Grazing Options for Deer Growth

P.R. Wilson, T.N. Barry, J, Hodgson, A. Ataja, J. Niezen,
G. Semiadi & D. Freudenberger

1. Introduction

Growth is the primary basis of deer production. Attainment of bodyweight targets underpins venison production, reproductive performance and velvet production.

Rapid growth is particularly critical for venison production in New Zealand in order to achieve a carcass weight of 50Kg or more (92Kg liveweight) which attracts a premium price at the time of the year at which the schedule is highest The seasonal venison schedule peak occurs in August and remains high until approximately mid-December when it falls, usually by approximately $1.00 per Kg carcass weight. The influence of seasonal schedule fluctuation on total carcass value before and after achieving the 50Kg target is shown in Table 1.

Table 1 **Venison schedule price and total values for carcasses 49 and 50 Kg September 1990 - February 1991 (Sources: "The Deer Report", "Deer").**

	MONTH											
	SEPT		OCT		NOV		DEC		JAN		FEB	
Carcass Wt (kg)	Schedule $/kg	Carcass Value $	Schedule $/kg	Carcass Value $	Schedule $/kg	Carcass Value $	Schedule $/kg	Carcass Value $	Schedule $/kg	Carcass Value $	Schedule $/kg	Carcass Value $
50	6 20	310	6.40	320	5 90	295	5.45	273	4 85	243	4 75	236
49	5.65	276	5 65	277	4.80	235	4.65	228	3.90	191	3.90	191
Difference ($)		34		43		60		45		52		45

Thus failure to achieve targets results in a substantial reduction in carcass value, or alternatively, the need to retain the animal over the following winter to achieve the premium schedule price at the age of 20-24 months The latter is a biologically inefficient process and reduces economic returns to the farmer

Red deer grazing conventional ryegrass clover pasture have grown and performed as well as, if not better than, equivalent deer from the feral environment Studies of rumen contents of deer from the feral environment in New Zealand have shown a high proportion of dietary intake to be grass and clover species. These observations lead to the assumption that ryegrass and clover were the preferred dietary species for deer

However, recent observations (Scott,1989) have shown that red deer have a preference for pasture species other than ryegrass. Red clover, lotus and chicory are amongst the preferred species of 16 tested. Ryegrass was the least preferred pasture species This observation lead to the question of whether deer would grow faster on more preferred pasture species.

Another constraint to deer growth is the seasonal pattern of pasture production in many parts of New Zealand. Dry periods during summer, resulting in a reduced

pasture quantity and quality, limits lactation and therefore growth from birth to weaning. Low pasture growth rates during winter constitute a management problem making it difficult to achieve high growth rates during that season. Furthermore, stags have a physiological reduction in growth rate during winter. Means of overcoming feed quality and quantity deficits at certain times of the year, evaluation of highly palatable and high energy diets and investigation of means of manipulating the physiological growth pattern of stags all provide fertile areas for research.

In 1987 a team at Massey University involving animal scientists, agronomists and veterinarians set out to study deer growth with the objective of having a higher percentage of stags achieve 92kg liveweight by 12 months of age. In addition to investigating a range of forage types spanning all four seasons, focusing on lactation and growth to weaning, and autumn, winter and spring growth, our trials have investigated immunisation against melatonin and gondatrophin releasing hormone and have investigated the nutritional and metabolic basis of a range of our findings using deer fistulated in the rumen or oesophagus (Ataja, 1991) and using deer housed in metabolic cages (Domingue *et al* 1991). This paper presents a brief summary of the research findings on grazing strategies to date.

