Proceedings of the New Zealand Grassland Association 47: 249-253 (1986)

THE USE OF PASTURE HEIGHT AS A PREDICTOR OF FEED LEVEL IN NORTH ISLAND HILL COUNTRY

R.W. WEBBY and W.J. PENGELLY
Whatawhata Hill Country Research Station,
MAF, Hamilton.

Abstract

Considerable effort is expended measuring pasture parameters that relate to animal performance. Traditionally farmers have used visual impact and experience as their method of pasture assessment to make management decisions. The simplest measurement collected by researchers, pasture height, is developed to the point where it can be used as a guide to predict pasture mass and animal performance. This paper presents relationships between height and mass for improved pastures in summer dry North Island hill country. A pasture 5cm tall will give hogget growth of 60 g/day in summer, 90 in autumn, 100 in winter and 200 in spring. Similarly 5cm will be 2250 kg DM/ha in summer, 1900 in autumn, 1520 in winter, 1640 in spring and 2200 in late spring.

Keywords: Height, mass, predictor, grazing, quality, animal performance, feed levels, parameters, pasture.

INTRODUCTION

Pasture mass can be a difficult parameter for farmers and advisers to estimate. Differences in mass can be difficult to visualise, and the assessment requires cutting, washing, drying and weighing.

Pasture height, however, is a simple parameter to measure. Differences in pasture height often provide a greater visual impact than differences in mass. Pasture height, irrespective of associated mass, has been shown as a good predictor of hogget growth (Webby et al. 1982). The data presented in this paper aim to quantify height-mass relationships in different seasons to serve as an objective guide to those who need to determine pasture levels. Height is also compared with the single probe capacitance meter (Design Electronics) and'the visual assessment technique (Haydock and Shaw 1975).

METHODS

Data were collected over five years from pasture management trials at Whatawhata. Pastures were of mixed species, co-dominants ryegrass (*Lolium* perenne), brown top (Agrostis *tenius)*, sweet vernal (Anthoxanthum *odoratum)*, goose grass *(Bromus mollis)*, white clover *(Trifolium repens)*, sub clover *(T. subterraneum)*, typical of both steep and easy warmer North Island hill land. Grazing management included both set stocking and rotational grazing. Pasture data came from two sources:

(1) Dry matter (DM) cuts taken to ground level in 0.125m² quadrats with 10 associated height measurements made for each cut. The means of all the measurements taken in the paddock made one data pair, either 10 cuts and 100 heights (paddocks 0.2 to 0.6 ha), or 20 cuts and 200 heights on bigger paddocks (5 ha).

(2) For each ground level cut, a single height measurement was recorded, representing the average pasture height in the quadrat, one cut and one height representing a pair.

Pasture height as used here, is defined as the free standing leaf height, not including stem or seed head. Height measured was the nearest free standing leaf to the measuring device, which may have been a calibrated pencil, a thin ruler or a calibrated steel rod.

In a separate data set, individual quadrats (.125m²) were measured, first with the probe, 10 points within the quadrat, then the height was measured as the mean for the quadrat using the technique described above. The DM was then assessed by visual estimate and finally the plot cut and the actual DM yield established in the usual way.

RESULTS AND DISCUSSION

Height — Dry Matter Relationship

When all data were pooled a good relationship between height and mass occurred in continuously grazed pastures (r^2=.76), while variability was large in pre graze pastures (r^2=.23), and less (r^2=.61) for post grazed pastures.

By grouping the data into pasture types (ryegrass, browntop), grazing history (rotation, continuously grazed) and seasons, a clearer picture emerged. Lines based on quadratic and linear relationships that best followed the data were derived, one line for each season. These are presented in Fig. 1.

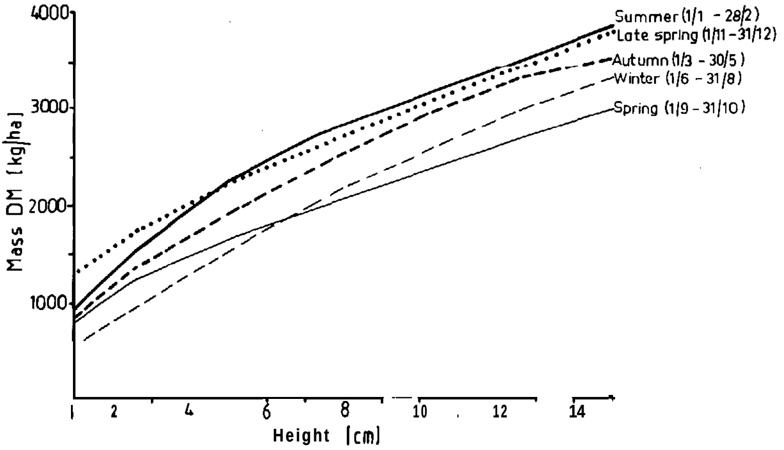

Figure 1. Relationships Between Pasture Height (cm) and Mass (kg DM/ha) in Different Seasons

TABLE 1: The Basis of the Data Used to Derive the Lines in Figure 1.

