

NUTRITION OF DEER IN A TEMPERATE CLIMATE

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SUMMARY

The deer farm manager's role is to ensure that the requirements of the animal and the feed supply are appropriately matched to ensure a satisfactory level of production. This may require modification of the basic pattern of feed supply from pasture (e.g by irrigation or supplementary feeding) or an alteration in the pattern of feed demand (eg advancing the calving season; Fennessy *et al.*, 1986).

There are important periods in the animal's life where a failure to meet critical targets can be very costly in terms of production. For young hinds this means ensuring that they grow well enough to reach puberty at 15-16 months. To ensure good growth rates of calves on their dams, lactating hinds must be fed well. For adult stags over winter, it means feeding to appetite on a high quality diet so that the stag can withstand the influence of adverse climatic changes. This paper outlines many of the important factors to be considered in the nutritional management of a red deer herd. Much of the discussion is similarly applicable to other species of temperate origin, such as fallow deer. The paper will draw largely on New Zealand experience, but many of the principles are relevant to the management of deer in a variety of environments.

INTRODUCTION

The fundamental concept with the farming of any species on grassland is to match up the nutritional demands of the animal with the natural supply of feed from the grassland. These, of course, are the same demands placed on both the animal and the grassland by evolution. However, usually we have modified the environment, or the animal or placed the animal in a different environment or are requiring a different product from that required in the evolutionary stakes. Consequently managerial skills are required - ensuring the appropriate level of nutrition is offered to the animals at the appropriate times. Luxury feeding the year round is not management.

THE TEMPERATE CLIMATE

The temperate New Zealand climate causes a pronounced seasonal pattern of pasture growth with relatively low rates in winter and very high rates during spring. The actual rate of winter growth varies widely throughout the country according to the winter temperatures. Spring growth is generally very reliable, with the actual onset varying according to climate - eg August in many parts of the North Island compared with September-October in the lower South Island. Spring growth can also be cut

short prematurely by the onset of dry weather. Overall, it is probably the summer-autumn period which has the greatest impact on management in that it is usually water which is limiting pasture growth at these times. In this respect there are major variations between years in summer rainfall. From the deer farmers' point of view, the pattern of pasture growth creates a few problems. While calving in December might admirably suit the South Island high country farmer, such a calving time is quite inappropriate in the summer-dry Hawkes Bay area of the eastern North Island. Consequently managing the animal and the pasture supply is all important.

NUTRITION AND PERFORMANCE

Nutrition affects performance. However, the important questions are how and to what extent, and how this can be assessed and usefully monitored in the practical situation. Therefore in considering nutritional requirements by season of the year and class of stock, it is necessary to have some good idea of the management objectives. While most of this paper refers to red deer, the principles also apply to fallow deer.

Hinds

In rising 2 year old red hinds, pregnancy rate is strongly related to bodyweight in the autumn at mating time (Table 1). The Invermay data suggest that hinds must be at least 70 kg to reach puberty and successfully take the stag, ie they must reach about 70% of their mature liveweight. This is the weight for an individual so that to achieve a high pregnancy rate in 2 year olds overall, the mean herd weight would need to be substantially higher.

Table 1: Relationship between mating weight and pregnancy rate in rising 2 year old red deer at Invermay (1984, 1985)

Liveweight (kg) at mating	Pregnancy rate	
	%	N
62-65	0	0/2
66-69	0	0/2
70-73	91	10/11
74-77	88	15/17
78-81	88	14/16
82-85	90	18/20
86-88	94	15/16
>89	75	6/8

