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A guide to feed planning for sheep farmers

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A guide to feed planning for sheep farmers

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Chapter 5—managing the spring

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Summary

Pasture and animal needs

- Use pasture length as an indicator of dry matter quantity and sheep performance
- Develop more accurate assessment of pasture quantity through measurement
- Establish sheep and cattle seasonal pasture needs from tables
- Develop skills in condition scoring and weighing of sheep.

Feed planning

- Estimate the number of sheep grazing days in a paddock from pasture quantity assessment and animal feeding needs
- Establish rotations for controlled grazing management
- Compile a whole farm feed budget to find periods of feed deficit or surplus and help with animal feeding decisions.

Policy decisions

- Each year reassess farming policy decisions
- Consider pasture supply, market signals, feeding priorities, and your individual preferences
- Important stock policy decisions like sheep-cattle ratios, stocking rate, classes of stock and seasonal operations impact on feed planning
- Make objective feed planning a conscious policy decision.

Seasonal considerations

- **Winter:** ration pasture and supply supplements or crops to maintain sheep and cattle live weights
- **Spring:** have sufficient pasture cover for lambing-calving and manage later pasture surplus for good animal performance
- **Summer–autumn:** maintain good body condition in ewes, grow young stock well and be prepared to cope with animal health problems or drought.

Chapter 1

Pasture supply and animal needs

The aim of this booklet is to assist you in more effective use of pasture to achieve high sheep production. Essential for this is the ability to assess the quantity and quality of pasture in a paddock and knowledge of animal feeding needs.

This chapter discusses how to assess the amount of pasture in a paddock in relation to animal performance and seasonal pasture needs of sheep. The next chapter deals with setting up grazing rotations and feed budgeting.

Pasture quantity assessment from length

A simple way of assessing pasture dry matter quantity (kg DM/ha) is from visual length estimates. This technique is not as accurate as measurement-based methods, but is a very practical day-to-day indication of the approximate amount of dry matter in a paddock and probable animal performance.

To use the visual assessment method successfully, it is important to convert pasture length to a DM equivalent. That conversion varies with the seasons.

Conversion of length to DM for an average ryegrass-clover pasture in different seasons is illustrated in Fig. 1.1.

There will be considerable variation in the quantity of DM for a given pasture length according to plant density, uniformity and species. Nevertheless average pasture length is a useful barometer for pasture availability and animal performance.

Pasture quantity assessment from measurement

Accurate visual assessment of the amount of pasture DM in a paddock, based on pasture length, is an acquired skill gained from specialist training and plenty of practice. It varies considerably from pasture type to pasture type, farm to farm and from season to season.

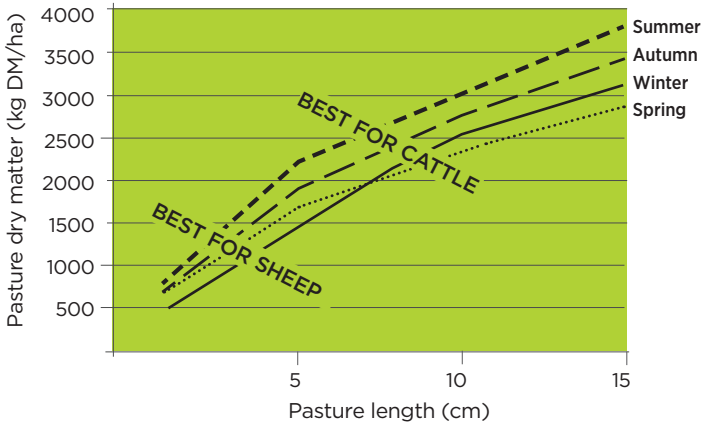


Fig. 1.1 *Generalised seasonal conversion of pasture length to pasture dry matter for an average rye grass-clover pasture.*

There are three recognised techniques for physically measuring kg DM/ha:

- Pasture cutting and weighing
- Pasture probe
- Rising plate meter (pasture length)

The basic requirement is that you become "calibrated" against one of the above objective measurement techniques. To provide yourself with appropriate benchmarks, this will initially mean either obtaining the appropriate equipment and comparing your visual assessment against actual measurements, (NB a microwave oven can be used for dry-matter determination with pasture cuts) and/or seeking assistance from a consultant or pasture specialist.

Pasture quality

The quality or feeding value of a pasture varies with its stage of growth, weather conditions and season. Generalised values are given in Appendix 2 for the main nutritional components of energy and protein.

As a rule, the feeding value (eg. digestibility or metabolisable energy content—MJ ME/kg DM) of pasture is highest when it is young and leafy but declines as the pasture becomes stalky or dead material accumulates.

There is a worked example in Appendix 1 and a series of tables providing feed requirements for most classes of stock.

Seasonal pasture needs of sheep

The amount of feed adult sheep need varies during the year. For most of the time they get by on maintenance or enough to hold body weight but their needs increase at mating and late pregnancy-lactation (Fig. 1.1). The minimum pasture lengths needed for ewes to meet these variable feed requirements are indicated in the Table 1.1.

The needs of growing lambs varies with the growth rate expected. Pasture lengths to aim for are also indicated in Table 1.1.

There are detailed tables of sheep feed requirements for different levels of performance in Appendix 1.

The pasture length guidelines in Table 1.1 can apply equally to set-stocking or rotational grazing. In the case of rotational grazing, the indicated pasture length will be a minimum (often referred to as residual DM) meaning that stock should go into a paddock with a greater length and be shifted when they have grazed down to that indicated. With set stocking pastures should be held at or just above the length indicated.

When pasture length falls below these minimum levels, forage crops or feed supplements should be used. It is suggested stock be confined to a "sacrifice" paddock for feeding of supplements like hay or silage so other pasture areas can recover.

Table 1.1 *Minimum pasture length and dry matter quantities for different sheep production levels during the year.*

	Pasture length(cm)	Pasture DM (kg/ha)	Feed intake(kg DM/d)	Production level
Ewes				
Mid pregnancy	1-2	400-500	1.0	Maintenance
6 weeks pre-lamb	2-3	600-800	1.3	60-80 g/d
Ewes and lambs	4-5	1400-1600	1.8	180-200g/d (lambs)
Summer	1-2	900-1000	l.0	Maintenance
Mating	2-3	1200-1400	1.4	120-150 g/d
Lambs				
Weaned				
- spring	3-4	1200-1400	0.8	160-200 g/d
- summer	2-3	1400	1.0	130-150 g/d
- autumn	2-3	1200	1.2	80-100 g/d
- winter-spring	3	1100	1.2	100-120 g/d
Hoggets summer	2-3	1400	1.3	60-80 g/d

Body condition scoring

A good way of monitoring the ewe production levels in Table 1.1 is by use of body condition score (BCS) as outlined in Appendix 4.

Body condition scoring is a means of comparing sheep regardless of differences in breed, body-frame size or category of ewes e.g. hill country vs intensive farming. It is still important to monitor liveweight changes during the year—each condition score is equivalent to about 5 kg liveweight.

The BCS as outlined in Appendix 4 gives an indication of the amount of body fat and production status of ewes regardless of breed or frame size.

Chapter 2

Feed planning

Feed planning enables you to objectively match pasture supply and animal feed demands on your whole farm during the year (Fig.2.1). This structured approach enables more sophisticated pasture feeding to maximise production and achieve livestock target weights.

The concepts are well within your grasp and simply mean the development of skills outlined here and access to information provided in the appendix tables. Bringing it all together will require participation in training exercises and ongoing contact with a proficient colleague or consultant.

This chapter takes you through the three levels of feed planning:

- Estimating the number of grazing days in a paddock
- Setting up a rotation
- Compiling a whole-farm feed budget.

The essential ingredients needed for effective feed planning are:

- Accurate knowledge of paddock and farm areas
- The ability to assess the amount of pasture in a paddock (see Chapter 1)
- A knowledge of seasonal pasture growth on your farm
- Aknowledge of sheep feeding needs (see Table 1.1 and Appendix 1).

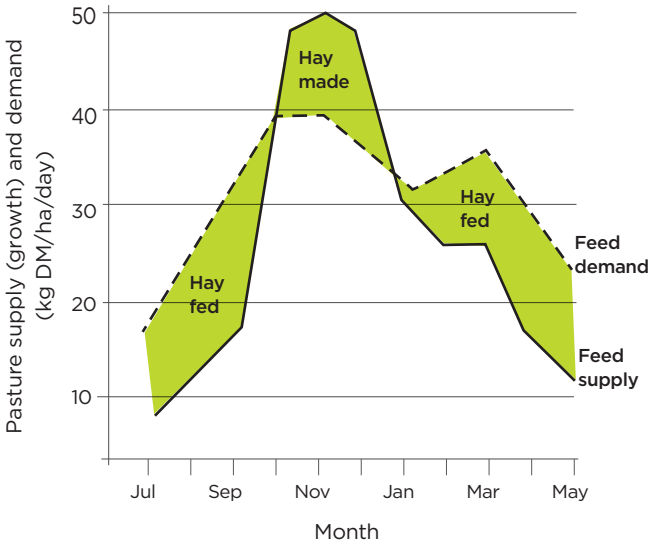


Fig 2.1 *Profile of feed supply and feed demand for 70:30 sheep:cattle ratio—taken from feed budget example on page 18.*

Sheep grazing days in a paddock

Below is a worked example estimating the number of sheep grazing days in a paddock.

Table 2.1 *Estimation of the amount of pasture and sheep grazing days in a paddock.*

Assumptions: early winter (1 May) when pasture growth is 10 kg DM/ha/day and maintenance feed required for the ewes is 1 kg DM/head/day.

Paddock size	5 ha
Average pasture length	before grazing: 4 cm—1400 kg DM/ha after grazing: 1 cm—800 kg DM/ha
This same method can be used for other classes of stock using pasture feeding	
Pasture growth	Ignore in this case
Pasture available	(1400-800) x 5 = 3000 kg DM/ha
Number of ewes	1500
Feed required	1500 x 1 = 1500 kg DM/day
Number of grazing days	3000/1500 = **2 grazing days**

Where pasture growth and grazing period are greater the extra DM should be included in the quantity of feed available eg. in this case pasture available from growth is insignificant at 5 x 10 = 50 kg DM/ha/d.

