Discussion of Red Deer Breeding Policy for increased Velvet Production at Windermere Red Deer Stud

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Introduction

I farm with my wife Paula and our family at Koromatua, near Hamilton. This property is an intensively farmed Red Deer Stud. We are also establishing a Commercial Velvet farming operation on a property in Southland. We have been breeding Red Deer since 1982 and the Stud was established in 1988. Our experience has always been with Red Deer, and my address will only relate to Red Deer breeding programmes.

Early History at Windermere

1. The Key Starting out Decisions we addressed

a) Choice of suitable land? Quality? Situation? Size? Cost? Tuberculosis risks?
b) Choice of stock? **"Good foundation stock are the key to success".**
c) Choice of markets to be supplied?

2. Early Days in the Industry

When we began deer farming in 1982, deer were regarded as "Gold on four feet". There was much "Hype", and excessive prices were being paid for stock, fuelled by tax incentives, and the expectation of huge returns from female young stock. Most of our early deer were from helicopter capture; and were large framed Red hinds, that originated mainly from Wairarapa and areas of East Cape.

Through a rigid Tuberculosis testing policy from the beginning, and then a closed herd policy for a few years, we were lucky to avoid the nasty Tuberculosis scares of the early and mid-1980's. We were the third herd in the Waikato to become Tuberculosis Accredited; and fortunately we have never lost that status.

In 1988 our totally New Zealand breeding herd began its first influx of Imported Bloodlines, and we began to focus on new breeding objectives. Our **Primary Focus** was for **Velvet** production and our **Secondary Focus** was for **Venison**. Our key requirements now were **"High Quality Breeding Hinds"** and **"High Quality Male Genetics"** via natural mating or artificial insemination.

The Breeding Objectives of Windermere Stud

1. To breed the highest quality of Red Deer possible; and which are capable of maximising farmers returns from:

   VELVET
   VENISON
   BREEDING STOCK
   TROPHY MARKET

2. Our over-riding selection criteria has always been for the **Best Velvet genetics**, most suited to maximise returns from the Velvet Industry, coupled with **Good Temperament** traits.

2. To develop sufficient depth in our breeding; so that a high "Breeding Value" can be expected from our sale stock, being elite breeding stags and breeding hinds.

4. To achieve a high standing in the Industry as a reputable source of quality stock.

Main Programme to achieve Objectives

"Programme to breed stock with the highest quality of velveting potential"

Our Initial Premises were to:

1. Choose carefully the genetic line which will best supply the style of velvet and quality of animal you wish to farm.
2. Choose a genetic line which is known or proven to have good **Heritability**.
3. Develop a pool of quality **breeding hinds** which are known to **perform** (from a history of sibling or progeny performance).
4. Use Single-Sire Mating and very accurate identification of calf to dam.
5. To ruthlessly cull all deer with poor performance or undesired traits.

How should we select Bloodlines?

New Zealand Warnham Park Woburn Abbey Other English parks	Scottish Furzeland German Yugoslavian	Hungarian Danish Romanian Russian etc.

All the above bloodlines have their own special attributes, and it is important to select for your own specific purpose. In our case this was for **increased velvet production** with **strongly heritable traits**.

Our initial new bloodlines were Warnham Park, Yugoslavian and Hungarian, but we are now solely breeding with English Park bloodlines which are from **Warnham Park** and **Woburn Abbey**. Both are semi-closed herds which have been breeding for antler performance for well over a hundred years and hence have gained a high degree of **heritability**. Both these English Parks have been foremost in Britain with their achievements.

We are specifically targeting the above bloodlines for the following reasons:

(i) Style of Velvet Antler - short, thick, early maturing.
- heavy beam, heavy trez tynes and heavy bulb.
(ii) Known good Heritability.
(iii) Good carcase conformation (from top quality Sires and Dams).
(iv) Strong potential for future trophy market.

We are striving to breed very high quality **pure** lines, as these will give farmers the highest chance of good genetic **pass-on**. These bloodlines are the following:

(i) **Pure Warnham Park**
(ii) **Pure Woburn Abbey**
(iii) **Pure Warnham x Pure Woburn**

Genotype and Phenotype

The **Genotype** of a breeding stag or hind, is their exact genetic composition, and represents an average of the genetic value of all its male and female parentage.

The **Phenotype** of an animal, is the physical attributes it displays, and may or may not be truly representative of its Genotype.

Hence the true value of a sire stag is not always determined by its own appearance, but by its ability to **pass-on** strong **traits** for:

- Velvet Growth
- Body Conformation
- Temperament

How close do we intend Breeding our Bloodlines?

