Feed efficiency and GHG emission

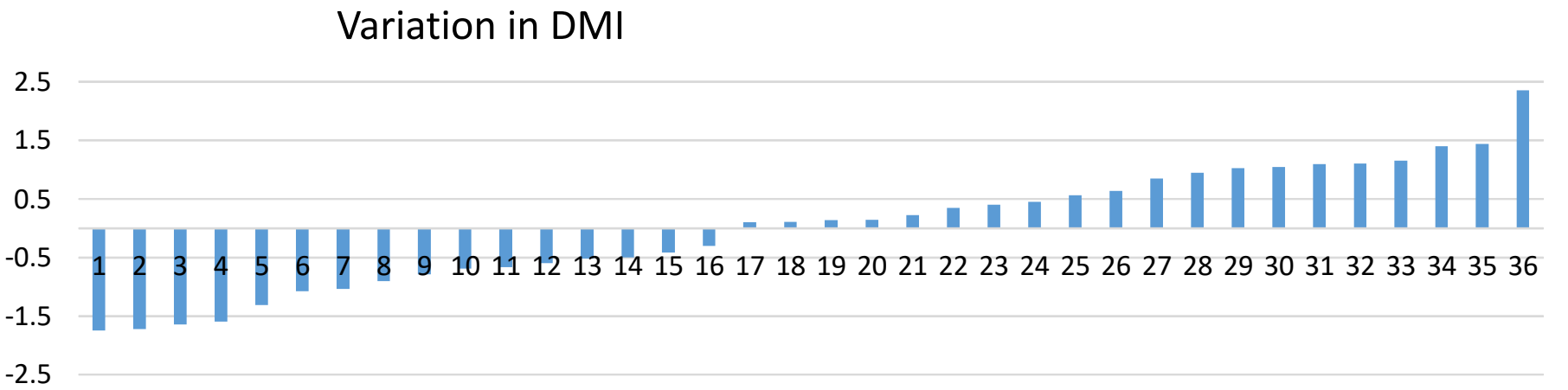
Jan Lassen

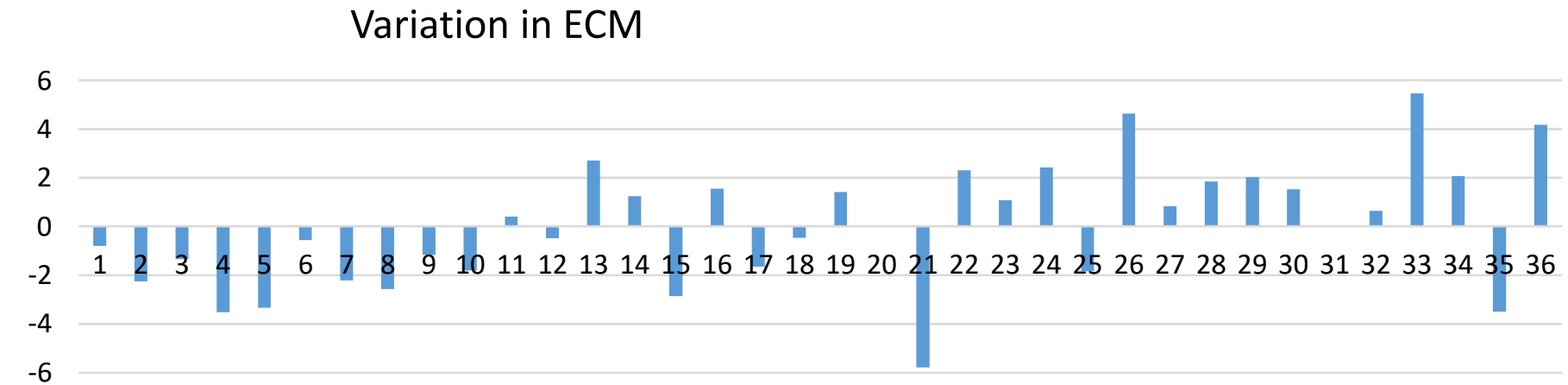
The political agenda

- Reduce GHG and improve ressource efficiency

- Selection is a tool to help both
  - Feed cost is up to 70% of variable cost – small improvements has huge value
  - 10% decrease in GHG in 2030

- Create value for the farmers that use VG





Yield alone cannot explain variation in DMI!

Johansen et al. JDS, 2017, 100, 8861

Genetic correlation through lactation

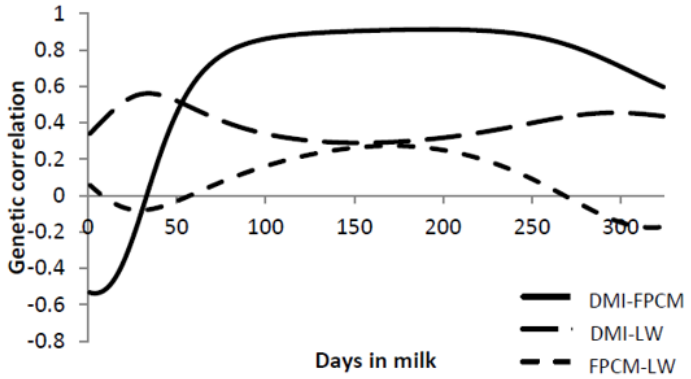
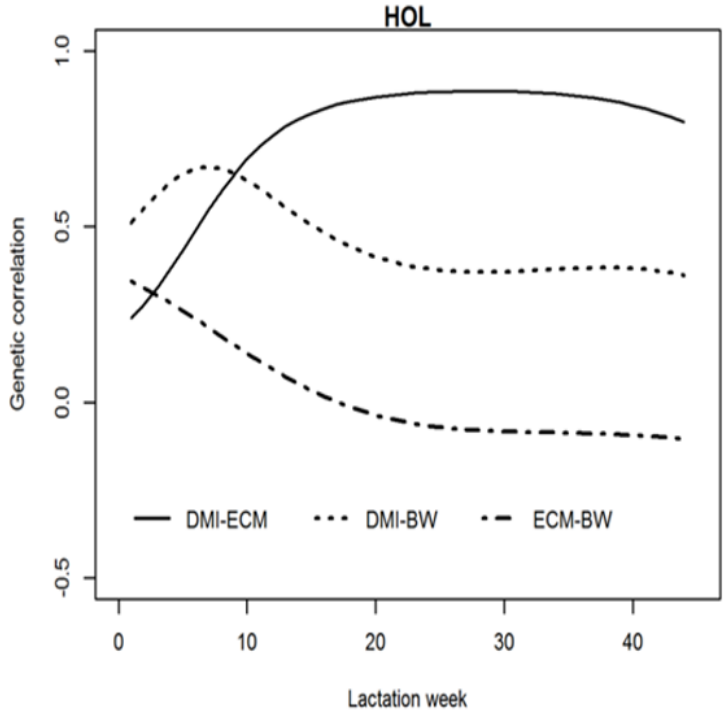


