

Methods to estimate genetics parameters related to nitrogen use efficiency and methane emissions in dairy cows

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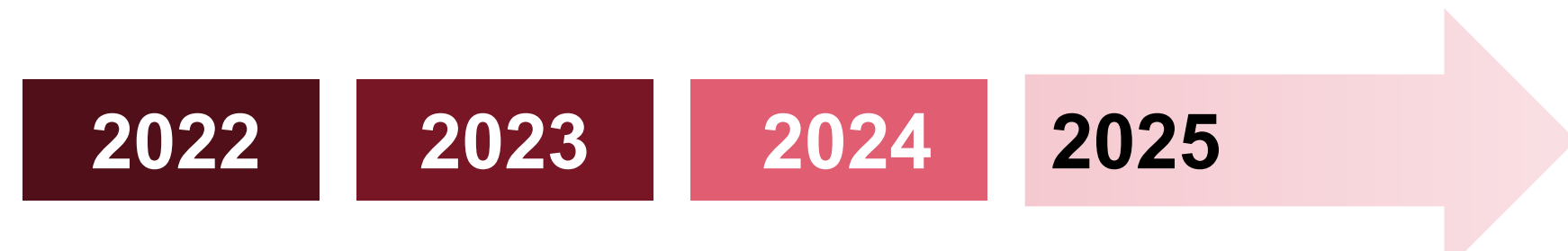
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Background

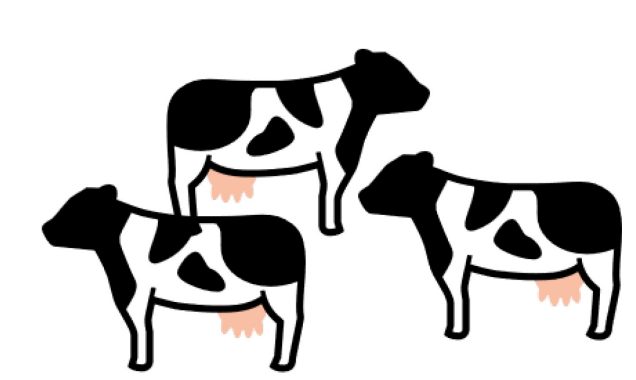
Dairy farming's environmental impact, notably nitrogen and methane emissions, prompts concern. If selecting cows for lower nitrogen and methane emissions becomes possible, sustainability could improve further. The presented project aims to estimate nitrogen use efficiency (NUE, milk N yield/N intake) and methane (CH₄) production and intensity from milk samples, estimate heritability of these traits, and identify traits for co-selection by estimating genetic correlations of NUE and CH₄.

Animals, Material and Methods

• **Duration of experiment:**



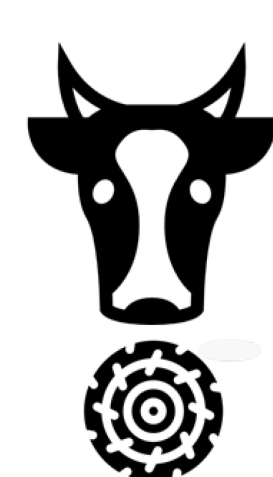
• **Holstein cows (lactation day 90 – 250)**



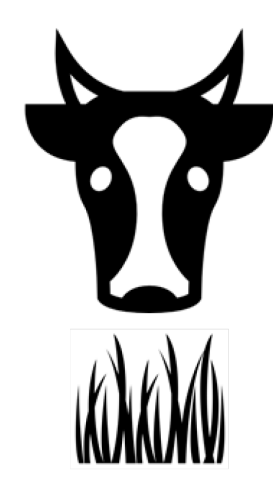
2'500 – 2'500
173 from historical data in Posieux
1, 425 from the current study

