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LIMITATIONS OF A NATIONAL PERFORMANCE RECORDING SCHEME WITH REFERENCE TO BASIC DIFFERENCES WITH TRADITIONAL METHODOLOGY OF SHEEP BREEDERS

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In sheep breeding, the aims of scientists and breeders are essentially the same. The means of attaining them are sometimes different (Ponzoni 1984).

Man's breeding objectives are not always compatible with the sheep's production capabilities. A knowledge of how the sheep functions is a necessary prerequisite for successful breeding.

Breeding objectives, with a low fleece weight component, have been successful in improving production in growth rate, mature size and reproductive performance. Hence, the success of New Zealand performance recording schemes compared with Australia where fleece weight is of paramount importance.

The Merino breed is unique because of the extent to which its wool producing ability can be developed by selection, within the limitations of the environment.

WHAT HAS BEEN MEASURED

The basic measurements of greasy fleece weight, yield, fibre diameter and liveweight were all in use before the inception of the Australian sheep industry, being used as references to breeding progress toward more productive sheep.

The concept of using such measurements as <u>aids to selection</u> seems to have been discarded by some in favour of using them as the <u>basis for selection</u>.

Fleece weight is not a simple character, but a very complex one. It is the expression of the sheep's genetic capacity to grow wool modified by everything that happens to it throughout the annual production cycle; that is, the total environmental effect.

It is important to the breeder to clearly understand where the production is coming from - how much of it is genetically determined and how much is the result of the doing ability of the sheep.

Non-sheep breeders seem to have difficulty coming to grips with

these concepts. The basis of the problem is that the genetic and phenotypic fleece weight distribution curves do not correspond especially at the higher levels of performance and in widely fluctuating environments as in southern Victoria and Tasmania.

This is a major explanation for the genetic plateaux reached by direct selection for fleece weight and at levels of production below those already reached in the industry.

The early Australian breeders were able to greatly improve the Merino by selection within a very favourable climatic and nutritional environment. In the more favoured stud breeding localities, ewe breeding flocks have reached an average wool production of 10-11 kilograms. For many years it was conceded that such cuts were not possible in the colder, high rainfall sheep areas. However, with pasture improvement and the acquisition of genetically high wool producing types it has been possible to raise wool cuts in breeding flocks to 8-9 kilograms in a good season in areas as far apart as Hamilton and Omeo in Victoria.

RECOGNITION OF HIGH WOOL PRODUCING ABILITY

If a broad view of the industry is taken and the relative wool producing abilities of Australia's various strains of sheep are compared, for example, in wether production trials, it will become evident that the highest producers have skin and fleece types with similar distinctive features.

However, the possession of this type of skin and fleece is no guarantee of high wool production.

High production will depend on the sheep's system to nourish the wool producing mechanism, while maintaining other essential functions.

The skin mechanisms are highly heritable and make a major contribution to the additive portion of the genetic variance for fleece production.

How much the potential wool production is expressed will depend on the doing ability of the animal to make effective use of its environment. While doing ability is under genetic control it is more difficult to recognise the specific characteristics involved.

WHAT NEEDS TO BE MEAUSURED

Skin Type,
measured by wool production per unit area, aiming at identifying the optimum wool follicle arrangements and the extent to which wool production is maintained toward the perimeter of the fleece.

Coy(1982) describes a productive skin as thick, soft and a rich colour, expanding when cut and with deep connective tissue. The fleece structure is distinguished by having a more pronounced crimp, the staple formation larger and more regular, the wool longer and with high fibre density within the staples. The follicle groups are large and regular in shape and size, allowing a greater follicle population per skin area, a higher secondary to primary ratio and uniform fibre distribution. The main

visual characteristics are the regular staple formation and crimp broader than expected from measured fibre diameter.

Amount of Skin

measured by the total wool growing surface area. The skin must be of the correct type. Excessive folds are not necessary to achieve high wool cuts, but a loose skin is essential.

