

Developing decision-making tools for improving pasture quality on deer farms in New Zealand

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Abstract This paper describes the development of a learning package to support improved pasture quality on New Zealand deer farms. The first step has been to determine the specific requirements of deer farmers that will enable them to improve pasture quality decisions on-farm. Decision support software that interprets and demonstrates the impacts of pasture quality and animal physiology on the performance of young growing deer has also been developed. Key themes identified to aid pasture management decision-making included identifying the right pasture quality, management systems to maintain pasture quality and maximising the potential of livestock. This paper reports on the type of knowledge that deer farmers require in the learning package.

Keywords: decision making, deer, growth rate, learning packages, pasture quality, software

Introduction

The Meat New Zealand Pasture Quality Workshops have been a highly successful extension programme in the sheep and beef industry. Over the past two years (2002 and 2003) the workshops have been delivered to approximately 2300 sheep and beef farmers throughout New Zealand (McIvor pers. comm.). The programme aimed to improve farmer knowledge about pasture quality, improve pasture management decision-making, and ultimately increase farmer profitability through improved growth rate of young stock.

Feedback from the programme indicated that it was successful in achieving these aims. Formal evaluation showed that 75% of attendees thought the programme would definitely aid their pasture management decision making (Westbrooke 2003). Evaluations showed that the field exercise to visually assess pasture quality had the highest value to farmers, followed by the principles of pasture quality and then the Q-Graze software package (Westbrooke 2003).

The programme is supported by the Q-Graze software package (Woodward et al. 2001), which is an integral part of both the learning

process. This software package predicts diet selection, intake, and live-weight gain of young sheep and cattle.

Several deer farmers who attended thought that the workshops could be valuable for deer farmers if the content was modified to deer farming systems.

Deer farmer focus groups were asked what knowledge and skills would need to be included in a Pasture Quality Workshop to make the event of value. These focus groups also investigated how the farmers would prefer the workshops to be run, specifically the length, timing and advertising of the workshops.

In addition, the unique seasonal nature of food intake in deer meant that the software needed significant modification to predict the performance of deer.

This paper describes the outcomes from the deer farmer focus groups and how the Q-Graze software will be used to meet the learning needs of deer farmers.

Methods

Focus groups

The focus sessions were conducted with two deer farmer groups. One group consisted of

three members of the Waikato / Bay of Plenty Deer Farmers' Association who were asked to identify the key decisions in managing pasture quality on deer farms and knowledge and skills needed to assist farmers with making those decisions.

The second group was Deer South, a benchmarking group in the lower South Island. A needs analysis was incorporated into a regular group meeting. In small groups

farmers were asked "For your farming operation, what are key decisions you make that involve pasture quality?" Farmers documented their decisions singly with a brief explanation where possible. These responses were then clustered into themes by the whole group and farmers were asked for a more detailed description of the issues relating to those themes (Table 1).

Appendix

Table 1. The themes and issues of pasture quality on deer farms

Theme	Issues
Identifying the right pasture quality	<ul style="list-style-type: none"> • Pasture species and cultivars • Stock preferences • Critical timing for quality
Management systems to maintain quality	<ul style="list-style-type: none"> • Grazing management systems • Livestock integration • Fertiliser use • Controlling grass seed head • Supplementary feeding
Maximising the potential of livestock	<ul style="list-style-type: none"> • Genetic potential of different breeds • Seasonality • Requirements of different deer classes

Agricultural industry professionals including a farm systems researcher, farm consultants and the Producer Manager of Deer Industry New Zealand were also interviewed to find out what information they thought should be addressed in the workshop and how. The semi-structured interviews were conducted by telephone. Their responses have been incorporated into Table 1.

Software development

The initial Q-Graze software development is outlined by Woodward et al. (2001). Functions for deer were developed as part of a separate project for a whole farm systems research model (Vetharanim et al. in prep) and modified to suit the Q-Graze platform.

Of specific note were alterations to the Q-Graze software to add seasonality to feed intake, increasing metabolic demand for maintenance when temperatures dropped, and adding the opportunity to select different red deer genotypes.

The model was calibrated using measured growth responses from the literature to reflect variations in response to quality in different seasons, responses to pasture height, and selection of pasture components when grazing.

Results from the focus groups

Farmers considered three major themes important to improving pasture quality on deer farms (Table 1).

