CRV, leading in health and efficiency

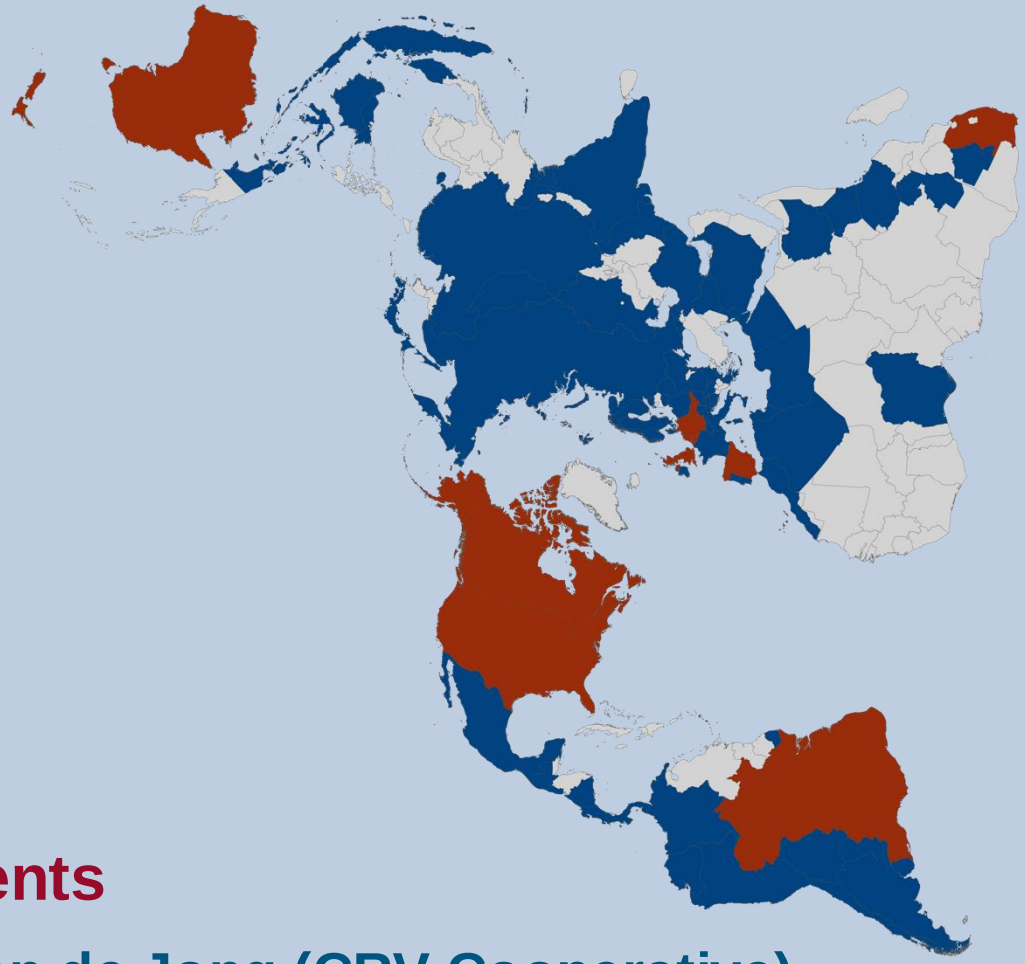
CRV – The Netherlands Methane Solution

Christopher Orrett

February 2025

CRV

BETTER COWS > BETTER LIFE



Programme

1. Methane Recording In the Netherlands
2. Modelling
3. Incorporating Methane
4. Farmer Incentives

Acknowledgements

Larissa Zetouni (CRV R&D), Niek Meijer, Gerben de Jong (CRV Cooperative), Birgit Gredler-Grandl, Anouk van Breukelen, Yvette de Haas, Roel Veerkamp (Wageningen), Jeroen Heck (Friesland Campina)

BETTER COWS > BETTER LIFE

Methane at CRV

Climate Smart Cattle Breeding

- In 2020 CRV, Wageningen and Friesland Campina began Climate Smart Cattle Breeding Project
  - Evaluation for methane
- 100 Sniffers to measure methane on 79 Farms
- PhD by Anouk van Breukelen
- Ended 2025

New Zealand Methane

- In 2020, CRV, LIC and Helical began a pilot to measure methane with Greenfeeds
  - 157 CRV Bulls have been measured
  - Daughters of these bulls born (spring 2023) to see if lower bull methane = lower daughter methane
- Ends 2026

GreenFeed @ Duursma

- In 2021, CRV and Agrifirm entered into a collaboration on methane
  - 3 Greenfeeds have been installed at Wietse Duursma's farm
  - Despite initial teething challenges data has been validated
- Ongoing

Relivestock

BETTER COWS > BETTER LIFE

Climate Smart Cattle Breeding

- 226,449 weekly sniffer records
- 11,595 cows
- 1,380 bulls
- 89 farms

Carltech Sniffer see also:
https://wiki.icar.org/index.php/Sniffer_SOP#Carltech

BETTER COWS > BETTER LIFE

Sniffer locations by postcode. Symbol size denotes number of farms in that postcode (1 or 2)

Greenfeed @ Duursma ★

- 11,824 weekly green feed records
- 397 cows
- 154 bulls
- 1 farm

Sniffer locations by postcode. Symbol size denotes number of farms in that postcode (1 or 2)