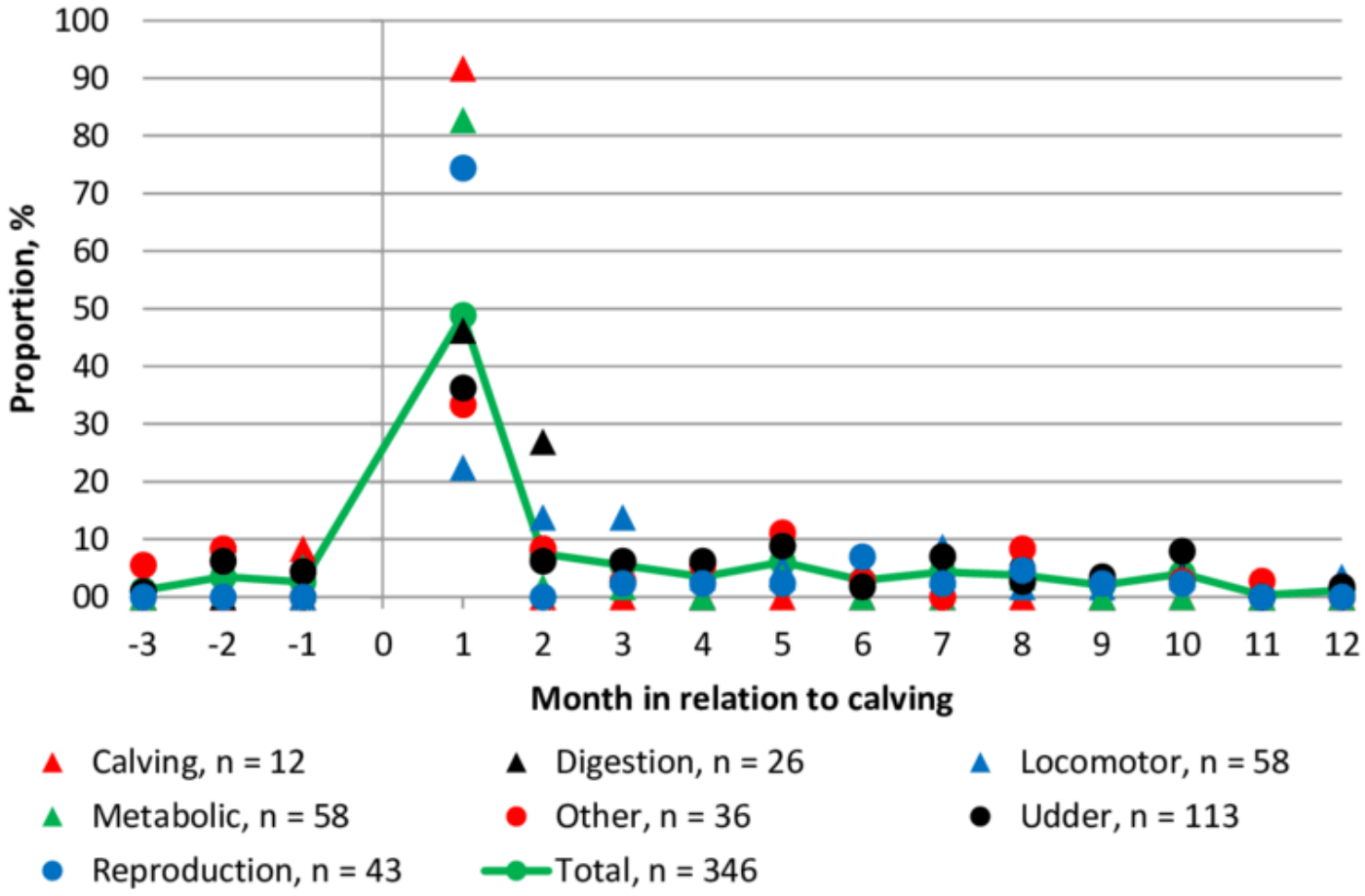
Figure 2.6 Pairwise genetic correlations when two traits are measured on the same day from 1 to 324 days in milk (DIM) between 1. dry matter intake and fat and protein corrected milk (DMI-FPCM, SE of median=0.06, of 3rd quartile=0.09), 2. dry matter intake and live weight (DMI-LW, SE of median=0.11, of 3rd quartile=0.10), and 3. fat and protein corrected milk and live weight (FPCM-LW, SE of median=0.12, of 3rd quartile=0.13).

