Genetic parameters for litter traits including farrowing duration and piglet survival up to weaning in French Large White sows

I. Mérour, E. Bernard, J.P. Bidanel, L. Canario

Session 02 – « New phenotypes for new breeding goals »
Genetic selection

😊 ➔ Litter size

sad ➔ Stillbirth

sad ➔ Pre-weaning mortality

➔ Need for birth assistance

Context

Phenotypic trends

From 2002, selection for NBA instead of total number of piglets
Which new traits could be included in the French breeding goal to improve piglet survival?

- farrowing duration
- birth assistance
- piglet weight characteristics
### Material & Methods

#### Data collected in 24 nucleus LW herds

<table>
<thead>
<tr>
<th>Traits</th>
<th>Abbreviations</th>
<th>Litters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Litter size</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of piglets born alive</td>
<td>NBA</td>
<td>20,648</td>
</tr>
<tr>
<td>Number of stillborn piglets</td>
<td>NSB</td>
<td></td>
</tr>
<tr>
<td>Number of weaned piglets</td>
<td>NW</td>
<td></td>
</tr>
<tr>
<td><strong>Birth weights</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average piglet birth weight</td>
<td>ABW</td>
<td>2,086</td>
</tr>
<tr>
<td>Within-litter standard deviation of piglet birth weight</td>
<td>SDBW</td>
<td></td>
</tr>
<tr>
<td><strong>Farrowing process</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farrowing duration</td>
<td>FD</td>
<td>14,957</td>
</tr>
<tr>
<td>Birth Assistance</td>
<td>BA</td>
<td>19,597</td>
</tr>
</tbody>
</table>

10,854 dams and 1,080 sires
Distributions and statistical transformations

**Farrowing duration**

- < 2h: 20%
- 2-3h: 60%
- 3-4h: 20%
- >= 4h: 0%

**Birth Assistance**

- 0: 80%
- 1: 20%
- Several: 0%

**Distributions**

- Normal distribution
- Poisson distribution
Model

- REML methodology applied to multiple trait animal models (DMU software)
  - Fixed effects: parity, herd/year/season, mating type (AI or natural service)
  - Random effects: additive genetic value, sow permanent environment
  - Covariates: sex ratio, NBA, age at weaning
Heritability estimates

Prolificacy

- NBA: 0.12
- NSB: 0.08
- NW: 0.07

Farrowing process

- FD: 0.05
- BA: 0.02

Birth weight characteristics

- ABW: 0.39
- SDBW: 0.17

Not possible to include in a breeding program

Possible candidate traits for selection

Standard errors [0.01 ; 0.05]
Genetic correlations with Farrowing Duration

Longer farrowing duration ⇔ higher occurrence of stillborn piglets
Heterogeneity of piglet weights ⇔ longer farrowing process
FD and BA : similar underlying genetic cause
Genetic correlations with Birth Assistance

**BA** is moderately associated to the number of stillborn piglets **BUT** is not dependent of average litter weight and heterogeneity within litters.
Genetic antagonism between ABW and (NBA and SDBW)
No significant correlation of SDBW with number weaned piglets due to cross fostering
Implications

NBA = ABW

SDBW

FW

NW

= ABW

FD

BA

NSB

0.31

0.53

0.33

0.23

-0.43

0.38

0.67

0.35

0.41
Conclusions and perspectives

- Estimates of heritability of FD and BA are low
  - recorded routinely by French breeders ⇔ keep an eye on relationships with other traits
- New French LW breeding goal: NW instead of NBA

- New concern: ¶ human interventions
  - New breeding goals might decrease the need for birth assistance
- Is it possible to find an approximate measurement to avoid individual recording of birth weights?
Special thanks go to breeders for diligent data recording

This study was conducted with the technical collaboration of:

Thanks for your attention