MEASUREMENT IN BEEF CATTLE IMPROVEMENT

T.H. Rudder

Beef Cattle Husbandry Branch, Department of Primary Industry, Rockhampton, Qld.

SUMMARY

The value of objective selection within beef herds depends on the level of acceptance by commercial producers. To date, the level of acceptance has been comparatively low, possibly because researchers and extension officers have not fully understood and appreciated the current situation.

Traditionally selection of breeding cattle has been done by a few studmasters using subjective visual assessments based on breed characteristics. These studmasters are strongly commited to their breed society of choice. This society not only facilitates sale of breeding cattle, but also fills social needs. It follows then alternative systems based on objective measurement present a threat to both social and financial interests.

To be accepted, measurement systems must progress from comparatively small changes to the established norm to the complete package. Progress will depend on the rate producers gain understanding of the concepts of objective selection. Extension officers must tailor their advice to each situation making sure the producer sees the relevance of proposed change.

Methods of calculating costs and returns should be made readily available. Due to the wide variation between properties there is no meaningful generalisation.

There is a need to fully brief extension officers on the concepts of objective selection and its long term implications. Because of the traditional system is firmly entrenched and has financial and social implications, active opposition is strong. It follows the counter argument must be equally confidently presented.

INTRODUCTION

The purpose of developing a system of objective selection methods is to improve productivity of beef cattle through adoption by commercial producers. Therefore, success or failure of this innovation depends on the level of acceptance by the end user. An understanding and appreciation of the existing situation, as well as a knowledge of the technical aspects of the proposed innovation, is necessary.

EXISTING SITUATION

At present the dominant criteria for selection within beef herds are subjective visual assessments based on breed characteristics. This technique is firmly entrenched; and many producers, and some rural academics, consider

these measurements to be objective. Well-organized breed societies continually promote this approach believing that the existing traditional approach is the correct way to select breeding cattle for beef herds.

The social aspects of the traditonal approach are often overlooked by researchers and extension officers. Membership of a breed society, participation in shows and sales does fill a social need for many.

Proposed change towards a more logical method of selection of beef cattle represents a threat to many studmasters. Many sell a combination of grain and animal at greatly inflated prices because of beliefs generated by a long period of conditioning by breed society advertising. Thus, financial interests are threatened.

For many years leading studmasters have been considered by commercial producers to be industry leaders. Any significant change becomes a threat to their self esteem and standing in the industry.

The concept of objective measurement of economically important traits to assess genetic merit is slowly becoming accepted by innovators and early adopters. However, there are many in the industry who either actively oppose change, or passively pay lipservice without adopting the change in a meaningful way.

It follows that measurement systems have to be tailored to the current position of the end user. They must progress from a few comparatively simple measurements to the complete package. Naturally within any region there are producers at different levels of acceptance and adoption of measurement systems.

REQUIREMENTS OF MEASUREMENT SYSTEMS

To be effective, measurement systems must satisfy a number of criteria. These include:

a) Measurement must be accurate and supply information that reflects the genetic value independently from the phenotypic value.

b) Traits measured must be economically important and encompass the whole beef production cycle. It is dangerous to concentrate only on one aspect.

c) Efficiency in terms of time and cost. It must be remembered that this is one aspect of many the owner/manager has to consider.

d) Measurements suggested must be relevant to the producer and presented in a form that allows him to assess its relevance.

DEVELOPING A MEASUREMENT SYSTEM

Specialists in any field have a tendancy to advocate an all-embracing list of recommendations without really considering the current need of the end user. The original N.B.R.S. scheme was a prime example of this. Many producers and extension officers did not and still have not the knowledge or facilities to use a complete measuring and recording system.

Adoption of objective selection through the use of objective measurement will be an evolutionary process. As producers and extension officers gain expertise and confidence they will progress from a relatively simple, incomplete approach towards the complete package. Accordingly, measurement systems must be designed to fill this need within the limits of basic principles for economic genetic progress.