BETTER COWS > BETTER LIFE

Modelling

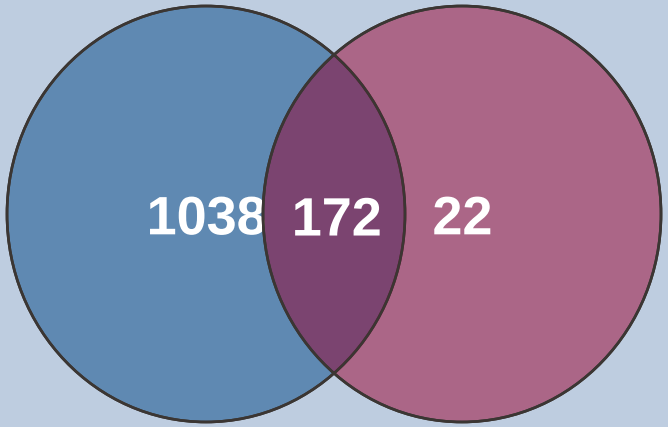
Climate Smart Cattle Breeding

- 180,423 weekly sniffer records
- 9,528 cows
- 79 Herds

r_g = 0,76
Breukelen et al., 2023

GreenFeed @ Duursma

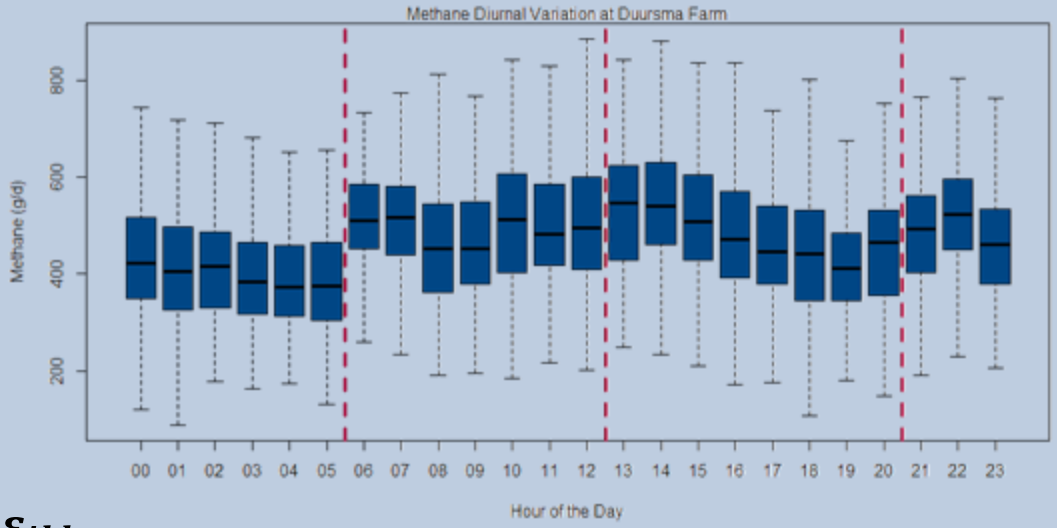
- 18,588 weekly greenfeed records
- 301 Cows
- 1 Herd



BETTER COWS > BETTER LIFE

NB November 2024 figures

Modelling



- Precorrection for diurnal variation

$$y_{i[k]l} = \mu + Farm_i . \sum_{j=1}^{1} (sinj\theta 2\pi + cosj\theta 2\pi) + [GF_k] + \varepsilon_{ikl}$$

- Model Terms (Lactation 1 & 2)

$$y1_{ijklmnopr} + y2_{ijklmnopr} = HYS_i + DIM_j + FD_k + Het_m + Rec_n + Inb_o + A_p + PE_i + E_{ijklmnopr}$$

- Model Terms (3+)

$$y1_{ijklmnopr} + y2_{ijklmnopr} = HYS_i + DIM_j + Par_k + Het_m + Rec_n + Inb_o + A_p + PE_i + E_{ijklmnopr}$$

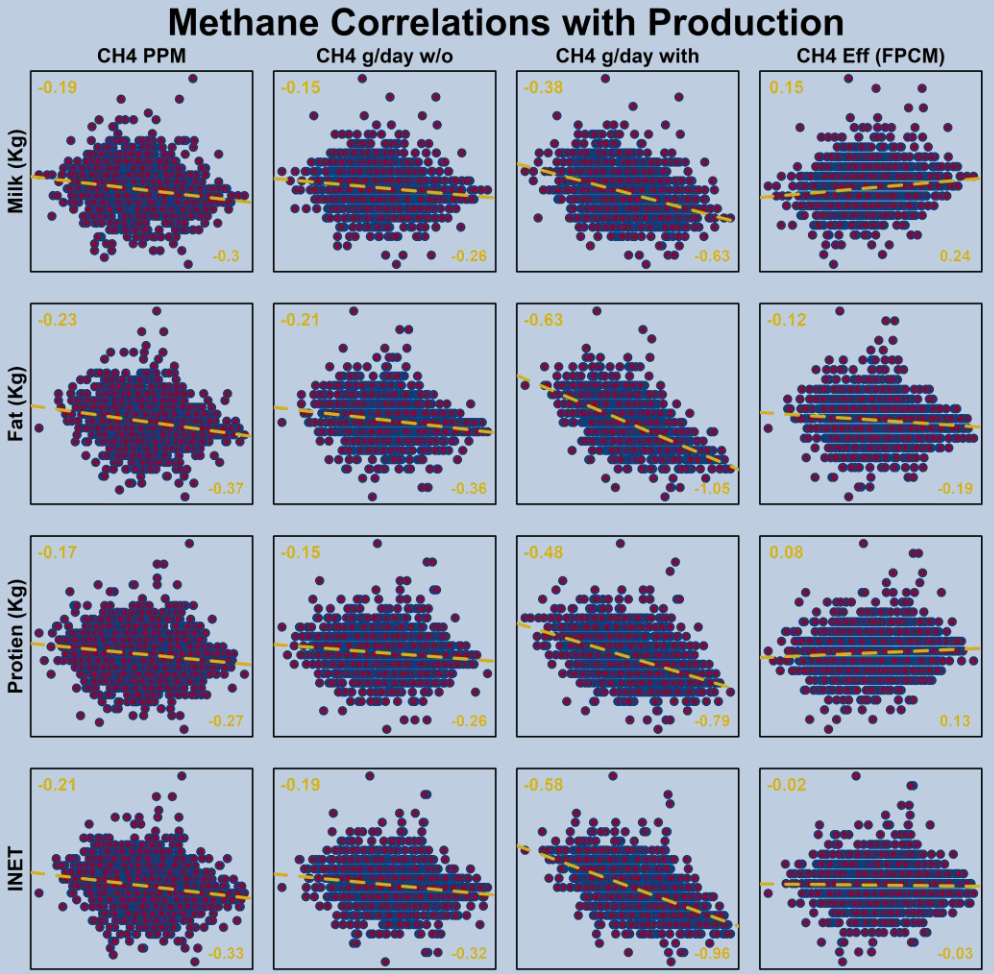
Θ=Time of recording, [GF = Green Feed]*,HYS=Herd Year Season, DIM= Days in milk, [FD = Fresh date or Par=Parity]*, Het = Hetrosis Effect, Rec = Recomination Effect, Inb= Inbreeding, A=Random Animal Genetic Effect, PE=Random Permanent Environment Effect$_i$ E= Residual error
*as applicable

