

Validation of national methane mid-infrared prediction equation

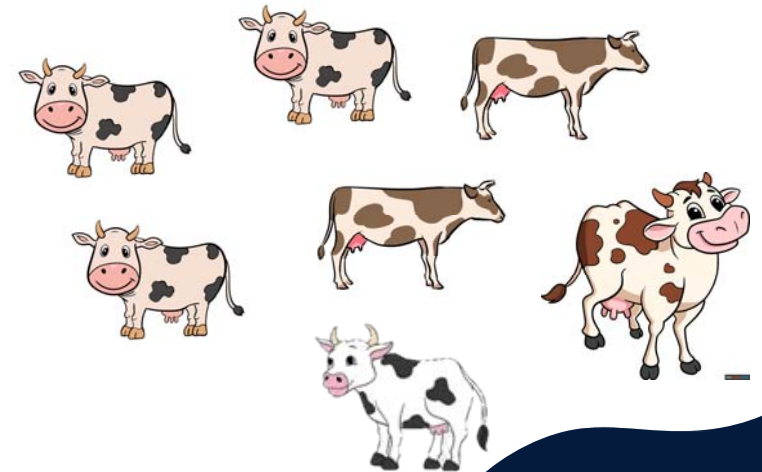
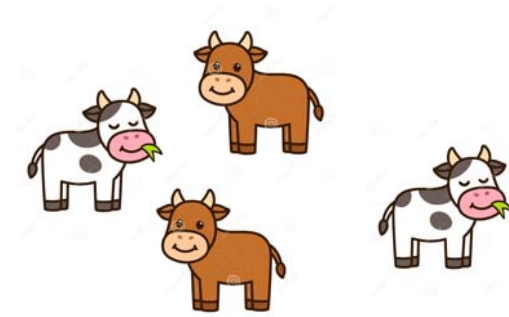
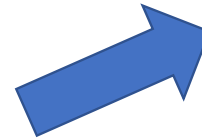
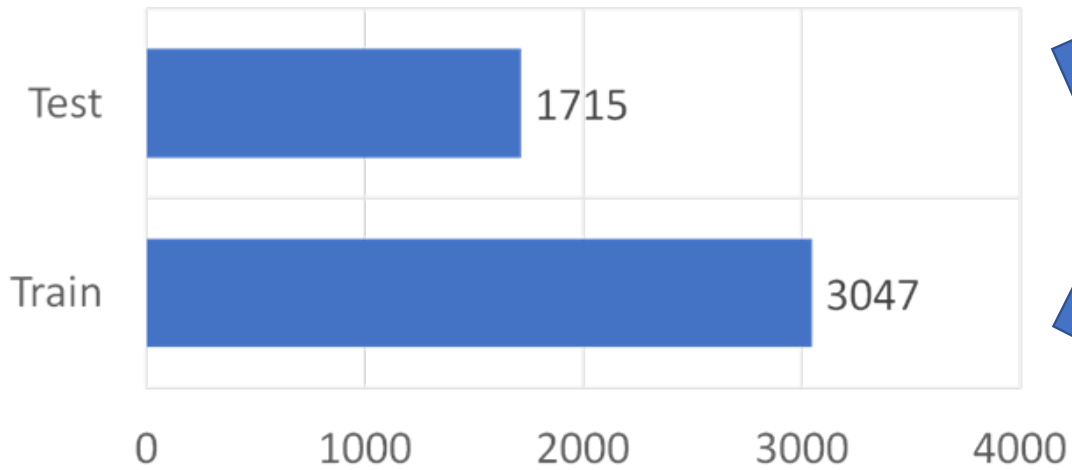
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Objective

Number of records



Predicting methane emissions of individual grazing dairy cows from spectral analyses of their milk samples