Manzanilla Pech et al., 2016 JDS



Li et al., 2018 JDS

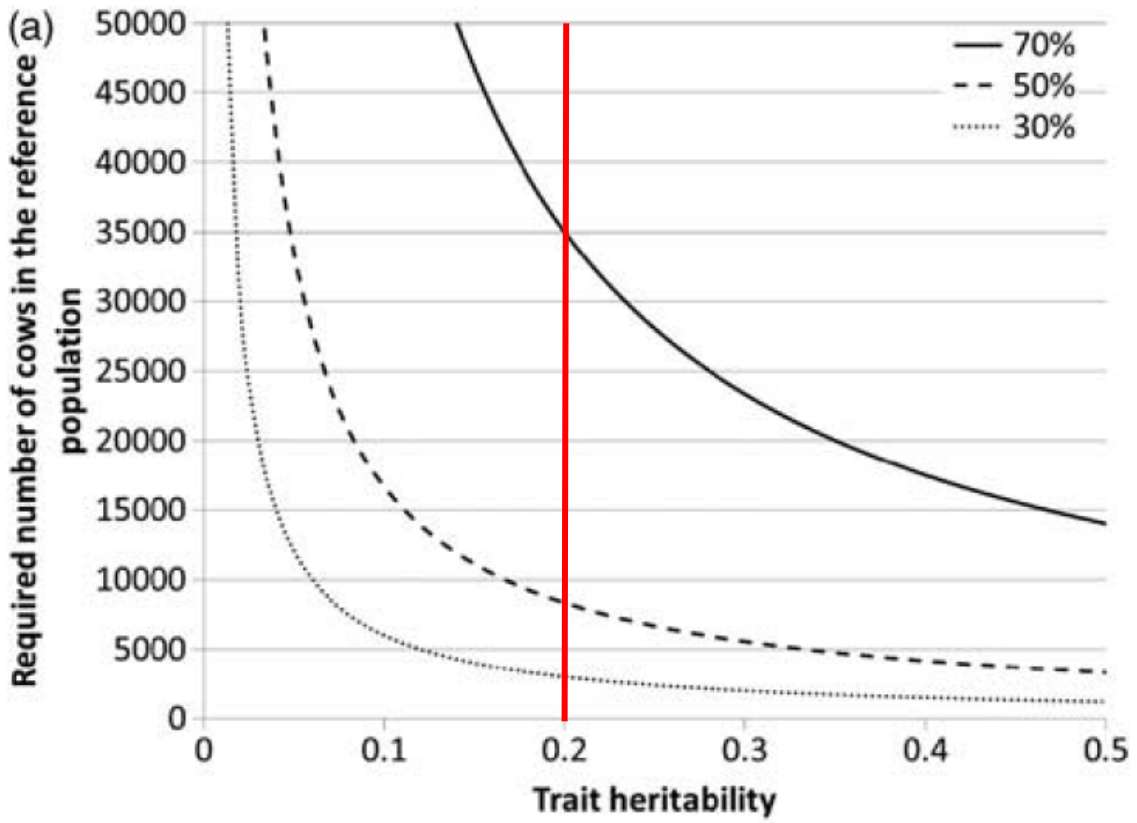
Diseases occur in early lactation



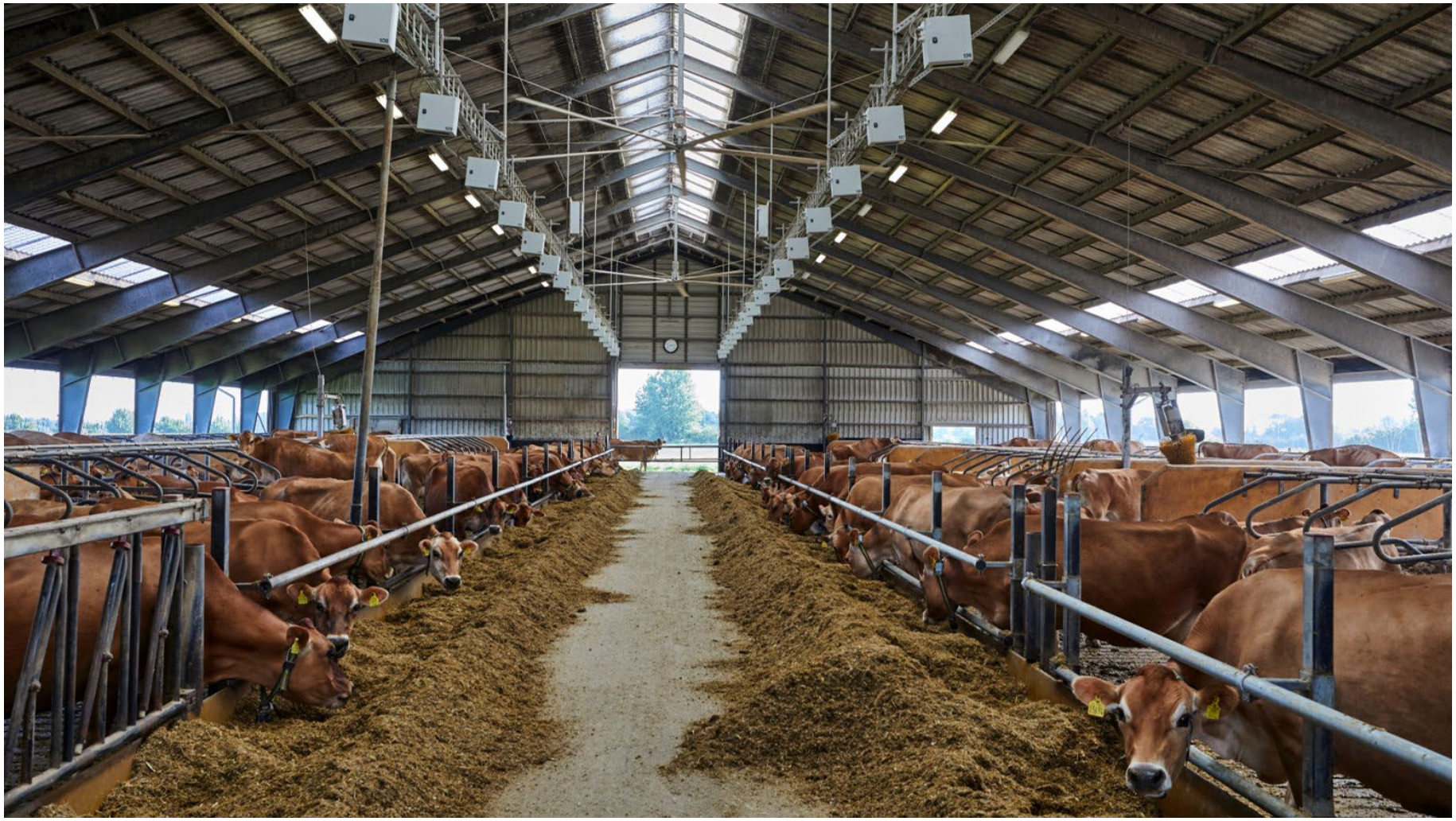
Lehmann et al., 2016

Many cows are needed in reference group

- With $h^2 = 0.20$
- 3000 -> rel of 30%
- 8000 -> rel of 50%
- 35000 -> rel of 70%

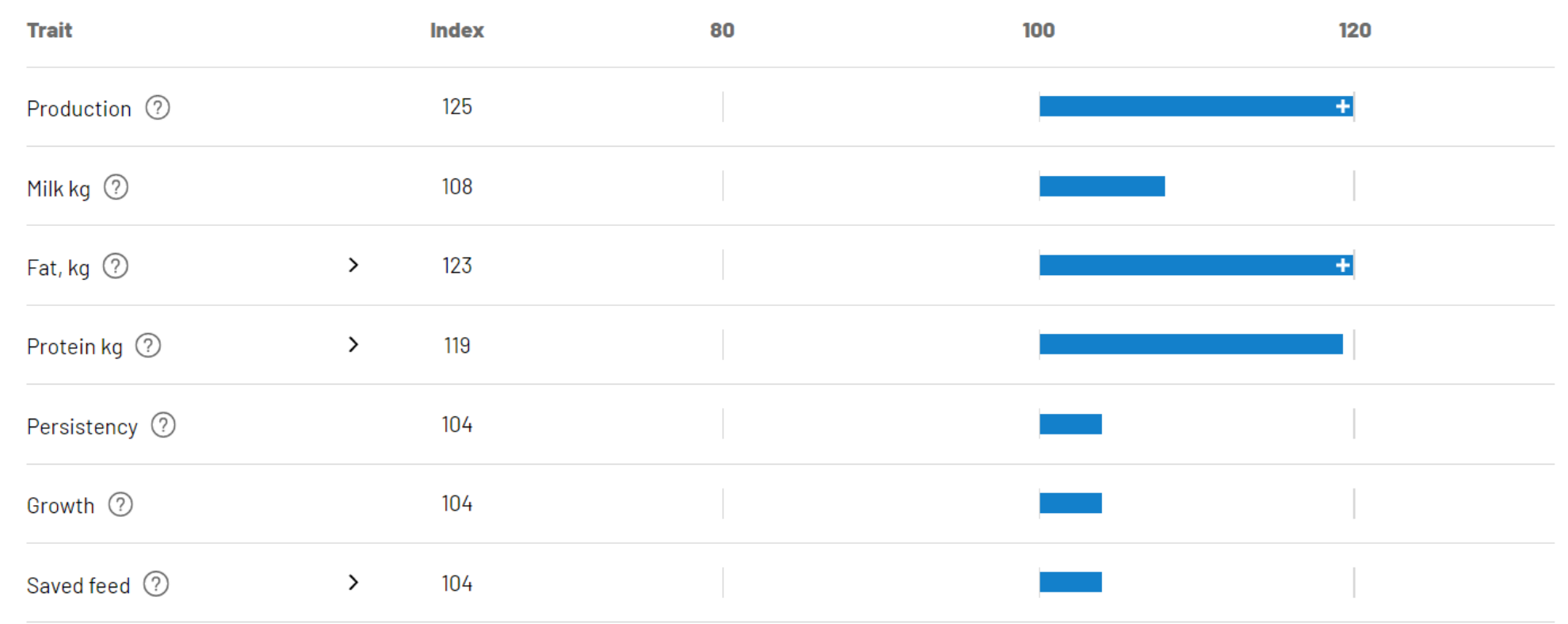


CFIT – Cattle Feed InTake



Breeding values are available – VJ Luxplus

Production & Efficiency



NAV proof run date: 06-09-2022 Reliability 74 % Number of daughters: 0

Vision with the CFIT system

- Identification of the individual cow
- Individual feed intake pr cow pr day
- Individual body weight pr cow pr day
- Used for breeding value estimation
- Used for management on farm
- Documentation (ESG and climate)
- Cow behaviour, health and reproduction
- Continued developement

VG strategy is based on:

