Measuring machines & practical feed estimation:

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To cover:

Measuring machines
• Why farmers measure cover;
• Ways to measure cover (Plate / Probe / Visual / CDAX);
• Controlling variability.

Practical feed estimation
• Intake estimation from pre- and post grazing mass;
• Supplementary matters: rotation length vs animal intake, pasture growth, & pasture quality.
Two key reasons why farmers measure cover

- Average farm cover measures feed reserve in storage (like silage or hay in a pit/barn) – on nearby plots 5000 kg DM/ha needed for 20 sheep / ha 1 May – 1 October; 4500 from growth & 500 from stored cover released through rotation.

- Pre- and post-grazing herbage mass used to monitor intake to see if (i) animals getting enough; (ii) feed is being rationed as per the budget.
Rising plate & Capacitance probe meters

- Rising plate measures height in 5 mm units (“clicks”);
- Average of (say) 20 drops = meter reading (MR);
- \( Y = aX + b \) conversion MR to kg DM/ha most used (also sq. root) \( \sim 140 \text{ kg DM/ha per 5 mm}; \) intercept \( 200 \) – 1000 kg DM/ha;
- Common errors: “rolling”, hoof marks, sward stubble, hill slope, sward variability, washer size;
- Accuracy: meter ± 3 mm; operator ± 25 mm; other (??)
- Price c. $500

- Capacitance probe has an aluminium cylinder to sense surface area of grass;
- Internal cylinder height 30 cm;
- Sensitivity radius 50 mm;
- Small signal – measured in picofarads of capacitance and varies with atmospheric conditions, morning dew, herbage moisture %;
- Use wax or oil to stop water film build up on probe;
- Single reading error ± 400 kg DM/ha; any calibration error extra
- Grassmeter $1650

Always “truth test” when setting up measurement protocol!
Readings on the same transect on wet ground (30 meter drops)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14.13</td>
<td>13.37</td>
<td>12.90</td>
<td>12.80</td>
<td>13.30</td>
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<tr>
<td></td>
<td>10.33</td>
<td>9.47</td>
<td>9.87</td>
<td>9.07</td>
<td>9.68</td>
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</table>

Difference in predicted cover (kg DM/ha) 506

$F(1,8df) = 79; P < 0.001$
Visual Assessment of Pasture Cover
(B – Ra – N – T)

- Benchmark (A mental picture that lets us tie our scoring to a kg DM/ha value, ranked compared to benchmark)
- Rank (Is this paddock longer or shorter than something else – a history student with no previous experience can do this!)
- Number (Allocate kg DM/ha value)
- Truth test (one way to do this is by judging over first week if animals appear over/under fed cf. calculations.)

Visual assessment is usually of similar accuracy to the rising plate or capacitance meter.
CDax pasture meter – measures by interruption of light beams at approx. 1 cm height intervals, GPS/computer connected, can produce spatial maps colour coded to kg DM/ha.
Calculations

Intake (kg DM/animal/day) given by:

\[
\frac{\text{Herbage removed}}{\text{Grazing intensity}}
\]

Where:

Herbage removed = pre-grazing minus post-grazing herbage mass (kg DM/ha);

Grazing intensity = animal . days/ha in the grazing event.
<table>
<thead>
<tr>
<th></th>
<th>16 d.</th>
<th>48 d.</th>
<th>72 d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-grazing (kg DM/ha)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-grazing (kg DM/ha)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removed (kg DM/ha)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheep number</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Grazed area (ha)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graz. intensity (shp . D /ha)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Intake (Removed / Intensity)</td>
<td></td>
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</tbody>
</table>
Herbage Mass (kg DM/ha)

- 72 Day
- 16 Day
- 48 Day

Cover trajectories for each rotation (2013)

Set stocking

N Fert.
Pasture growth back-calculated (from pasture cover and animal bodyweight data)

- 72d 6.1 t DM
- 16d 5.1 t DM (37.5 kg/ha N)
- 48d 4.8 t DM

Pasture Growth Rate (kgDM/ha/day)

37.5 kg/ha N on 16d farmlet
1 Leaf  2 Leaf (lamina above and base below)  4 Leaf
Samples collected mid afternoon on a sunny day and taken to the drying oven within 60 minutes = high soluble sugars and OMD/ME, but relativity valid.
Determining herbage intake of animals in a rotational grazing event.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Sheep</td>
<td>1600</td>
</tr>
<tr>
<td>No Cattle</td>
<td>20</td>
</tr>
<tr>
<td>Pre-grazing cover (kg DM/ha)</td>
<td>1800</td>
</tr>
<tr>
<td>SU per cattle beast</td>
<td>4</td>
</tr>
<tr>
<td>Post-grazing cover (kg DM/ha)</td>
<td>900</td>
</tr>
<tr>
<td>Total Sheep SU</td>
<td>1680</td>
</tr>
<tr>
<td>Days per paddock</td>
<td>4</td>
</tr>
<tr>
<td>Ha paddock area</td>
<td>8</td>
</tr>
<tr>
<td>Intake of stock (kg DM/sheep/day)</td>
<td></td>
</tr>
<tr>
<td>Grazing intensity (Sheep.days/ha)</td>
<td></td>
</tr>
</tbody>
</table>

Herbage removed
3-leaf grazing time versus farm recommended (considers animal needs)
Grass: Unique properties

- Leaf growth from base (below grazing height);
- Flexible (pseudo)stem OK for treading;
- Leaf turnover and programmed senescence;
- Root growth from tip for soil penetration;
- Root turnover cycle ~3x longer than leaf cycle;
- Vegetatively self replacing;
- Mobility over time;
Practical Feed Estimation

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