

Cattle Feed InTake CFIT

3D camera system for individual measures of dairy cattle feed intake and body weight on commercial farms

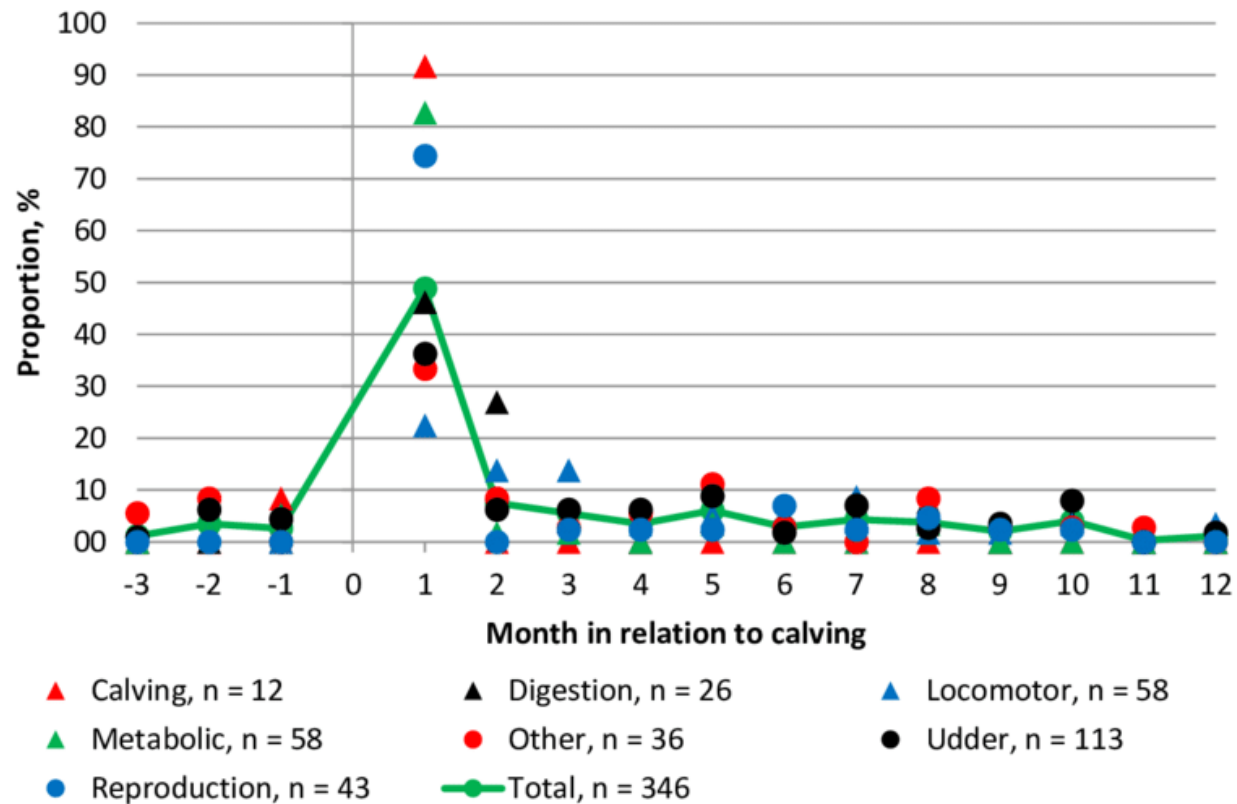


Vision with the CFIT system

- 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 development



Diseases occur in early lactation



Genetic correlation through lactation

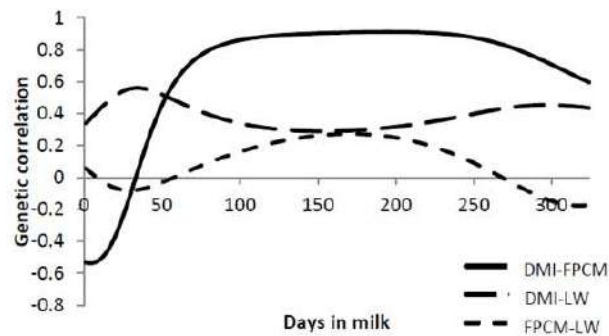
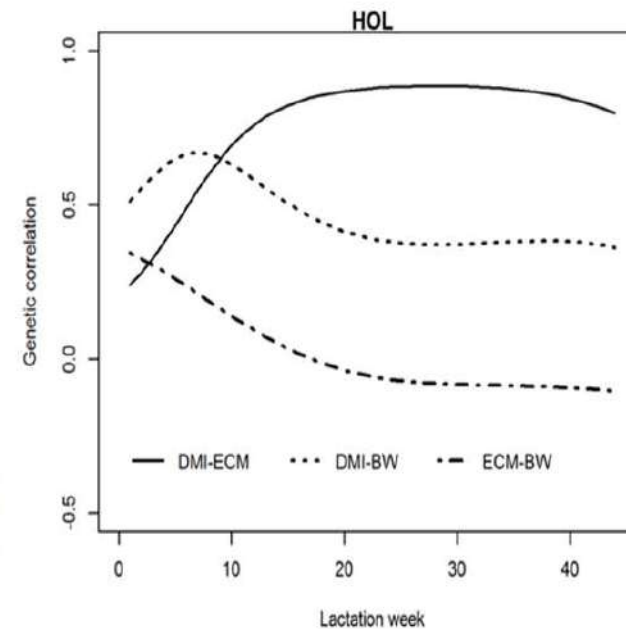


