



Practical use of the rising plate meter for yield estimation

- **AUTHORS:** Jason Rankin, Martin Komainda.
- **DESCRIPTION:** With the extreme volatility experienced in the fertiliser and feed markets in both the short and long term, grazed grass remains the cheapest feed source available to all ruminant and equine livestock farmers in many temperate regions to achieve optimal weight gain in growing livestock, milk yield in lactating animals and a forage base in horse husbandry. However, this is based on the assumption that high yields of grass can be grown and utilised efficiently by the grazing animal.

While utilising grazed grass in livestock diets can be a great way to reduce feed costs, optimising the intake of high-quality forage can be very challenging due to grass growth and quality variability, often influenced by weather conditions as well as the condition of grass swards across all paddocks. It is important to manage surpluses and deficits caused by weather conditions to optimally utilise grazed grass and reduce impacts on animal and sward performance.

To manage surplus and deficits in grass growth, decisions must be made at a much earlier stage to maximise grassland utilisation and prevent financial impacts. To improve decision making for grassland managers, it is necessary to be able to continually quantify grass supply throughout the grazing season. To do this accurately, the use of grass measuring equipment, such as a rising plate meter, is essential.

- **RATIONALE:**

- Able to take account of sward density and height
- Quick to take multiple readings across an area, which can encourage more extensive width/breadth measurement of each individual paddock, giving more accurate grass cover information
- Can reduce need for topping and maximise efficient use of expensive fertiliser inputs due to more informed knowledge of grass cover
- Can be used to identify poorly performing paddocks on farm to prioritise land improvement measures



Fig.1: Platometer use



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- POTENTIAL FOR APPLYING THE MANAGEMENT OPTION - SELECTING AN APPROPRIATE RISING PLATE METER**

Rising plate meters (RPM) are used most frequently for estimation of area needed for livestock grazing for certain period of time. It can be used for dairy cows, beef and sheep. They are more often used on intensive livestock farms (mostly dairy farms) with relatively high stocking rates where they are seeking to maximise the amount of grass grown and utilised (including making sure that grass offered to cows is of good quality). For a pure grass sward consisting of only one plant species there is a good relationship between grass height and forage value in a way that the value in terms of crude protein or energy declines with height as a result of increasing cell wall constituents with ongoing senescence. The correlation between sward height and forage quality is, however, hard to assess in mixed swards where legumes, forbs and grasses occur because of variability in phenological development. Recent studies have looked into the possibility to use Rising Plate Meters to assess the distribution of a patchy and heterogeneous grass sward that is important to conserve biodiversity.

RPM are usually fitted with a disc with a 30-35 cm diameter, and usually weigh 200-482 g. With a wide range of rising plate meters now on the market, there are various options available to suit all farmers.

- **Mechanical plate meter** – Works using a mechanical clicker, must note down the initial and end readings on the clicker for each paddock.





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- **Electronic plate meter** - Calculates grass cover automatically across the whole paddock, which can then be put into grass management software such as AgriNet™ via USB



- **Bluetooth electronic plate meter** - The plate meter will link to an app on the operator's mobile phone via Bluetooth. The app has the farm paddocks laid out on a satellite map, with the GPS coordinates recorded of each plate meter reading. This will automatically calculate grass cover for each paddock. Often these apps will allow for data to be transferred to grass management software like AgriNet™ to monitor the grass "wedge" available on farm.





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- **POTENTIAL FOR APPLYING THE MANAGEMENT OPTION - USING THE PLATE METER FOR ACCURATE RESULTS**

Technique is extremely important when measuring with a rising plate meter. Inaccuracy during measuring can lead to pasture covers varying by up to 600 kg DM/ha.

1. Make sure to hold the plate meter fully upright to prevent excessive grass cover readings.
2. Be careful not to force the plate meter into the ground abruptly, which can cause inaccurate herbage mass readings. Care must be taken on land that has been poached due to ruts being able to exaggerate readings.
3. Make sure to take a wide range of readings across the entire paddock, not just around the gateway or in one area of the paddock, as this will give a much better representation of pasture cover across the whole paddock. The recommended method to measure a paddock is to walk in a “W” pattern and take 30-50 readings per paddock (depending on paddock size – around 40 readings per ha). When taking subsequent measurements of paddocks, make sure to walk a similar pattern to previous measurements.
4. When using a mechanical plate meter, make sure to count the number of readings taken across the paddock. The number of readings is used to divide the difference between the initial and final number on the clicker, which will give an average compressed sward height in centimetres.

- **CALCULATING PASTURE COVER FOR A MECHANICAL RISING PLATE METER**

Pasture cover can be calculated from average compressed sward height from each paddock with a mechanical plate meter by using a standard calibration equation.