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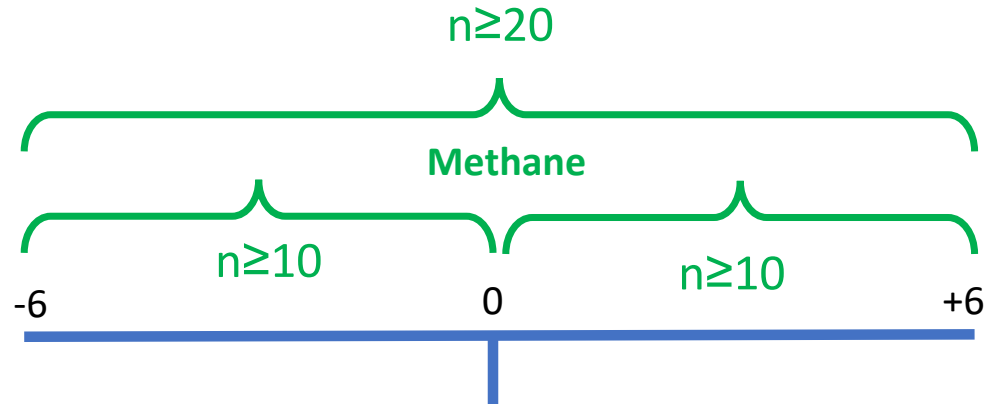
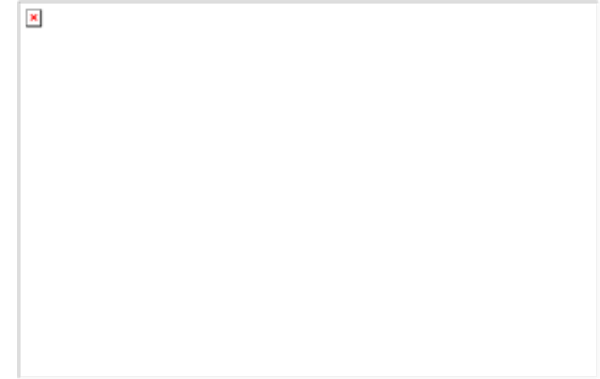
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Data

- 93,888 individual methane spot measures (>2 minutes)
 - 384 lactations from 277 dairy cows



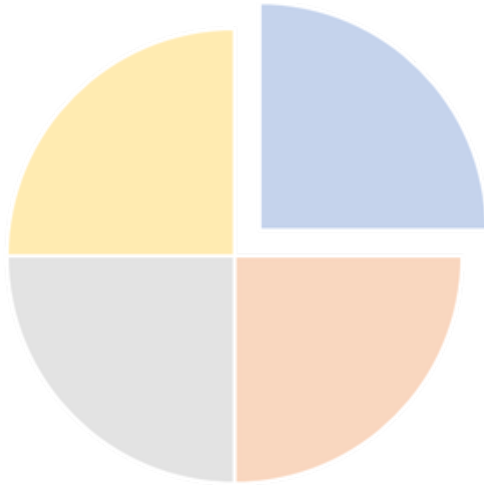
AM & PM Milk sample

- Yield & composition
- Spectrum
- Days post calving

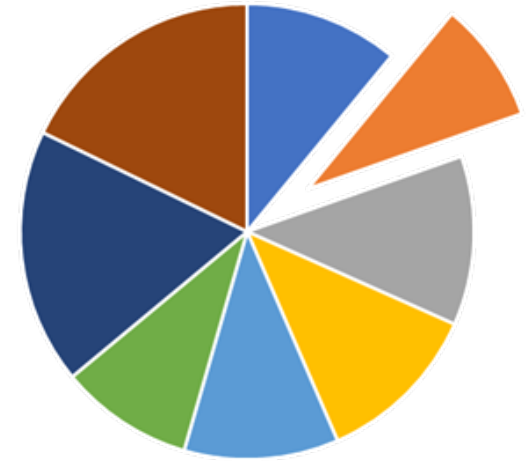
AM only
PM only
AM+PM
AM&PM

Approach

Four fold cross-validation



One farm out



$$\text{Methane} = \int (\text{spectrum, days in milk, yield, fat\%, protein \%})$$

Partial least squares or neural networks

Results

- $\mu = 323.4 \text{ g/d}$
- $\sigma = 75.2 \text{ g/d}$
- Average of 30 spot measures to ± 6 days
 - 111 minutes
- Repeatability = 28%