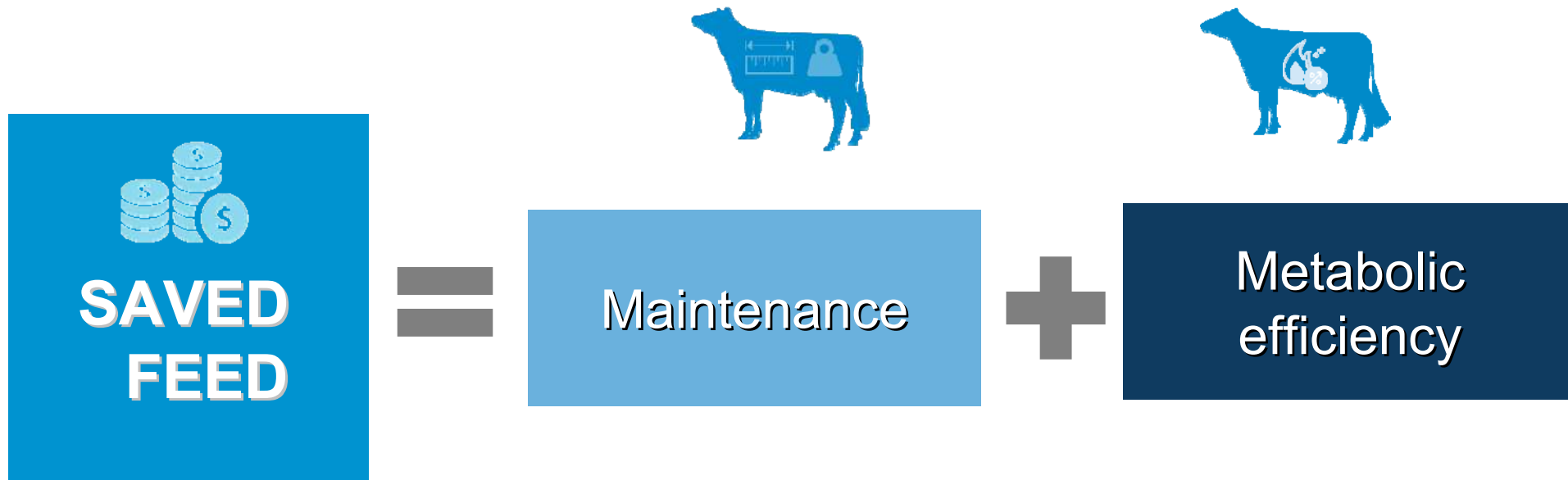
Figure 2.6 Pairwise genetic correlations when two traits are measured on the same day from 1 to 324 days in milk (DIM) between 1. dry matter intake and fat and protein corrected milk (DMI-FPCM, SE of median=0.06, of 3rd quartile=0.09), 2. dry matter intake and live weight (DMI-LW, SE of median=0.11,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

