

GROWTH AND NUTRITION OF FALLOW DEER

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Summary

- Fallow, being of northern temperate origin, exhibit highly seasonal, photoperiodically induced patterns of growth and feed intake.
- Average on-farm pre-weaning fawn growth rates to 3.5 months of age range from 140-190 g/day (5.0-6.7 oz/day) but can be severely compromised by poor doe nutrition.
- For young bucks on pasture at Ruakura, subsequent autumn (3-5.5 months of age), winter (6-9 months), spring (9-12 months) and summer (12-15 months) growth rates averaged 77, 34, 125 and 46 g/day (2.7, 1.2, 4.4 and 1.6 oz/day) respectively.
- Recommended feeding levels (kg or lb of dry matter per day), calculated from red deer data, are presented for various classes/ages of stock.
- Winter supplementation of grazing deer usually involves the feeding of high energy rations to offset heat loss. However, total concentrate (semi-feedlot) feeding during harsh northern winters will rely on more balanced diets.

Introduction

Deer have adapted to seasonal changes in feed supply in a wide range of climatic conditions from the cold polar region to the tropics. But this very adaptation for survival can limit their potential as farmed animals. This is particularly the case for species of temperate origin such as fallow deer, red deer and elk. The more obvious adaptation characteristic shared by these three species is summer calving. Less obvious in the natural range, but important, are seasonal variations in appetite and growth that are related to natural cycles of feed availability and annual reproductive cycles.

Annual appetite cycle

For the successful farming of fallow deer it is helpful to understand what controls their growth. It might be thought that seasonal growth patterns in deer reflect the availability and quality of feed. However, the voluntary feed intake of penned deer fed concentrates *ad libitum* varies with season in the same manner as for deer kept outside under more natural conditions. Seasonal variations in voluntary feed intake have been found with several species of deer (fallow, mule, white-tail, roe and red deer) and also some sheep breeds. Characteristically feed intake is lowest over winter and highest in spring and summer.

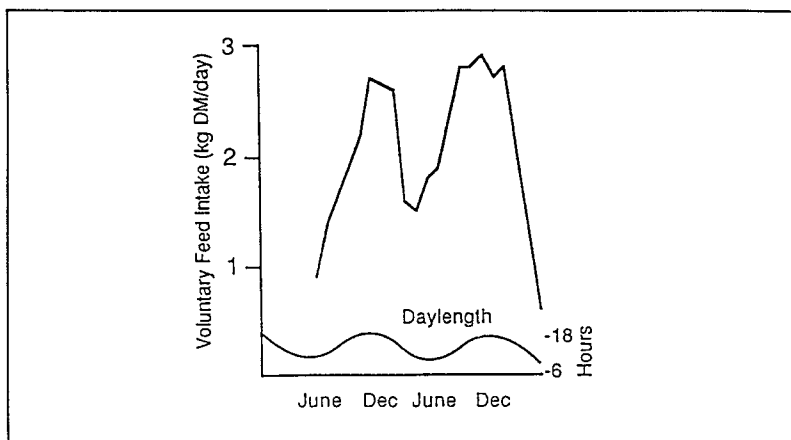


Figure 6.1: Voluntary feed intake of a pelleted feed by penned red stags under natural photoperiod (Kay 1979).

Studies with red deer have shown that the annual day length (photoperiod) cycle is the stimulus to the annual appetite cycle (Figure 6.1). Increasing photoperiod (spring and summer) was found to result in increased voluntary feed intake by stags penned indoors. Equally, decreasing photoperiod (autumn and winter) resulted in a reduced voluntary feed intake. Using artificial light to provide a shorter 6 month cycle of photoperiod changes, but a 12 month ambient temperature cycle, resulted in 2 peaks and 2 troughs of feed intake with penned red deer stags over a 12 month period. While both intact and castrated male, and also female red deer responded similarly to changes in day length the feed intake response in red deer hinds appears the less marked and the more delayed (Suttie & Simpson 1985). Photoperiod effects on feed intake probably also occur for fallow deer.

Seasonal changes in liveweight

Although liveweight gains of fallow deer are affected by season, the actual pattern of change varies with animal age and sex. Typically, fallow commence fawning in summer. The suckling period can extend for 8 months but on farms generally ends after 100 days with weaning in late March. Over this suckling period fawns of both sexes grow faster than at any subsequent time. In addition, buck fawns grow faster than doe fawns (Table 6.1).