Compressed sward height (CSH) is calculated by:

$$(\text{Final reading} - \text{initial reading}) / \text{number of readings taken} = \text{CSH (cm)}$$

This is then inputted into the calibration equation for Perennial Ryegrass swards in the UK which is:

$$\text{CSH (cm)} \times 125 + 640 = \text{pasture cover (kg DM/ha)}$$

$$\text{e.g. } 15 \times 125 + 640 = 2,515 \text{ kg DM/ha}$$

- **SUPPORT**

Using a rising plate meter is unlikely to receive or require financial support or become part of an agri-environmental scheme. The initial cost of plate meter purchase and implementation is not substantial, but the subscription and use of grass management software as well as continuous labour requirement from regular measuring can become a bigger cost. Farmer adoption of the plate meter relies on the perceived benefits of improved grassland utilisation, reducing concentrate use and improving fertiliser use efficiency.



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LIMITATIONS

Rising plate meters lose accuracy at higher covers (above 3,500 kg DM/ha) so are not suitable for use in silage swards. Some modern rising plate meters are unable to assess sward heights >22.5 cm making them unsuitable for diverse multi-species grass swards. When the grass sward is highly variable in terms of sward height due to extensive management, standard calibration equations might not work properly. In these scenarios it is hard to obtain a reliable measure of pasture cover using standard equations.

Calculating pasture cover with an individual equation from own calibration cutting:

An easy-to-apply approach to calibrate your own equation for pasture cover is the so-called double-sampling approach. In this, we firstly measure the compressed sward height per paddock (e.g. 50 points per ha). Thereafter, a lower number of points of known compressed sward height are used for the calibration of a linear regression function (e.g. 8 points per ha). For this, you measure the sward height with the rising plate meter, then place a steel frame right below the measured area, cut the herbage biomass manually to a standard height (commonly 4 cm) within the steel frame, dry the herbage sample until constant weight, and produce an excel sheet containing the columns height and herbage dry matter. Use linear regression between sward height and herbage biomass to derive your own equation. You can use this equation to transform all sward height measurements per ha into a pasture cover value.

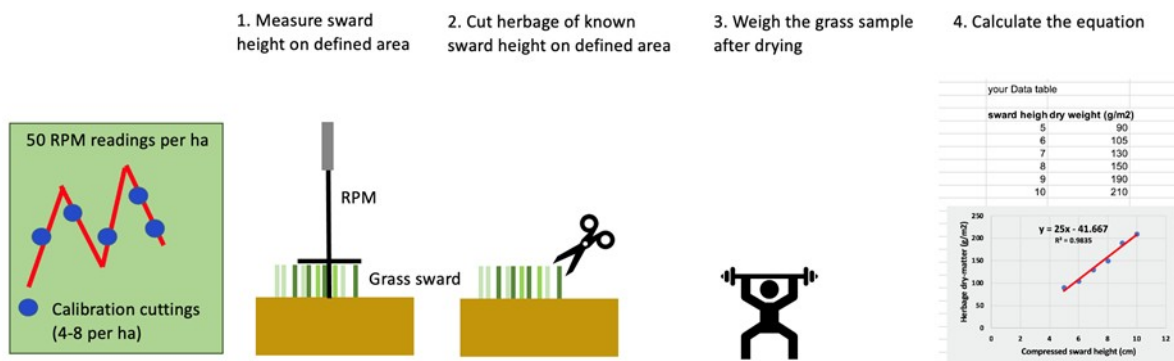


Fig.1: Calculate your equation of pasture cover from calibration cutting

Other regions (such as New Zealand) vary their calibration equation depending on the time of year and sward type to account for differences in dry matter content and whether grass is in a vegetative or reproductive state.



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- FURTHER READING**

A major study on herbage mass estimation techniques (including the most appropriate platemeter equations for Northern Ireland) was carried out at AFBI Hillsborough from 2009-2013. The results of this study (which includes details of how the equations were formulated) can be found here:

<https://www.agrisearch.org/publications/technical-reports/a-review-of-herbage-mass-estimation-techniques-a-appropriate-for-northern-ireland-and-suggested-developments-to-improve-adoption-and-accuracy-of-grassland-management-assessments-d-64-13/viewdocument/179>

A recent study performed in Germany by Obermeyer et al. (2022) on multispecies grassland tested the difference between electronic modern rising plate meter against an established old method. The study also found reasonable results to assess multiple ecosystem services such as the botanical composition. It can be found here:

<https://www.publish.csiro.au/CP/CP22215>

All numbers have been derived from New Zealand calibrations -
<https://pasture.io/measurement-tools/rising-plate-meter-equations>

Using RPM in protected areas for evaluation of sward heterogeneity:
<https://www.publish.csiro.au/CP/CP22215>