GROWTH AND VENISON PRODUCTION: RED AND FALLOW DEER

3

J.L. Adam and G.W. Asher
Ruakura Animal Research Station
Hamilton

R.A. Sandrey
Lincoln College
Canterbury

SUMMARY

- Both male red and fallow deer showed seasonal growth patterns between weaning (3-4 months) and 14 months of age.
- Increases in stocking rate with males of both species decreased individual performance but increased per ha production.
- Conversion of pasture dry matter to gains in both live and carcass weight in both species were similar to those reported elsewhere for Friesian beef steers.
- Growth rates of red deer stags were virtually zero over autumn-winter (15-21 months) but rapid gains were made over spring to 24 months.
- Gross margin analysis, using red deer stags, showed that the stocking rates of 16 and 20 stags/ha were more profitable than 24 stags/ha up to 14 months.
- Additional hot carcass weights/stag were calculated which would equate gross margins for 24 month killing with that of 14 months.
- Estimates were made of the likely value changes in the venison schedule required to spread the stag kill over the season.

Introduction

Associated with the increase in numbers of farmed red deer and the completion of several deer slaughter premises (D.S.Ps) has been the emergence of specialist deer farming systems. These include farms producing weaners, rearing stags for venison and those producing primarily velvet.

Profitable venison production depends upon stag growth rate between purchase and slaughter. Relevant to venison production is the effect on growth rate of both season and stag age. These effects have been documented with indoor housed ad libitum concentrate fed stags (Fennessy 1981) and with stags at pasture (Adam 1984). Of particular importance was the zero growth of rising two year old stags over the 6-7 month autumn-winter period. This led to the observation that a slaughter age of 14 months would be preferable to 24-26 months (Adam 1984). However, this could have the effect of increasing both slaughter capacity and slaughter costs to cope with a seasonal kill.

This paper examines the effects of stocking rate, with red and fallow deer, in terms of per animal and per hectare production up to 14 months of age. Gross margins were calculated for red deer stags at different stocking rates, for slaughter at 14 versus 24 months together with likely differentials in venison schedules required to spread the age at slaughter.

Stocking rate trials

Information used in this paper was taken from two separate trials. For the first, 60 weaner red stags were purchased or loaned in each of March 1982 and 1984. They were stocked at the rates of 16, 20 and 24 stags/ha until they reached 14 months of age.

In April 1984, 40 weaner fallow bucks were similarly acquired and stocked at 32 and 48 bucks/ha to 14 months. Both species were reared on 0.5 ha farmlets. For red deer farmlets were divided into 10 paddocks, but for fallow deer the farmlets were subdivied into eight paddocks. Farmlets were rotationally grazed with stock being shifted on the same day on all stocking rate treatments within a trial.

Whereas fallow bucks were slaughtered at 14 months of age, the red stags were kept until 24 months before slaughter for each of the 2 years of the trial. For the first intake, the full stocking rates of 16, 20 and 24 stags/ha were taken through to 24 months. For the second intake, stocking rates were reduced by 4 stags/ha in February (14 months) for the period up to 24 months of age.

Venison production at 14 months

Both the fallow and red deer showed obvious seasonal growth patterns between weaning (3-4 months) and 14 months of age (Fig. 1). For both species most of the variation in 14 month weight due to stocking rate had showed up by the end of autumn.

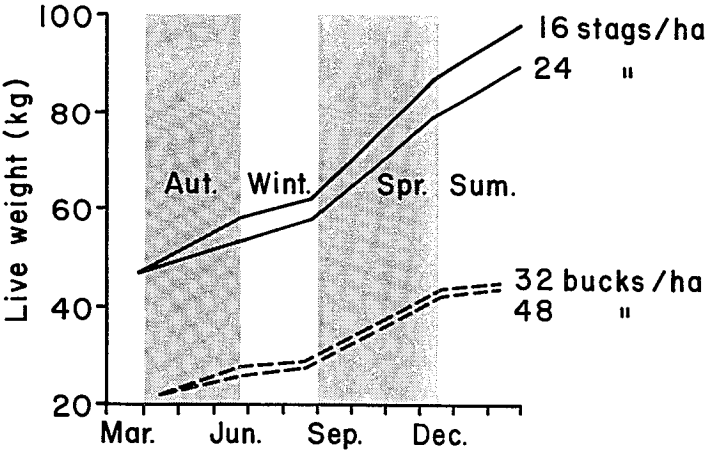

Fig. 1: Effects of stocking rate and season on the growth patterns of male red and fallow deer.

The large effect on daily gains of stocking rate in autumn, relative to other seasons, can also be seen in Table 1.

Table 1: Effects of stocking rate and season on the growth rates (g/d) of male red and fallow deer.

