How complex is to calculate daily yields?

The Italian situation

Mauro Fioretti
R&D Office, A.I.A.
• Recorded dairy cows: 1351614
• Recorded herds: 15495
• Average herd size: 87.2 heads/herd
14 milk analysis laboratories
78 local offices (performance recording)
Some figures

Recorded dairy cows
1.208.854 (89.4%)
32.976 (2.4%)
109.784 (8.2%)

Recorded dairy farms
13.450 (86.8%)
602 (3.9%)
1.443 (9.3%)
<table>
<thead>
<tr>
<th>Type of recording</th>
<th>Frequency (Weeks)</th>
<th>4</th>
<th>5</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>0.2</td>
<td>0</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AT</td>
<td></td>
<td>24</td>
<td>69</td>
<td>93</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATJ</td>
<td></td>
<td>1.8</td>
<td>2.4</td>
<td>4.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMS</td>
<td></td>
<td>0</td>
<td>2.6</td>
<td>2.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>26</td>
<td>74</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Type of recording

WHO: PERFORMANCE RECORDING IS PERFORMED BY AN OFFICIAL TECHNICIAN («A» method)

• **A(4,5)** = all milkings in 24 hours recorded
  • Sample in only one milking, alternated

• **AT(4,5)** = only one milking in 24 hours recorded, the other one is estimated by coefficients (Liu)
  • Alternated
  • Sample in the recorded milking

• **ATJ(4,5)** = in case of electronic systems where all milkings are saved in a file; only one milking recorded, the other one is collected directly by production’s file => **NO ESTIMATION** (*)
  • Sample in the recorded milking

(*) In case of missing identification of the cow in the previous milking (e.g. broken podometer), coefficients are applied
Sample collection

• No proportional sampling in type A (avoid complex procedures)
• Only one sample is taken and analysed (AM/PM)
• Vials type:
  • Barcode generally
  • No barcode: only one province with 1.79% of total recorded heads
• Sampling is always performed by official technician
• Sample is analysed by accredited labs
• Results are merged with cow yield by barcode and inputted in central database
Methods to calculate daily yields

A4, A5

24 hours milk yield = sum of all recorded milking in 24 hours

• Morning + Evening
• Morning + Afternoon + Evening

Only 1 AM/PM sample

Sample composition is attributed to the whole 24 h yield
Methods to calculate daily yields

**AT4, AT5**

Only one milking recorded

Alternate (AM/PM) milking + sample

Milk, fat and protein yields in the missing milking are estimated through multiplicative coefficients (ICAR Method: Liu)

Coefficients depend on

- Time distance from previous milking
- Milking time (morning or evening)
- Parity (primiparous; pluriparous)
- Month of milking (0,1,2,...)
24 hours yields’ estimation (AT) - Flow

Recorded milk yield ($MY_R$) → Coefficients → Estimated milk yield of missing milking ($MY_M$) → Estimated 24 h milk yield ($MY_R + MY_M$)
Step 1

Recorded fat (protein) percent (%R)

Fat (prot) kg yield of recorded milking (KgYr)

Fat (prot) kg yield of missing milking (KgYm)

Step 2

100 * Estimated 24 h milk yield (MYr + MYm)

Estimated 24 h fat (prot) yield (KgYr + KgYm)

Fat & protein %
AMS

• Recording using AMS in 2.6% of total recorded farms (around 400 farms)

• One sample (sampler)

• Performance recording length: at least 12 Hours (starting time: sampler insertion, end time = sampler extraction) in order to have enough time to sample all the cows in the farm.

• Alternance (AM/PM)

• The day in which sampler is extracted is the performance recording date
• All yields recorded for a cow within 48 hours back from the end time of test are recorded together with their milking starting times.

• Daily milk yield is calculated as

\[ \frac{1}{2} \times (\text{sum of all recorded yields in 48 hours}) \]

• Yields are taken from AMS software
• Fat and protein % are imputed to the whole daily yield
Main issues – A4, A5

*Fat and protein content*

One sample only (AM/PM)

Fat and protein content from a single milking are imputed to the whole 24 h yield
Main issues – AT4, AT5

This method allows to pay only one visit to the farm to be recorded, so it is economically more affordable.

Issues about the accuracy of estimated yields.
Main issues – AT4, AT5

Check in real situation – milk

Farms with electronic milk meter (ATJ)
- Retrieved 2 years of single milkings (times – yields) (AM/PM)
- Estimation of daily yields (Liu) using AM or PM milkings
- Differences between AM/PM estimated and real 24 h yields
## Main issues – AT4, AT5

### Differences ESTIMATED (Liu) – REAL (Milk Meter software) yield

<table>
<thead>
<tr>
<th></th>
<th>Total milkings</th>
<th>Mean</th>
<th>Std Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>25.838</td>
<td>0.32</td>
<td>2.24</td>
<td>-23.91</td>
<td>19.05</td>
</tr>
<tr>
<td>PM</td>
<td>25.950</td>
<td>-0.40</td>
<td>2.43</td>
<td>-22.79</td>
<td>28.26</td>
</tr>
</tbody>
</table>

### Average REAL 24 h milk yield, Kg

<table>
<thead>
<tr>
<th></th>
<th>Average REAL 24 h milk yield, Kg</th>
<th>Average ESTIMATED 24 h milk yield, Kg</th>
<th>Average % difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>35.00</td>
<td>35.32</td>
<td>+0.85 %</td>
</tr>
<tr>
<td>PM</td>
<td>34.96</td>
<td>34.56</td>
<td>-1.02 %</td>
</tr>
</tbody>
</table>

- Overestimation for AM milkings
- Underestimation from PM milkings
Main issues – AMS

24 h milk yield calculation system

12 hrs enough?

Inputs for consider new calculations method with protocol changes (Pavel)