



geno



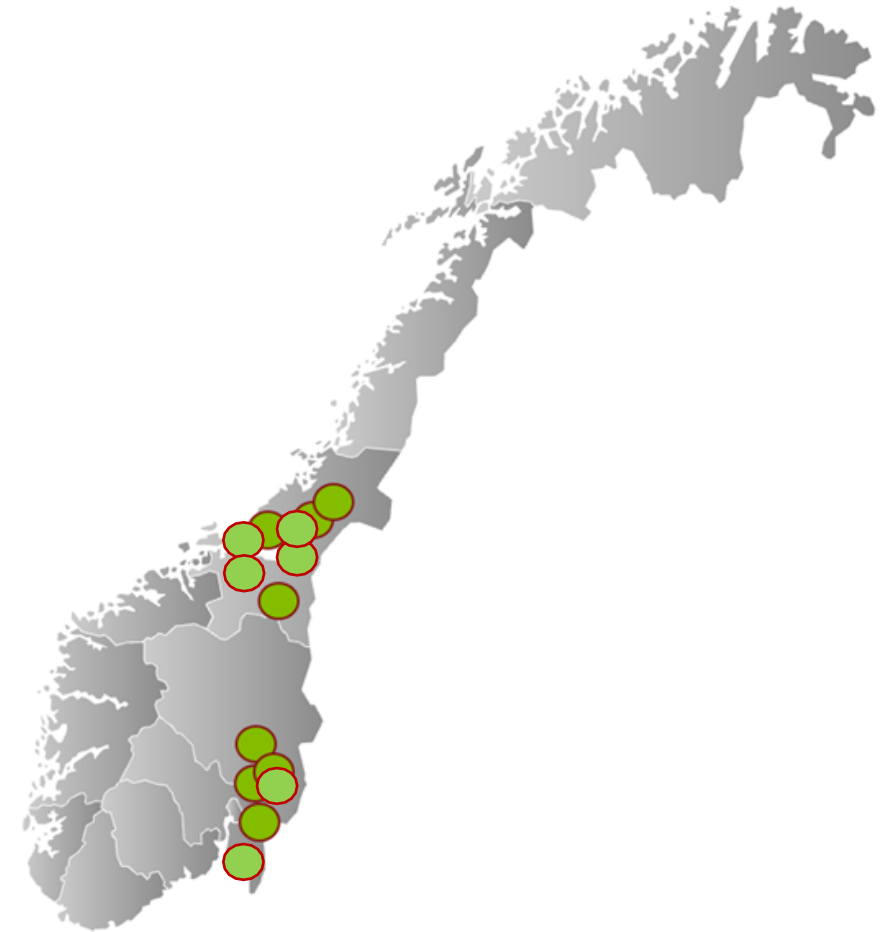
Heritability of dry matter intake in Norwegian Red with measures on feed intake in commercial herds

EAAP, Lyon, France 2023

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Background

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





Aim

Estimate variance components and heritability of feed intake traits in Norwegian Red dairy cows

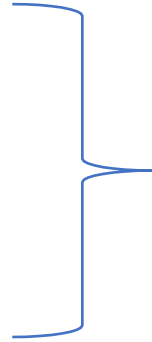
Data

- 557 Norwegian Red dairy cows
- 61,321 daily records on feed intake
- Data from January to October 2022
- Monthly feed analyses
- Concentrate data from AMS
- Individual roughage intake
- Min 8 days with data
- Logical feed intake
- Pedigree: 6,556 animals



Trait definitions

- Roughage %
- Kg roughage
- dDMI



Daily records →

1 daily phenotype per cow

- Roughage % = daily proportion of roughage in diet (DMI)
- Kg Roughage = daily roughage intake in Kg
- dDMI = daily dry matter intake (roughage + concentrate) in Kg

