

An integrated herbage system for Southland and South Otago

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Abstract

The intensive sheep farming systems in place in Southland and South Otago are not capturing the genetic potential of lamb growth rates. Growth rates of works lambs average 100-140 g/day post weaning — less than half their genetic potential. The major reason for low growth rates of lambs is the lack of adequate quality feed. Planting a range of herbage species, with the area in each pasture species balanced with its growth characteristics, can give a balanced supply of quantity and quality feed sufficient to meet the requirements of the animal system. This leads to more balanced matching of feed supply and demand, both within the four seasons of the year, and from year to year.

Keywords lamb growth, alternative species, integrated herbage

Performance of current pastoral systems

Southland and South Otago contain 21% of the national sheep flock, producing 30% of the national wool production, and 37% of the national lamb production. After one hundred years of refinement in farm management, controlled grazing systems have now been adopted by most farmers in the region. This had led to increases in stocking rate, but lamb growth rates have not improved.

Figures obtained from a Southland freezing works which processes some two million lambs annually, drawing the vast majority from the Southland plains area, produced the following average killing weights for the seasons (cold).

Season	Average lamb weight (kg)
88-89	13.61
87-88	13.52
86-87	13.37
85-86	13.43
84-85	13.42
Average	13.47

These data illustrate only small variations in average lamb weight, depending upon the season. If the 88-89 results are considered in more detail and the mid point of last season's lamb kill is taken to be 18 March, with an average carcass weight of 13.61 kg and 40% dressing out weight, and if weaning is assumed to have been on 10 December with an average weaning weight of 22.5 kg, average lamb growth rate is 114 g/day. Everest & Scales (1983) found similar lamb growth rates on a range of farm types in the South Island. Lamb growth on 42 summer moist properties averaged 117 g/day from weaning until March, with a range of 33-190 g.

This lamb growth rate is considerably below potential. High growth rates (Table 1) have been recorded in a number of instances (Parratt & Young 1983). A small percentage of most farmers' flocks achieve growth rates of 180-200 g/day, but most lambs fall well short of this.

Reasons for low lamb growth rates

Low lamb growth rates are caused by two major factors: health problems, such as worm burdens and trace element deficiencies, and, principally, lack of adequate nutrition on our typical ryegrass-white clover pastures. In order to understand the solution to this problem, it is necessary to outline a summarised example of nutrient levels.

Table 2 is drawn from the New Zealand Society of Animal Production publication on supplementary feeding.

It should be stressed that because of the difficulty in extrapolating data obtained from pen-fed animals into maintenance requirements for grazing animals, there is some variation in feed requirements between published references, and some later works do have figures different from those outlined below. These differences do not affect the philosophy and principles behind this paper.

If a 30 kg lamb is grazing pasture with an average M/D of 9 (9 megajoules (MJ) of metabolisable energy (ME) per kg of DM) its maximum daily DM intake is 1 kg and maximum achievable growth rate is approximately 30 g/day (Table 2). However, if that same lamb is grazing pure red clover with an average M/D of 11, its daily energy intake is $11 \times 1.5 = 16.5$ MJ. This will result in a growth rate of approximately

Table 1 High bodyweight gains summarised from the literature (Parrett & Young 1983). NB: All feeding *ad libitum*.

Bodyweight gain (g/day)	Bodyweight range studied (kg)	Breed	Sex	Diet	Comments	Reference
377	c.30	Cheviot	R & E	Barley based concentrate		Andrews <i>et al.</i> 1969
181	c.30	Cheviot	R & E	Dry grass		
347	22-40	DD x (BL x COR) W		Grazing lucerne	No allowance for gut fill	Nicol <i>et al.</i> 1968
397	35-45	SUF x (FINN x DH)	R	Barley based concentrate	Hight protein diet throughout	Orskov <i>et al.</i> 1976
485	28-35	SUF x (FINN x DH)	R	Barley based concentrate	Realimentation following change from low to high protein diet	
322	20-30	DD x (BL x COR) —		Grazing white clover	Pasture	McLean <i>et al.</i>
300	20-30	DD x (BL x COR) —		Grazing lucerne	Species	
209	20-30	DD x (BL x COR) —		Grazing perennial ryegrass	Comparison	

Key: SUF = Suffolk; DH = Dorset Horn; COR = Corriedale; DD = Dorset Down; BL = Border Leicester; FINN = Finnish Landrace; MER = Merino; CHEV = Cheviot; HBRED = Halfbred. R = Ram; W = **Wether**; E = Ewe.