Doing Ability

as gauged by the observable thrift or doing ability of the individuals in a flock over a period of time - how they grow, develop and fatten in response to good or bad times, and how their wool production fluctuates throughout the year.

Doing ability has both a mental and physical basis under genetic control. A short list of observable doing characteristics would include -

Mental - alert, competitive temperament, denoting the sheep's ability to fend for itself, ewe mothering ability, lamb's ability to get up and suck.

Physical - physical fitness, including feet and mouth, ability to graze, reproductive ability, disease resistance, ability to cope with adverse weather.

A simple analogy can be drawn between the sheep's skin and a shower rose. The rose is like the skin in that it can have many combinations of size and number of holes (follicles), but the amount of flow will depend on the pressure behind the rose (nutrition supplied to the follicle system).

Feed conversion efficiency

The relative feed conversion efficiencies of the many different types of sheep in existence is still a matter of conjecture.

A commercial producer has to make an initial choice of breed, strain or type to suit his purpose of production. If this choice is somewhere near the mark, he should then be able to proceed on the basis that his highest producers are also his most efficient animals, provided all forms of production (wool, meat, lambs) are taken into account.

Coy (1982) stresses the need to maintain a balance in feed conversion between wool and carcase products. He proposes an index to distinguish between classes of sheep with different conversion capabilities:-

$$I = \frac{\text{wool weight (kg)} \times 100}{\text{liveweight gain (kg)}}$$

applied between lamb and hogget shearings.

This is not a selection index and is applicable only when sheep are making appreciable liveweight gains.

Animals with an index rating much above 40% are likely to fail under environmental stress, though they may be high converters of feed into wool.

Animals with an index rating below 35% tend to become excessively fat and may be poor converters of feed into wool.

The genetically high wool producer needs to develop its more elaborate skin, requiring better nutrition and developing more slowly, depending on the environment (nutritional). Selection at too early an age explains why potentially high producers are often eliminated before they reach their peak.

The proportions of the various types of sheep in a flock are a strong indication to the sheep classer of previous breeding policies and where that flock stands in the industry as regards its productive potential.

NATIONAL PERFORMANCE RECORDING SCHEMES

At least three types of recording schemes are possible -

Recording performance data for simple characters as a basis for selection
Measurements of fleece weight, fibre diameter, yield and liveweight have been in vogue throughout the development of the Australian sheep industry.

Increasing the accuracy of these simple measurements is not likely to speed up responses to selection.

Computers have made it more practicable to develop selection indexes, but they are very complicated to operate and suitable measurements of skin morphology are so expensive (Howe 1982).

The industry requires simple uncomplicated selection criteria which can be applied to large numbers of animals while guaranteeing success commensurate with the work involved. Present indications are that a more reasoned subjective assessment backed up by scientific verification where more precise measurement is possible is currently most appropriate. It is important to measure meaningful things. If we cannot measure them at least observe them.

Recording average and range of values for key production characteristics in parent-type studs -
Such a scheme would have value in assisting breeders to find studs to improve specific features of production.

The kind of information which might be made available would include -

growth rate, liveweight;
reproductive performance, male and female;
fleece weight under specified feed conditions, or by location;
staple length, fibre diameter, follicle density, secondary to primary ratio, follicle group arrangement.

Recording the breeding value of sires in semen banks -
With the advent of frozen semen and the wider use of artificial insemination it is possible to develop a national register of successful sires, classified on the basis of essential qualities, and records of the resultant progeny from known joinings.

Since the breeding value of an animal is much more important, than its current productivity, to industry progress, any scheme which can establish some measure of breeding value is likely to be beneficial.

In those studs using population genetics and measured selection criteria built into an index, the best rams are joined at random within the stud. The result is that the breeding value of the sires is much closer to the average than is the case with traditional studs.

With traditional methodology, in the more important structured studs where ewes are segregated into groups of different types, the rams bred in the various sections have a long lineage of production bred into them. As a result their specific qualities are more likely to be passed on to their offspring.

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