



geno



Breeding values for daily dry matter intake in Norwegian Red dairy cows and correlation to other traits

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Aim

Dairy production based on Norwegian feed resources

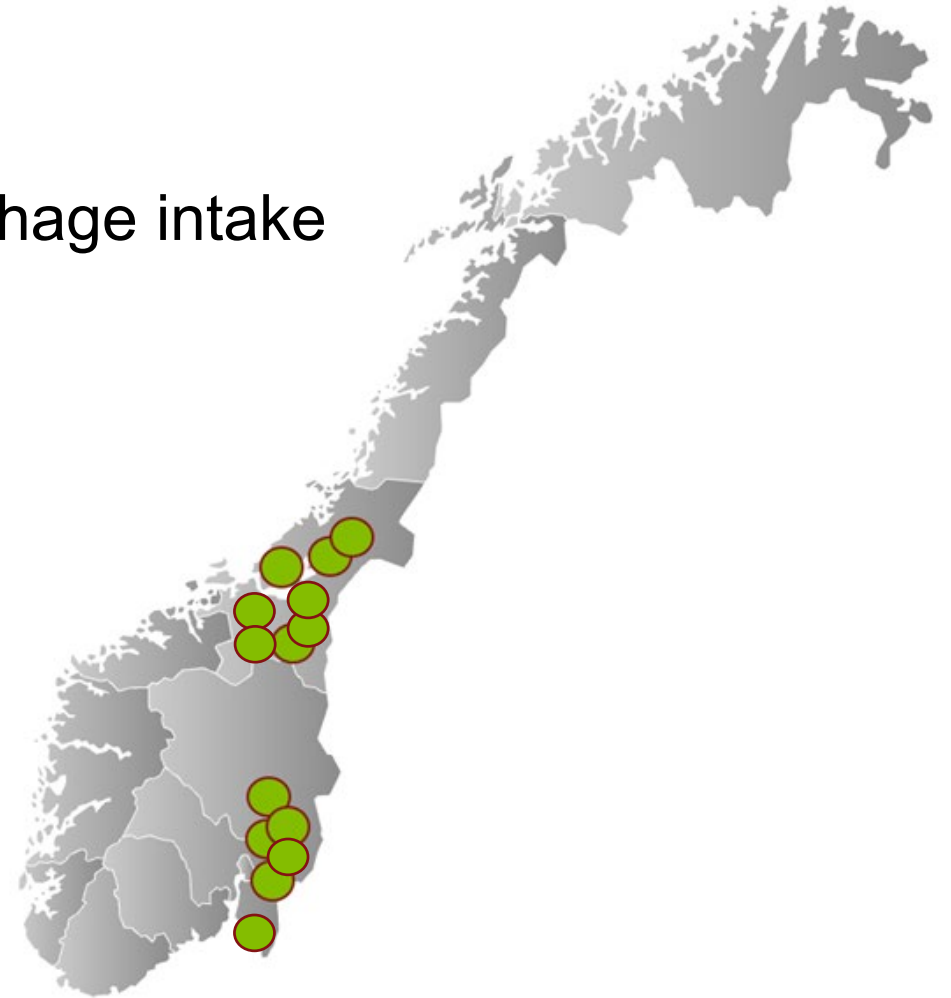
Geno aims to accomplish this by :

- Better utilization of roughage
- Increased amount of roughage in the diet
- Improved feed efficiency
- Lower methane emissions



How to achieve our goals ?

