

Recommendations for improving performance in deer production systems

1. Improving pregnancy rate and achieving early conception date in breeding hinds

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Abstract

Increased profitability of deer farming through increased reproductive performance in terms of pregnancy rate and conception date was one of the aims of the Deer Master project. Reproductive data collected on 16 South Canterbury farms over three years was used to determine performance and how production could be increased

For mixed age (MA) hinds, pregnancy rate increased during the 3 years from 89 to 95%. However, median estimated conception date remained unchanged. There was no consistent increase in pregnancy rate for R2YO hinds with the 1999 result the lowest of the three years. There was no change in median estimated conception date for R2YO hinds.

Hind age, hind body condition at mating, liveweight of R2YO hinds and mating management were factors which affected pregnancy rate and conception date. Sire type, previous estimated conception date and mating group size did not affect reproductive performance.

1. Introduction

The Deer Master Project was initiated to evaluate normal production performance from commercial deer farms (Campbell, 1998).

Within a deer production system, the ability of a hind to successfully rear a fawn is paramount to achieving high levels of production. Each hind consumes part of the feed costs, animal health costs and capital cost of the stag and failing to produce a fawn represents a zero return to the system. Consequently efficient deer production systems need to achieve a high pregnancy rate (hinds conceiving per hind mated)

It is also desirable to have an early (early- mid November) mean fawn birth date as this is critical for achieving high (>50kg) weaning weight (Beatson et al, this publication) and contributes to fawn survival and therefore weaning rate (Audige, 1995 and Beatson et al, this proceedings). Advancing the median fawning date (date by which 50% of fawns have been born) by 2 weeks, from a median of 1 December to 17 November (Figure 1) was seen as a further means of increasing productivity

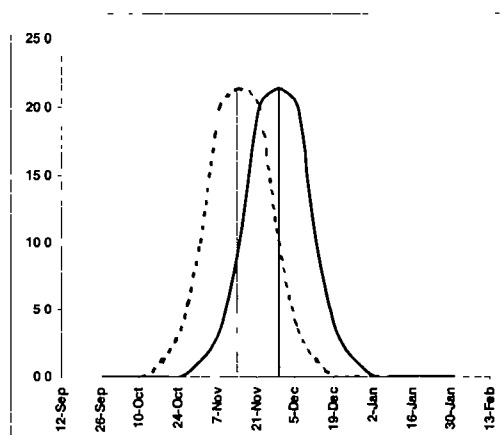


Figure 1. Deer Master fawning profile (solid line) and target profile (broken line) advanced by 2 weeks

The mean pregnancy rate and median fawning date of Deer Master herds at the inception of the project and the target performance levels are presented in Table 1.

Table 1. Mean herd pregnancy rate and median fawning date of MA and R2YO hinds at the beginning of the project and those set as a target.

		Start	Target
Mean pregnancy rate	Mixed Age	85%	93%
	R2YO	80%	90%
Median fawning date	Mixed Age	2 Dec	15 Nov
	R2YO	13 Dec	1 Dec

This paper investigates and identifies factors which may contribute to a high proportion of dry hinds and a late median fawning date within a herd

Observations in this paper are not subject to statistical analysis unless otherwise stated.

2. Information source

The survey of hind pregnancy and estimated conception date was carried out in the North Otago/South Canterbury area. Data from up to 16 herds over 3 years was collected.

Data included

- Pregnancy status (pregnant or non-pregnant) was determined in mid June by ultrasound examination (rectal probe), using the technique of Revol and Wilson, (1991).
- An estimate of the age of pregnancy and therefore an estimated conception date.
- Body condition score of hinds before mating (March) and after mating (May) using the technique of Audige *et al* (1998)
- Liveweight of R2YO hinds.
- Age (in years) of hinds.
- Mating management

For some analysis, hinds were grouped by estimated conception date into early, (estimated conception date prior to 1 April), mid, (estimated conception date between 1 April and 18 April) and late (estimated conception date after 18 April)

3. Generic Data

Pregnancy rate and conception date information for all mixed age (R3YO and older) hinds scanned in all 3 years is presented in Table 2.

Table 2. Mixed age hind conception data for 1997, 1998 and 1999 breeding season for all participating farms.

