FEED PLANNING WORKSHOP : ESTIMATING PASTURE SUPPLY

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Introduction

The objectives of this workshop session are to

- review the methods for assessing pasture supply
- understand the advantages, disadvantages and limitations of the various alternatives
- build confidence in assessing pasture supply

Pasture supply

The supply of pasture on any given area is most commonly quantified as kg DM/ha (pasture mass) although less objective terms such as grazing days/ha are sometimes used

Pasture mass is measured by cutting sample areas (0 2 - 0 5 m^2, defined by a narrow metal grid) of the pasture to "ground level", most often using a shearing handpiece The definition of "ground level" can vary between operators but is practically as close to the ground as possible without picking up much soil contamination or cutting horizontally growing clover stolons A useful test (see later) that ground level is being correctly defined is that there is zero mass at zero height

Ensuring sufficient representative sampling areas are chosen is often impractical, especially in heterogeneous swards where a minimum of 25 sampling sites need to be selected at random It is more common to limit the sample cutting sites to 6-8 and use the results from these in conjunction with one of the indirect methods described below

Pasture cut from sampled areas is weighed, and a weighed subsample dried in a forced air oven at 70-80°C until there is no further decrease in weight (24-48h) Dry matter % of the subsample is calculated and applied to the fresh weight of the original sample to give mass of DM/sample area and multiplied up to the /ha figure

Microwave ovens can be used but limit the sample size Care must be taken to include a source (cup) of water in the microwave

The above procedure is laborious and costly and thus unsuitable for routine use at farm level Many indirect alternatives for assessing pasture mass have been established These include

1 Eye assessment
2 Pasture height (sward stick)
3 Falling plate/disc
4 Conductivity probe

Eye assessment

People who regularly assess pasture mass by eye can rapidly and consistently rank pasture for mass The accuracy of their estimate or prediction depends, as it does for all indirect techniques, on calibration of estimates with actual pasture cuts Eye assessment like the other techniques estimate to within ± 100-200 kg DM/ha on low pasture masses (less than 1500) and ± 200-300 kg DM/ha for higher pasture masses When assessing pasture mass by eye it is important to walk across the paddock and avoid assessment biased by pasture growth at gateways

Pasture height

Pasture height, to the nearest cm, can be simply and quickly measured using a ruler or proprietary "sward stick" Pasture height is more correctly defined as "sward surface height", and is a measure of the uppermost touching (but unextended) plant part In a relatively homogeneous sward, the mean of 25 individual height measurements will give an acceptable estimate of pasture height In more variable (height, aspect, contour) paddocks, 50 measurements are needed

It is recommended that height measurements (and others discussed later) are taken along a W formation across the paddock This sampling method is designed to minimise possible biases from corners or fencelines

Falling plate

The falling plate or disc is, as its name suggests, a disc allowed to fall down a shaft and the height at which the pasture maintains the disc above ground level is recorded Proponents of the falling plate extol its advantage over sward height of incorporating density into its assessment

Conductivity probe

There are a number of commercially available conductivity probes for assessing pasture mass The probes, which range from a single to multiple spikes, measure the change in conductive between air (the control) and water as represented by the moisture content of the pasture The electronics associated with such probes, relate the change in conductivity to DM/ha using pre-selected empirical relationships

In contrast to the other three methods, the electronic basis of conductivity probes permits them to accumulate successive readings and provide mean estimates

The strengths and weaknesses of the four indirect methods described are summarised in Table 1

Table 1: The strengths and weaknesses of indirect methods of pasture mass assessment.

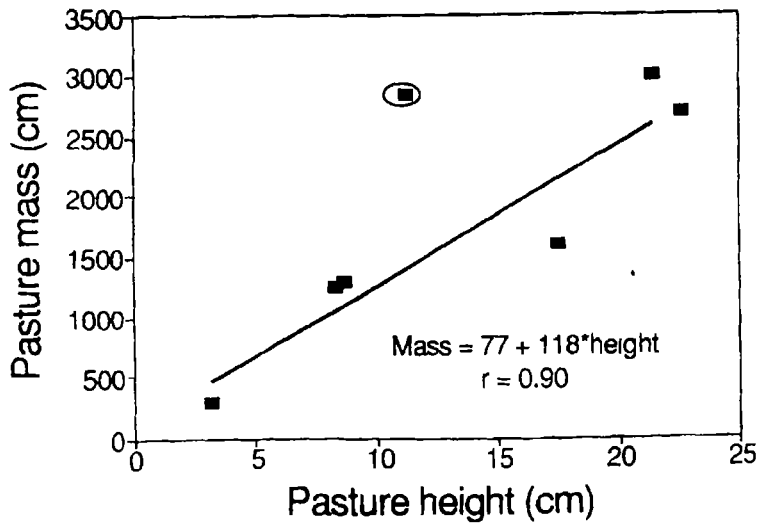
Method	Strengths	Weaknesses
Eye assessment	fast, brain integrates pasture variability	training needed
Pasture height	simple equipment, easy to understand, related to intake, inexpensive	not automated, ignores density
Falling plate	bulky equipment, "height" value less, easy to relate to	incorporates density, not automated
Conductivity probe	fast, automated	"believe" in output as fact, expensive

