

Validation of a new estimation equation for nitrogen excretions of dairy cows with on-farm data

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Introduction

- Aim of “**MoMiNE**” project: improvement of estimation of **nitrogen excretions** of dairy cows in Germany
- current equation: Bannink & Hindle, 2003 → based on milk data from the Netherlands
- new equation: **Honig et al., 2024** → based on data from research stations in Germany (1,628 cows; project **eMissionCow**, 2018-2021)



$$\text{N-excretions (g/d)} = -235.2 + 4.8 \times \text{milk yield (kg/d)} + 0.8 \times \text{milk urea content (ppm)} \\ + 84.1 \times \text{milk protein content (\%)} \text{ (for Holstein and Fleckvieh/Simmental)}$$

- equation is made to predict N-excretions of herds on a whole farm context with information from milk recordings only



Validation with on-farm data is needed to check applicability for individual feeding groups and single farm data.

Material + Methods

- 2 dairy farms from Mecklenburg-Western Pomerania (Germany)

Farm A (~ 320 cows in milk)

Farm B (~480 cows in milk)

- Data collection: September 2023 – December 2024

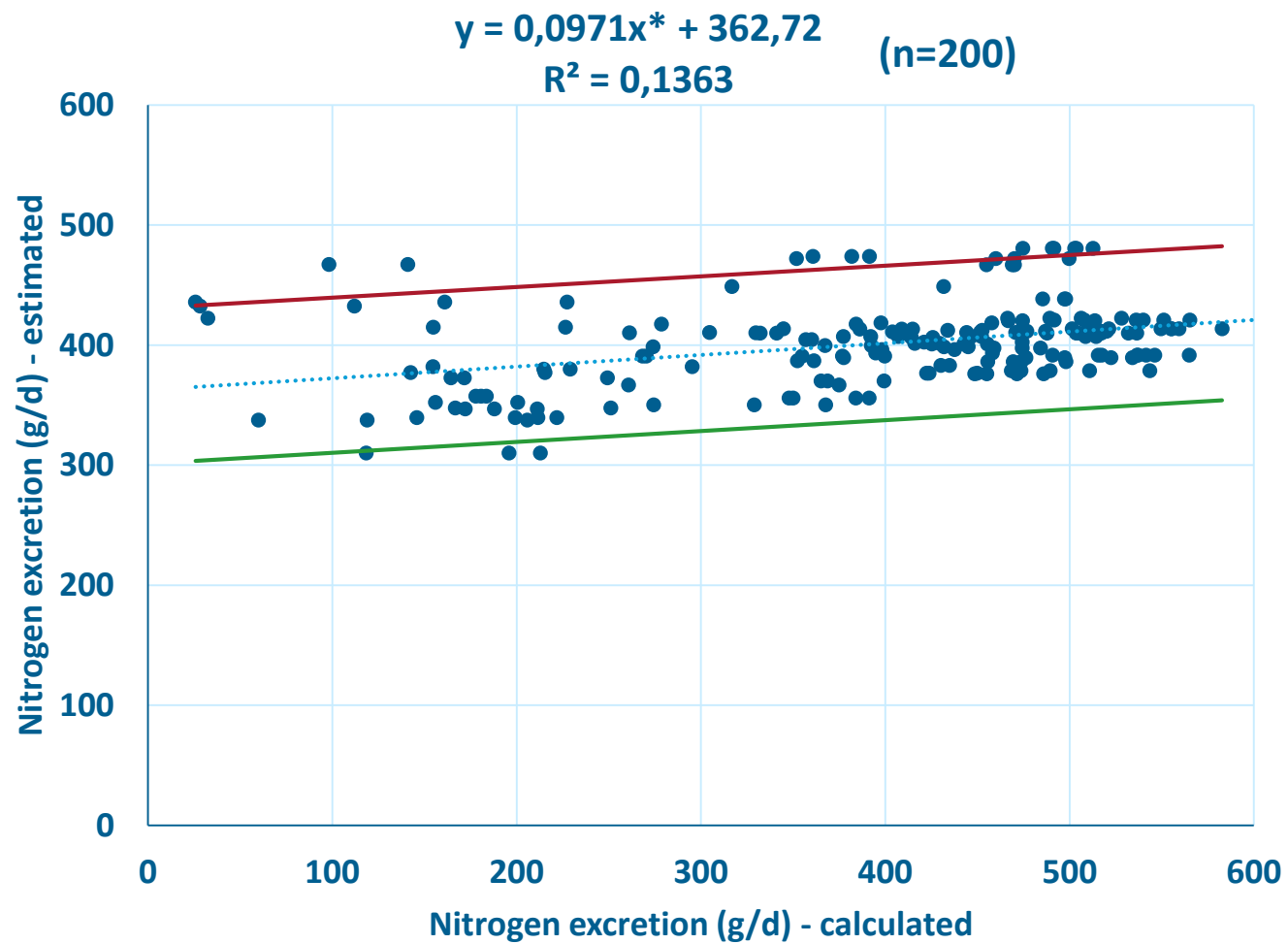
- **milk recording data** (1x per month -> **Farm A: 16 months**; **Farm B: 15 months**)
- information about **number of animals, average milk yield and days in milk (DIM) per feeding group**
- **rations** and their dates of changing
- **feed intake per feeding group** (**Farm A = daily**, **Farm B = weekly**)

