NUTRITION

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The golden rule of all nutrition - there is no value in hungry stock!

Hofmann (1989) classified the world's ruminants as concentrate selectors (browsers), roughage feeders (grazers) and intermediate feeders.

Browsers

- Rely on browse (foliage in summer; twigs in winter
- Salivary glands are large and produce serious saliva that contains complex tannins
- Rumino-reticulum is small relative to the digestive tract
- Reticulo-omasal orifice is large allowing passage of large forage particles
- Well developed caecum
- Rapid internal fermentation
- Skim readily digestible nutrients and rapidly excrete refractory particles to prevent distension of gut

Grazers

- Adapted to grass and sedges for all seasons
- Broad muzzle and flat incisors allow short grazing
- Salivary glands small
- Saliva and rumen not efficient producing complex tannins
- Rumino-reticulum up to 25% liveweight
- Reticulo-omasal orifice is small delaying passage of large particles
- Slow complete fermentation

Deer used for farming in Australia are predominantly intermediate feeders. The use each feed type less well but benefit from greater nutritional flexibility.

Fallow Deer are similar to sheep in their digestive requirements whereas Red Deer require high fibre since they are true intermediate feeders. Elk are also intermediate feeders and require a higher fibre diet than Red Deer.

Frothy Bloat of grazers is not seen in deer because of the much higher passage of material through the reticulo-omasal orifice (60% faster than cattle). *Passive Bloat* is a problem when deer are deeply sedated and in lateral recumbency for any length of time.

Pasture management a problem with deer since palatability is directly related to succulence. Hence preferential grazing of chicory and legumes over ryegrass.

Principles of Grazing Management

- Mazimise intake when pasture is of peak nutritional value
- Minimize fodder conservation of seasonal excesses
- Match animal seasonal requirements with seasonal pasture output
- Minimize proportion fed for maintenance of breeders
- Minimize over-wintered stock (low weight meat stags and barren hinds)

Constraints on Grazing Management by Deer

- Tight photoperiod control of reproduction prevents alteration of fertility of males and females
- Strip grazing possible after training
- Calving and peak lactation of temperate species always in early summer – requires irrigation, high rainfall area and/or supplementary feeding
- Restriction of food necessary in spring to prevent obesity of hinds
- Tropical species less able to adjust to seasonal pasture fibre changes

Note: Housed stock have 2/3 daily maintenance requirements for energy. Thus in cold climates it is economical to lot feed indoors. But great care must be taken with ration formulation particularly in relation to copper requirements.

Dry Matter Intake

Within limits, deer can compensate for deteriorating diet quality simply by consuming more. But, low quality forages ferment and pass from the rumen slowly and intake becomes limited by gut fill. Stemmy pastures impose quality limitations and should be mowed or grazed by cattle (leafy pastures should be grazed first by deer than by large grazers).

The rumen of deer undergoes an annual cycle which determines the amount of dry matter that can be ingested.

Rumen Cycle in Red Deer

- Intensive Pre-Rut 20L
- Rut 10L
- Post-Rut 25L
- Mid-Winter 15-18L

Projecting feed requirements involves three steps:

- Calculating nutrient requirements
- Estimating the pasture supply
- Calculating the shortfall to be made up with supplemental feed

Energy Requirements of Deer

Energy requirements are usually expressed on a metabolic weight basis ($W^{0.75}$)[1].

The fasting metabolic rate of red deer (under laboratory conditions) is 0.33 to 0.40 MJ/Kg$^{0.75}$. The energy increment for rumination is about 17%, standing 15% and grazing 25%. Thermoregulation can require another 25 - 30% increment. Thus during winter metabolic rate could be about 0.75 MJ/Kg$^{0.75}$ depending on environmental conditions. Add to this the requirements for ambulation (hard flat surfaces about 2.6KJ/Kg/Km) and some idea of the complexity of formulating the energy component of rations can be gained.

([1] metabolic weight is calculated by W^3 and then double square root)

Energy requirements increase during *gestation*; in the final days the increase in the conceptus is 5MJ/day (Red Deer) and 12 MJ/day (Elk), *lactation and calf growth*; daily increased requirements are of the order of 16MJ (Red Deer) and 40MJ (Elk). This doubles their daily requirement and dietary insufficient results in rapid weight loss, poor milk production and poor calf/fawn growth rates.

Post-weaning growth differs for stags and hinds. From 6 to 18 months of age stags require 37MJ/Kg liveweight gain, and 55MJ/Kg for hinds. The higher value being due to fat deposition. *Velvet production* requires only a small amount of the total daily energy - (0.5MJ/day Red Deer; 1MJ/day Elk).

Protein Requirements of Deer

Daily protein requirements for maintenance range from 8 - 10 g/ $W^{0.75}$ of digestible protein for a pelleted diet of 16% protein.

"Protein requirements are less well defined than energy requirements and there is still no reason to expect species differences. The objective of protein supplementation is to precisely meet the animal's needs for amino acids since above this level, feed protein (generally, an expensive feed ingredient) is used as an energy source. Also, excessive protein consumption by stags can result in preputial ulceration and prolapse from ammonia burns on the penis sheath.

