INTERBEEF R & D PROJECT

“Int. Evaluation for fertility traits”
- Summary of survey
- Conclusion

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Interbeef survey: GE for fertility traits in beef cattle

- National GE – systems in place (traits, breeds)
  - male fertility
  - female fertility
  - models

- Preferences for international GE
  - male / female fertility
  - traits, breeds

- Questions put together by F. Reinhardt and J. Dürr

- 9 countries replied (January / February, 2014)
  - 5 evaluation centers
  - 4 others (breeding organizations)

- The technical support of IB center is greatly appreciated!
Interbeef survey: GE for fertility traits in beef cattle

Countries responding

- CHE
- CZE
- DEU
- DNK
- FIN
- FRA
- GBR
- IRL
- SWE
National GE systems for fertility traits in beef cattle

Breeds / # countries with GE:

- Limousin, Blonde d’Aquitaine, Salers 5
- Charolais 4
- Angus, Hereford, Highland, Simmental 3
- Aubrac, Belgian Blue, Galloway, Parthenaise, Piemont, Rouge de Pres 2
National GE systems for fertility traits in beef cattle

Male fertility traits

- Recording of male fertility traits in 4 countries
- GE of male fertility traits currently in 2 countries

Traits (recorded / evaluated)

- % cycling femals pregnant 1 / 0 (FIN)
- age at puberty 0 / 0
- scrotal circumference 3 / 1 (IRL, GBR, SWE) $h^2=0.33$
- semen quality 1 / 0 (SWE)
- testosterone concentration 0 / 0
- Others (calving rate) 1 / 1 (IRL) $h^2=0.01$
National GE systems for fertility traits in beef cattle

Female fertility traits
- Recording of female fertility traits in 9 (all) countries
- GE for female fertility traits currently in 5 countries (IRL, GBR, DNK, DEU, FRA)
- Traits (recorded / evaluated)
  - age at 1st calving: 7 / 3 (IRL, GBR, CZE, FIN, CHE, SWE, DEU)
  - age at puberty: 0 / 0
  - calving date: 5 / 0 (IRL, CZE, FIN, CHE, SWE) ??
  - calving interval: 8 / 4 (IRL, GBR, CZE, DNK, FIN, CHE, SWE, DEU)
  - calving rate: 2 / 1 (IRL, SWE)
  - calving success: 3 / 0 (IRL, FIN, SWE)
  - days to calving: 2 / 0 (FIN, CHE)
  - 1st service conception rate: 1 / 1 (FRA)
  - number of calves (78 mon./FRA): 7 / 2 (IRL, CZE, FIN, CHE, SWE, DEU, FRA)
  - post partum re-conception interval: 0 / 0
  - pregnancy rate: 1 / 0 (IRL)
  - others (life span, gestation length): 1 / 0 (CZE ?)
  - others (cow survival): 1 / 1 (IRL)
Female fertility traits

Heritabilities used for national GE

- age at 1st calving (CA1) 0.20
- calving interval (CI) 0.025 – 0.09
- calving rate (CR) 0.06
- 1st service conception rate (HCS/PCS) 0.015
- number of calves (NC) 0.15
- number of calves 78 mon. (NC78) 0.04
- cow survival (CS) 0.02
- life span (LS = CS?) 0.11
- gestation length (GL) 0.20
Female fertility traits

**Models used for GE (not complete)**

- IRL: Linear MT-R-A – Model (CA1, CI, CS)
- DEU: Linear MT-R-A – Model (CA1, CI) // Survival Kit (NC)
- FRA: Linear MT-A Modell (HCS/PCS) // Linear A-Model (NC78)

- Summary: environmental effects, individual non genetic effects
  - Random: contemporary group: (herd x year)
  - Fixed: calving season, (parity x age), sex of calf
Female fertility traits

Publication rules

- IRL, GBR: All animals with reliabilities
- DNK: All animals > 10% Rel.
- DEU: Males > 30% Rel. // Females ≥ 2 calvings
- FRA: Only Males > 35/30 daughters and > 30% Rel.
# International GE: Breeds nominated