Setting up a rotation

Decide when and where the rotation is to start and how long it is to last. For this example a winter rotation is to last three and a half months from the end of mating until just before lambing for 1,500 ewes.

Assuming there are 35 paddocks available, there will be an average of three days per paddock. To plan this, a farm map of paddocks and sheet with the headings below will help.

Table 2.2 *Paddock rotation form*

Paddock number	Area (ha)	Pasture length (cm)	Pasture DM (kg DM/ha)	Grazing days	Date in	Date out
1	5	4	3000	2	1/5	2/5
2	6	4	4200	3	2/5	5/5
etc.						

Note: If pasture growth is significant during the rotation period it should be included in pasture DM available

The order of paddocks is usually made for ease and convenience of shifting sheep, tied in with any shearing or crutching plans and starting with the paddocks to be used first at lambing. This will give them maximum time to recover and have the required 2-3 cm of pasture cover needed during lambing.

Feed budgeting

Feed budgeting will allow you to match pasture supply with animal feeding needs during the year. Importantly it will identify pasture shortages in advance and allow them to be countered by nitrogen application, cropping and hay conservation or purchase.

The broad aim of feed budgeting is to maintain overall pasture cover between 1,000 and 2,500 kg DM/ha. Outside these limits both animal and pasture performance will suffer.

The feed budget can be compiled manually or with the use of a computer spreadsheet or specialist packages available through farm management consultants and computer software companies. Continually review your feed budget according to seasonal changes.

The steps involved in constructing a feed budget are:

- Reconciliation of stock carried
- Assessment of pasture cover
- Calculation of feed supply and demand.

Reconciliation of stock carried

The example feed budget (Fig 2.2 page 18-19) has been worked out for a 250 ha property with annual pasture production of 10,655 kg DM/ha, and based on the reconciliation of stock carried in Table 2.3.

Assessment of pasture cover

Pasture DM in each paddock needs to be assessed and averaged for the whole farm during key periods like late summer, early winter, pre-lambing and at lamb weaning. The following example is for the pre-winter period using the case farm in the feed budget in Fig. 2.2 (page 14).

Table 2.3 *Reconciliation of stock carried*

Property size	250 ha			
Stocking rate	15 SU/ha = 3750 SU total (winter)			
Livestock		**birth**	**deaths**	**repl.**
	sheep (70%)	110%	5%	25%
	cattle (30%)	95%	5%	25%
Class of stock		**SU**	**Number**	**Total SU**
	Ewes	1.0	2206	2206
	Hoggets	0.7	574	402
	Lambs	0	2426	0
	Rams	0.8	22	18
	ma Cows	5.0	168	840
	R2 Heifers	3.5	44	154
	R1 Heifers	2.5	45	113
	Calves	0	160	0
	Bulls	4.5	3	14

Table 2.4 *Assessment of average pasture cover for a 250 ha farm with 40 paddocks during early winter.*

Paddock number	Area (ha)	Pasture length (cm)	Pasture DM (kg DM/ha)	Total paddock DM (kg)
1	4	3	800	3200
2	6	4	950	5700
3	5	3	800	4000
"				
40				
Total	**250**			**486750**

Average pasture cover = 486750/250 = 1947 kg DM/ha

This corresponds with the average cover at the end of April on the completed feed budget on pages 18–19.

Feed supply and demand

The next step is to work out feed supply and animal feed demand during specified time periods to show feed surplus or deficit using the format opposite.

Table 2.5 *Calculation of daily and monthly feed budget DM supply and demand eg. for July (31 days) in example feed budget*

Feed supply	**Feed demand**	
Available pasture DM	Sheep	
Starting cover of 1200 kg DM/ha less final cover of 853 kg DM/ha = 347/31 days **= 11.2 kg DM/ha/d**	Ewes	= 2173 kg DM/d
	Hgts	= 720
	Wths	= 60
	Rams	= 25
	Total	= 2978
		= 2798/250 ha
		= 11.8 kg DM/ha
Pasture Growth		
= 5.0 kg DM/ha/d		
	Cattle	
	R lyr Hfrs	= 135 DM/d
	R 2yr Hfrs	= 176
	Cows	= 1008
	Bulls	= 24
	Total	= 1343
		= 1343/250
		= 5.3 kgD m/ha/d
Total supply	**Total demand**	
= 11.2+5	= 11.8+5.3	
= 16.2 kg DM/ha/d	**= 17.1 kg DM/ha/d**	
Therefore deficit is 0.9 kg DM/ha/d (for whole farm during July-0.9 x 250 x 31 = 6975 kg DM)		

In this case the 6975 (say 7000) kg DM deficit is made up with nitrogen boosted pasture (2500 kg DM) and hay (4500 kg DM) which had been conserved in December.

The above exercise carried out for each of the 12 months completes a whole farm feed budget as shown on pages 18–19.

Fig 2.2 *Example annual feed budget*

Sheep and beef feed budget for the period ending_____

Farmer					
Effective area (ha): Initial cover (kg DM/ha):		250 1200	250	250	250
	Month	July	Aug	Sept	Oct
Pasture movements (kg dm/ha/d)	Growth rate/day	5	15	50	60
	Intake/day	17.1	20.7	30.0	37.9
	Difference/day	-12.1	-5.7	20.0	22.1
Supplements (enter total) (kg DM)	Hay	4500	1500		
	Silage				
	Nitrogen	2500	5000	2500	
	Final cover	853	703	1313	1997
Sheep intake (kg dm/head/d)	No. ewes	2173	2173	2140	2033
	Intake/head/day	1.0	1.4	2.2	2.7
	No. two tooths				
	Intake/head/day				
	Hoggets	900	750	750	750
	Intake/head/day	0.8	1.0	1.2	1.5
	No. lambs			1625	2426
	Intake/head/day				
	No. wethers	60	40	35	30
	Intake/head/day	1.0	1.0	1.0	1.0
	No. rams	25	15	15	15
	Intake/head/day	1.0	1.0	1.0	1.1
Sheep demand ha/day: (kg dm/ha/d)		11.8	15.3	22.6	26.6

250	250	250	250	250	250	250	250
Nov	Dec	Jan	Feb	Mar	April	May	June
60	40	30	25	25	20	15	10
38.5	35.5	30.7	29.9	33.9	32.1	28.0	21.7
21.5	4.5	-0.7	-4.9	-8.9	-12.1	-13.0	-11.7
	-10000						1500
2643	2744	2723	2587	2310	1947	1543	1198
2033	1830	1702	1632	1632	2206	2206	2173
2.7	1.5	1.2	1.1	1.4	1.6	1.3	1.0
750	750	750	574	574			
1.8	1.8	1.2	1.2	1.5			
2426	2000	2000	2000	1940	1940	1746	1150
	1.0	1.0	1.2	1.4	1.5	1.5	1.5
25	20	15	10	60	60	60	60
1.2	1.2	1.2	1.0	1.0	1.0	0.8	0.8
25	25	25	25	25	25	25	25
1.2	1.2	1.1	1.1	1.2	1.5	1.3	1.0
27.5	24.5	19.8	19.6	23.7	26.0	22.1	15.8

Cattle intake (kg DM/head/d)	**No. Calves**			107	160
	Intake/head/day				
	No. Rlyr hfs	45	45	45	45
	Intake/head/day	3.0	3.0	6.0	6.0
	No. R2yr hfrs	44	44	44	44
	Intake/head/day	4.0	4.0	4.0	8.0
	No. cows	168	168	168	168
	Intake/head/day	6.0	6.0	9.0	13.0
	No. breeding bulls	3	3	3	3
	Intake/head/day	8.0	8.0	10.0	10.0
	No. R2yr steers				
	Intake/head/day				
	No. R3yr steers				
	Intake/head/day				
	No. Rlyr bulls				
	Intake/head/day				
	No. R2yr bulls				
	Intake/head/day				
	No. R3yr bulls				
	Intake/head/day				
Beef demand ha/day (kg DM/ha/d)		**5.3**	**5.4**	**7.4**	**11.3**
Total demand ha/ day(kg DM/ha/d)		**17.1**	**20.7**	**30.0**	**37.9**
Days/period		**31**	**31**	**30**	**31**

Matching supply and demand each month shows pasture has dropped below the critical minimum of 1000 kg DM/ha during July and August. This could be remedied by either buying or making more hay to feed in those two months, or applying nitrogen in May–June, or putting in a winter crop.

The compilation of a feed budget is time consuming but well worth the effort. A computer can complete the large number of calculations very quickly and reduce the time input required. Whether you do it manually or use a computer it is important you consult an expert, particularly when starting off.

160	158	158	155	155			
45	45	45	45	45	45	45	45
6.0	6.0	6.0	6.0	5.0	4.0	4.0	4.0
44	44	44	44	44	44	44	44
8.0	8.0	7.0	7.0	7.0	6.0	6.0	6.0
161	161	161	151	151	168	168	168
13.0	13.0	13.0	13.0	13.0	6.0	6.0	6.0
3	3	3	3	3	3	3	3
10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0
11.0	**10.8**	**10.3**	**10.3**	**6.1**	**5.9**	**5.9**	**5.9**
38.5	**35.5**	**30.7**	**29.9**	**33.9**	**32.1**	**28.0**	**21.7**
30	**31**	**31**	**28**	**31**	**30**	**31**	**30**

Feed budget worksheet

1. Define feed budget period

The following table will help you calculate either a short term budget or provide the basis of the annual feed budget (Figure 2.2). Write in the boxes provided the days in each month the feed budget will cover. To get the growth per month refer to appendices 6.1 and 6.2 or local pasture growth rates where available. Add up the total feed growing per month to get the total growth per hectare over the feed budget period.