For their first year of life, deer benefit from protein levels of up to 16% protein. Other classes of stock should receive these levels only in spring and early summer when their demands are high. Winter maintenance requirements of adults are fully covered with protein levels of 8-10% although attention to palatability is necessary."
(Hudson, R.J. *Nutrition of Farmed Deer*)

Nutritional Value of Some Common Foodstuffs

Foodstuff	Metabolisable Energy† (MJ/Kg)	Crude Protein (%)	Digestible Protein (%)*
Barley	12.5	9 - 11	4 - 6
Lupins	14.0	27 - 37	21 - 31
Oats	11.5	9 - 13.5	4 - 8.5
Peas	13.0	19 - 27	14 - 21
Wheat	12.0	15	10
Clover	10.5	14	9
Ryegrass	9.5	16	11
Lucerne - pasture	11.0	20	15
Lucerne - hay	9.8	18	13
Lucerne - silage‡	8.8	18	13

†MJ/Kg = Megajoules per kilogram at 90% dry matter
‡ 30% dry matter
* Approximation only - extrapolated from cattle values

Intake on grass pastures is determined largely by standing crop. The feeding rate of wapiti is reduced to 50% at about 850 kg/ha (Hudson and Watkins 1986). Wapiti compensate by grazing longer but reach an upper limit of about 12 hours/day. The general recommendation for deer during periods of rapid growth is to manage pastures to provide at least 1200 kg/ha or a sward depth of about 10-15 cm.

In Australia and New Zealand, deer have been traditionally grazed on "cattle and sheep" pastures - principally ryegrass and white clover. This is often overgrazed in a deer enterprise. Pasture height and management for deer should be similar to dairy farming.

Research has shown that chicory will allow target HCW's of 50KG (LW 92KG) to be reached by December.

Pasture mixes and target weight achievements:

- Ryegrass/white clover at 5cm (sheep type pasture) = low target weight
- Rygrass/white clover at 10cm (dairy cow type pasture) = 50% target weight
- Chicory/red clover (30cm to 10cm chicory) = 90-100% target weight

Well managed, by rotational grazing, chicory and red clover will produce well for up to six years. Both red clover and chicory are dormant during winter.

Rotational grazing (to prevent over-grazing) is the key to good deer pasture management.

Weaner deer are very sensitive to pasture height. One study showed 42% of weaner stags achieved 92Kg live weight at 12 months of age on >10cm pasture, compared to none on ó 5cm. The economic implications of this is that all 42% of the mob could have been sent for slaughter with resultant reduced pressure on autumn pasture with profits achieved up to 8 months earlier.

Assessing the feed requirements of different classes of stock can be difficult and all exert different grazing pressure on their environment. One way of estimating the feed requirements of different species of livestock is by comparing their feed requirements to a standard feed requirement.

In Australia the standard is the Dry Sheep Equivalent (DSE) - ie the feed energy required by a 45Kg live weight merino wether to maintain its live weight. In New Zealand the Stock Unit (SU) is used. The conversion ratio is:

1 NZ SU = 1.9 DSE

DSE ratings are influenced by:

- Live weight
- Sex
- Age
- Production status

Water

- Access to fresh COLD water essential
- 50% greater intake per Kg DM than sheep – therefore very high requirements in summer
- Appetite and feed intake severly depressed if water restricted
- Faecal moisture remain high despite restriction
- Fallow Deer better in arid climates and have lower water intake per Kg DM than Red Deer

Guide to Comparative Average Annual DSE Rating		
Species	Live Weight (Kg)	Average Annual DSE Rating
Breeding Cow	500	12.0
Breeding Ewe	55	1.8
Fallow Doe	45	1.8
Red Hind	100	3.4
Rusa Hind	80	2.8
Chital Hind	80	2.8

The main determinant of feed requirement is live weight. Experienced stock managers also rate pasture in terms of estimated carrying capacity (DSE/hectare). This allows an estimate of the number of a particular class of stock that can be carried on a given area and for how long.

Specialised knowledge is required in relation to deer because of their grazing patterns and selection of pasture.

Supplementary Feed

- Grains, hay and silage
- Introduce grains slowly to avoid rumen overload (0.1Kg/head/day to start)
- Lupins low in starch
- Quality roughage better than grain in hinds particularly
- Adequate trough space
- Hay quality important – stalky Lucerne can have 25% wastage
- Grain guide – 1Kg/head/day Red Deer; 0.5Kg/head/day Fallow Deer

Voluntary Intake

Voluntary intake is directly proportional to palatability. Pelleted feeds with over 3% molasses increases palatability, but may be inefficient in that it leads to obesity of hinds. Dystocias and lactation failure seem to follow harsh winters, when animals stand around feeders overfeeding on concentrate rations.

The substitution factor among various supplements and between supplements and pastures is not simple. The exchange ratio between hay and concentrates is not simply proportional to their ME values.

Voluntary intakes of concentrates may be x1.5 that of hay and the ME concentration may be 20% higher. This means that the total energy intake is greatly enhanced and the performance (especially of calves) is substantially improved.

Voluntary feed intakes are increased when chicory/red clover is grazed compared with ryegrass/clover pasture. This is directly related to palatability.

References and Links

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