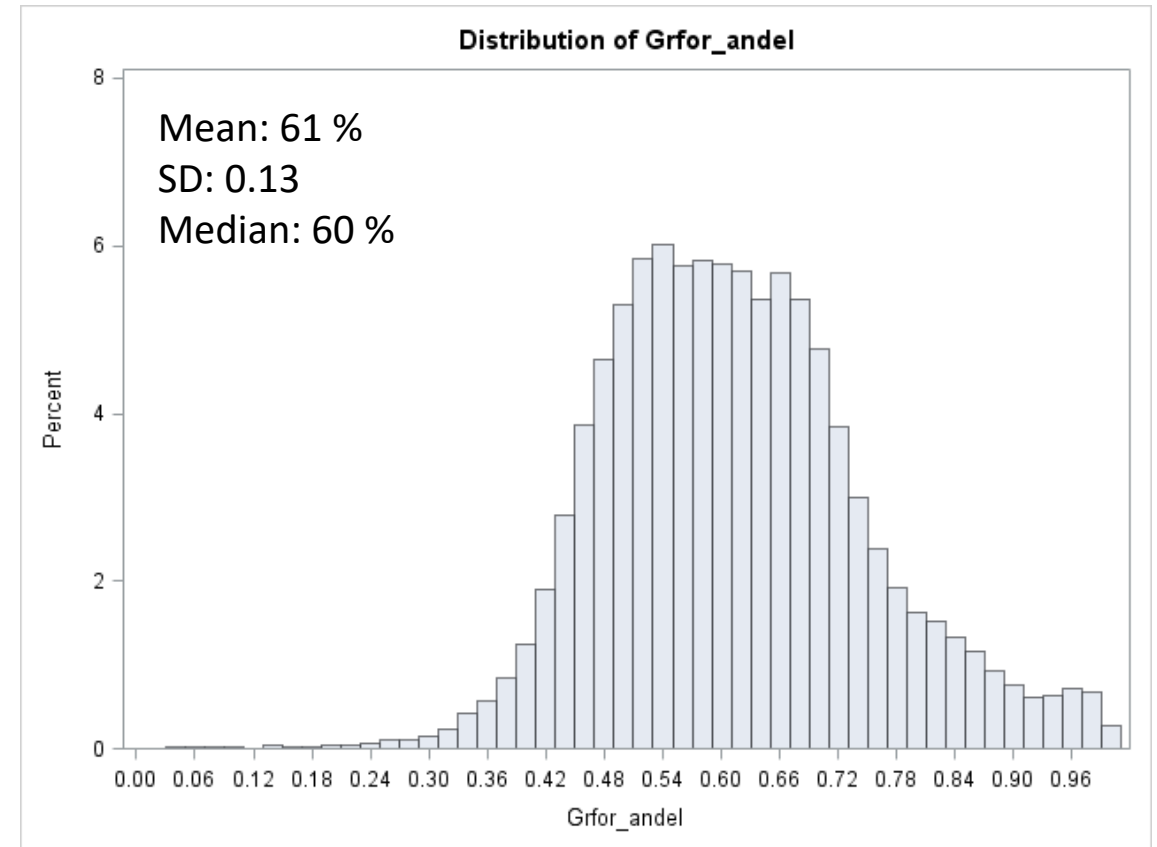


Percentage roughage intake (daily)

**Roughage % = Proportion
roughage in dDMI**



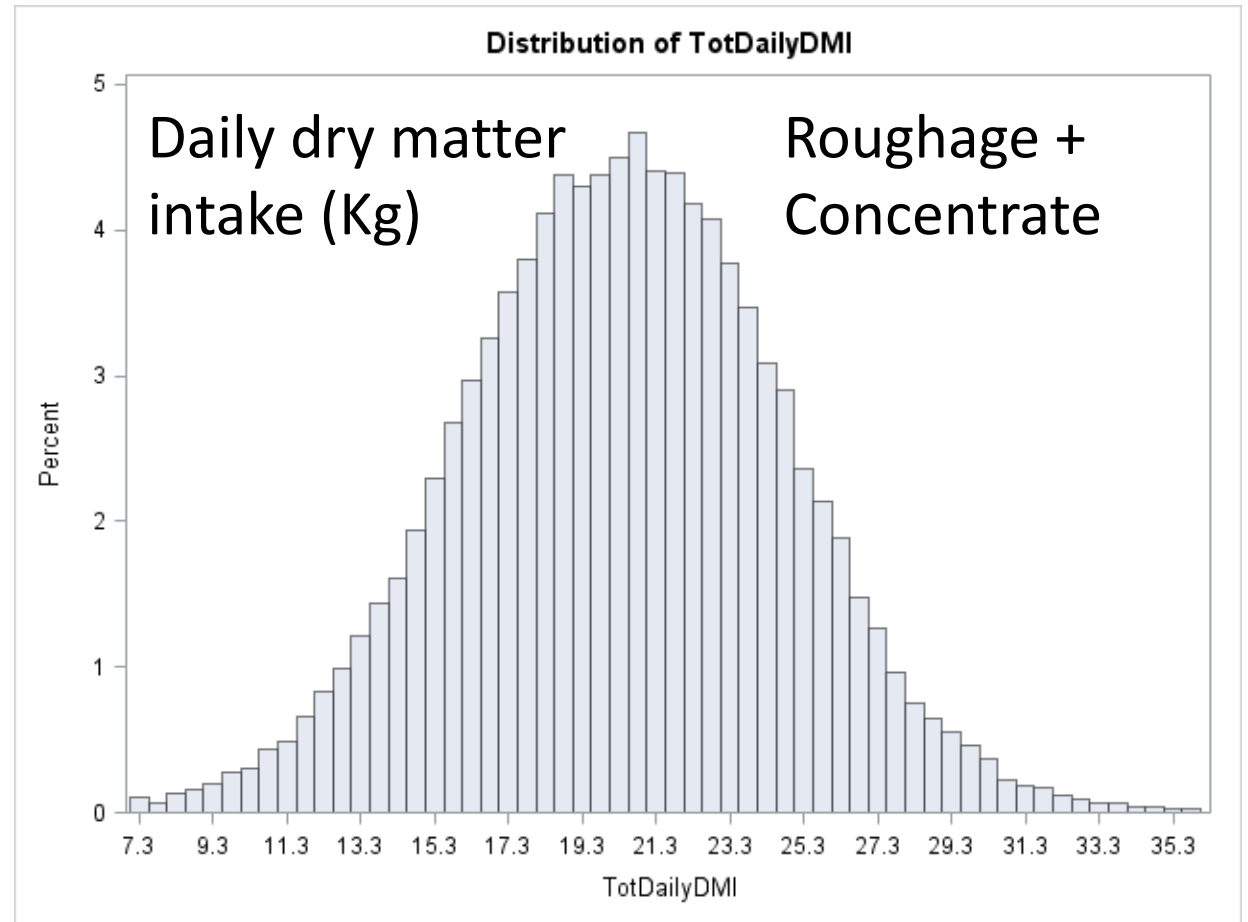
Interesting trait for improving proportion of
grass in the diet