- Little difference
 - AM v PM, neural networks v partial least squares
- Flanking 6 days > previous 6 days > subsequent 6 days

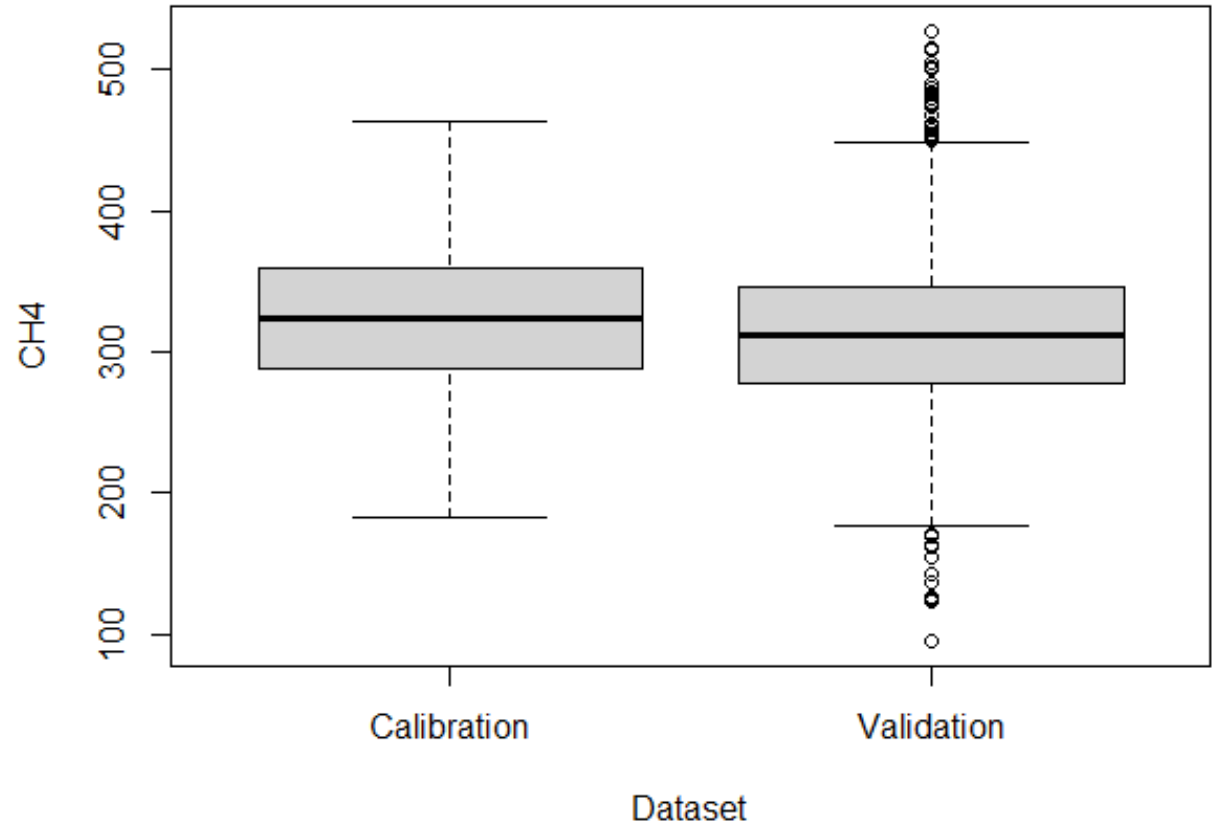
Results

Model	No spectra	With spectra
Spectra		0.55 (0.07)
DIM	0.32 (0.13)	0.55 (0.06)
Yield	0.10 (0.18)	0.64 (0.05)
Composition	0.32 (0.13)	0.57 (0.06)
DIM + yield	0.52 (0.10)	0.64 (0.06)
DIM + composition	0.41 (0.10)	0.55 (0.06)
Yield + composition	0.32 (0.07)	0.62 (0.05)
DIM + yield + composition	0.54 (0.09)	0.64 (0.05)

