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Improving productivity to improve profitability is the aim. Individual animal productivity is a major component of profitability.

Performance recording is the basis of improving productivity. While recording performance is the first stage, using the information is the second and vital stage. Therefore what value are records?

Records have three main uses and can help us with:

- . Decisions on culling
- . Management
- . Genetic selection and breeding, but firstly sorting out the farming objectives is necessary.

### Objectives

Objectives are the critical issue. There is no point in keeping records without clearly working out the objectives. Setting out objectives involves a number of questions:

- . How do you want to make money out of your deer? (velvet, venison, breeding hinds)
- . How much input do you want to put in to the operation?
- . How big do you want your animals?
- . Do you want to breed your own breeding stags or buy them?

The objective will tell you where you are starting from. This is the stage where an outsider can help considerably. A fresh mind which is detached from the immediate day-to-day issues will often bring a clarity to the issues.

### Culling

Deer have a long productive life. Therefore culling the poor performers early in life will result in higher per animal productivity of the remainder. The costs of running a superior animal (within a strain of deer) are virtually the same as running a poor producer. Therefore any increase in per animal production will improve profitability. This is illustrated in the example of the comparative performance of a group of red velveted stags in Table 1. The top 1/6 of stags as two year olds were very much superior over their 2 to 5 year seasons.

Selection on yearling live weight is another alternative (Table 2) retaining the heaviest 1/6 of yearlings would also have resulted in an increased average velvet weight. However, if you want to improve lifetime velvet weight, it pays to select on 2 year old velvet weight and not on yearling live weight.

Similar principles apply to keeping the better producing hinds. Hinds which fail to produce and rear a calf are simply unprofitable. Culling non-pregnant yearlings is a good place to start and therefore pregnancy scanning in hinds in early winter becomes a useful option.

### Management

Management is the key to profitability. Knowing the performance of the animals is a great place to start. Comparing performance across years provides a rational basis for seeing what performance is actually doing. For example, weighing yearling stags and hinds at critical times of the year provides useful data for comparisons. However, the timing is quite critical due to the pattern of growth in young deer. Weights at weaning, end May, end August, mid-December and mid-March are all timed to fit this pattern of growth. Comparing July weights in the year with October weights in another year is not very helpful. The actual timing of weighing depends on the individual farmer's situation and especially on the individual's objectives. All of these weights are not necessarily helpful but choosing the ones that suit your farming situation can be a great help.

### Genetic selection and breeding

When it comes to breeding decisions, the objectives must be clear. If the objective is to improve velvet returns then improving per animal returns is the base. In looking at velvet antler, per animal returns depend on weight and grade. In general terms, velvet weight is positively related to live weight. Antler weight increases at a faster rate than body weight such that a doubling of stag weight results in a trebling of antler weight. Within NZ red deer, a 10 kg increase in liveweight is associated with an 0.1-0.2 kg increase in velvet weight. Currently, quality grading is based on the Korean ideals of stage of growth, length and beam (and the presence/absence of bez tines). In the future, other quality criteria may well come into play e.g. calcification, blood content - but any of these will require new methods of measurement.

Once the character to be improved has been sorted out and the components which make it up identified (e.g. for velvet this means weight and quality), the next stage is to ask the question as to whether the components can be improved. The four questions relate to: heritability, variability, measureability and repeatability. Velvet weight is heritable, with Chinese figures suggesting a value of around 40% for heritability within a strain of deer. It is measureable.

Velvet weight is also variable (the data in Table 1 show the range for a group of nearly 100 NZ red stags). Similarly, velvet weight across years follows a similar pattern in all stags (i.e. it is repeatable). All of these mean that velvet weight can be improved. Experience indicates that velvet quality (e.g. beam, calcification) can also be improved but scientific data are not readily available. The absence of a bez tine in sika deer, as compared with its general presence in red deer, indicates that this is a strain character and therefore is a genetic effect. Therefore stags can be selected which have a lower incidence of bez tines.

