

Genetic parameters of novel mid-infrared predicted milk traits in three dual-purpose cattle breeds

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Dual-purpose cattle



Dual-purpose
Belgian Blue
(dpBB)

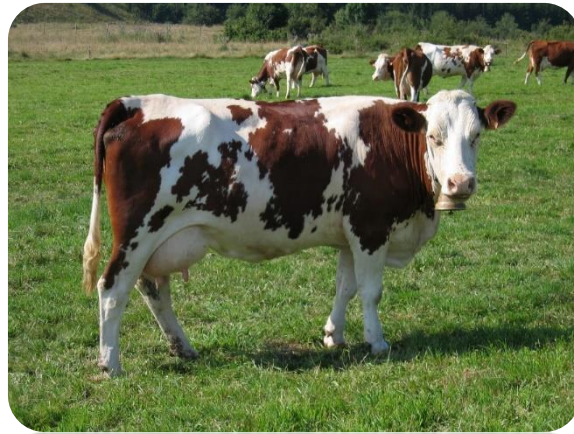


Montbéliarde
(MON)



Normande
(NOR)

Dual-purpose cattle



Difficulty in gathering relevant large-scale data in routine

- Small sized cattle populations
- (Organic) pasture based production systems

Usefulness of mid-infrared spectra (MIR)



Milk samples

(milk payment, milk recording)



MIR analysis

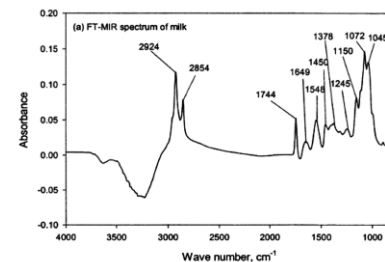


Quantification

Calibration equations



→ wide range of novel phenotypes !



Raw data = MIR spectra

Objectives

- Genetic parameters of 39 novel MIR predicted milk traits
- How MIR traits can predict longevity at early stages?
- Any help from genomics?