185 g/day. Therefore, although factors such as protein levels and trace elements play a part, I suggest the major reason the majority of South Otago and Southland farmers achieve poor growth rates post weaning is inadequate nutrition. Pastures in the region reflect this level of nutrition. White clover produces good quality feed, but of insufficient quantity. **Ryegrass** produces good quantity of feed, but because of management constraints, lacks quantity and quality over summer. Attacks by grass grub and porina reduce the percentage of **ryegrass** in pastures, and it is replaced with **dogstail** and similar species. Physical and financial management constraints mean that many farmers cannot achieve sufficient quality of feed to grow lambs anywhere near their genetic ability.

Improving animal nutrition

Limited research data are available on animal growth rates achieved on species other than lucerne, white clover, ryegrass, and mixed ryegrass-white clover pasture. What work is published correlates closely with Table 3 (Fraser & Poppi *pers. comm.*). While most reported lamb growth rate trial work is of limited duration, raising questions of whether growth rates can be sustained, many farmers have seen evidence of high lamb growth; for example, when a ewe becomes a straggler in a forestry block before lambing, retrieved twin lambs can weigh 50 kg and be as large as mother. We are now seeing spasmodic sowings of a variety of **herbage** species on a number of properties. In the Canterbury-North Otago area these sowings are directed chiefly at drought tolerance, while in South Otago they are directed more towards better lamb growth rates. However, as farmers are finding out, not only is establishment of many of these species different to what they are accustomed too, but

management requirements are significantly different, particularly those species requiring rotational grazing. Chicory, for example, produces high dry matter yields and high lamb growth rates over summer, but its lack of winter activity accentuates a feed pinch over winter-early spring. In addition, its

Table 2 Relationship between pasture type, energy content, and potential growth rates.

Feed values	MJME/kg DM
Ryegrass and white clover pasture	
— spring leafy	12.0
— summer leafy	10.3
— summer stalky	8.0
— autumn	10.8
— winter	11.2
Browntop-dogstail dominant pasture	
— spring	11.5
— early summer	9.0
— mid summer	7.0
— autumn	10.8
— winter	11.0
White clover — summer	12.0
Red clover — summer	11.0
Greenfeed oats, barley	12.5
Tama	12.0

Maximum Feed Intake (30 kg lamb)	Feed M/D	DM intake	Feed intake	Lamb growth
	(g/day)	(kg)	(MJME)	rate
7.0		0.5	4	-70
8.0		0.75	6	-30
9.0		1.0	9	30
10.0		1.3	13	100
11.0		1.5	17	200
12.0		1.7	20	260

M/D is the short form of MJME/kg DM, and is the accepted method of measuring energy supplied by pasture to animals in New Zealand.

Table 3 Lamb growth rates (g/day) on different pasture species.

Plant species	Growth rate (g/day)
White clover	321
Lucerne	308
Puna chicory	300
Roa tall fescue	266
Matua prairie grass	230
Wana cocksfoot	225
Low endophyte ryegrass	22s
Hieh endoohvte rveerass	155

need for spelling between grazings creates management problems once several paddocks are established over various parts of the farm.

Develop an integrated herbage system

All **herbage** species have characteristics which provide them with competitive advantage over other species when provided with conditions which suit those characteristics. The objective of an integrated **herbage** system is to develop the right combination of species which are best adapted to the various parts of a property, and which meet the livestock production goals. By using the various growth characteristics of such species as Italian ryegrass, perennial ryegrass, tall fescue, chicory, red **clovers**, prairie grass, mountain brome, and perhaps even species such as *Lotus corniculatus*, a more balanced supply of quality and quantity feed sufficient to meet animal requirements through the various seasons of the year can be achieved. Also, the fluctuations in feed supply from year to year can be minimised, as can the likelihood of large feed excesses and associated management problems, by combining the strengths and weaknesses of each plant's growth characteristics. The problems associated with feed deficiencies, be it quantity or quality, will also be minimised.

The next important step is to consider the characteristics of the property and the constraints in the system before sowing out new **herbage** species. Each property has its own constraints, such as areas required for set stocking of ewes and lambs over

spring-early summer, soil type, contour and aspect, rainfall and probability of summer drought. Therefore, each property will have its own combination of possible **herbage** species mix.

An example of such a system is best illustrated in Figure 1.

Area "A" (15% of farm)

Northerly faces dropping into a gully. Tending to dry out over summer, but the warmest part of the farm over winter. This area, planted into winter-active species such as Italian ryegrasses, prairie grass and phalaris, is used chiefly for wintering **hoggets**.

Area "B" (15% of farm)

Cold lying faces over winter, but hold on well over summer. These areas are sown out in summer-active species such as chicory and 'Grasslands Hakari' mountain brome, and are used for summer finishing and growing out of young stock. The rest of the farm (70%) needs to be set stocked by ewes from August to December, and sown in species that will accommodate this.

Area "C"

Northerly faces on the side of a hill, prone to drying out over summer. Suitable species would include cocksfoot and tall fescue.