The following list of measurements is given in an approximate evolution order, accepting that some change will be needed according to the particular situation. Initially only males would be measured, but data on females can be included.

a) Animal Identification

The identification system must give each animal an unique identification, both within and across years. A system that does this is year of birth digits followed by identification number, e.g. 75-123 is for the one hundred and twenty-third calf tagged in the 1975 drop. The hundreds digits can be used to differentiate between sex, generation, breed, etc., e.g. 100 to 300 series for males, and 400 to 600 series for females, and so on.

Plastic tags with large numbers are the most practical for easily read identification. They can be fitted at, or near birth and onwards. Different colours can be used for group identification.

No ear tag can be regarded as permanent for all animals. Losses will occur and a back-up identification is desirable. Either ear tattoo, or fire brand using the ear tag numbers can be used. With fire brands care should be taken to comply with any requirements under the Brand Act of the particular State.

Given animal identification, performance based on gain can be implemented. This method has limitations, but if taken from say three to four months of age to 18 to 24 months gives a reasonable approximation of final weight for age. It could be regarded as a stepping stone to the next level in the progression.

b) Day of Birth

Selection based on weight for age is the most important factor for economic genetic improvement. Thus, recording day of birth has high priority.

Obviously daily observation, identification and measuring day of birth is the most accurate. In the practical world some compromise is usually necessary. Observation at four to six week intervals and ranking estimated by weeks or half-weeks seem to be a workable compromise. Naturally the shorter the period between observations the better. Under currently used systems breed society registrations record day of birth together with animal identification. However, many commercial producers who could profitably breed their own bulls, or already breed herd bulls, do not do this. They have to develop their own management system and expertise.

c) Final Weight for age at 18-24 Months

This is a particularly valuable piece of information and the aim should be to get producers to this stage as quickly as possible. The

only pre-requisite, besides identification and day of birth, is that the cattle are paddocked together from weaning to 18-24 months of age.

At 18-24 months of age, damage effects and preweaning paddock effects usually will be absorbed. Also, in the Central Queensland experience day of birth effects over a five month calving period, are not important at this age.

d) Tick Resistance

Where cattle tick is endemic the relative tick resistance between animals of tropically adapted breeds, e.g. Belmont Red, Braford, Brangus, Charbray, Droughtmaster, Santa Gertrudis, should be recorded. In these breeds tick resistance varies from extremely good to extremely poor. Because this trait is highly heritable some selection on this basis is desirable.

Basic rules to follow are:

* Assess from September to April at ages of 12 to 18 months.

* Base assessment on two counts with a group average of more than ten standard ticks per side, or one count with a group average of more than 25 standard ticks per side.

* Groups to be assessed should be together for at least six months and have had experience of tick.

* Restrain animals when counting to ensure accuracy and reduce the changes of operator injury.

Selection on the basis of final weight for age and tick resistance can be effectively implemented with only identification and day of birth information. However, there is a management penalty in that objective culling cannot commence until 12-18 months (ticks) or 18-24 months (final weight for age). Thus, excess bulls and/or heifers could be carried. Also, information on cows is foregone. The next stage is to collect measurements to overcome this deficiency.

d) Cow-calf Pairing

Ranking of cows and claves on weaning weight for age provides useful information. This information can be used to cull cows and/or calves on an economic objective basis. When final weight for age is markedly less than 18-24 months this information is likely to be needed to account for dam age effects not only at weaning but also at say 12-15 months of age.

There is no easy method of cow-calf pairing, but aspects to note include:

* Handle cattle in small groups where possible and be prepared to take time.

* Calves from about two to four months of age are generally easier to mother up than either markedly younger or older calves.

* Cross-check records for error. That is list numbers of cows in

numeric order with their calves and vice versa.

e) Weaning Weights

Measuring weaning weight supplies information on genetic merit and this information can be used to facilitate management, especially in the case of bulls. Irrespective of what age final selection is made an initial culling on weaning weight for age leaves a smaller group to cope with. Provided reproduction levels are adequate breeding cows can be culled on this measurement.