• **Participation of cantonal & private farms**

• **Ration depending on farm & season**



Silage

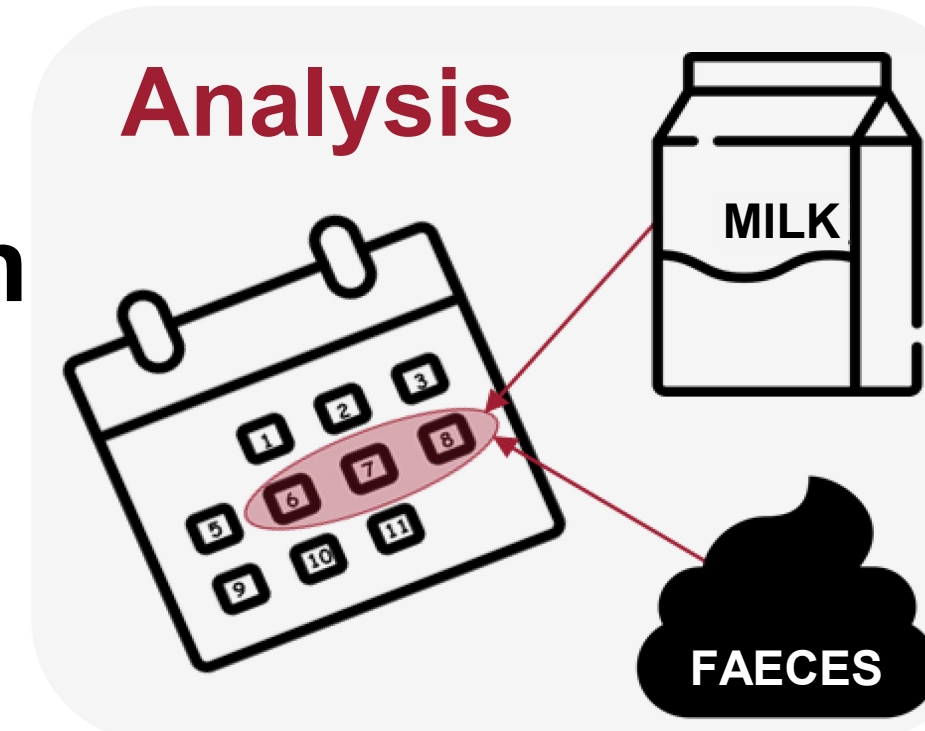


Pasture



Concentrate

• **Measuring period/cow: 3 days**



Feed analysis
1× per farm and measuring period



Phenotypes

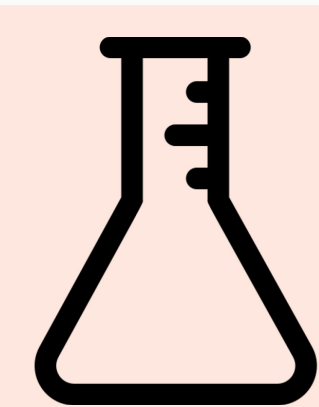
★ **Reference methods (with historical data and data from current study)**

"Gold standard" techniques are accurate but expensive, and feasible only for a limited number of individuals.

