Global 24-Hour Calculation Trends in Automatic Milking Systems

Materials and Methods

- Data were obtained from 52 organisations from around the world
- Consisting of 90 questions, the survey provides an analysis of all data, which were submitted between December 2018 and March 2019
Results – General aspects of 24-hour AMS calculations
What is the importance of AMS within your organisation?

- More than 50% of our records are from AMS: 3 (7.7%)
- Between 20 and 50% of our records are from AMS: 8 (20.5%)
- Between 5 and 20% of our records are from AMS: 11 (28.2%)
- Less than 5% of our records are from AMS: 9 (23.1%)
- None of our recorded herds are from AMS: 8 (20.5%)
What recording methods do you use for AMS?

<table>
<thead>
<tr>
<th>Answer options</th>
<th>Number of organisations</th>
</tr>
</thead>
<tbody>
<tr>
<td>We use milking data from a multiple number of days, including the sample day</td>
<td>22</td>
</tr>
<tr>
<td>We use milking data from a multiple number of days, excluding the sample day</td>
<td>3</td>
</tr>
<tr>
<td>We use milking data from one day</td>
<td>7</td>
</tr>
<tr>
<td>We use an automatically calculated milk total based on robot software</td>
<td>4</td>
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</tbody>
</table>

• The majority of MROs take milking data from a multiple number of days, mostly including the sample day, with only some MROs excluding the sample day
Most MROs record between 4 and 7 days

- 2 days: 13.0% of organisations
- 3 days: 4.3% of organisations
- 4 days: 30.4% of organisations
- 5 days: 4.3% of organisations
- 6 days: 4.3% of organisations
- 7 days: 39.1% of organisations
Do you use the LAZENBY (2002) METHOD described in the Guidelines

- Yes
- Yes, but with adaptations

Number of organisations

- Yes: 11
- Yes, but with adaptations: 2

- This AMS method factors in different intervals to provide a more complex overall average, an important factor in AMS calculations
How do you calculate fat and protein yields using AMS?

- We use milk yield from several days, including the sampling day, to calculate the fat and protein yields.
- We use milk yield from several days, excluding the sampling day, to calculate the fat and protein yields.
- We only use milk yield from the sampling day to calculate the fat and protein yields.
What data quality indicators do you monitor when extracting data from the robot software?

- Milk yield per milking: 22
- Data format: 13
- Milking interval – Missing: 12
- Interrupted milkings: 11
- Recognised data loss: 6
- Other: 4
- Milk secretion rate: 3
- Milking speed: 2

Number of organisations
What data quality indicators do you monitor when extracting data from the robot software?

Number of combined indicators used by MROs

% of organisations that use combined indicators

- 1: 61.5%
- 2: 17.3%
- 3: 9.6%
- 4: 7.7%
- 5: 3.8%
Do these indicators affect calculations?

Number of organisations

- No, but they are used for generating user alert messages: 5
- No, they are only informative: 7
- Yes, they are used, excluding individual milkings from data processing: 11
Do you use the BOULOC ET AL. (2002) method described in the guidelines

- This method is designed for calculating milk yield production over one day
- Implementation is low with only 5 MROs stating they use the method
- Most MROs calculate over a multiple number of days, with one MRO using an adaptation of the method
What sampling schemes do you use for AMS?

<table>
<thead>
<tr>
<th>Answer options</th>
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<tbody>
<tr>
<td>Scheme Z – sampling from one milking per cow and recording</td>
<td>27</td>
</tr>
<tr>
<td>Scheme M – separate samples from several milkings, all analysed separately</td>
<td>6</td>
</tr>
<tr>
<td>Scheme E – samples from several milkings joined in equal amounts for analysis</td>
<td>3</td>
</tr>
<tr>
<td>Scheme P – samples from several milkings joined proportionally for analysis</td>
<td>2</td>
</tr>
</tbody>
</table>

- The most common practice is to use scheme Z only (27 MROs), which involves sampling and recording from **one milking per cow**
- Prevalence of one-milking sampling has increased with an eye on **reducing costs**, an important area for future discussion
Number of sampling schemes used by MROs

Number of organisations

- 1 organisation uses 3 schemes
- 6 organisations use 1 scheme
- 23 organisations use 1 scheme

Number of sampling schemes used by MROs
Do you use the GALESLOOT & PEETERS (2000) method described in the guidelines?

- Yes to correct fat content: 5 organisations
- Yes but with adaptations: 2 organisations
- No, we use no correction: 16 organisations
- No, we use a different correction method for...: 4 organisations

Number of organisations
What coefficients do you use?

We estimate our own national coefficients: 6
We use second-generation Dutch coefficients: 3
We use coefficients from a third organisation: 2
We use the original Dutch coefficients: 1

Number of organisations

0 1 2 3 4 5 6 7

We estimate our own national coefficients
We use second-generation Dutch coefficients
We use coefficients from a third organisation
We use the original Dutch coefficients
When analysing several samples or combining them in a non-proportional way, how do you calculate daily fat and protein yields?