- Data combination per feeding group → **n=200 (Farm A)**, **n=174 (Farm B)**

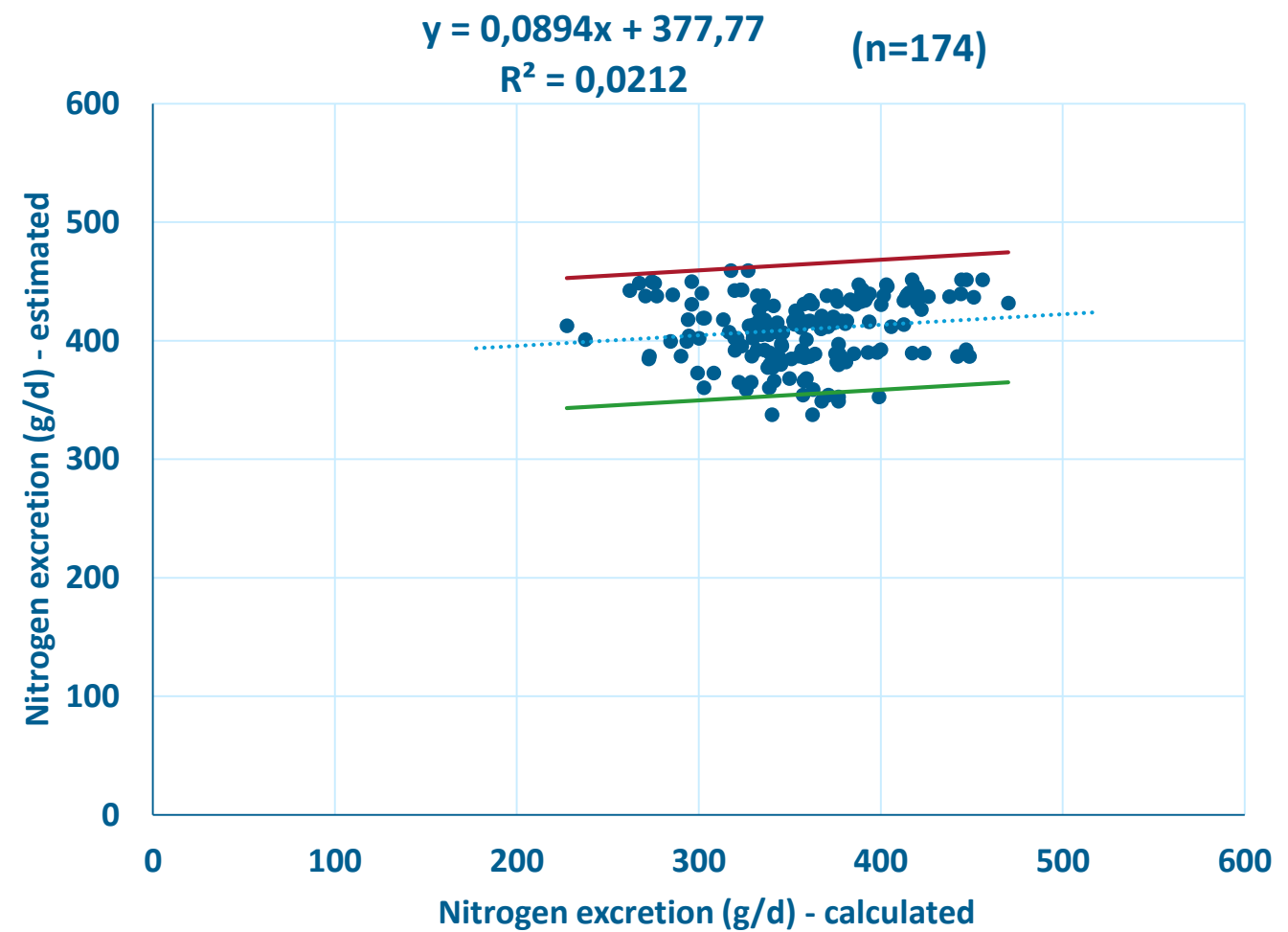
$$\text{nitrogen excretion} = (\text{crude protein intake} / 6.25) - (\text{milk protein} / 6.38)$$