Month	Days	Days for your feed budget	Total pasture growth kg DM/ha
January	31		
February	28		
March	31		
April	30		
May	31		
June	30		
July	31		
August	31		
September	30		
October	31		
November	30		
December	31		
Pasture growth (B)			**Kg DM**

2. Calculate the feed supply

(A) Feed on Hand

(i) Pasture (Average total cover)

kg.....DM/ha X.....ha = ...kgs DM

(ii) Supplements

Brassicas

.....ha X ..... Kg DM/ha = ...kg DM

.....ha X ..... Kg DM/ha = ...kg DM

.....ha X ..... Kg DM/ha = ...kg DM

Note: An average brassica crop yields 10,000kg DM/ha

Hay

.....Bales X.....kgs DM/bale= .....kgs DM

.....Bales X.....kgs DM/bale= .....kgs DM

Note: A conventional hay bale averages 16.0 kg DM

Silage

.....Tonnes X .....% DM X 10 = ...kgs DM

.....Bales X 180 kgs DM = ...kgs DM

Grain

.....Tonnes X 850 kgs DM/tonne = ...kgs DM

(B) Pasture Growth

From Appendix 5 or from local information

Kg/DM/ha grown (B) = ...kgs DM

Total feed supply (A + B).....

3. Calculate feed required

(C) Stock requirements

Stock type	Number	Daily demand kg DM	Number of days	Total kg DM
Livestock feed requirements (C)				

Note: For feed requirements for various classes of stock see Appendix 1

(D) Where applicable, **lambing requirement or pasture cover required** at the end of the feed budget period (use average total cover).

..... ha X .....kg DM/ha pasture cover (D) = ...kg DM

Total requirement (C & D) .....kg DM

(A& B)—(C&D) = surplus or deficit .....kg DM

Chapter 3

Policy decisions

It is important to stand back and reassess your basic farming policy decisions from time to time. In farming, these policy decisions have a direct impact on feed planning. The following pointers may help prompt you in this reassessment.

Consider:

- What am I good at and what do I like doing? (eg. specialising in lambs or wool or weaner cattle)
- Is this a store or finishing farm?
- Is my stock policy too complicated to make the most of my feed resources?
- Where is most of my profit from?
  - ewes
  - lambs
  - ewe hoggets
  - finishing cattle.

First things first

The main policy decisions are the type and numbers of livestock run. The next decision is how they are managed.

Things which will influence these decisions will include:

- Seasonal pasture supply
- Market signals
- Individual preferences
- Profitability is the overriding factor for all policy decisions and the challenge is to match feed supply with animal demands to maximise dollar returns.

Market signals

Undoubtedly market signals will influence decisions but as a general rule it is dangerous to react too quickly.

Likes and dislikes

Likes and dislikes of individual farmers will naturally influence decisions eg. some farmers enjoy sheep work over cattle and vice versa. Concentrate on what you do best, but be willing to try something new and innovative at times.

Examples of policy decisions

Sheep-cattle ratios

Seep and cattle complement each other. Cattle cope better with longer rank feed while sheep assist in maintaining pasture quality, grazing lower and helping plant density.

Ratios of sheep to cattle stock units vary considerably from perhaps 70:30 on hill country to 30:70 on easier country to 100% sheep or 100% cattle on more intensive finishing land.

Different sheep:cattle ratios will affect stock carrying capacities and the pasture feed-demand profile. Fifteen sheep units/ha do not equate with 15 cattle units/ha. As illustrated in the following two graphs (Figs. 3.1 and 3.2) increasing proportions of cattle mean greater pasture demands, especially in autumn, winter and early spring and an overall reduction in stock carrying capacity.

Other aspects to consider are that as cattle numbers increase labour requirements overall are less but capital investment is much greater than for sheep. Nevertheless, higher performing farms generally have a higher proportion of cattle.

This has been identified by the Beef + Lamb New Zealands Board with the results shown on Table 3.1

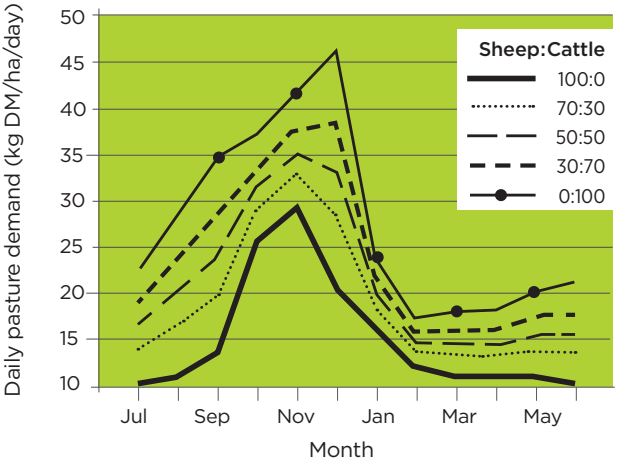


Fig. 3.1 *An example of the influence of different sheep:cattle ratios on daily pasture demand (from a paper by R.W.Webby to N.Z.Grassland Assoc. Conference, 1993)*

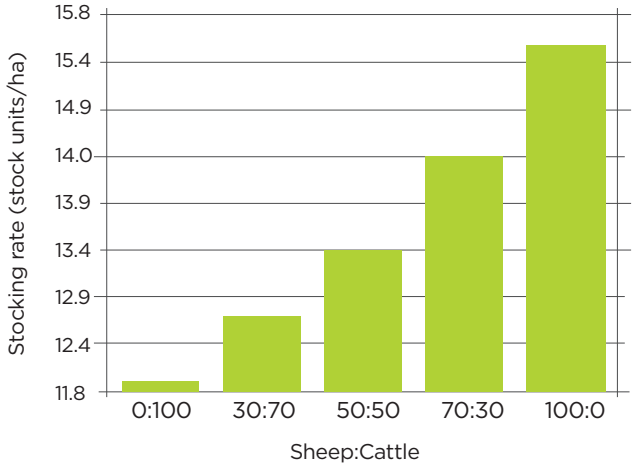


Fig.3.2 *An example of different stocking rates needed to retain adequate cover for various sheep:cattle ratios (from paper by R.W.Webby to N.Z. Grassland Assoc. Conference 1993)*

Table 3.1 *Profitability characteristics of low and high gross margin (GM) sheep farms.*

	N.I. hill country		N.I. intensive finishing	
	Low GM	**HighGM**	**Low GM**	**High GM**
Area- ha	254	514	269	289
SU/ha	10.0	8.8	9.8	7.6
Sheep:cattle	20:80	60:40	0:100	50:50
Fertiliser kg/ha	124	176	258	145
Lambing %	100.8	139.1	147.1	141.1
Prime lamb %	40	60	50	70
Lamb carcass (kg)	16.64	17.52	17.88	18.15
Wool - kg/SSU	4.3	6.24	0	7.05
Cattle carcass (kg)	296	312	346	326
Gross revenue/ha	**618**	**804**	**792**	**961**

Source: Beef + Lamb New Zealand's Economic Service Sheep & Beef Farm Survey 2008-09.

This example clearly shows that the top farms run a higher percentage of cattle and spend more on fertiliser. Their feed planning skills are probably superior.

Classes of stock

The proportions of breeding and dry stock will depend largely on the type of country. Generally breeding and store stock are run on hill country and specialist meat and finishing stock on more fertile rolling or flat land.

In some seasons, it may be more productive to quit lambs and calves as store and concentrate on improving the breeding performance of capital stock.

Stocking rate

Local knowledge and experience will largely dictate stocking rate for a particular farm. Contour of the land, local climate, sheep:cattle ratio, fertiliser application and natural fertility will all influence carrying capacity. This will range from 8-10 stock units per hectare (SU/ha) on marginal hill country to 25 SU/ha on intensive finishing land. In the South Island high country the rate may be as low as one stock unit per hectare or less.

The ideal is to match stocking rate with feed availability to achieve optimum production. If the stocking rate is too low per head performance will not compensate for wasted feed. If the rate is too high there is little flexibility to deal with difficult climatic conditions. Naturally there will be some trade-off at times when pastures will need to be grazed hard to hold quality.

A major factor regarding stocking rate is the ability to conserve feed as hay or silage or shift feed from peak growth in spring to times of shortage during summer or winter (see Fig. 2.1 on page 8). There are also management techniques for shifting feed to periods of shortage such as the use of autumn saved pasture during winter or deferred grazing ("standing hay") with cattle in spring-summer. Use of fodder, root or greenfeed crops (Appendix 3) can also be considered.

These conservation, management and cropping measures can effectively increase stock carrying capacity.

Seasonal operations

Decisions will need to be made on critical dates for seasonal operations like mating-lambing-calving, weaning, shearing and buying and selling. Naturally these will need to tie in with seasonal pasture availability and interact with feed planning.

Feed planning

A well-planned feeding system can result in better use of available pasture and higher stock performance. This will mean a conscious policy decision to adopt a more objective approach to feeding and management as outlined in the first two chapters.

Decisions on grazing management may involve a choice of one or varying combinations of set stocking and/or rotational grazing. There are few clear-cut advantages of one over the other though rotational grazing is more effective in rationing pasture.

Like many other decisions, your choice of grazing management is finally going to be the one you feel most comfortable with given all the information available.

Seasonal considerations

When making decisions about your farming policy, consider seasonal characteristics and requirements for your particular farm. These are:

- Getting through the winter period
- Handling the spring pasture surplus
- Coping with problems during summer-autumn.

These considerations impact on stock policy, classes of stock, stocking rate and grazing management. Winter feed supplies often dictate stock numbers carried. All grass wintering provides less flexibility than on properties where hay or silage can be made or feed crops grown. When options are limited, carry minimal young stock and place greater emphasis on good lambing or calving percentages to help cope with the spring surplus. It may also be prudent to off-graze or pad-winter beef breeding cows and run a carefully controlled winter ewe grazing rotation to ensure adequate pasture cover for lambing and calving.

Chapter 4

Preparing for winter

Over winter, good ewe condition needs to be maintained and young stock fed well. The body condition and health of ewes at lambing and the amount of pasture cover, both influence spring production.