Season	r^2 Value	RSD	Number of Pairs
Summer (1/1 to 28/2)	.67	566	549
Autumn (1/3 to 31/5)	.69	670	677
Winter (1/6 to 31/8)	.76	400	954
Spring (1/9 to 31/10)	.56	424	688
Late Spring (1/11 to 31/12)	.67	484	461

Between late spring, autumn and winter, the slope between height and mass is similar (see Fig. 1). The main difference between these seasons is that the intercept of the line changes, in other words the whole line moves up or down. Between spring and summer the lines part from a common intercept then run parallel from 7.5cm with a difference of 740kg DM.

Pastures with poor plant types (dominantly brown top and other low producing species), tend to yield less at low heights (300kg DM less at lcm), but more in tall pastures (500 to 800kg DM more at 15cm).

Seasonal Influences

While these height-mass relationships (Fig. 1) should hold true for average season, the influence of abnormal growth periods should be allowed for. The relationships indicate that pastures in summer below 5cm lose density as the influence of residual material is lost, causing the line to steepen. If wet conditions occur during summer this may not occur, then the late spring height-mass relationship may be more appropriate. This affect may carry through until the autumn where the height-mass relationship is typical of a season where cleaned out pastures recover after a drought. For pastures not cleaned out, a height-mass relationship closer to the summer season may be more appropriate.

The spring height-mass relationship is based on pastures typically continuously grazed at this time. With rapid pasture growth in late spring, and the presence of reproductive material, mass increases markedly at all heights.

Comparison With Probe and Visual Assessment

Table 2 shows a reasonable similarity between pasture height, the probe, and visual assessment as techniques for measuring mass. The probe and visual assessment must relate directly to DM, whereas pasture height as well as being a satisfactory indicator of DM, as shown here, is also a pasture measurement in itself.

TABLE 2: r^2 Values in Linear Relationships With DM.

	(100 pairs for each season) Probe	Height	Visual Assessment[1] (top operator)
Autumn	.73	.70	.70-.80
Winter	.70	.72	.90-95
Spring	.87	.77	.80-90

[1] The r^2 values for visual assessment apply to an operator doing at least one calibration (involving pasture cuts) per week.

Measuring Height

Height is difficult to measure in units smaller than lcm, hence the adoption of this unit. Although there can be a lot of DM below lcm, pastures are seldom grazed below this. The bulk of the pasture mass is in the zone up to 15cm, levels above this height have not been considered.

Height is best measured by taking the average of at least 30 measurements within a paddock. Increasing with paddock variability to 100 or more in a large hilly paddock. This, as a technique, may not be practical on a farm scale operation. In this situation a sampling of only the areas most typical of the paddock would suffice. Extremes at either end of the height range should be avoided, only measuring what appears to be the average height in the paddock or the area sampled.

The range of heights in a paddock will vary depending on pasture conditions. A tightly continuously grazed pasture or a well grazed post measurement will show little variability whereas a "Pre" graze measurement will, see Fig. 2 (Webby, unpubl.). In the pre graze the actual mean height is 5.66cm (Fig. 2). It may appear, if you look down on the paddock (from top of the hill) to be as high as 10cm, or if you look up from the bottom as low as 4cm, indicating that care is needed in sampling the paddock.

Animal Performance

The value of height as a predictor of hogget performance is shown in Figure 3. These are fitted lines that are strongly quadratic. The basis of these data are shown in Table 3.

