

# Individual herbage intake estimation of grazing dairy cows, based only on behavioural characteristics

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## Objective

The objective of the study was to estimate individual herbage dry matter intake (hDMI) of grazing dairy cows based solely on eating and rumination behaviour characteristics as independent variables.

## Materials and methods

- 4 experiments
- 9 treatments (supplementation, herbage mass and Holstein cow type)
- 94 dairy cows, 105 complete 7-d measurements
- Reference for hDMI: n-alkane double indicator method
- 27 behavioural characteristics RumiWatch<sup>®</sup> (converter 0.7.3.31)
- Best subset regression approach and bootstrap cross-validation

General conditions	median	min.	max.
Herbage mass (kg DM ha <sup>-1</sup> )	827	589	2333
Feed intake (kg DM d <sup>-1</sup> )			
Herbage	13.3	4.7	20.4
Concentrate		0	4.0
Maize silage		0	7.9
Milk yield (kg d <sup>-1</sup> )	22.6	14.0	36.3
Body weight (kg)	610	428	718



Behavioural characteristics	median	min.	max.
Total eating time (ET <sub>tot</sub> , min d <sup>-1</sup> )	619	441	742
Eating time pasture head up (ET <sub>up</sub> , min d <sup>-1</sup> )	69	7	174
Eating time pasture head down (ET <sub>down</sub> , min d <sup>-1</sup> )	475	348	680
Rumination time pasture (RUT, min d <sup>-1</sup> )	456	303	601
Rumination chews per bolus, pasture (RU <sub>cb</sub> , n bolus <sup>-1</sup> )	55	37	68
Rumination rate (RU <sub>rate</sub> , n min <sup>-1</sup> )	71	57	85
Other chews (OC <sub>nd</sub> , n d <sup>-1</sup> )	1390	189	2816
Other chews, pasture (OC <sub>np</sub> , n d <sup>-1</sup> )	767	105	1748

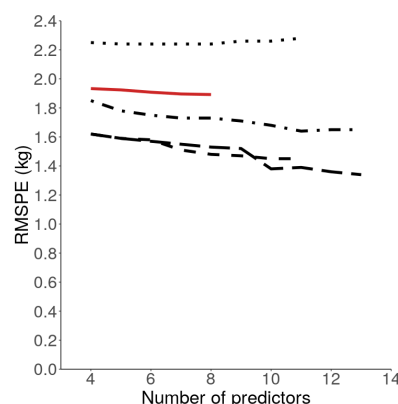
## Results

Regression coefficients of the equation with 4 to 8 predictors for hDMI of dairy cows

No.	Intercept	ET <sub>down</sub>	OC <sub>np</sub>	ET <sub>tot</sub>	OC <sub>nd</sub>	ET <sub>up</sub>	RUT	RU <sub>cb</sub>	RU <sub>rate</sub>	R <sup>2</sup>	RMSPE <sup>§</sup>
1	5.2030	0.0613	0.0017	-0.0431		0.0492				0.56	1.93
2	5.5128	0.0601	0.0060	-0.0420	-0.0028	0.0509				0.57	1.92
3	1.0890	0.0629	0.0065	-0.0425	-0.0029	0.0489	0.0071			0.58	1.91
4	2.3068	0.0583	0.0071	-0.0376	-0.0031	0.0455	0.0108	-0.0652		0.59	1.90
5	4.6572	0.0574	0.0068	-0.0361	-0.0029	0.0447	0.0121	-0.0507	-0.0600	0.60	1.89
β*		1.17	0.97	-0.73	-0.66	0.61	0.24	-0.12	-0.10		

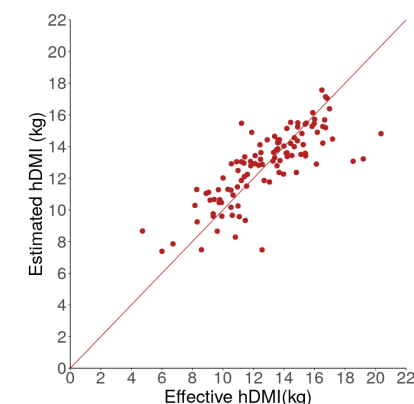
\* Standardised coefficients of the 5th regression, § Root mean square prediction error

### RMSPE of different hDMI estimation approaches



- Without information on supplementation and feeding behaviour
- Exclusively with feeding behaviour information
- Without information on supplementation, but with feeding behaviour information
- With information on supplementation and with resp. without feeding behaviour information

### Effective & estimated hDMI (eq. 5)



## Conclusions

- One eating or rumination behaviour characteristic alone is not sufficient to estimate individual hDMI accurately.
- The appropriate combination of several behavioural characteristics reduced the RMSPE to around 15%.
- An estimation based exclusively on easily recorded behavioural characteristics offers the possibility to automate individual hDMI assessment in future.