Theme 1: Identifying the right pasture quality

Pasture species and cultivars The Deer South group wanted information on the grass types, clovers and other pasture species that best suited deer. They recognised that there was a lot of information supplied by seed companies, but wanted independent confirmation of the value of the pasture options for deer systems.

Stock preferences The interaction between stock preference and stock performance was recognised by farmers. The specific question here was 'which stock classes prefer what and do they produce better because of it?' Farmers were also interested in information that would present the trade-off between stock performance per head and farm performance per hectare.

Critical timing of quality Farmers and consultants wanted more information on the impacts of changing pasture quality at different times of the year. In addition the consultants were interested in short-term changes in management; the effect of "letting the pastures go" for a week or two.

Information on the effect of dead material on animal productivity was also identified as important.

Farmers mentioned early spring, lactation (summer), post weaning (autumn) and winter.

During early spring the emphasis is on finishing weaners approaching 1 year of age.

Lactation occurs in summer as mean calving date is often around 1 December. Questions of importance are 'which is the most important part of lactation, early or late?' and 'how does this impact on hind condition score and mating success?'

Weaning often occurs during March and the growth of young stock before winter was identified as a critical part of a profitable system.

During winter the question 'is quality important in winter if the animal doesn't have the drive to grow?' was of major importance for decision making regarding pasture quality.

A farmer's quote from the focus group

"How important is quality for deer, if you can't grow quantity why worry about quality?"

Theme 2: Management systems to maintain quality

The consultants, during their interviews emphasised the difficulty of maintaining pasture quality when the peak feed demand in December and January was later than the peak pasture growth period, which was often during October and November. During early spring the emphasis was on providing feed and cover for calving. This was a conflict between having high quality pasture which could be controlled during the high growth period of late spring, while trying to provide cover for new-born calves through longer pasture.

Grazing management systems The management of hinds with calves at foot was the key area which controlled overall pasture quality on deer farms.

Questions that farmers wanted more information and discussion on were:

- When to rotate hinds with calves at foot and how?
- Is there an optimum relative stocking rate with set stocking to achieve minimum contact between hinds at calving?
- How to manage set stocking?
- Is there a set rotation?
- Size of mobs and blocks- is there an interaction?

- When is the best time (during lactation) to move hinds and calves with least disruption and achieve the best pasture quality?
- When does feed quality affect lactation?
- If you rotate animals early, what are the effects on weaning– do you reduce problems at weaning?

Livestock integration Integration of other livestock classes such as sheep and beef cattle is an under-utilised practice on many deer farms.

Reasons for not integrating other stock classes are based on perceptions of spreading or causing disease in the deer and of calf losses due to interference.

Demonstrations or examples of effective, economic integration and information on the true disease incidence were identified as a key to changing current practice to help improve pasture quality.

Allocating pasture quality resources to different livestock classes was also an area where some information or demonstration of net benefits was requested.

Fertiliser use Of specific interest to deer farmers was the role of fertiliser nitrogen on pasture quality.

Controlling grass seed head The benefits of both mechanical and chemical removal of grass seed head needed quantification for deer systems. Questions included when and how to apply both types of seed head control.

Supplementary feeding The use of grain and supplements to smooth out fluctuations in pasture quality was a topic that farmers were interested in. Also of interest was 'what is the cheapest supplement to get results and for which stock classes?' Velvetting stags were the example used by farmers.

A farmer's quote from the focus groups.

"Management systems to have quality pasture at critical times of the year are needed"

Theme 3: Maximising the potential of livestock

Genetic potential of different breeds Hinds may range in size from Red deer (*Cervus elaphus scoticus*) at 100 kg to Elk or Wapiti (*Cervus elaphus canadensis*) at 230 kg. This poses significant difficulty in determining potential growth rates of their offspring when cross breeding. Information on the genetic potential of different deer species at different times of the year was wanted by farmers to help benchmark their current production.

An example of the use of benchmarking targets to help improve production was a lamb growth target of 400 g/day in the New Zealand sheep industry. It was thought that

similar benchmarks would provide targets for the deer industry to aim for.

Seasonality There was considerable interest in animal requirements at different times of the year. This was not just about the amount and quality of pasture the animals required, but also the condition that the feed should be in e.g. muddy winter pastures on saturated soils. The question asked was 'how long could stags be left on muddy pasture before animal health became a problem?' This reflected the potential problems that the industry faces with Yersiniosis and Johnes disease, both of which are soil/faeces borne.