Phenotypic distribution of dDMI

dDMI

- Mean: 20 Kg
- SD: 4.35
- Min: 7
- Max: 36
- Median: 20.37
- CI 99%: 7 – 31



Model

Mixed linear animal repeatability model:

$$\underline{\text{Feed intake} = \text{Herd} + \text{DIM} + \text{Pa} * \text{CAge} + \text{htd} + a + \text{pe} + e}$$

Feed intake trait: **Roughage %, Kg roughage or dDMI**

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

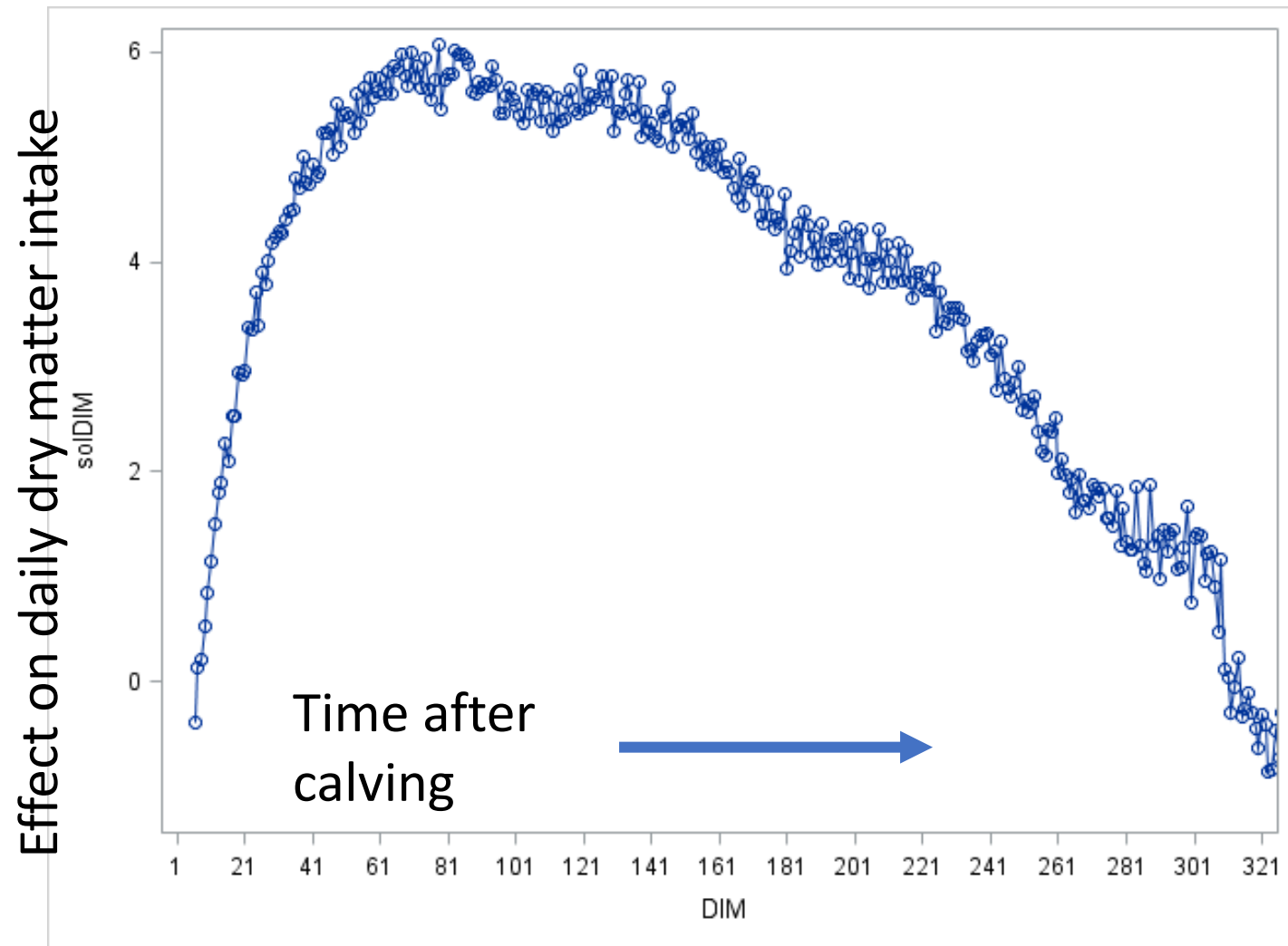
Random effects - Herd-testday (htd), animal genetic (a), permanent environmental effect of animal (pe), residual (e).

