RECORDING IN BEEF CATTLE IMPROVEMENT

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For the purpose of this discussion the term 'recording' is taken to mean the collection of information, such as pedigree, body weight, calving percentage, carcass weight, etc., and its organization into a form which enables the breeder to select the more desirable animals for use in the breeding program. Thus having records increases the breeder's knowledge of differences between animals. Where animals are treated alike, their records can be used to increase the accuracy of selection made by the breeder.

THE DEVELOPMENT OF RECORDING IN THE BEEF CATTLE INDUSTRY

With the development of agriculture in England during the early 19th century, animals possessing common characteristics were no longer confined to a small area or restricted to a few breeders. Breed associations were formed to protect the 'purity' of the breeds by recording the lineage or pedigree of the individual animals; the first, the Shorthorn society, was initiated in 1822. The pedigree as a prediction tool has had great value where memory, and many years of experience could associate certain traits with individuals. However, the proliferation of both the number of registered animals and people breeding registered animals, together with the problem of allowing for environmental effects on the observed merit of individual animals now makes the pedigree a less reliable selection tool when used in isolation.

The use of objective measurements to record the performance of beef cattle has developed since the Second World War as a result of the development and a better understanding of both genetic theory and the effects of environmental and genetic interactions on performance, together with developments in statistical and computing technology, and economic pressure of intensified production systems in both stud and commercial practice.

The last 5 years have been a period of rapid advancement in beef cattle recording in Australia with the establishment of a National Beef Recording Scheme (NBRS) at Armidale (N.S.W.), the decision of 17 beef cattle breed societies to use the NBRS facilities for processing their pedigree records, and the availability of combined pedigree-performance 'packages' for many breed society members through the NBRS. It is anticipated that by 1980 approximately 10,000 herds will be using NBRS facilities in Australia.

RECORDING SYSTEMS FOR BEEF CATTLE

Two basic recording options are available to the beef producer; on farm 'do-it-yourself' systems, or systems that use a centralized computing facility.

On-farm systems, where the breeder does all the necessary calculations, have the advantage of cost saving and can provide on the spot results so that selection decisions can be implemented more quickly, often while cattle

are still conveniently yarded. However, more complete calculations such as cow life time summaries and sire summaries are difficult to calculate manually and time consuming in large herds. These on-farm systems are more suited to large herds where minimal records can be used in selecting female replacements.

Centralized record processing systems require that processing of the data be done at a computing centre. Thus records must move off the farm and a turn around time for processing and return of results must be allowed for. The accuracy of computation of the records, and the much wider range of analysis available, and the presentation of results in a format ready for use in making decisions, have very definite advantages. Such schemes are recommended for stud herds and commercial herds who breed bulls for use or sale. The NBRS, which operates under the administration of the Australian Meat and Live-stock Corporation, is the largest centralized recording facility in Australia with approximately 600 herds enrolled on the performance file and approximately 10,000 herds enrolled in the various breed pedigree files. In addition to the NBRS, two other centralized recording facilities offer facilities to process performance records for the industry, with a total clientele of approximately 60 herds, and several other breed societies have their own pedigree recording processing systems.

TYPES OF RECORDS RELEVANT TO BEEF CATTLE IMPROVEMENT

As breed pedigree recording systems are well organized and understood within the industry, the remainder of this paper will be confined to the recording of objective performance in beef cattle.

Almost any production trait of beef cattle can be measured and recorded but to be of use in a breeding program the following points must be considered:

- Can the traits be recorded easily and accurately?

- Are the records relevant to the breeding objective?

- Are the traits being recorded sufficiently heritable to allow improvement to be achieved by selection?

- Can the records be interpreted validly?

The main traits of economic importance that should be considered in a recording program include:

* Reproductive characters e.g. calving percentage, dystocia levels, scrotal circumference and serving capacity.

* Body weights (usually recorded at weaning and yearling stages)

* Functional characters e.g. eye pigmentation, temperament, horns/polled

* Carcass composition e.g. fat depth, grade and yield.

The recording of some characters that are difficult to measure can be avoided whilst still making genetic progress for the traits involved because of the high correlation that exists between some production characters. For example, feed conversion efficiency is correlated with daily gain in growing

stock and milk production in cows is correlated with the weaning weight of her progeny.

THE USE OF RECORDS IN BEEF CATTLE IMPROVEMENT PROGRAMS

Whatever their intended use, records must start with the individual animal and must be accurate. If comparisons of breeding potential are to be valid, every effort must be made to provide similar environmental conditions for the animals being recorded. Then by adjusting the records to eliminate other known environmental differences, such as age, and comparing animals in terms of standardized records, a basis is provided for a sound program of genetic improvement.

