INDOOR WINTERING OF DEER FOR VENISON PRODUCTION

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Introduction

The practice of bringing deer indoors during their first winter of life is routinely used in the United Kingdom and Europe and has become popular during the last few years, particularly in the Southern parts of New Zealand. There are several reasons for inwintering, such as overcoming low winter growth, improving feed utilisation, providing improved shelter, improving farmer convenience, allowing earlier slaughter, increasing overall farm stocking rate, sparing spring pasture and, in elk type animals, obviating the need to remove spike antlers prior to slaughter. The purpose of this paper is to describe suitable systems for inwintering deer, to suggest improvements and provide some solutions to the pitfalls.

Basic Requirements for Inwintering

These are summarised briefly here as a more detailed description was given in an earlier volume of these proceedings (Suttie *et al* 1994).

The most important requirements are a suitable barn or covered yard with adequate ventilation, a good water supply, sufficient trough space and appropriate flooring to provide a dry surface. Electric lighting is an advantage whether this is used to advance growth (see below) or whether it is simply an aid to the farmer for observing the animals and for feeding and cleaning. An appropriate feed must be provided, typically based on hay or silage, with grain, supplemented by a cost-effective protein source. The deer for inwintering are usually in the first winter of life and may be of either sex. At Invermay all of our studies have used male red deer but overseas fallow deer have been inwintered successfully and on farms elk type animals have successfully been kept indoors during winter. Farmers can choose to inwinter all their weaner deer or select size cohorts which best fit their required supply of animals for slaughter. For example, it may be cost effective to inwinter larger deer to finish them faster to achieve a specific schedule price. Alternatively, smaller calves could benefit from some preferential treatment during winter, if slaughter dates were subsequently advanced in spring.

A typical inwintering system would begin any time after weaning in late summer or autumn. Weaned calves would be progressively adapted to conserved feeds and could either remain indoors after weaning or could be brought back in later, depending on seasonal feed availability. The deer would remain indoors throughout winter and could either be slaughtered from the pens or released to pasture, in spring, for finishing. This decision is dependant on the growth of the

animals and the slaughter schedule. The stocking density indoors i.e. the space requirement, will determine how many deer can be kept in a given area. In the UK the recommendation for a 60-90 kg ewe is 1.2-1.4 m^2/head. Typical practice in New Zealand is to give red deer calves 1.25m^2/head. At Invermay we use, and hence recommend 2m^2/head because this allows for animal growth over winter. Sufficient trough space should be provided to permit all animals to feed at once. The UK recommendation for adult ewes is 15 cm and 48 cm for *ad libitum* and restricted fed animals, respectively. At Invermay we recommend 45 cm for red deer calves in any feeding system. It is of critical importance during the feed adaptation period, particularly if high levels of grain are to be fed, to gradually adapt ruminant animals to the diets. At Invermay we recommend gradual changes, with 5 days/change. It can take 25 days to adapt deer from all grass to a high level of grain, with hay or silage being fed throughout the change.

Growth and Food Intake of Inwintered Calves

At Invermay we have carried out a number of trials designed to evaluate the food intake and growth potential of deer calves kept indoors during winter, in comparison with those kept outside, but off pasture. In Figure 1 the mean food intake of groups of stag calves during winter is shown. The study was replicated in successive winters. The stags were fed lucerne cubes and barley (Year 1) and lucerne chaff and concentrates (Year 2) either *ad libitum* or to maintenance in indoor pens or outside. Within each treatment, replicate groups of 10 calves were used. The data are broadly similar in both years. The *ad libitum* fed stags ate about the same indoors or outside, about 1.5 kg DM/head/day, but the restricted stags outdoors ate 17% and 12% more than restricted stags indoors during each year. The growth rates of the *ad libitum* fed deer were higher in Year 2 than Year 1 but did not differ between indoors and outdoors groups for the *ad libitum* fed deer (Figure 2).

Figure 1: Food intake during winter in groups of deer calves fed at different rates either inside or outside in either of two years.