There are two main aspects to consider during winter:

- Rationing feed so available pasture, supplements or crop meet animal needs until pasture increases in spring.
- Keeping ewes in good condition (CS 3) before lambing, and avoiding under or over-feeding to prevent metabolic problems or bearings.

When planning winter grazing rotations, whether by electric fence breaks or individual paddocks, ensure some paddocks have sufficient pasture cover (3-5 cm) at lambing. Graze lambing paddocks early in the rotation to allow pasture time to recover. Paddocks facing the sun (i.e. north facing) will recover quicker during the colder winter months than shady faces.

Prioritising feed

It is likely you will have three main groups of sheep to winter:

- Ewe hoggets
- Two tooth ewes
- Mixed age ewes.

Ewe hoggets

If ewe hoggets have reached a satisfactory weight pre-winter (e.g. 40 kg liveweight or 65 per cent of mature liveweight by mid-May) to eventually meet adult live weight targets, the aim should be to maintain or increase their weights to spring when their growth will pick up to 170–200 g/day. Weighing scales should be used to monitor progress. If they are wintered on pasture, a proportion of the farm relative to hogget stock units should be allocated and pastures kept at around 3cm long. If winter crops such as swedes or kale are used, the ration must make up the shortfall in pasture. Care is needed with hoggets which normally lose their lamb teeth in early spring. They should be transferred back to softer feed, like pasture.

Two tooth ewes

Generally two tooth's are still growing over winter and reach mature body size the following summer. This is a good reason for running them separate to the main ewe mob on slightly longer pastures of 2–3 cm. In most cases running two tooths and older ewes together is a necessary compromise due to limited paddock numbers.

Mixed age ewes

There may be a need to take older or lighter conditioned ewes (CS 2.5 or less) out for preferential treatment over winter. The amount of feed offered the main mob of ewes will depend on their body condition. If this is good (CS 3 or better) maintenance will suffice on pastures 1–2 cm in length.

Shearing policy

Shearing before lambing is common in the South Island and becoming increasingly popular in the North Island. Pre-lamb shorn wool is usually bright and white and shows comparatively less tenderness or break.

Shearing may increase the feed requirement of ewes by 10–30% for two to four weeks depending on temperature, wind and rain, as they need extra energy to maintain body heat. This extra feed must be budgeted for by saving an area with above maintenance levels of 3–4 cm pasture length, preferably in a well sheltered area for after shearing.

The use of cover combs reduces the period of increased feed needed by one or two weeks. Provision of shelter from wind and rain can also reduce the feed required and lessen the risk of stock deaths.

Mating harnesses

Mating harnesses can be used to assist winter management. With crayon colours changed twice each 17 day mating cycle, you can keep track of ewes likely to lamb each seven to eight day period. Harnesses can also provide information on returns (i.e. re-mated ewes) or unmated ewes.

Ewes due to lamb in the first week can be set-stocked on saved feed while the later lambing ewes can continue to be rotationally grazed.

The benefit of identifying late lambers is greatest when feed is short at lambing as these sheep can be restricted for longer. Unmarked or very late marked ewes can be culled prior to winter to free feed for productive ewes.

Pregnancy testing

Ultrasound technology allows scanning of ewes 4-6 weeks after mating to identify ewes carrying single, multiples and dry ewes. The main benefit is to feed multiple bearing ewes better in late pregnancy and lamb them separately in sheltered paddocks with easier topography. Dry ewes can be sold.

Forage crops

Winter forage crops are a way of transferring feed into the winter. Root crops like swedes or turnips are low in dry matter (10–20%—i.e. 80–90% water) but high in digestibility (75–90% —i.e. high availability of nutrients).

Cereal greenfeeds

Cereal greenfeeds such as oats, barley and ryecorn may be sown after harvesting a summer crop in January–February. The timing of sowing and site has a big effect on how well the plants grow and the amount of feed produced.

Annual ryegrasses

Annual ryegrasses can be sown in autumn for winter greenfeed and spring grazing. Tama and Moata ryegrasses are commonly used as they are vigorous growers and recover after grazing for repeated use over winter. Winter growth rate is usually higher in the North Island than the South, and spring growth of 40–70 kg DM/ha/day usually occurs a month earlier in the North Island.

Extra spring production is one of the major advantages of annual ryegrasses over root crops such as swedes or turnips. There is more information on these forage and root crops in Appendix 3.

Possible problems before and during lambing

Optimum feeding of breeding ewes during winter and early spring is critical to avoid metabolic disorders (e.g. pregnancy toxaemia or milk fever) and to ensure good ewe performance and early lamb growth.

Ewes should hold their body condition during pregnancy (around CS 3). This means an overall increase in live weight of 8–10 kg to lambing, allowing for the weight of foetus and body fluids (see Appendix 1.7). For ewes mated in good condition (CS 3) maintenance feeding during winter at 1–2 cm pasture length, then increasing this from four to six weeks before lambing to 2–3 cm is the ideal. Exercise of ewes during late pregnancy helps muscle tone and ease of lambing.

Chapter 5

Managing the spring

In spring, pasture growth increases rapidly and drives stock performance. Time lamb and calving dates so the increased feed requirements of stock are met as spring pasture growth increases.

Lambing date

Lambing starts five months after rams go out. Late March mating means lambs start dropping late August with peak lambing early September, ideally when pasture growth is increasing. Reference to the generalised regional pasture production figures in Appendix 5 shows in most areas September is when pasture growth increases rapidly.

Lambing too early before pasture growth kicks in reduces ewe production, lamb growth, and beef cattle performance. Breeding ewes and cows will be under- fed during early lactation and pastures overgrazed.

Aim for lambing pastures of 2–5 cm. This can be done with quick rotations of 25–30 days with ewes or alternatively by set-stocking at appropriate densities.

Feeding during lactation

In a good season, ewes reach peak milk yield two to three weeks after lambing as the lambs' capacity to drink milk is rapidly increasing. After this, milk production gradually declines from two to three litres a day to about half a litre 8-10 weeks after lambing. As ewe milk production declines, lambs consume increasing quantities of pasture.

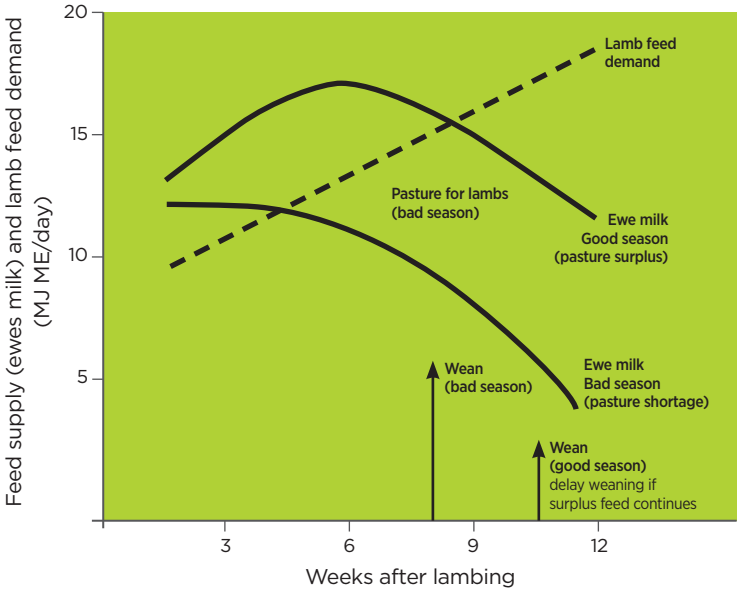
Lamb weaning age

Weaning dates should be flexible, depending on seasonal feed supply and lamb selling policy (Fig 5.1) .

Lambs should be weaned when they are competing with their mothers for feed. This will vary from season to season but is generally when average pasture length falls below 3 cm.

Early lamb drafting for slaughter should be done before or at weaning as lambs at weaning temporarily "harden up" as they adjust to a sole pasture diet.

Fig. 5.1 *Profile of feed supply and demand for lambs showing suggested weaning age in good and bad seasons*



Weaned lambs should be offered "clean" paddocks (i.e. with little or no worm larvae contamination) not recently grazed by ewes and lambs, with with high legume content and 3–5 cm length.

Ewes in good condition (CS 3) can be put onto pastures 1–2 cm length after weaning as their feed requirement almost halves to around one kg DM/d when they stop lactating. Ewes in light condition (CS 2.5 or less) should be given a lift on high-quality pastures to ensure they are going into mating at a BCS of 3–3.5. Ewe weight loss after weaning should be avoided at all costs as this will prejudice both wool growth, at its maximum over spring summer, and subsequent ovulation rate next mating.

Maintenance of pasture quality

It is crucial to have ewes on at least 3 cm of pasture at lambing and to maintain this until weaning. If pasture becomes rank (longer than 10 cm) plant density declines and subsequent pasture growth and quality will be reduced.

The ideal pasture length can be maintained by set-stocking ewes and lambs at the right density or using a fast rotation of 10–20 days following weaning. If pasture growth starts getting away, either the area allocated to ewes and lambs needs to be reduced or extra stock like cattle introduced. Where practicable, areas can be closed-up for conservation as hay or silage.

Chapter 6

Coping with summer-autumn

Summer-autumn is when production is largely 'set' for the coming year. Critical issues are:

- Maintenance of pasture quality
- Having ewes in good order for tupping (CS 3)
- Growing young stock well
- Dealing with drought
- Watching for animal health problems.

Once the spring feed surplus is past, feeding priorities become important. Lambs being finished must reach target weights rapidly, and replacement ewe lambs need to reach a target of 40 kg or 65 per cent of mature body weight by late autumn. Maintenance of feed quality for ewes is important for good body condition (CS 3) at tupping. Finishing cattle will also need priority grazing.

Holding pasture quality

High stock performance is only possible if good quality pasture is maintained -i.e. leafy with a strong legume content. Lax grazing over spring not only produces poor quality feed in summer but pasture composition suffers and low producing species like browntop and sweet vernal increase. Poorer species show decreased response to fertiliser, give lower pasture growth during winter and a slower, later flush of spring feed.