Variance components estimated with DMU (by Madsen & Jensen 2013)

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

Fixed effect solution days in milk for **dDMI**

- Fixed effect of days in milk for daily dry matter intake (dDMI)



Results variance components

Variance components and heritability for feed intake traits, SE in pharenthesis

Variance component	Kg Roughage	dDMI
Genetic σ_a^2	15.9 (4.43)	2.65 (0.69)
Permanent environment σ_{pe}^2	14.97 (3.62)	2.40 (0.57)
Herd testday σ_{htd}^2	44.64 (1.86)	4.28 (0.18)
Residual σ_e^2	33.95 (0.19)	5.62 (0.03)

Roughage % not significant

Heritability

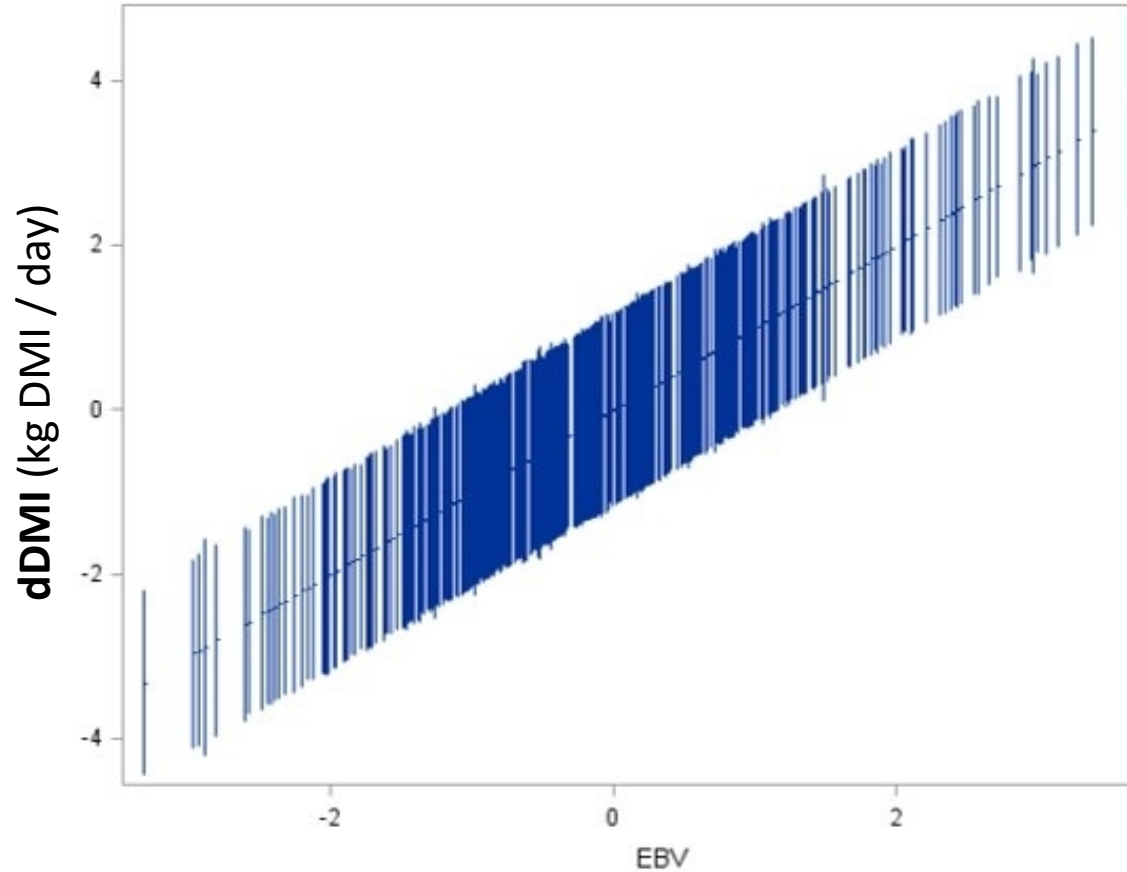
	Kg Roughage	dDMI
Heritability h^2	0.15	0.18