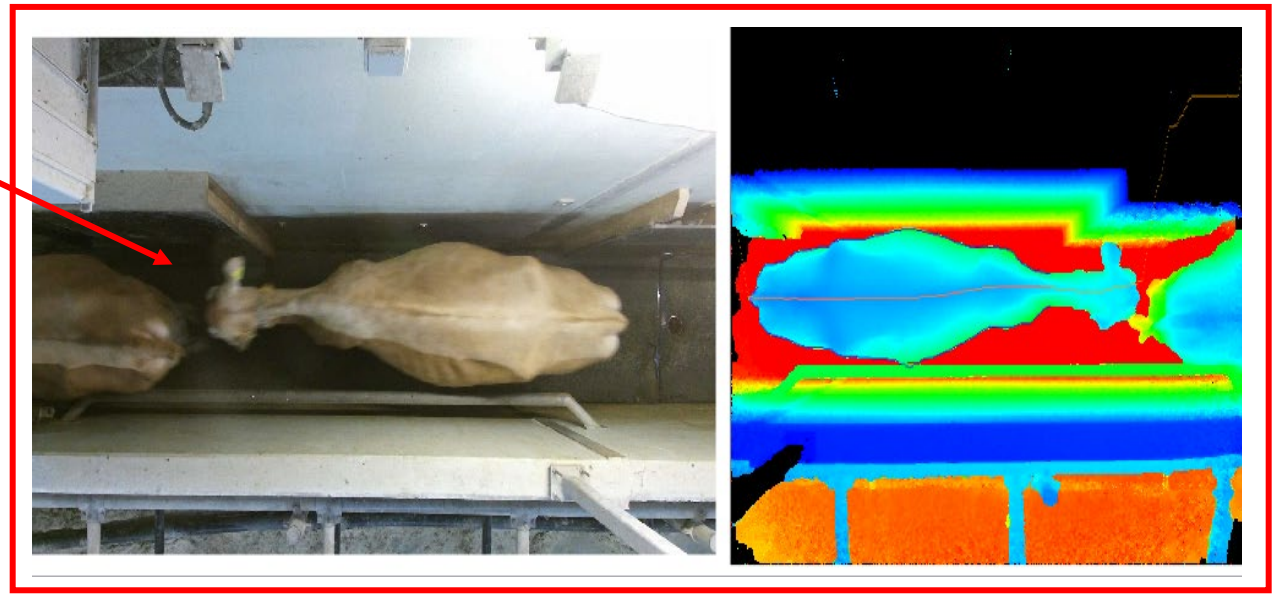
- Full lactations are necessary in all lactations
- Research farm data will not provide enough data
- The research farm approach is too expensive, time consuming and impractical in commercial farms
- Data from normal production herds are needed for documentation

How do we identify the cows ?