Results → all feeding groups

Farm A



Farm B

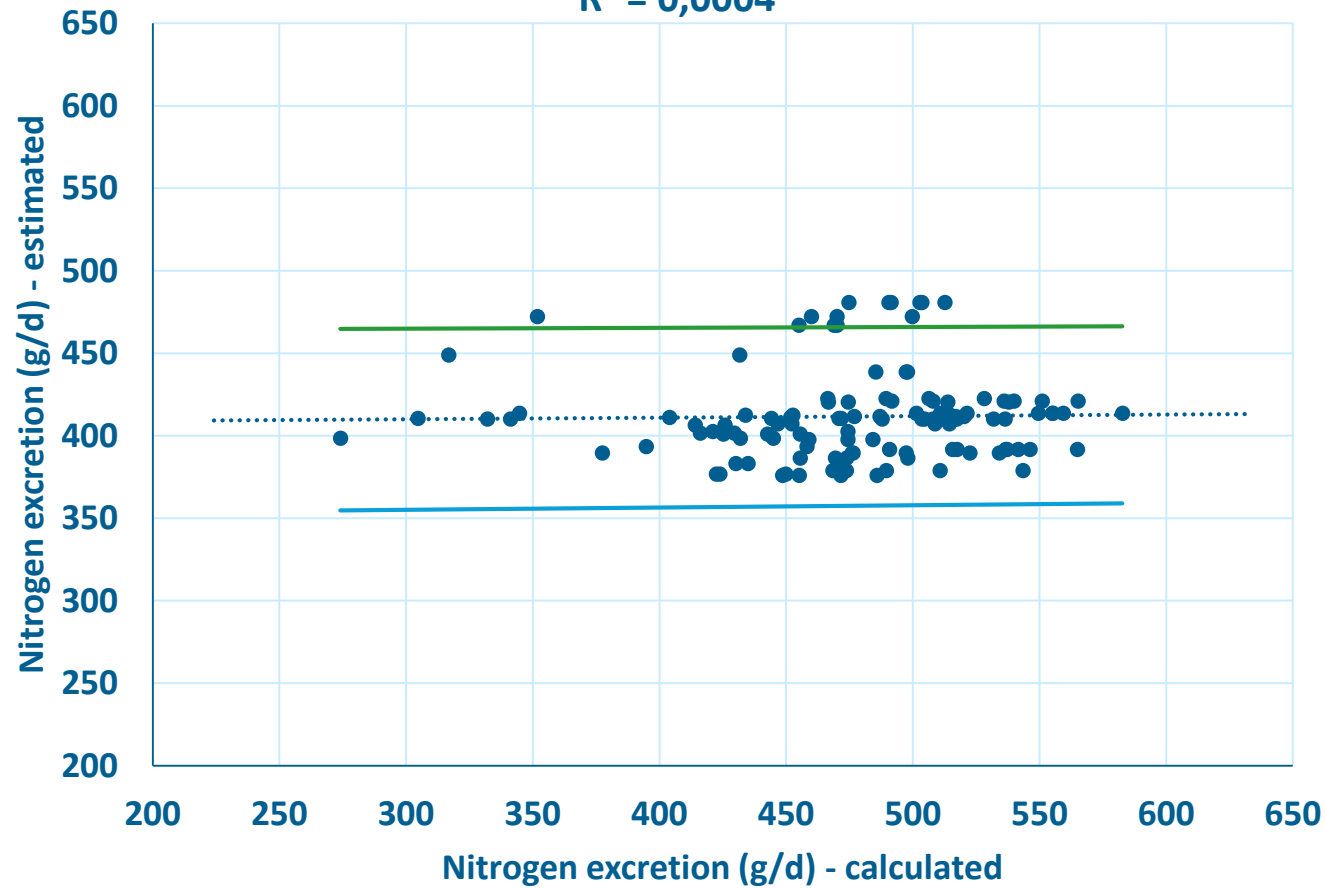


$$\text{nitrogen excretion} = (\text{crude protein intake} / 6.25) - (\text{milk protein} / 6.38)$$

Results → high yielding feeding groups only (without fresh and late lactation cows)