### Selection or hybridisation

However, in making decisions about breeding, the most important consideration is whether to stay within the basic NZ red deer or hybridise with the larger strains of red deer or with wapiti. The red deer family is a particularly diverse one varying in size from the small sika to the large wapiti, about a three-fold range in bodyweight. Consequently the options allow us to increase size very quickly by using other strains or sub species or more slowly by selecting within a strain. The decision will depend on the individual farmers objectives.

A comparison of expected impact of selection within NZ red deer (strain A) with hybridisation between strains is shown below. The large strain (strain B) is assumed to be about 30% larger than NZ red deer. The heritability of both velvet weight and liveweight is taken to be around 40% within a strain. However, with hybridisation between strains the heritability is effectively 100%.

Strain A	averages	- stags 200 kg: hinds 110 kg
		- velvet weight at 5 years at 3.6 kg
Strain B	averages	- stags 260 kg: hinds 145 kg
		- velvet weight at 5 years at 3.6 kg

Selection within Strain A using a stag from the top 3% of both live weight and velvet weight over average red hinds:

Top A stag (3.6 kg velvet; 250 kg live weight) X Average A Hinds

Average progeny performance: Strain average + difference between strain average and the individual multiplied by one half the heritability for the strain of individual used.

therefore;

$$\begin{aligned}\text{for Velvet} &= 2.5 \text{ kg} + 1.1 \text{ kg} \times 0.5 \times 0.4 \\ &= 2.5 + 0.22 \\ &= 2.72 \text{ kg}\end{aligned}$$

$$\begin{aligned}
 \text{for Liveweight} &= 200 \text{ kg} + 50 \text{ kg} \times 0.5 \times 0.4 \\
 &= 200 \text{ kg} + 10 \text{ kg} \\
 &= 210 \text{ kg}
 \end{aligned}$$

Hybridisation between an average Strain B stag and average Strain A hinds

Average stag from Strain B (3.6 kg velvet, 260 kg live weight) X  
Average hinds from Strain A

Average progeny performance

$$\begin{aligned}
 \text{For velvet:} & & 2.5 \text{ kg} + 1.1 \text{ kg} \times 0.5 \times 1.0 \\
 & = & 2.5 \text{ kg} + 0.55 \\
 & = & 3.05 \text{ kg}
 \end{aligned}$$

$$\begin{aligned}
 \text{For live weight} & & 200 \text{ kg} + 60 \text{ kg} \times 0.5 \times 1.0 \\
 & = & 200 \text{ kg} + 30 \text{ kg} \\
 & = & 230 \text{ kg}
 \end{aligned}$$

Summary of Comparison

	Strain A		Strain B
	<u>Average</u>	<u>Top</u>	<u>Average</u>
Stag live weight (kg)	200	250	260
Velvet weight (kg)	2.5	3.6	3.6
Hind live weight	110	*	145

Progeny averages expected by mating of these stags over average Strain A hinds

	<u>Within strain</u>	<u>Hybridisation between strains</u>	
Stags Live-weight (kg)	200	210	230
Velvet weight(kg)	2.5	2.72	3.05
Hinds Live-weight	110	116	128

These comparative figures illustrate the general differences expected by following the two alternatives.

However, making the decision to go with the first cross is easy. It is the next step which is difficult. This depends on the objectives. Do you go bigger by mating the hybrid hinds back to the strain B stag or is the whole operation simply to produce faster growing animals for slaughter. It is these questions which need to exercise the mind of the farmer. Good thinking!

## Summary

Keeping and using records is good for business.

It is better to keep few records and do it well than take great numbers.

From a practical point of view, the following are basic records.

	<u>Stags</u>	<u>Hinds</u>
Weaning weight	*	*
15 month weight	*	*
Winter weight	*	*
Velvet weight	*	
Velvet beam	*	