

PRACTICAL ASPECTS OF GENETIC IMPROVEMENTPROGRAMMES FOR DEER FARMERS

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Increases in performance through genetic gains within a population strived for by most, if not all, deer farmers. There are no magic recipes for increasing genetic performance of your deer herd, but it basically boils down to common sense with regard to:

1. Selection of superior animal as parent stock (eg, the top 1% of velvet stags as sires).
2. Culling of poor performing animals out of the breeding herd (eg, bad tempered hinds or hinds with poor mating ability).

At the present time in deer farming, while most farmers are eager to pick out (mostly by eye-ball assessment) the better stags as sires, few are yet willing to cull poor performing animals (especially hinds). With time, this situation may change.

The first major consideration of any deer farmer should be to optimise his animal and pasture management before getting too serious about genetic improvement plans. The full benefits from selection/culling programmes will only be achieved if the deer are well managed within their particular environment.

* No genetic improvement will compensate for poor management.

Even under good management there will be year to year variations (often beyond the farmers control) that may prevent stock from attaining their full genetic potential. The farmer's aim should be to try to allow the animals to reach their full potential as a population and then select/cull accordingly within that population.

As long as there is variation within a population of deer (and variation is seldom lacking in red deer herds) there is always potential for increasing the genetic merit of the future generations. The greater the variation that exists, the greater the potential for increasing genetic merit of offspring relative to the parent stock.

This is especially so with species where one individual is capable of passing its genes onto many offspring. In the case of deer, this is the stag.

EG One stag can service up to, lets say, 50 hinds, therefore, 50% of his genes have been passed onto each of 50 calves in one year.

One hind, however, can only pass 50% of her genes onto one calf (rarely two) per year.

Therefore, it makes sense to initiate genetic selection programmes using the stag as the main animal for increasing the genetic merit of future generations.

Further considerations of selection/culling hinds should not be neglected, however, especially if the farmer can obtain good records on hind performance and performance of her offspring.

The basic principles of selection have been quite clearly explained by Dr Peter Fennessy in the Spring 1982 issue of The Deer Farmer (pages 24-25). The salient points are as follows:

1. The purpose of a selection programme is to identify the genetically superior deer and use these animals as breeding stock. Each year's crop will be, on average, genetically superior to the previous year's crop, for the character selected.
2. The rate at which the improvement will exert itself is dependant upon the "selection differential" ie, the intensity that breeding animals are selected. eg Selecting the top 1% of stags as sires will result in greater annual gains than selecting the top 20% of stags.
3. The "heritability" (h^2) of the character will also determine annual progress, ie the proportion of the variation of a trait, within a herd, that is of genetic origin.

eg $h^2 = 0.10$ - 10% of trait variation due to genetics (considered a low heritability).

The higher the "heritability" of a trait (h^2 is determined from quite complex studies) then the greater the potential for rapid genetic increases.

At this stage we have no " h^2 " estimates for deer but assume similar values for cattle (except velvet production of course). Chinese work suggests a quite high " h^2 " for velvet yield in spotted deer (ie, 0.35).

4. The "generation interval", or average age of the parents when the progeny are born, will affect the potential rate of genetic gain, ie if older hinds and older stags are used, the potential rate of genetic gain will be reduced. Aim for an early recruitment of top progeny into the breeding herd.
5. The greater the number of traits selected for in any one programme, the smaller the genetic gains per year for each trait, ie keep it simple and select for only one or two traits (and possibly cull poor performers in other traits).

What to select for in your deer

This will depend a lot on the preferences of the farmer. Even so, many farmers have not really considered, in depth, what they actually want from their deer.

There are dozens of traits that can be improved by genetic selection but many have low heritabilities or are of minor economic importance (eg, coat colour in fallow deer).

Let us consider some traits:

a. Liveweight-for-age:

Heritability for liveweight-for-age is probably quite high ($h^2 = 0.3-0.4$).

First question you should ask - "is a big animal a better animal?"

Certainly, a fast growing, early maturing meat animal is more efficient in terms of total farm energetics if:

- i) The reproductive unit (the dam) does not get larger (and require more feed).
- ii) The progeny are more efficient at converting grass into muscle.
- iii) The progeny do not tend towards early fatness.
- iv) The progeny can be slaughtered earlier at a given carcass weight.

Consider these points if you are thinking of a meat production system. eg Rapid gains in carcass weight can be achieved using Wapiti/Red hybridisation. If the basic reproductive unit is the red hind and a Wapiti-type sire is used, the resultant offspring will grow more rapidly than red/red offspring, but the energy requirements of the breeding unit (the red hind) remains the same.

However, if red/wapiti hybrid females are incorporated into the breeding unit, the total energy requirements of reproduction will increase because of increased dam size. This consideration will also apply to genetic gains in liveweight-for-age using just red/red mating.

Therefore consider - what is the fate of female offspring? (do you want larger hinds?).

- Is the reproductive performance of larger hinds improved?
- Is the venison from larger or younger animals of adequate quality?

Many of these questions can only be answered by trial and error.

Within breed selection and cross breed selection for liveweight-for-age has the major advantage of being correlated with gains in velvet antler weight.

b. Velvet antler yield:

It appears that selection for velvet yield increases are worthwhile, for two main reasons:

- i) Increases in velvet size/weight are accompanied by disproportionate increases in monetary value, (ie, tremendous jumps in grade prices).
- ii) The " h^2 " estimates are high (0.35 based on Chinese work with spotted deer).

However, remember, because a hind does not produce velvet it is impossible to tell her genetic potential without good records on the performance of her sons. Initially, you will rely heavily on selection of high yielding sires.

Follow the theoretical example outlined by Fennessy in *The Deer Farmer* - a potential annual gain of 0.03 kg is a big gain over a ten year period.

c. Temperament

Farmers often talk about selecting on temperament. The following points should be considered:

- i) "h²" is likely to be low, because the environment plays a huge part in an individual's temperament.
- ii) Temperament is very hard to objectively measure.
- iii) A stag with excellent temperament in spring and summer can be downright dangerous in autumn and winter.
- iv) "Extra - quiet" stags during the rut may be poor sires due to low libido (not proven but logical).

Selection for good temperament ultimately boils down to personal "gut-feelings" on the part of the farmer - and he may not necessarily be wrong.

However, I support the view of selecting breeding individuals on the basis of other traits and culling those few that show "bad" behavioural characteristics.

d. Fertility (increased fawning rate)

This probably involves selective culling of poor performing hinds (which requires good record keeping). Poor fertility in stags is usually self-culling (infertile stags sire no offspring!).

e. Fertility (increased twinning rate)

Twinning is quite rare and it is unlikely that major increases in twinning rates can be achieved in the short term. However, record twinning hinds and her offspring. Such data are being put on a register at Invermay - this may be helpful later.

Conclusions

1. Decide what you desire most from your deer, eg good velvet yields, large carcasses at earlier slaughter.
2. Keep the selection programme simple. The more traits selected for, the less gain for each trait per year.
3. Strive to objectively record the performance on which you wish to select animals.
4. Culling of poor performing individuals may be necessary from time to time.

The gains are there to be made, and they are permanent genetic gains, but - it is not an overnight success and it requires persistence.