ICAR working group on 
Recording, Evaluation and Genetic 
Evaluation of Functional Traits

Erling Strandberg

Members of WG
- Ab Groen, NL
- Erling Strandberg, Sweden
- Nicholas Gengler, Belgium
- Johann Sölkner, Austria

Objectives
- writing a portfolio of recommendation sheets on recording, evaluation and genetic improvement for functional traits in dairy cattle. Recommendation sheets will be written for seven functional trait groups:
  - udder health
  - female and male fertility
  - calving ease and stillbirth
  - feet and legs problems
  - workability
  - longevity
  - metabolic stress and feed efficiency

Aims of guidelines
- Suggest "good practices" for recording and evaluation
  - Good practice may depend on country and change over time
- Step-wise decision-support in developing a recording and evaluation system for fertility, to support genetic improvement in dairy cattle
  - Both when starting a new program and when updating an existing one

Members of WG
- Ab Groen, NL
- Erling Strandberg, Sweden
- Nicholas Gengler, Belgium
- Johann Sölkner, Austria
- Christa Egger-Danner (*)
- Lucy Andrews (UK)
- Jennie Pryce (NZ)
Layout of guidelines

- General introduction
- Background information on fertility and correlated traits
- Step-wise decision support for recording and evaluating fertility and correlated traits

ICAR-GIFT Guidelines on Recording and Evaluation of Fertility a first draft

First draft

- Only female fertility
- Male fertility to be covered separately
- Decision support tree
- Decision depending on:
  - Availability/Possibility for recording
  - Quality of traits, e.g. \( h^2 \), correlation with goal
  - Philosophy: Better something than nothing

Female fertility has several aspects

- Fast return to normal ovarian activity after calving
- Strong signs of estrus
- High probability of conceiving when inseminated at correct time
- Ability to carry pregnancy to term

Step-wise decision support
Step 0 - Prerequisites

- Unique animal and herd id system
- Animal pedigree information
- Birth recording
- A well-functioning central data base
- Milk recording system
- Everything following Interbull recommendations

Decision support tree
Step 1 – Calving interval
- Data from milk recording system
- Measure of return to cyclicity, estrus, conception rate, and ability to keep embryo.
- Only available for cows which have a subsequent calving
  - bad fertility sires will have more of their daughters with missing calving intervals and won’t look as bad as they are
  - important to handle this censoring somehow, and not exclude culled cows
  - takes long time to get information

Step 2 – Measures based on insemination dates

<table>
<thead>
<tr>
<th>Trait</th>
<th>Return to cyclicity</th>
<th>Estrus</th>
<th>Conception rate</th>
<th>Keep embryo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calving to first ins. CFI</td>
<td>++</td>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Non-return rate NR</td>
<td></td>
<td>++</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Number of ins. per series NINS</td>
<td>(+)</td>
<td>++</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First to last insemination FLI</td>
<td>+</td>
<td>++</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insemination interval II</td>
<td>+</td>
<td>(+)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calving to last insemination CLI</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Generally low heritabilities, 1-4%

Step 3 – Body condition score
- Can be fairly easily added to type trait evaluation (if not included)
- Measure of body reserves and energy balance
- Related to return to cyclicity, estrus strength, and probability of conception
- Rather high heritability, similar to milk
Step 3 – Other type traits?

- Some type traits (mainly related to "dairyness") unfavorably correlated to fertility
- May be through relationships with milk yield and body condition, may not add any new information.

Step 4 – Heat strength

- Can be recorded by the farmer or the inseminator and reported with the insemination data (or milk recording data)
- Low heritability, many daughters needed
- Other measures (pedometer, conductivity) can be used for management purposes

Step 5 – Physiological measures

- Progesterone profiles to identify various measures of fertility
- Calving to first luteal activity CLA
  - Higher $h^2$ than CFI (0.16-0.21)
- Proportion of samples with luteal activity within first 60 days, PLA
  - $h^2$ 14% with monthly sampling, high $r_g$ w/ CLA
  - Not influenced by farmer decisions
  - Cheap, in-line measurements in future?

Working procedure for guidelines

- GIFT working group
- Contacted specialists
- ICAR conference(s)
- Free suggestions via Interbull discussion forum (National genetic evaluation) and ICAR homepage
- …
Next step

- writing a portfolio of recommendation sheets on recording, evaluation and genetic improvement for functional traits in dairy cattle. Recommendation sheets will be written for seven functional trait groups:
  - udder health
  - female and male fertility – almost done
  - calving ease and stillbirth,
  - feet and legs problems,
  - workability,
  - longevity,
  - metabolic stress and feed efficiency.