Software expectations from the industry: genetic evaluations for the future

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Nordic Cattle Genetic Evaluations

• Responsible for joint genetic evaluation for dairy cattle across Sweden, Finland and Denmark

• Populations sizes
  • 360,000 RDC cows
  • 800,000 Holstein cows
  • 70,000 Jersey cows
NAV routine genetic evaluation

- Traditional genetic evaluation (4 times a year)
  - Phenotypes
- Genomic prediction (12 times a year)
  - Genotypes+Phenotypes (DRP)
    - Two steps
Traits in genetic evaluation

- Yield traits
- Beef traits
- Fertility traits
- Calving traits
- Udder health
- Claw health
- Other disease
- Longevity
- Type traits
- Young stock survival

On average 25 years of data
Traditional genetic evaluation

How are traits measured?

- Continuous
- Classes (0/1 or 0-4)

Statistical models

- We apply linear Multi Trait and Multi Lactation models
- We assume normality - not 100% perfect
Genetic evaluation

- Traditional genetic evaluation (4 times a year)
- Phenotypes all traits

New phenotypes

AMS systems

Stand-alone systems

Milk recording
- New lab tests

Yield per quarter, milking time, weight, activity, rumination etc.

Activity and rumination

Pregnancy tests and BHB (beta-hydroxybutyrate)
• Tissue sampling
• >20,000 in 2014 – increasing!
Routine genomic prediction

Phenotype eg milk yield (DRP derived from EBV)

SNP’s

GEBV
Traditional evaluation and genomic prediction for Holstein - yield information

100 mio testdays
12.000 GT cows
26.000 Nordic and foreign bulls

22 mio testdays
5.000 GT cows

60 mio testdays
3.000 GT cows

390 mio MME solved to calculate GEBV
Next 5 years

- Tissue sampling
- all animals at birth in 2018 (?) – increasing number of genotypes!
Genetic evaluation

- Traditional genetic evaluation (4 times a year)
  - Phenotypes (+ more daily measurements)
- Genomic prediction (weekly)
  - More genotypes + phenotypes
  - Two steps (simultaneously use of genotypes and phenotypes – one step)
  - Include knowledge about QTLs or SNPs carrying substantial amount of information
MIX99 use in NAV

- MIX99 used since the first joint Nordic routine run in 2005
- Current use
  - Estimation of breeding values – mastitis, milk yield incl. HV correction
  - DRP calculations in relation genomic prediction
  - Reliabilities
Software - key point for routine evaluation in practice

- A reliable software program with backup from program developer
- Flexible models
- Optimal use of computer capacity
- Efficient solving algorithm – has always been critical within dairy cattle breeding and will also in the near future be a challenge

MIX99 has so far done an excellent job for NAV