Table 6.1: Mean (\pm sd) growth rates of fallow deer fawns between birth and 100 days of age recorded on commercial farms in northern New Zealand.

Farm	Bucks	Does
R1	160 \pm 18 g/day (5.7 oz/day)	142 \pm 13 g/day (5.0 oz/day)
R1	170 \pm 16 g/day (6.0 oz/day)	146 \pm 11 g/day (5.2 oz/day)
F4	189 \pm 16 g/day (6.7 oz/day)	160 \pm 10 g/day (5.7 oz/day)

After weaning, autumn growth rates of fawns at pasture are generally no more than 50% (i.e. ~80 g/day) of those before weaning (Figure 6.2).

A further reduction in growth rate occurs over the winter when fawns are between 6-9 months of age. In early spring, fawn growth rates increase in line with increases in pasture growth and quality. The extent to which the surge in liveweight gain over spring is kept up over summer will depend on pasture management over spring. In particular, the prevention of seed head formation on grasses during spring will help in maintaining pasture quality through the summer. For ryegrass/white clover pastures both summer temperatures and rainfall are important determinants of pasture production (Baars 1976).

By the end of their second summer at about 14-16 months of age, both bucks and does are approaching puberty. At this age, bucks may, at best, maintain their autumn liveweights through the ensuing 6 month autumn/winter period to the following spring. Unlike the situation of a year earlier, rising 2 year bucks do not gain weight over their second autumn and winter.

Following the onset of puberty at about 14 months of age, entire males can become difficult to handle particularly during yarding. However, many producers take this as an opportunity to send for slaughter those bucks not required for breeding. At this time carcass weights of bucks have proved acceptable to venison processors. In addition, carcasses typically averaging about 24 kg were shown to contain as little as 7% chemical fat (Gregson & Purchas 1985).

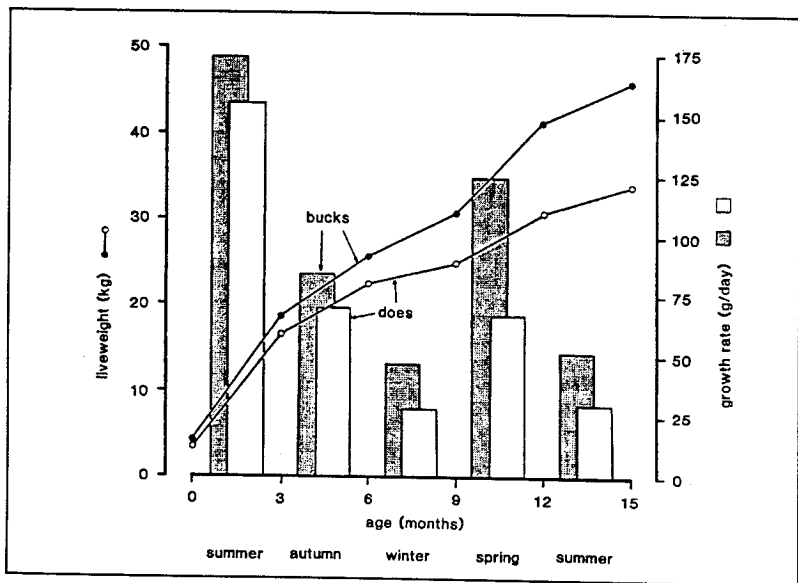


Figure 6.2: Growth rates of bucks and does from birth to 15 months of age for fallow deer on commercial farms in northern New Zealand (Asher, 1984).

After puberty, fallow bucks exhibit an annual liveweight cycle which is most marked when they are used as sires (Figure 6.3). Over the rutting season sire bucks may lose up to 25% of their pre-rut liveweight. Mixed age does also show an annual cycle of liveweight, but fluctuations are less marked than for bucks, with the increase in pre-fawning liveweight reflecting the weight of the unborn fawn and the products of conception.