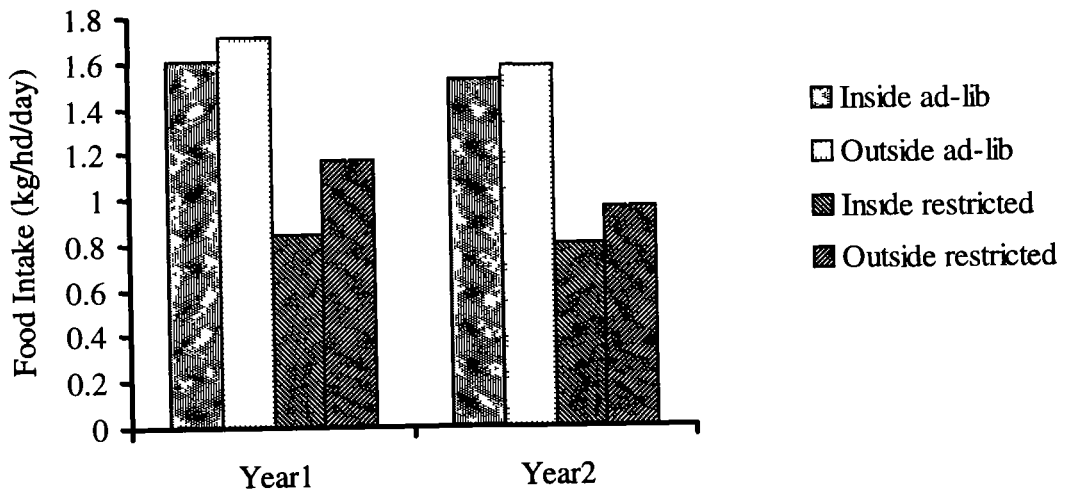
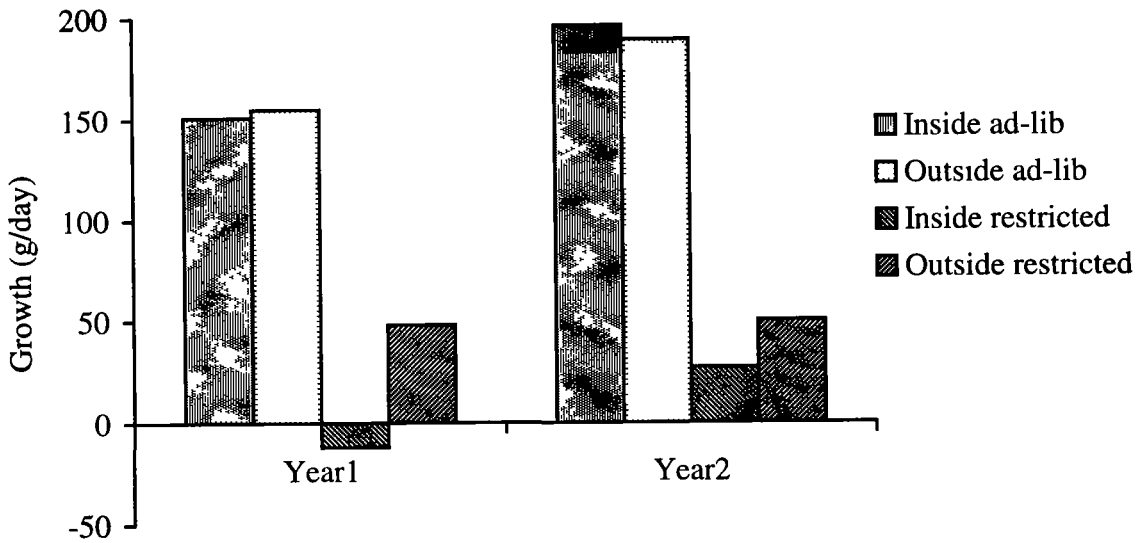
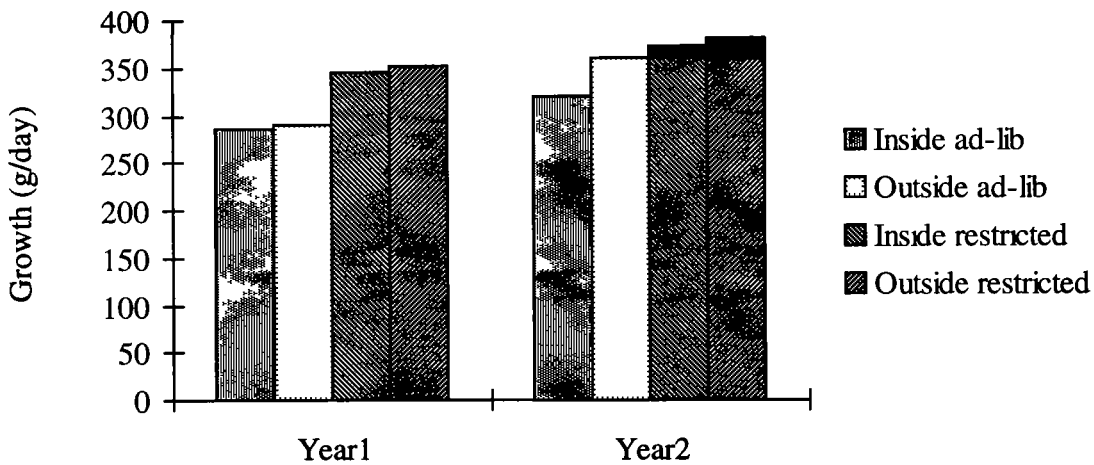


Figure 2: Growth rates during winter in groups of deer calves fed at different rates either inside or outside in either of two years.