<table>
<thead>
<tr>
<th>Breed</th>
<th>#</th>
<th>Countries</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angus</td>
<td>5</td>
<td>(IRL, DNK, FIN, CHE, SWE)</td>
<td>3</td>
</tr>
<tr>
<td>Blonde d’Aquitaine</td>
<td>5</td>
<td>(DNK, FIN, CHE, SWE, FRA)</td>
<td>2</td>
</tr>
<tr>
<td>Charolais</td>
<td>8</td>
<td>(IRL, GBR, DNK, FIN, CHE, SWE, DEU, FRA)</td>
<td>1</td>
</tr>
<tr>
<td>Dexter</td>
<td>1</td>
<td>(DNK)</td>
<td></td>
</tr>
<tr>
<td>Galloway</td>
<td>1</td>
<td>(DNK)</td>
<td></td>
</tr>
<tr>
<td>Hereford</td>
<td>5</td>
<td>(IRL, DNK, FIN, CHE, SWE)</td>
<td>3</td>
</tr>
<tr>
<td>Highland Cattle</td>
<td>2</td>
<td>(DNK, FIN)</td>
<td></td>
</tr>
<tr>
<td>Limousin</td>
<td>8</td>
<td>(IRL, GBR, DNK, FIN, CHE, SWE, DEU, FRA)</td>
<td>1</td>
</tr>
<tr>
<td>Simmental (Beef)</td>
<td>7</td>
<td>(IRL, GBR, DNK, FIN, CHE, SWE, DEU)</td>
<td>2</td>
</tr>
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</table>
## International GE: Traits proposed

<table>
<thead>
<tr>
<th>Trait</th>
<th>#</th>
<th>Countries</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycl. females impreg.</td>
<td>2</td>
<td>(FIN,SWE)</td>
<td></td>
</tr>
<tr>
<td>Age at 1st calving</td>
<td>5</td>
<td>(IRL,GBR,FIN,SWE,DEU)</td>
<td>2</td>
</tr>
<tr>
<td>Calving interval</td>
<td>8</td>
<td>(IRL,GBR,DNK,FIN,CHE,SWE,DEU,FRA)</td>
<td>1</td>
</tr>
<tr>
<td>Calving rate</td>
<td>1</td>
<td>(IRL)</td>
<td></td>
</tr>
<tr>
<td>Calving success</td>
<td></td>
<td>(FIN)</td>
<td></td>
</tr>
<tr>
<td>1st serv. conc. rate</td>
<td>2</td>
<td>(CHE,FRA)</td>
<td></td>
</tr>
<tr>
<td>Post p. re-conc. rate</td>
<td>1</td>
<td>(CHE)</td>
<td></td>
</tr>
<tr>
<td># of calves</td>
<td>4</td>
<td>(CHE,SWE,DEU,FRA)</td>
<td>3</td>
</tr>
<tr>
<td>Cow survival</td>
<td>1</td>
<td>(IRL)</td>
<td></td>
</tr>
</tbody>
</table>
Final comments

- IRL: Harmonization of traits necessary
- SWE: National evaluation in the first step
- DEU: Focus on max. 3 breeds and 3 traits
Conclusions for an international GE for fertility traits

Male fertility traits: Interbeef evaluation currently not required

Female fertility/reproduction traits: Yes, demand in many countries

1. Priority of traits
   1. Calving interval should be available in all countries !?
   2. Age at first calving should be available in all countries !?
   3. Number of calves ( = ~ cow survival / longevity / life span)

2. Priority of breeds
   1. Charolais, Limousin
      ▪ close relationships via FRA, # of records, pedigree data already in IDEA
   2. Simmental, Blonde d'Aquitaine
      ▪ Simmental (as an example without FRA)
      ▪ Blonde d'Aquitaine (close relationships via FRA, # of records)
   3. Angus, Hereford
      ▪ Examples without FRA
Model considerations

- Focus on female fertility

- Fall back on traits derived from reliable dates (birth date, calving dates)
  - Calving interval (CI)
  - Age at 1st calving (CA1)
  - Number of calvings (NC), instead of cow survival/longevity or life span

- Simple/robust models within breed
  - Multi trait repeatability animal model
    \[ CI = (\text{herd} \times \text{year}) + \text{(parity} \times \text{age}) + \text{sex(calf)} + a + p + e \] (rep. rec.)
    \[ CA1 = (\text{herd} \times \text{year}) + a + e \]

  - Survival Kit (S-MGS-Model, censored data)
    \[ CN = (\text{herd} \times \text{year}) + \text{sire} + e \]
Next steps (to be discussed)

- Agreement about traits

- Definition of contents and formats of INTERBEEF reproduction file

- Data call by INTERBEEF

- Development of GE system by vit
  - Plausibility checks (must be defined, harmonized over all countries/breeds)
  - Data preparation (pedigree data, reproduction data)
  - Adaptation of evaluation programs
  - Calculation of reliabilities
  - Preparation of EBV-Files for participating countries

- Validation of results (in cooperation with participating countries)
Thank you

IT-Solutions for Animal Production