Implementation of French national genetic evaluation of beef calf temperament from field data

Eric VENOT, Jean GUERRIER, Philippe LAJUDIE, Vincent DUFOUR, Olivier LEUDET, Xavier BOIVIN, Jean SAPA, Florence PHOCAS

1 INRA, 2 IDELE
since 90’s, several studies have been performed on Limousine breed to set up a temperament test on bulls tested in performance or progeny test stations

- « docility test » to get rid of worst breeding bulls
- evidence of moderate genetic variability for the different traits
- test not feasible on farm
Research project COSADD

- between 2007 and 2009, research project to define temperament traits measurable on farm
- data recording on farm and result analysis done by Haïfa Benhajali & Florence Phocas at INRA
- based on results of “docility test”, 12 Limousine bulls were used in 24 herds to get at least 40 progeny / bull

moderate heritabilities for the different measured traits:

~ 0.3 in constrained conditions

~ 0.2 if temperament is scored
### 2 on-farm selection criteria of calf temperament

Number of movements in constrained conditions during the 10 first seconds of the weighing at weaning

<table>
<thead>
<tr>
<th><strong>REAC</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Constrained conditions</strong></td>
</tr>
<tr>
<td>age between 4 et 10 months (opt. 5 - 8 months)</td>
</tr>
</tbody>
</table>
**2 on-farm selection criteria of calf temperament**

<table>
<thead>
<tr>
<th>Number of movements in constrained conditions during the 10 first seconds of the weighing at weaning</th>
<th>Calf temperament score given by a qualified technician along with the other 19 type traits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REAC</strong></td>
<td><strong>COMP</strong></td>
</tr>
<tr>
<td>Constrained conditions</td>
<td>Field and Farm conditions</td>
</tr>
<tr>
<td>age between 4 et 10 months (opt. 5 - 8 months)</td>
<td>age between 4 and 12 months (opt. 5 - 8 months)</td>
</tr>
</tbody>
</table>
Beef calf temperament recording system

Since end 2011:

► specific beef technician training course on calf temperament measure on farm, prepared by IDELE (with video examples)

► specific table set up in the French National database + all practical tools associated

temperament recording on farm for the 9 beef cattle breeds under selection in France
Data available

► national database extraction => 474 177 records

► animals born between November 2011 and May 2014

360 068 different animals

30 % with both measures (109 539)

70 % with only 1 measure (250 529)

90 % with COMP only (224 895)

10 % with REAC only (25 634)
Other breeds: between 23 et 55 % of the animals with both traits

Parthenaise & Bazadaise: > 84% of the animals with both traits

Data available
French beef cattle genetic evaluation of calf temperament
28th October 2016

Temperament score distribution

<table>
<thead>
<tr>
<th>Comes to the technician</th>
<th>No movement</th>
<th>Walks</th>
<th>Quick walk</th>
<th>Runs</th>
<th>In Alert</th>
<th>Attacks</th>
</tr>
</thead>
</table>

Notes de comportement
Distribution des notes de comportement
BLA
CHA
LIM
PAR

Comes to the technician
No movement
Walks
Quick walk
Runs
In Alert
Attacks

Temperament score distribution

Calf temperament scores are distributed as follows:

- BLA: Blue line
- CHA: Red line
- LIM: Green line
- PAR: Yellow line

The graph shows the distribution of calf temperament scores across different behaviors.

1. Comes to the technician
2. No movement
3. Walks
4. Quick walk
5. Runs
6. In Alert
7. Attacks

The percentage distribution across these categories is visually represented in the graph.
Number of movements during the first 10 seconds of weighing

► 0 to 9 (and +)
Data selection for genetic parameter estimation

► Performance exclusion
  • twins and embryo transfer calves
  • tied calves (very few)
  • calves with unknown dam
  • Contemporary group with less than 3 calves with REAC and 5 for COMP

► Only herds with at least 3 birth campaigns kept

Number of birth years by herd
## Data description

<table>
<thead>
<tr>
<th></th>
<th>REAC</th>
<th>COMP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BLA</td>
<td>CHA</td>
</tr>
<tr>
<td>**Number of</td>
<td>8 599</td>
<td>16 846</td>
</tr>
<tr>
<td>performances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>**Number of herds</td>
<td>124</td>
<td>122</td>
</tr>
<tr>
<td><strong>Herd size</strong></td>
<td>29 (23)</td>
<td>49 (28)</td>
</tr>
<tr>
<td><strong>Performance mean</strong></td>
<td>2,5 (1,9)</td>
<td>2,1 (1,8)</td>
</tr>
</tbody>
</table>
**Fixed effect model definition**

- **Associated information available in French national database**
  - age at the measure, sex...
  - technician associated with the measure
  - dam parity
  - management group

- **only for scoring measure COMP:**
  - **COSEPO**: weaning status (not weaned, just weaned, weaned),
  - **SIAPCO**: measure condition (Box, on field or tied animal)
  - **DIAPCO**: distance between technician and animal scored
    (<5m, 5-10, >10m)
  - **PREFEM**: dam presence during scoring
Fixed effect model definition

- Contemporary group (HERD x TECHNICIAN x SEX x MANAGEMENT GROUP x BIRTH GROUP)
- Age in class