Identifying and selecting only the most genetically superior animals to be parents of the next generation is the basis of every suitable breeding programme.

I believe that to achieve a reasonable chance of respectable "Pass-On" of velvet genetics, it may be necessary to breed with certain families of genetic lines that could become quite close. If the desired strong velvet traits are being achieved, then the addition of too many outside genetic pools may weaken the performance.

"In-Breeding" versus "Line-Breeding?"

When a Breeder breeds his genetic lines too close and is criticised for doing so or gets abnormalities, we call it "In-Breeding". When a breeder has successful results from a close breeding policy, it is then more respectfully called "Line-Breeding".

In our breeding we do pursue some "Line-Breeding" but always with the addition of some occasional strong outcrosses. We believe that father-daughter matings, and full brother full sister matings are unacceptable, as this may lead to an increase of undesirable recessive traits appearing in the herd.

Calculation of "In-Breeding" Percentage of Mated Relations

The reduction in performance of strongly inbred animals is known as inbreeding depression, and may include decreased fertility, high calf mortality, poor growth performance, and abnormal velvet growth patterns.

Since inbreeding depression depends on the combination of genes received, which is largely a matter of chance, the level of inbreeding at which depression will become detectable is hard to predict with any degree of certainty. A safe approach would be to avoid matings which lead to offspring being more than 6.25% inbred.

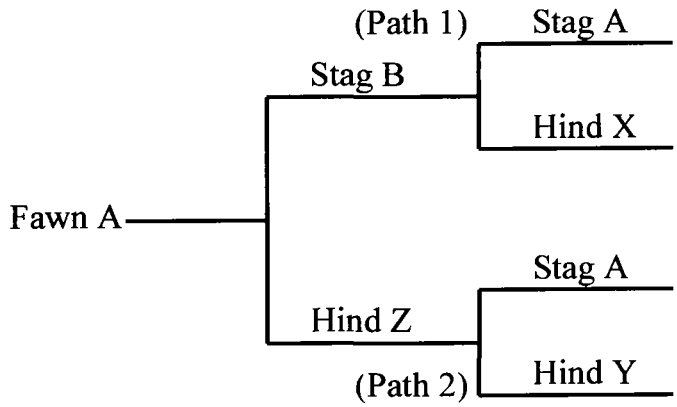
A quick method of calculating the % Inbreeding (F) of an individual is shown as follows:

$$\% \text{ Inbreeding (F)} = \Sigma \left(\tfrac{1}{2}\right)^{n+1} \times 100$$

Where Σ = summation of all paths by which the parents of inbred animals are related.

n = the number of separation between the parents of the inbred animals and the common ancestor on both sides of the pedigree.

For Example HALF SIBS MATED TO EACH OTHER



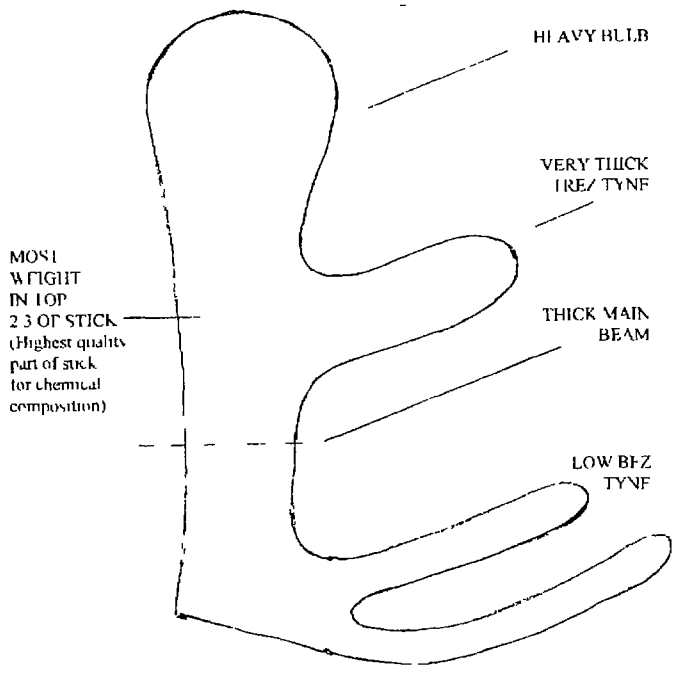
% Inbreeding (Fawn A) = $\Sigma (½)^{n+1} \times 100 = 12.5\%$

The Inbreeding Coefficients of Mated Relatives

MATINGS OF	% INBREEDING (F)
Half-sibs	12.5
Full-sibs	25
Parent/Progeny	25
Cousins	6.25

In the event that Inbreeding does occur to12.5% (for example); although the inbred animals will remain unchanged, the situation can be remedied in the next generation by "Out-crossing" to genetically superior animals which are unrelated to the previously used bloodline. (Clark, 1994).