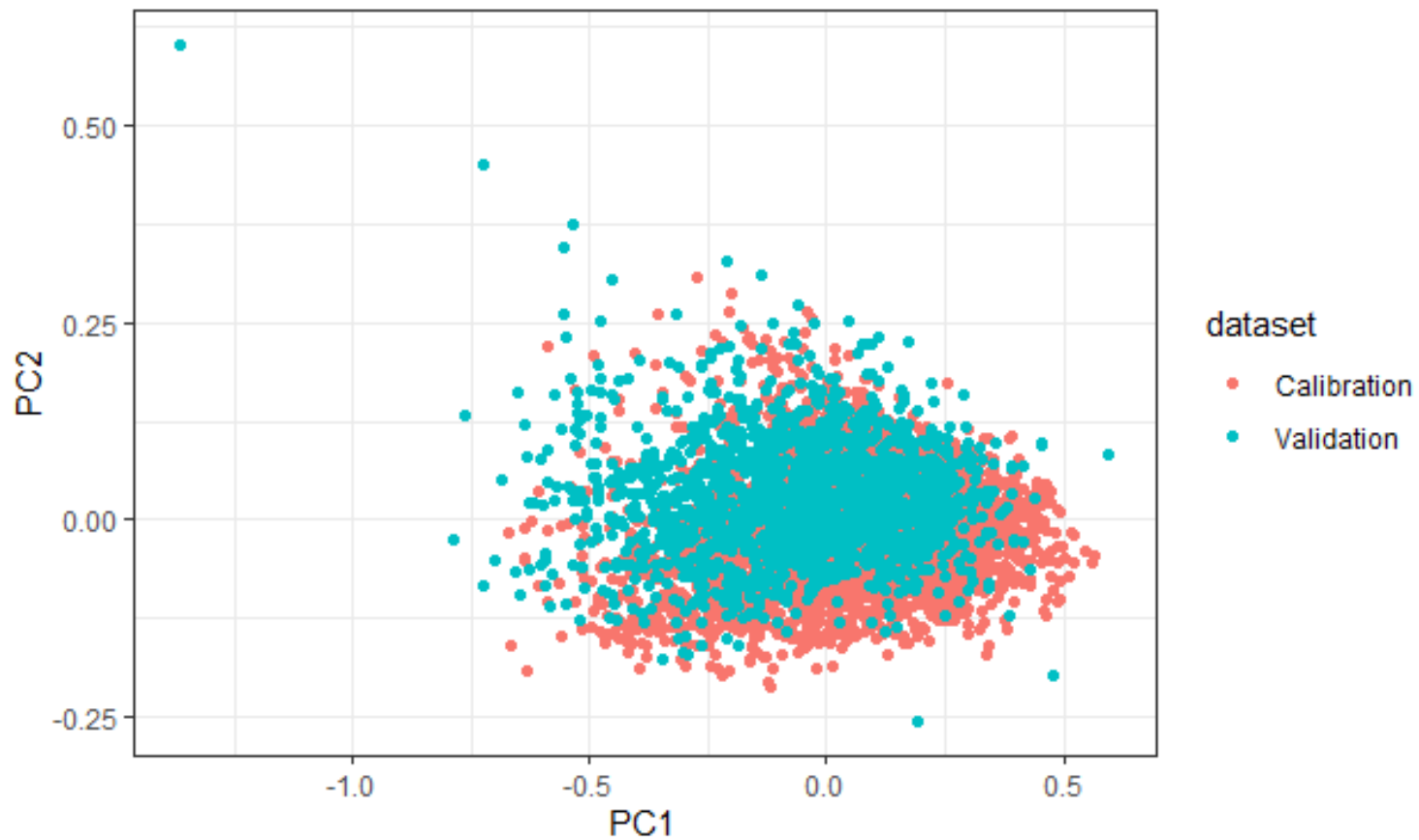


Validation dataset

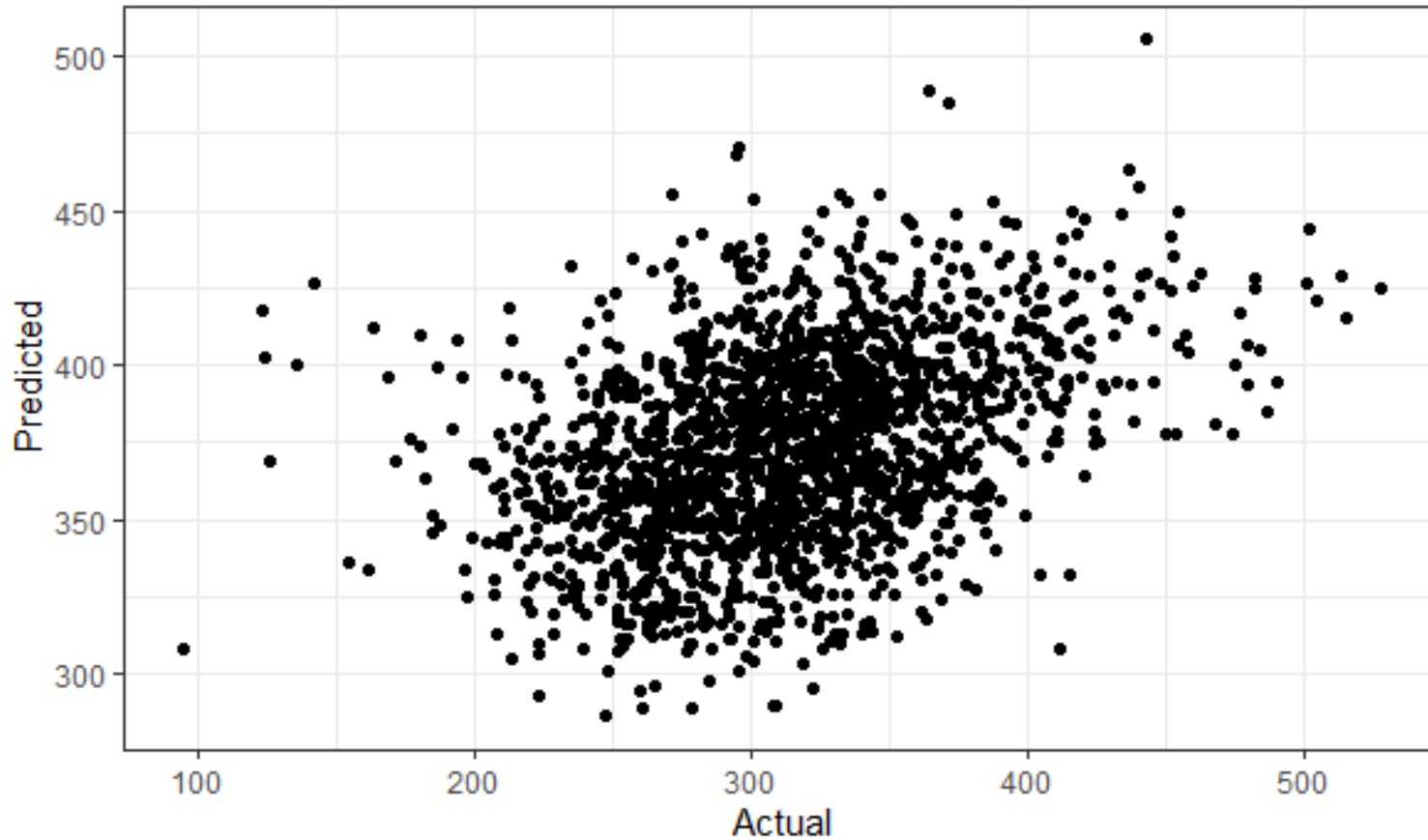
- Calibration
 - N = 3,047
 - From 2020 to 2022
- Validation
 - N = 1,715
 - From 2023