- We use milk weights to generate a weighted average: 5 organisations
- We carry out a direct analysis of combined samples: 2 organisations
- We use a simple average of all samples analysed: 1 organisation
- We use a formula to calculate 24-hour yields from a non-proportionally combined sample: 0 organisations

Number of organisations
How long does the sampling period last when using schemes M and E (hours)

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<tr>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>3</td>
</tr>
</tbody>
</table>
Results – estimating independent factors and coefficients for AMS
Survey summarises how many records were used for estimations or recalculation of factors and coefficients. The following numbers were provided:

- Number of herds from 3 to 13,300
- Number of cows from 360 to 400,000
- Number of milkings 14 to 1,779,324
- Number of lactations 5,000 to 1,200,000
- Recommendation in this field could be valuable
Over what period do you collect data for estimations or recalculations?

- **2-5 years**: 4 organisations
- **5-10 years**: 2 organisations
- **Use one-year data**: 2 organisations
- **N/A, never**: 1 organisation
- **Irregularly, as required**: 1 organisation

Number of organisations
How are herds and/or cows selected for estimations or recalculations?

- All data available: 15
- Other criteria: 3
- Independently defined criteria: 3
- Randomly chosen: 2
- Statistical analysis: 0

Number of organisations
Do you edit or exclude raw data?

Yes: 8 organisations
No: 2 organisations

Number of organisations
Which types of data do you exclude?

- Duplicate records: 15
- Records with missing information (IDs, lactation figures, dates,…): 13
- Other: 4
- Excessive differences in milk yield production between milkings: 3
- Lactation stages (days in milk): 2
- Intervals between milkings: 2

Number of organisations
For the number of exclusion criteria applied, see below:

- 1 criterion: 8 organisations
- 2 criteria: 7 organisations
- 3 criteria: 3 organisations
- 4 criteria: 2 organisations
- Multiple exclusion criteria are recommended.
Do you use uniform, national factors/coefficients?

- Yes: 7
- No, based on region/production system: 2

Are there any differences in factors/coefficients between breeds nationally?

- Yes, different factors/coefficients are used: 7
- No, the same factors/coefficients are used for all breeds: 2
What type of comparative analysis is used for AMS estimations/recalculations?

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<tbody>
<tr>
<td>All samples are analysed separately (24-hour, golden standard)</td>
<td>4</td>
</tr>
<tr>
<td>Different approach</td>
<td>2</td>
</tr>
</tbody>
</table>
How do you evaluate results based on estimations/recalculations (method Z, M) and which statistical indicators do you use?

<table>
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<tr>
<td>Correlation between estimated/predicted daily yields and actual/true daily yields (from reference method, golden standard)</td>
<td>5</td>
</tr>
<tr>
<td>Comparison of means, standard deviations and maximum difference (overall, within subgroups)</td>
<td>4</td>
</tr>
<tr>
<td>Systematic bias, SD for differences and accuracy ($R^2$)</td>
<td>2</td>
</tr>
</tbody>
</table>
Conclusions, recommendations and future policies

• 52 organisations took part in the survey, comprising 90 questions
• A very important part of the project is to establish a future policy and set out practical recommendations for the future
• Impact of AMS on milk recording
• This trend is seeing MROs start to create new services and additional value for customers
• Data are also being combined from different sources toward future integration
• Data is mostly applied based on a multiple number of days for calculating 24-hour milk yields
• Most of the organisations use milk yield from the sampling day to calculate the fat and protein yields which is recommended practice
Conclusions, recommendations and future policies

• Data quality systems are routinely used when handling AMS
• Raw data should always be used
• The prevalence for calculating 24-hour milk yields based on one day has decreased
• The most common practice is to exclusively use scheme Z
• There is a general trend toward simplification with a view to cutting costs
• Fat % should be factored in when taking only one sample, with some MROs stating corrections are not always applied
• Not all MROs estimate their own factors and coefficients
• There is general consensus on the areas in the Guidelines that need to be prioritised
Acknowledgements: The ICAR Dairy Cattle Milk Recording WG wishes to thank all of the organisations that took part in the survey.
Welcome Address

Dear colleagues,

On behalf of the Czech Moravian Breeders' Corporation and all of the breeder organisations in the Czech Republic, it is with great pleasure that I invite you to Prague, the venue for the 2019 ICAR Congress and IDF/ISO Analytical Week, marking the first occasion the event will have been hosted in the Czech Republic.

The Czech Republic is a vibrant, modern country situated in the heart of Europe. Boasting a rich cultural heritage, the country offers visitors a wealth of attractions and impressive historic sites. Its capital city, Prague, is

PRAHRE