What Style of Velvet are we selecting for in our breeding?



We select for:

(i) Good Beam Thickness
(ii) Short to Medium Beam Length
(iii) Heavy Trez Tyne
(iv) Heavy Bulb
(v) Correct Two-Tyne velvet with low Bez-Tyne placement
(vi) Finely Compact Internal Composition

Many of our Warnham Bloodlines are already producing this style of velvet, we believe the addition of Woburn bloodlines will produce an optimal velvet type that lies between the two styles and which will be superior to both. Good breeding takes years of planning and years of waiting. Waiting until the stags are two years old, so that the equivalent females can be ranked; and then waiting many years more to establish the **pass-on** performance of the sire stags sold.

Where do we select new genetic lines?

- Deer imported into New Zealand over the past one and a half decades have provided huge genetic advancement.
- The best of the imported bloodlines now form the cornerstones of genetic advancement in New Zealand.

- With extensive breeding specifically for velvet antler, unlike their Parks of origin (which did not cut for velvet) huge genetic gains are now being made in New Zealand. These are being further accelerated by the extensive usage of Embryo Transfer and Artificial Insemination programmes.

- The rate of genetic advancement in many breeding herds in New Zealand is now occurring faster than in their Parks of origin.

- More is known of the history of performance of certain genetic lines already in New Zealand, and many outstanding stags and hinds are now being bred here.

- There will continue to be a place for Imported Genetics but these will always have to go through the selection process for performance in New Zealand. True velvet statistics are not available from the English and European Parks, and all stock will require evaluation in the New Zealand market place, where the best performers will be identified over time.

Velveting of Sire Stags

We velvet all our sire stags prior to sale. Even though stags do not look as impressive without antlers, we feel we must provide buyers with the essential two year old velvet statistics and velvet style. It is now one of our most important parameters in determining our breeding and selection policy.

Master sire stags will be grown out to hard antler at some stage, to give purchasers some indication of the trophy potential of progeny.

Ranking of value of Stud Sire versus Stud Hind?

Commercial Breeding Situation

The genetic and financial gains from a superior sire stag are enormous. They will improve the genetic base for the female herd, improve the production from the velvet herd, and produce at least fifty live fawns per year for a breeding of life of eight to ten years.

Best female progeny should be retained and subsequently mated to future superior sires to further accelerate velvet production per animal.

Alternatively quality females with a known history of good velvet genetics can be purchased as a foundation which will further accelerate genetic gains in the herd. These are now much more readily available and affordable as more breeding stock is now appearing in the market place.

Stud Breeding Situation

The ultimate success of a stud will always be determined by the **quality** and **genetic strength** of its elite **stud hinds**. These must then be mated to high quality master sires, within a good overall breeding policy. A top sire will only be able to prove his full potential if combined with genetically superior stud hinds. On a one to one basis I believe these elite hinds make a greater than fifty percent contribution to the performance of superior progeny.

There is now a small family of outstanding Red deer females in New Zealand (originally imported or progeny thereof) who have consistently produced more outstanding sire lines than any others.

Cattle Breeders have also believed in special attributes of certain maternal lineages, often referred to as cow families. Studies have now shown Cytoplasmic and Mitochondrial differences in these cows which may explain their inheritance of economic traits (Gibson, Freeman, & Boettcher. 1997). Certain families of Red Deer hinds also appear to carry a genetic ticket for velvet excellence. When these hinds can be identified, then techniques of **Embryo Transfer**; **Laparoscopic Ovum Collection** with **In-Vitro Fertilisation**, will accelerate the rate of genetic gain in the National herd.

How to choose a good Sire Stag and at what cost?

(a) Define the required quality of stag for budget and style of operation.
(b) Define required style of velvet.
(c) What can we expect in performance from a Cross-bred stag, compared with a Pure-bred stag?
(d) Has Hybrid Vigour contributed to the outward appearance of a given stag or his velvet?