Validation dataset



Results



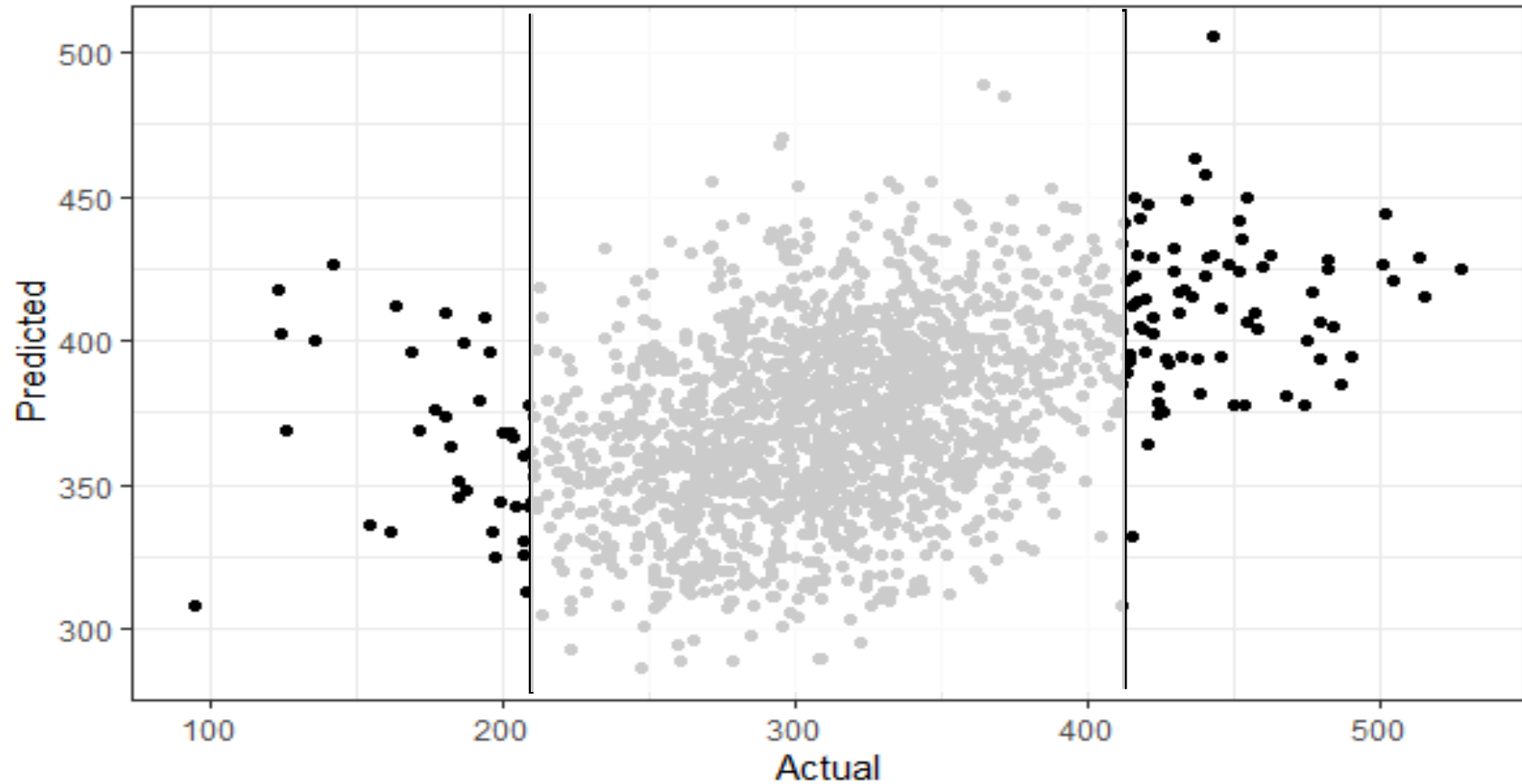
- Correlation between actual and predicted of 0.38 *
- Root mean square error of 78.76 g/d