Area "D"

A cold lying back of a hill, which could be sown in such species as tall fescue and improved Yorkshire fog.

Areas "E" and "F"

The balance of the farm, sown in perennial **ryegrass** or tall fescue and white clover.

Benefits

Such a system leads to easier management, because no one species dominates a large part of the farm. For example, **ryegrass** areas can have heavy grazing pressure applied in the late November period to control its tendency to shoot to seed. Because it may comprise only 50% of the total area of the property, this can be achieved with the stock numbers in hand. However, the greatest benefit is the ability to manipulate the lamb fattening system. For instance, changing the balance of species will alter the relative feed supply curve to better fit an early lambing system. The other big advantage is having quality **herbage** available sufficient to grow lambs closer to their genetic potential. Providing pastures with the ability to grow lambs at 200 g/day would increase the net return on a typical 2500 stock unit Southland property by between \$6000 and \$9000 per year.

Ironically, total feed supply would increase under such a system, but total feed demand would drop. The lamb growth rates and associated feed intake presented in Figure 2 are derived from data in Tables 1-3.

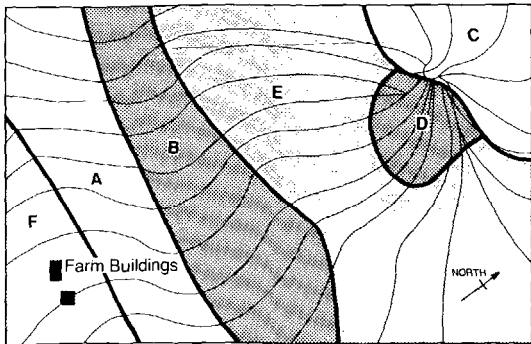


Figure 1 Hypothetical farm unit.

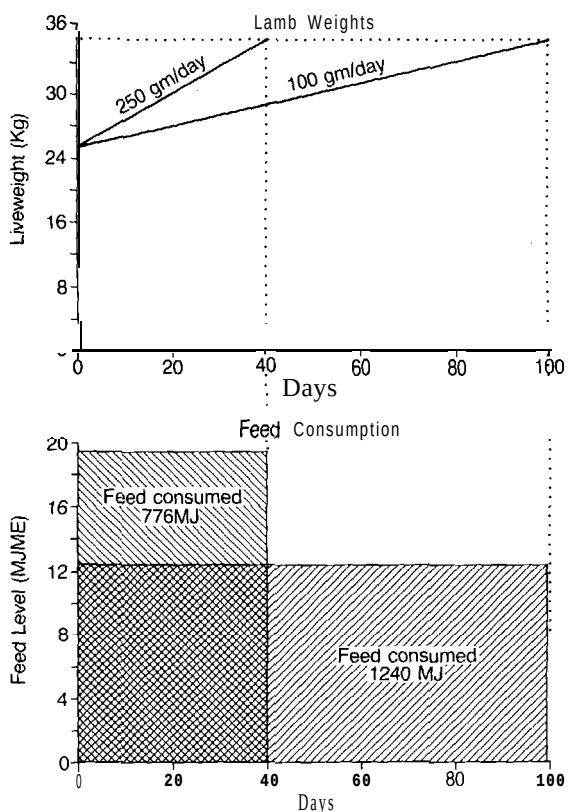


Figure 2 Comparative feed consumption with rate of growth (feed consumption measured in megajoules of metabolisable energy).

A 25 kg weaned lamb offered sufficient feed for it to grow at 100 g/day will take 100 days to reach a 35 kg liveweight (14 kg works lamb). The feed consumed is 100 days $\times$ 12.4 MJ/day = 1240 MJ of energy. But a lamb offered 19.4 MJ/day will grow at

250 g/day, reaching its 35 kg target weight in 40 days. The total energy consumed = 40 days $\times$ 19.4 = 776 MJ.

The resulting feed saving creates the opportunity to grow lambs to heavier weights at increased profitability, or to grow more lambs.

Further research needed

While the above example sounds fine in theory, and indeed will work in practice, there are numerous possible problems.

Trace element levels vary among **herbage** species; for instance iodine levels are considerably higher in ryegrass-white clover pastures than in native pastures and brassicas. When we start pushing lambs towards their genetic growth potential, the risk of other factors, such as trace elements, becoming limiting is increased. This is an area full of unknowns, **particularly** for the consultants and farmers putting such a system into practice.

In addition, we have very little information on achievable growth rates on various **herbage** species, diet preferences by various classes of animals, and indeed **herbage** production and persistence in the Southland and South Otago environment.

Therefore, while it is possible to adopt such a system right now, considerable development work is needed before the full potential of such a system can be implemented.

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