1 Reading electronic eartag

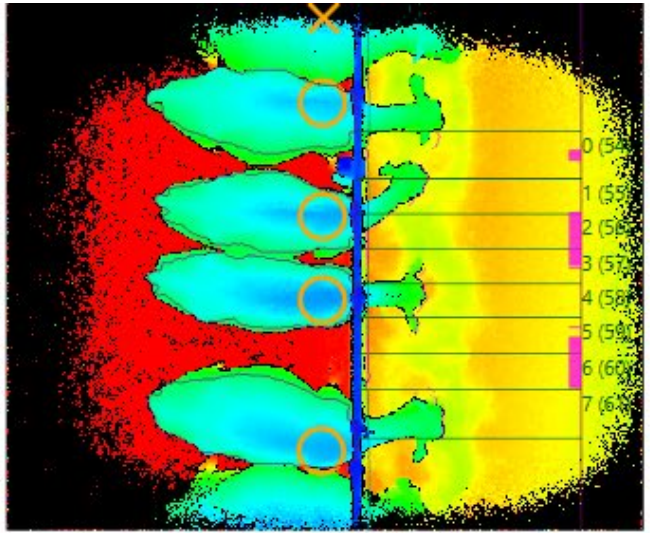
2 Taking pictures

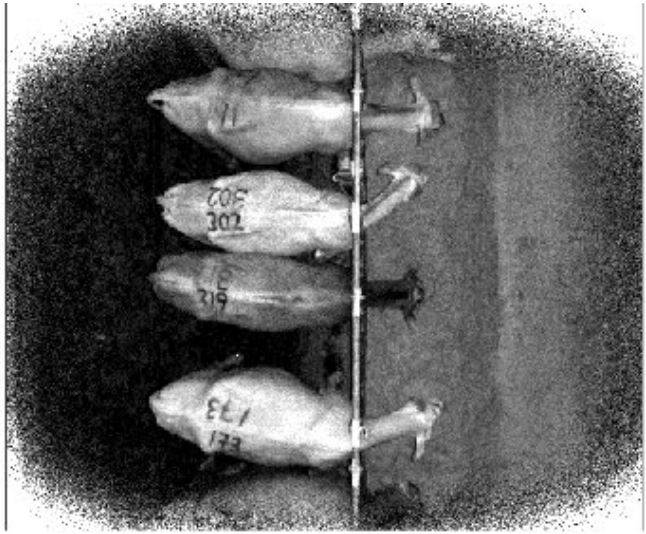
3 Saving pictures



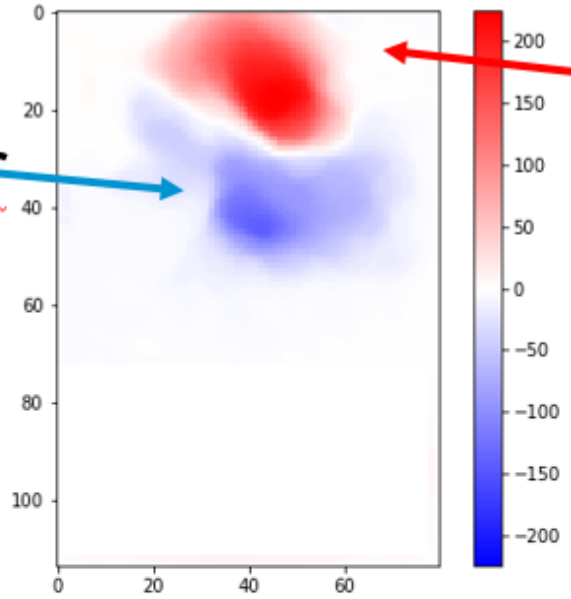
4 Taking information out of images

How we identify the cow at the feeding table





How we quantify feed intake from a visit



Blue is higher

Red is deeper

Removed 14.39 l

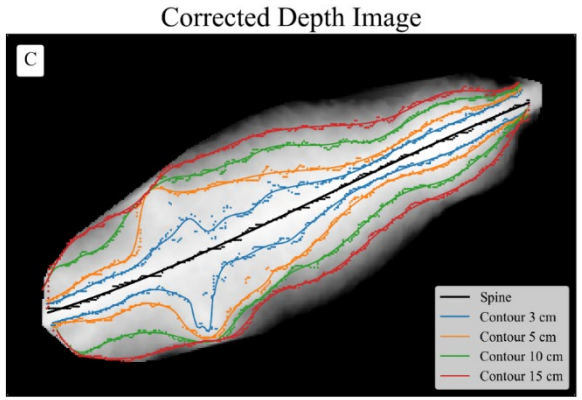
Added 10.75 l

Total 3.64 l

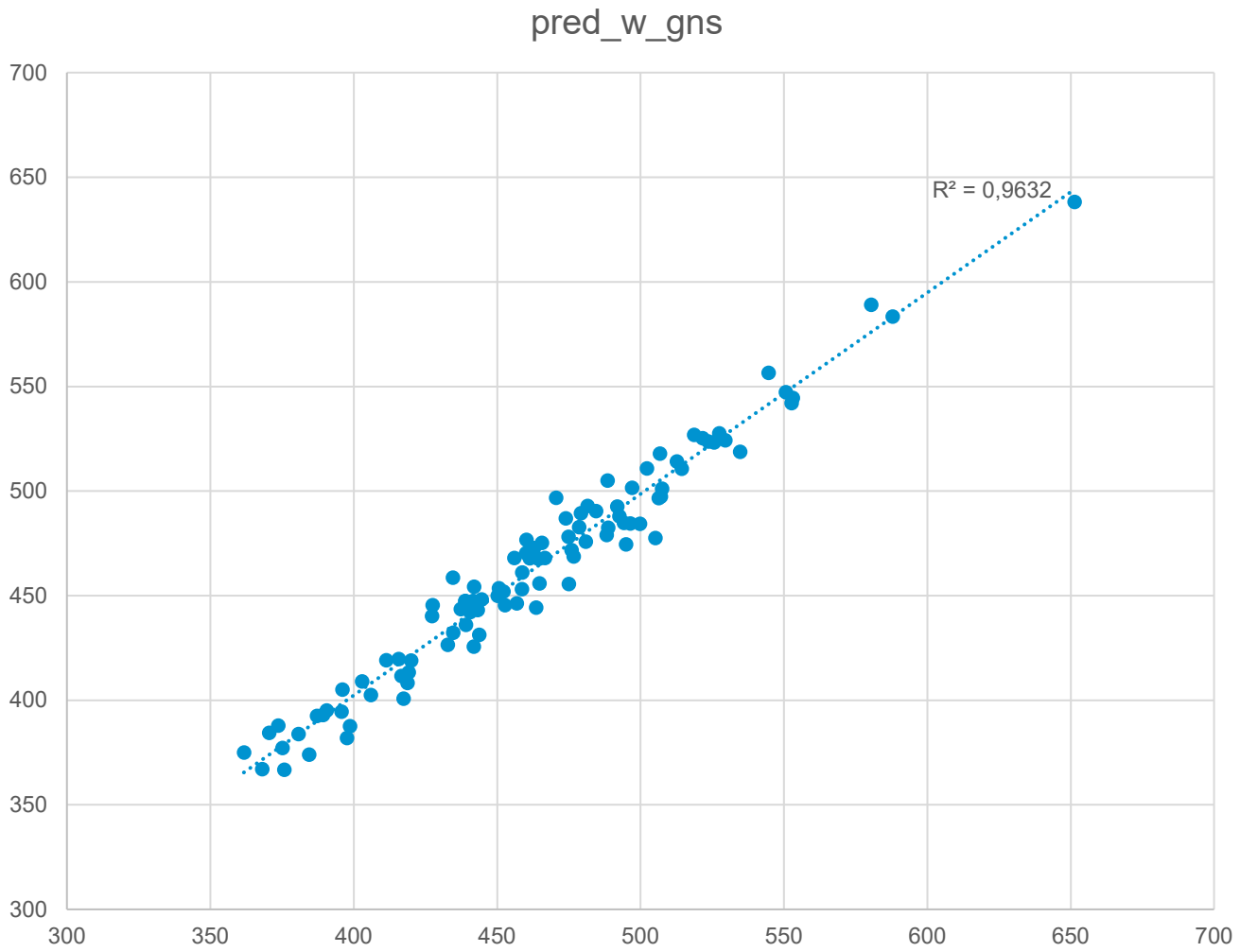
Total is difference between red and blue

Weight prediction

- 1329 measurement from 102 Jersey cows
- 460 average weight (350-650 kg)
- 400 contour variables pr visit
- PLS model