Integrating direct and indirect methods

All indirect methods need regular (at least within a season) calibration with pasture sample cuts Estimating mean pasture mass in a paddock using cuts is too laborious and expensive Combining the two methods is the most accepted approach

Representative areas of a paddock (low, medium and high mass) are identified and the area to be cut is measured by the indirect method before cutting A calibration curve is then created (see Figure 1 for that established for the workshop) An average estimate of the pasture mass for the paddock(s) can be read from the mean indirect measure

Figure 1:



Feeding value of the pasture

The metabolisable energy available from pasture is the product of the mass and the ME value (MJME/kg DM), so where feed flows are being made in ME terms, an estimate (or lab measurement) of ME value is required Factors which enhance (green leaf, legumes) and reduce (stem and dead material) ME value must be assessed and ME value adjusted accordingly (Table 2)

Table 2: ME value of pasture

Pasture	MJME/kg DM
Base level	10 5
100% legume	+1 5
very leafy	+1 0
stemmy	-1 0
Heavy seedhead	-2 0
>50% dead material	-3 0

Stage I feed planning as discussed in this workshop does not handle very well any difference between the quality of the diet consumed and the pasture on offer Some classes of stock, such as sheep, when offered a pasture of lower average ME value can maintain a high quality diet (+ 1 to 2 MJME/kg DM) above the pasture on offer when offered a high allowance, by selecting only the high quality green material However, their dry matter intake and total ME intake still declines On the other hand, at low allowances or post-grazing pasture mass, quality of the pasture on offer and diet consumed are more closely related

Some feed budgeting proponents use ME values for the pasture *likely to be consumed*, but the majority use values for the *pasture on offer* and accept that underestimates of diet quality are likely to be compensated by over estimates of feed intake at any given pasture quality Although treatment of variation between pasture quality and diet quality is not precise in simple feed budgets the potential effect on the outcome of the plan is an order of magnitude less than that associated with inaccurate pasture mass assessment

Summary

Skills and confidence in estimating and measuring pasture mass and quality can readily be built up by those regularly involved These assessments form the basis of pasture feed planning When supplements are being used it is equally important that they are quantified in mass and ME value

NZ Veterinary Association - Deer Branch
Feed Planning Workshop

[This workshop was undertaken by delegates as a series of calculations based on a farm visit to D & G Stevens It involved a series of scenarios These are presented here to act as a guideline for similar calculations Ed]

This spreadsheet illustrates a response to the Feed Planning Workshop case study

Exercise 1 Establish the starting variables for a feed flow

Feed flow for George Steven's weaner stags and hinds from 22 Apr to 17 Sept (5 months)

The figures in bold have been entered for this example feed flow

(a) Animals

		Number	Lwt (kg)
Class 1	Stags	96	52
Class 2	Hinds	136	47

(b) Pasture cover

Paddock	Height	Mass	Area	M/D*	Total DM	Total ME
HB east	10 7	**1600**		**5.2**	**11**	8320 91520
HB west	21 4	**2700**		**6.8**	**9.8**	18360 179928
BH	11 2	**2800**		**4.5**	**10.5**	12600 132300
Total	16 5	39280				403748
Average cover						2380

(c) Supplementary feed

Type	Quantity	Wgt/un	DM%	M/D	Total ME
Balage	207	400	43	10 1	360000
Barley	18	1000	87	12 8	200500
				Total	560500

Exercise 2 Establish the time course variables for the feed flow

1. Animal	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Lwt gain (g/d)					
stags	**150**	**80**	**80**	**100**	**200**
hinds	**130**	**70**	**70**	**90**	**180**
Mean monthly LWT (kg)					
stags	54	58	60	63	67
hinds	49	52	54	56	61
Beginning	52	56 5	58 9	61 3	64 3
End	56 5	58 9	61 3	64 3	70 3
Beginning		50 9	53	55 1	57 8
End	50 9	53	55 1	57 8	63 2
ME requirements (MJME/day)					
stags	23	21	21	23	28
hinds	24	22	22	24	29
Total ME per month	162546	147868	151737	161847	197939