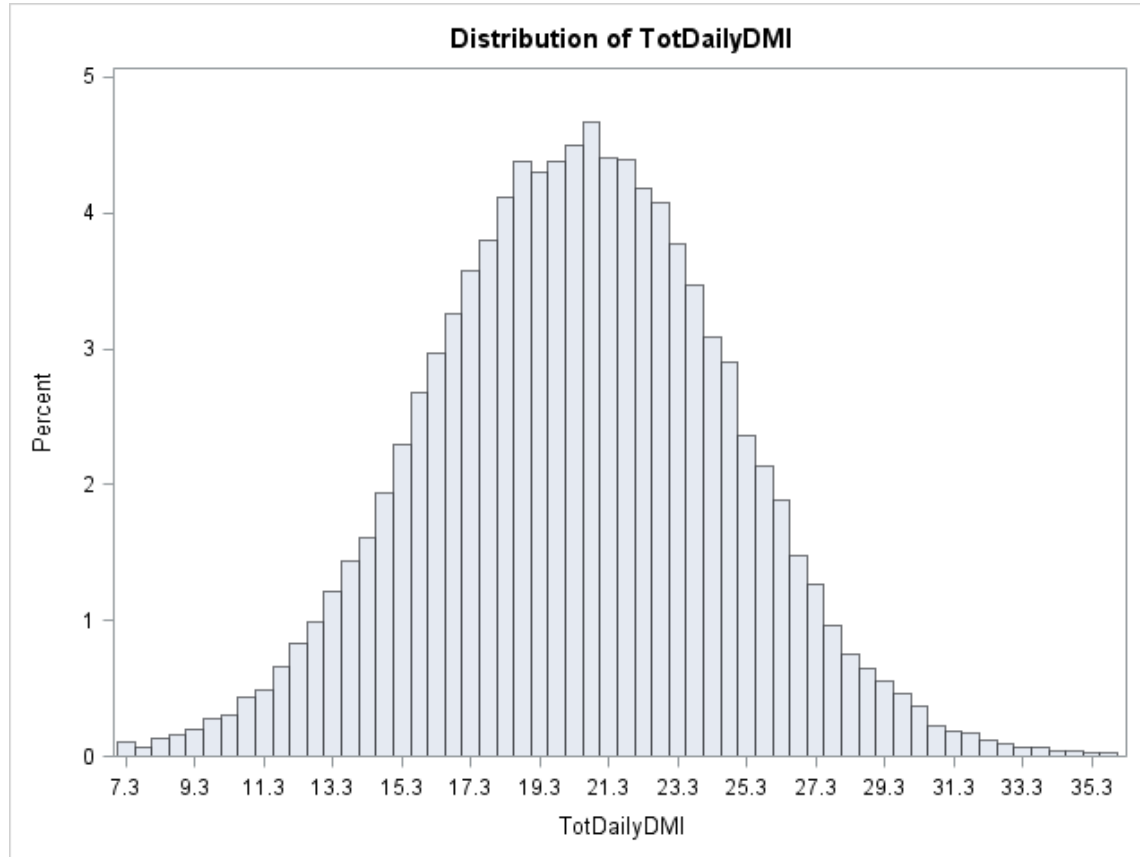
- Geno has equipment to measure individual roughage intake and methane in Norwegian Red dairy cows
- Commercial dairy herds (**14**) + 2 research herds
- Farms with AMS and GreenFeed
- Data collection ongoing
- All cows are genotyped (~ **1,000** pr. Year)



A close-up, high-contrast photograph of a human eye. The eye is looking slightly to the left. The eyelashes are dark and prominent, with some individual hairs clearly visible. The iris is dark, and the pupil is visible. The background is dark and out of focus. The text "DATA AND MODEL" is overlaid in white, bold, sans-serif font across the middle of the eye.

DATA AND MODEL

Phenotypic distribution of dDMI



dDMI (Kg DMI per day):

- Mean: 20.37
- SD: 4.35
- CI 99%: 7 – 31
- Min: 7
- Max: 36

Data

- 557 Norwegian Red dairy cows
- 61,321 daily records on feed intake
- Data from January to October 2022

Trait definition:

dDMI

daily dry matter intake (kg roughage
+ kg concentrate)



Model

Linear animal repeatability model:

Daily dry matter intake **dDMI** = Herd + DIM + Pa*CAge + htd + a + pe + e

Fixed effects - Herd, days in milk, Parity (2, 3+) or calving age for 1st parity cows.

Random effects -

Model

Linear animal repeatability model:

Daily dry matter intake **dDMI** = Herd + DIM + Pa*CAge + htd + a + pe + e

Fixed effects - Herd, days in milk, Parity (2, 3+) or calving age for 1st parity cows.

Random effects - Herd-testday (htd), animal genetic (a), permanent environmental effect of animal (pe), residual (e).