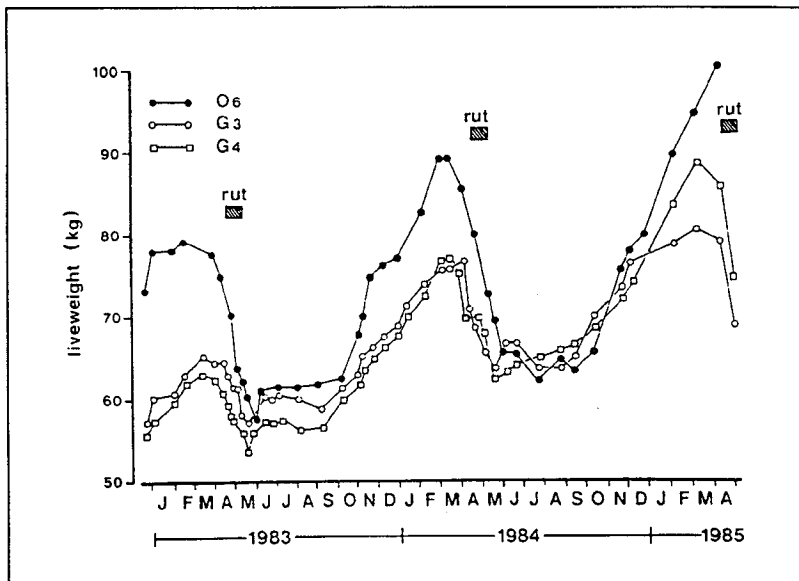


Figure 6.3: Liveweight changes of sexually mature fallow bucks used as sires on the Ruakura Agricultural Centre (Asher 1986).

Effects of castration on growth

After puberty entire males not only become more difficult to handle but are also more agonistic toward each other during the breeding season. As a consequence of this, groups of entire bucks are not usually yarded at this time. Where markets require an all year round supply of chilled venison this can be restrictive.

One possible way to extend the killing season is by castrating bucks. In one of the earliest trials at the Ruakura Agricultural Centre, bucks were allocated to two unequal sized groups which were balanced for birth date, birth weight and weaning weight. Bucks in the smaller group ($n = 11$) were castrated at 5 months of age with elastrator rubber rings and the larger group ($n = 21$) were left intact. The two groups of animals were grazed as one mob to about 27 months of age.

Liveweight profiles of entire and castrated bucks from birth to 18 months of age are shown in Figure 6.4. Pre-weaning growth rates to 3.5 months for both groups averaged 187 g/day (6.6 oz/day) and between weaning and castration 77 g/day (2.7 oz/day). From this latter time until 9 months of age, both entire and castrated bucks grew slowly at the same rate of 34 g/day (1.2 oz/day). However, from the start of spring the mean growth rate of entire bucks was 125 g/day (4.4 oz/day) compared with 96 g/day (3.4 oz/day) for the castrated group. Over the summer period from 12 to 15 months of age the entire bucks averaged 46 g/day (1.6 oz/day) with castrates averaging 27 g/day (0.9 oz/day). By 15 months of age castrated bucks were 9.8% lighter than entire bucks. By 27 months this difference increased to 14% (see Chapter 9).

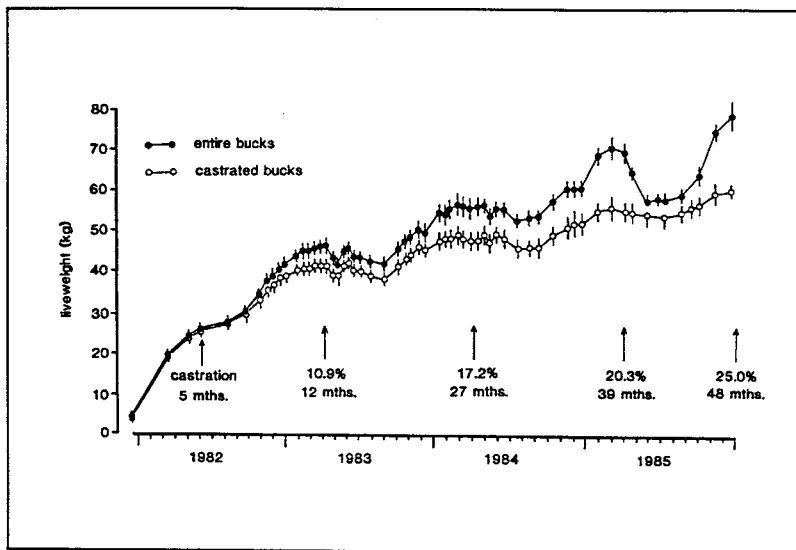


Figure 6.4: Growth (mean \pm 95% confidence limits) of entire and castrated fallow bucks on the Ruakura Agricultural Centre (Asher 1986). The percentage difference in liveweight is indicated for various ages up to 48 months.