* Correlation in the training dataset of 0.64

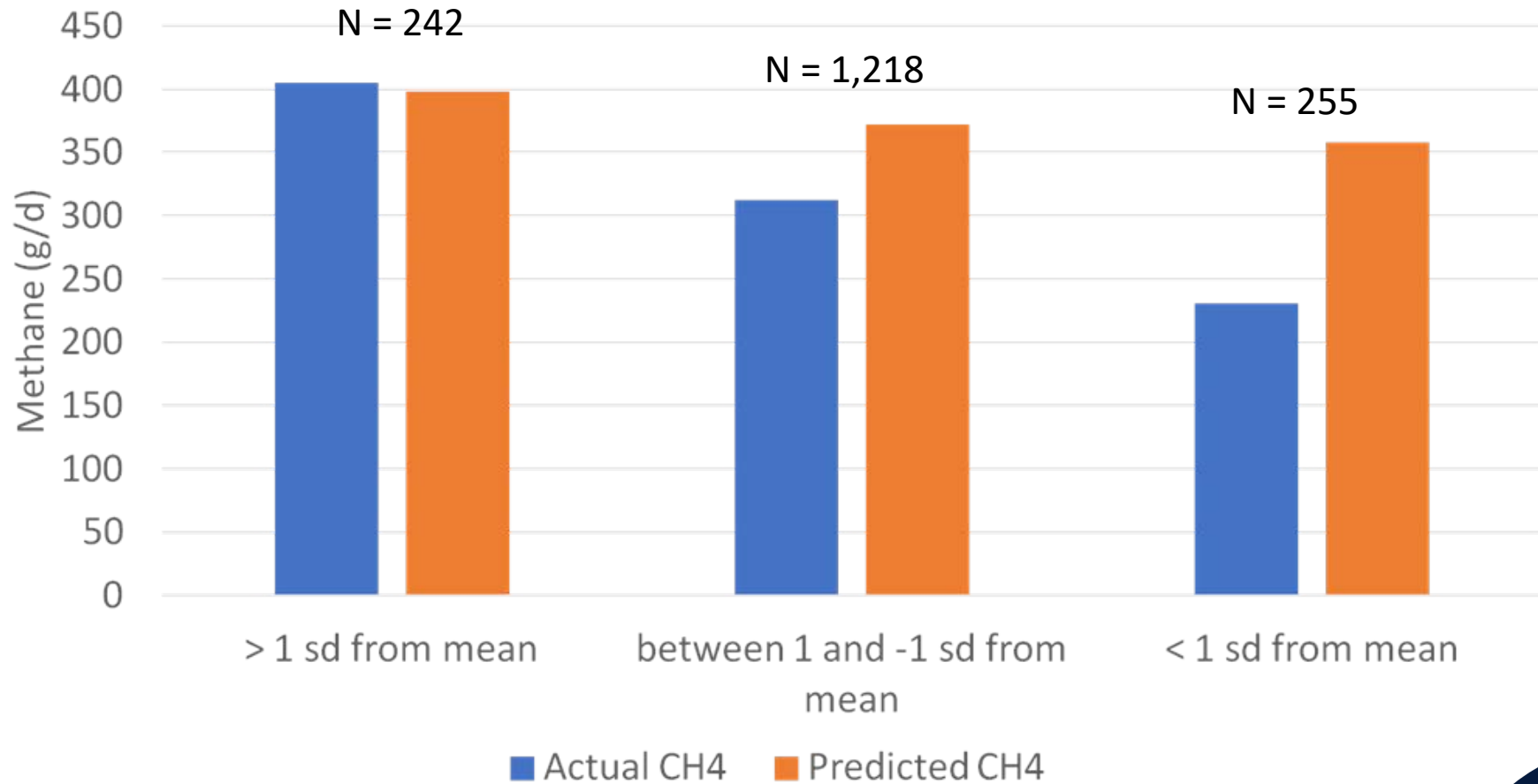
Results

Low 10%
emitting cows

High 10%
emitting cows



Results



Conclusions

- Accuracy of the prediction relatively low
- Ability in identify high and low emitting cows
- Ability in identifying groups of cows