Variance components estimated with DMU

Heritability calculated as: $(\sigma_a^2 / (\sigma_a^2 + \sigma_{htd}^2 + \sigma_{pe}^2 + \sigma_e^2))$



RESULTS

Heritability of feed intake - dDMI

Dry matter intake (roughage + concentrate)
kg/day per cow per day:

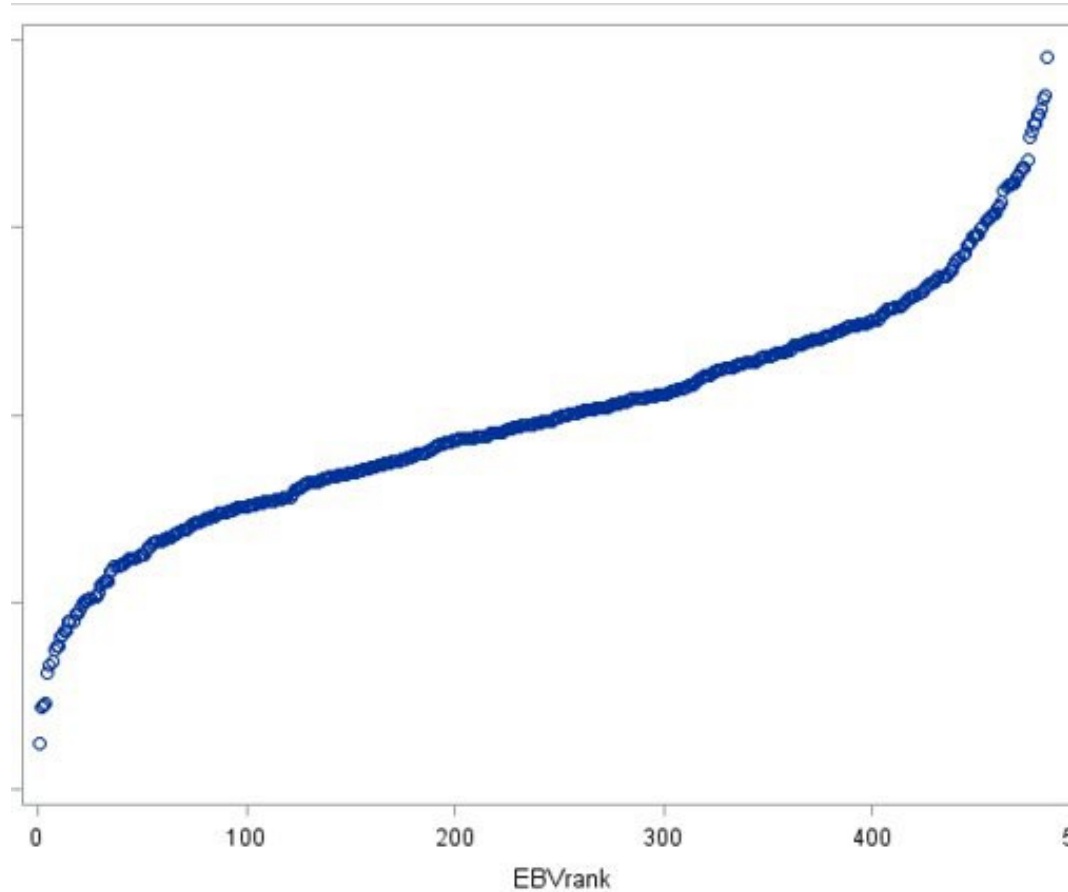
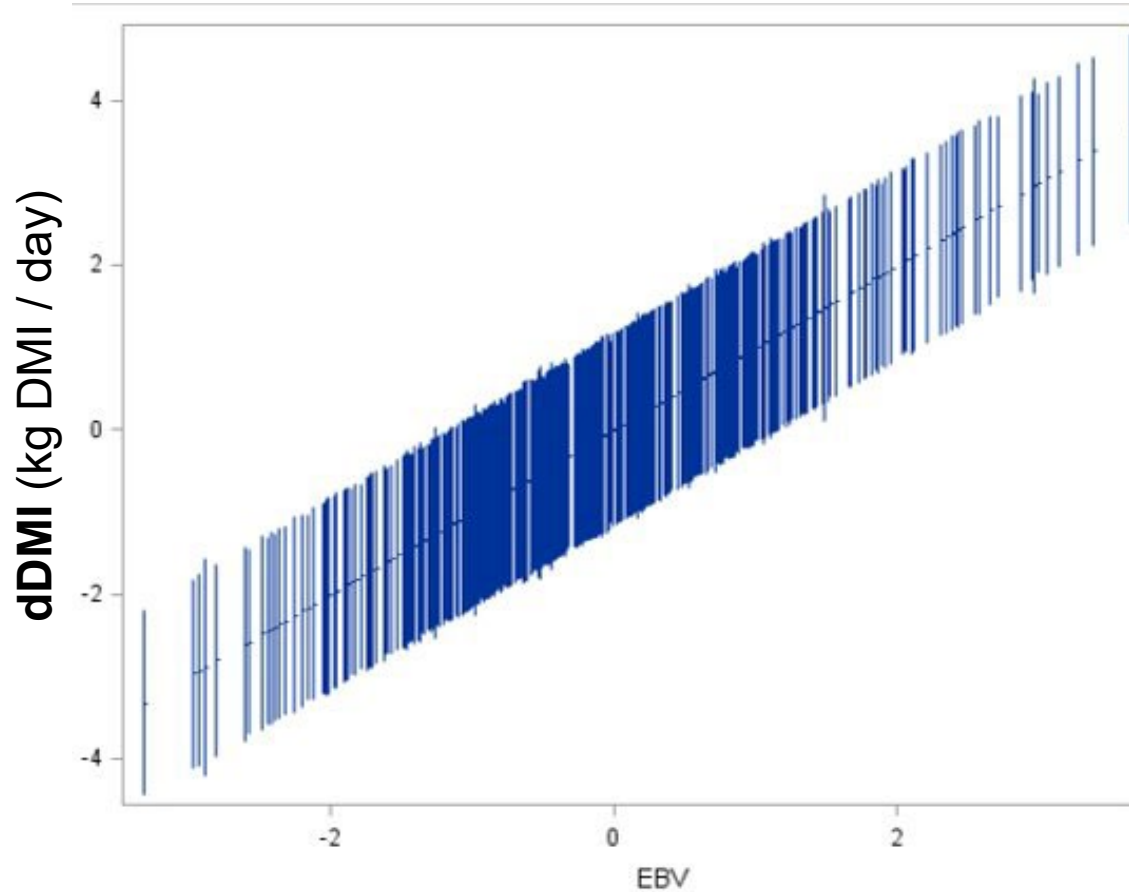
Variance component	estimate	se
Herd-Testday	4.28	0.18
Additiv genetic	2.65	0.69
Permanent environment	2.40	0.57
Residual	5.62	0.03