Feeding levels

Ryegrass/white clover pastures, whether grazed directly or offered as conserved products (hay or silage), can provide the nutrients required by fallow deer. For efficient utilisation of pastures, information is required on seasonal pasture production, target performance levels for fallow deer and the feed required to achieve the targets.

Presently there are no published estimates of feed or energy required by fallow deer at pasture. However, as a guide, feeding levels for fallow have been calculated from liveweight gain/energy intake relationships found with red deer (Fennessy *et al.* 1981). Although feed requirements were calculated in terms of metabolisable energy (Table 6.2), for some practical purposes it is more convenient to express feed requirements in terms of pasture dry matter (Table 6.3). As the energy contents of pasture dry matter and several other feeds are known, conversion from metabolisable energy to dry matter is straight forward (Table 6.3).

It should be stressed however, that the feed requirements given in Tables 6.2 and 6.3 are estimates and intended as a guide. Contained in these estimates are allowances for growth, season and, in the case of does aged 2 years and over, an allowance for milk production intended to support fawn growth rates of around 180 g/day (6.4 oz/day) over summer. From what has already been discussed, it will be appreciated that rutting bucks are unlikely to consume their estimated feed requirement. As a consequence such animals lose considerable liveweight over the rut (up to 430 g/day or 15 oz/day loss for a 30 day period).

Table 6.2: Calculated energy requirements of fallow deer (megajoules of metabolisable energy per day).

	Autumn liveweight	Season			
		Autumn 100 days	Winter 65 days	Spring 100 days	Summer 100 days
Young bucks					
0.25 to 1.25 yr	20 kg (44 lb)	11.0	11.8	14.2	13.0
1.25 to 2.25 yr	47 kg (103 lb)	13.3	15.4	16.0	15.0
Sire bucks					
2 yr	65 kg (143 lb)	17.0	16.1	18.1	18.1
3 yr	85 kg (187 lb)	20.7	19.6	20.3	20.3
4+ yr	105 kg (230 lb)	24.3	23.0	24.1	24.1
Young does					
0.25 to 1.25 yr	18 kg (40 lb)	9.7	10.4	11.3	11.3
1.25 to 2.25 yr	38 kg (84 lb)	11.3	13.1	15.2	20.7
Breeding does					
	45 kg (99 lb)	12.9	13.9	15.8	21.6
	55 kg (120 lb)	15.0	16.1	17.5	23.4

Table 6.3: Calculated feed requirements (kilograms of dry matter per day) of fallow deer.

	March liveweight	Season			
		Autumn 100 days	Winter 65 days	Spring 100 days	Summer 100 days
Young bucks					
0.25 to 1.25 yr	20 kg(44 lb)	1.0 (2.2 lb)	1.0 (2.2 lb)	1.2 (2.6 lb)	1.3 (2.9 lb)
1.25 to 2.25 yr	47 kg(103 lb)	1.2 (2.6 lb)	1.4 (3.1 lb)	1.3 (2.9 lb)	1.5 (3.3 lb)
Sire bucks					
2 yr	65 kg(143 lb)	1.6 (3.5 lb)	1.4 (3.1 lb)	1.5 (3.3 lb)	1.8 (4.0 lb)
3 yr	85 kg(187 lb)	1.9 (4.2 lb)	1.8 (4.0 lb)	1.7 (3.7 lb)	2.0 (4.4 lb)
4+ yr	105 kg(230 lb)	2.3 (5.1 lb)	2.2 (4.8 lb)	2.1 (4.6 lb)	2.4 (5.3 lb)
Does					
0.25 to 1.25 yr	18 kg(40 lb)	0.9 (2.0 lb)	0.9 (2.0 lb)	0.9 (2.0 lb)	1.1 (2.4 lb)
1.25 to 2.25 yr	38 kg(84 lb)	1.1 (2.4 lb)	1.2 (2.6 lb)	1.3 (2.9 lb)	2.0 (4.4 lb)
Breeding does					
	45 kg(99 lb)	1.2 (2.6 lb)	1.2 (2.6 lb)	1.3 (2.9 lb)	2.1 (4.6 lb)
	55 kg(120 lb)	1.4 (3.1 lb)	1.4 (3.1 lb)	1.5 (3.3 lb)	2.3 (5.1 lb)

Growth and venison production

It was mentioned earlier that pasture can provide the nutrients required by deer. Indeed, in much of New Zealand, deer production is based on the harvesting of pasture by grazing. Supplementing pasture intakes of fallow deer with hay, silage or grain is primarily aimed at making up seasonal shortfalls in available pasture.

