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## PRESIDENTIAL ADDRESS

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### New Zealand - the sheep seed basket of the world

D.B. BINNIE

Although having a small proportion of the total numbers of sheep breeds in the world, New Zealand has breeds which cover most of the important attributes required. We lead the world for crossbred wool types, our product having a high reputation for colour, length and soundness, with high per head production at modest animal live weights.

We have smaller numbers of fine and superfine woolled sheep, but enough to expand rapidly when the need arises as at present.

The meat production from our sheep has been ideal for the commodity trading that was prevalent until the sixties. However, changing markets left our product needing considerable development. This process has started with selection programs and importation of new breeds of sheep.

Natural selection occurs during any prolonged period of breed development. The dominant feature of New Zealand sheep on a world scale is the natural selection that has come about through our low cost, low labour, pasture grazing systems. Our sheep are hardy and adaptable to a wide range of climates, can thrive with or without intensive concentrate feeding and, above all, are free-lambing, easy care sheep, capable of producing both meat and wool in a pasture grazing situation.

In any sheep breeding system there are three major components:

- Identification of desirable genotypes
- Multiplication of those genotypes
- Dissemination of those genotypes.

#### IDENTIFICATION

Since the establishment of the first association of sheep farmers interested in improvement through breeding there has been emphasis on recording pedigrees. This, coupled with careful visual observation of individual sheep and the reliance

on phenotypic relationships between visual characteristics and production, was the basis of improvement for over 100 years. Debate over the strength, or even existence of some of the claimed correlations, and the development of methods of measuring production and calculating genetic parameters, brought the long-established methods of breeding under challenge.

In the early fifties, Professor Al Rae and Mr Bob Barton of Massey Agricultural College, working closely with Messrs Tony Parker, Holmes Warren and Harry White developed the first recording system that placed emphasis on objective measurement for production traits. It was based on using a card index and calculators. Subsequent development and enhancement resulted in the National Flock Recording Scheme, launched in 1967 and administered and supported by the Department of Agriculture, New Zealand Wool Board, and New Zealand Meat Producers' Board. Amongst ram breeders, the early adopters learnt the new skills of performance recording - objective measurement of live weights and fleece weights and how to fill in data entry forms for computer systems. More importantly, they also learnt how to integrate the use of performance records into their selection and culling systems. The advisers and scientists involved with the scheme also had a rapid period of learning. Development of performance recording skills, the ability to interpret and apply records to animal breeding programs, and new basic knowledge derived from the accumulating body of data resulted in a period of rapid advances in knowledge by all three parties involved - ram breeders, advisers and scientists.

By 1976, this evolution was so far advanced that many breeders were calling for, and scientists acknowledging the need for, a major upgrading of the scheme. Sheeplan was the result, a scheme now capable of catering for the needs not only of a

new entrant to performance recording with relatively simple requirements but also for many of the now sophisticated needs of the longer-standing, more experienced clients.

Some client needs were still not able to be fully met by Sheeplan because of computer limitations at the time. Developments in computer technology and another 10 years of experience have resulted in Sheeplan being completely overhauled and updated to appear as Animalplan.

The comprehensive flexibility of Animalplan caters for a vast range of animal breeding situations. From the simplest recording requirements to the most sophisticated in the industry today - including not only the performance characteristics that were included in Sheeplan, but any characteristic a breeder wishes to include for his flock.

In the mid-sixties, a very significant alternative to the traditional system of ram-breeding from registered ewes was begun. Based on the fact that commercial ewe populations had been sired by rams from registered flocks for generations and that they therefore had to be very close behind the registered flocks for average genetic merit, this meant that the variance within the commercial flock was much greater than the difference in average genetic merit between the ram-breeding and commercial flocks. Screening the very best commercial ewes into unregistered ram-breeding flocks resulted in flocks of higher average genetic merit being assembled and a further swing towards performance-based breeding objectives.

The latest breakthrough in the identification of superior genotypes is the advent of sire referencing. With the carefully planned introduction of common genes to participating flocks plus the use of sophisticated statistical techniques on high-speed computers, the between-flock environmental differences can (at long last) be allowed for, and sires from throughout the country be evaluated for a large range of performance characters.

Semen from reference sires is used in each participating flock alongside the breeder's sires and all progeny are measured for performance. By comparing the progeny of reference sires between flocks, the environmental differences between

flocks can be gauged. Then, since the environmental differences have been estimated, the genetic differences between sires in the various flocks can be estimated and a national list of sire rankings can be published.