Heritability 0.18



Breeding values, EBV for dDMI

EBV for daily dry matter intake roughage + concentrate (kg)



EBV range from from -3.32 to 3.65 (± 1.2)

Correlations between EBV for dDMI with indexes from routine genetic evaluations

Traits with strongest negative correlation to EBV's for dDMI:

Trait	Correlation to dDMI
Number of inseminations ^{1st to 4th parity}	-0.21
Time from calving to first insemination ^{1st to 4th parity}	-0.16
Top line ^{1,*}	-0.14
Calf size, direct ^{2 1st parity}	-0.14
Bone structure ^{3,*}	-0.13
Number of inseminations ^{heifers}	-0.13
Clinical mastitis, ^{1st to 3rd parity}	-0.12 to -0.15
Silent heat ^{3rd to 5th parity}	-0.12 to -0.14

p<0.0001

* Trait not included in the Norwegian total merit index

¹ Trait top line: Scored from 1 to 9, 7 optimum. 1 = weak, 9 = upwards.

² Calf size, direct: High score is small calf

³ Bone structure: High score is very fine and thin bones, low score for coarse bones (broad and thick).

Negative correlation =
High dDMI associated with low index
for other traits

Correlations between EBV for dDMI with indexes from routine genetic evaluations

Traits with strongest positive correlation to EBV's for dDMI:

Trait	Correlation to dDMI
Kg protein 305 days	0.34
Kg milk 305 days	0.30
Angularity*	0.26
Kg fat 305 days	0.24
Stature body*	0.21
Rump width*	0.18
Body depth*	0.15
Foot angle*	0.15

p<0.0001

* Trait not included in the Norwegian total merit index

Positive correlation =
High dDMI associated with
high index for other traits

Summary

- dDMI in NR-cows is heritable (0.18)
- Significant differences in EBV for dDMI among NR cows
- Higher EBV for dDMI correlated with lower index for fertility (number of inseminations) and health (mastitis)
- Higher EBV for dDMI correlated with increased milk production, angularity, and body size
- More data needed for genetic correlations to traits in TMI
- Definitions of feed-efficiency as a novel trait are needed



Els Korsten