When using weaning weights care should be taken to avoid confounding genetic with environmental factors. Some of the obvious considerations include:

* Compare within paddocks because paddock differences are often larger than one would imagine and paddock by year interactions occur.

* Compare within approximately three month calving period unless there is access to an analytical technique to account for day of birth differences.

* Account for dam age differences by the best available method.

* If sire differences are to be measured, arrange joinings to avoid dam differences, e.g. age, generation. And re-group dams soon after joining to be able to cope with paddock differences.

f) Reproduction

The rate of genetic improvement achievable depends on reproductive rates. Therefore, measurement of this trait to supply information to maximize reproductive rates is important.

(i) Cows that fail to produce a calf should be marked for culling subject to sufficient herd replacement heifers. Also, cows that require assistance at calving should be similarly treated and the calf should be marked down for culling. There is some evidence of genetic influence in dystocia, an important consideration in some herds.

(ii) In the multiple sire joining system bull fertility is unlikely to have marked effect on reproduction rates because bull:cow ratios are not critically defined. Obviously the lower the percentage of bulls used and the smaller the number of bulls in the paddock the greater the chance of adverse effects.

Where single sire joining is used, and where there are only two or three bulls in the paddock, measurement of likely bull fertility is a useful precaution, especially in Brahman and Brahman derived breeds. These breeds have a higher proportion of sub fertile bulls than other breeds.

Measurements include veterinary examination to isolate defects of the reproductive tract, semen evaluation, and testicle circumference. However, there is no certain method to predict that a bull will sire a given number of calves, but risk of failure can be reduced if seriously defective bulls are eliminated.

g) Miscellaneous

Gross physical defects are usually rare but readily observed.

In Hereford herds eye pigmentation can be measured, either subjectively, or objectively. In this a subjective measurement is probably sufficient.

Colour and conformation are of little economic importance, but gross deviation from the established norm warrants measurement and possible culling. Provided discretion is used only few animals are involved. Those animals markedly different from the norm are generally not saleable as breeding stock. Probably the main exception to this is the colour pattern favoured by Braford breeders, which results in a major source of genetic waste.

MEASURING SERVICES

Objective selection methods will be widely adopted only when producers thoroughly understand the principles involved. This understanding will come with use of the system from measurement through to recording and use of the records. Any centralized measuring service must be capable of providing an educational role, not only a service role.

State Departments of Primary Industries are already structured to fill the educational role and a temporary service role. In my opinion, gaps that need to be considered are training of officers to gain a better understanding of what is required, and in some cases, provision of a mobile weighbridge.

The only expensive piece of equipment needed is a weighbridge - roughly $3,000 installed. Besides recording measurements for performance recording, a weighbridge is of value in selecting cattle for sale. However, there is a possibility of group participation in acquiring a mobile weighbridge to service a number of properties.

COSTS AND ECONOMICS OF MEASUREMENTS

Costs of measurement depend on facilities available, stocking rate, managerial ability, numbers, selection pressure and complementary use of capital equipment. Similarly, economics depend on a number of variables, e.g. selection differential, reproductive rates, generation interval, and alternative cost of bulls.

The best that can be done is to outline a system of estimating these factors. Each situation must be considered separately, because there is no general cost or return that is universal.

a) Costs

Major fixed costs are a weighbridge, a squeeze crush when tick assessment is important, and a calculator. Objective measurement cannot be done without a weighbridge, but the installation of a weighbridge is generally followed by complementary use, e.g. selecting sale cattle and ensuring heifers are heavy enough to join. These kinds of measurements tend to improve managerial decisions, therefore it is invalid to allocate the total annual cost against objective selection. Similar arguments can

be advanced for other pieces of equipment.

(i) Fixed Costs

Weighbridge	$3,000 installed	-	Depreciation	$135	
		-	Maintenance	$ 60	
		-	Interest	$132	$327
Squeeze Crush	$ 250 installed	-	Depreciation	$ 11	
		-	Maintenance	$ 5	
		-	Interest	$ 11	$ 27

(Based on life of 20 years, salvage value 10% of initial cost, maintenance 2% of initial cost, and interest at 8% of average investment).