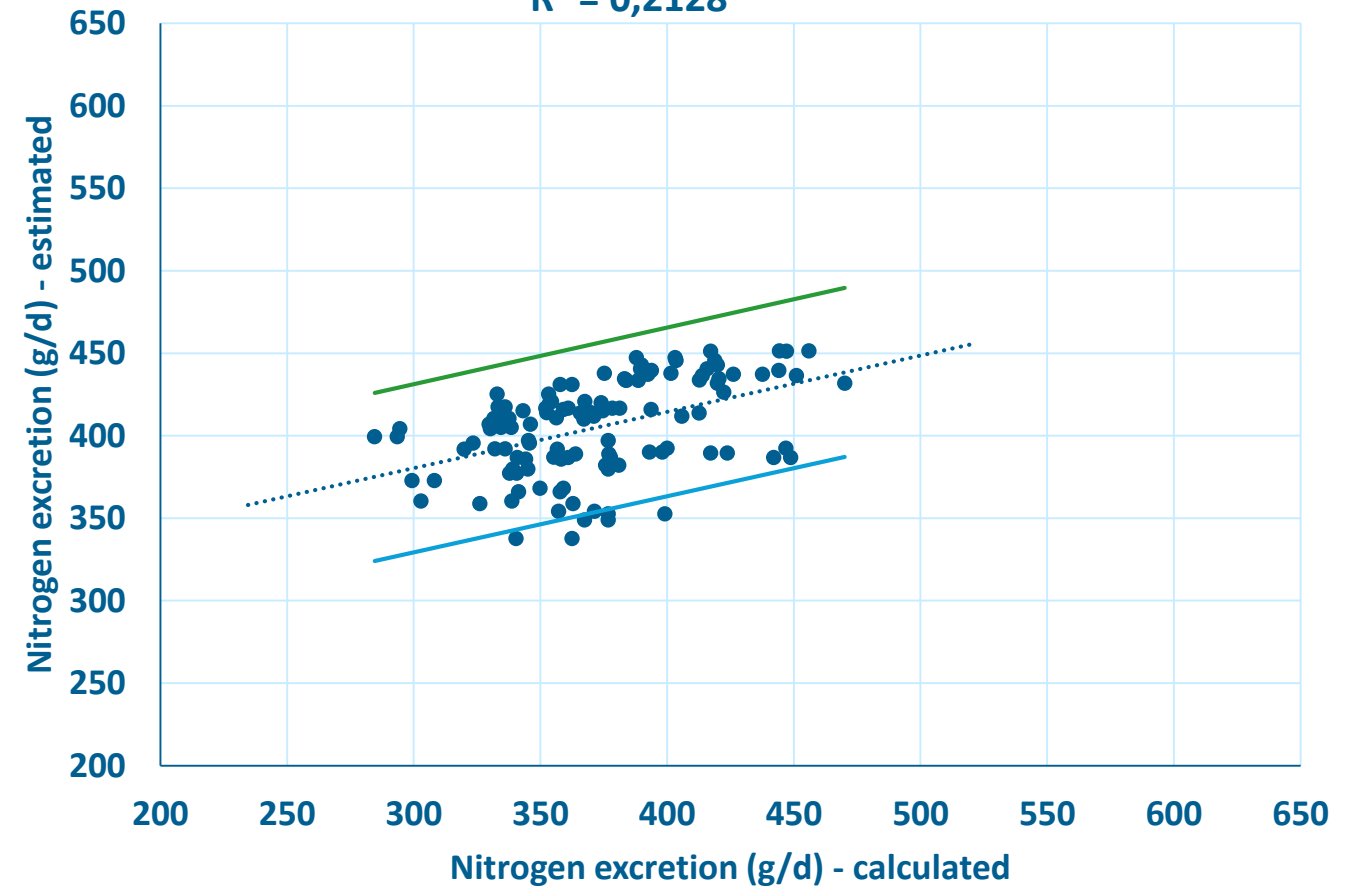
Farm A

$$y = 0,0093x + 407,23 \quad (n=120)$$
$$R^2 = 0,0004$$



Farm B

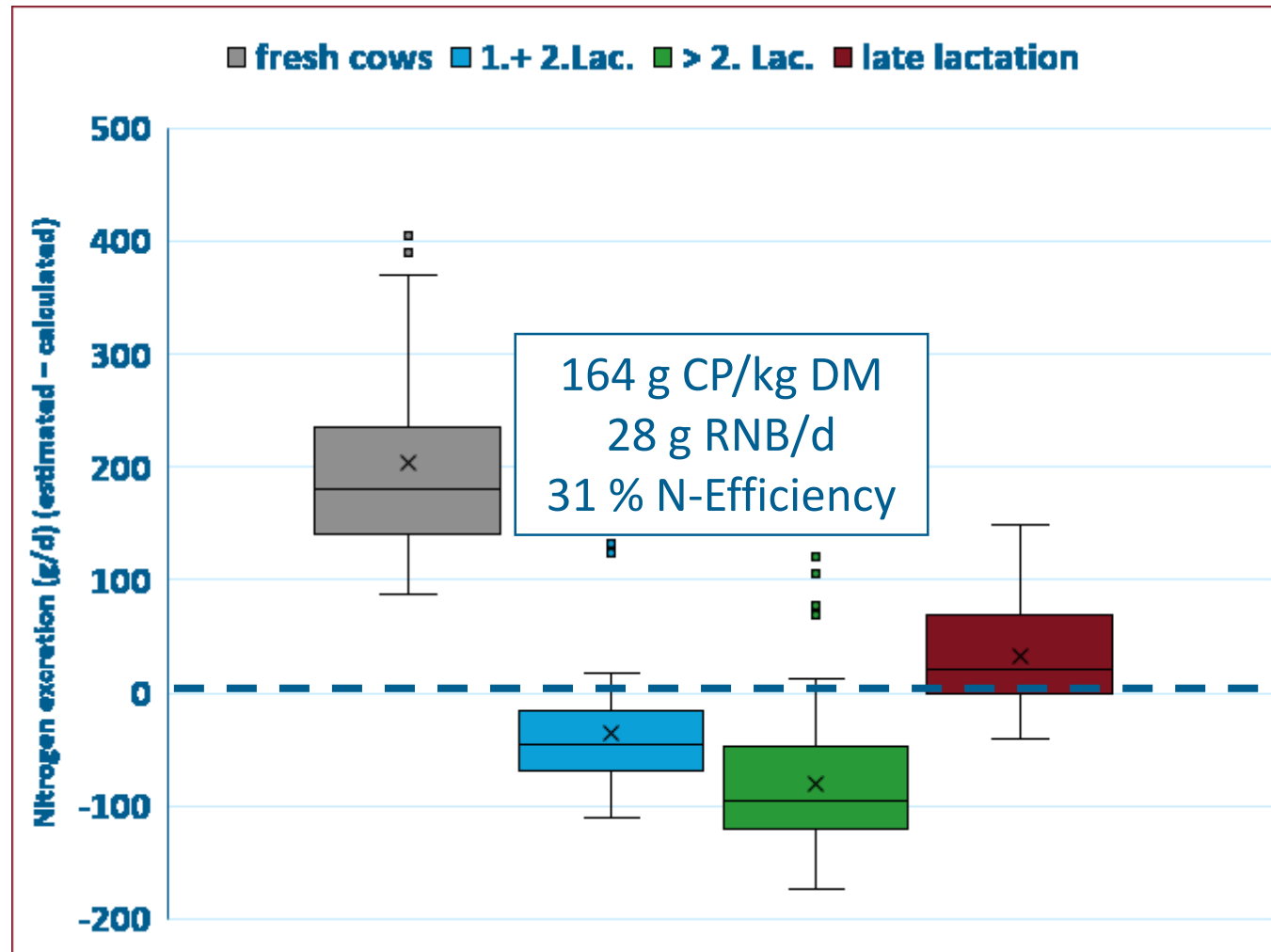
