Genomic bulls in The Netherlands and their impact on the population

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Interbull Workshop Verden 2014
The start

2006   Proofs computed (3K SNPs) by CRV for breeding program

2007   Proofs computed based on 50K

2008   Introduction six packs genomic bulls in market

2010   Exchange genotypes Eurogenomics
       First national proofs Genetic Evaluation Sires (GES)
         - Blending on Paternal Pedigree Index
         - Only CRV-bulls

2011   Genomic proofs added AI Kampen bulls

2014   GMACE proofs published
       Genomic proofs used as pseudorecords in genetic evaluation
Impact on population - Content

- Generation interval

- Genetic trends – after introduction genomics
  - Bulls
  - Cows

- How well do genomic EBVs predict daughter EBVs

- Publication policy
Genetic trend B&W bulls
(rolling 3 year average)

- NVI trend: 10 points/year
- Longevity trend: 75 days/year
- NVI trend: 35 points/year

birthyear

days/points
Genetic trend B&W bulls  
(rolling 3 year average)
Genetic trend B&W bulls
(rolling 3 year average)

- Negative trend: -0.5 point
- Positive trend: +1.0 point/year
Trends in cow population
Mainly selection on production

Introduction TMI

Extension TMI: more fertility and calving traits

Genetic trend B&W cows
(rolling 3 year average)

kg protein

kg milk

birthyear

kg prot

kg milk

Genetic trend B&W cows
(rolling 3 year average)

Effect of TMI:
SCC and fertility

EBV (mean=100, stddev=4)

birth year


-2 -1.5 -1 -0.5 0 0.5 1 1.5 2

Final Score
SCS
Fert Index
Claw Health

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Genetic trend B&W cows and bulls

Cows follow bulls:
- First in negative trend
- Now in positive trend

First genetic evaluation
SCS in TMI-NVI
Introduction genomics

EBV (mean=100, stdev=4)

birth year


SCS cows
SCS bulls
Effect of ‘genomics’

Bulls:
- Increased trend in TMI – NVI
- Increased trend in production, longevity and health

Cow population:
- Change in genetic trends due to change in TMI/breeding goal
- No yet change in genetic trend due to genomics
  - But will follow the bulls !!!
How well does genomics work?

- More than 50% of CRV-inseminations in Holstein with genomic bulls

- Important that breeding values keep their level
  genomic proof -> daughter proof

- Validation
  - Interbull tests
  - Proof on farms :
    - compare published genomic proofs with daughter proofs
Comparing 3 groups of bull

<table>
<thead>
<tr>
<th>Top 200 in press list</th>
<th>NVI</th>
</tr>
</thead>
<tbody>
<tr>
<td>National (NLD+FLA) daughter proven</td>
<td>208</td>
</tr>
<tr>
<td>Interbull daughter proven</td>
<td>243</td>
</tr>
<tr>
<td>Genomic bulls</td>
<td>306</td>
</tr>
</tbody>
</table>

-> genomic bulls are 60-100 points (> 1 gen. stdev) higher than daughter proven bull

= about 4 years of selection (without usage of genomic)
### Comparison daughter EBV minus genomic EBV

*(n = 821)*

<table>
<thead>
<tr>
<th>Trait</th>
<th>Unit</th>
<th>% gen.stdev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>rel NVI</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>NVI</td>
<td>-9</td>
<td>-12%</td>
</tr>
<tr>
<td>milk</td>
<td>-36</td>
<td>-6%</td>
</tr>
<tr>
<td>fat</td>
<td>-0,6</td>
<td>-2%</td>
</tr>
<tr>
<td>protein</td>
<td>-0,9</td>
<td>-6%</td>
</tr>
<tr>
<td>herdlife</td>
<td>-40</td>
<td>-15%</td>
</tr>
<tr>
<td>overall conformation</td>
<td>-0,5</td>
<td>-12%</td>
</tr>
<tr>
<td>frame</td>
<td>-0,4</td>
<td>-9%</td>
</tr>
<tr>
<td>udder conf</td>
<td>-0,1</td>
<td>-1%</td>
</tr>
<tr>
<td>F&amp;L</td>
<td>-0,4</td>
<td>-9%</td>
</tr>
<tr>
<td>SCC</td>
<td>-0,3</td>
<td>-6%</td>
</tr>
<tr>
<td>Udder Health index</td>
<td>-0,2</td>
<td>-5%</td>
</tr>
<tr>
<td>Fertility index</td>
<td>0,1</td>
<td>3%</td>
</tr>
</tbody>
</table>

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Genomic vs Daughter EBV

NVI

kg milk

CRV Interbull Workshop Verden 2014
Changes EBV bulls genomics -> daughter EBV

<table>
<thead>
<tr>
<th>Class NVI based on genomics</th>
<th>low</th>
<th>high</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-20%</td>
<td>98</td>
<td>164</td>
</tr>
<tr>
<td>21-40%</td>
<td>42</td>
<td>169</td>
</tr>
<tr>
<td>41-60%</td>
<td>16</td>
<td>162</td>
</tr>
<tr>
<td>60-80%</td>
<td>7</td>
<td>163</td>
</tr>
<tr>
<td>81-100%</td>
<td>1</td>
<td>163</td>
</tr>
</tbody>
</table>

Of 164 bulls in lowest class based on genomics: 98 in the lowest class based on daughters and 1 in the highest class

Of 164 bulls in highest class based on genomics: 95 in the highest class based on daughters and 2 in the lowest class

Bulls ranking low (1) to high (5) in 5 classes

Of 164 bulls in highest class based on genomics: 95 in the highest class based on daughters and 2 in the lowest class
Publication policy genomic EBVs

NLD GEBV published:
- reliability at least 30%

GMACE GEBV published:
- Bull has no EBV based on daughters having records
- Reliability at least 30%
- Reliability GMACE > 10% higher than NLD gEBV

-> as soon as foreign genomic proof is available through GMACE, it is published (following Interbull)
-> also with NVI (rank index) !!!

-> Interbull proofs available in publication list (gesfokwaarden.eu)
-> in database Stierzoeken/Siresearch (global.crv4all.com)
Final remarks

Effect on population

- large effect on bull population
  -> change in breeding programs
  -> shorter generation intervals
  -> larger genetic trend
- yet not much effect on cow population
  -> BUT coming years a large change

Genomic EBVs -> keep the same level
Thank you for your attention