Year	Mated	Pregnancy rate (%)	Between farm range	% Early	% Middle	% Late	Estimated median fawning date
1997	4638	89.3	73 – 98%	21	49	20	30 Nov
1998	3681	91.8	78 – 98%	36	43	14	30 Nov
1999	4480	94.8	89 – 98%	26	45	25	1 Dec

Key points

- Since 1997, the proportion of adult hinds scanned “in fawn” has increased about 6% from 89% to 95%. For the average adult herd (n=323) this represents an additional 19 hinds in fawn.
- Over the past three years there has been no change in the median fawning date of mixed age hinds of the group. However, the median fawning date on individual farms varied between 19 November and 11 December suggesting there is the opportunity for improvement on some farms.

Reproductive data for R2YO over the past three years is presented in Table 3

Table 3. R2YO hind conception data for 1997, 1998 and 1999 breeding season for all participating farms.

Year	Mated	Pregnancy rate (%)	Between farm range	% Early	% Middle	% Late	Estimated median fawning date
1997	1180	81.9	57 – 93	4	33	46	11 Dec
1998	1158	85.4	80 – 97	4	24	57	15 Dec
1999	1614	77.8	52 - 96	6	16	60	15 Dec

Key points

- Pregnancy rates in R2YO hinds have not shown the same consistent increase as their mixed age counterparts with the 1999 result lower than 1998. However, in any year there remained individual properties able to achieve R2YO hind pregnancy rates above 90%.
- Achieving early conceptions in R2YO hinds has also proven difficult with only 4-6% of hinds conceiving before 1 April in any year.
- This data highlights that on many properties R2YO hinds are an area of weakness in terms of pregnancy rate and conception date.

4. Factors affecting pregnancy rate and conception date

4.1 Age of hind

Pregnancy rates and estimated conception date for hinds with known age in 1997, 1998 and 1999 are given in Table 4.

Table 4. Estimated median conception date and pregnancy rate of hinds stratified by age.

Age	Pregnancy rate	Median Conception date	Number of hinds
R2YO	86.1	28-April	1101
R3YO	90.9	14-April	887
R4YO	91.8	11-April	623
R5YO	92.3	9-April	1977

Discussion

For R2YO hinds the median estimated conception date occurred 17 days later compared to all other age groups combined (28 April vs 11 April). This data confirms the difference between R2YO hinds and those older (Audigé *et al.* 1999a) but is unique in that it also highlights differences between R3YO and R5YO hinds.

Hinds fawning for the second time (R3YO) were 5 days later on average than hinds 5YO and older. Hinds at their second mating may be still to reach mature body weight and may be of lower body condition having fawned and lactated later than older hinds. This is known to delay oestrus. They may also be lower in social hierarchy and therefore subject to more social stress which may also affect their ability to conceive early.

Scan negative rates in R2YO (13.9%) were almost twice those recorded in the oldest animals (7.7%) and similar to the 15.3% reported by Audigé *et al.* (1999a) for R2YO.

Reproductive performance of R2YO hinds remains an area for improvement on many deer farms. However, the biological potential of this age group is demonstrated by the high pregnancy rate on some farms.

Summary

- *MA hinds conceive on average 17 days earlier than R2YO hinds.*
 - *There are significant differences between R5YO hinds and younger hinds in terms of conception date.*
 - *Younger hinds have a higher probability of not conceiving relative to older hinds on most but not all farms*
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4.2. Body Condition score of MA hinds

Audige *et al* (1998) proposed a system for assessing the body condition of hinds (body condition score [BCS]) and showed BCS to be an important contributor to reproductive success

In this study, BCS of MA hinds taken at mating had an influence on both pregnancy rate and conception date (Table 5).

Table 5. Median conception data of hinds of different BCS categories at weaning and conception date and pregnancy rate of a subset of the Deer Master herd.