Saved feed index



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



CFIT – Cattle Feed InTake



Installations and agreements March 2023





 7,5 herds **RDC** ~ 3500 cows

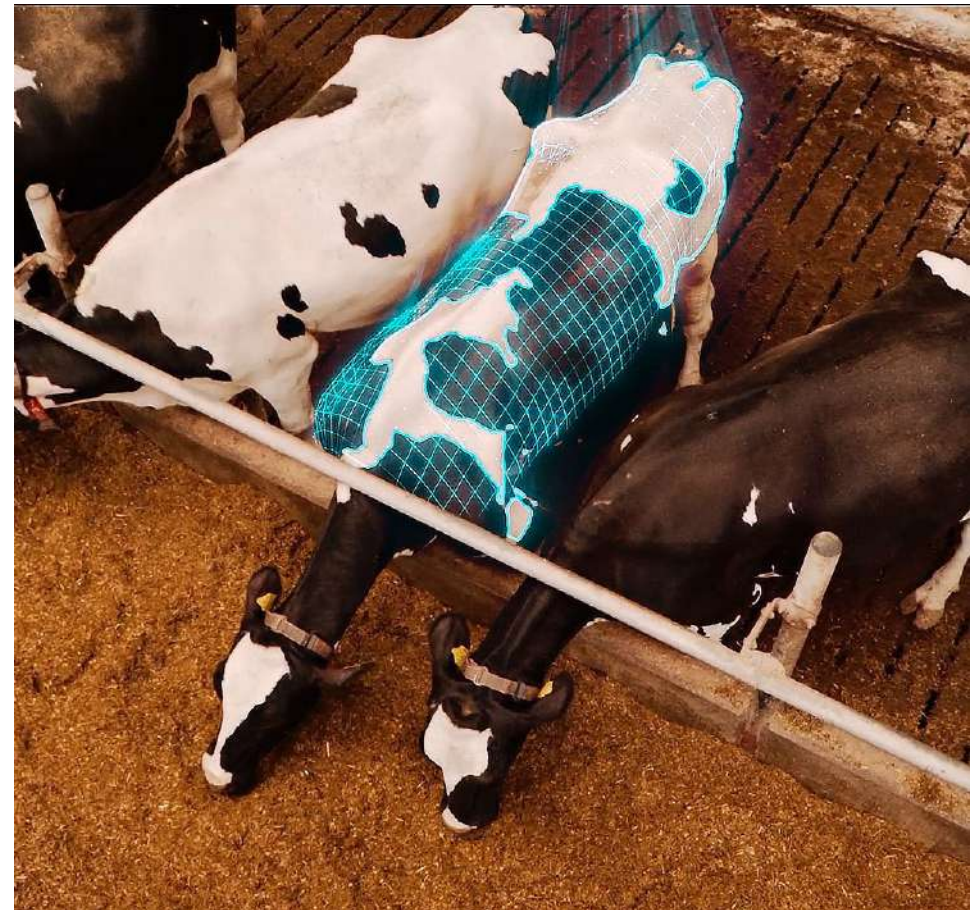
 8 herds **JER** ~ 4000 cows

 9,5 herds **HOL** ~ 5000 cows

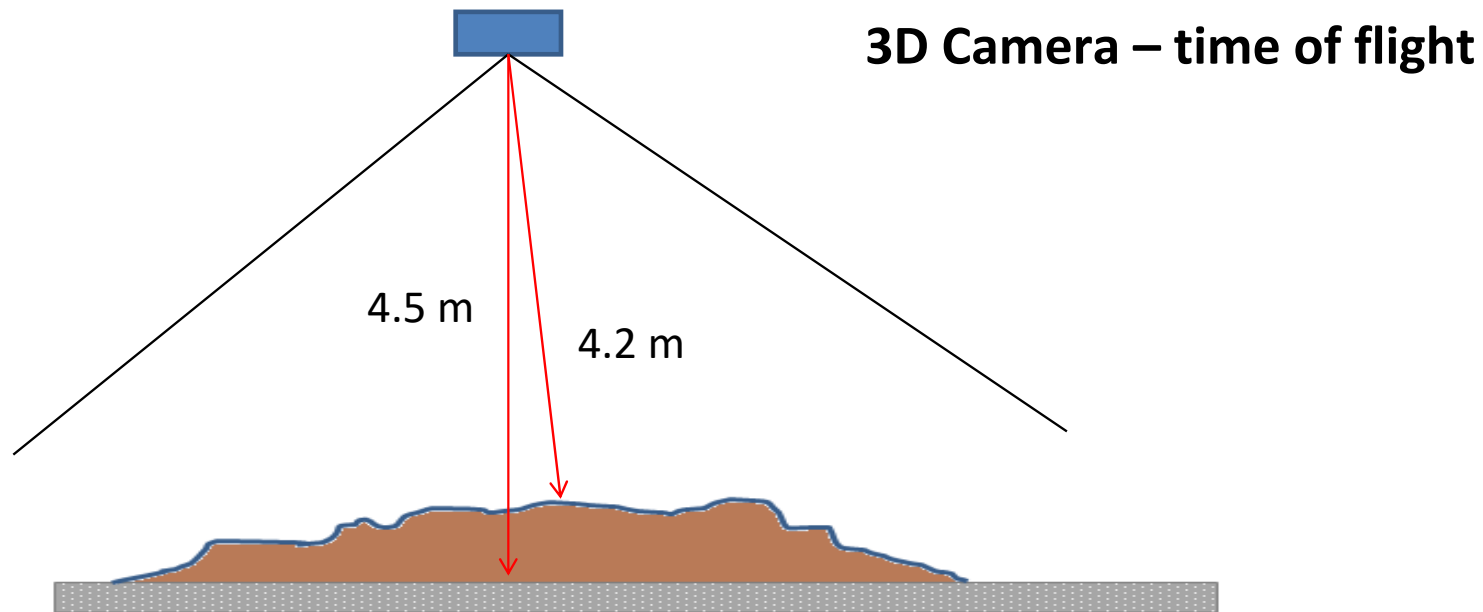


Data flow and amount

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

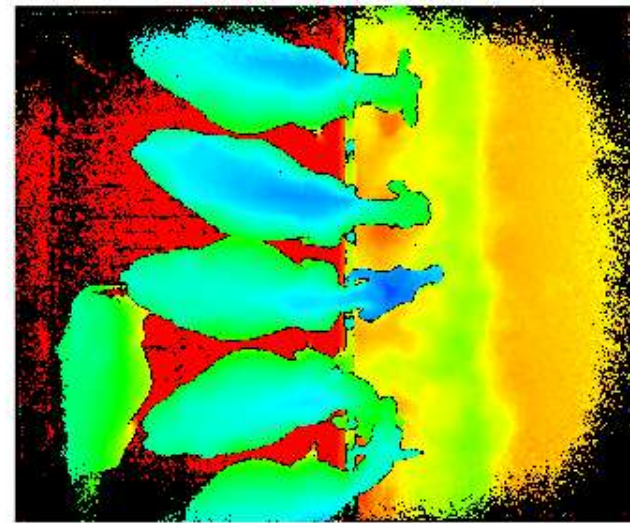
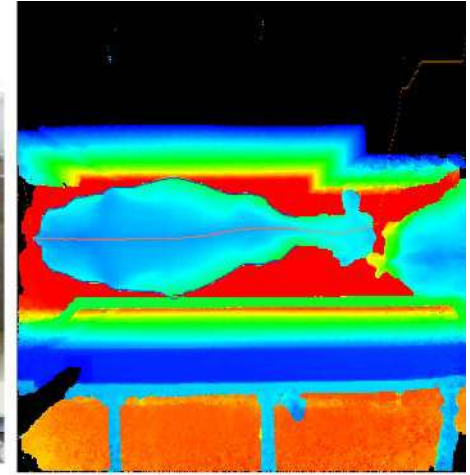
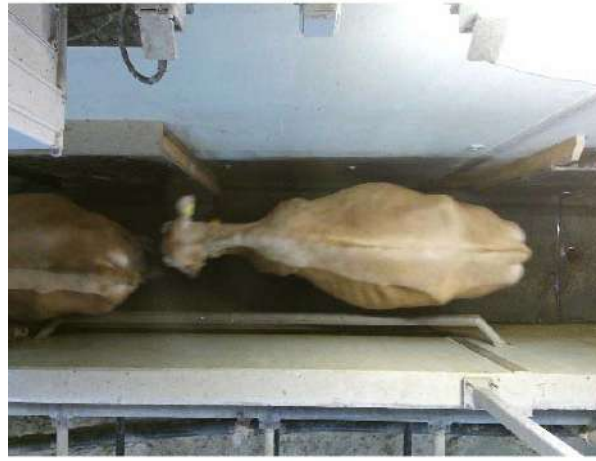


System setup







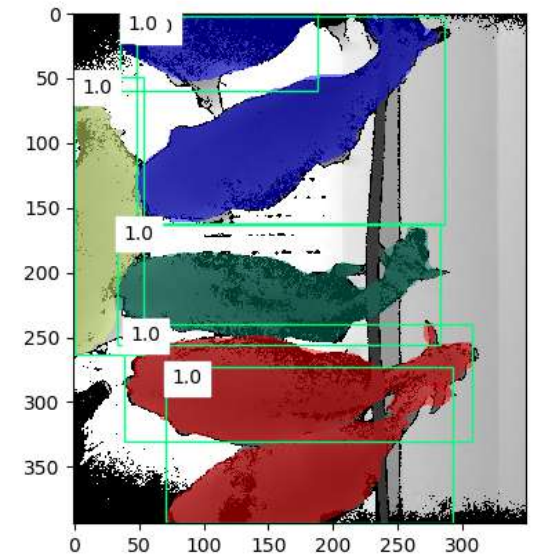
Zero calibration of floor at each feeding

What are we doing?