BETTER COWS > BETTER LIFE

Modelling

	Methane g/day
Milk	0.39
Fat	0.19
Feed Intake	0.2
Body Weight	0.09

Methane Grams Per Day With Predictors

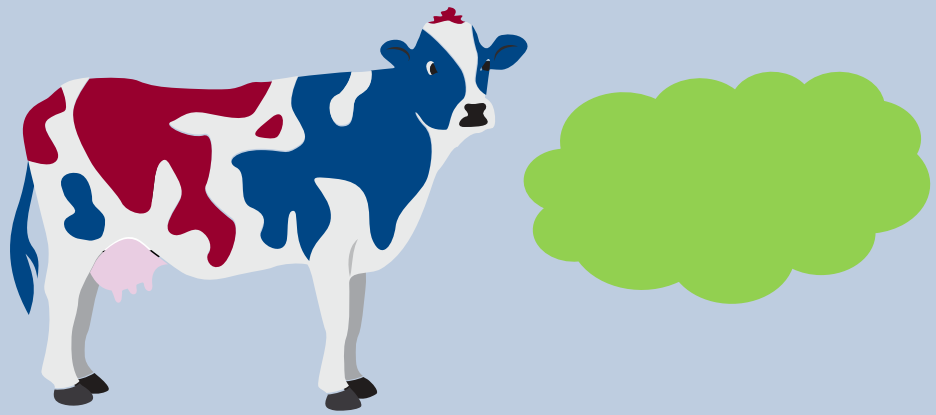


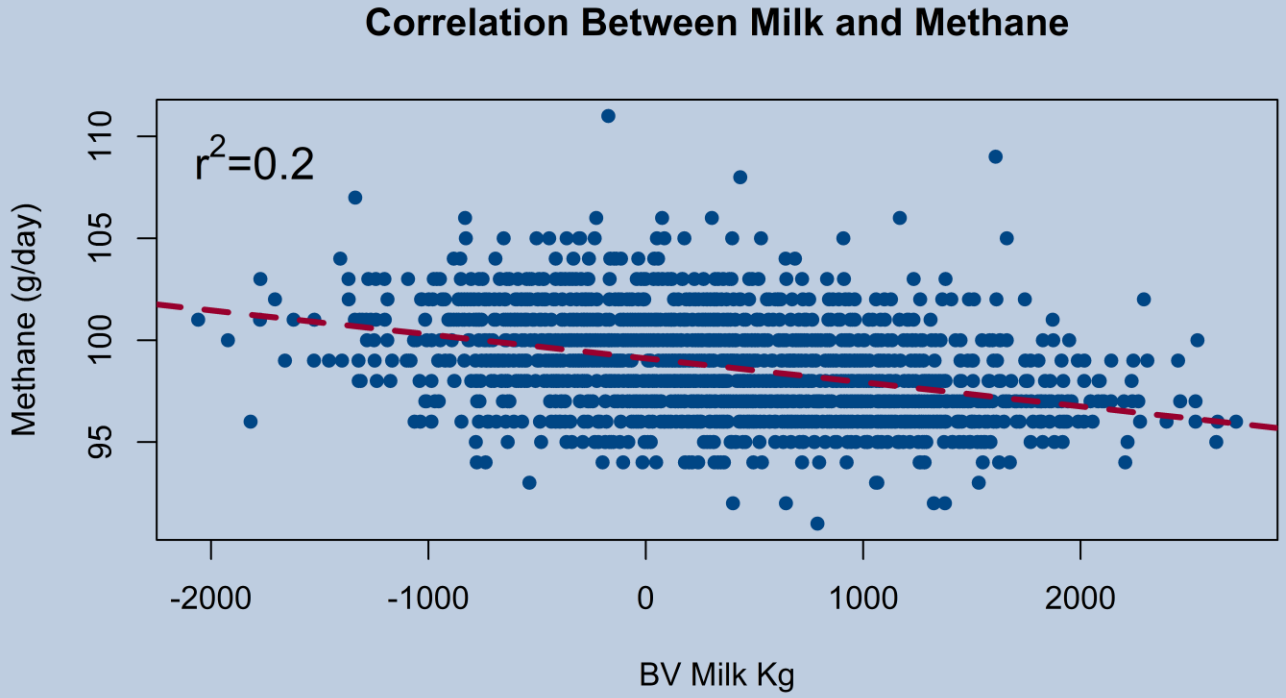
Production correlations based on bull breeding values

BETTER COWS > BETTER LIFE

Residual Methane

- Correlation between Milk and gross Methane directly is moderate
- We have been able to partition the methane required for production from the extra methane produced per cow.
- r^2 between breeding values of 0.2 so a correlation coefficient of 0.44.
- The estimates from the more accurate MACE methodology are 0.39



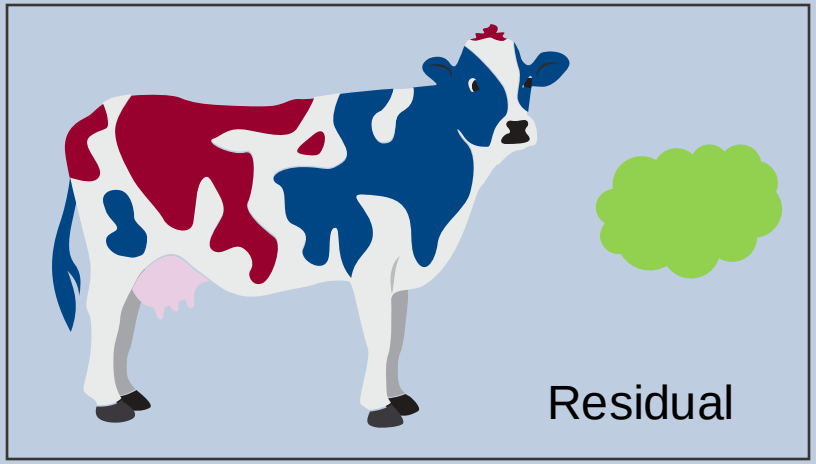


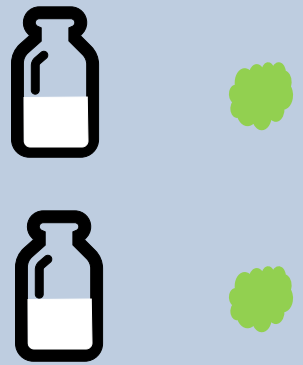
BETTER COWS > BETTER LIFE

Residual Methane

- Correlation between Milk and gross Methane directly is moderate
- We have been able to partition the methane required for production from the extra methane produced per cow.
  - Potential from the total is ~ 39.1
  - Potential from the residual is ~ 38

(Expressed as genetic standard deviations)

