**Genetic evaluation of Saved feed**

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**Outline**

- Introduction to Saved feed (Gert)  
- Recording of individual feed intake (Jan)  
- Genetic evaluation of metabolic efficiency (Rasmus)  
- What are the other countries doing? (Gert)

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**Introduction to Saved feed**

\[ \text{EBV(Saved feed)} = \text{EBV(Maintenance)} + \text{EBV(Metabolic)} \]

Covered at NAV workshop 2019 and GEBVs are published  
Focus in this presentation

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**Research on feed intake**

- FUNC initiated in 2013  
- Followed up by several projects (SWE, FIN, DNK)  
- Huge investment from industry  
- Made international collaboration possible
**Feed efficiency**

- Waste
- Methane and Carbon dioxide
- Heat
- Urine and faeces
- Feed + Water
- Production
- Meat
- Milk
- Featus

**New traits – new challenges**

- Registrations have always been on the shelf – from management
- Not for feed intake and methane
- Still investments from industry
**Definition of a registration**

- Time since registration was performed
- Is the registration made on an informative cow
- Is the cow part of a research project

**EDCP project**

- Will continue in next 5 years
- CDCB and VIT will join additionally – UK will leave
- Where are we in 5 years?

**CFIT**

- Robust system - 3.5 years in first test herd
- Identification of a cow at each visit +95% accurate (IP)
- Repeatability of individual daily feed intake of 55% (IP)
- Preliminary heritability of 25% for feed intake
- Repeatability of individual weight based on contours 89% (IP)
- Install over next 2 years to have 1500 cows in all 3 breeds

**Status on CFIT**
Where are we now with metabolic efficiency?

- Which data do we have for cows with phenotypes and genotypes - January 2020?

<table>
<thead>
<tr>
<th>N cows</th>
<th>HOL</th>
<th>RDC</th>
<th>JER</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFS</td>
<td>425</td>
<td>320</td>
<td>Few</td>
</tr>
<tr>
<td>Abroad</td>
<td>1,250</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>CFIT</td>
<td>None</td>
<td>None</td>
<td>400</td>
</tr>
</tbody>
</table>

- What can we do with these data?

Genetic evaluation - Metabolic efficiency

- What is metabolic efficiency?
  - The difference between the actual and predicted feed intake

- Implications with RFI
  - Require information about: Feed intake, ECM, BW, BCS, pregnancy status, etc.
  - Easy to identify efficient animals
  - Complicated to evaluate genetically
  - Caused by mobilization

- Data sources:
  - Nordic HOL + abroad HOL data (The Canadian data) + Nordic RDC

<table>
<thead>
<tr>
<th>N cows</th>
<th>HOL records</th>
<th>Abroad HOL records</th>
<th>Nordic RDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st parity</td>
<td>754</td>
<td>26,271</td>
<td>992</td>
</tr>
<tr>
<td>2nd parity</td>
<td>537</td>
<td>18,478</td>
<td>752</td>
</tr>
<tr>
<td>3rd parity</td>
<td>310</td>
<td>9,582</td>
<td>260</td>
</tr>
<tr>
<td>N Cows/ genotyped</td>
<td>754/425</td>
<td>1,459/1,351</td>
<td>682/320</td>
</tr>
</tbody>
</table>
Genetic evaluation - Metabolic efficiency

- Challenges with this data set
  - Animals in different feeding trials
  - Measured in different periods of lactation
  - Measured by different equipment
  - Not all animals are genotyped
  - Means the genetic correlation is <1 between research herds

- Genetic parameters
  - Holstein - DFS (759 cows) + Canadian (1,459 cows)
  - RDC - Finnish data (682 cows)
  - Heritability 12-15%
  - Validation reliability 5-10%

- Reliability in small reference populations - experience from JER on protein yield (heritability higher than for Metabolic efficiency)

<table>
<thead>
<tr>
<th>Animals with genotypes</th>
<th>Extra reliability next to pedigree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,200 bulls</td>
<td>10%</td>
</tr>
<tr>
<td>2,000 bulls</td>
<td>15%</td>
</tr>
<tr>
<td>2,000 bulls + 10,000 cows</td>
<td>30%</td>
</tr>
<tr>
<td>2,600 bulls + 20,000 cows</td>
<td>35%</td>
</tr>
</tbody>
</table>

- How many cows do we need with phenotypes and genotypes?
  - To get 10% extra reliability next to pedigree info >6,000 cows with feed intake data is needed
  - Research farm data is not sufficient to achieve high reliabilities
  - Continues data collection is the way to increase reliability
  - CFIT seems to be the opportunity!
Publication of GEBVs

\[
EBV_{\text{Saved feed}} = \frac{\text{EBV}_{\text{Maintenance}} + \text{EBV}_{\text{Metabolic}}}{2}
\]

Published in 2019

Intense work ongoing for a publication of GEBVs in 2020

Overview other countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Ongoing/plans</th>
<th>When</th>
<th>Saved feed</th>
<th>Inclusion in TMI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Metabolic aff.</td>
<td>2020</td>
<td>Ongoing</td>
<td>Ongoing</td>
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<tr>
<td>AUS</td>
<td>1. Maintenance aff. (weight+conf.)</td>
<td>Ongoing</td>
<td>Yes</td>
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<td>USA</td>
<td>1. Maintenance from conf.</td>
<td>Ongoing</td>
<td>Yes</td>
<td>2020/7 disc.</td>
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<td>Ongoing</td>
<td>Yes</td>
<td>Ongoing</td>
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<tr>
<td>DEU</td>
<td>1. Maintenance aff (weight+conf.)</td>
<td>2021</td>
<td>Yes</td>
<td>(2021)</td>
</tr>
<tr>
<td>NLD</td>
<td>Feed intake</td>
<td>Ongoing</td>
<td>(Yes)</td>
<td>2018</td>
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<tr>
<td>CAN</td>
<td>Ongoing</td>
<td>No plans yet</td>
<td>Look at options</td>
<td></td>
</tr>
<tr>
<td>FRA</td>
<td>No concrete plans</td>
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<tr>
<td>NOR</td>
<td>Planning 2020</td>
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Overview

What are other countries doing?

Looked at DEU, NLD, FRA, AUS, NOR, USA & CAN

- General lack of feed intake data, and weight data
- Research farm data, some exchanges have taken place across countries for HOL
- NLD have installed “feed intake boxes” in a few “private” farms
- Very little and only Nordic research farm data exists for RDC and Jersey
- Research data often based on historical data

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Conclusions

- Feed efficiency is hot topic world wide
- GEBVs for Metabolic efficiency in 2020
- Reliable GEBVs depends on large scale feed intake recording
- CFIT seems to be the possibility