Roughage % not significant

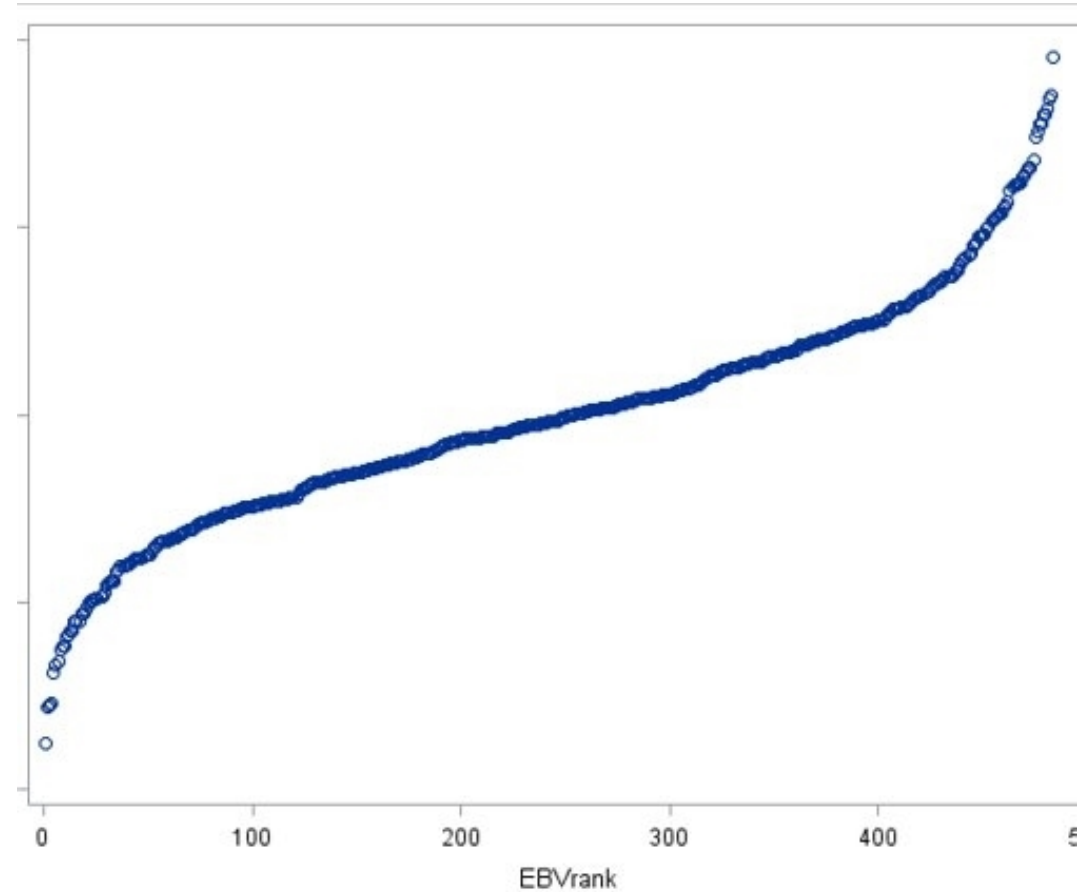


Breeding values for dDMI

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



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



Summary

- Genetic variation for feed intake in NR cows exists
- Further research – how should we define feed efficiency?
- Feed efficiency and methane
- Genetic associations to other important traits
- Data collection works!

We aim to balance climate effects, feed efficiency, production, health and fertility in a sustainable breeding goal for Norwegian Red





Els Korsten