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Optimising calf growth of red deer in summer and autumn

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ABSTRACT

The potential for red deer calves to grow is at its maximum during lactation and the early autumn before the first winter. Capturing this potential is one key to economic success in venison production. On-farm and experimental results have shown a wide range of live weight gains during these periods. Feed allowance during this time should ensure that residual pasture mass should not be below 1200-1500 kg DM/ha, while pasture allowance should be above 4 kg DM/d. Feed quality needs to be above 11 MJ ME/kg DM or a pasture should contain more than 70% green leaf. Poor liveweight gain in calves during late lactation and autumn delays subsequent slaughter and may lead to a substitution of weaners for hinds, decreasing the net productivity of a farming system. Strategies for improving both the amount and quality of feed on offer during summer and autumn include improved spring management, use of grasses with later flowering dates, increasing the use of specialist high-quality feeds such as red clover, chicory and lucerne, using management to increase white clover content and using brassicas or concentrate feeds if other options fail.

Keywords: red deer; calves; growth; feed quality; feed quantity; pasture management; specialist forages; brassicas.

INTRODUCTION

Red deer follow the growth pattern of other ruminants with the potential for growth being greatest during lactation and early life but also have a distinct seasonal pattern of growth (Fennessy *et al.*, 1981) and intake (Webster *et al.* 1998), which is high during the long days of summer and low during the short days of winter. These two patterns interact to produce a maximum potential for growth during the first summer and autumn of a calf's life. Achieving the potential for growth of the young deer during the first summer and autumn is a key to economic success. Success depends on achieving early slaughter. Early slaughter at 10-12 months of age minimises the costs and maximises the returns when producing venison.

The performance of red deer during lactation is one of the key areas to address when aiming to maximise early growth. A second area of importance is ensuring good growth rates of weaners if early weaning is chosen, especially in early autumn, before significant reductions in intake due to decreased day-length reduce the potential to grow.

This paper summarises the data to date of potential growth rates during the summer and autumn and the factors influencing those growth rates. The economic implications of not meeting those targets are also considered to provide a framework for decision making regarding implementing alternative feeding strategies. Finally some options to ensure growth targets are met are presented.

Potential growth rates in summer and autumn

The potential for red deer calves to grow is highest during lactation. This is both physiological and nutritional. The range of measured growth rates (Table 1) shows the large variation during lactation. Growth in calves from birth to mid January ranging from 451 to 526 g/d over three years from farms in Hawkes Bay, while calf growth from mid January to early March ranged from 318 to 377 g/d (Walker *et al.*, 2000). Average calf growth of approximately 700 g/d was achieved from birth until late December in South Canterbury assuming a birth date of 1 December based on pregnancy scanning data (Beatson *et al.*, 2000). During January and February calf liveweight gains of between 235 and 468 g/d were achieved in South Canterbury (Beatson *et al.*, 2000). Nicol *et al.* (2000) reported calf liveweight gain in January and February ranging from 200 to 690 g/d.

TABLE 1: Seasonal variations in growth (g/d) of red deer calves in New Zealand from birth to 1 year of age

	Seasonal growth rate variation (g/d)				
	Early Lactation[1]	Late Lactation[2]	Autumn	Winter	Spring
High	700	680	350	150	350
Low	400	220	100	40	250
Difference	300	460	250	110	100

[1] Birth to mid January
[2] Mid January to early March

Autumn growth rates are generally lower than those recorded in summer, and decline as day lengthdeclines. Calf growth rates recorded from early March to mid April ranged from 150 to 330 g/d, while the same herds grew at between 60 and 180 g/d between mid April and early June (Beatson *et al.*, 2000). Walker *et al.* (2000) reported autumn growth rates of 108 to 155 g/d while Wilson & Audige (1996) reported gains of between 7 and 185 g/d, with a mean of 96 g/d. Nicol & Barry (2003) reported calf liveweight gain of between 152 and 246 g/d in a summary of experiments.

It is important to understand the variation in growth rate. While the physiology and seasonality responses drive the general pattern of growth, the variation within each season is influenced by factors such as feed quality and quantity as well as management.