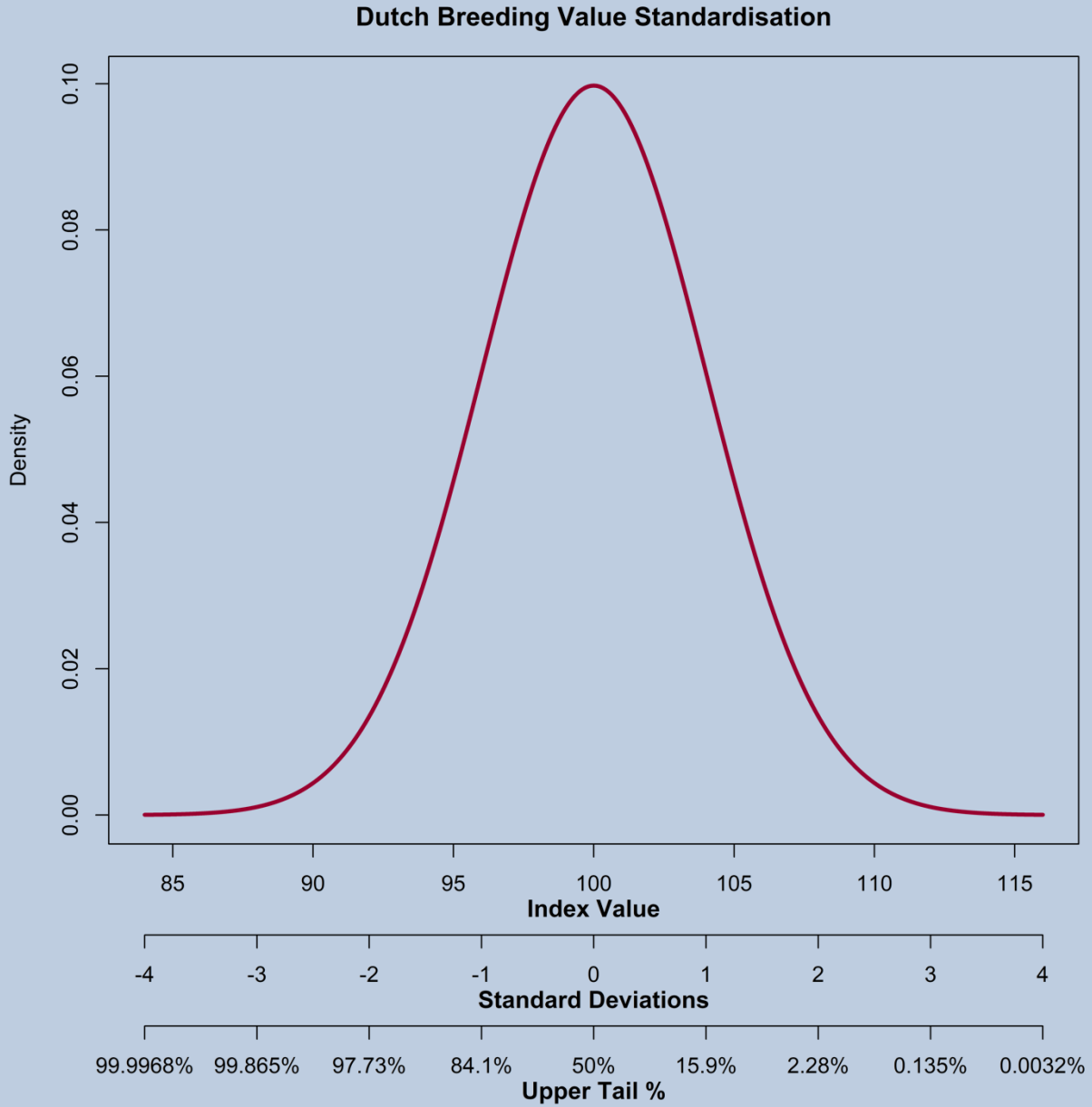




Brief Note on Dutch Breeding Values

- Dutch Breeding Values are Standardised
  - Mean 100
  - Genetic Standard Deviation 4

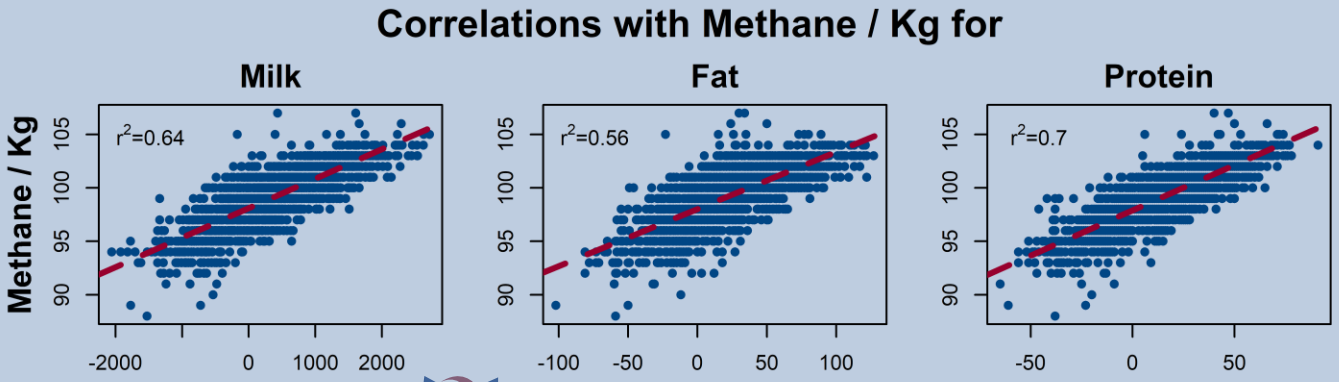
- For methane 1 standard deviation
  - g/day = 39.1g
  - g/kg FPCM = 1.32
  - Residual (corr. FPCM) = 38.0
  - Residual (corr. DMI) = 38.3