Calculator	$ 50	-	Depreciation	$ 10	
		-	Maintenance	$ 5	
		-	Interest	$ 4	$ 19

(Based on life of five years and nil salvage value).

Stationery, etc.	$ 5	$ 5
TOTAL		$378

(ii) Variable Costs

The example given is based on handling 100 animals with good facilities and experienced personnel. There is some benefit of scale of operations because each operation has a certain preparatory phase irrespect of numbers. However, the purpose of the example is to illustrate the method of calculations.

Wages have been arbitarily set at $45 per day. The realism of this depends on whether existing labour has equivalent opportunity value.

Tags @ 30¢	$ 30.00
Prepare record book and number tags (1 man for ½ day)	$ 22.50
Identify calves and record day of birth (4 observs. @ 2 men for 3/4 day)	$270.00
Calf-cow pairing and record (3 men for 1 day)	$135.00
Weigh weaners (2 men for ½ day)	$ 45.00

Process records (1 man for ½ day)	$ 22.50	
Locate culls (2 men for ¼ day)	$ 22.50	$ 90.00
Tick assessment (3 men for 1 day)	$135.00	
Process records (1 man for ½ day)	$ 11.25	
Locate culls (2 men for ¼ day)	$ 22.50	$168.75
Final weight (2 men for ½ day)	$ 45.00	
Process records (1 man for ¼ day)	$ 11.25	
Locate culls (2 men for ¼ day)	$ 22.50	$ 78.75

As an example, consider a situation of 100 bull calves of which 25 are to be retained, and 100 heifers of which 50 are to be retained. The selection will be based on culling 50% of the bulls at weaning and 25% of the heifers; then 10% of the initial number of both sexes will be culled on tick resistance and 15% of the initial number of both sexes on final weight for age. All fixed costs are allocated to objective measurement.

Class of Cost	Heifers	Bulls	Both
Fixed costs	$189.00	$189.00	$378.00
Tags, identify, cow-calf pairing, weaning data	$547.50	$547.50	$1,095.00
Tick assessment (75 heifers, 50 bulls)	$126.56	$ 84.38	$210.94
Final weight for age (65 heifers, 40 bulls)	$ 51.19	$ 31.50	$ 82.69
TOTAL COST (50 heifers, 25 bulls)	$914.25	$852.38	$1,766.63
COST PER HEAD	$ 18.29	$34.10	$ 23.56

This example assumes that nothing is currently being done. In the stud situation calves are identified, day of birth recorded, and cow-calf pairing done. Thus additional costs would be restricted to weaning, final weight, and where appropriate, tick assessment.

b) Economics

The major economic response would be through the selection of herd bulls. In herds of 100 or more breeders from a large proportion up to all bull requirements can be produced from the herd. In the example given the cost would be $34 a head over the steer value at the age of final selection. As a rough comparison herd bulls are often two and a half to three times steer prices.

Producers with medium-sized herds (say 250 breeders and upwards) have an opportunity to sell reasonably priced bulls on the basis of performance records. Even a fifty per cent increment on steer prices represents a good business deal for both seller and purchaser.

A producer who breeds his own bulls can select from within up to the top 5% depending on type of breeding program, i.e. across the herd, or from an elite group. Given that these bulls are selected on economically important traits, progeny by these bulls can be expected to be superior than those by bulls emerging from conventionally managed studs. Overall, bulls from studs cannot hope to compete with bulls selected from the top 20% of a herd because the selection differential is much lower.

Again it is meaningless to generalize about extra returns. For practical purposes, one really needs to look at only the next generation, or in other words, three to five years ahead, depending on age at sale. This is simply calculating the potential increment in the trait from the average selection differential and its heritability value.

It is the responsibility of research to supply information concerning long term effects. In the economic situation one cannot realistically look ahead more than three to five years.

There is a research need to demonstrate results of breeding programs based on objective selection in both the short term and long term. Various selection strategies, and discounting rates for economic data must be evaluated. This kind of information is needed by extension officers and is not readily available.

* * *