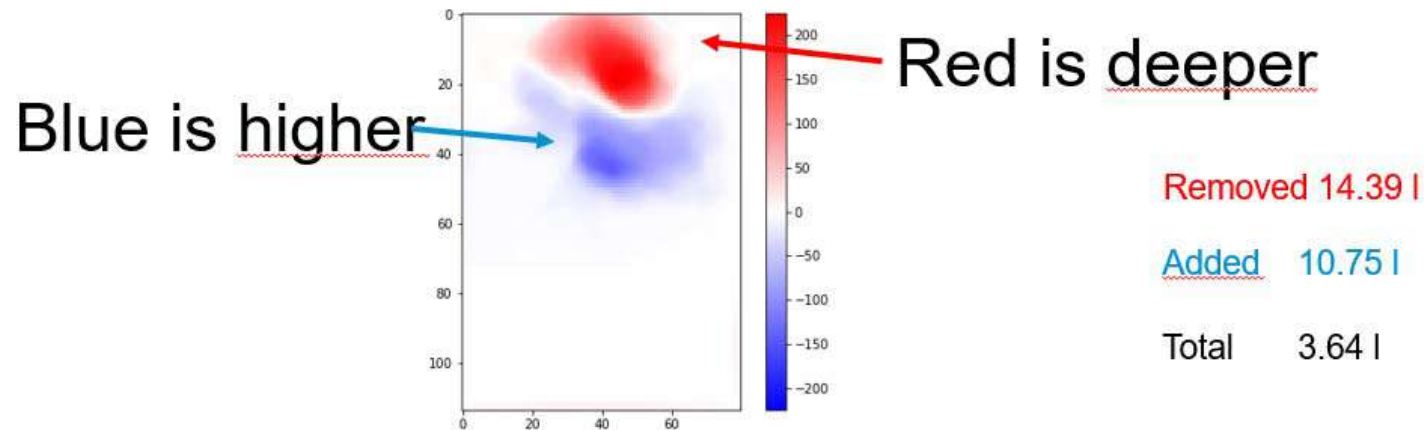


Contour -> MASK-CNN

-  ID accuracy with contour model 95-98% in Jersey
-  Change of algorithm from contour to MASK-CNN
-  Including colour, patterns, contours in model
-  ID accuracy +99% in all three breeds



Example of feed intake



Total is difference between red and blue

A photograph of two men shaking hands in the center of a barn aisle. The aisle is lined with metal stalls on both sides, each containing a cow. The floor is covered with hay. In the background, a large open doorway reveals a lush green landscape with trees. The scene is lit from the background, creating a silhouette effect on the men and the interior of the barn.