There is also some evidence of such a relationship between fertility and weight in older deer at Glensaugh in Scotland (Hamilton and Blaxter 1980) although the relatively poor nutritional conditions and the relatively low hind weights should be taken into account. Certainly under good farming conditions in New Zealand, fertility rates in adult hinds are high and such relationships between weight and fertility have not been seen (Fennessy

unpublished data). In addition, lactation may have a depressive effect on reproductive efficiency in hinds. Under poor nutritional conditions such as in parts of Scotland, lactating hinds do not become pregnant or alternatively become pregnant late in the season (Clutton-Brock et al., 1982). No such effects have been reported for farmed deer in New Zealand although there is some 'hearsay evidence' that lower calving percentages were experienced on some Canterbury farms following a recent drought when weaning took place post-rut. However, Adam et al., (1985) found in their Scottish work that their lactating hinds conceived about 2 weeks later in the season than weaned hinds. Certainly, when feed supplies are short, it is strongly recommended to wean pre-rut and to allow the hinds some time under good feeding conditions to recover body condition prior to mating. Overall, the aim with hinds must be to have them in good condition for mating. The advantages of pre-rut weaning to facilitate better management will be discussed later.

After taking out the stags in late May, the hinds can be 'tightened up' to take some weight and condition off over winter. Although this does reduce winter feed costs, the major reason is the experience that it can be very difficult to keep condition off hinds in late spring when pasture growth is very rapid under New Zealand conditions. Hinds which are in very good condition in early spring can easily become overfat, thus contributing to calving difficulties. Consequently, taking condition off hinds in winter is a useful management approach.

Running "at-risk" hinds on hilly country during the spring is also advocated to minimise calving difficulties. Whether it is the exercise and/or the level of nutrition which is important is unclear although exercise is likely to be important in maintaining good muscle tone. Such "at-risk" hinds include red deer mated to wapiti or to large wapiti x red hybrids. Where hill country was not available such hinds have been run at a high stock density on short pasture, with access to a high energy supplement such as grain (Moore, pers. comm.).

The milk-feeding period is arguably the most critical period in the life of the deer. To achieve a good level of production in later life it is essential that the calf gets a good start from the mother. Therefore the nutrition of the dam is vital at this time, and hinds need to be fed at a high level on a high quality diet. While high quality pasture is preferred, this is not always available in adequate quantities in which case, hinds should be fed a high quality supplement such as grain. The actual feed requirements for a lactating red hind and her calf are about twice that for a hind during the winter. The importance of feed quality too cannot be overlooked. In the early days at Invermay, we were very conscious of the need to provide hinds with cover for calving. To this end paddocks were allowed to go rank. The result was good cover but at the cost of weaning weight in the calves. Our management has now been altered so that paddocks are kept under tight control prior to calving so that high quality vegetative pasture is available for the lactating hinds. Appropriate cover is provided by tree branches, patches of long grass or the suchlike.

The impact of pasture quality on milk yield and growth rate of calves is well illustrated in some Scottish work by Loudon and Milne (1985) shown in

Table 2. The lower milk yields due to lower pasture quality were reflected in lower calf growth rates.

Table 2: Milk yield of hinds and growth rate of their calves on two different pasture types. (A, heather dominant hill sward; C, high quality improved pasture; from Loudon and Milne, 1985).

Stage of lactation (days)	Milk yield (kg/day)		Calf growth rate (g/day)	
	A	C	A	C
0-20	1.56	1.95	366	401
40-60	1.34	1.88	259	362
80-100	0.68	1.16	185	350

The question of whether to wean pre-rut or post-rut has provoked numerous arguments. However, in recent years, the managerial advantages would seem to have swung the vast majority of farmers to pre-rut weaning. Following weaning in late February-early March hinds can be preferentially fed to ensure that they are in good condition to go to the stags. Calves can also be offered high quality pasture and the parasite control programme can be carried on simply through the rut period, without concern over the presence of rutting stags.

Stags

The annual cycle of the adult stag is dominated by the rut. During this 6-8 week period in autumn, many stags will eat little or nothing, and bodyweight losses of up to 33% have been recorded. At the end of the rut the stag's fat reserves have virtually reached zero. Consequently the winter provides a major challenge and it is essential that stags be fed to appetite on a high quality diet over this period. Of course, this is also modified by the environment, such that stags in the far south of New Zealand can have dramatic climatic changes to contend with. It is important to appreciate that even when fed to appetite, stags will generally only maintain their post-rut liveweight through the winter, ie any weight gain over this period is minimal. However, stags must be fed well to ensure that they do not succumb to adverse climatic changes and that they have the capacity to increase feed intake when required. During the spring-summer, high rates of gain are usually recorded so that the stag is again in excellent condition prior to the rut. Although water is often overlooked, it is essential to ensure that stags have access to plenty of water during the heat of summer and early autumn.