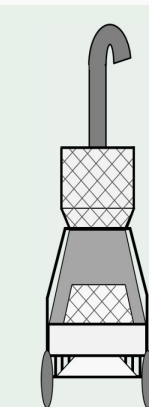
Nitrogen use efficiency

Weighing feed intake, chem. analysis of milk and feed

286 individuals



NUE measured



CH₄ measured

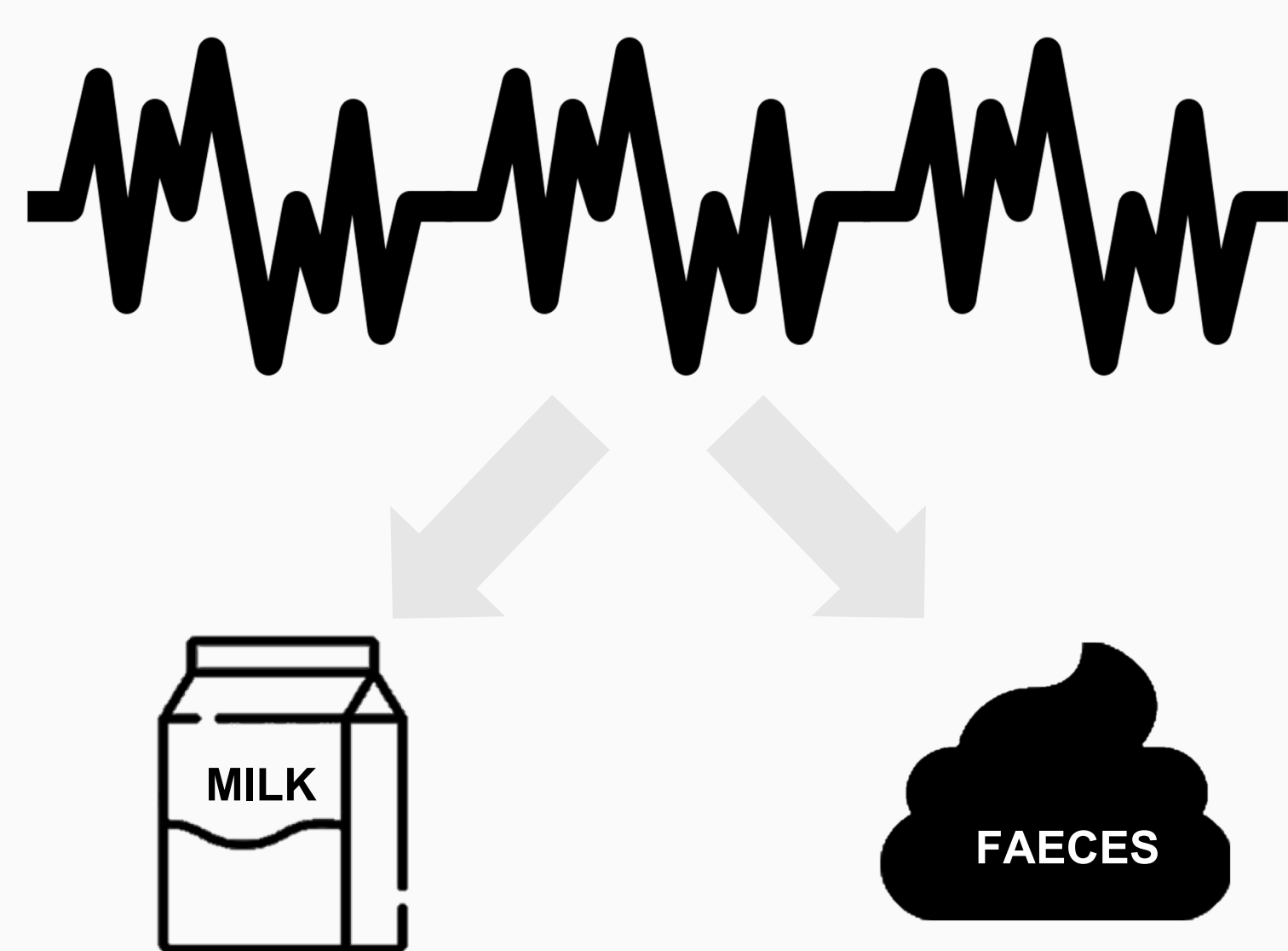
Methane emissions

