GENETIC PARAMETERS FOR BODY WEIGHT, BCS AND LAMENESS IN AUSTRIAN DAIRY COWS

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Approach – field data for novel traits

• Study based on data of Austrian project „Efficient Cow“

• **Preselection of farms** with higher degree of phenotype recording across different production conditions in Austria

• Extended data recording on-farm on **170 farms in Austria** with app. 5,500 cows for one year (1.1.2014 – 31.12.2014)
  - 3,200 Fleckvieh (Simmental)
  - 1,200 Brown Swiss
  - 1,100 Holstein

• **Data recorded**: general information about the farm, various data related to health (veterinarian diagnoses, claw trimming, farmer observations, ketotest,...), feeding information, **body weight** and body measures, linear scoring, **body condition score**, lameness, infrared-spectra,...
Aim of the presentation

• Does body weight have an impact on lameness?

• Use of management traits like body weight (BW), body condition score (BCS) and lameness (LAME) for breeding?
# Observed data

<table>
<thead>
<tr>
<th>Breed</th>
<th>Nr. obs.</th>
<th>Nr. cows</th>
<th>Body weight (kg/std)</th>
<th>BCS (1-5/std)</th>
<th>Lame (1-5/std)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleckvieh (Simmental)</td>
<td>21,650</td>
<td>3,421</td>
<td>731.3 (85.2)</td>
<td>3.29 (±0.55)</td>
<td>1.29 (±0.66)</td>
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<tr>
<td>Brown Swiss</td>
<td>9,826</td>
<td>1,488</td>
<td>651.9 (75.4)</td>
<td>3.06 (±0.51)</td>
<td>1.24 (±0.62)</td>
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<tr>
<td>Holstein</td>
<td>7,319</td>
<td>1,192</td>
<td>682.8 (77.4)</td>
<td>2.86 (±0.62)</td>
<td>1.44 (±0.75)</td>
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Records between 5 and 365 DIM
Body weight

• In Austria standard housing systems for dairy cows are without equipment for weighing routinely.

• During the observation period of the project “Efficient Cow”, all cows were weighed at each time of milk recording.
Trend of Body Weight (BW)

Efficient Cow, 2014 - Fleckvieh (Simmental)
Body condition score (BCS)

<table>
<thead>
<tr>
<th>Body Condition Score</th>
<th>Vertebrae at the middle of the back</th>
<th>Rear view (cross-section) of the hook bones</th>
<th>Side view of the line between the hook and pinbones</th>
<th>Cavity between tailhead and pinbone Rear view Angled view</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Severe underconditioning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Frame obvious</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Frame and covering well balanced</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Frame not as visible as covering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Severe overconditioning</td>
<td></td>
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Recorded at each milk recording by trained staff.
BCS 1 = severe underconditioning; BCS 5 = severe overconditioning
Trend of Body Condition Score (BCS)

Efficient Cow, 2014 - Fleckvieh (Simmental)

Lines: Average Trend, 75% of Observations, 90% of Observations

Days in Milk (DIM) vs. Body Condition Score (BCS) for 1st, 2nd, and >=3rd Lactations.
Lameness score (Sprecher et al. 1997)

1. **Normal**
   Stands and walks normally with flat back. Long confident strides.

2. **Mildly Lame**
   Stands with flat back, arches when walks. Slightly abnormal gait.

3. **Moderately Lame**
   Stands and walks with arched back. Short strides.

4. **Lame**
   Arched back standing and walking. Favors certain legs.

5. **Severely Lame**
   Constant arched back. Great difficulty moving.

**Efficient Cow:**
Lameness was recorded by trained staff from the milk recording organisations at each milk recording using the scoring system (Sprecher et al. 1997) with 1 = normal to 5 = severely lame.
% of cows with different lameness scores (Fleckvieh)

1 = % of cows never lame (only score 1)
2 = % of cows with at least one lameness score of 2 and lower
3 = % of cows with at least one lameness score of 3 and lower
4 = % of cows with at least one lameness score of 4 and lower
5 = % of cows with at least one lameness score of 5 and lower
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Records between 5 and 365 DIM
Model

Linear animal model

Fixed effects:
• Herd
• Calving year-season
• Calving age-lactation
• Days in milk class within lactation
• Classifier (for BCS and lameness)

Random effects:
• Animal (genetic effect)
• Permanent environmental effect
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<td><strong>Body weight</strong></td>
<td>0.44 (0.05)</td>
<td>0.39 (0.08)</td>
<td>0.57 (0.13)</td>
</tr>
<tr>
<td><strong>BCS</strong></td>
<td></td>
<td>0.22 (0.03)</td>
<td>0.05 (0.15)</td>
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<td><strong>Lameness</strong></td>
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<td>0.07 (0.02)</td>
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*Standard error in ()*
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<td><strong>Body weight</strong></td>
<td>0.36 (0.07)</td>
<td>0.58 (0.10)</td>
<td>0.69 (0.27)</td>
</tr>
<tr>
<td><strong>BCS</strong></td>
<td></td>
<td>0.18 (0.05)</td>
<td>0.71 (0.41)</td>
</tr>
<tr>
<td><strong>Lameness</strong></td>
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<td></td>
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Standard error in ()
### Heritabilities and genetic correlations

**Holstein Friesian**

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<td><strong>Body weight</strong></td>
<td>0.35 (0.07)</td>
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<tr>
<td><strong>BCS</strong></td>
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<td>0.34 (0.07)</td>
<td>-0.10 (0.26)</td>
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<tr>
<td><strong>Lameness</strong></td>
<td></td>
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Standard error in ()
Conclusions

• Recording of body weight was easier to handle than taking different body measures

• Positive feedback for management tools like body condition scoring or lameness from farmers

• Genetic analysis showed that animals that are heavier have more lameness

• Similar results for all three breeds (except BCS/lameness)

• Potential to use these management data for breeding – possibilities for automation
Acknowledgement

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Thank you!