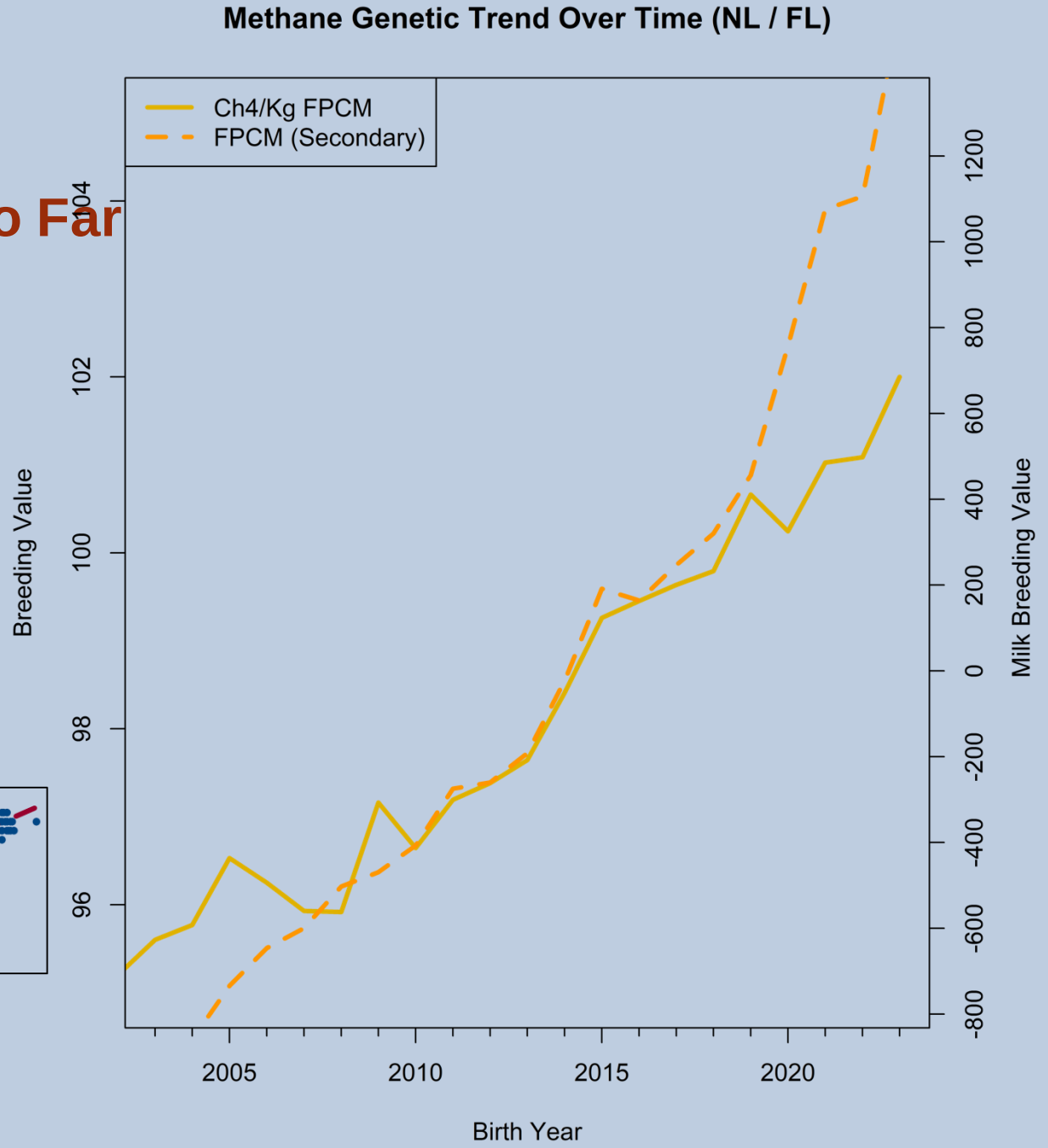


BETTER COWS > BETTER LIFE

The Genetics of Methane : The Story so Far

- Significant gains have been made in gCH_4 KgFPCM $^{-1}$ ~ 0.32 units year^{-1}
- Period 2003-2023
  - 0.1g CH4 per Kg FPCM Per Year (2g)
  - 13% of 13.5 g (NIR 2019)