+ only for temperament score:
  - PREFEM: dam presence during scoring
  - DIAPCO x SIAPCO: Distance Animal-Technician x Measure condition
Test with uni-trait models including maternal effects (genetic and/or Perm. Envt)
no evidence of maternal effect

Results for uni-trait models:

<table>
<thead>
<tr>
<th></th>
<th>BLA</th>
<th>CHA</th>
<th>LIM</th>
<th>PAR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REAC</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heritability</td>
<td>0.16 (0.03)</td>
<td>0.13 (0.02)</td>
<td>0.17 (0.02)</td>
<td>0.12 (0.02)</td>
</tr>
<tr>
<td><strong>COMP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heritability</td>
<td>0.11 (0.03)</td>
<td>0.09 (0.01)</td>
<td>0.10 (0.01)</td>
<td>0.10 (0.02)</td>
</tr>
</tbody>
</table>

Previous COSADD results:
- 0.31
- 0.17
Genetic parameter estimation

Test with uni-trait models including **maternal effects** (genetic and/or Permanent envt)

*no evidence of maternal effect.*

**Results for uni-trait models:**

<table>
<thead>
<tr>
<th></th>
<th>BLA</th>
<th>CHA</th>
<th>LIM</th>
<th>PAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>REAC</td>
<td>Heritability</td>
<td>0.16 (0.03)</td>
<td>0.13 (0.02)</td>
<td>0.17 (0.02)</td>
</tr>
<tr>
<td></td>
<td>Phenotypic Variance Coeff.</td>
<td>43%</td>
<td>52%</td>
<td>41%</td>
</tr>
<tr>
<td></td>
<td>Genetic Variance Coeff.</td>
<td>17%</td>
<td>19%</td>
<td>17%</td>
</tr>
<tr>
<td>COMP</td>
<td>Heritability</td>
<td>0.11 (0.03)</td>
<td>0.09 (0.01)</td>
<td>0.10 (0.01)</td>
</tr>
<tr>
<td></td>
<td>Phenotypic Variance Coeff.</td>
<td>27%</td>
<td>27%</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td>Genetic Variance Coeff.</td>
<td>9%</td>
<td>8%</td>
<td>8%</td>
</tr>
</tbody>
</table>
Direct genetic correlation between REAC and COMP

<table>
<thead>
<tr>
<th>BLA</th>
<th>CHA</th>
<th>LIM</th>
<th>PAR</th>
<th>COSADD PROJECT LIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.33 (0.13)</td>
<td>0.43 (0.09)</td>
<td>0.39 (0.14)</td>
<td>0.32 (0.13)</td>
<td>0.28 (0.28)</td>
</tr>
</tbody>
</table>

Number of movements at weighing et
Temperature score at weaning
are 2 different traits.

<table>
<thead>
<tr>
<th>REAC</th>
<th>COMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>« Ease of manipulation »</td>
<td>« Ease of animal raising »</td>
</tr>
<tr>
<td>&amp; « Security »</td>
<td></td>
</tr>
</tbody>
</table>
Pilot genetic evaluations

- Genetic parameters for other breeds: $h^2_{\text{REAC}}=0.15$ et $h^2_{\text{COMP}}=0.10$
- Sires with reliability $\geq 0.5$ and at least 25 progeny with performance included in genetic evaluation

<table>
<thead>
<tr>
<th></th>
<th>LIM</th>
<th>CHA</th>
<th>BLA</th>
<th>PAR</th>
<th>SAL</th>
<th>ROU</th>
<th>AUB</th>
<th>BAZ</th>
<th>GAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of publishable bulls in 2014</td>
<td>16455</td>
<td>23482</td>
<td>4513</td>
<td>1432</td>
<td>2663</td>
<td>925</td>
<td>2054</td>
<td>29</td>
<td>271</td>
</tr>
<tr>
<td>REAC</td>
<td>601</td>
<td>239</td>
<td>161</td>
<td>165</td>
<td>83</td>
<td>24</td>
<td>21</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4%</td>
<td>1%</td>
<td>4%</td>
<td>12%</td>
<td>3%</td>
<td>3%</td>
<td>1%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>COMP</td>
<td>1023</td>
<td>417</td>
<td>187</td>
<td>177</td>
<td>90</td>
<td>69</td>
<td>35</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>6%</td>
<td>2%</td>
<td>4%</td>
<td>12%</td>
<td>3%</td>
<td>7%</td>
<td>2%</td>
<td>3%</td>
<td>1%</td>
</tr>
</tbody>
</table>
Pilot genetic evaluations – genetic trends

EBV’s mean of sires with reliability ≥ 0.3 and at least 5 progeny with performance

French EBV expression:
Mean = 100
1 genetic std = 10
CONCLUSION

► previous studies showed the interest and feasibility of calf temperament genetic evaluation (at weaning).

► based on these results, a new organization has been set up to:

   - train technicians through a specific training course,
   - update technician tools to collect these info on farm
   - update National database.

► this study confirms the feasibility of calf temperament genetic evaluation base on data collected on farm

Both traits are now included in French national evaluation: first official publication beginning 2016

KEEP CALM AND RAISE YOUR ANIMALS MORE EASILY