2. Growth from Birth to Weaning

Red deer hinds require approximately 47 5 MJME per day for lactation (Fennessey & Milligan, 1987), more than twice that required for maintenance To achieve this level of intake, forages available must be palpable, of sufficient bulk on offer, and of high energy content. Provision of this type of feedstuff presents problems to farmers in most parts of New Zealand and therefore growth potential of young deer to weaning is often not realised. In 1989/90 our group studied bodyweight patterns of both hinds and offspring on red clover and conventional ryegrass white clover pastures. Red clover was chosen for the study on the basis of previous dietary preference studies, because it has a deep tap root offering a component of drought resistance, and its high nutritive value.

Hinds and their offspring were randomly allocated to four treatment groups involving three herbage allowances of red clover and one of perennial ryegrass white clover (PRG/C) as a control Deer were placed on the trial plots for a 60 day period from the end of December 1989. All deer were weighed regularly during that time. Final corrected bodyweight differences are presented in Table 2

Table 2. The effect of grazing red clover upon fawn growth during lactation (1989-90).

	Ryegrass/white clove pasture	Red Clover		
	Medium	Low	Medium	High
Herbage allowance (kg DM/hind/d)	10	6	10	16
Weaning weight (kg)	42.8	46.7	49.5	51.3
Fawn growth (g/d)	333	380	433	461
Hind weight change (g/d)	-52	5	58	53

Niezen et al (1991).

Deer performance increased with an increasing allowance of red clover. Of interest is that even on a low allowance of red clover, weaning weights were higher than those on ryegrass/white clover pastures. Another significant observation from this study is that hind bodyweights on all of the red clover allowances increased during lactation while those on ryegrass/white clover decreased bodyweight This resulted in a difference in weight at weaning from the medium and high clover groups in excess of 6kg when compared with those on ryegrass/white clover.

This study has been repeated in part during the 1990/91 season, with the inclusion of chicory as a pasture variable. Preliminary results indicate that, again, a higher growth rate of offspring has been achieved from red clover, while an intermediate improvement in growth rate has been achieved on chicory swards. Once analysed these data will be reported fully elsewhere.

3. Growth During Autumn and Spring

At the end of the experiments reported in 2. above, fawns were re-randomised in equal numbers (10) of both stags and hinds and were allocated to grazing either red clover or perennial ryegrass/white clover pasture during autumn During winter, all deer were managed together on ryegrass/white clover pasture because the growth rate of pure red clover swards decreases to insignificance during winter and there is a risk of damaging the root crown if red clover pastures are grazed heavily during that period. During the spring the deer were re-allocated to their original autumn grazing groups and once again grazed on red clover or ryegrass/white clover swards. Feed allowance was 7kg DM/head/day during autumn and 8kg DM/head/day during spring. Results are presented in Table 3

Table 3. Effect of grazing red clover upon the growth of stags and hinds from weaning to 1 year of age (1990).

	Pasture		Red Clover	
	Stags	**Hinds**	**Stags**	**Hinds**
Liveweight gain (g/day)	197	173	263	200
Autumn	110	54	103	55
Winter	343	218	366	238
Spring				
Mean Liveweight (Kg)				
March 7	46.3	47.3	47.1	47.9
May 19	60.7	59.9	66.3	62.5
September 11	73.2	66.1	78 1	68.7
November 29	100.3	83.3	107.0	87.5
Stags attaining at least 92kg by 30 November (%)	85		100	
Carcass data:				
Dressing out %	53 0		55.4	
GR tissue depth (mm)	6.3		9.2	

G. Semiadi, personal communication.

Growth rate of young deer grazing red clover was greater than that of comparable deer grazing pasture during both autumn and spring. The response was slightly greater during autumn than during spring. During winter there was no evidence of compensatory growth in deer that had grazed the PRG/C sward during autumn.

The most significant outcome of this study was that 100% of the stags grazing red clover during autumn and spring achieved the target weight of 92kg or greater by November 30. Eighty five percent of animals grazing pasture throughout achieved this target. Stags grazing red clover had a slightly higher killing-out percentage and GR measurement. Interestingly, one stag from each treatment group was graded overfat.