$$y = 0,3411x^* + 277,95 \quad (n=116)$$
$$R^2 = 0,2128$$



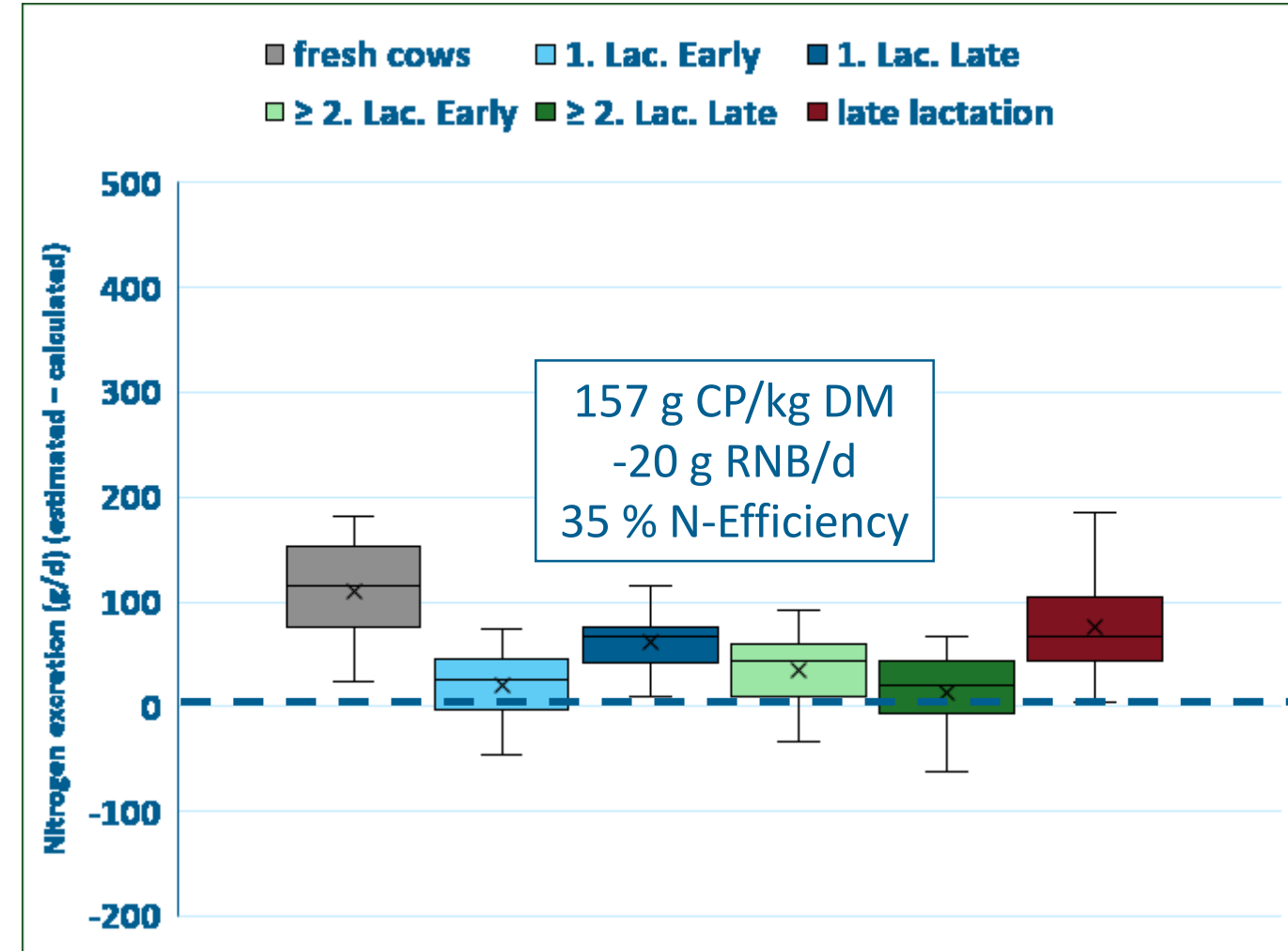
Differences between estimated and calculated nitrogen excretions