Lambs and young growing cattle need to graze pastures lightly and leave plenty of residual feed (2–3 cm) if they are to gain weight rapidly. This can mean that pasture quality or digestibility declines as the proportion of dead material increases and clover declines. Pasture quality starts to decline when length gets over 10 cm (2,500-3,000 kg DM/ha).

When rotational grazing:

- Ewes can mob graze to clean up paddocks behind young growing stock lambs or calves
- Two-tooth ewes grazed ahead of mixed-age ewes continue to gain weight while the older ewes handle the real "clean up"—even then they should not be grazed too hard or body condition will be lost
- Breeding cows can follow the ewes by one or two days or be mobbed together with the ewes to give more grazing pressure on hill country with large paddocks
- The summer rotation should be short, about 25–30 days on hill country, depending on rate of pasture growth
- If the rotation is extended to 40 days or more, pasture quality and stock liveweight gains will decline.

If pastures get too long, paddocks should be dropped out of the rotation. These deferred areas of 'standing hay' can later be grazed with cattle or late hay made if contour permits

On hill country where ewes are set-stocked:

- Pasture needs to be held at about 3 cm (1,600 kg DM/ha)
- Cattle can be moved through paddocks if pasture starts to get away i.e. longer than 5–6 cm
- Integration of cattle is essential to "control" reject pasture where lambs are set-stocked for long periods (several weeks).

If the spring flush of growth continues longer than usual, late weaning can provide extra grazing power as ewes and lambs run together eat more feed than if they are separated and the ewe stops milking. This also applies with breeding cows.

To avoid pasture deterioration, farms which run only sheep must maintain lower pasture height after grazing and during set-stocking than farms with cattle. This means pastures to be grazed should never be longer than 6-8 cm.

Ewe feeding

Ewe feeding is a compromise between the need to maintain pasture quality for growing stock while maintaining or increasing liveweight for the coming mating. Generally ewes will need to regain liveweight after weaning and there may be a need to give preferential treatment to two-tooths and/or older ewes which are sometimes relatively lighter (CS 2–2.5).

It is better to maintain or keep ewes gaining weight wherever possible over summer than to keep ewes light and count on being able to flush. This means they will be in good body condition (CS 3–4) for mating and wool growth will be enhanced.

Feeding during mating

It is important to have ewes in good body condition (CS 3–4) by the time mating begins and preferably on good leafy feed as the rams go out. If ewes are actually gaining weight during mating (i.e. flushed) there will be an additional benefit of possibly 5–10 per cent in lamb drop.

- Ewes can gain 0.5–1.0 kg in live weight during the first few weeks of mating if sufficient green leafy feed is available
- The benefits of increased lambing have to be balanced against the value of added carcass weight to finishing lambs
- Ideally ewes should be rotated rapidly, going on to about 5-6 cm of pasture (2,200 kg DM/ha) and not grazing below 3 cm (1,500 kg DM/ha)
- On hill country, ewes may be set-stocked on saved paddocks where a rotation isn't practical and pastures held at about 3 cm length.

If ewes are grazing older varieties of red clover they should be moved onto pasture at least a fortnight before mating. Old varieties of red clover may contain oestrogens that can suppress ovulation.

Care should be taken to avoid mating ewes on lucerne stands in warm, wet weather. These climatic conditions are conducive to the development of fungal infections in lush lucerne crops. The plant responds to these infections by producing coumestrol, an oestrogenic compound which suppresses ovulation, particularly in young sheep.

While ewes can be flushed on the crop, they should be removed 10-14 days before they go to the ram. They can be returned to the crop immediately after they have been mated.

Silage or brassica crops can be used for mating during drought or where lambs have priority for best pasture.

After the first few weeks of mating ewes can be grazed harder on pastures 1-2 cm long without affecting lambing percentage. Severe restriction on pastures less than 1-2 cm in early pregnancy can retard development of the placenta and cause low lamb birth weights. This can also have detrimental carry-over effects on ewe milking and lamb growth.

- Cold stress within about 26 days of conception can affect embryo survival so autumn shorn ewes must have adequate shelter and plenty of feed
- Cover combs reduce the amount of feed needed to maintain body heat in colder areas
- Feed intake after shearing can rise by 10-30 per cent for three to four weeks but it is not necessary to feed at this level for longer than a week if weather is favourable.

Wool growth

Wool production responds to good feeding in summer more than any other time of the year. This is because wool grows three times faster in summer than winter in crossbreds and 1.5 times faster in Merinos.

Generally if good body condition (CS 3) is achieved and maintained over the summer period wool production will be high.

Feeding lambs

Lamb growth rate in spring is usually high (over 200 g/d) but as summer progresses good growth performance is often limited by declining feed quality. It is important to weigh stock regularly to monitor performance.

For high lamb feed intake, pastures should never be below 3-5 cm (1,500–2,000 kg DM/ha). With set-stocking these levels can be maintained by increasing or reducing numbers of paddocks used or by introducing cattle.

Replacement ewe lambs should be fed similarly to finishing lambs if minimum target weights of 40 kg pre-winter are to be achieved.

Specialist lamb finishing feeds are valuable tools for driving lamb growth rates. They typically generate higher lamb growth rates than pasture and assist in providing feed during drought.

Popular feeds include lucerne, chicory, red clover, plantain and brassica crops such as rape (Appendix 3).

Lamb growth rate on brassicas is usually lower for the first six weeks of grazing than after this. Brassicas can cause nitrate poisoning with blood in the urine or “red water”. This may cause death but many lambs gradually adjust to the nitrate levels and recover.

Risk of nitrate poisoning can be lessened by introducing lambs to the crop gradually, grazing the crop for a few hours a day to start, rather than switching suddenly from pasture to all crop.

Managing drought

Drought management must begin as soon as the dry period starts. There are two distinct situations; (i) the expected dry spell each year, or (ii) the unexpected long dry period.

If you experience a dry period each year you should build into your farming system some or all of the following:

- Set an appropriate stocking rate
- Lamb old ewes early to sell "all counted" if the dry spell starts early
- Sell small store lambs early
- Buy replacement ewes rather than breeding your own
- Maintain flexible sheep and cattle drafting policies to reduce stock numbers
- Slow down rotations to build up feed
- Establish drought tolerant pastures such as lucerne, cocksfoot, tall fescue and phalaris
- Grow summer crops as an insurance for lambs.

When drought occurs:

- Reduce grazing pressure on the areas that dry out first
- Reduce stock numbers
- If ewes must be grazed hard, draft off poorer conditioned ones (CS 2) for preferential feeding
- Consider supplementary feeding.

If the drought continues:

- Omit flushing ewes but give two tooths preference for feed
- Consider selling ewe lambs and buying replacement ewes later
- Avoid severe over grazing by using sacrifice paddocks for feeding supplements
- Buy supplements if reserves are low.

Suitable supplements depend largely on cost. For maintenance almost any feed will do but for finishing lambs or weight gain in ewes, supplements of higher feed value are required like grain, pellets, good silage or crops such as rape, green feed or lucerne.

When rain finally arrives you should give paddocks a chance to get going as regrowth will be slow. This will be harder if growth is eaten as it appears. Continue feeding restrictions or supplementary feeding until pasture length gets to about 3 cm, then start rotational grazing again.

If rain occurs early enough, give priority to two tooths then mixed age ewes at mating. If regrowth coincides with the start of mating consider putting rams out two weeks later than normal.

Animal health considerations

Major animal health issues influenced by grazing management over summer-autumn are:

- Internal parasites
- Ryegrass staggers
- Facial eczema and other fungal toxin diseases.

Internal parasites

Drench resistance in sheep internal parasites is common on NZ farms, so grazing management should aim at reducing the worm burden. This is difficult on farms with predominantly breeding sheep but with a proportion of cattle or dry sheep, pastures can be prepared for lambs.

It takes two to three weeks for worm eggs shed onto pasture during summer to become infective larvae. So the popular practice of spelling pasture from lamb grazing for three to four weeks may in fact coincide with high larvae numbers.

Ideally lambs should graze 'safe pastures' or paddocks with low larvae numbers. These will include:

- Regrowth after hay or silage conservation
- Summer crops or new pastures
- "Safe paddocks" only grazed by dry sheep or cattle for the previous
- Three months.

These conditions are not always easy to achieve but the rewards are faster lamb growth, reduced need for drenching, fewer days and reduced risk of drench resistance. Planning for this should have started in early spring.

If lambs must graze contaminated pasture, they should not be forced to graze hard. Over 50 percent of infective larvae are in the bottom 3 cm of the sward, so pastures should be kept above this length.

When lambs are rotationally grazed, they can be followed by cattle or dry sheep to clean up residual pasture. If lambs are set-stocked, you should alternate their grazing areas with paddocks used for dry sheep or cattle at six weekly intervals.

Lamb ill thrift can have many causes. Scouring and failure to thrive can be caused by bacterial stomach infections, mineral deficiencies, diseases like facial eczema (FE) or shortage of feed. Checks for these problems should be made immediately symptoms appear.

Ryegrass staggers

This condition is caused by a ryegrass endophyte fungus. A chemical toxin produced by the endophyte gives the grass protection against insect attack but causes staggers in sheep and cattle.

Affected stock are best handled as little as possible and preferably set-stocked. The endophyte is present in all parts of the grass plant so rapid rotations to avoid hard grazing are of no benefit.

Facial eczema

Outbreaks of FE typically occur in autumn following warm humid weather. It happens when sheep eat the toxic spores of a fungus which grows on dead plant material. Animal performance falls long before visual animal symptoms are seen. Zinc dosing is effective but preventive grazing management is cheaper and easier. This should be done in conjunction with pasture spore counts.

To reduce the long-term impact FE has on livestock performance. include FE tolerance in ram selection criteria.