The animal requirement at different times of the year was also linked to the animals' seasonality. Farmers asked 'at what times of the year could you offer animals increased feed to achieve increased production and what times of the year is it only worth feeding maintenance?' Benchmarks relating to different seasons were requested by the farmers.

Requirements of different deer classes More definitive values for the feed requirements of the various classes of deer were required.

Deer farmers recognised that feed budgeting was not a strong part of the industry and attributed this to a lack of general knowledge about the requirements of different stock classes. This parallels the sheep and beef industries, though the deer farmers expressed the view that lack of knowledge of appropriate feeding levels was perhaps more widespread in the deer industry than in the sheep and beef industries.

The need for more information on stock feeding requirements also came from the recognition that the classes of deer compete more than other livestock classes throughout the year. An example of this is the conflict between the weaned calf and the hind in autumn. The newly weaned calf has a high potential to grow and so should have the best feed in autumn. The hind which has just finished lactation often needs to gain weight in autumn for successful mating. As well as this, research has shown that early conception is reliant on good body condition and feeding of hinds at this time. So there is a conflict between growing the weaner and getting next year's calf born early through good hind nutrition. Further conflicts also occur in spring when weaner calves are being grown to meet early markets while hinds are needing good feeding to reduce gestation length.

Some analysis of the relative value of feeding each stock class to its potential was requested. This would then allow better prioritisation of feed resources.

Packaging the themes within the Pasture Quality Workshop

Farmers wanted the three themes discussed for deer breeding, finishing and velvet farming systems. Farmers also wanted financial data for any options presented and both extensive and intensive deer systems to be kept in mind when evaluating management options.

The Waikato group suggested discussing each farming system in turn, for each of the themes. The Deer South Group suggested discussing each theme in turn, incorporating comments on all deer farming systems. However both groups were interested in managing competing groups of stock.

The interest in the different systems of deer farming reflect a growing trend to specialisation in one of the three major options of breeding, finishing or velvet production, depending on the climate and land type (Nicol and Stevens 1999).

Modifying the pasture quality workshop programme for deer farmers

The Meat New Zealand Pasture Quality Workshop programme included the following sessions:

1. Introduction
2. Current farmer practice
3. Principles of Pasture Quality
4. Q-Graze – an introduction to the computer programme
5. Field exercise
6. Q-Graze computer programme
7. Management of Pasture Quality
8. Consolidation of the day – Where to from here?
9. Evaluation

To accommodate the needs of deer farmers there will be a modification of the material and programme of the Meat New Zealand Pasture Quality workshops.

Identifying the right quality The issues identified by the deer farmers were the same issues identified by sheep and beef farmers (Lambert et al. 2000) through a similar process. These issues have been incorporated into the original Pasture Quality Workshop programme. These were addressed in sessions 2 and 3 when farmers identified the features of pasture quality and then presented with formal descriptors of pasture quality and how to interpret these in a grazing system. Session 5 used a field training exercise to develop skills in identifying the contribution of pasture components to the diet offered to the grazing animal. The Q-Graze programme, presented in sessions 4 and 6 aided with the

assessment of the impact of those pasture components on animal performance.

Management systems to maintain quality Session 7 discusses management options available to farmers and places them in a whole farm context. It does so generically, without a prescriptive approach, to ensure that farmers understand the principles behind the changes. This allows farmers to adapt the principles to specific farming conditions. This approach will still be taken, but will be fortified with some economic models of the outcomes of choosing one solution or livestock class over another. This will address the need expressed by farmers for more information into the financial impacts of decisions, while still discussing the principles of management.

Maximising the potential of livestock Session 4 – 'Q-Graze – an introduction to the computer programme' will be changed to reflect the need for more explicit information on livestock potential. This session is currently used to introduce the software without specifically exploring animal responses. This session will now be used to demonstrate the animal physiological principles underlying 'Maximising the potential of livestock'. The Q-Graze software will be used to model variations in liveweight gain due to seasonality, deer genotype, current liveweight, climatic effects and pasture quantity and quality. This demonstration will also help farmers to set benchmarks for their livestock stock classes, and environmental and pasture conditions.

Addressing the farm systems The specific farming systems of breeding, finishing and velvet production will be addressed through the underlying principles of pasture quality management. This will again allow farmers to gain an understanding of why and how to manipulate pasture quality at any one time to meet their objectives, regardless of farm system.

