each given lactation



Setup of the model

Decisions so far according to the model for a methane index

- Only data between March 2021 and September 2024
- Split into first and later lactation (2+) cows
 - Total 4,019 Holstein cows with 587,640 observations
 - 1. lactation 1,675 Holstein cows with 177,421 observations
 - 2+. lactation 2,837 Holstein cows with 410,219 observations
- CH₄ concentration as phenotype
- Simple repeatability model

Heritability

Trait	1. lactation	2+. lactation
CH4_Concentration	0.1876	0.1566
CH4:CO2 ration	0.0794	0.0789
CO2_Concentration	0.1124	0.1361

CH4_C: van Breukelen et al. (2024): h^2 0.18 & van Engelen et al. (2018): h^2 0.11

CH4:CO2: van Engelen et al. (2018): h^2 0.03 & Lassen and Løvendahl (2016): h^2 0.16

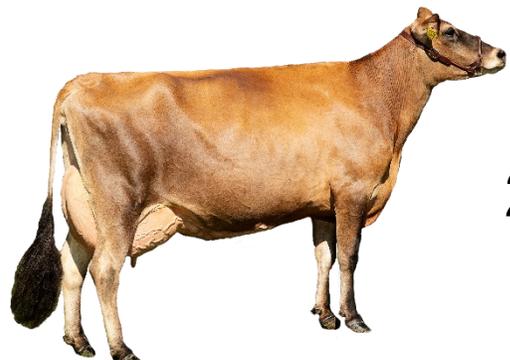
CO2_C: van Engelen et al. (2018): h^2 0.12

The next steps

- Develop a single step genomic model
- Continuously test the results (validation and stability)
- Setup for routine breeding evaluation
 - Collecting data
 - Including of new data
- Methane index for Holstein animals in 2025
- Methane index for Jersey and RDC in 2026



2025



2026



Thank you for your attention

Question