4. **Winter Growth**

The theme of this study was to compare the growth of young deer grazing annual ryegrass/perennial ryegrass/white clover pastures ARG/PRG/WC with those of comparable deer grazing normal perennial ryegrass/white clover pastures ARG/WC. "Grasslands Moata", annual ryegrass was introduced with the objective of increasing winter animal carrying capacity and of improving pasture nutritive value "Moata" ryegrass has a higher growth rate during winter and has a slightly higher energy content than perennial ryegrass.

The first component of the study involved comparing pastures maintained at either 5cm or 10cm surface heights. Pastures were maintained at these heights for two consecutive 100 day periods being winter from early May to late August and spring from late August to the end of November. The "Moata" annual ryegrass was introduced to an existing ryegrass clover sward by direct drilling in two directions with band spraying to control the existing herbage. Grazing was by continuous set stocking with pasture heights being monitored regularly and stock introduced or withdrawn as necessary in order to maintain pasture heights at 5 or 10cm.

Results are presented in Table 4

Table 4. Effect of direct drilling perennial ryegrass/white clover pasture with annual ryegrass upon the growth of weaned red deer stags from 6 to 12 months of age (Experiment 1988).

	Perennial ryegrass /white clover		Annual ryegrass/perennial ryegrass/white clover	
Surface height	**5cm**	**10cm**	**5cm**	**10cm**
Initial liveweight (kg)	59.8	56.9	60.2	60.7
Pasture mass (kg DM/ha):				
Winter	1236	1840	1148	1694
Spring	1731	2251	1690	2022
Organic matter digestibility (%):				
Winter	81.9	81.4	82 5	81 6
Spring	79.1	76.4	79 0	77 8
Liveweight gain (g/d).				
Winter	74	153	79	131
Spring	147	234	211	209
Stags attaining at least 92kg liveweight by 30 Nov (%)	0	42	21	50
Carcass data:				
Dressing-out percent		54.6		55.2
GR tissue depth (mm)		5.8		5.0

Ataja et al (1991a)

In this trial "Moata" annual ryegrass comprised 45% of the sward dry matter during winter and 22% during spring. The major finding of this study was the increase in deer production from grazing 10cm compared with 5cm pastures which resulted in a considerably higher number of deer reaching the 92kg target weight at 12 months of age. The introduction of "Moata" annual ryegrass resulted in a small increase in the number of stags attaining the slaughter rate as a result of higher growth rates on the 5cm pastures during spring and to a higher weight at the beginning of spring in the group of animals on the high allowance during winter. Organic matter digestibility was high at all times as a result of carefully maintaining pastures in a vegetative state. The "Moata" pastures carried three deer per hectare more than controll pastures during winter

The next experiment involved comparing pasture based on perennial or annual ryegrass under rotational grazing. "Grasslands Moata" was introduced as above Stock were placed onto the PRG/C pastures when they were 10cm surface height and removed once they reached 8cm surface height to give a residual pasture mass of approximately 1600kg DM/ha. Stock were grazed on the annual ryegrass paddocks where a higher surface height was required (11-14cm) to produce similar pasture mass values. A 5 week rotation was used in winter and a 3 week rotation in spring

Results are presented in Table 5

Table 5. Effect of direct drilling perennial ryegrass/white clover pasture with annual ryegrass upon the growth of weaned red deer stags from 6 to 12 months of age (Experiment 1989).

	Perennial ryegrass /white clover	Annual ryegrass/perennial ryegrass/white clover
Initial liveweight (kg)	52.9	52.9
Before grazing (kg DM/ha):		
Winter	2105	2012
Spring	2235	2190
After grazing (kg DM/ha):		
Winter	1600	1587
Spring	1576	1665
Organic matter digestibility (%):		
Winter	80.3	86.1
Spring	78.9	80.4
Liveweight gain (g/d):		
Winter	140	165
Spring	226	235
Stags attaining at least 92kg liveweight by 30 Nov (%)	41	60
Carcass data·		
Dressing-out %	52.6	53.8
GR tissue depth (mm)	2 9	3 6

Ataja et al (1991b).