Validation study

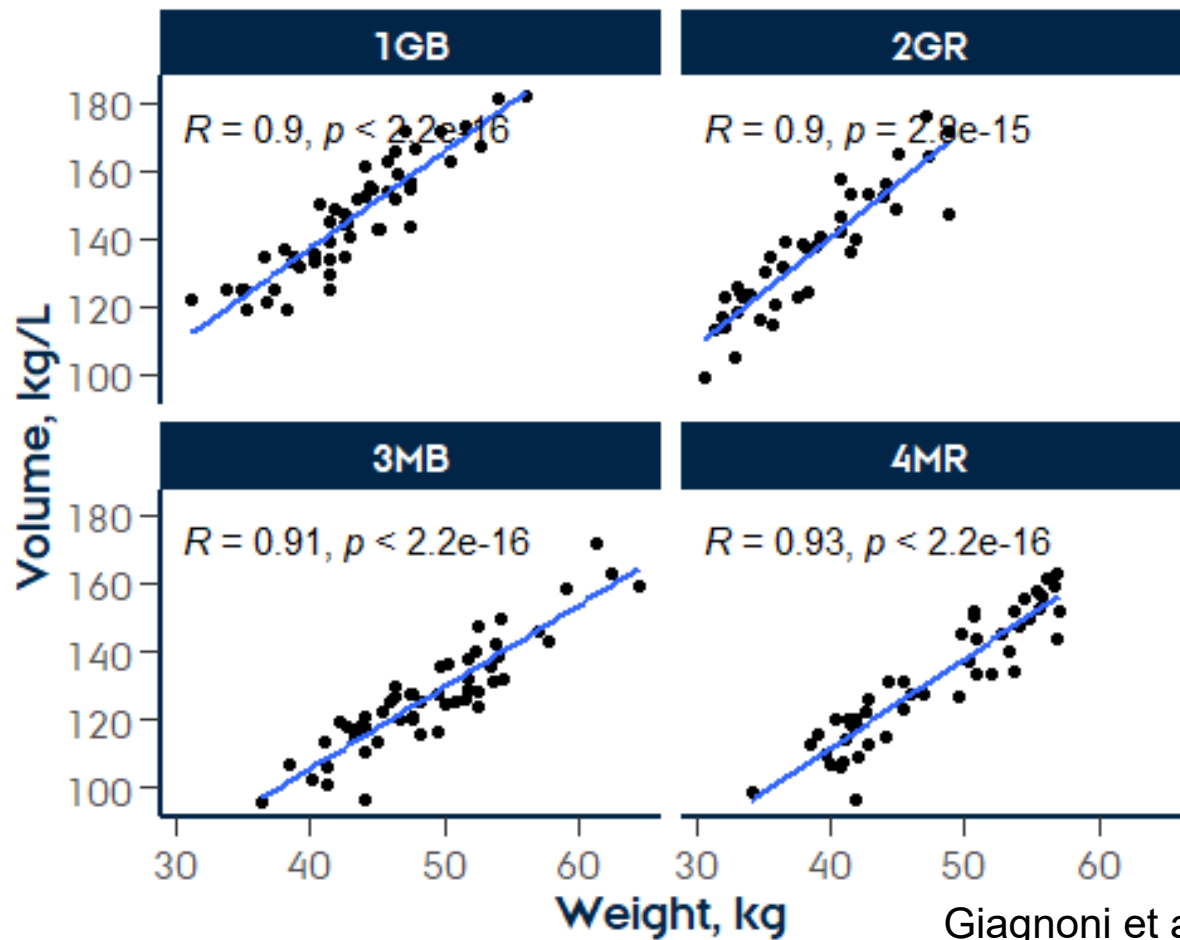
Validation study at Aarhus University

- Scale measures together with cameras
- 4 diets: maize/grass silage and barley/drybeetroot
- 48 HOL cows in latin square design
- Challenge the camera system with different densities
– especially with different silage types