Data

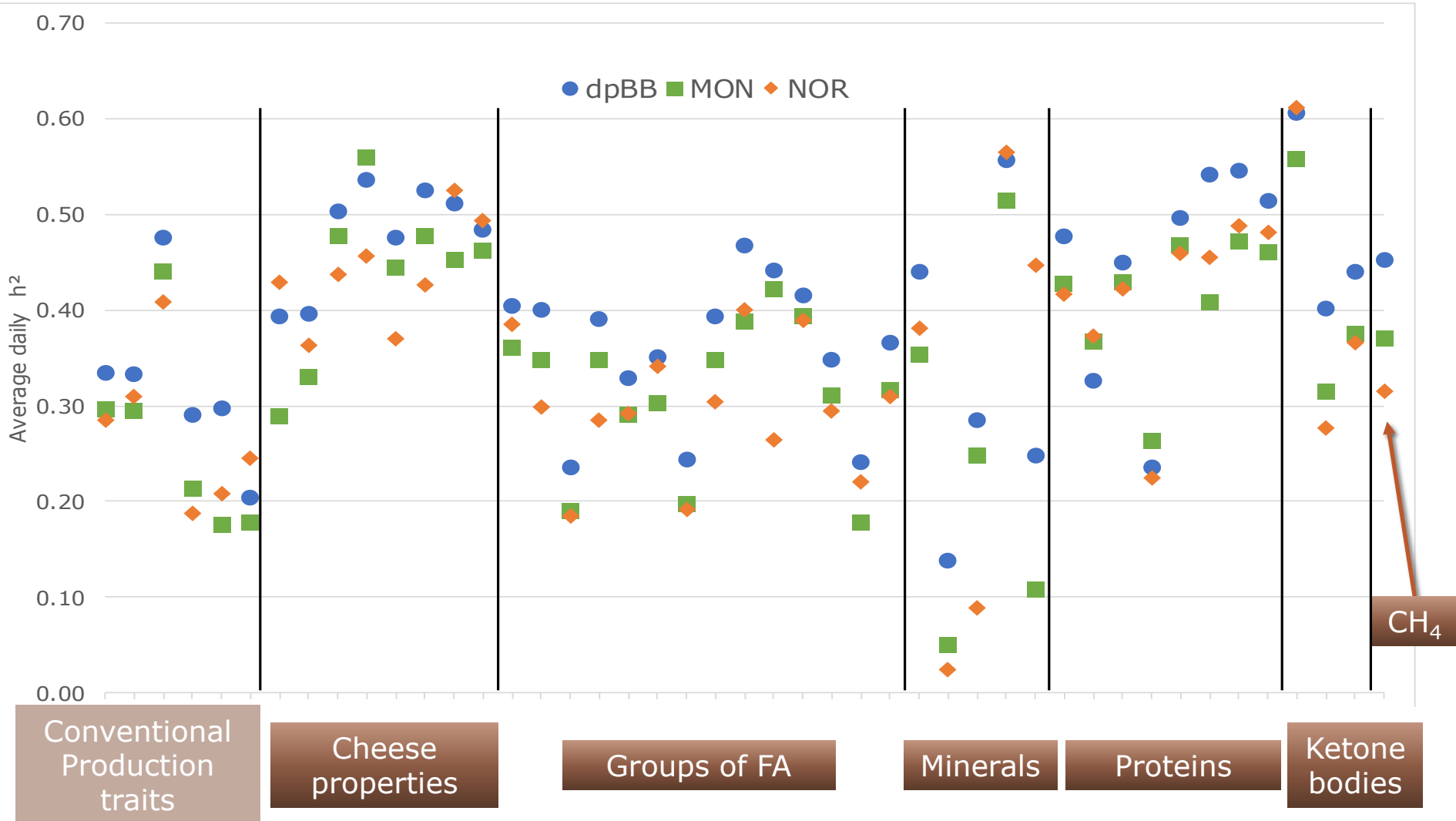
	dpBB	MON	NOR
Cows in production	2,988	1,330	621
1 st lactation test-day	21,287	10,062	4,637
2 nd lactation test-day	11,771	6,716	2,532
3 rd lactation test-day	6,246	4,217	1,370
Pedigree	7,744	3,807	2,304