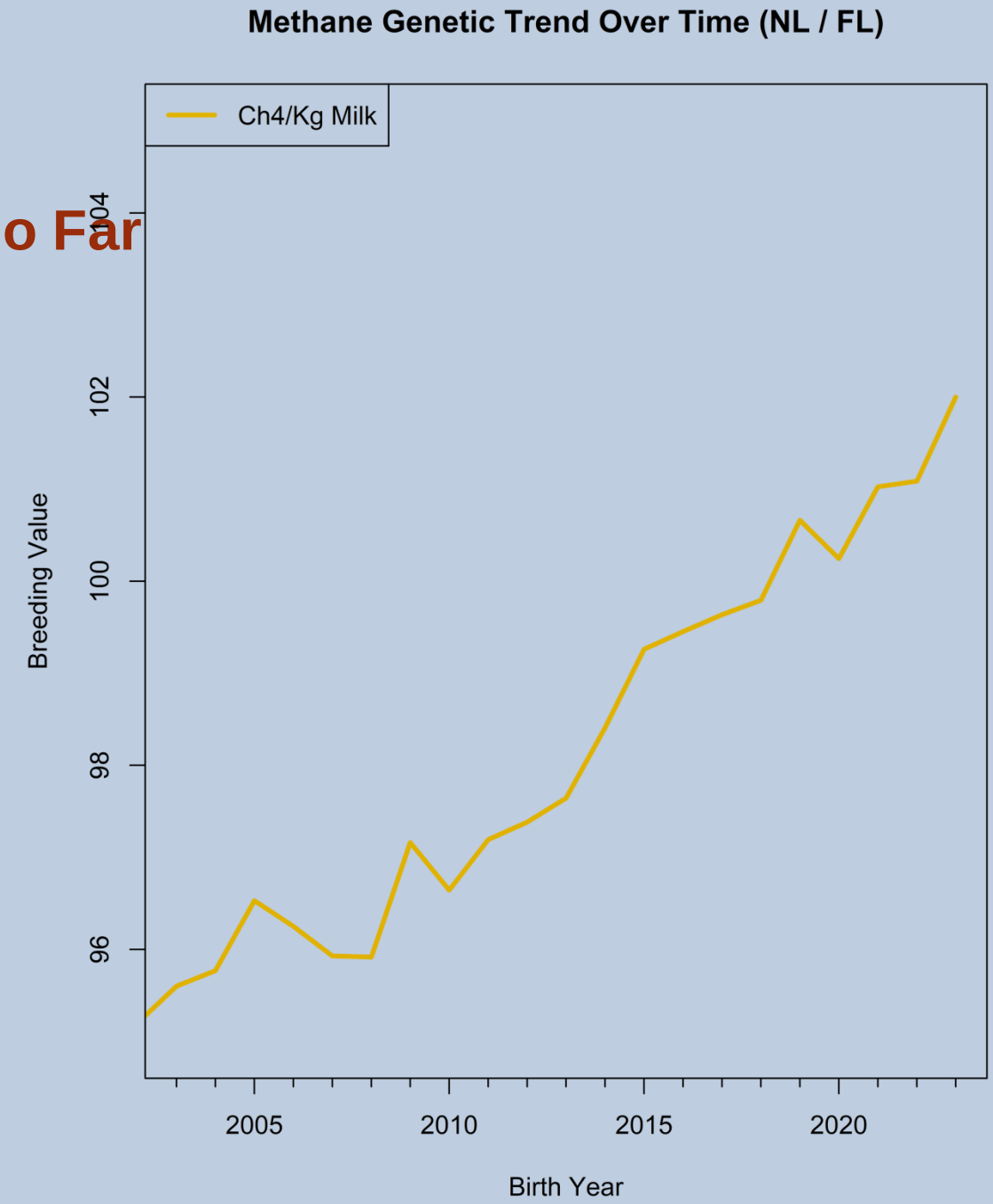




BETTER COWS > BETTER LIFE

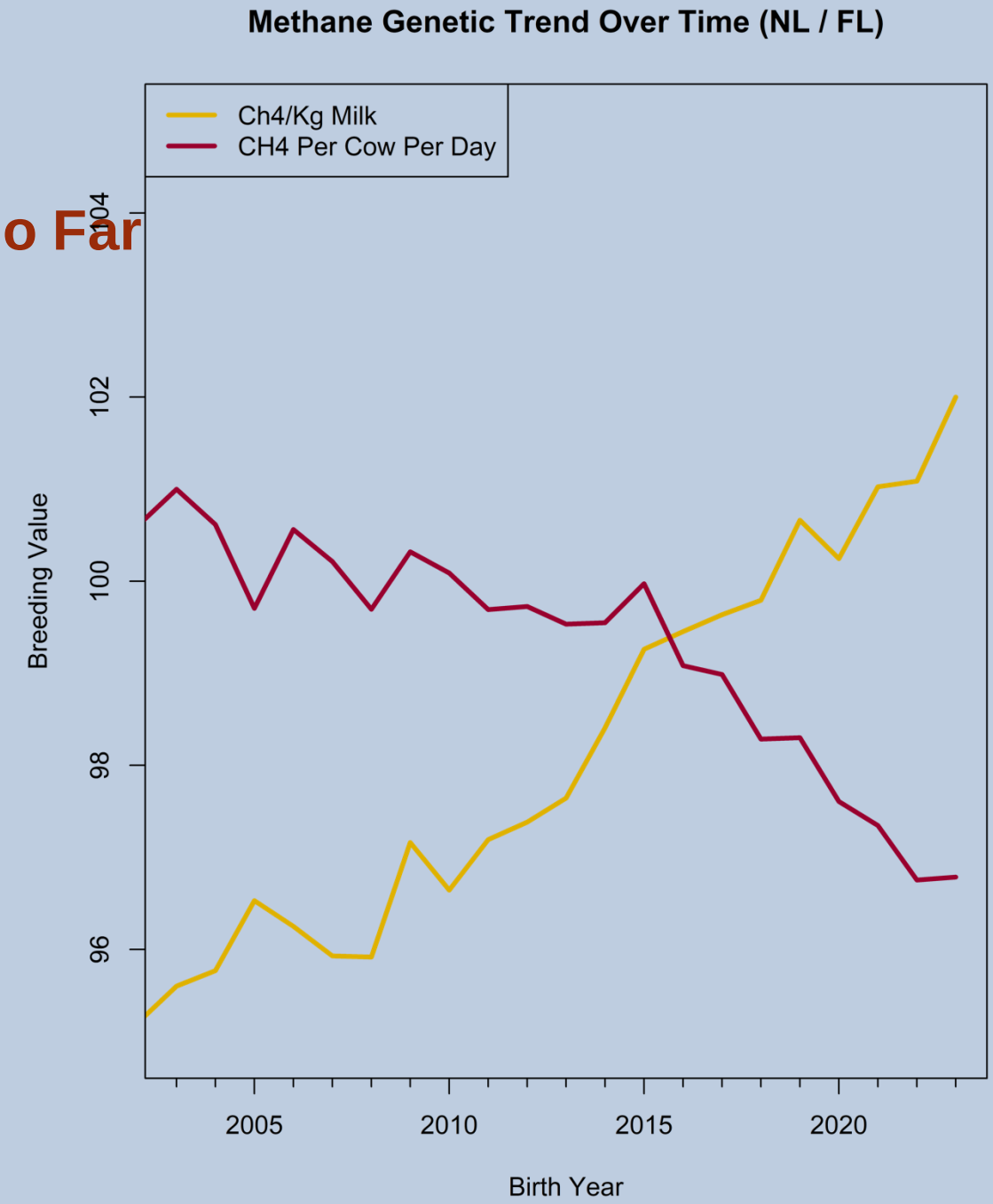
The Genetics of Methane : The Story so Far

- Significant gains have been made in gCH_4 KgFPCM $^{-1}$ ~ 0.32 units year^{-1}
- Equates to improvement of:
  - 0.1g CH4 per Kg Milk Per Year
  - In the period 2003-2023 this equates to a reduction of 2 g methane per litre
  - 13% of the estimate in the National Inventory Report (2019) of 13.5 gCH_4 KgFPCM $^{-1}$
  - Half of the observed reduction since 1990



The Genetics of Methane : The Story so Far

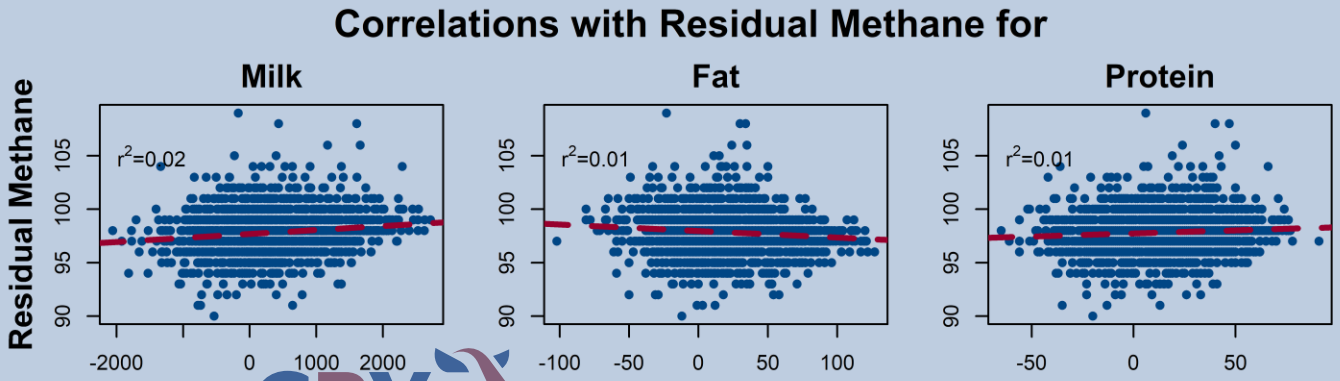
- As a consequence (genetically) methane per cow is increasing.
- Between 2003 and 2023:
  - 4.2 BV Points, 1.05 genetic sd, 41.19 g CH_4 Per Day
  - 15,036g Per Cow Per Year
  - 22,554 tonnes of Methane (1.5 Million Cows)
  - 563,851 tonnes $C0_2$ equivalent