Species	Stocking rate/ha	Season			
		Autumn	Winter	Spring	Summer
Red	16	137	67	211	159
	24	87	49	196	143
Fallow	32	68	22	117	28
	48	53	25	116	41

In addition, there was a decrease in growth rate, regardless of stocking rate, over the summer. This may have been due to the spring flush of pastures getting out of control particularly on the farmlets stocked with fallow deer. Thus the fallow deer were forced to graze a standing hay crop. For both species, by about 14 months of age (February) increasing stocking rate decreased average animal carcass weight and increased per ha carcass production (Table 2).

Table 2: Effects of stocking rate on per animal and per ha production.

Species	Stocking rate/ha	Per animal	Hot carcass weight (kg)	
			Gross/ha	Net/ha
Red	16	56.5	904	498
	24	51.5	1236	625
Fallow	32	25.5	816	430
	48	24.7	1185	608

Despite the arbitary choice of using two fallow buck weaners as "equivalent" to one red stag weaner, and the shorter trial period for the fallow, per ha carcass productions were similar for red and fallow deer for "equivalent" stocking rates. However, because two widely differing stocking rates are inadequate to estimate the relationship between stocking rate and production, the results cannot be used to compare the average performance of the two species.

Conversion of pasture dry matter to gains in both live and carcass weight showed futher similarities between red and fallow deer (Table 3). Thus for the whole trial between 11 and 14 kg of pasture dry matt=r were required/kg liveweight gain. Similarly, between 17 and 21 kg of dry matter were required/kg of hot carcass weight gain.

Table 3: Conversion of pasture dry matter (kgs/kg) to increases in live and hot carcass weight.

Species	Stocking rate/ha	Season Autumn	Winter	Spring	Summer	All	Hot carcass
Red	16	9	21	8	16	11	21
	24	11	14	8	9	11	19
Fallow	32	16	50	8	43	14	21
	48	17	25	7	24	11	17

When expressed per 1000 kg of pasture dry matter intake the weights of carcass produced were similar to that of Friesian beef steers. They also increased with increasing stocking rate as reported for those steers by Joyce (1970).

Venison production at 24 months

Three key results were found when red stags were retained beyond 14 months (February). Firstly, there was virtually no increase in stag liveweight over the 7 month period from March to September. Secondly, average increases in hot carcass weight varied from 6.5 to 10.5 kg/stag between stocking rates over the period 14 to 24 months. These gains were made over the spring. Finally, velvet yields at 24 months averaged 0.8 kg/stag. These weights did not appear to be influenced by stocking rate.

Gross margins

Stocking rate to 14 months with red stags

Venison production at 14 months averaged 920, 1118 and 1234 kg/ha for stags stocked at 16, 20 and 24/ha. Gross margins for the three stocking rates were $1282, $1320 and $833/ha (Table 4).

Table 4: Gross margins for red deer stags killed at 14 months of age.

Stocking rate (stags/ha)	16	20	24
Venison (gross kg/ha)	920	1118	1234
Revenue (@ $6.25/kg)[1,7]	5748	6991	7713
Costs			
Weaner stags (@ $225)[2]	3600	4500	5400
Opportunity cost of capital[3]	540	675	810
Winter feed[4]	94	206	322
Transport ($10/stag)	160	200	240
Expected deaths (@ 2%)[5]	72	90	108
Total variable costs	4466	5671	6880
GROSS MARGIN ($/ha) (Revenue-costs)[6]	1282	1320	833

[1]Quoted price 50.1 to 70 kg hot carcass weight April 1986.
[2]Landed price.
[3]15% interest rate on landed price.
[4]Hay @ $3/bale and maize @ 28.8c/kg.
[5]2% death rate calculated on landed price.
[6]Ignoring all fixed costs and some variable costs such as animal health.
[7]May be overstated as revenue $5.50 for 50 kg and lower.

The opportunity cost of capital is included, but not the opportunity cost of other resources such as land and management because they are assumed to be fixed. Little difference exists in profitability, using marginal analysis, between the two lower stocking rates, and both dominate the highest stocking rate. Preliminary results suggest that the optimal stocking rate is nearer 20 than 16 stags/ha.

Stocking rate to 24 months with red stags

As long as it is remembered that stocking rates were reduced in only one of the second years to fit the animal requirement to pasture supply, comparisons of the stocking rates have been made in Table 5.

The cost of the stags was calculated at their respective slaughter value (less transport costs). Gross margins were negative in all cases. Adding $30/stag for velvet enabled one of the stocking rates to break even. From this data and the cost assumptions used it is impossible to determine which stocking rate is "optimal" for rising 2 year stags. However, stags stocked at 20/ha were apparently less profitable than other stocking rate options. Some indication of the superiority of the 14 month stags (or conversely the opportunity cost of not slaughtering at 14 months and not replacing with new weaners) is shown by the extra hot carcass weight per stag required to bring up gross margins to the level of 14 month stags. This analysis allows for $30/stag net returns from velvet.