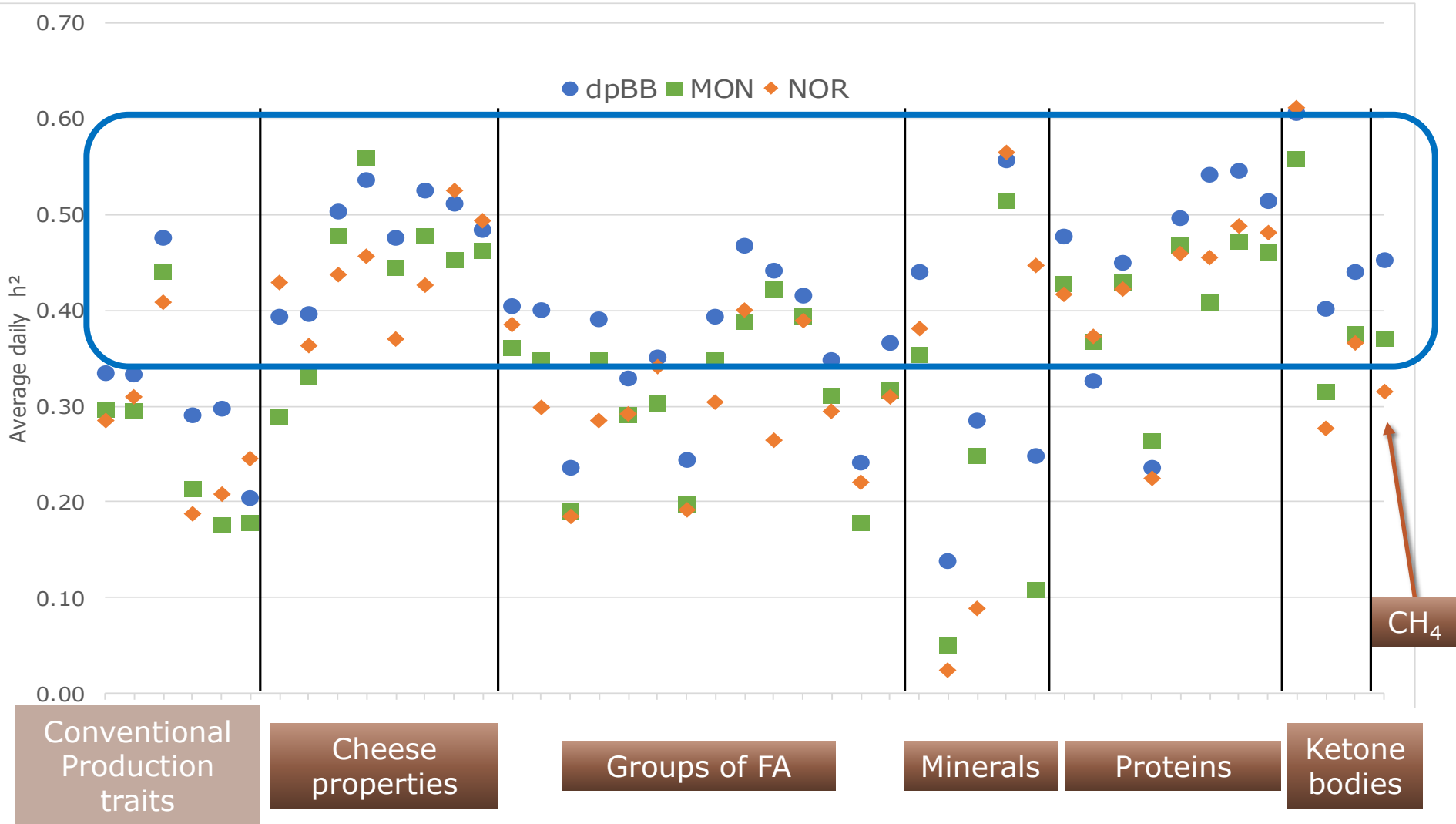
MIR predicted milk traits

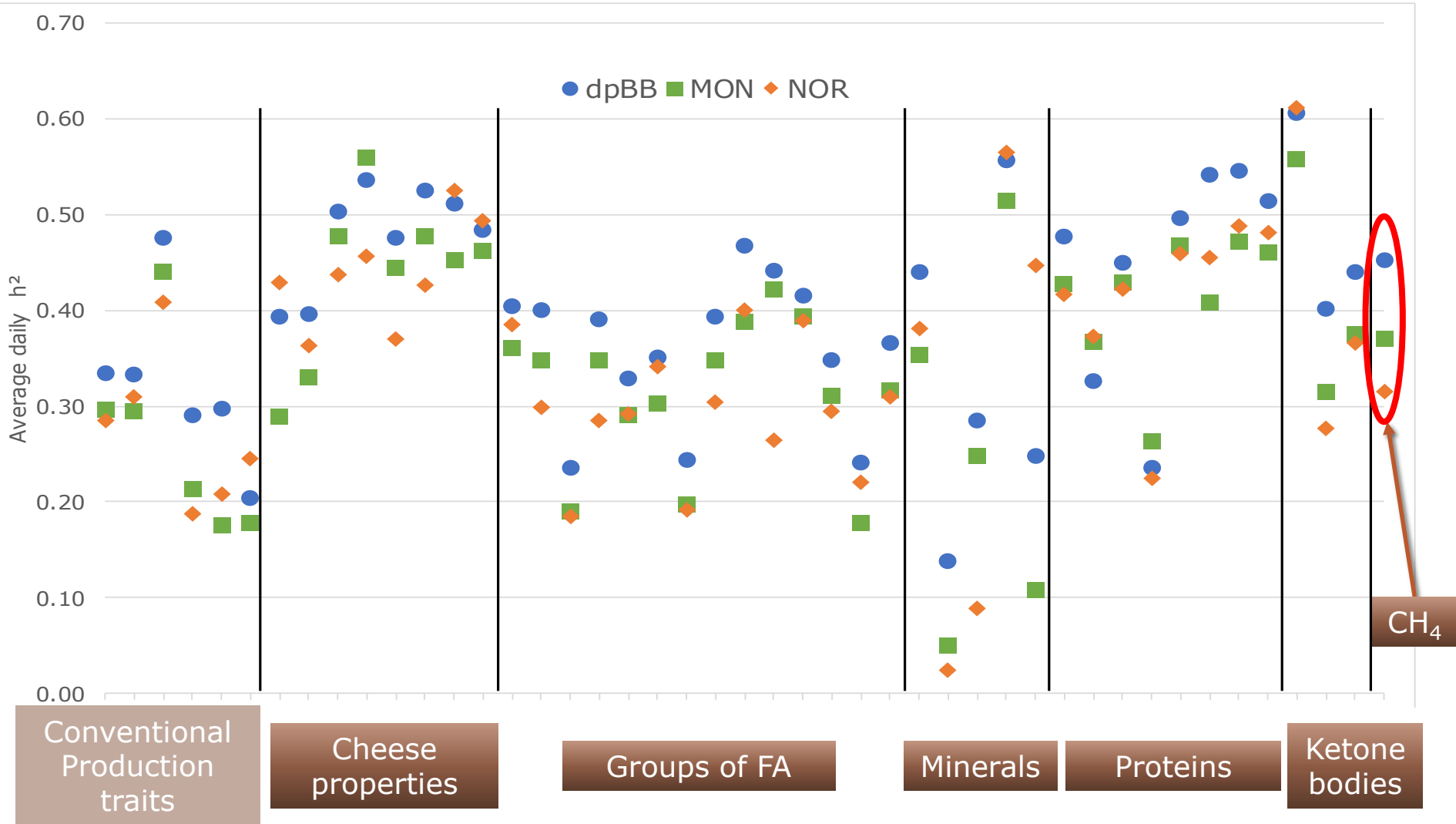
- Cheese properties: 8
- Groups of fatty acids (FA): 14
- Minerals: 5
- Protein components: 8
- Ketone bodies: 3
- Methane (CH₄)