Growth rates of the *ad-libitum* fed animals were 150-180g/day, these are good by industry standards for production red deer In contrast the groups fed to maintain body size grew little during winter The outdoor groups grew slightly, but not significantly more All groups were released to pasture as one mob in spring As shown in Figure 3 growth rates of all groups were faster in spring than winter but the previously restricted deer did not grow significantly faster than the previously *ad libitum* fed groups

Figure 3: Spring growth rates on pasture in groups of deer calves fed at different rates during winter either inside or outside in either of two years.



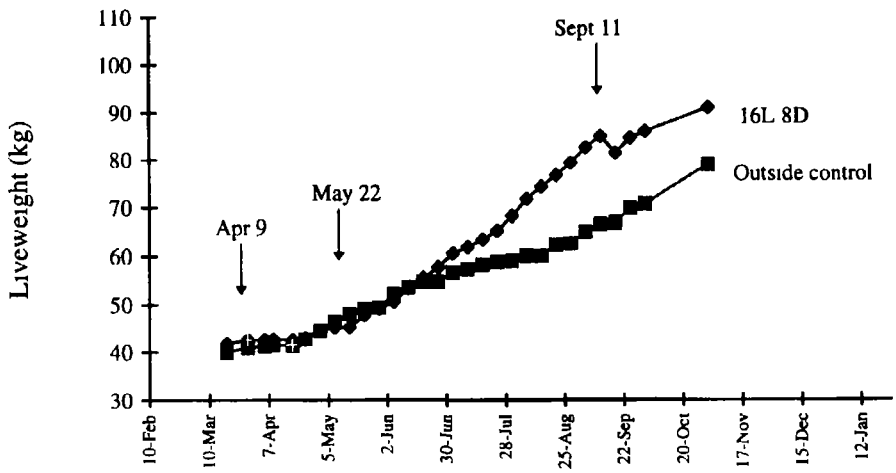
Therefore, although some compensatory growth was shown this was not sufficient overall to permit full catch up growth to take place Consequently the winter *ad libitum* fed deer could be slaughtered earlier than those restricted during winter The inwintering environment had no effect on spring growth rate - as in both years the inside and outdoor wintered deer, within each feed group, were similar Simply housing deer during winter is therefore unlikely to present an economic advantage if the animals are fed *ad libitum* but if the animals are to be fed less than to appetite housing may result in a further saving in feed However, the modest levels of compensatory growth in animals that have been fed restricted diets must be considered by the producer The decision on feeding level and whether or not to house is probably most dependant on the requirement to achieve a given slaughter weight at a specific time to achieve an attractive schedule price A more detailed account of this study can be read in Webster *et al* (1996)

Improved Winter Growth Rates

Growth of deer is seasonal and rapid spring-summer growth rates are off-set by low growth rates during winter This pattern is partly controlled by daylength and the long days of summer are known to stimulate rapid growth

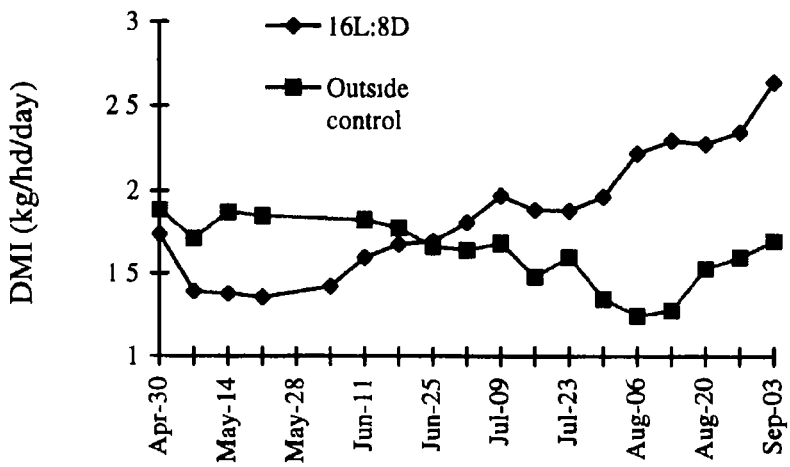
At Invermay we have evaluated the potential for exposing young red deer stags, destined for venison production, to mid-summer daylength during winter in order to improve winter growth rate Facilities required to carry out this simple procedure are similar to those for basic inwintering except that an electric lighting system capable of producing at least 250 lux is needed with a electronic timer to enable the lights to be switched on and off at the correct times We have found that 16 hours of light per day followed by 8 hours of darkness (16L 8D) is optimal to induce rapid spring-like growth The increased growth rate is not observed immediately but appears after six weeks exposure to 16L 8D and is maintained for up to a further 20 weeks if the lighting regimen is kept up Figure 4 illustrates a typical experimental result for two groups of deer kept on 16L 8D indoors or outside during winter