0: calculated=estimated; > 0: overestimated; < 0: underestimated

Farm A



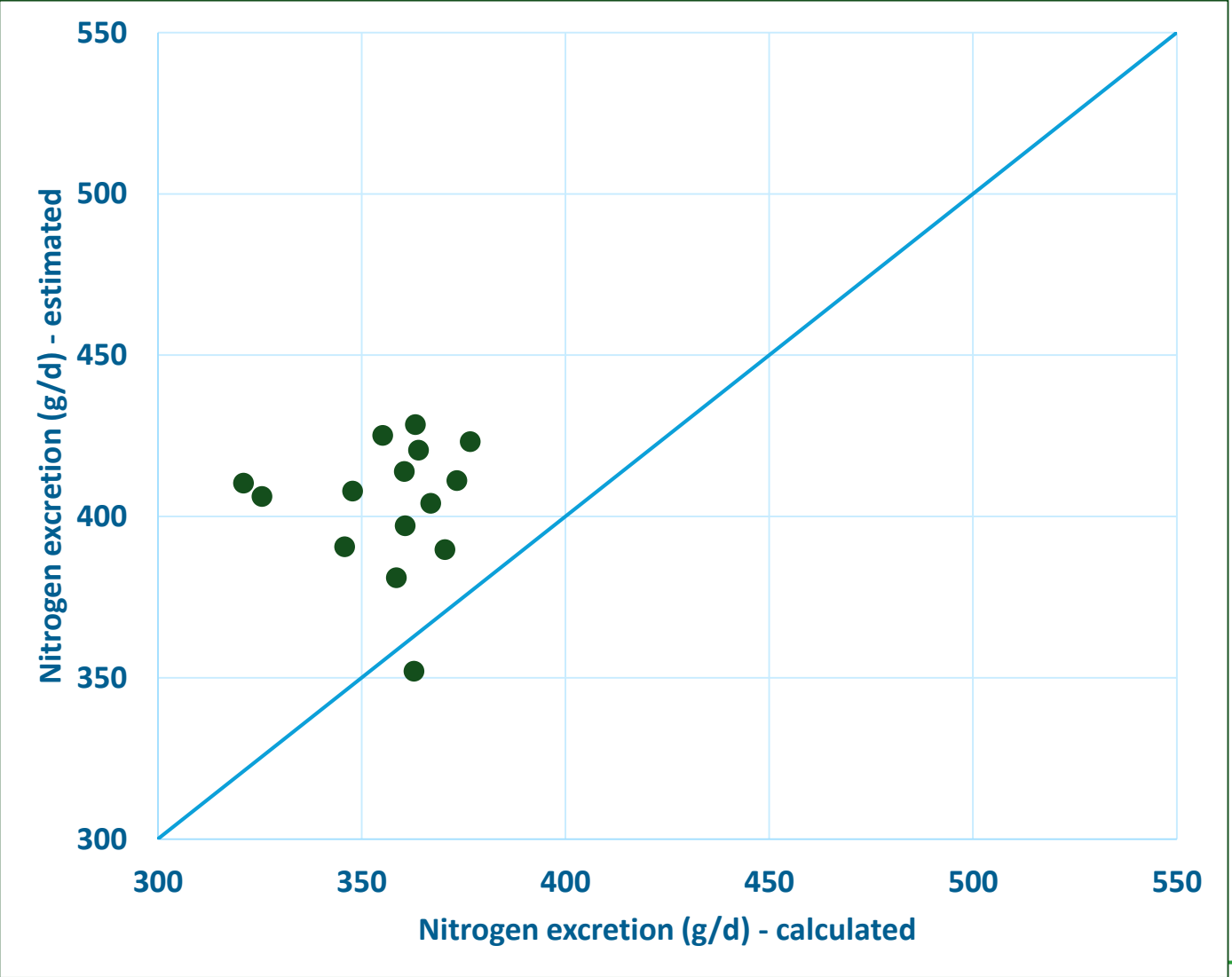
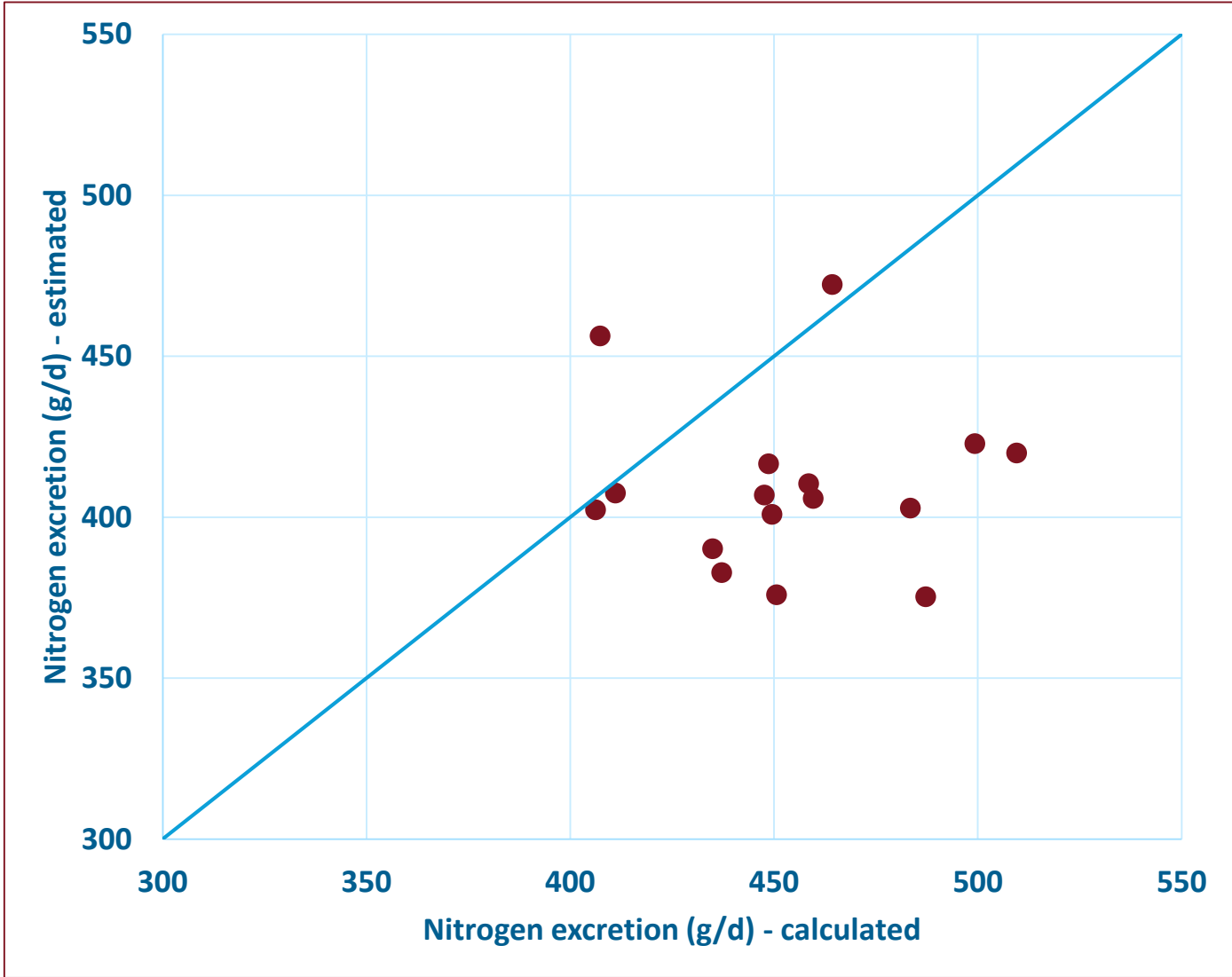
Farm B