Effects of feed allowance and quality on calf growth during summer and autumn

Providing the appropriate feed allowance is a major factor influencing the performance of calves. Little work

has been done to develop appropriate pasture allowances for red deer during lactation. Fennessy & Milligan (1987) provided a guideline for residual pasture dry matter yield of 1200 to 1500 kg DM/ha based on observations and extrapolation from sheep grazing behaviour. A generalised pasture allowance function produced by Adam & Asher (1986) indicated that maximum calf growth in autumn was approached when pasture allowance was greater than 5 kg DM/d.

Feed quality is another important factor influencing calf liveweight gain during summer and autumn. The most visually apparent feature of pastures associated with quality is green leaf. Growth of the suckling calf increased at a rate of 70 g/d for every 10% increase in green leaf during January and February from a base of approximately 200 g/d when green leaf comprised 30% of the pasture on offer (Nicol *et al.,* 2000). The energy concentration of the diet is also directly related to calf growth during January and February. (Beatson *et al.* 2000) reported an increase in calf growth of approximately 50 g/d for every 1 MJ ME/kg increase in diet energy concentration from a base of 200 g/d when the pasture on offer was approximately 8 MJ ME/kg DM. This may be due to both an increase in milk production (Loudon *et al.,* 1984) and an increase in feed intake by the calf. During autumn, after early March weaning, (Beatson *et al.,* 2000) reported an increase in calf growth of approximately 25 g/d for every 1 MJ ME/kg increase in diet energy concentration.

Pasture species also has a direct effect on pasture quality through factors such as improved intake. Dicotyledonous forages such as white clover, lucerne, chicory and red clover increase calf growth during summer and autumn. These forages often provide a higher proportion of green leaf (Barry *et al.,* 1998), greater digestibility (Niezen *et al.,* 1993) and lower rumen retention time (Freudenberger *et al.,* 1994; Kusmartono *et al.,* 1997), all contributing to a potentially higher feed intake and liveweight gain (Kusmartono *et al.,* 1996; (Barry *et al.,* 2000). Nicol & Barry (2003) summarised the benefits of these species and concluded that specialist dicotyledonous forages increased liveweight gain of calves by between 16 and 27% in lactation and by 26 to 47% in March and April after weaning above the base production from perennial ryegrass white clover pastures of 331 to 399 g/d and 165 to 200 g/d in late lactation and post weaning respectively.

Weaning is an important behavioural and nutritional step in the development of a calf. Common weaning options are pre-rut in late February or early March and post-rut in May or June. Weaning time, methods and post-weaning nutrition may all influence the growth of the calf in autumn. Weaning management, summarised by Pollard & Stevens 2003, has the potential to reduce post-weaning calf growth rates by up to 100 g/d. In on-farm conditions the reduction in calf growth due to pre-rut weaning averaged 50 g/d, while hind conception date was 7-12 days earlier than post-rut weaning (Pollard *et al.,* 2002).

Implications of achieving target growth rates

The opportunities to recover any below-average performance of calves in summer and autumn are very limited during the rest of the year as winter growth is limited by a low seasonal intake and often determined by the weather, while spring growth is high and relatively consistent (Stevens *et al.,* 2003). Growth lost during the summer and autumn is often only recovered by holding weaners longer in a venison production system.

TABLE 2: Modelling the implications of slow, moderate or fast calf growth rate during summer and autumn, assuming an average birth date of 1 December and a 1 January liveweight of 26 kg. Feed requirements have been calculated at an energy concentration of 10 MJ ME/kg DM. Potential reductions in hind stocking rate has been calculated after allocating feed to spring (2 kg/hind/d), summer (4 kg/hind/d) and winter (1.8 kg/hind/d).Weaner growth rate during winter was 75 g/d (June-August), during spring was 300 g/d (September-November), and 200 g/d during summer (December-February). The slaughter dates are when the average carcass weight reaches 55 kg based on a 56% dress-out percentage. The price of venison is the 10-year published national average schedule (1992-2002, Source: Agri-Fax).