Figure 4: Liveweight in two groups of deer on either 16L:8D inside or outside during winter. Experimental feeding began in March and the 16L:8D daylength treatment began on April 9. On May 22 rapid growth began. All animals were released to pasture on September 11



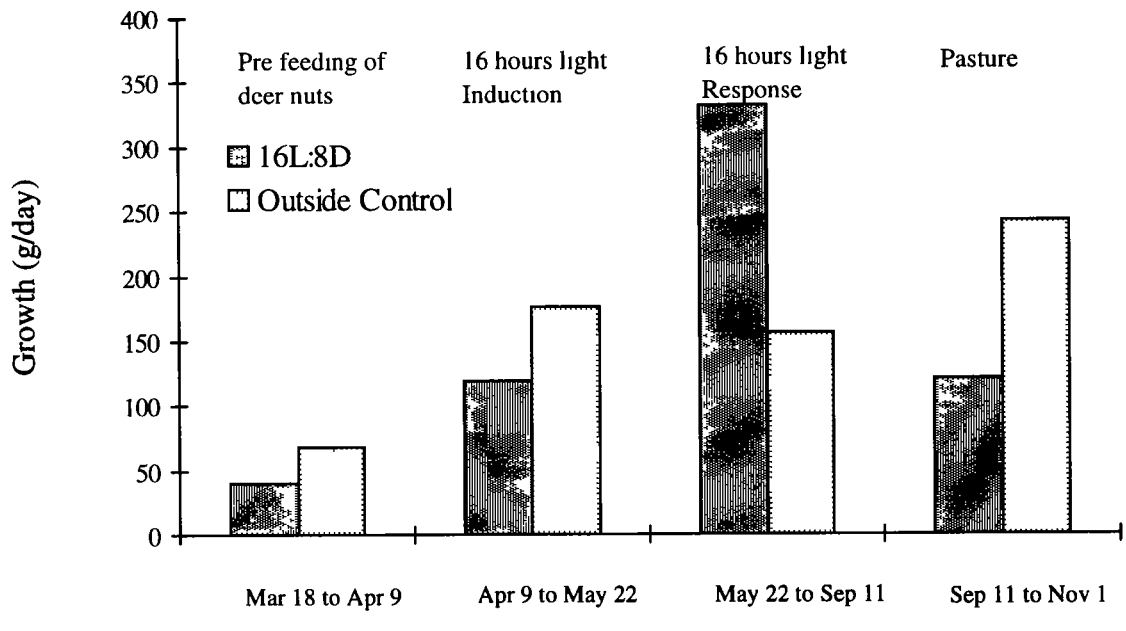
The change in liveweight observed in the 16L 8D group is similar to the normal spring increase but it takes place some two months earlier Figure 5 illustrates the food intake of both groups of stags over the period of concentrate feeding

Figure 5: Food intake from the groups of deer whose liveweight was shown in Figure 4 from April 30 to September 3. Note the rapid increase in food intake in early June after the 16L:8D daylength treatment had taken effect.



The food requirement for the stags on 16L 8D is much higher than the control animals The growth rates of the stags during each period of the trial are shown in Figure 6