The FE fungus survives best in dead material from high producing species like ryegrass and does very poorly in low quality rank pasture. The most dangerous pastures are those where leafy ryegrass has been hit by dry conditions giving whispy dead leaf.

The first step in FE-prone areas is to identify hot spots on the farm.

- Cooler south facing slopes generally have fewer spores than warmer north-facing areas

- Spore counts from known hot spots can be used as an indicator for FE build up
- Minimising dead material build up in pastures reduces the risk of FE outbreaks
- If high spore counts occur, safe areas should be grazed first. Planned build up of feed in these paddocks in summer makes this possible.

If high risk pastures need to be used they should be grazed lightly so stock don't eat base litter in the bottom 1-2 cm of pastures. If FE occurs regularly, stock policies should be planned for summer-autumn to reduce numbers in an FE season and avoid a shortage of "safe" feed.

Other fungal diseases

There are various fungal toxins which depress feed intake and production including the Fusarium fungus toxin, zearalenone. This fungus also lives on dead material in the pasture and the toxin depresses ovulation rates in ewes.

Dangerous conditions can't be predicted using spore counts or climate patterns but toxin levels can be measured in grass and urine samples. Zinc dosing is ineffective, so grazing management is the only treatment. It is best to avoid grazing dead material with ewes approaching mating. A fast rotation before and during mating helps avoid zearalenone.

Reading list

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The New Zealand Forage Sowing and Management Guide. Challenge Seeds.

Proceedings of the 1993 Central Districts Sheep and Beef Cattle Farmers Conference. pp 75-84).

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Appendix 1

Feed requirements of sheep and beef cattle

Beef + Lamb New Zealand recommend our FeedSmart tool to help calculate feed demand. All the tables in this book are available at the tap of your finger. You can download the tool from www.feedsmart.co.nz.

For information on how to use it, visit our website to download the User Guide and to watch the user guide videos.

Explanatory Notes:

These feeding tables for sheep and beef cattle give daily requirements of metabolisable energy in megajoules per day (MJ ME/d) for different levels of production. (Tables for ME requirements sourced from Livestock Feeding in Pasture).

The ME values in the tables can easily be converted to kilograms of dry-matter per day (kg DM/d) for different feeds using the ME feed values in Appendix 2 and the ready reckoner in Appendix 1.1.

For example the daily ME requirement to maintain weight for a 50 kg ewe grazing mixed length leafy pasture with an ME content of 10.8 (from Appendix 2) would be 8 MJME/d (from Appendix 1.2). Using the ready reckoner in Appendix 1.1 this comes to 0.9 kg DM/d i.e. 10 MJ ME/d at a concentration of 11 MJ ME/kg DM. (see values circled on Appendix 1.1 and 1.2 for this example).

Appendix 1.1 *Ready reckoner to convert metabolisable energy (MJ ME/day) to dry-matter (kg DM/day).*

Kg DM per day for different ME concentrations in feed

(MJME/kg DM) concentrations in feed							kg DM per day for different ME concentrations in feed				
(MJME/kg DM)							MJME/kg DM)				
	8	9	10	11	12		8	9	10	11	12
	kg DM/d						kg DM/d				
1	0.1	0.1	0.1	0.1	0.1	**21**	2.6	2.3	2.1	1.9	1.7
2	0.2	0.2	0.2	0.2	0.2	**22**	2.7	2.4	2.2	2.0	1.8
3	0.4	0.3	0.3	0.3	0.2	**23**	2.9	2.5	2.3	2.1	1.9
4	0.5	0.4	0.4	0.4	0.3	**24**	3.0	2.7	2.4	2.2	2.0
5	0.6	0.5	0.5	0.4	0.4	**25**	3.1	2.8	2.5	2.3	2.1
6	0.7	0.7	0.6	0.5	0.5	**26**	3.2	2.8	2.6	2.4	2.2
7	0.9	0.8	0.7	0.6	0.6	**27**	3.4	3.0	2.7	2.4	2.2
8	1.0	0.9	0.8	0.7	0.7	**28**	3.5	3.1	2.8	2.5	2.3
9	1.1	1.0	0.9	0.8	0.7	**29**	3.6	3.2	2.9	2.6	2.4
(10)	1.2	1.1	1.0	(9)	0.8	**30**	3.7	3.3	3.0	2.7	2.5
11	1.4	1.2	1.1	1.0	0.9	**31**	3.9	3.4	3.1	2.8	2.6
12	1.5	1.3	1.2	1.1	1.0	**32**	4.0	3.5	3.2	2.9	2.7
13	1.6	1.4	1.3	1.2	1.1	**33**	4.1	3.7	3.3	3.0	2.7
14	1.7	1.5	1.4	1.3	1.2	**34**	4.2	3.8	3.4	3.1	2.8
15	1.9	1.7	1.5	1.4	1.2	**35**	4.4	3.9	3.5	3.2	2.9
16	2.0	1.8	1.6	1.4	1.3	**36**	4.5	4.0	3.6	3.3	3.0
17	2.1	1.9	1.7	1.5	1.4	**37**	4.6	4.1	3.7	3.4	3.1
18	2.2	2.0	1.8	1.6	1.5	**38**	4.7	4.2	3.8	3.4	3.2
19	2.4	2.1	1.9	1.7	1.6	**39**	4.9	4.3	3.9	3.5	3.2
20	2.5	2.2	2.0	1.8	1.7	**40**	5.0	4.4	4.0	3.6	3.3

Appendix 1.2. *ME requirements for maintenance and liveweight gain of mature ewes (MJ ME/ewe/day)*

	Liveweight (kg)					
Liveweight gain (g/d)	**45**	**50**	**55**	**60**	**65**	**70**
0 (Maintenance)	7.0	8.0	9.0	10.0	10.5	11.0
50	10.0	11.0	12.0	13.0	13.5	14.0
100	12.5	13.5	14.5	15.5	16.0	16.5
150	15.5	16.5	17.5	18.5	19.0	19.5

For hard hill country add 1.0 MJ ME/ewe/day)

Appendix 1.3. *ME requirements for wether and ram lambs (MJ ME/lamb/day)*

	Liveweight (kg)				
Liveweight gain (g/d)	**20**	**25**	**30**	**35**	**40**
0	4.5	5.5	6.5	7.5	8.0
50	6.0	7.0	8.0	9.0	10.0
100	7.5	8.5	10.0	11.0	12.0
150	9.0	10.0	11.5	12.5	13.5
200	10.5	11.5	13.0	14.5	15.5
250	12.0	13.0	14.5	16.0	17.5
300	13.5	14.5	16.5	18.0	19.5

Appendix 1.4. *ME requirements for ewe hoggets (MJME/hogget/day)*

	Liveweight (kg)					
Liveweight gain (g/d)	**20**	**25**	**30**	**35**	**40**	**50**
0	4.0	4.5	6.0	7.5	7.0	8.5
50	6.0	6.5	8.5	10.0	9.5	11.5
100	8.0	8.5	10.5	12.5	12.5	14.5
150	10.0	10.5	13.0	15.0	15.0	17.0
200	12.0	12.5	15.0	17.5	17.5	20.0

Appendix 1. *ME requirements of ewes (MJME/d) during different stages of lactation*

	Single-suckling				Twin-suckling			
	week				week			
	1	3	6	9	1	3	6	9
40 (kg)	21.0	23.0	20.0	18.5	23.0	26.0	23.0	20.0
45 (kg)	21.0	24.0	21.0	19.5	24.0	27.0	24.0	21.0
50 (kg)	24.5	28.5	24.5	20.5	28.5	32.0	28.5	22.0
55 (kg)	25.0	29.0	25.0	21.5	29.0	33.0	29.0	23.0
60 (kg)	26.0	30.0	26.0	22.0	30.0	34.0	30.0	24.0
65 (kg)	27.0	31.0	27.0	23.0	31.0	35.0	31.0	25.0
70 (kg)	28.0	32.0	28.0	24.0	32.0	36.0	32.0	26.0
Lamb pasture requirement	-	3.0	5.0	9.0	-	2.0	4.0	8.0

Note:
(1) Each kg of ewe liveweght lost is equivalent to 17MJ ME while each kg of ewe liveweight gained requires an additional 65 MJ ME.

(2) For triplets or quads add 1.0, 2.0 and 4.0 MJ ME/d for weeks 3, 6 and 9 respectively.

Appendix 1.6. *Additional ME requirement of pregnant ewes (MJ ME/ewe/day)*

	Weeks before lambing			
	-6	-4	-2	0
Single (5 kg)	2.5	3.5	5.0	7.0
Twins (4 kg)	4.0	6.0	8.0	12.0
Triplets (3 kg)	4.5	6.0	9.0	13.5
Add to ewe maintenance				

Source 1.2-1.6: A.M. Nicol and I.M. Brookes (2007) Pasture and Supplements for Grazing Animals. Edited by PV Rattray, IM Brooks & AM Nicol, New Zealand Society of Animal Production.

Appendix 1.7. *Weight of gravid uterus for ewes and cows (kg)*

Stage of gestation	Ewes single	Ewes twin	Cows
70	1.5	2.0	
100	3.0	5.0	
125	5.5	10.0	8.0
140	8.5	14.5	
200			20.5
265			55.0

Appendix 1.8. *ME requirements for maintenance and growth in cattle (MJ ME/d)*

		Liveweight gain (kg/d)					
Liveweight (kg)	**Maintenance**	**0.25**	**0.50**	**0.75**	**1.0**	**1.25**	**1.50**
100	**14**	23	28	32	37	41	46
150	**21**	31	37	43	49	55	61
200	**28**	39	47	54	62	69	77
250	**35**	46	55	64	72	81	90
300	**40**	53	63	73	84	94	104
350	**45**	59	71	82	94	105	116
400	**49**	66	78	81	103	116	129
450	**54**	72	86	99	113	127	141
500	**58**	78	93	108	123	138	152

Note: Add 5% to maintenance values for bulls. Deduct 5% from liveweight gain values for bulls.