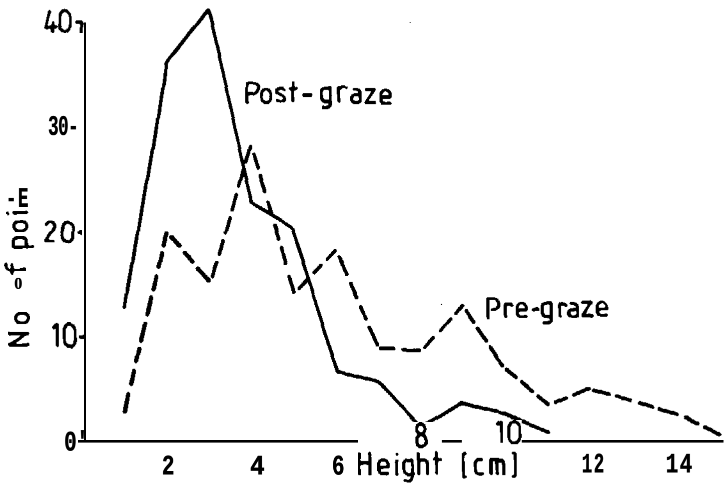

Figure 2. Population Distribution of Height Measurements for Tagged Plants Pre and Post Graze

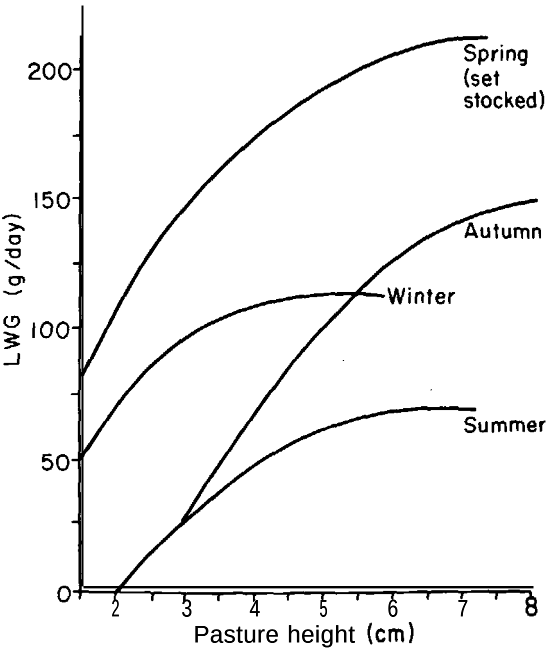

Figure 3. Pasture Height as a Predictor of Hogget Growth on Good Quality Pasture

TABLE 3:

	r^2	RSD	Number of Pairs
Summer	.76	23	10
Autumn	.72	28	15
Winter	.83	11	19
Spring	.89	19	8

Pasture height, particularly as it relates to "ease of harvest" must determine intake (Allden and Whittaker 1970). Pasture quality is also important in determining animal performance, particularly in hoggets (Webby 1984). If a dry matter level can be determined from a height measurement, prediction of related animal performance must also consider pasture quality. A pasture of 2000kg DM/ha, 100% green will grow hoggets at 150g/day, if 50% green, same mass, only 50g/day LWG could be expected.

SUMMARY

Pasture height, as technique for pasture measurement be it in its own terms or as an indicator of mass (see Appendix I), is comparable to other methods of assessment. However height has advantages in that it is simple to measure and relates well to feed availability.

APPENDIX 1: Pasture Height as an Indicator of Standing Pasture Yield (Kg DM/ha).

Height	Summer (1/1-28/2)	Autumn (1/3-31/5)	Winter (1/6-31/8)	Spring (1/9-31/10)	Late Spring (1/11-31/12)
cm	DM	DM	DM	DM	DM
15	3800	3500	3300	2980	3750
14	3670	3410	3150	2850	3600
13	3540	3310	3000	2720	3450
12	3400	3180	2850	2590	3300
11	3250	3040	2690	2460	3150
10	3100	2880	2505	2330	3000
9	2950	2700	2330	2200	2840
8	2800	2500	2150	2070	2680
	2640	2300	1950	1930	2520
6	2450	2100	1740	1790	2360
5	2250	1900	1520	1640	2200
4	1950	1680	1290	1480	2000
3	1650	1460	1060	1300	1800
2	1300	1180	810	1080	1560
	900	860	560	800	1280

As these data were derived from the pastures at Whatawhata (steep and easy warmer North Island hill land), care should be taken in extrapolating it to other areas.

References

Allden, W.G.; Whittaker, I.C.McD. 1970. *Aust. J. agric. Res:* 755-766.
Haydock, K.P.; Shaw, N.H. 1975. *Aust. J. of Exp. agric. An. Husb. 15:* 663-670
Webby, R.W. et al, 1982. *Proc. Ruakura* Fmr. *Conf. 34:* 119-120.
Webby, R.W. et al, 1984. Ibid 36: 106.