In April of 1983 and 1984, initial studies were undertaken on the Ruakura Agricultural Centre to determine the effect of stocking rate on growth and venison production from young fallow bucks grazing ryegrass/white clover pastures. Newly weaned 4 month old bucks were allocated to 2 stocking rate treatments of 32 and 48 bucks/ha (13 and 20 per acre). In each year, initial liveweights and the source of stock was the same for each treatment. Each group of bucks was rotationally grazed on its own 0.5 ha (1.1 acre) farmlet which was divided into 8 paddocks. Grazing periods varied between 2 and 7 days depending on season and year, with paddock changes being made on the same day, within years, for each stocking rate. While the grazing cycle varied with season it did not differ between stocking rates except during the spring of 1984. Over spring, the grazing cycle varied as different proportions of each farmlet's area were conserved for silage. In 1983 two paddocks per farmlet were conserved for silage at both stocking rates, whereas 3 paddocks were conserved at the lower stocking rate only in 1984.

The intake of pasture dry matter was calculated as the sum of the differences between pregrazing pasture dry matter and residual pasture dry matter for each grazing period. Bucks were weighed at 28 day intervals and slaughtered at 14 months of age.

Bucks exhibited seasonal patterns of growth between 4 and 14 months of age at both stocking rates (Figure 6.5). In each of the 2 years daily liveweight gains were highest in spring and lowest over winter. All bucks reached a final slaughter liveweight of around 44 to 45 kg (97-99 lb) regardless of stocking rate. Daily intakes of pasture dry matter by bucks ranged from 0.7 kg (1.5 lb) at 4-6 months up to 1.3 kg (2.9 lb) at 14 months. These intakes were slightly lower than the estimated requirements (Table 6.3). One possible reason for this difference was that the technique for measuring pasture intake did not take into account the contribution of pasture growth and, therefore, slightly underestimated actual intake.

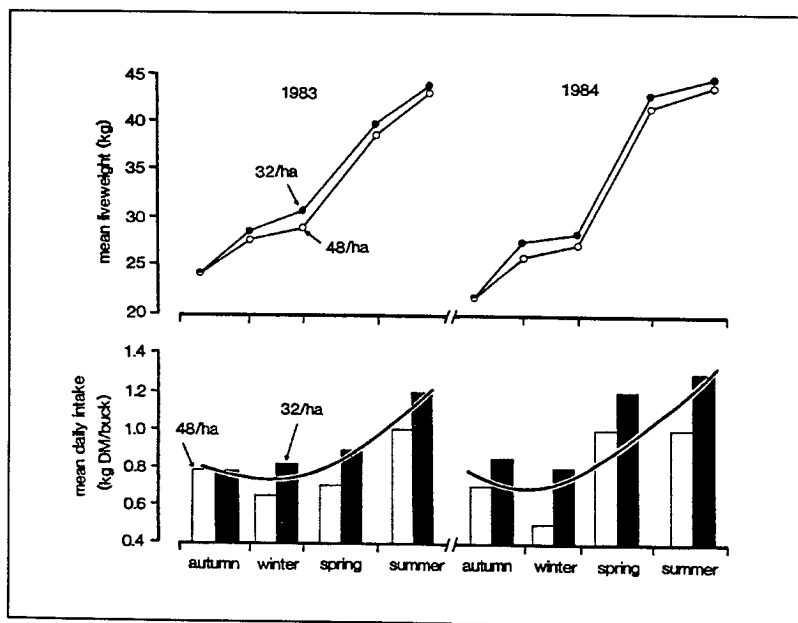


Figure 6.5: Seasonal changes in mean liveweight and dry matter intakes of fallow bucks on low (solid bar graph) and high (open bar graph) stocking rate farmlets.

Average pre-grazing pasture dry matter varied between seasons. While it was generally higher for those bucks at the lower stocking rate, pasture utilisation was always lower (Figure 6.5). Maximum pasture utilisation for both stocking rates occurred in winter (~59%). The very high pre-grazing pasture dry matter offered to the lower stocked bucks in summer 1983, which was accompanied by a low pasture utilisation (~13%), was due to inadequate pasture conservation measures in the previous spring.