During session 8, "where to from here", at the Meat New Zealand Pasture Quality Workshops, farmers noted a range of management changes that were planning to make on their own properties (Westbrooke 2003). The range of management changes showed that farmers were able to draw from the principles discussed at the workshop the management options most suited to their farm to improve their pasture quality. For this reason the Deer Pasture Quality Workshops will focus on principles rather than specific management strategies.

Logistics of the workshops

Workshop length There was a preference for a one day workshop format (8 of the 16 respondents), followed by a one day

workshops with follow-up (6 respondents of the 16), then a half day workshop (5 respondents). Based on the farmer responses the one day format was chosen for the workshop.

Preferred time of year to hold workshop The first choice of the farmers was to hold the workshop in winter (June/July) followed by March/April or May. No farmers requested the period August through to December. Winter has the advantage of being close to the period when the farmers are preparing the pasture for the coming season. However, it may be difficult to show pastures of different quality at that time.

Advertising Farmers noted the local newspaper, direct mail out, Deer Farmers Association branches, Deer South and the New Zealand Deer Industry newsletter as their preferred forms of advertising.

Further feedback

An assessment of the outcomes of the Deer South focus group was made at a South Canterbury/North Otago Deer Farmers' Association (SCNODFA) field day. The key areas where feedback was sought were:

- Variation between genotypes
- Seasonality of feed demand and growth of deer
- Climatic effects on both deer and the pasture
- Cultivar and pasture species selection
- The impacts of fertiliser on pasture quality and deer performance
- Workshop timing and format.

The SCNODFA endorsed the findings from the Deer South group with verbally positive responses to the first 5 points by more than 75% of the group. The preference for one day workshops in May, June and July was also endorsed.

Conclusions

Deer farmers acknowledged the importance of pasture quality in improving on-farm performance. The requirements for understanding the drivers of pasture quality were similar to those identified by sheep and beef farmers, with differences in information requirements reflecting their different farming system and deer feeding requirements.

Deer farmers recognised that they needed more information on the physiology and behaviour of deer to adequately develop benchmarks and expectations, before they could place the true importance of pasture quality in the context of their farming systems. The Q-Graze software has been modified to enable the demonstration of the relative effects of day length, genotype, size

and ambient temperature on the growth rate of young deer.

The economic impacts of changing pasture quality and quantity, and increasing feed utilisation were important factors in decision-making for deer farmers. Examples of these factors will be included in the final learning package to demonstrate their relative importance.

The Deer Pasture Quality Workshop aims to help deer farmers become familiar with the principles of pasture quality, the process of visually assessing pasture quality, the software, and economic outcomes from changing management practices. It will aid farmers in pasture management decision-making thereby improving growth rates and target slaughter dates of young deer.

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References

Lambert MG, Paine MS, Sheath GW, Webby RW, Litherland AJ, Fraser TJ and Stevens DR 2000, 'How do sheep and beef farmers manage pasture quality?', *Proceedings of the New Zealand Grassland Association*, no. 62, pp. 117-121.

Nicol AM and Stevens DR 1999, 'Trends in the use of forages in New Zealand deer production', in Hans-Joachim G. Jung & George C. Fahey, Jr. (eds.), *Nutritional ecology of herbivores: proceedings of the Vth International Symposium on the Nutrition of Herbivores*, American Society of Animal Science, 1999.

Simpson AM, Webster AJF, Smith JS, and Simpson CA 1978, 'Energy and nitrogen metabolism of red deer (*Cervus elaphus*) in cold environments; a comparison with cattle and sheep', *Comparative Biochemistry and Physiology*, 60:251-256.

Stevens DR, Corson ID and Littlejohn RP 2003, 'Preliminary findings of genotype variations in growth rate and feed intake of weaner deer', *The nutrition and management of deer on grazing systems. Grassland Research and Practice Series 9, New Zealand Grassland Association*, pp. 41-44.

Vetharaniam I, Stevens DR, Woodward SJR, Rollo M, Asher GA and Archer J in prep, 'Modelling growth, pregnancy and lactation of the red deer'.

Westbrooke V 2003, 'Follow-up evaluation of the Meat New Zealand Pasture Quality Workshops', *Client Report to Meat New Zealand*, 27 March 2003, 12 pp.

Woodward SJR, Lambert MG, Litherland AJ, and Boom CJ 2001, 'Can a mathematical model accurately predict intake of grazing animals? Testing the Q-Graze model', *Proceedings of the New Zealand Society of Animal Production*, no. 61, pp. 4-7.