General Facts and Advice on Sire Stag Purchase

(i) Make a careful informed decision
(ii) Purchase from a **Proven** Bloodline and from a **Reputable** Breeder.
(iii) Ideal Qualities - large framed, good natured stag with heavy correct velvet.
(iv) Carefully assess **Temperament** of stags (and hinds) prior to purchase. Sedation of animals for public auction without declaration, still occurs. In this era of the Consumers Guarantee Act, this practice is rapidly becoming indefensible. It also perpetuates poor temperament traits.
(v) 15 month stag weight x 2 - approximately equals five year old stag weight.
(vi) 2 year velvet weight x 2 - approximately equals adult velvet weight at six years.
(vii) The **top** two year old sire stags should be cutting close to or in excess of 3 kg of correctly cut velvet (G.I.B Standard).

(viii) There are definite advantages in knowing the correct velvet weight for age prior to purchase (Don't be confused by quoted Hard Antler weights or Over-Grown Velvet weights).

Example of Returns for a Stag Purchase at $25,000

Conditions

- Stag Fully insured for ten years.
- All male progeny being retained in a velveting herd.
- Velvet from Stag pays **all** Grazing and Veterinary Accounts

Annual Costs

Interest at 9.5%	$2,375	
Insurance at 7.0%	$1,750	
	$4,125	(year one)
Total depreciation of stag at 10% over 10 years	$2,500	(per year)
Total Interest and Insurance over 10 years at 16.5% calculated on an annually decreasing value after depreciation	$22,687.50	
Stag Purchase	$25,000.00	
Total Expenditure	$47,687.50	
This total expenditure has been tax deductible at 33%	15,736.88	
TOTAL		$31,950.62

Each year the above stag has gone to 50 hinds and 45 live fawns are born each year

Total Fawns in ten years 450 fawns

Therefore Mating Cost per fawn $\frac{\$31,950.62}{450}$ = $71.00 per fawn

Velvet Harvest from one velveting stag over 10 years to cover this mating cost $\frac{\$71.00}{10}$ = $7.10 per year

1996-1997 average velvet return for 1 kg = $85.00

$$\frac{\$85.00}{\$7.10} = 0.08 \text{ kg}$$

Therefore **annual velvet production** of all male progeny only has to increase by **0.08 kg per year** to cover their cost of production by the above $25,000 stag.

Any increase over and above a lift of 0.08 kg velvet per stag is all a **Profit!**

All females sold for a premium of more than $71.00 per head will represent additional **Profit!**

All females will carry significantly enhanced genetics in line with the male progeny, and the best will naturally be retained at a considerably increased margin of **value**.

What are the gains from putting $25,000 stag over your hinds compared with an average $8,000 to $10,000 stag?

(i) Bigger improvement in velvet and better genetic gains.
(ii) Sale of a limited number of male progeny as Sire Stags.
(iii) Sale of selected top females as breeding stock.
(iv) Sale of sire services or semen.
(v) Higher chances of substantial returns as a trophy stag.

Additional Notes regarding Sire Purchase

- Sire Stags purchased for less than the High Priced cut-off for Breeding Stags can be written down to their Herd scheme value in the financial year of their purchase. This figure varies from year to year, but was $11,605 for 1996 and is $8,210 for 1997.

- In the first fifteen months of owning, using and insuring a Sire Stag the owner gets **two** seasons usage! Therefore in the first 15 months of purchase of a $20,000 stag $9,050 can be written off against taxable income, and yet achieve two years matings.

Sources of Knowledge

My sources of knowledge are derived in the main from practical experience and observation of the overall development of the Deer Industry in New Zealand over seventeen years.

I have a medical Degree and am a practicing Anaesthetist. I have a general scientific knowledge which includes the principles of Mendelian genetics and apply this to deer farming and breeding.

Stud deer breeders still have much to learn from the work of established sheep and cattle breeders, especially in the field of E.B.V's (Estimated Breeding Values).

Veterinary Role in Deer Breeding

1) Veterinarians are an educated knowledge source for farmers. Farmers will appreciate being given constructive advice.
2) To assist farmers in deer breeding decision making, for production increases.
3) To review quality aspects and genetic potential of breeding herds.
4) To offer advice relating to Sire Stag and Hind purchases.
5) To act in a client advocacy role to direct farmers to the appropriate stud breeders or specialist veterinarians.
6) Many veterinarians will take a specialist interest in deer reproduction and breeding; and can advise, assist or provide the services of Artificial Insemination and Embryo Transfer Programmes.

Conclusion

I have briefly discussed our Red Deer breeding objectives at Windermere, and in particular our selection policy for superior velvet genetics.

I have highlighted the immense importance of quality females in the breeding equation, and the huge economic returns to be made from the use of quality sire stags.

Stud Breeding has an enormous contribution to make towards genetic advancement and production increases of the National herd.

This industry has made momentous gains in the relatively short time since its inception, and we look forward to being a small part of its continuing advances.

References

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