The mean hot carcass weight at 14 months of age was only slightly heavier for bucks at the lower stocking rate in each of the 2 years of the trial (Table 6.4). However, the total carcass yield/ha was ~45% higher for the higher stocked bucks. Similarly, net carcass gain/ha, estimated as the difference between total carcass yield and 58% of initial total liveweight, was ~45% higher for the high stocked groups. The fact that average carcass weights were not more markedly depressed as stocking rate increased from 32 to 48 bucks/ha suggests even higher stocking rates were possibly justifiable. The total and net carcass yields from these fallow bucks were achieved on farmlets producing between 10 000 and 12 000 kg (22 000-26 000 lb) dry matter/ha/year.

Table 6.4: Carcass yield characteristics of fallow bucks at 14 months of age stocked at 32 and 48 per ha (13 and 20 per acre).

Year	Stocking rate	Mean hot carcass	Carcass yield	Net carcass gain
1983	32/ha (13/acre)	24.7 kg (54 lb)	789 kg/ha (704 lb/acre)	402 kg/ha (359 lb/acre)
	48/ha (20/acre)	24.1 kg (53 lb)	1156 kg/ha (1031 lb/acre)	580 kg/ha (517 lb/acre)
1984	32/ha (13/acre)	25.5 kg (56 lb)	816 kg/ha (728 lb/acre)	430 kg/ha (384 lb/acre)
	48/ha (20/acre)	24.7 kg (54 lb)	1184 kg/ha (1058 lb/acre)	622 kg/ha (555 lb/acre)

Constraints to on-farm production

A number of differences in the patterns of feed demand exist between fallow deer and more traditional livestock. These arise due to the late onset of fawning and the seasonal pattern of liveweight growth. Whereas pasture growth exceeds the demands of deer over spring, the reverse occurs over summer and autumn. Consequently, summer pasture growth appears an important limitation to increased on-farm production. Further limitations can arise in summer and late autumn due to ryegrass staggers and facial eczema. Essentially the primary constraint to increased production is the poor alignment between the feed demands of deer and pasture production. One consequence of this can be a markedly seasonal venison kill of 14 to 16 month old bucks over the late summer/early autumn period before their growth stops for up to 6 months.

In other chapters, ways of overcoming the constraints to increased productivity will be discussed involving earlier fawning, the use of larger terminal sires (Mesopotamian fallow) and the principals of good pasture management.

Concentrate feeding

The equable year-round climate in New Zealand is conducive to year-round grazing systems, whereby the feeding of concentrate rations or conserved pasture (hay or silage) is largely restricted to periods of relative pasture deficit in winter or late summer (depending on region). Such feeding is usually in the form of supplementary rations rather than an exclusive diet. Winter supplementation

generally aims to provide deer with an adequate energy intake to offset heat loss by increasing heat production. Therefore, it is usual to provide deer with supplements high in energy rather than protein (available winter pasture will generally provide adequate protein to over-wintering deer). Summer supplementation during periods of drought is often directed at maintaining high lactational yields of does rearing fawns. As milk production involves considerable investment by the doe into energy and protein metabolism, consideration may need to be given to supplementation of both energy and protein intake.

In general terms, cereal grain feeds (oats, maize, barley) have high energy value but very low protein value. Feeds such as lucerne (alfalfa) hay, lupin grain, soy beans and other legume-type crops generally have high protein contents. The choice of supplementary feed will be dependent on the desired nutrient and local availability/cost.

In the North American continent, climatic conditions are considerably more extreme than in New Zealand. It is not uncommon for farmers to provide a total concentrate diet to fallow deer for periods of 6 months during winter. This situation contrasts markedly with supplementary feeding and the choice of feeds needs to be considered carefully. In particular, a balanced diet should be provided under semi-feedlot conditions. Again, the choice of feedstuffs will depend on cost and local availability. It is generally recommended that winter feed rations for fallow deer contain 10-12% protein. In North America, this is usually obtained by incorporation of lucerne (alfalfa) hay and soy bean meal within a maize (corn) grain base (often in pelleted form).

When feeding concentrate rations to fallow deer, care should be taken to introduce new feedstuffs slowly to their diet. Rumen flora require a period of time to adjust to new rations. Sudden introduction to different diets will, at best, lead to short-term scouring and, at worst, lead to rumen-overload and acidosis (often fatal).

Consideration should also be given to preventing dominant individuals from hoarding feed and denying access to subordinate animals. This is best achieved by distributing the rations in long feed troughs.

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