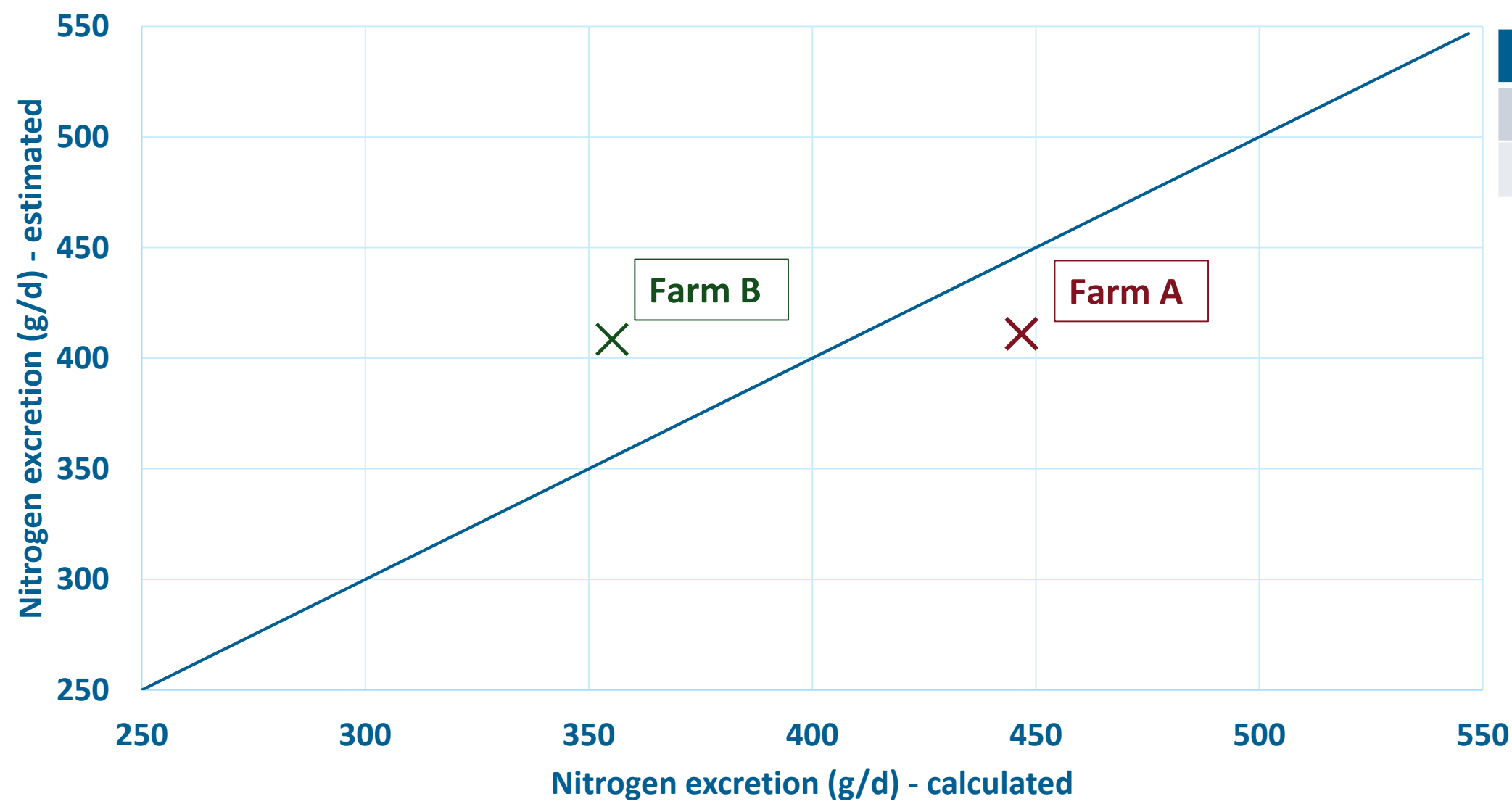
Use of weighted means per farm and month to prevent bias by feeding group (weighted by number of animals per feeding group)

Farm A (n=16)

Farm B (n=15)



Averages of all available weighted means per months per farm (n=16/15)



	Farm A	Farm B
Bias %	- 9,7	13,3
RMSPE %	37,5	41

Conclusions

- Data from more farms is needed to reduce the influence of individual farms on average values
- **Quality of estimation** is strongly influenced by feeding group and the strategy of protein feeding of the herd
- Modelling of estimation equation based on data from **research stations where milk urea was analysed by reference method**
 - > feeding that **deviates from recommendations and analyse of milk urea by mid-infrared absorption** can cause deviating estimates
- Scope of application of the new equation: estimation of **nitrogen excretions at farm or county level**
 - > **not suitable** for evaluating individual feeding groups, but rather annual averages at farm level



Thank you for your attention!



Mecklenburg-Vorpommern

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