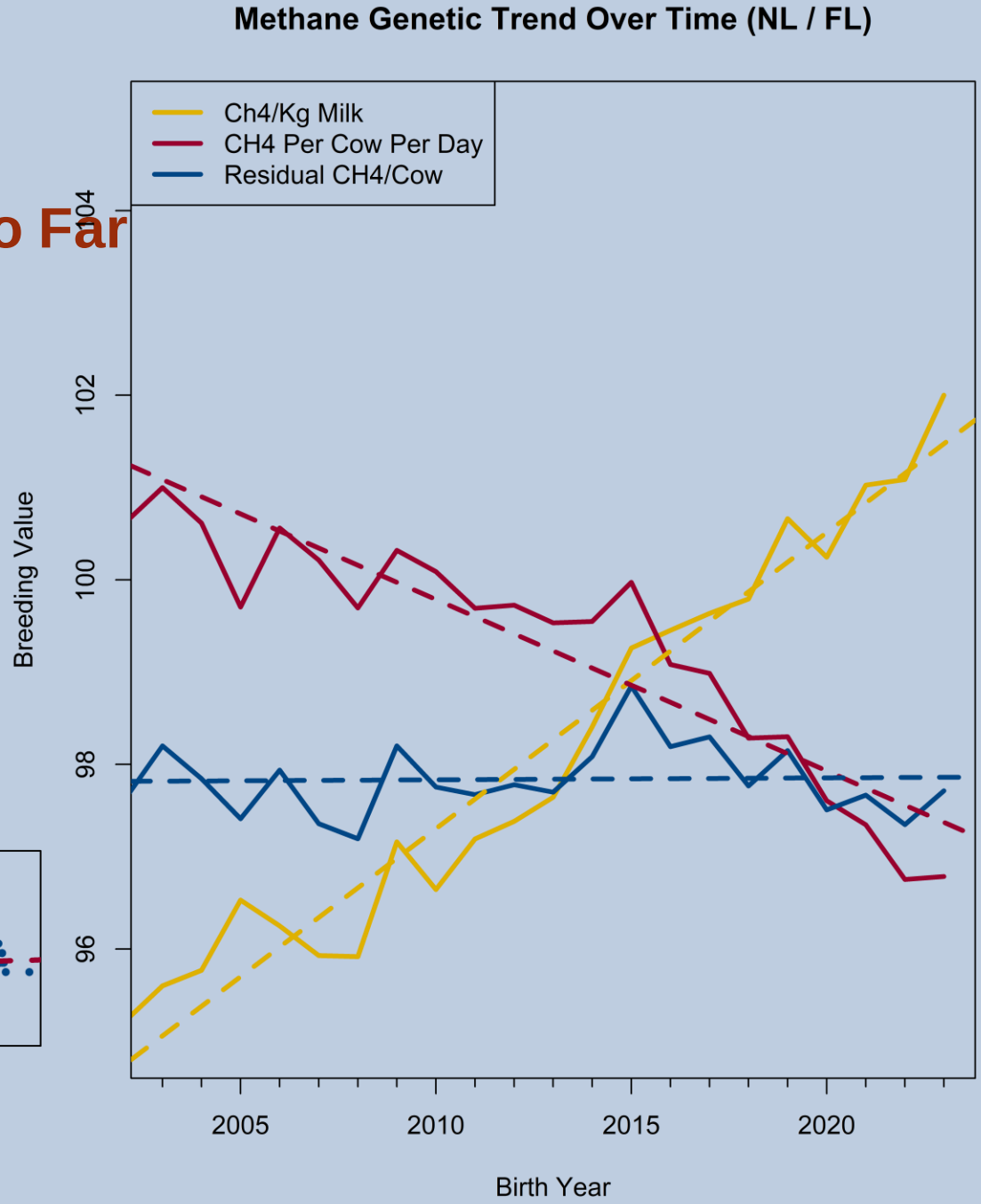


BETTER COWS > BETTER LIFE

The Genetics of Methane : The Story so Far

- Residual is uncorrelated with other traits and as a result hasn't been subject to selection
- This provides the basis to explore trends and the potential for programmes designed to reduce methane.



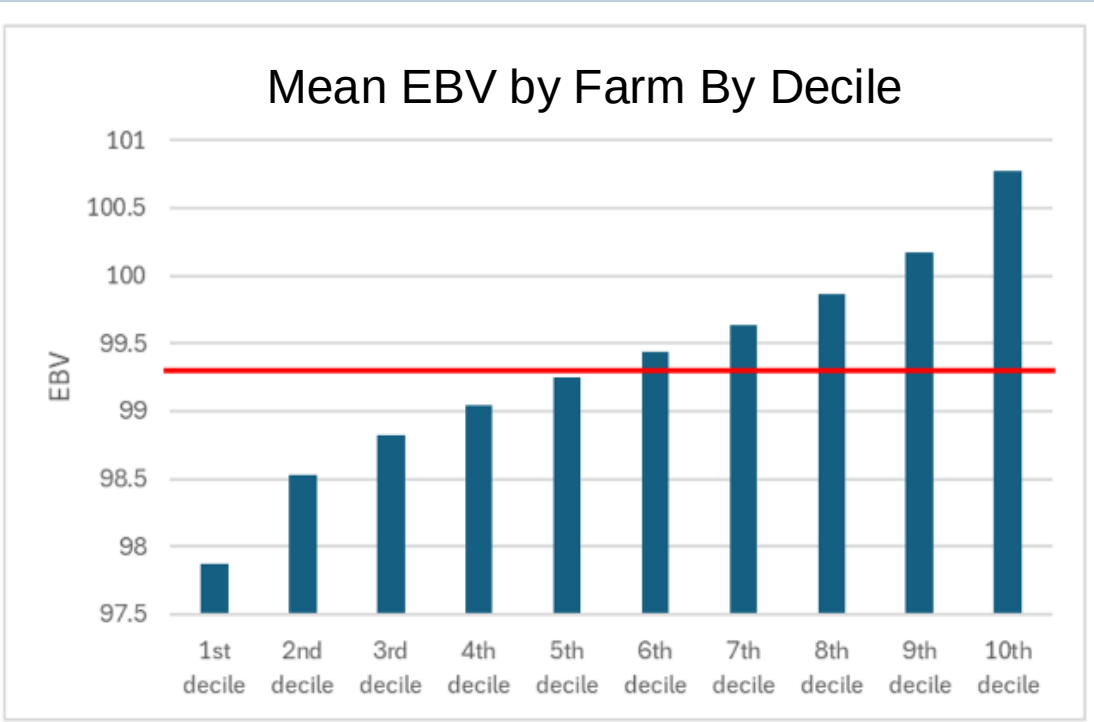


BETTER COWS > BETTER LIFE

Remuneration in the Supply Chain

Kringloopwijzer

- The kringloopwijzer is a body in the Netherlands that provides advice to dairy farmers on emissions.
  - Methane, Nitrogen, Carbon Dioxide, Phosphate
- Estimates based on indicators
  i.e. milk production, estimating DMI requirements from which an emissions estimate is calculated
- In January 2026 these estimates will be adjusted to account for the average genetic merit of the animals at a given farm.
  - A farm that averages animals 1 genetic standard deviation below the mean will have a 1% reduction applied to the emissions total



