Calculation of the lactation performance from daily milk recording data

N. Wirtz, A. Bünger, K. Kuwan, F. Reinhardt and R. Reents
VIT Verden, Heideweg 1, D-27283 Verden, Germany
http://www.vit.de
35th ICAR Session, Kuopio, Finland, June 7th to 10th 2006

Farmers using technical equipment

Number of farms using herd management software (Eastern Germany)

- Nearly all big farms are using herd management software (HMS)
- Milk recording organisations get:
  - Test day records
  - Reproduction records
  - Animal movement information (I&R) directly from the farms (HMS) covering 82.5% of all dairy cows
  - Why not using daily milk recording data?

Demands from the practice

- Using daily milk records for:
  - Lactation performance for milk yield
  - Lactation performance for fat and protein yield
  - Consideration of additional information on milk yields in genetic evaluation
  - Impact of varying length of testing intervals

Daily milk recording data

Results of a study using farm computer data

- Data
  - 31 herds with daily milk recording data from 9 regions in Germany
  - 4,349 cows
  - 4,474 cows x lactation
  - Considered DIM: 1 to 600
  - 365,349 daily milkings (730,698 single milkings)
  - 32,187 daily milkings with information on contents of both a.m. and p.m. milkings as well as the mixed sample from the a.m. and p.m. milking

- Reliable data must be guaranteed before it can be used by milk recording organisations
- Methods for calculating the lactation performance were proposed

Preparation of the milk recording future

German Cattle Association (ADR)

- The German milk recording organisations decided to use daily milk recording data for the calculation of lactation performance.

- Authorization of the ADR working group „Implementation of Milk Recording“
  - Formulation of a regulation for milk recording scheme „daily“
    - Minimum farm and software requirements
    - Method of identifying the test day performance
    - Method of calculating the lactation performance
  - (Basis: regulation for milk recording at automatic milking systems)
Content

• Demands for implementing daily milk recording data using automatically stored single milk weights on a farm
• Identifying the test day performance of each cow
• Identifying and using the single milk weights of each cow
• Calculating the lactation performance of each cow
• Publishing the results (test day, lactation performance)

Demands for using daily milk weights

Farm
• Basis of the automatic daily milk weight collection are electronic milk meters installed in milking parlour
  • Approved by ICAR
  • Checked by the milk recording organisation every year
• A farm software solution
  • Saving all single milk weights of each cow between the actual test day and the test day before
  • Submitting all single milk weights to the IT centre
  • Transferring the data using standard transfer formats

Milk recording organisation
• Approving that a farm meets all requirements of daily milk recording
• Admitting the farms for daily milk recording

Identifying the milk performance

At the test day
• Milk yield (kg), milk content (sample bottles)

Between the test days
• Determination of an average 24 hour milk yield, calculated from all „acceptable“ single milk weights
  • Definition of an „unacceptable single milk weight“:
    - A record is deficient
    - A record is missing
  • Minimum requirements to the number of single milk weights that are used to calculate the average 24 hour milk yield
    - 85 % of the theoretically possible single milk weight numbers (⇒ ICAR guidelines)

Calculation of the lactation performance

• Lactation performance has to be calculated in the data centre
• Using the calculated average 24 h milk yield (24MY)

Automatic Milking Systems (German Method)

Lactation curve and test days: Calculation of the lactation milk performance

Automatic Milking Systems (German Method)

Lactation curve and test days: Calculation of the lactation milk performance
**Automatic Milking Systems (German Method)**

Lactation curve and test days: Calculation of the lactation milk performance

- Test day
- ∅ 24 hour milk yield (24MY)
- Milk yield (test day)

**Automatic Milking Systems (German Method)**

Lactation curve and test days: Calculation of the lactation milk performance

- Test day
- ∅ 24 hour milk yield (24MY)
- Lactation milk performance

**Automatic Milking Systems (German Method)**

Lactation curve and test days: Calculation of the lactation fat performance

- Milk yield (test day)
- Fat yield (test day)

**Daily Milk Recording (DTI Method)**

Lactation curve and test days: Calculation of the lactation milk performance

- Test day
- ∅ 24 hour milk yield (24MY)
- Lactation milk performance

**Daily Milk Recording (DTI Method)**

Lactation curve and test days: Calculation of the lactation milk performance

- Test day
- ∅ 24 hour milk yield (24MY)
- Lactation milk performance

**Interpolation method for calculating lactation milk performance**

- Interval between recording dates (in days):
  - \( l_{x1} = 0.5 \times ((\text{test day})_{x} - (\text{test day})_{x-1}) \)
  - \( l_{x2} = 0.5 \times ((\text{test day})_{x+1} - (\text{test day})_{x}) \)
- Average 24 hour milk yield: 24YM
- Milk yield

\[
\text{MY} = \sum_{x=1}^{n} (l_{xy} \times 24\text{MY}_{xy})
\]

where
- \( x \) = test day (1, 2, ..., n)
- \( y \) = interval before (y=1) or after (y=2) the test day
Daily Milk Recording (DTI Method)

Lactation curve and test days: Calculation of the lactation fat performance

\[ \text{FY}_x = \sum \sum i \times 24MY_{xy} \times \text{fat}\%_{xy} \]

where
- \( x \) = test day (1, 2, ..., n)
- \( y \) = interval before (\( y=1 \)) and after (\( y=2 \)) the test day

- Fat yield
  \[ \text{FY} = 100 \times \frac{\sum \sum i \times 24MY_{xy} \times \text{fat}\%_{xy}}{\text{MY}} \]

- Fat percent
  \[ \text{FP} = \frac{\text{FY}}{\text{MY}} \times 100 \]

Publishing the results

Results of the test day
- Milk yield of the test day
- Milk fat and protein content

Lactation performance
- MY: using the 24MY of each DTI
- FY: 24MY x content

Differences between
- MY: test day vs. lactation performance
- Milk content (FY, PY): test day vs. lactation performance

Conclusion

- The DTI method follows more or less the standard test interval method
- is a practicable and flexible way to process data
- is a complicate, but more exact way to calculate the lactation performance
- is a valid way to use daily milk recording data
- is introduced in Germany

- German guideline for daily milk recording
  - Farm requirements
  - Requirements to the data quality
  - Calculating the lactation performance via DTI method
  - Reliable calculation method by using the test day records if the data quality of single milk weights is rather poor
  - Publishing the results

Farmers using technical equipment

Number of dairy farms using VIT PC or internet solutions

<table>
<thead>
<tr>
<th>Year</th>
<th># milk recording farms</th>
<th># farms using VIT PC data / internet services</th>
<th>% of all farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>34,200</td>
<td>2,142</td>
<td>6.2</td>
</tr>
<tr>
<td>1997</td>
<td>32,400</td>
<td>2,822</td>
<td>8.7</td>
</tr>
<tr>
<td>1999</td>
<td>29,600</td>
<td>3,560</td>
<td>12.0</td>
</tr>
<tr>
<td>2001</td>
<td>25,477</td>
<td>4,055</td>
<td>15.9</td>
</tr>
<tr>
<td>2003</td>
<td>24,233</td>
<td>4,460</td>
<td>18.4</td>
</tr>
<tr>
<td>2005</td>
<td>22,545</td>
<td>4,729</td>
<td>21.0</td>
</tr>
</tbody>
</table>

http://www.vit.de

Thank you for your attention!