Nordic genetic evaluation for purebred beef cattle
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Why go Nordic?

- Increase the accuracy of estimated breeding values
- Enable within breed comparison of cows and bulls across Nordic countries
- Is resource efficient

MORE phenotypes + MORE complete pedigree = MORE reliable Estimated breeding values
Nordic purebred beef evaluation

Breeds
- Aberdeen Angus (AAN)
- Beef Simmental (SIM)
- Charolais (CHA)
- Hereford (HER)
- Limousine (LIM)

Breeding values
- Calving
- Growth and carcass
Registrations

- **Calving ease** and calf survival scores (> 1998)
- Birth, weaning and post-weaning **weights** and **carcass** records since the 80’s for DNK and SWE and 90’s for FIN
- **From:** Farmers, technicians, test stations (SWE) and slaughterhouses
Calving traits

3 traits (12 breeding values)
- Calf survival (up to 24h)
- Calving ease
- Birth weight

2 groups
- First calving
- Later calving
Calving traits

3 traits (12 breeding values)
- Calf survival (up to 24h)*
- Calving ease*
- Birth weight*

2 groups
- First calving
- Later calving

*maternal and direct breeding values
Weight/growth and carcass traits

7 traits (10 breeding values)

- Birth weight
- Weaning weight gain
- Post-weaning weight gain (FIN&SWE)
- Yearling weight (DNK)
- Slaughter daily gain
- EUROP conformation class
- EUROP fat class
Weight/growth and carcass traits

7 traits (10 breeding values)

- Birth weight*
- Weaning weight gain*
- Post-weaning weight gain (FIN&SWE)
- Yearling weight (DNK)*
- Slaughter daily gain
- EUROP conformation class
- EUROP fat class

*maternal and direct breeding values
Methods for HV adjustment

- Growth and carcass
  - Simple adjustment
  - Country – year – breed – sex

- Calving ease/Calf survival
  - Snell scores
  - Country – year – breed – sex – primi- vs multiparous calvings *

* Small groups are merged
Calving, Snell scores

- Given the proportions in each category, replace category labels (e.g., 1-4) by the expected value on the underlying scale
- Distance between categories adjusted for frequency distribution
Calving, Snell scores

- Given the proportions in each category, replace category labels (e.g., 1-4) by the expected value on the underlying scale.
- Distance between categories adjusted for frequency distribution.
- More realistic breeding values for cows with difficult calving.
Genetic parameters

- Estimated for Charolais and Hereford and applied them within breed group (Continental and British)

- Pattern of genetic correlations among traits was remarkably similar for Charolais and Hereford.

- Same principle applied in both, the calving and the growth/carcass evaluation
Breed-wise multi-trait animal model

**Fixed**
- Country-sex
- Country-twin *(only carcass)*
- Country-year-month
- Country-dam age-time
- CG: Herd-birth year
- Adjustment for age at weighing *(only carcass)*

**Random**
- Animal genetic
- Maternal genetic
- Dam permanent environmental (maternal)

*The genetic model also includes:*

- Genetic groups
Genetic Groups definition

• Selection path: Differences in genetic level between genders are assumed to be negligible

• Based on country of origin and year of birth
  • Danish, Finish, Swedish, European, American, Canadian and “rest” (Non-Nordic countries and breeds other than the breed of evaluation are pooled together).
  • 10-year groups (capture the trend)
  • GG ≥ 100 animals
Genetic trends
Angus, weaning weight gain, direct

\[ \sigma_A = 15 \]
Properties of the breeding values

- **Stability**: EBVs from successive evaluations (more data)
  - Correlations
  - Standardized EBV change (*as a function of reliability and genetic standard deviation*)

- **Validation**:
  - Legarra and Reverter method
  - AI sires used in more than one country
Summary

• First joint Nordic EBVs for calving, weight gain and carcass traits for pure beef cattle published in November 2021
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• Coming next:
  • Include more breeds
  • Include fertility
  • Genomic prediction