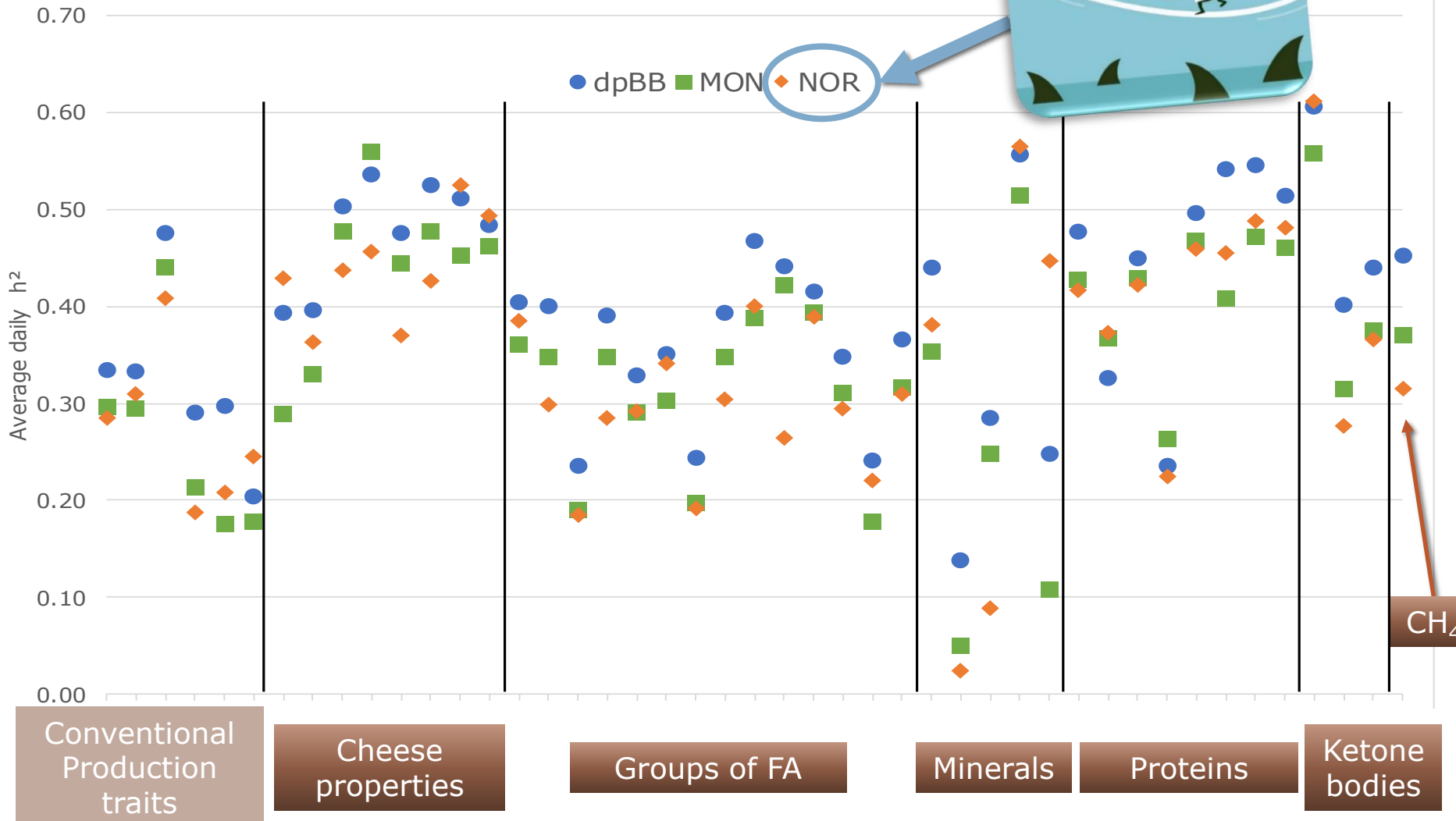


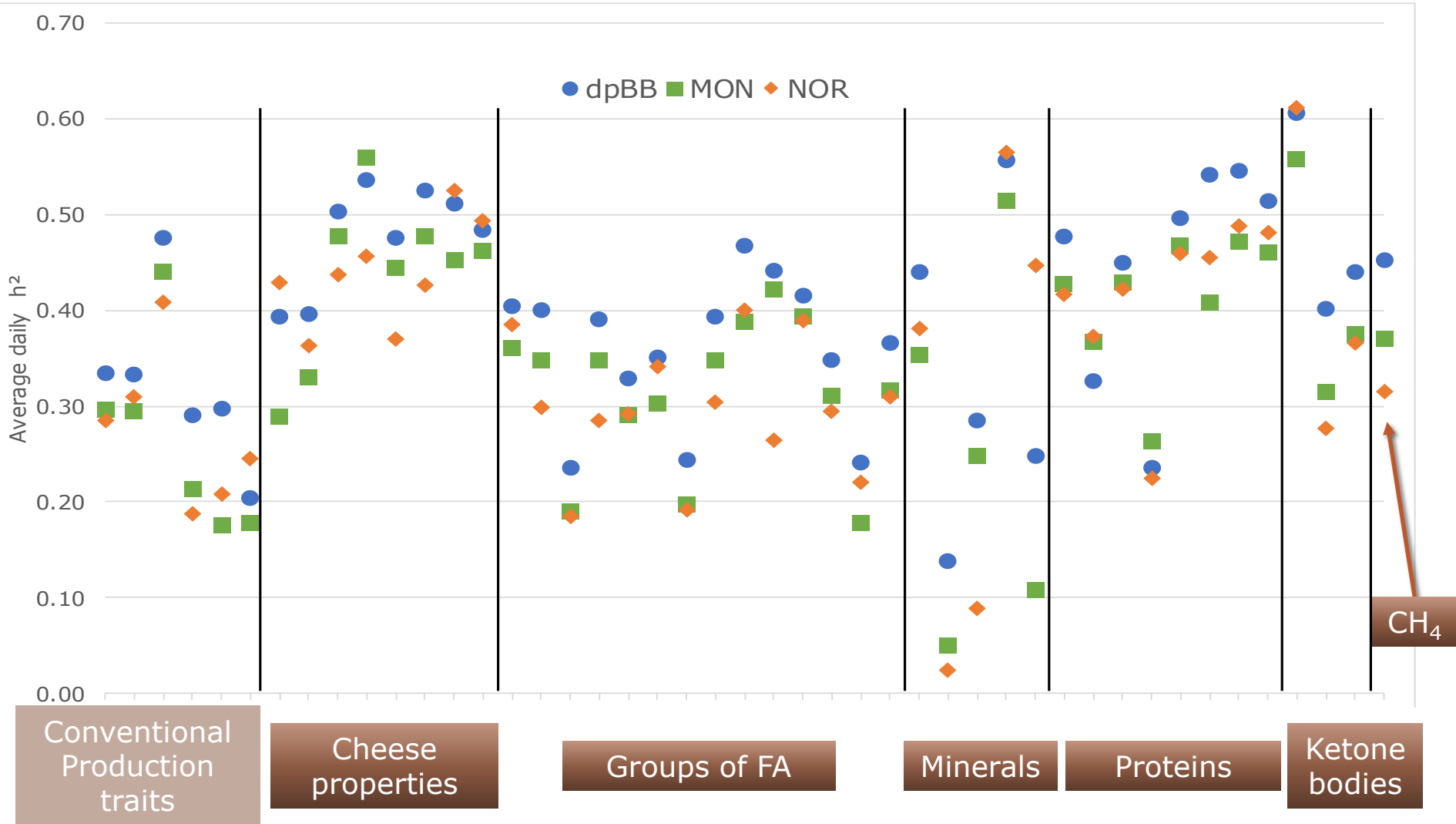
**single-trait
multi-lactation
random regression
test-day model**











Prediction of
longevity at early
stages ?

production &
novel MIR traits



Prediction of
longevity at early
stages ?