Via GreenFeed®

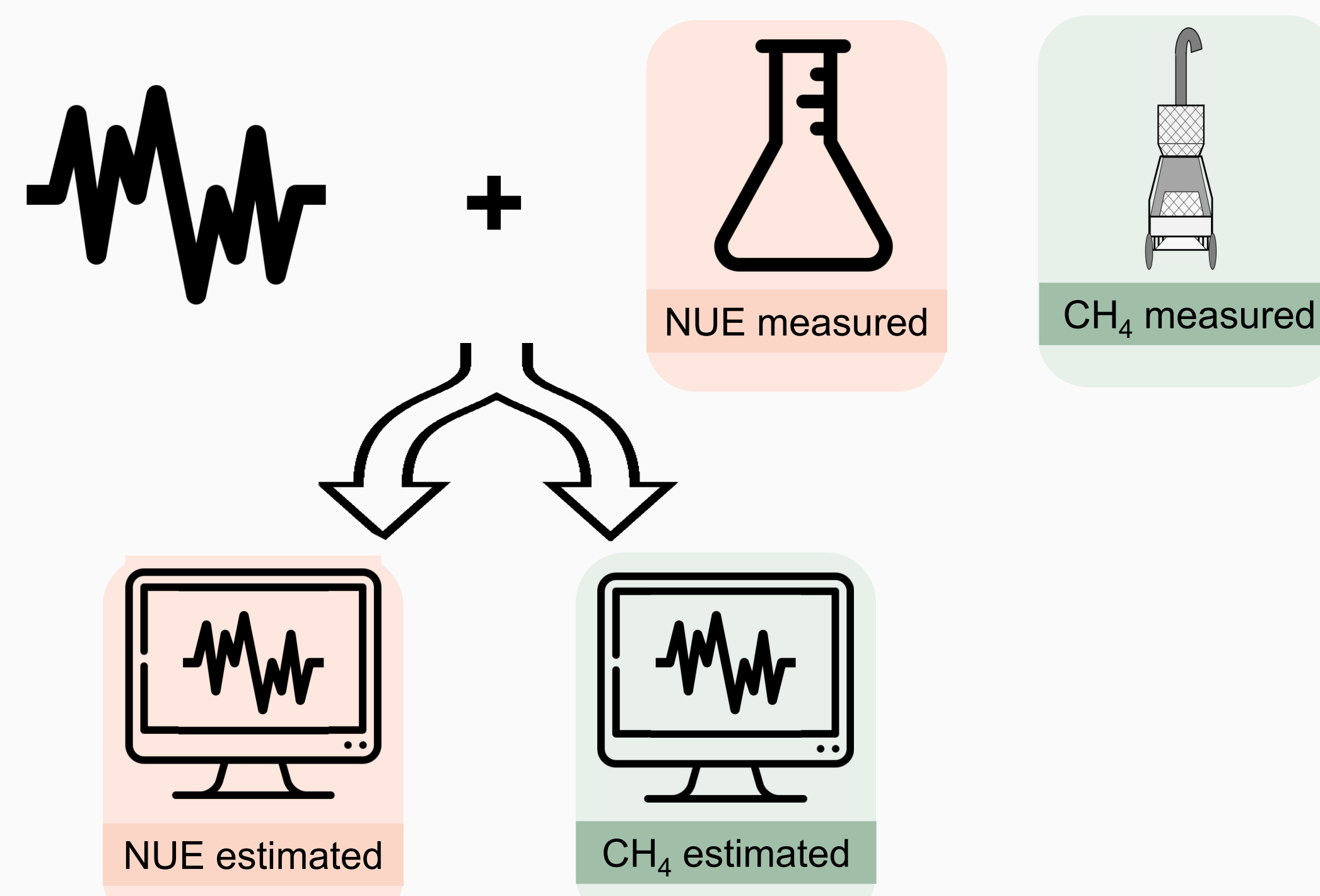
257 individuals

★ **Infrared spectroscopy**

An expedient and cost-effective alternative exists in the form of near-infrared (NIR) and mid-infrared (MIR) spectroscopy.