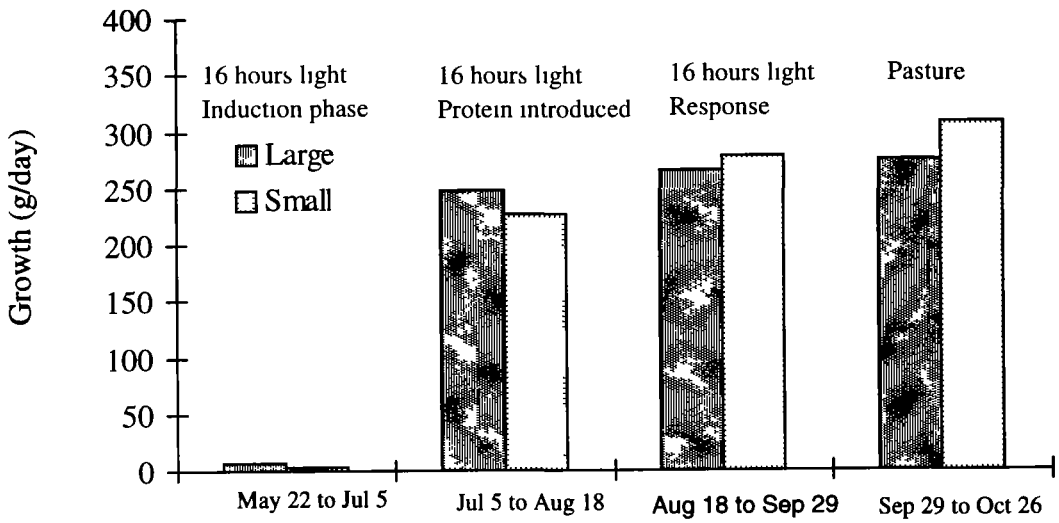
Figure 6: Growth rates of the groups of deer from March 18 to November 1



Note that during the induction phase (the first six weeks of the exposure to 16L 8D) growth rates are lower in the 16L 8D group Also the ability to show rapid growth on pasture when returned to natural light outside in spring is reduced, a great deal of the annual growth potential has already been expressed under the 16L 8D daylength treatment

The 16L 8D treatment has been taken up by farmers and has been used successfully and economically when adequate feed is provided Figure 7 illustrates some on-farm data from Russell McDonald from Te Anau

Figure 7: Growth rates of deer kept indoors at Russell McDonald's property at Te Anau. The 'large' deer were about 65 kg and the 'small' deer 55 kg at the start of the winter. Protein supplementation was introduced about the time the daylength induced changes in growth rate would have been expected. A feature of these results is the continued good growth rate on pasture after turnout.



He obtained a robust response to daylength in groups of large and small deer calves after he supplemented the diets with *ad libitum* silage and barley with 250g/head/day of rapeseed meal Prior to supplementing the protein, growth rates were low However, the role of the additional protein in the growth response is confounded by the provision of additional protein at the same time as the inductive response to daylength was taking effect The improved protein level of the diet is nevertheless likely to be important in permitting the stags to grow at the rate induced by the daylength treatment Note that growth rates of 250 - 300 g/day are much faster than those normally shown by red deer during winter under natural lighting conditions

The clear message is that using the 16L 8D treatment is effective at stimulating growth if producers accept that previous notions of acceptable winter feeding levels no longer apply The animals cannot achieve rapid gain of weight on silage and barley alone Even if the silage is of high quality, the deer simply cannot eat enough of it to express high growth rate The costs of high protein supplements need to be factored in to the economic decision making processes Currently rapeseed meal is economic and can be fed dusted on to silage It does not need to be made into expensive pellets

On-going Research

We are currently investigating the optimal feeding rate of protein supplementation for silage and barley fed deer In the near future we expect to carry out research into the effects of optimal start dates in autumn, start weights and various types of protein supplementation on reliably achieving prescribed slaughter weights and dates in spring-summer This has the clear intention of improving supply management of venison producing deer

Conclusion

The venison producer is now in the position of determining what are acceptable winter growth rates and managing his/her deer accordingly

Important constraints are the cost/availability of supplementary feeds and the projected (contracted) spring venison schedule A key point is the concept of a supplementary feed Perhaps we should challenge the notion of a 'supplement' and replace it with the term 'strategic' 'Supplementary' relies on the concept that additional feed is only necessary if pasture is unavailable 'Strategic' carries with it the concept that, with a knowledge of deer growth patterns and feed requirements, specific feeding can significantly improve economic production This is clearly illustrated by the need to use strategic supplementation to permit the rapid growth rate induced by 16L 18D during winter

Inwintering is a two-edged welfare sword which needs to be evaluated carefully On the one hand animals are being sheltered and preferentially fed but also 'indoors' is an unnatural environment and the deer are kept closer together than would be the case outside This could lead to increased levels of stress As with all welfare decisions, benefits and costs need to be weighed up Perhaps a good compromise is to fence a barn so that deer have access to both indoors and outdoors? The use of 16L 8D would also be possible as the deer would only need to be held indoors in the evenings for the period of increased lighting over and above natural daylength However, this would admittedly require more labour

It may be desirable from a "natural venison" standpoint to insist on pasture finishing of deer It is likely that no significant change will be made to colour or eating quality but the subjective connotation of what is natural for the consumer may prevail

Overall we are moving rapidly to the position of having a precise understanding of the necessary inputs to successfully in winter deer calves to produce appropriate, reliable spring venison

References

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