Just keeping records does not change the merit of an animal but records do serve to emphasise valid differences between animals. Beef breeding research has shown that appreciable genetic improvement can be made in most traits of economic importance by selection on the basis of differences in individual performance, however, the meaningful use of records requires certain conventions be followed as described below

1. ### Accuracy of Records

    Inaccurate records obscure genetic difference between animals and decrease the effectiveness of selection. Procedures that can effect the accuracy of performance records include:

    *   weight variation due to gut fill. Weight loss of up to 10% has been recorded on a 12 hour fasting period after which the rate of loss declines. More accurate weight will be recorded if cattle are denied feed and water for about 12 hours before weighing (yarding overnight) or where they are weighed within 1-2 hours of being yarded from the paddock. Where weight gain of individual animals over time is to be recorded, weighing the animals at the same time of day will minimize gut fill variation due to grazing behaviour patterns.

    *   differences between operator in measuring can be quite large so where physical measurements are being taken for comparison, for example height at withers, one operator should take all the measurements.

    *   management procedures such as drenching should be applied to all the animals being compared.

    *   equal opportunity should be given to all animals being compared, and they should be run together under similar feed conditions during the test period.

    *   age spread between animals being compared can cause inaccuracy due to differences in metabolic efficiency at different ages, or to changes in pasture quality and availability over a season. Animals being compared should be within a $\pm$ 55 day age range.

2. ### Adjustment of Records

    Performance records need to be adjusted for known environmental differences so that genetic differences will be a larger part of the total difference recorded. These adjustments can be applied as actual adjustment calculated from within the group being recorded, where group size is large,

or as standard adjustments calculated from a large sample within the industry.

Factors that need to be adjusted (the NBRS standard adjustment in bracket) include:

- Age of dam   2 yr old   (+15%)

                 3 yr old   (+10%)

                 4 yr old   (+5%)

             > 4 yr old   (nil)

- Sex of animal   heifer (+10%), bull (+5%),   steer (nil)

- Age of animal: to a standard 200, 365, 420 or 550 days for animals within a ±55 day age spread.

** Environmental factors such as paddock and season differences, age spread >±55 days, cannot be adequately adjusted for within the scope of commercial recording systems, and adjustment of unequal management treatment such as foster rearing should not be attempted.

INTERPRETATION OF RECORDS

The adjusted records need to be presented in a form so that differences between animals are easily and readily apparent in quantitative units. Animals can be ranked in order of merit for the trait recorded but the relativity of the difference in the ranking may not be constant. The use of a performance 'ratio' for the trait, where the individual performance is calculated as a percentage variation from the average performance of the group, gives the most meaningful interpretation of the records.

As important that performance records are in making breeding decisions, they must be kept in perspective to the overall productivity of the herd. For example, undue emphasis on small differences in weight gain between individuals whilst disregarding important functional characters such as walking ability or calving ease, will be to the long term detriment of the herd, irrespective of the amount of genetic improvement achieved for weight gain.

Progeny records such as sire summaries are only valid where representative matings were arranged. Unless this requirement has been met, and a sufficient number of progeny are recorded, this type of record can be extremely misleading.

PROBLEMS OF RECORDING AND AREAS REQUIRING ACTION

1. Identification

The basis of any recording system is identification of individual animals, and as yet no identification system that can be read without restraining the animal has proven to be completely permanent. There is an urgent need for a more suitable permanent identification system.

2. Modified Recording Programs for Commercial Herds

The requirement to record birth dates is a major constraint to the

implementation of performance recording in many commercial herds. The
feasibility and technical efficiency of modified programs that avoid the
need for the recording of birth date by using a constant starting point,
such as branding, needs to be evaluated.

3. Recording and Selection of Cattle for Single Characters

Selection for characters such as weight gain, should be carried out in
conjunction with monitoring of non-selected traits such as calving difficulty
and reproductive efficiency. Total animal performance must be the criteria
of successful recording, not isolated individual production characters.

4. Herd Directory

A directory of herds who record objective performance of their breeding
cattle, such as produced by the New Zealand Beefplan should be available
to the industry.

5. Encouragement of Breed Societies

The initiatives in performance recording now being taken by many breed
societies needs to be encouraged and developed. Because the stud industry
has such a wide influence on the rate of improvement in the beef industry,
the use of objective performance recording to increase their effectiveness
in identifying breeding stock of superior genetic merit is a clear cut
responsibility.

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