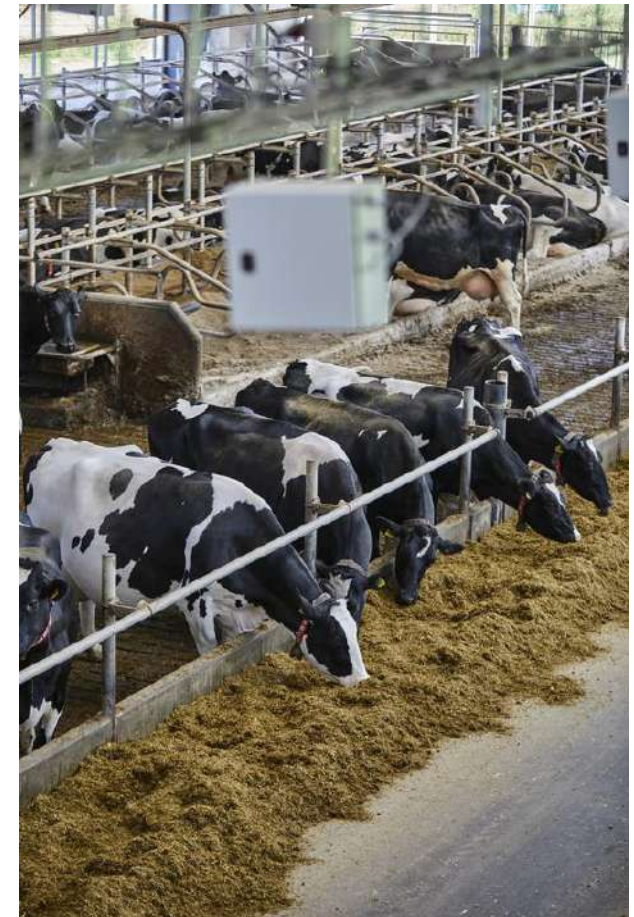
Giagnoni et al.,2022







Results – comparing kg and volume

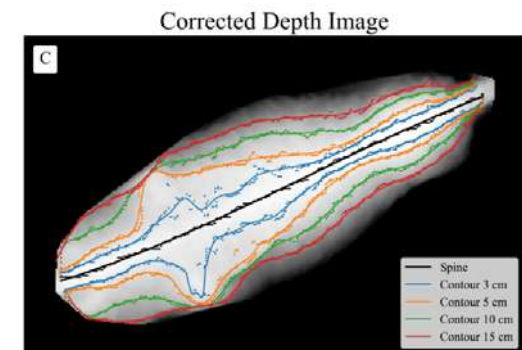


Giagnoni et al., 2022

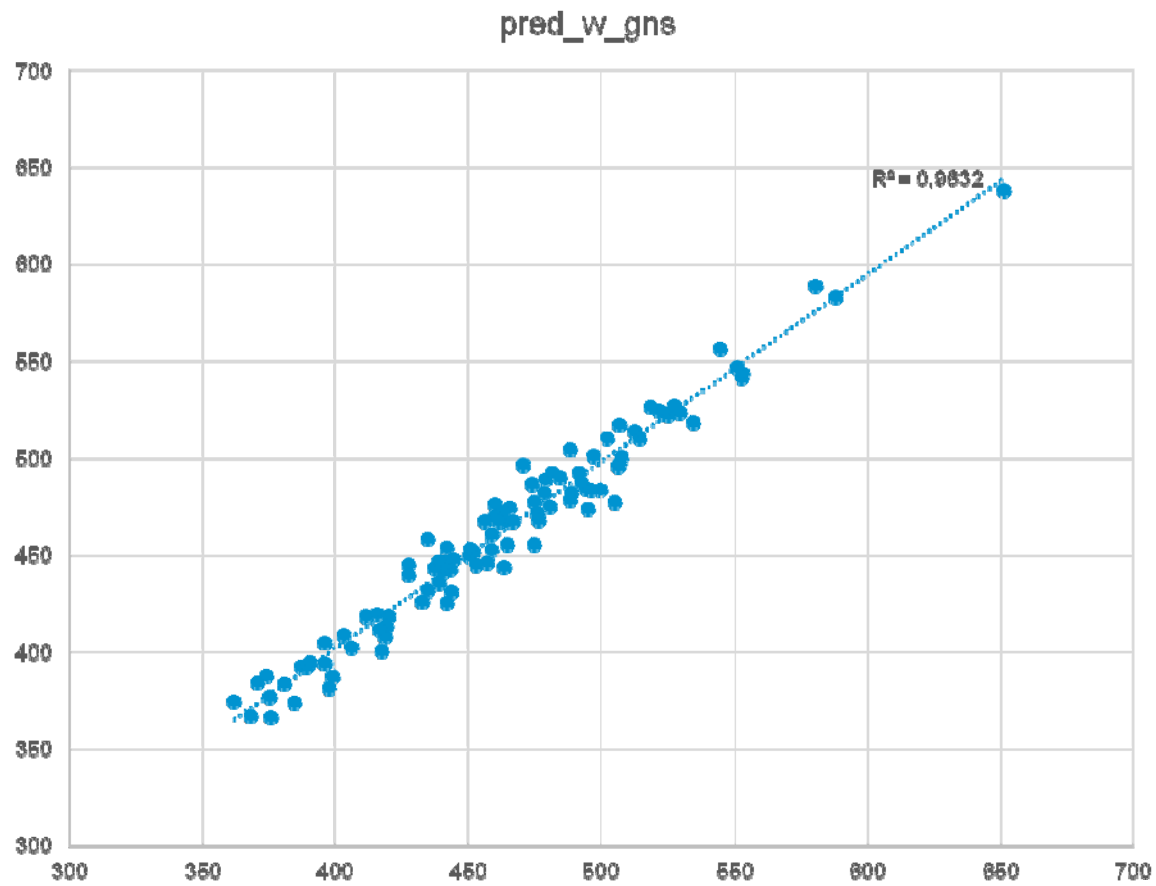


Data

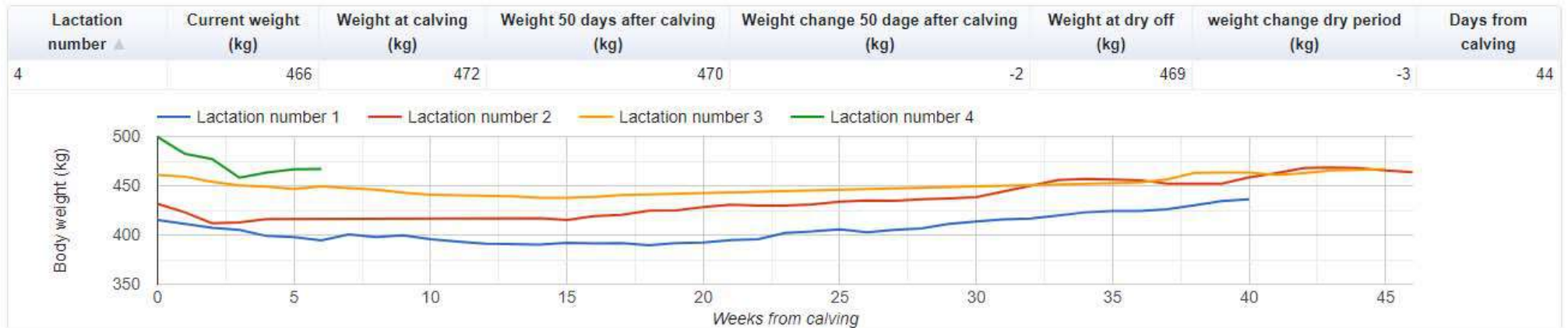
-  1329 measurement from 102 Jersey cows
-  460 average weight (350-650 kg)
-  400 contour variables pr visit
-  PLS model