Under this management "Moata" annual ryegrass comprised 82% of the sward DM during winter and 65% during spring. In controll pastures perennial ryegrass comprised respectively 87 and 79% with the remainder being largely white clover. The higher percentage of "Moata" is reflected in the higher organic matter digestibility when compared with the previous experiment. In both experiments white clover seldom comprised more than 10% of the feed on offer.

Again a modest proportion (41%) of young stags grazing perennial ryegrass pasture at 10cm attained target slaughter weight by 12 months of age A greater proportion (60%) of stags grazing pastures containing annual ryegrass attained the target slaughter weight due largely to faster growth during winter. Carrying capacity during winter was similar for perennial and annual ryegrass pastures in this trial which is a result differing from the previous trial However, spring carrying capacity was less on annual ryegrass than on perennial ryegrass pastures in both experiments due to the annual ryegrass dying out at this time of the year and the sward opening up resulting in a lower herbage production.

Both of these winter-spring trials have shown that an increase in growth rate is possible by the use of "Moata" annual ryegrass However, the management of ARG/PRG/WC pastures is problematic, particularly in spring and summer as the annual ryegrass tends to go reproductive early in summer

and therefore the pasture both dies out and declines in quality and bulk An economic analysis of all this data has shown that the reduced carrying capacity in spring and the cost associated with establishment and maintenance of the annual ryegrass swards negated the improvement in financial returns as a result of a higher proportion of animals attaining target slaughter weights at the required time and the overall slightly higher stocking rate during winter on the "Moata" swards.

5. Discussion

This paper briefly discusses some of the results from 3 years of trial work investigating growth responses on a range of pasture types and under different management systems. A summary of results is presented in Table 6. While there are some seasonal and managemental differences in conduct of trials between years, there are a number of important conclusions that can be reached from our data so far.

Table 6: Summary of trial results 1988-90 on attainment of slaughter weights (92 kg lwt) by red deer stags

Year	Treatment			% achieving 92kg L.wt by Nov 30
	Autumn	Winter	Spring	
1988	-	Moata 10[1]	Moata 10[1]	50
	-	Moata 5[1]	Moata 5[1]	21
	-	PRG/C 10[2]	PRG/C 10[2]	32
	-	PRG/C 5[2]	PRG/C 5[2]	0
1989	-	Moata[3]	Moata[3]	60
	-	PRG/C[3]	PRG/C[3]	41
1990	Red clover[4]	PRG/C	Red clover[5]	100[6]
	PRG/C[4]	PRG/C	PRG/C[5]	85[6]

1. Moata sward and minimum pasture height (cm)
2. Perennial ryegrass/white clover sward, and minimum pasture height (cm)
3. Moata and PRG/C minimum residual DM 1600kg/ha
4. Allowance 7kg DM/day
5. Allowance 8kg DM/day
6. Half of each group were grazed on red clover prior to weaning and were heavier at weaning (see Table 2).

The first major conclusion is that progress can be made in terms of deer growth from good management of perennial ryegrass/white clover pasture Grazing at 5cm surface height during winter and spring resulted in no deer attaining target slaughter weight by one year of age. However, grazing to 10cm surface height during winter and spring resulted in 40% of animals reaching the target weight and when this system was extended to include autumn in another trial, 85% of young stags reached slaughter weight by one year of age. The important message is that to achieve maximum growth rates, very generous pasture allowances must be offered Many in the deer industry have been sceptical that these pasture allowances cannot be provided in practice, but we believe the major difficulty is one of perception and that farmers are simply not accustomed to feeding their stock so well The important thing for the deer industry is to recognise that in order to achieve maximum financial returns, given the relationship between carcass weight, growth patterns and the venison schedule fluctuations, high individual animal performance must be achieved. From an animal health perspective, there are probably clear advantages in reducing winter mortality which is common in poorly fed weaner deer during the winter.