	Growth rate during summer and autumn		
	Slow	**Moderate**	**Fast**
Summer growth rate (g/d)	250	400	500
Autumn growth rate (g/d)	100	200	300
Liveweight 1 June (kg)	50	68	83
Slaughter date	January 24	November 17	September 27
Price ($/kg)	$5.53	$6.78	$7.16
Carcass value ($)	$304	$373	$394
Production changes compared to fast summer and autumn growth rates			
Extra days on-farm	119	51	0
Extra feed used (kg/weaner)	370	170	0
Potential reduction in stocking rate (hinds/ weaner finished)	0.65	0.6	0

Weaners slaughtered at 10-12 months of age, rather than at 13-16 months of age, use between 170 and 370 kg less feed (Table 2). This late supply of weaners can be measured by either the production cost of that feed or reduced stocking rate, at a critical production time when new calves are being born. This amount equates to 0.6 hinds for every weaner kept on between late September and late November (Table 2), reducing future production.

Achieving early slaughter also achieves a premium price for the venison sold. Historically this premium has been $1.80/kg, or $99 /animal for a 55 kg carcass. A simple economic model to combine the effects of price premium and stocking rate effects (Table 2) shows the impacts of achieving slow, medium or fast growth rate targets during late summer and autumn. The model assumed winter and spring growth-rates were the same on all systems, used the 10-year average venison schedule to calculate returns, and apportioned the potential extra spring feed between late pregnancy and winter to calculate extra hinds that may be carried. Fast summer and autumn calf growth rates provided a premium of $21 over calves grown at a medium rate and $90 over slow-growing calves. The reduction in hind carrying capacity was relatively similar when calves grew at a moderate or low growth rate during summer and autumn. This relates to the relative feed requirements during spring, summer and winter which have been accounted for in the model. Therefore, while the moderate feeding programme showed only a small difference in weaner value, it had a large impact in potential hind stocking rate.

Strategies to meet growth targets during summer and autumn

Several strategies can be implemented to optimise calf growth during summer and autumn. The relative merits of these strategies may alter with the on-farm circumstances and so decisions on which strategies to use will be case specific. These options are general ones to improve feed quality. Once feed quality is improved it can then be allocated to stock on a priority basis. It is much easier to allocate high quality feed than to try to use low-quality feed.

Maintaining high concentrations of green leaf will be the first option for many. Management strategies here may include ensuring that hinds are calved in early-, medium- and late-calving groups to ensure the maintenance of short, green, leafy pasture on as much of the calving area as possible. Such a strategy decreases the time hinds need to be set-stocked to enable operations such as topping to be carried out.

The use of late-flowering species such as Timothy, or late-flowering ryegrass cultivars can also help to maintain high proportions of green leaf. These pastures produce more feed later, coinciding with calving, and are generally easier to control during seeding, helping to maintain green leaf.

Roundup topping using low rates of glyphosate to retard grass growth and seedhead development (Casey *et al.*, 2000) may also be used to increase green leaf and clover content in regions where summer rainfall is reliable. The average green leaf increase of 5% (Casey *et al.*, 2000) would provide an increase in calf liveweight gain of 35 g/d based on the result of (Nicol *et al.*, 2000).

Alternative pastures, including lucerne, red clover and chicory, may provide the opportunity to improve calf growth in summer and autumn (Nicol & Barry, 2003). These forages can be used as specialist pastures or as a supplement to standard pastures. As specialist pastures, the farmer is relying on their ability to grow more dry matter during the summer and autumn to offset their lack of growth during winter. Use as a supplement to standard pasture can be achieved through several options. One of these is sowing such species along with standard pasture species such as ryegrass and white clover. Species such as red clover and chicory have a shorter life in mixed sowings, but contribute to summer production during the first two to three years, significantly and economically enhancing animal performance (Stevens *et al.*, 2000). Another option is to provide calving hinds with access to small areas of specialist pastures. Calf weaning weight increases of approximately 5 kg have been measured using this approach.

The provision of brassica crops to offset poor pasture supply and quality has also proved successful in January and February (Judson *et al.*, 2000) providing calf liveweight gains of 440 to 495 g/d.

Finally the use of high-quality supplements can influence calf growth when pasture supply and quality are unable to provide adequate calf growth rates (Stevens, 1999).

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