MD = MJME/kgDM

2. Pasture

	May	**Jun**	**Jul**	**Aug**	**Sept**
Pasture growth	**20**	**5**	**5**	**10**	**25**
M/D	**11**	**11**	**11**	**11**	**11**
Total ME grown	6600	1650	1650	3300	8250
on area	1089001	27225	27225	54450	136125
Target pasture cover at end of month	**2000**	**1700**	**1200**	**1200**	**1500**

Exercise 4. Feed Flow

	May	Jun	Jul	Aug	Sept	
Initial pasture cover	2380	2215	1936	1636	1480	
Flow done in total ME	403748	402102	351458	296946	268549	
Add pasture grown	108900	27225	27225	54450	136125	
Add supplementary feed as ME						
balage	**52000**	**52000**	**52000**	**52000**	**52000**	
barley		**18000**	**18000**	**27000**	**27000**	
Deduct animal demand	162546	147868	151737	161847	197939	
ME at end of month	402102	351458	296946	168549	285735	
Final pasture cover	2215	1936	1636	1480	1574	
Balage left (ME)	308000	156000	104000	152000	100000	% used
Barley left	200500	182500	164500	137500	110500	72
						45
Balage DM/head/day	0 7	0 7	0 7	0 7	0 7	
Barley DM/head/day	4	4	4	4	4	
	0 0	0 2	0 2	0 3	0 3	
	0	0	0	0	0	

Exercise 5 (1a) What-if Pasture growth rate is halved

	May	Jun	Jul	Aug	Sept	
Initial pasture cover	2380	2015	1578	1120	1067	
Flow done in total ME	403748	365652	286396	203271	193649	
Add pasture grown	54450	13613	13613	27224	68063	
Add supplementary feed as ME						
balage	**55000**	**55000**	**55000**	**90000**	**100000**	
barley	**15000**			**35000**	**45000**	
Deduct animal demand	162546	147868	141737	161847	197939	
ME at end of month	365652	286396	203271	193649	208773	
Final pasture cover	2015	1578	1120	1067	1150	% used
						99
Balage left (ME)	305000	250000	195000	105000	5000	47
Barley left	185500	185500	185500	150500	105500	
Balage DM/head/day	0 78	0 78	0 78	1 28	1 42	
Barley DM/head/day	0 17	0 00	0 00	0 39	0 51	

Exercise 5 (1b) Pugging of 400 kg DM/ha (evenly over all winter)

	May	Jun	Jul	Aug	Sept	
Initial pasture cover	2380	2000	1559	1096	1003	
Flow done in total ME	389228	348562	268398	284366	167449	
Add pasture grown	108900	37225	27225	54450	136125	
Add supplementary feed as ME						
balage	**27500**	**55000**	**55000**	**55000**	**55000**	
barley				**50000**	**50000**	
Deduct animal demand	162546	147868	151737	161847	197939	
ME at end of month	363082	282918	198886	181969	210635	
Final pasture cover	2000	1559	1096	1003	1161	% used
						99
						47
Balage left (ME)	332500	277500	222500	167500	112500	
Barley left	200500	200500	200500	150500	100500	
Balage DM/head/day	0 39	0 78	0 78	0 78	0 78	
Barley DM/head/day	0 00	0 00	0 00	0 56	0 56	

Exercise 5 (ii) Extra animals to consume all supplements

	May	Jun	Jul	Aug	Sept	
Initial pasture cover	2380	1904	1464	995	903	
Flow done in total ME	403748	345548	165729	180623	163929	
Add pasture grown	108900	27225	27225	54450	136125	
Add supplementary feed as ME						
balage	**55000**	**55000**	**55000**	**100000**	**100000**	
barley		**40000**	**40000**	**50000**	**60000**	
Deduct animal demand	222100	202044	207330	221144	270460	
Extra animals	85	85	85	85	85	
ME at end of month		265729	180623	163929	189594	
Final pasture cover	1904	1464	995	903	1045	% used
						101
						95
Balage left (ME)	305000	250000	195000	95000	-5000	
Barley left	200500	160500	120500	70500	10500	
Balage DM/head/day	0 78	0 78	0 78	1 43	1 42	
Barley DM/head/day	0 00	0 45	0 45	0 56	0 67	