Calibrating Plate Meters for Better Grass Measuring
Farmers who make the most effective use of grass measure it regularly throughout the season. Many use plate meters to gauge how much is available for livestock and draw up grass budgets. Calibration of the plate meter helps to ensure that the measurements more accurately reflect what is in the paddock. Farmers measuring grass can increase utilisation by 30% which means that from a sward yielding 10 tonnes DM/ha, an extra 3 tonnes DM/ha will be grazed over the season. This will be enough to keep an extra five ewes and lambs or one 350 kg beef steer over the season, and is worth approximately £200/tonne DM. Improving the accuracy of grass measuring increases the farmer’s confidence in rationing grass and ensures that the energy and protein requirements of livestock are met. It also makes it easier to assess grass growth rates, pasture yields and identify which paddocks are performing well.
Why calibrate?
What do we need to account for?

- Varying factors including rainfall, sunlight and soil temperature changes and other factors mean that a sward produces different amounts of dry matter at the same height throughout the season.

- Dry matter affects intakes: high rainfall leads to low dry matter (wet grass) whereas low rainfall leads to high dry matter (dry grass) and can affect the amount that can be eaten.

- There is seasonal variation in the amount of seed head, green material, dead material and clover content that needs to be accounted for.

- Density of the sward being measured may change from low (new re-seed) to high (permanent pasture) or according to the stock that graze it.

- Pastures grazed by dairy cows are less dense than those grazed by sheep. Closely grazed sheep pastures may have a tiller density of 20,000 tillers per m², whereas more laxly grazed dairy pastures may have a tiller density of only 5,000 tillers per m² (Mathew et al. 1996).

**Figure 1: Dry matter affects production**

- 80 kg fresh grass eaten per day

  **Wet grass (more water)**

  12.5%DM

  Lower energy content in 10kgDM: 110MJ ME

  **Dry grass (less water)**

  17.5%DM

  Higher energy content in 14kgDM: 154 MJ ME

**80kg wet grass** will provide **maintenance +10 litres**

**or 80kg dry grass** will provide **maintenance +19 litres**

(assuming a 550kg dairy cow needs 59MJ for maintenance (M) and 5MJ per litre of production)
How the plate meter works

A platemeter measures sward height and uses pre-set equations to convert sward height readings to kg DM/ha; kg DM/ha can be used for pasture budgeting to predict shortfalls or excess of grazing and estimate changes in grass availability.

An example of an equation is:

\[ \text{kgDM/ha} = \text{average compressed sward height (cm)} \times 140 + 500 \]

The multiplier (x140) reflects the dry matter (DM) % in the pasture (i.e. 14%); the ‘adder’ in the equation is to compensate for an amount of grass at the bottom of the sward that is not measured by the plate meter.

- Start with some basic equations that roughly fit the growing season as given below, and then make adjustments to the equation based on comparing oven dried grass sample values for kgDM/ha with the platemeter’s kgDM/ha readings.

Equations to start with which are based on UK sward stick readings are:

<table>
<thead>
<tr>
<th>Month</th>
<th>Equation</th>
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</thead>
<tbody>
<tr>
<td>March - April</td>
<td>( \text{kgDM/ha} = \text{sward ht} \times 147 + 837 )</td>
</tr>
<tr>
<td>May</td>
<td>( \text{kgDM/ha} = \text{sward ht} \times 169 + 1277 )</td>
</tr>
<tr>
<td>Jun - Aug</td>
<td>( \text{kgDM/ha} = \text{sward ht} \times 194 + 1089 )</td>
</tr>
<tr>
<td>Sept - Nov</td>
<td>( \text{kgDM/ha} = \text{sward ht} \times 187 + 900 )</td>
</tr>
<tr>
<td>Dec - Feb</td>
<td>( \text{kgDM/ha} = \text{sward ht} \times 194 + 500 )</td>
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How to calibrate your platemeter

Option A
Calculate dry matter from microwave or oven dried grass samples and use this to adjust the first half (the multiplier) of the platemeter equation.

Option B
If no oven is readily available, grass is generally:
- 12% DM following five days of wet weather
- 14-15% DM with a small quantity of surface moisture
- 17-18% DM with no surface moisture
- 20-25% DM after five days of dry and/or sunny weather

Option C
Oven dry grass samples, work out the dry matter and carry out regression analysis to find the new equation that needs to go into the platemeter software.
- Calculating this can be done with a Microsoft Office Excel spreadsheet (or similar) and often done by an advisor; see case study overleaf.