EBV & GEBV for
production &
novel MIR traits

21,287 test-day
records



2,988 primiparous
dpBB cows

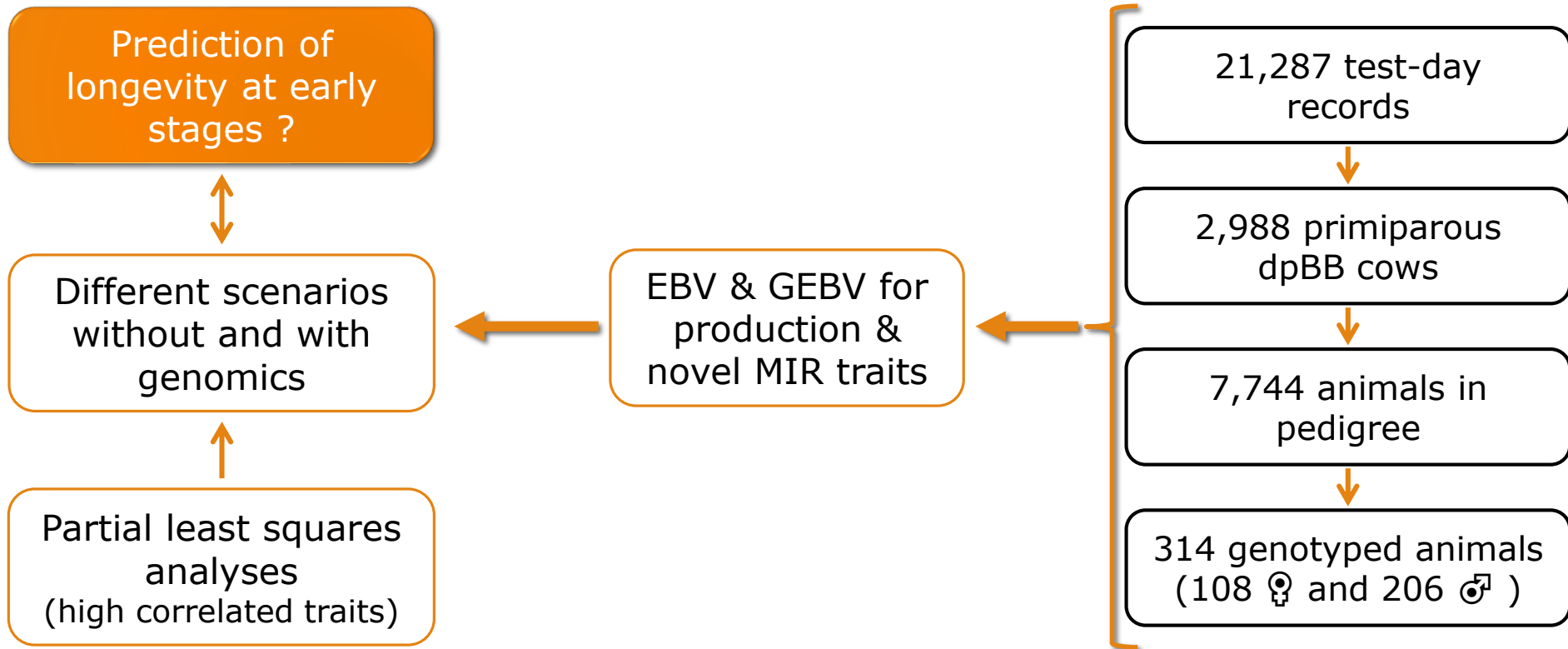


7,744 animals in
pedigree



314 genotyped animals
(108 ♀ and 206 ♂)






Longevity from MIR traits?

Scenarios	EBV (r)	GEBV (r)
S ¹ : Milk, fat & protein yields	0.25	0.19
S ² : Acetone, citrates & BHB	0.22	0.37
S ³ : S ¹ + S ²	0.34	0.41
S ⁴ : S ¹ + UFA + SCFA + MCFA	0.42	0.29
S ⁵ : S ² + UFA + SCFA + MCFA	0.37	0.42
S ⁶ : S ³ + UFA + SCFA + MCFA	0.51	0.47

Based on genotyped dpBB bulls with ≥ 10 daughters (N=160)

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Take home messages

- Novel MIR predicted milk traits for dual-purpose cattle:
 - heritable → selection
 - promising early indicators of longevity (for dpBB)
- Use of genomics:
 - Slight increase of reliabilities (not shown)
 - GEBV for novel MIR traits tend to be better predictors of longevity