Table 5: Gross margin analysis for stags killed at 24 months.

Stocking rate (stags/ha)	12	16	20	24
Venison (gross kg/ha)	781	1080	1190	1480
Revenue (@ $6.25/kg)[1]	4879	6750	7438	9256
Costs				
14 month stags[2]	4128	5660	6500	7464
Opportunity cost capital[3]	619	834	995	1120
Winter feed[4]	274	488	735	1020
Transport to DSP ($10/stag)	120	160	200	240
Expected deaths[5]	83	112	131	150
Total variable costs	5224	7254	8545	9994
GROSS MARGIN ($) (Revenue-costs)	-345	-504	-1107	-738
Velvet ($30/stag)	360	480	600	720
NEW GROSS MARGIN	+15	-24	-507	-18
Extra carcass wt[6] (kg/stag) plus velvet	17.1	13.3	14.5	8.8

[1]Quoted price 50.1 to 70 kg hot carcass weight April 1986 and $5.75/kg 70.1 kg and over. May overstate income.
[2]Cost calculated on venison return at 14 months.
[3]15% interest on cost calculated on venison return at 14 months.
[4]Hay @ $3/bale and maize at 28.8c/kg.
[5]2% death rate calculated on venison return at 14 months.
[6]Equates to a gross margin of $1,300/ha at 14 months.

Optimal slaughter age

The optimal slaughter is reached when the returns from keeping a stag in the herd are equated to the associated costs. This decision rule derived by Sandrey and Zwart (1984) is:

$$pw + wp + PvWv = rpw + ci$$

where pw = venison price times expected carcass weight change
wp = carcass weight times expected change in price
PvWv = expected price and yield of velvet cost)
ci = other cost including opportunity costs of other resources used

The analysis shown in Table 5 clearly demonstrates the components of the above equation. Terms on the left are dominated by the marginal costs of keeping stags for an extra year. Hot carcass weight gains of between 8.8 and 17.1 kg/stag would be required before it is as profitable to keep stags for 2 years as it is to use the same resources for a one year turnover of weaners, even allowing for the $30/stag return from velvet. Unless these returns can be made or the venison schedule increase then stags should be killed at between 14 and 16 months. The opportunity cost of resources other than capital will vary when a system other than purchasing more weaner stags is the next best alternative. For example, given current returns from sheep, if the second year of stags replaced sheep the the opportunity cost of "other" resources would be lower. Negative gross margins would still result without velvet but the extra carcass weight/stag needed to equate to sheep would be lower than shown in Table 5.

Seasonality of venison production

The above equation can also be used to provide some insight into other issues. Producers are faced with a situation where little growth can be expected (March and September) with rising 2 year stags. For an interage class comparison expected velvet returns are zero. Thus, from a farmers perspective, costs on the right of the equation must be balanced by a change in schedule price.

Assuming no growth over the second autumn-winter period until the following spring, we can calculate the increase in schedule price required to ensure farmers are indifferent to the two killing ages. The opportunity cost of capital (15%) and the expected probability of death (2%/year) translates to a cost of $18.79, $22.86 and $25.22 per ha per week for the respective stocking rates of 16, 20 and 24/ha (Table 4). An increase of about 2c/kg each week would compensate for this. Difficulties arise when the opportunity cost of other resources are considered. If sheep farming is the alternative, then the opportunity costs are low until winter feeding costs are incurred. However, if a high turnover using weaner stags is considered, another 2c/kg/week is required. Additional winter feed costs must also be added if killing is delayed until winter. Thus at least 4c/kg/week, plus winter feeding costs, are needed to ensure farmers are indifferent to the killing age of 14 month stags.

Restricting slaughter capacity would ensure an even supply of venison. This forces farmers to bear all the costs associated with the inability to kill at the optimal time. Increasing capacity to handle a seasonal kill would impose costs on D.S.Ps. More research would be required to establish the economically optimal timing of killing from the industry's viewpoint. Information on scale costs of killing, marketing requirements and the net opportunity costs to the nation would be needed to determine optimum plant size and thus seasonality of kill.

References

Adam, J.L. (1984) Growth and venison production of farmed red deer stags in the northern region. 9th Annual Conference New Zealand Deer Farmers Association, Hamilton. pp 72-79.

Fennessy, P.F. (1981) Nutrition of red deer. Proceedings of a deer seminar for veterinarians. Queenstown. pp 8-15.

Sandrey, R.A. and Zwart, A.C. (1984) Dynamics of herd buildup in commercial deer production. Agricultural Economics Research Unit Research Report No. 153.