BCS	Median conception date	Pregnancy rate (%)	Number of hinds
0-2.5	11-April	84.6	609
3.0-3.5	11-April	95.1	2053
4.0-5.0	6-April	95.5	668

Discussion

Mixed age hinds with a low BCS (≤ 2.5) were less likely to conceive than hinds of a higher body condition (≥ 3). Hinds of BCS greater than 3.5 were no more likely to conceive than those at 3-3.5 suggesting a threshold may exist around 2.5, consistent with observations of Audigé (1999b). The difference in pregnancy rate between hinds in poor condition (≤ 2.5) and those in good condition (≥ 3.5) is about 10 percentage units

BCS also has an effect on conception date. Hinds in good condition (4-5) conceived 5 days earlier than those in lesser condition. It cannot be determined from this work whether this is causal. Factors such as weaning status, previous fawning date, feeding and weaning date may also influence BCS at mating

Mating BCS may also be related to age. A large number of hinds with BCS 2.5 and below 3.0 at mating were identified as R3YO. A later birth date and lactation for hinds fawning for the first time may represent a significant draw on body reserves, which are not recovered before mating. In many cases later lactation and declining pasture quality and quantity make increasing BCS of hinds prior to mating difficult

4.3 Changes in Body Condition Score

The effect of changing BCS in MA hinds during mating (Table 6), was investigated to establish whether there was an opportunity to influence reproductive performance.

Table 6. Mean pregnancy rate of hinds with various BCS at mating and the change of BCS between mating and scanning and subsequent conception date and pregnancy rate of a subset from the Deer Master herd.

BCS at mating	BCS change	Median conception date	Pregnancy rate (%)	Number of hinds
	-1			0
0 - 2.5	0	13 April	84	219
	+1	8 April	86	133
	-1	12 April	83	260
3.0 - 3.5	0	5 April	94	341
	+1	9 April	95	98
	-1	31 March	87	48
4.0 - 5.0	0	25 March	95	220
	+1	31 March	100	7

Discussion

There appears to be little benefit in increasing BCS over the mating period in terms of conception date or pregnancy rate, if herds are at or above the 2.5 BCS threshold prior to mating. There appears to be a modest positive effect on conception date and possibly rate, if hinds are below the threshold BCS of 2.5

However large BCS loss (- 1.0), regardless of BCS at mating, decreased pregnancy rate, even in hinds with a high BCS at the beginning of mating

Summary

- *Hind BCS needs to be 2.5 or better at mating for optimum results*
 - *It is necessary to get hinds in optimum body condition before mating rather than during mating*
 - *BCS loss during the mating period should be avoided if optimum results are desired*
 - *A 10% difference in pregnancy rate between hinds in good (4-5) and poor (0-2.5) condition can be expected*
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4.4 Mating Management

A number of mating management systems have been employed. These include use of CIDR's, teaser stags and high stag:hind ratio rising 2YO stags. The result from this work has been disappointing in the effort to increase reproductive performance. Full details are outlined in Beatson et al (1998).

4.5 Mating Group Size

In the past, ratios of 1 stag to 40-60 hinds have been described as normal practice (Audige *et al* 1999a) for red deer. There is however, little performance data of large single sire mating groups.

The use of large (80-135) single sire mating groups was investigated. Results for the last three years (Figure 2) are given below