Appendix 1.9. *ME requirements (MJME/d) of beef cows during lactation*

	Month of lactation		
Liveweight (kg)	**1**	**3**	**5**
350	74	80	75
400	79	85	80
450	85	91	86
500	90	96	91
Calf pasture requirements	-	10	30

Note:

(1) Each kg of liveweight lost is equivalent to 28 MJ ME while each kg of liveweight gained requires an additional70 MJ ME

(2) Increase values by 35% for dairy-beef cows with higher milk

Appendix 2

Nutritional value of common feeds and quick reference for supplementary feeding

Appendix 2.1. *Nutritional value of different feeds (from Supplementary Feeding—see reading list)*

	% DM	*Relative ME Value on DM Basis	ME Concentration (MJME/kg DM)	% Crude Protein DM Basis
Pasture				
Short leafy	15	1.1	11.7	27
Mixed-length leafy	18	1.0	10.8	21
Dry stalky	28	0.8	8.1	10
Lucerne				
Green vegetative	15-25	0.9	8.5-11.0	30
Bud formation		0.8	8.5-9.5	25
10-20% flowering		0.8	8.0-9.5	22
Silages	15-20	0.9	8.4-9.5	
Lucerne	19	0.8	7.1-8.5	21
Formic acid lucerne	19	0.8	8.0-9.5	21
Wilted lucerne	30			
Maize	33	1.0	10.2-10.8	
Hays				
Pasture good quality	85	0.8	8.4	12
Poor quality	85	0.7	7.3	12
Lucerne	85	0.8	8.0-9.5	17
Straws				
Oats	86	0.6	7.0	4
Wheat	86	0.5	5.7	3
Barley	86	0.7	7.1	5
Ryegrass	86	0.7	7.1-8.0	6
Pea	86	0.7	7.2	9
Corn stover	84	0.8	6.9-9.4	5

*Relative ME values are relative to leafy pasture with a value of 1.0 (ME concentration of 10.8 MJME/kg DM)

Crops				
Swede—tops	15	1.3	13.5	15
—bulb	10	1.3	13.5	11
Turnip—tops	13	1.3	14.1	20
—bulb	9	1.2	12.9	12
Choumoellier	15	1.1	11.7	14
Rape	20	1.2	12.4	16
Kale	16	1.1	11.9	15
Mangels	13	1.1	11.9	10
Fodder beet	20	1.1	12.1	9
Carrots	13	1.2	13.0	9
Potatoes	24	1.2	12.6	8
Green maize	24	0.9	8.8-11.3	10
Lupins (sweet)	18	1.0	10.3	17
Fodder radish	11	1.0	11.5	10
Green feeds				
Oats	17	1.2	13.0	15
Barley	17	1.2	12.5	15
Ryecorn	17	1.1	12.2	15
Wheat	17	0.9	9.5	15
Concentrates				
Wheat	86	1.3	13.5	14
Barley	86	1.2	13.1	12
Oats	86	1.1	12.0	13
Maize meal	86	1.3	13.9	10
Linseed cake	86	1.1	12.0	26
Peas	86	1.2	13.1	26
Bran	86	0.9	9.6	17
Pollard	86	1.1	12.2	18
Brewer's grains	30-40	0.9	10.0	25
Molasses	75	1.1	11.8	4
Lucerne meal	86	0.9	9.5-10.3	22

Note: The feed values in Appendix 2 refer to the important components of energy and protein but it should be remembered that sheep also require a balance of vitamins, minerals and water. Fortunately, good quality pasture contains about the right balance except where known mineral deficiencies such as selenium occur.

It is considered that energy is the main limiting feed component, hence its use for estimating feed quantities in Appendix 1. As a rule, protein concentration of a sheeps diet should be around 6–8% for adult maintenance, 12–16% for young growing stock and at least 15% for lactating ewes.

Appendix 2.2: *Quick Reference for supplementary feeding (From MAFTech "Facts and Figures for Farmers" 1987)*

Hay

- One bale of hay weighs 20–25kg, i.e. 40–50 bales/tonne
- One round bale is equivalent to 12–15 conventional bales
- One 25 kg bale of hay has the approximate equivalent feeding value of:
  - Two 14 kg bales of barley straw
  - 120 kg direct cut silage
  - 70 kg wilted silage and maize silage
  - 16 kg barley meal
  - 14–16 kg of pasture DM.

Silage

Type of silage	Green yield (tonnes/ha)	Density (kg/cubic metre)	Percent DM
Direct Cut grass	12–30	700–900	13–18
Wilted grass	12–30	500–800	20–30
Mature maize	30–70	500–600	20–35
Green maize	30–70	500–600	20–25

Note: Densities given above are for settled material, ensiled for a month or more.

To estimate amount of silage in a settled stack

- Cubic metre of silage averages 800 kg (0.8 tonne)
- Calculate volume of stack in cubic mares, then multiply by O.8
- The answer is the amount of war silage in tonnes.

To estimate DM content of silage

Twist the silage in your hand to see how easily the juice is expressed:

- If juice easily expressed by hand, DM below 18%
- If juice expressed with difficulty, 18-22%
- If little or no juice expressed, but hands moist, 22-27%

Silage feeding stack dimensions

Maximum height of feeding face:

- Self-feed cattle—2.0 m
- Self-feed sheep 1.3 m
- Front-end loader 4.0 m.

Width required for self feeding silage

Cattle:

- 150 mm per head for 24 hours access
- 250 mm per head for 12 hours access
- 600–700 mm per head for four hours access.

Sheep:

- 30 mm per head for 24 hours access.

Silage to hay conversions

- One tonne direct cut silage = 9 bales hay
- Onetonne wilted silage = 15 bales hay
- One tonne maize silage = 14–15 bales of hay.

Assessment of crop yields

Cut 1 sq.m of green material and weigh:

- Weight in kg multiplied by 10 gives yield of green material in tonnes/ha i.e. kg/sq.m x 10 = tonnes/ha.

Appendix 3

Pastures and crops—relative rankings of main species for different characteristics

(I = poor, 3 = good)

(Information supplied by Agresearch Palmerston North and Lincoln)

Note: The characteristics below will be influenced by the cultivar selected, management and climatic conditions.

Appendix 3.1 *Pastures*

	Perennial ryegrass	Hybrid ryegrass	Italian ryegrass	Tall fescue
Drought survivial	2	0.5	0	3
Drought growth	1	1	0	3
Low soil fertility tolerance	1	1	1	1
Heavy soil tolerance	3	3	2.5	3
Ease of grazing management	3	2	2	2
Tolerance of repeated				
close grazing	3	1	0	3
Grass grub tolerance	1	1	1	3
Feed value	2	2.5	3	2.5
Summer growth	1	1	1	3
Autumn growth	2	2	2.5	2.5
Winter growth	2	3	3	2
Spring growth	3	3	2.3	2
Persistence	3	1-3	0	3

Note: This is very generalised information on pasture species. For more detail on establishment and performance in particular areas you should contact Grassline or an appropriate consultant.

Cocksfoot	Phalaris	Prairie grass	White clover	Red clover	Lucerne	Chicory
3	3	2	2	2	3	3
3	1	2	0	1.5	3	3
3	1.5	1	1	1.5	1	1
1	2	1	3	2	1	2
3	3	1	3	2	2	1
2-3	2	0	3	2	0	0
3	3	1	0	2	3	3
1.5	2.5	3	3	3	3	3
3	1	2	2	2.5	3	3
3	3	2	2	2.5	3	3
1.S	3	3	1.5	1	0	0
2.5	2.5	3	3	2	3	3
3	3	2	3	1	2	1

Appendix 3.2: *Fodder and root crops*

	Rape	Kale	Bulb Turnip	Leaf Turnip	Swedes	Fodder Radish
Drought survival	2	2	2	2	2	2
Drought growth	1	0	1.5	2	0	2
Low fertility	2	1	2.5	2	1	2.5
Heavy soil tolerance	3	3	3	3	3	3
Tolerance repeat grazing	1.5	0	0	3	0	0
Feed value	3	3	2	2	2	2
Summer use	2.5	0	3	3	0	3
Autumn use	3	2	2	2	2	2.5
Winter use	1	3	2	1	3	0
Spring use	0	0	0	1	0	1
Metabolic disorders	1	1	0	0	0	0
Disease resistance	2	3	1	1	2	3
Pest resistance	1	3	2	2	2	3
Second crop	1	3	1	1	1	3

Appendix 3.3: *Greenfeed crops*

	Greenfeed oats		Greenfeed barley		Maize
Sown	Aug/Sep	Feb/Mar	Aug/Sep	Feb/Mar	
Drought survival		-	2	-	2
Low fertility tolerance	2	3	2	3	2
Heavy soil tolerance	3	3	3	3	3
Tolerance repeat grazing	0	1	0	1	0
Approx. feed value	3	3	3	3	3
Summer production	3	2	3	0	3
Autumn production (same year)	2	3	2	3	0
Winter production	-	3	-	2	0
Spring production	2	3	3	-	0
Metabolic disorders	Nitrate poisoning		-	-	-

Appendix 4

Condition scoring of sheep

Explanatory notes:

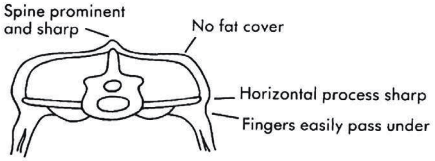
Condition scoring of sheep assesses the amount of body fat or condition by feeling the vertical (spine) and horizontal processes along the loin area as shown in the diagrams below. The technique is valuable as it relates to production ability of sheep regardless of body weight eg at 65kg liveweight a small framed ewe may have a condition score of 4 and a large framed ewe a condition score of 2.

As a rule for a given sheep there will be about a 5 kg difference in liveweight between condition scores.

Condition scores 0, 1 and 2 indicate under feeding and low production

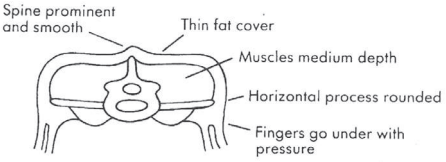
Score O: This is seldom used as it only applies to ewes which are extremely emaciated and on the point of death. It is not possible to feel any muscle or fatty tissue between skin and bone.

