German Experiences with Implementation and Publication of GMACE

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Historical Development

- National gEBV since 2010
- GMACE since 2014
  - Germany was first country that published GMACE (since implementation run 1404)
  - Including all summarizing indices and total merit gRZG

- In-between:
  - (national) gEBV base for all decisions in breeding programs
  - especially selection of sires of sons
  - national gEBV for potential foreign sires of sons on the base of first straws (or SNP exchange) ➔ full comparability to national bulls (traits, scale, reliability)

➔ When GMACE came for majority of important foreign young bulls national gEBV were/are available
  - And most important source of foreign HOL genetic was/is not in GMACE: USA/CAN
GMACE works

Presentation INTERBULL workshop in Berlin, May 2014:

- 847 foreign bulls with independent GMACE- and DEU-gEBV (no DEU info in GMACE)

<table>
<thead>
<tr>
<th>Trait</th>
<th>GMACE</th>
<th>gEBV DEU</th>
<th>Diff. GM-DEU</th>
<th>s Diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>rel. protein kg</td>
<td>66.2</td>
<td>72.6</td>
<td>-6.3</td>
<td></td>
</tr>
<tr>
<td>protein kg</td>
<td>40.6</td>
<td>41.3</td>
<td>-0.7</td>
<td>7.0</td>
</tr>
<tr>
<td>fat kg</td>
<td>40.4</td>
<td>42.7</td>
<td>-2.3</td>
<td>8.7</td>
</tr>
<tr>
<td>milk kg</td>
<td>1201</td>
<td>1154</td>
<td>48</td>
<td>229</td>
</tr>
<tr>
<td>prod. index (RZM)</td>
<td>119.7</td>
<td>120.5</td>
<td>-0.8</td>
<td>4.9</td>
</tr>
<tr>
<td>rel. RZE</td>
<td>61.7</td>
<td>55.8</td>
<td>5.9</td>
<td></td>
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<tr>
<td>conf. index (RZE)</td>
<td>118.0</td>
<td>117.6</td>
<td>0.4</td>
<td>4.0</td>
</tr>
<tr>
<td>stature</td>
<td>109.0</td>
<td>109.8</td>
<td>-0.9</td>
<td>3.7</td>
</tr>
<tr>
<td>udder depth</td>
<td>114.2</td>
<td>116.0</td>
<td>-1.8</td>
<td>4.3</td>
</tr>
</tbody>
</table>

- Average GMACE-gEBV very similar to (independent) DEU-gEBV
- In tendency GMACE-gEBV are lower compared to DEU-gEBV
- Reliabilities different
GMACE works

RZM = production index
Scale: $\varnothing = 100$, $s = 12$

$\varnothing$ GMACE: 119.7  $\varnothing$ DEU: 120.5  Diff.: -0.8
$\varnothing$ deviation: $\pm$ 4.9

RZE = total conformation index
Scale: $\varnothing = 100$, $s = 12$

$\varnothing$ GMACE: 118.0  $\varnothing$ DEU: 117.6  Diff.: +0.4
$\varnothing$ deviation: $\pm$ 4.0

→ No systematic over- or under-estimation
GMACE works, but …

- Converts national gEBV to other country scales
  - With loss of reliability
  - With in principal same ranking as in country of origin

- same/more “limitations” as classical MACE

- but different to MACE there is an alternative available (national gEBV)

- Technical issues:
  - Unsolved comparability of reliability
  - Heterogeneity of “composition” of national gEBVs ➔ IB de-regression “sub-optimal”
  - Provided national gEBV for GMACE “older” than national gEBV at publication
  - Only 3 times/year GMACE (national GE monthly)
  - Missing bulls in publication lists because of problems with ownership/BCC
  - No more genomic information with first daughter proof (inconsistent ‘transition’)

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Technical implementation

National candidate → National GES

Monthly evaluation

Young foreign bull

GMACE

MACE

National publication
Technical implementation

- National candidate
- National GES
- 3/year main publication
- GMACE
- MACE
- National publication
- Young foreign bull
GMACE publication (I)

DEU:
- Since 04-2014 (implementation run)
- With all summarizing indices and total merit index gRZG
- On the same webpage as national and MACE results (www.vit.de)
- In case national gEBV exist, these are published (source is given for every bull)
  - **DEU follows all publication rules from Interbull**

Technical implementation is finished
- All computer programs and jobstreams were adapted
- Use in routine evaluation now
- Automatic optimal integration/combination of GMACE – MACE – gEBV – EBV
- For domestic and international proofs
GMACE publication (II)

- Other countries:
  - In principle all other 26 countries participating in HOL MACE should do the same but
  - Some countries do not publish GMACE results at all
  - Some countries publish not all figures/traits
  - Some countries do not publish summarizing indices and total merit index
  - Some countries publish on webpages not accessible via the national publication webpage (only found by link on Interbull webpage)
  - Some countries publish results/traits on several webpages (of different organizations)
  - ...

→ Does majority of countries not see GMACE as useful results for breeders?

*(Interbull the worldwide network providing genetic information services for improvement of livestock)*
GMACE publication (III)

- In principle all other 26 countries participating in HOL MACE should do the same

- Interbull publication rules:
  - In the past (for MACE) we had/have relatively general/unspecific
    - But almost all countries acted similar ➔ ‘complete’ publication like intended
    - Even general documentation of rules is limited
  - Since GMACE different
    - … ‘implementation run’ …
    - New explicit rule ‘countries have only to publish single traits’

- Does Interbull want all countries to publish ‘complete’ results? (from MACE and GMACE)

- Consequences of not publishing summarizing indices and total merit index
  - foreign bulls can not be compared/selected on GMACE results
  ➔ could be the end (of relevance) of MACE/GMACE for individual bull selection
  ➔ only MACE would be needed for reference populations
GMACE DEU-bulls on other scales

- Many questions from German exporters of semen on the international publication of GMACE results
  - They can not find (all) results/bulls in many countries
  - They don’t understand figures
  - They do not know who is responsible for national publication of GMACE or do not get (sufficient) answers from national bodies responsible for IB publication

Additional Aspects

- In countries with national genomic systems (comparable to DEU situation) national gEBV for relevant foreign young bulls are already available

- Countries without genomic systems
  - Often no or incomplete publication
  - Reliability of GMACE gEBV low
  - Genomics in general are not promoted because no national g-bulls available
  - Potential clients for foreign bulls mostly select these on the base of information from country of origin (like daughter proven bulls, too)
Conclusion

- *GMACE in principle works*

but

- Impact of GMACE results in DEU is minor because
  - National gEBV are available for most foreign bulls
  - It came late (3x/year)
  - Includes not all bulls (BCC)
  - Has still technical problems (statistical and timing)
  - Is in general not promoted by many countries

- The restrictive policy of other countries in publication of GMACE results fosters tendency in Germany to be more restrictive in publication, too
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