Step 1 Sampling grass
- Make a sampling ring with a wire 113 cm long so that it forms a ring 36 cm in diameter. Cut sward samples to ground level from within this ring, weigh them, dry in an oven at 60°C for 24 hrs or microwave for 5 minutes and calculate the dry matter. Usually 3 representative samples per hectare paddock (or 1 sample per acre).

Pasture cover (kgDM/ha) from a 0.1 m² ring (36 cm in diameter) is simply the weight in grams after drying multiplied by 100. DM% is dry weight (g) divided by fresh weight (g) multiplied by 100.

Examples:
kgDM/ha = 25 g × 100 = 2500
and
DM% = 25 / 145 × 100 = 17.2

This method gives a good guide to yield, and when used frequently can help improve platemeter yield assessment. This method accounts for the sward’s height and density and is important where swards have high white clover content because there is a tendency to overestimate pasture cover as the clover appears dominant but lacks density below the leaf canopy.

Step 2 Changing the equation
- Use the dry matter figure from your calculation to change the multiplier in the platemeter equation referring to the platemeter handbook method to input a new equation e.g. input 17.2%DM as 172.

Step 3 Measure the grass regularly
- Weekly through April to October and use the information to manage grazing (see Farming Connect factsheets “Grazing Systems” and “Improving Grazing Management - measure to manage”; also available online www.menterabusnes.co.uk/farmingconnect/factsheets)
Case study: Bodrida Demonstration Farm

Since 2010, IBERS Grassland Development Centre has been working with Richard Rogers using a quad bike mounted “plate meter”, the Farmworks Feed Reader. Measurements are taken continuously as the quad bike drives across the field allowing paddock numbers and sward heights to be stored and simple calculations computed for each paddock. Uploading onto a computer allows comparisons with earlier measurements, conversion of meter readings to kgDM/ha and pasture budgeting. However accuracy relies on correct calibrations and the pre set equations in the system were developed in New Zealand and not directly related to Welsh conditions.

In the UK DairyCo have developed a widely used equation based on research results in dairy pastures (kgDM/ha = compressed sward ht x125 + 640). No calibrations have been made for beef and sheep farmers under Welsh conditions - this gave rise to an opportunity to develop a calibration for Welsh beef and sheep farm conditions.

How it works
The ultrasonic head reads the pasture height taking many readings per second. The average of each second’s data is sent through to the display terminal then stored inside the display console. On the office PC, Pasture-Plus (P-Plus) grazing management software transfers the data between the Feedreader and computer, and adds sward yield data to the P-Plus database. This enables the user to further interpret the data and carry out grass budgeting.

STRENGTHS:
• The Feedreader measures pasture much more quickly than walking around paddocks with a rising platemeter.
• It integrates with Pasture Plus software that interprets the data collected by the Feedreader - the version of Pasture Plus that comes with the Feedreader records field details and sward height or kg DM/ha. It can produce a “grass wedge chart” and carry out grazing planning.
• The package includes the option to create a map of the grazing platform via GPS measurements - the farmer found it useful to see the farm map highlighting which fields were at the correct stage for grazing; which fields were short; and which were too high.
• Data can be shared with other farmers via Ag-HUB - an internet based service provided by Farmworks in New Zealand.

At Bodrida we started off with the Feedreader’s built in equation and modified it after calibrating against sward samples taken from the pastures we were measuring.

When we compared the readings from the Feedreader with sward samples we found a difference. The table below gives the data for May grass growth where FR cover is data from the Feedreader and Oven Cover is derived from sward samples.
Regression analysis on the Feedreader data showed that the multiplier in the equation was 277 (kgDM/ha = sward ht x 27 + 216).

This showed us that the Feedreader was overestimating dry matter content and underestimating the amount of dry matter left behind that is unmeasured.

We then used Pasture Plus to download this new equation to the Feedreader for more accurate pasture assessment in the paddock.

**CONCLUSIONS:**

- The work carried out on the Farming Connect demonstration farm has shown that equations to derive pasture cover are different to the ones that New Zealand farmers use for their pastures.

- The figures that a platemeter provides are there as a guide— they need to be representative of the paddock and common sense and good judgment are needed to make best use of them based on pasture condition and animal performance.
Top Tips

• Measure grass regularly
• Reduce variability in grass measuring by following the correct method of plating and use the same person each week
• A platemeter is more accurate if it is calibrated for the pastures of the farm it’s being used on
• Use the information to make grazing decisions, ration grass and estimate growth rates
• Re-calibrate during the year to reflect seasonal influences on grass growth.

References