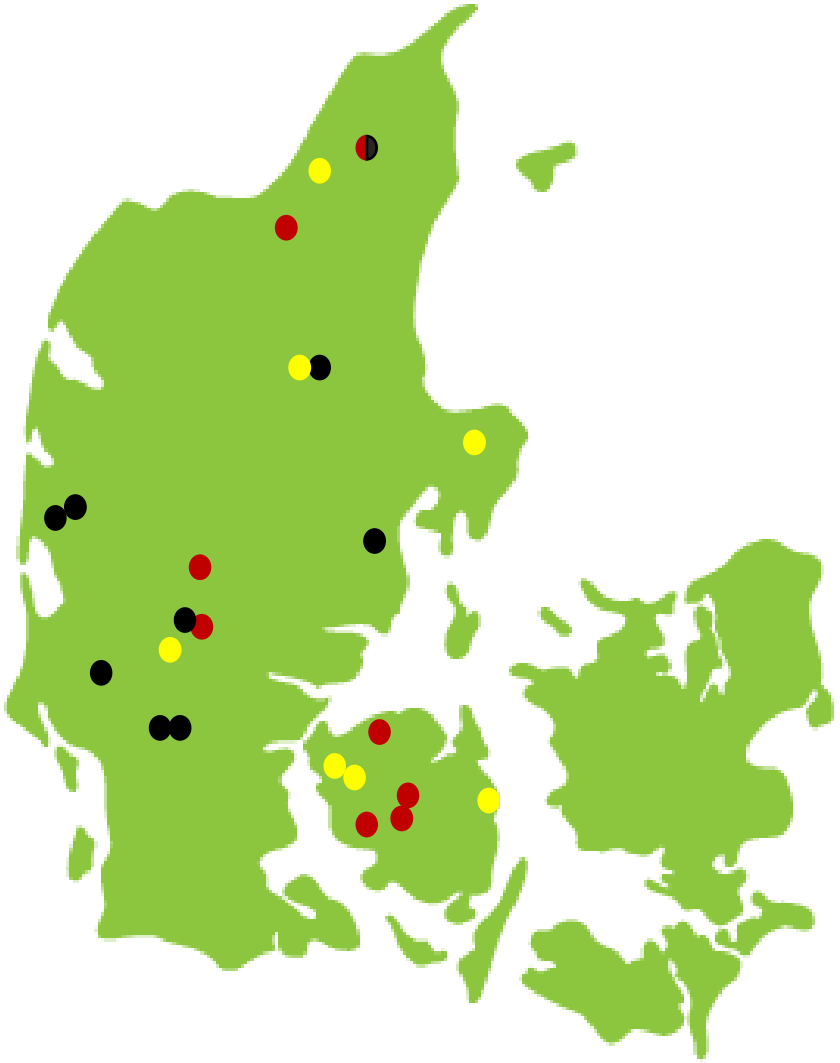


Pred vs obs


pred_w_gns
R² = 0,9632
700
650
600
550
500
450
400
350
300
300
350
400
450
500
550
600
650
700

Installations and agreements Sep 2022

- 7,5 herds RDC ~ 3000 cows
- 7 herds JER ~ 3000 cows
- 8,5 herds HOL ~ 4000 cows



Data flow and amount

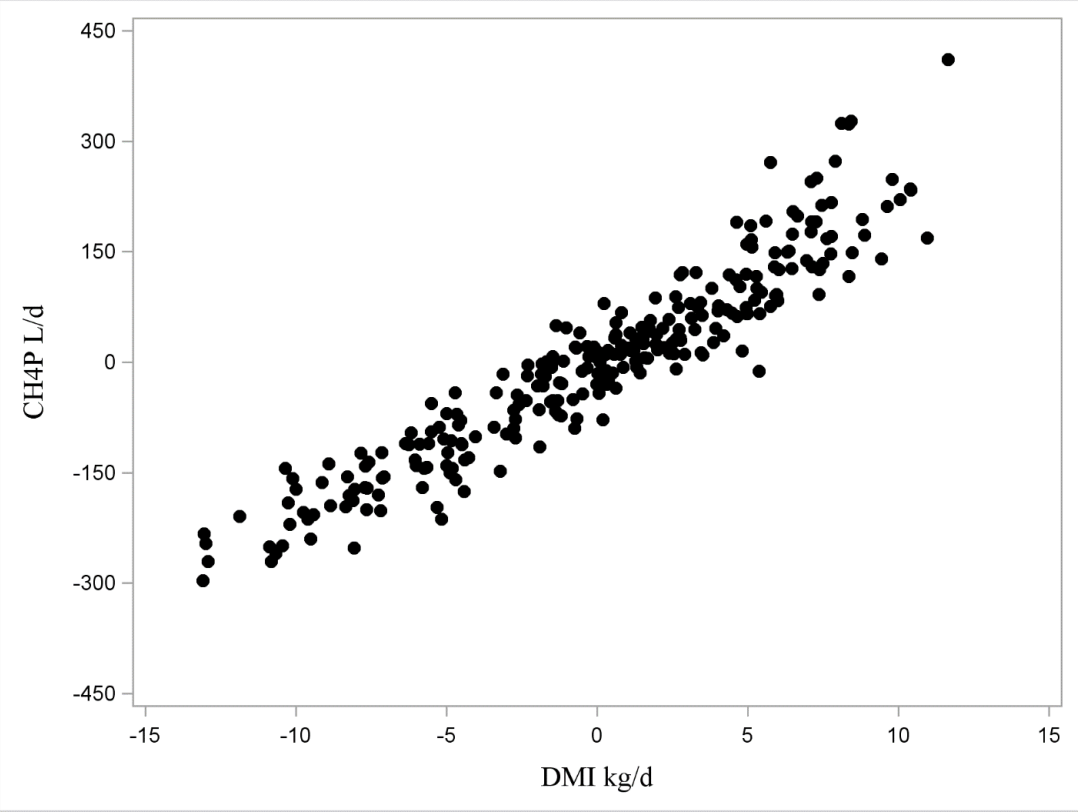
- +1700 cameras
- + 90.000.000 images pr day
- +700.000 feed visits pr day
- +100.000 meals pr day