Pred vs obs

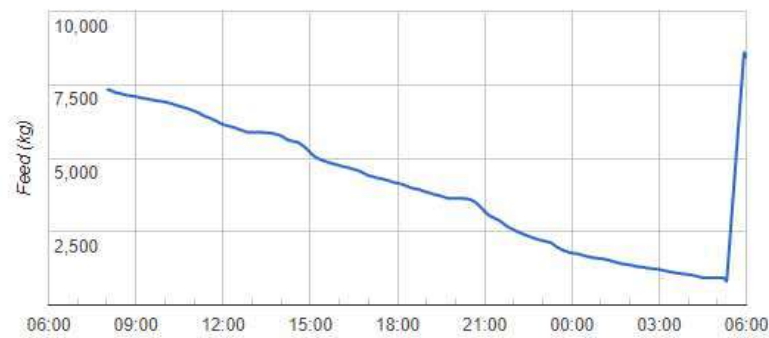


Example of a cow

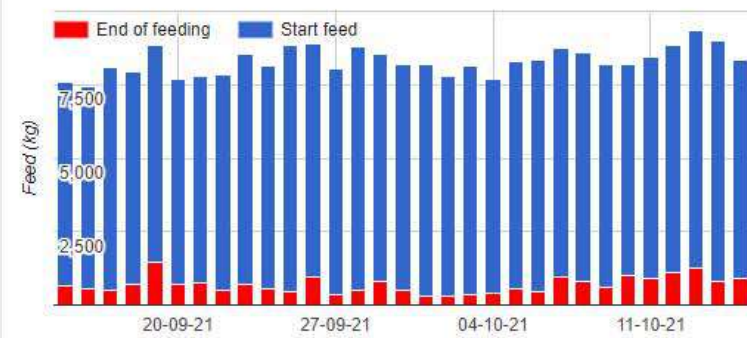


Data for farmer

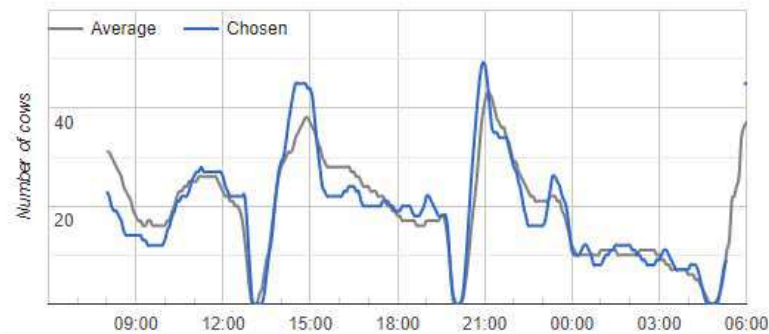
Total amount of feed



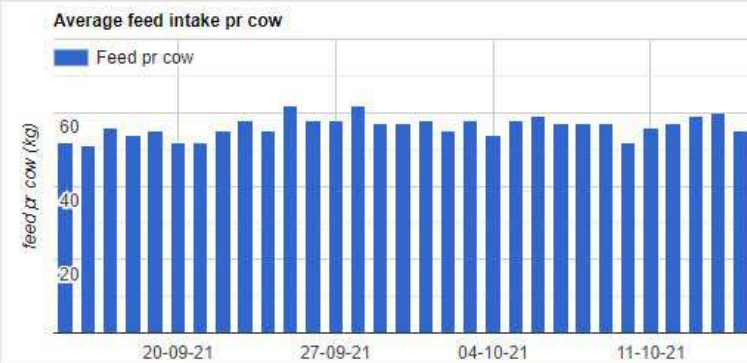
Amount of feed at start /end of day



Number of cows for the chosen day and average for the last 7 days



Average feed intake pr cow



Example of dif between cows at same yield level and lactation

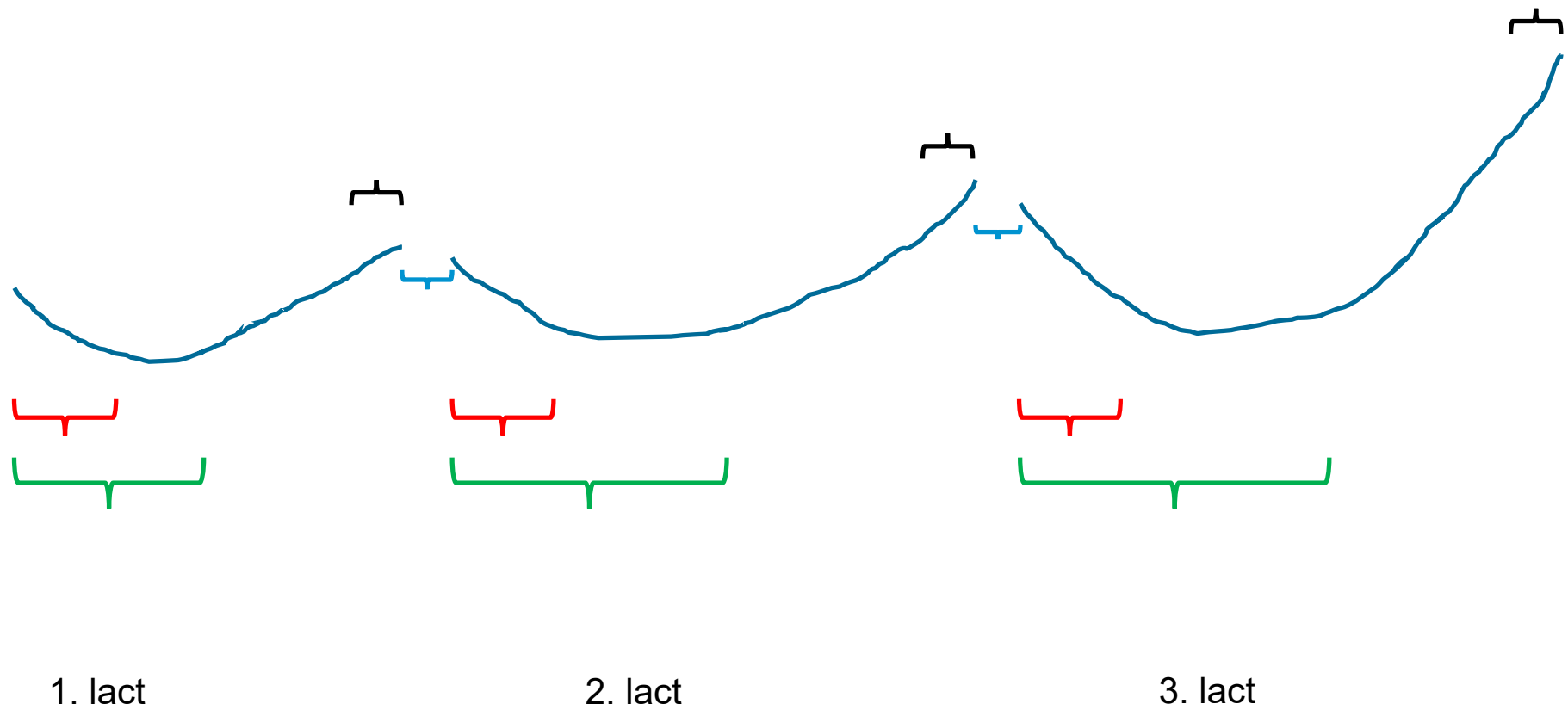
animal	Feed intake 0-305 days	lactation nr	ECM 0-305 days	CM	dif in CM
1	6749	1	10190	2047	
2	5407	1	10097	2284	237
3	6722	2	10310	2092	
4	5871	2	10574	2351	258
5	7544	3	11206	2227	
6	6151	3	11187	2499	272
7	7614	4	11469	2300	
8	5662	4	11684	2762	462

Weight development early lact

Weight development dry period

Days from calving at minimum weight




Weight change in late lactation



Recent improvements

- Improved head detection
- Automation of event handling
- Automated re-calibration

Sum up

-  The CFIT system and scale measures of daily feed intake corresponds with each other ($r > 0.90$)
-  CFIT data is both used for management and genetic analysis
-  CFIT continues to be developed and improved for more installations