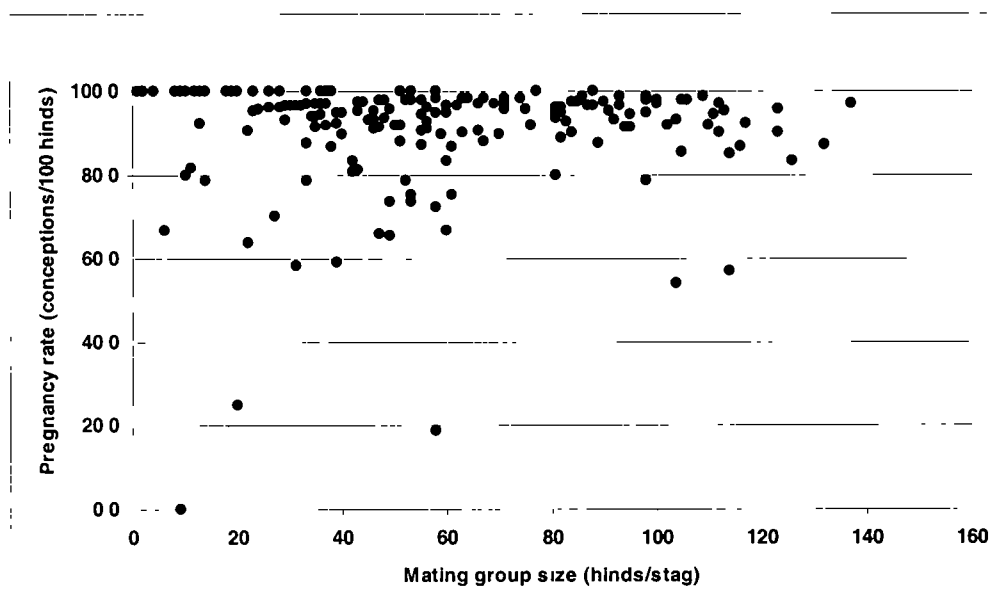


Figure 2 Pregnancy rate of red deer single sire groups recorded between 1997 and 1999. Data only includes adult hinds

Discussion

Large (60+) mating groups achieved a similar pregnancy rate to smaller (1 to 60) mating groups

Stag failure inevitably occurs and the disadvantage of large mating groups is that this would result in a greater number of non-pregnant hinds. To insure against this the use of a back-up stag is recommended. It is also recommended that only hinds and stags of proven fertility, and hinds of BCS 2.5 or more are selected, and that all management, health and nutritional factors are optimum, if low stag hind ratios are used.

There is a risk of creating a greater spread in conception dates in these larger mating groups. To establish whether this was a problem, the variation around mean conception date was calculated for each mating group which had pregnancies aged at scanning (Table 7)

Table 7. The average standard deviation of estimated conception date for single sire mating groups of different size.

	Single Sire Group Size		
	0-60	61-100	100 +
Average variation (SD) (days)	10.0	10.3	11.3
Number of sire groups	24	27	13

This shows that there is little difference in spread in conception date between small and large mating groups

Summary

For single red sires mating red hinds:

- *Large mating groups (60+) can achieve conception date and pregnancy rate equivalent to that of smaller sire groups.*
 - *Large mating groups (60+) increases the number of hinds mated to a superior sire, reduces the number of stags required and will reduce the number of paddocks required for mating.*
 - *Stag failure occurs regardless of mating group size and stag back-up is recommended.*
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4.6 R2YO hind liveweight

More than 20 years ago a threshold liveweight of 65-70kg was proposed for the onset of puberty in R2YO hinds. The pre-mating liveweight of R2YO hinds in this study was investigated to determine a liveweight useful as a management target.

R2YO hinds averaged 85.4 in 1998 and 82.1 in 1999. The difference between years is likely to be due to the adverse feed conditions that prevailed in the area during the 1998-99 summer.

Data from both years were combined and were sorted on liveweight prior to mating (Table 8).

Table 8. Pregnancy rate for R2YO hinds.

Weight Range (kg)	Number of hinds	Pregnancy rate (%)
>65	6	33.3
66-70	11	72.7
71-75	81	82.6
76-80	147	85.5
81-85	173	85.0
86-90	111	89.6
91-95	63	87.5
96-100	34	89.7
>100	32	88.2

Discussion

In general this data agrees with previous work suggesting a target between 70 and 80 kg is required for satisfactory pregnancy rates. It should be noted that there is a relationship between body weight and BCS. Thus, weight should be read in conjunction with the hind's BCS, with the latter needing to be ≥ 2.5 to achieve optimum performance, regardless of achievement of optimum weight.

4.7 Previous fawning date

In some deer herds there are hinds which are known to consistently fawn early (or are the first to fawn) over a number of years. However, it is unclear, on a population basis, whether hinds which conceive early one year have a greater chance of conceiving early the following year.

Scanning information from 1997, 1998 and 1999 was used to investigate how estimated conception date for individual hinds varied between years. Data from all properties which scanned hinds in two consecutive years was considered. Data was not included from R2YO hinds. Hinds from each farm were coded according to whether they conceived early (before 1 April), middle (between 1 April and 18 April) or late (after 18 April) in both year 1 and 2 (Figure 3).