Score 1: The vertical (spine) and horizontal (lumbar) processes are prominent and sharp. The fingers can be pushed easily below the horizontals and each process can be felt. The loin muscle is thin with no fat cover.



GR 0—5mm

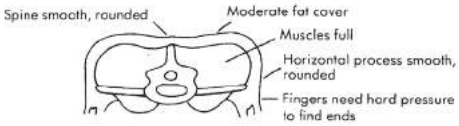
Score 2: The vertical processes are prominent but smooth, individual processes being felt only as corrugations. The horizontal processes are smooth and rounded, but it is still possible to press the fingers under. The loin muscle is of moderate depth but with little fat cover.



GR 5—8mm

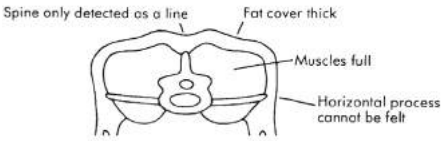
Condition scores 3 and 4 indicate good feeding and high production

Score 3: The vertical processes are smooth and rounded, the bone is only felt with pressure. The horizontal processes are also smooth and well covered; hard pressure with the fingers is needed to find the ends. The loin muscle is full, with a moderate fat cover.



GR 9—15mm

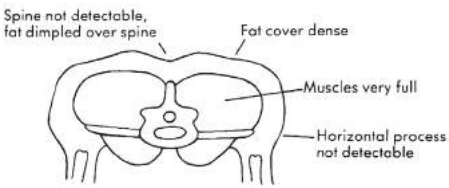
Score 4: The vertical processes are only detectable as a line; the ends of the horizontal processes cannot be felt. The loin muscles are full and have a thick covering of fat.



GR 15 ~ 20mm

Condition Score 5 is overfed and overfat (GR over 21 mm)

Score 5: The vertical processes cannot be detected even with pressure; there is a dimple in the fat layers where the processes should be. The horizontal processes cannot be detected. The loin muscles are very full and covered with very thick fat.



GR over 20mm

Appendix 5

Pasture production at different sites throughout New Zealand

(from nz farmer guide to grazing management, dec 1981)

Appendix 5.1: *Pasture Growth Rates (kg DM/ha/day) - North Island Sites*

Site:	Helensville	Dargaville	Rukuhia	Manutuke	Wairakei Flat
Soil Type:	Red Hill Sand Complex	Kaipara Clay	Hamilton Clay Loam	Recent Alluvial Soils	Atiamuri Sand
Jun	17	25	8	17	4
Jul	18	24	12	19	5
Aug	29	33	32	33	5
Sep	37	50	50	47	17
Oct	51	58	53	47	30
Nov	50	63	44	38	33
Dec	45	73	42	37	33
Jan	32	59	17	29	19
Feb	29	61	21	30	14
Mar	31	50	21	32	11
Apr	36	41	23	29	9
May	26	32	13	24	8

Yrs recorded	10	12	16	27	7
An. yield	12 760	17 160	10 220	11730	5 740
Highest	17 110	21 460	15 580	16 300	7 900
Lowest	9 470	12 260	5 090	7240	4 320

Wairakei Hill	Marton	Flock House	Masterton	Maraekakaho
Oruanui Hill Soil	Marton Silt Loam	Rangitikei Loamy Sand	Kotatau Silt Loarn	Takapau Light Silt Loam
8	12	13	16	10
7	13	5	16	10
11	23	8	32	20
29	44	21	56	40
45	47	27	70	40
42	40	28	51	13
52	43	22	30	14
34	32	17	15	9
18	26	19	12	13
24	29	15	21	15
18	25	14	26	18
13	17	15	25	18

7	11	6	5	7
9 000	10 850	6 270	10 880	6 740
11050	15 550	7 680	14 970	7 800
6 970	8 550	5 480	8 970	4 970

Appendix 5.2: *Pasture Growth Rates (kg DM/ha/day)—South Island Sites*

Site	Westport	Motueka	Winchmore Dryland	Winchmore Irrigated	Invermay Flat Land	Invermay Hill Site
Soil Type:	Addison "Pakihi"	Rosedale Hill Soil	Lismore Stony Silt Loam	Lismore Stony Silt Loam	Alluvial Soil	Warepa Series
Jun	11	13	5	5	5	5
Jul	10	17	5	5	5	5
Aug	13	30	9	11	12	5
Sep	16	58	30	31	32	25
Oct	38	57	37	40	55	46
Nov	55	55	27	41	49	47
Dec	54	36	19	48	47	44
Jan	49	15	13	48	40	36
Feb	40	14	14	43	33	28
Mar	32	32	16	31	29	24
Apr	21	30	14	20	18	16
May	10	16	8	10	8	9
Yrs recorded	**6**	**6**	**13**	**13**	**12**	**12**
An. yield	10 920	11 560	5 870	10 160	10 390	8 890
Highest	11660	13 280	7 750	12 020	12 760	13 500
Lowest	9 970	8 080	4240	9 050	7 520	3 240

Note: The average monthly pasture growth rates in the above tables are subject to considerable variation as shown in the highest-lowest records at the foot of each table. Because of this variability between years, and known variation between individual farms within areas, these pasture growth rates should be used as a general guide only.

Appendix 6

Pasture dry matter assessment using rising plate meter

The following tables, published in Farm Adviser February 1999, outline the latest technique developed by the Livestock Improvement Corporation Ltd and the Dairying Research Corporation Ltd to measure kgDM of dairying pastures. These techniques and principles generally apply to improved sheep and beef farm pastures.—*Ed*

Why change?

- Overcome regional differences that confuse farmers, consultants, and scientists
- Recognise seasonal changes occurring in ryegrass and white clover pasture
- More accurate and consistent pasture assessment for all New Zealand dairy farmers

The nationwide pasture assessment system is based on all available calibration data from ryegrass and white clover pastures collected from various sites over many years.

What for? Profit $

- More Efficient Pasture Utilisation leading to increased profit
- Increase confidence in pasture management

Measure Average Pasture Cover (APC), which is the most meaningful and accurate pasture information you can derive on your farm and should be the basis for decision making

How to assess Average Pasture Cover?

- Pasture cuts, dried and weighed X
- Rising plate meter √
- Calibrated eye assessment √

What does the Rising Plate Meter measure?

- Average pasture cover √
- Pre and post grazing guideline √
- Total herbage Mass assessed as amount of pasture above ground level as kgDM/ha.

Why a Rising Plate Meter?

- A plate meter gives a simple measure of compressed height of pasture
- Compressed height converts to kgDM/ha by calibrated equations of cut, dried and weighed samples
- The plate meter can be used to calibrate your eye assessment at regular intervals

How do you use the new formulas to assess kilograms dry matter per ha?

Use the Rising Plate Meter (RPM) using the seasonal equations

Use the RPM to measure pasture cover in each paddock on the farm and average them to give average pasture cover. For feed budgeting purposes you can use one equation—the Winter equation.

Use seasonal eye calibration to assess Average Pasture Cover (APC)

Calibrate your eye regularly against the RPM using the new seasonal equations at home and/ or at Discussion Group. Once you can confidently assess pastures of varying length (within 100-150 kgDM of RPM), you can now visually assess each paddock to get average pasture cover.

New Seasonal Plate Meter Equations

Months	Rising Plate Meter Equations
Winter (Apr—Aug)	Plate meter reading x 140 + 500
September	Plate meter reading x 115 + 650
October	Plate meter reading x 100 + 850
November	Plate meter reading x 110 + 1000
December	Plate meter reading x 140 + 1100
January	Plate meter reading x 160 + 1130
February	Plate meter reading x 180 + 1080
March	Plate meter reading x 165 + 950

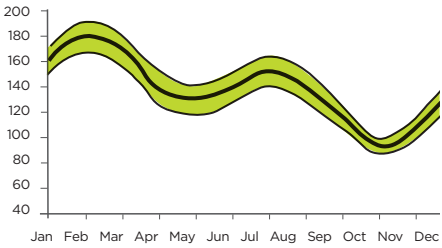
Alternatively you can read the equations off the graphs overleaf

Note: Take a minimum of fifty plonks in each paddock to more accurately assess APC.

Pasture dynamics that influence the pasture plate meter equations

Pastures change over the year. The seasonal formulas allow accurate estimates of APC at different times. Variation also occurs from year to year. The upper and lower lines in the graphs describe the 95% confidence levels. To minimize effect of natural variation take at least 50 plonks per paddock.

Multiplier

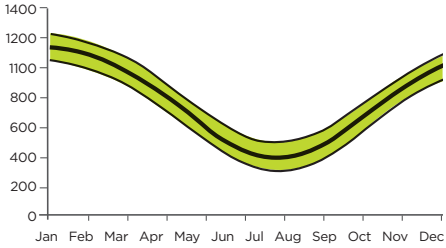


e.g. March dry matter kg per hectare = RPM reading x165 + 950. The "multiplier" converts the RPM reading to kgDM/ha. Throughout the season the relationship between RPM reading and kgDM/ha varies. In February there is twice as much DM per RPM reading as in October.

Why?

Seasonal changes (seed head)
Different rate of growth (fibre, DM%)
Rate of senescence (leaf death)
Rates of decay (moisture temperature)

Adder



e.g. March dry matter kg per hectare x165 + 950. The "adder" is the mass of pasture residue present even when the RPM reading is zero. Throughout the season this amount of pasture varies. It is highest in January and lowest in July.

Why?

Dry matter accumulates in the base of the pasture from August to December.

Decay of that accumulated pasture occurs from March to June.

Ready Reckoner

For easy use with RPM in the field

Step 1: Take initial reading on plate meter

Step 2: Take 50 plonks in a paddock

Step 3: Determine difference between final reading and initial reading

Step 4: match with readings on table to read off kgDM/ha

BY FARMERS.
FOR FARMERS