MIR traits ~ useful in 3 dual-purpose cattle breeds

Acknowledgements

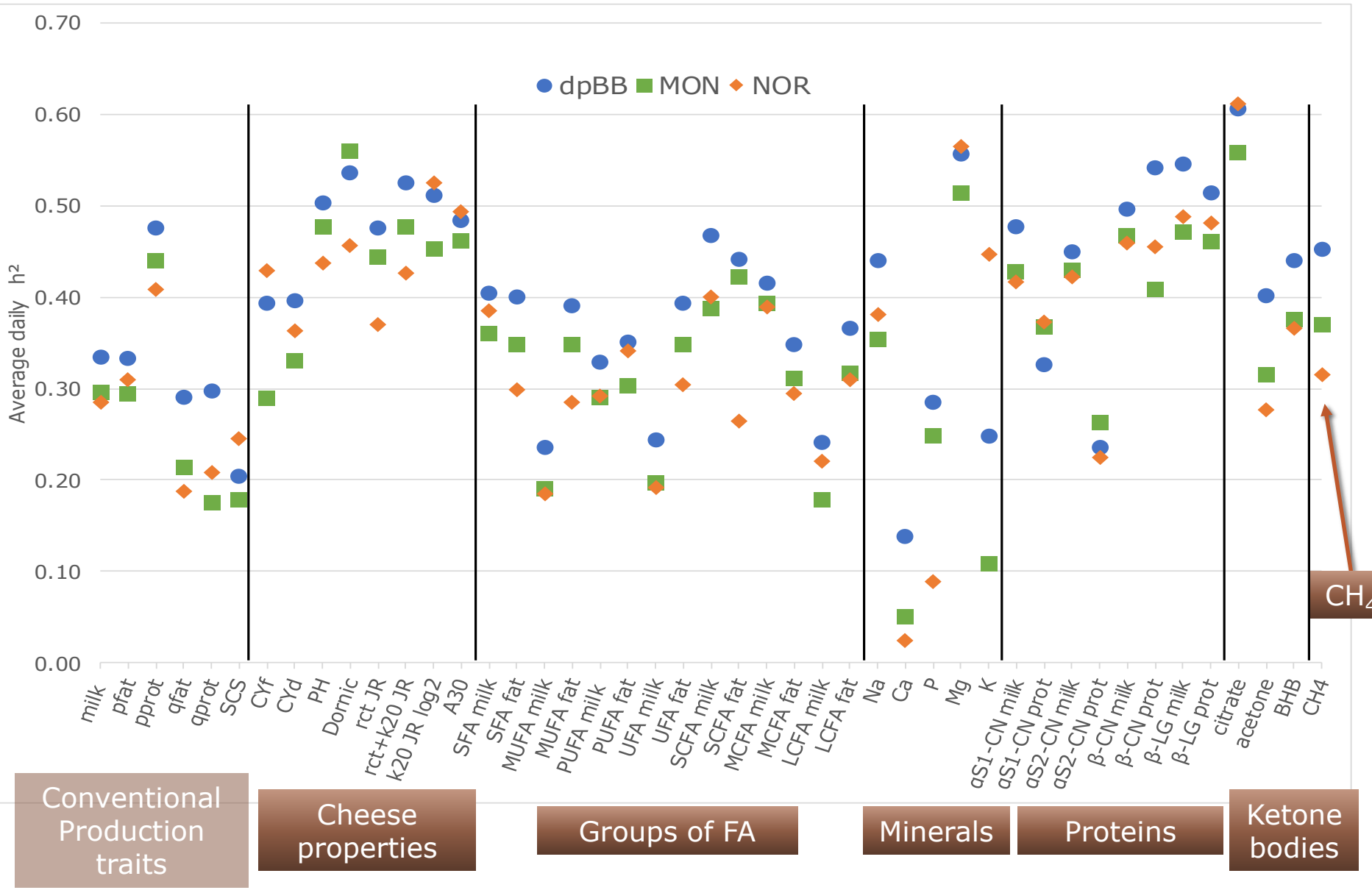


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R² of calibration equation

	min	max
Cheese properties	0.44	0.78
Groups of FA	0.77	0.99
Minerals	0.44	0.82
Proteins	0.69	0.77
Ketone bodies	0.62	0.89
CH ₄	0.70	