Young stock

The young stock are the investment in the future and the importance of the milk feeding period has already been emphasised. The autumn following

weaning is a time of opportunity for putting weight on to calves prior to winter. Providing a high allowance of good quality pasture is available and parasite control is maintained, growth rates of 150 g/day in red deer stags are readily achievable (Adam and Asher 1986).

During winter, growth rates are lower than in the autumn. This is not due only to feed availability but is a function of the animals' metabolism, as has been shown in indoor studies where young red deer have been offered a range of diets to appetite. Even where high quality feeds such as a barley based concentrate were fed, gains did not exceed 120 g/day over winter (Fennessy 1982). For practical purposes, in much of the North Island, winter is regarded as being of 65 days (Adam and Asher 1986) whereas in the South Island, 100 days is more appropriate (Fennessy et al., 1981).

The autumn-winter period also offers some scope to selectively feed lighter calves to give them the opportunity for some 'catch-up' growth. However, there is probably also a case to continue to run them separately over the following spring-summer period.

Spring-summer, from 9 to 15 months of age, is the major opportunity for putting on weight in young deer. In groups of young red stags fed to appetite indoors, daily weight gains of 300 g/day over the 6 months have been recorded. However to achieve such gains on pasture requires a very favourable climate plus good management to ensure that pasture quality is maintained through the whole spring-summer period.

With autumn comes the first rut for the young stag. While the rut is very mild with only a slight, if any, weight loss, the onset of winter and the associated depression in metabolism means that the young stag will usually only maintain weight from 15-21 months. However, in the second spring-summer, high rates of gain are again achievable, with up to 250 g/day being recorded during the 3 months of spring.

NUTRITION IN PRACTICE

Having outlined the overall situation, it is appropriate to consider some practical points, namely stocking rate and supplementary feeding. The level of nutrition available to the animals can be influenced via stocking rate as is shown in Table 3 for some Ruakura work. Interestingly the growth rates of the fallow deer were unaffected by the stocking rate at the levels chosen although undoubtedly effects would have been seen at higher stocking rates still. Not surprisingly, the effect of the increased stocking rate on growth rates was most apparent when feed supply was limiting, such as in the autumn.

In this respect it appears that to obtain top growth rates in deer grazing in a rotational or on-off system that they should be expected to utilise only about one-third of the feed present in a paddock before being shifted on. At higher utilisation growth rates tend to decrease.

Table 3. Influence of stocking rate and season on growth rate of male red and fallow deer from weaning to about 15 months of age. (Adam and Asher 1986).

Species	Stocking rate N/ha	Starting weight (kg)	Growth rate (g/day) by season			
			Autumn	Winter	Spring	Summer
Red	16	47	137	67	211	159
	24		87	49	196	143
Fallow	32	22	68	22	117	28
	48		53	25	116	41

Supplementary feeding is sometimes required to maintain an adequate level of nutrition when pasture is in short supply. Where concentrates such as grains are used, the same rules apply to deer as in sheep and cattle. Deer must be introduced to the concentrate slowly over a period of weeks to allow the rumen microbes to adjust to the new diet. If not, grain poisoning due to lactic acid overload can occur. In practice we recommend that no more than half the feed intake be made up of grain. In situations of total supplementary feeding, deer have been successfully fed good quality silages and hays along with grain.

CONCLUSIONS

The successful farming of deer requires a good deal of managerial skill. The objective is to maximise growth rates at the times of the year when the feed is available and the animals have the potential for high growth rates. In many areas, this requires some modification of the natural cycle (eg irrigation to provide summer feed) to ensure that the feed supply matches the requirements of the animals.

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