New Zealand now enjoys a unique position in the sheep breeding world in respect to genotype specification. No other country has the unique combination of in-depth performance and pedigree recording in its ram-breeding flocks, coupled with a national analytical service having the facilities and skills to process the records, and the numbers of sheep in its ram-breeding flocks to exploit the top animals thus identified.

## MULTIPLICATION

No amount of identification is useful unless the top genes are exploited. Multiplying the genes and increasing their frequency in the population is the next step. Several methods are available and their use depends on several factors such as

- are the genes to be multiplied within the breed in which they are currently found or are they to be combined with those of another breed?

- are there many ewes available for the multiplication process or are they present in only limited numbers?

- does the client wishing to purchase the final animals require them to be registered pedigree stock or not?

- are the top sheep individual rams or groups of rams, individual ewes or groups of ewes?

Under natural mating systems individual rams frequently produce 100-200 progeny per year, and sometimes 300 or more progeny per year. Instances of rams producing 700 progeny in a 6-week mating period have been recorded.

With artificial insemination using fresh semen the multiplication rate is about 300-400 progeny over 6 weeks. Using frozen semen as many as 2 to 3000 progeny can be generated.

Low-cost methods of increasing ewe reproductive rates range from flushing to the use of immunogens and injections of pregnant mare's serum gonadotrophin. These methods result in litter size increases of 0.2-0.5 lambs.

Where higher costs can be borne, drug regimes involving exogenous gonadotrophins can give very high ovulation rates. The final outcome in one season depends on the breed of ewe, the particular hormone regime used, and the number of times each ewe is flushed. But greater than 20 fertile embryos can be recovered per ewe per year from Romney ewes at present. These recovered embryos result in 10-15 progeny per ewe. Embryo splitting can further add to these results.

New Zealand has expertise in all these technologies, and particularly for the multiple ovulation and embryo transfer field, has two of the largest commercial programs in the world.

Expertise in ram management, fresh and frozen AI technology, multiple ovulation, embryo recovery and storage, and embryo transfer, when put alongside the on-farm advantages of access to significant numbers of fully recorded ewes and very large numbers of commercial ewes, means New Zealand is well-equipped to combine and multiply top genes.

### DISSEMINATION

The final stage in exploiting top genes is to distribute them to the client or user. Where crossbreeds are required New Zealand enjoys the advantages of having ewes grouped into large flocks where packages of crossbred sheep can be quickly and efficiently generated to specification.

For purebreds certainly, and in most circumstances, for crossbreeds, the method of delivery can be various -

Live rams or ewes

In-lamb ewes

Semen (fresh or frozen for internal orders and frozen semen for export orders)

Frozen embryos.

Quality assurance is an important component of gene dissemination and here too New Zealand is well-served.

Breed Societies and Animalplan can both provide assurance of pedigree if required.

Specification of performance attributes can be supplied by Animalplan for groups of ewes and for groups of rams or individual progeny-tested rams.

The animal health status of sheep can also be assured for a wide range of diseases through a combination of:

- strict quarantine protocols to keep New Zealand free of many diseases found in overseas countries
- detailed flock histories to assure freedom from diseases found on only some New Zealand properties
- comprehensive laboratory testing procedures to assure freedom of individual animals from some diseases.

All these health assurances rely on the high reputation established by New Zealand's government and private practice veterinary services.

### CONCLUSION

With New Zealand's

- long history of traditional breed society functions
- the development of national performance recording to the position of world leadership it now enjoys
- the establishment of national sire referencing schemes
- the adoption by the industry of screening as a method of assembling flocks of high-performance animals
- the high level of skills in reproductive physiology present in the industry, and
- the degree of quality assurance available to clients for pedigree, performance and health status, the sheep industry has a distinct competitive advantage in being the seed basket of the world sheep breeding industry. This advantage should be exploited and preserved. Serious consideration should be given to extending our sire referencing system to other countries. This would not only identify any areas of deficiency in our national array of genotypes, and point to where they can be obtained, but would also clearly demonstrate the ranking of our leading genotypes and greatly assist in their marketing. But as our genes become more widely available around the world, it is critical that we keep investing in the new technologies to preserve our leading position.

New developments such as identification of single genes through gene probes, and genotype multiplication through cloning give the potential

to revolutionise animal breeding. New Zealand must either invest and stay right up there, or else watch its competitive edge disappear and be taken over by other countries.