While we have observed some increase in deer growth from direct drilling with annual ryegrass and also an increase in winter carrying capacity on some occasions, our economic analyses show that the benefits of improving winter performance do not cover the additional cost involved.

Based on one year's information, but which has been re-inforced by provisional data from 1990/91 trials, it would appear that red clover has considerable potential as a feed for deer managed properly. Greatest weight gains appear to accrue during lactation, but improvement in weight gain can be carried forward when deer graze red clover during autumn and spring until one year of age Higher hind body weights during lactation probably improve the rate of onset of oestrus in hinds. Thus, establishment of red clover swards has a dual purpose in providing the quantity and quality of feed ideal for lactation, but also improving the growth rate of offspring to one year of age. From an annual management point of view, once the 12 month old deer are slaughtered the red clover then becomes available for the next annual cycle of lactation. We have never observed bloat in red deer grazing pure red clover, but we have observed a harmless red urine phenomena which has been described earlier (Wilson et al, 1990)

Because of its deep tap root red clover is ideal for growth over dry summer periods. Unlike white clover, red clover does not have stolons and hence does not spread under grazing conditions Damage to its crown and tap root will kill the red clover plant. This is the reason why it should never be overstocked and should never be grazed heavily during wet weather Thus, red clover could be developed as a specialist feed for a deer operation on a portion of the farm It must be recognised that it will need specialist management.

Currently, our group is extending its studies with red clover and are also evaluating chicory as a feed for lactating and growing deer Preliminary results show some advantage of chicory over ryegrass clover pastures, but not equivalent to red clover.

Our studies have shown that there is considerable potential for improving deer growth using a range of pasture species Complementary studies are being undertaken elsewhere in New Zealand (Hunt and Hay, 1991). It is likely that in the future, evaluation of further pasture species will be undertaken and with moves toward low input farming, research efforts will likely tend to focus on integration of a range of pasture species, along with a range of livestock species

References

Ataja, A.M 1991. Venison production from weaner red deer stags grazing Moata annual ryegrass or perennial ryegrass pastures. PhD Thesis, Massey University, Palmerston North.

Ataja, A M., Wilson, P.R , Barry, T.N., Hodgson, J. and Purchas R W 1991(a). Early venison production from red deer. 1. Effects of grazing perennial or annual ryegrass based pastures at two surface heights and of immunization against melatonin. Journal of Agricultural Science submitted.

Ataja, A.M., Wilson, P.R , Barry, T.N., Hodgson, J and Purchas R.W 1991(b) Early venison production from red deer. 2. Further studies comparing pastures based on perennial or annual ryegrass and immunization against melatonin. Journal of Agricultural Science submitted.

Domingue, B.M.F. (1989) A comparative study of voluntary intake and rumen digestion by deer, goats and sheep PhD Thesis, Massey University.

Fennessy, P F., Milligan, K E (1987). Grazing management of deer N Z.Soc.An.Prod. Occasional Publ. No. 10, 111-118

Hunt, W. and Hay, J. 1991. Trialing a high quality pasture system for maximum venison production The Deer Farmer, February page 21

Neizen, J.H., Barry, T.N., Hodgson, J., Wilson, P R. and Holmes, C.W. 1991 The effect of three allowances of red clover on red deer fawn growth and liveweight change in lactating hinds. Proceedings NZ Society of Animal Production 51 (In Press)

Scott, E.I. 1989. Pasture preferences of deer. Proceedings NZVA Deer Branch Course for Veterinarians No. 6, p176-180.

Wilson, P.R., Neizen, J H., Barry, T.N., Chick, M. 1990. Deer on red clover produce red urine: A case report. Proceedings NZVA Deer Branch Course for Veterinarians No. 7, p135-138.