BETTER COWS > BETTER LIFE

Remuneration in the Supply Chain

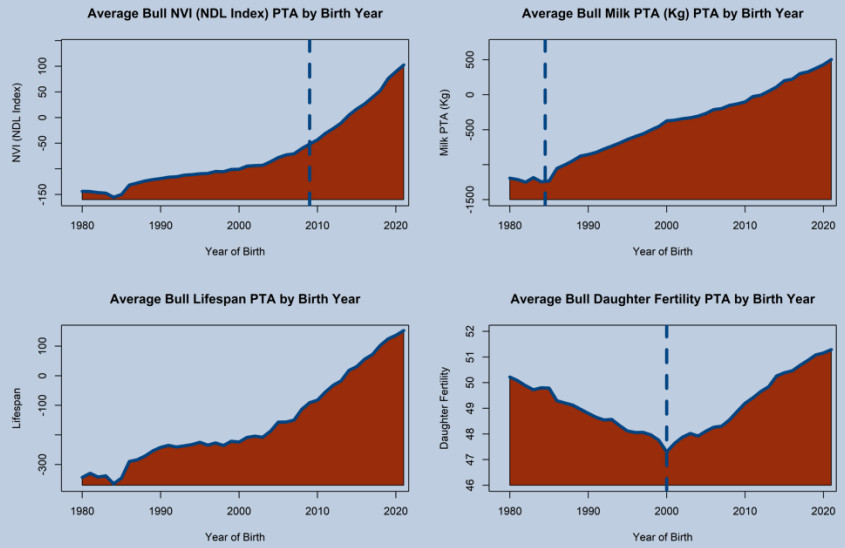
Friesland Campina

- Focus Planet rewards goals across 4 key areas of improvement:
  - Animal Health and Well-being, Climate, Biodiversity and Pasture
- Approximately
  - €2.63 per 100kg Milk is available for a 30% reduction in methane or 2.6 cents per litre.
  - Grams Per Day: 1 cow (~405g methane), 30%, 121g per cow, 30 litres (€0.79 cow, €0.0065 g CO_4, €0.25 genetic S.D)
  - Grams per litre: ~13.5 g/l at 30% = 3.06g which is 2.3 genetic S.D. for 2.6 cents or €0.0113 genetic S.D
- 1 genetic standard deviation in milk €750

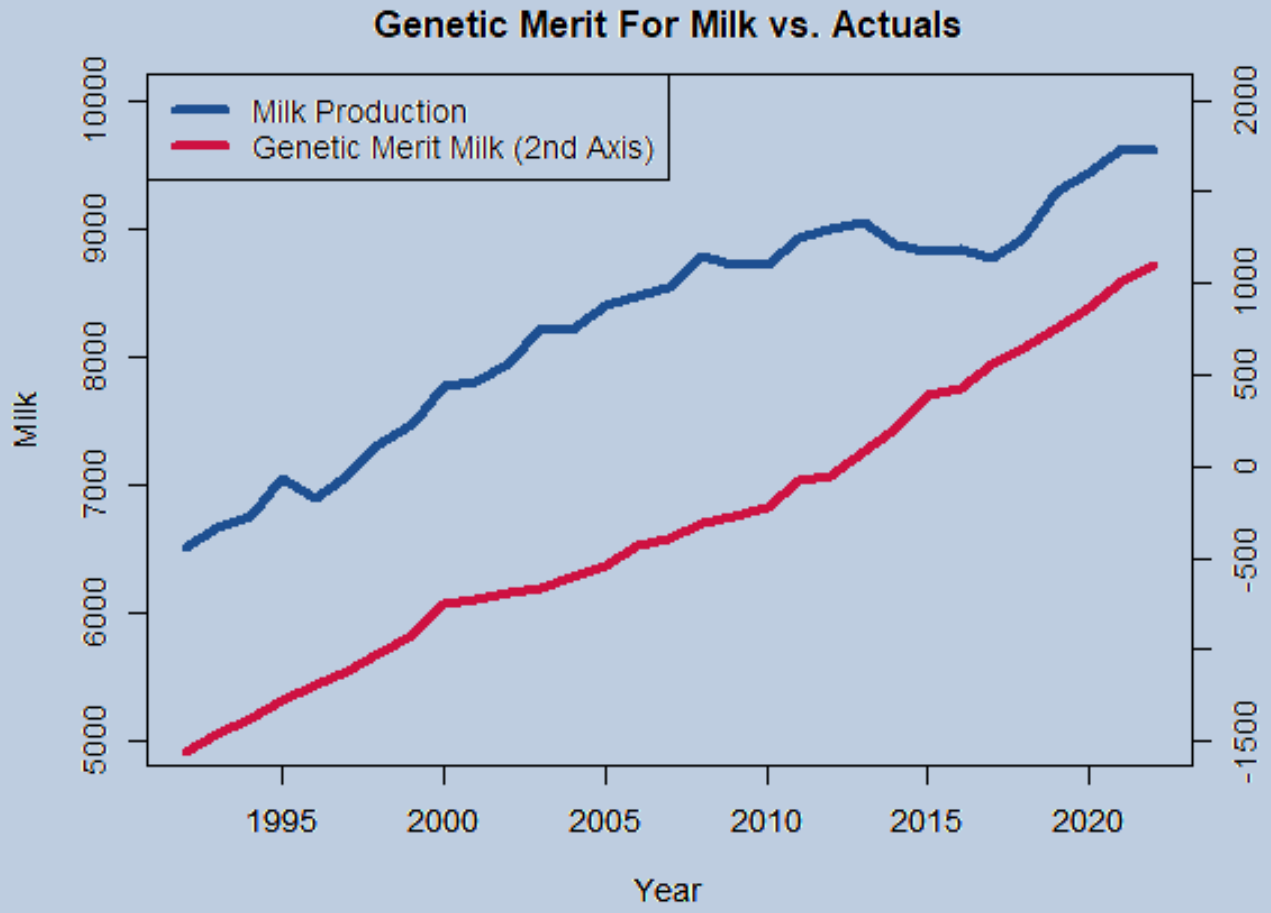
BETTER COWS > BETTER LIFE

The Role of Genetics in Dairying

- Genetics works!
- Not only does it work, it works better than anything else.



CRV Coöperatie Netherlands Flanders all bulls evaluated in system



BETTER COWS > BETTER LIFE

Summary

- Extensive phenotyping programme in the Netherlands for Methane
- Methane breeding value will be released in April 2025 in the Netherlands
- Significant value within breeding for a residual trait.
- This value will be recognised in independent auditing bodies like the Kringloopwijzer
- Valorisation models exist, however these probably aren't as effective for genetic improvement as for additives: more work is needed on the incentive models
- There is huge potential within genetics in building sustainable food production.

Acknowledgements

Larissa Zetouni (CRV R&D), Niek Meijer, Gerben de Jong (CRV Cooperative), Birgit Gredler-Grandl, Anouk van Breukelen, Yvette de Haas, Roel Veerkamp (Wageningen), Jeroen Heck (Friesland Campina)

BETTER COWS > BETTER LIFE