Methane emission

Documentation

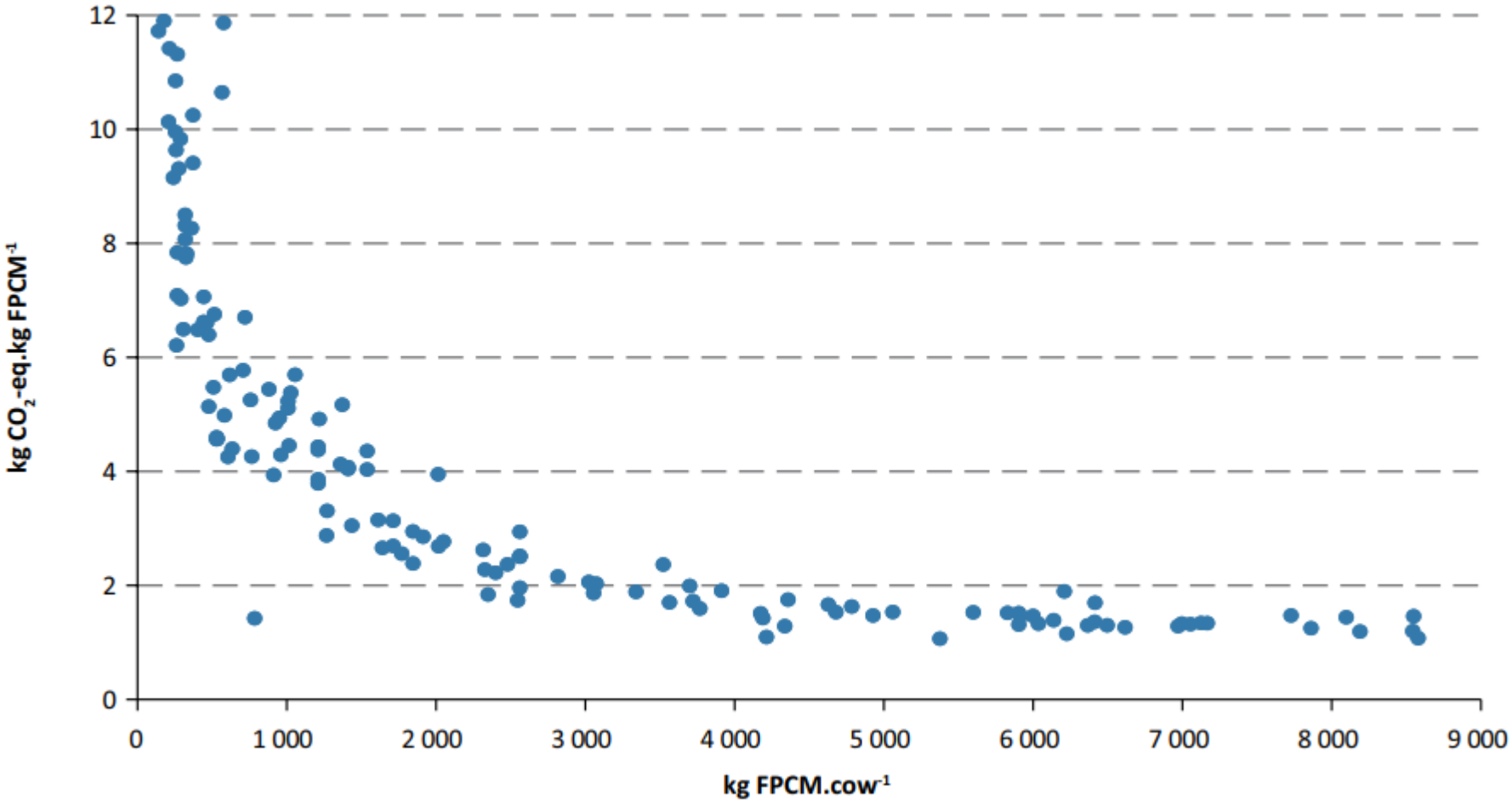
- All Adidas shoes have documentation of carbon footprint
- Same expectation for the food industry
- Tools will be necessary to provide this documentation
- Circularity of value

Low feed intake = low emission

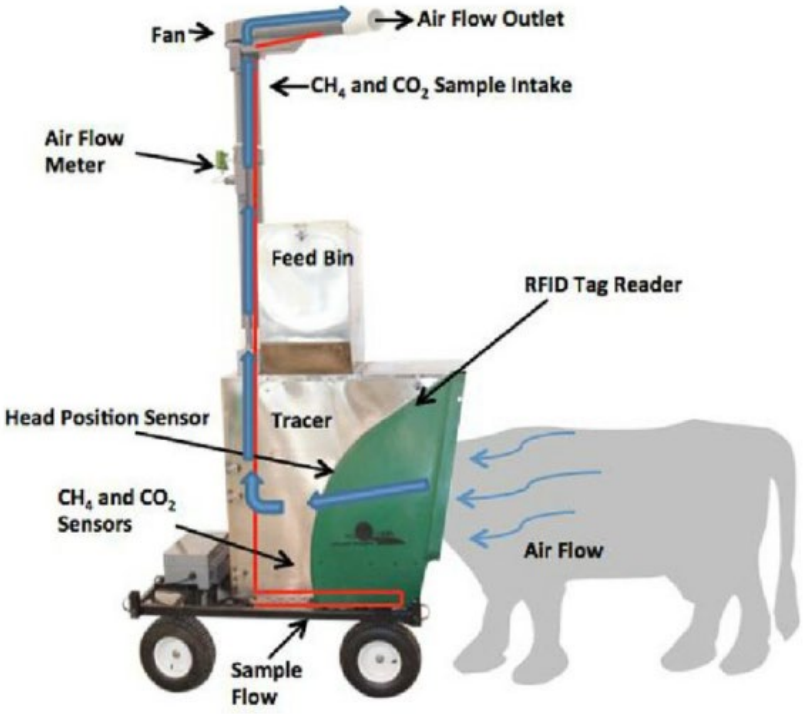


Zetouni et al., 2018

Methane intensity vs milk production



Methods to make records



Greenfeed

Sniffers

Recordings in VG

- Comparable with yield recording
- 40-50 herds will be part of the recording
- Equipment will be installed in AMS herds for 4 weeks
- Every herd will be visited 3 time yearly
- Data from all milking cows visiting the AMS
- Moved to next herd
- Investment in 40-50 installations

Initial results

- 3000 HOL cows
- Methane is heritable (~0.20)
- Genetic correlations with high standard errors
- Their signs are as expected

	Methane production	Residual methane
DMI	0.42	0.00
ECM	0.45	0.10
RFI	0.38	0.20
BW	0.65	0.05

Manzanilla-Pech et al., 2021

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- Selection is a tool to help both
  - Feed cost is up to 70% of variable cost – small improvements has huge value
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Sum up

- The CFIT system and scale measures of daily feed intake corresponds with each other (r>0.90)
- CFIT continues to be developed and improved for more installations
- CFIT already provides data for breeding value estiamtion on Viking Jersey
- Methane will soon be part of the selection criterion