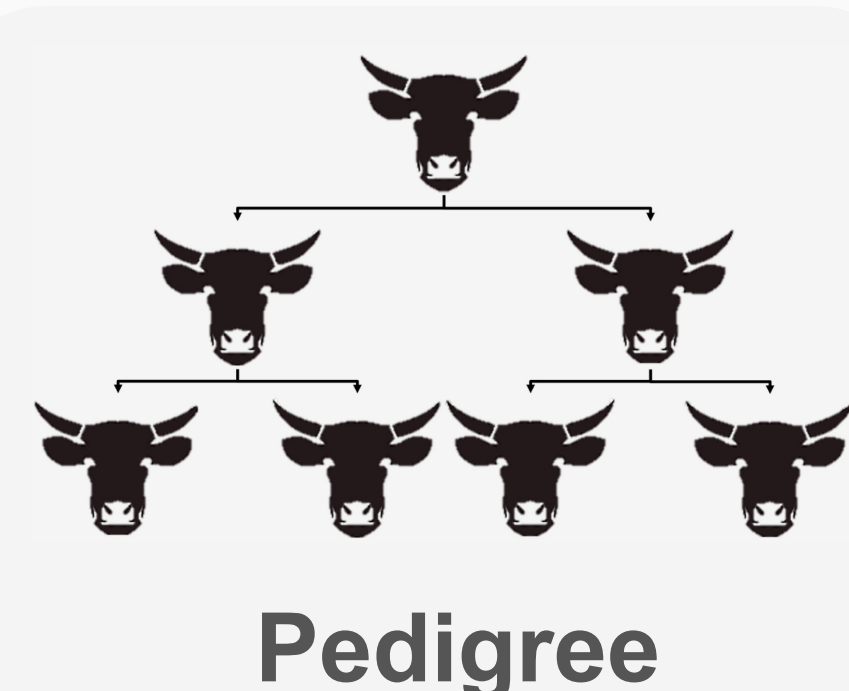
★ **Algorithms (artificial intelligence)**



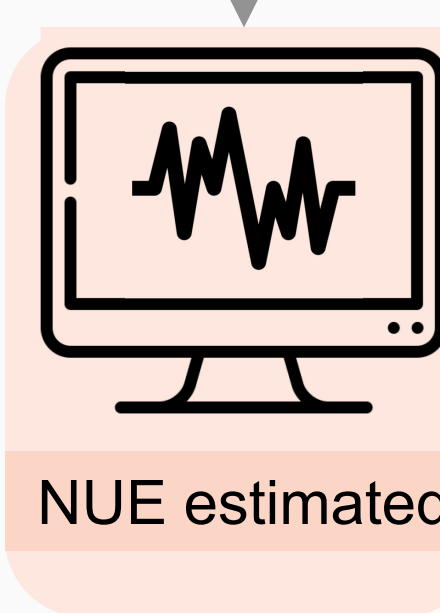
Genetic parameters

★ **Estimation with ASReml software**

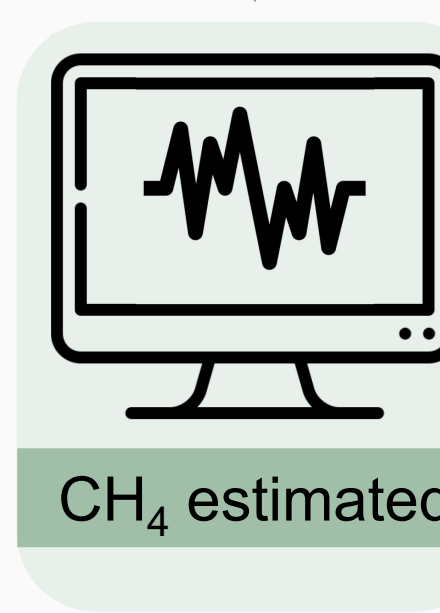
Estimate heritability for genetic selection and assess genetic correlations to identify potential conflicts between traits.



Pedigree



NUE estimated



CH₄ estimated

Heritability h^2
Univariate animal model

Correlations r_G
Multivariate animal model