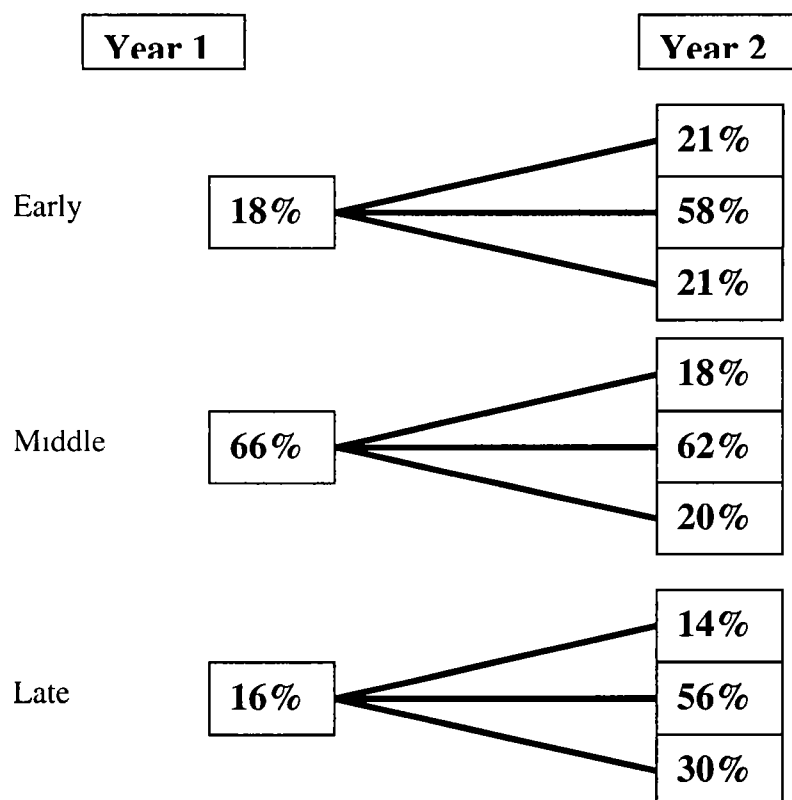


Figure 3 Percentage of hinds ($n = 2313$) wguwg conceived early (unfilled), mid (grey) and late (dark) in year 1 which conceived early, mid or late in year 2

Summary

- Year 1 conception date has no effect on year 2 conception date

4.8 Elk/wapiti vs red deer sires

Often the reproductive performance of wapiti/elk sires is considered to be inferior to red stags. The data of Audige *et al* (1999b) and Lawrence (1998) could not find evidence of this. The reproductive performance information of Deer Master herds provided a further opportunity to compare elk/wapiti with red deer sires.

An analysis was undertaken to determine whether there was a difference in pregnancy rate and conception date between adult (R3YO and older) red hinds mated to elk/wapiti stags and those mated to red stags. Only pregnancy scanning data collected from farms that used both red deer and elk/wapiti sires was used to estimate sire type effects on pregnancy rate and conception date.

Table 9. Pregnancy rate and median conception date of MA red hinds mated to either red or elk/wapiti stags

Sire	Number of hinds	Pregnancy rate (%)	Median conception date
Red	2218	90.9	10 April
Elk	921	94.1	10 April

Discussion

The median conception date (10 April) and pregnancy rate did not differ between elk/wapiti and red mated red hinds in this data set

Based on the current management for the two sire types there is no evidence to suggest hinds mated to either red stags and elk bulls consistently differ in their reproductive performance.

Summary

- *No evidence of different reproductive performance of red deer and elk/wapiti sires.*
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5. Take home messages

In order to achieve high pregnancy rates and an early mean conception date:

- Ensure hinds are in good condition (BCS >3.0) before mating
- Avoid BCS loss during the mating period
- Large mating groups (60+) can achieve a conception date and pregnancy rate equivalent to those of smaller sire groups
- Introduce stags to hinds early in late February
- Ensure R2YO red hinds are above 75kg and of BCS ≥ 2.5 before mating

Other industry recommendations to be considered based on other observations (Audigé *et al.* 1999b,c)

- Cull hinds which have failed to conceive previously
- Wean early (late February or early March)
- Run spiker (R2YO) stags with R2YO hinds during Jan and February

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