Queensland **Primary Industries and Fisheries**

Buying bulls

it's all in the genes

Queensland Government

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On 26 March 2009, the Department of Primary Industries and Fisheries was amalgamated with other government departments to form the Department of Employment, Economic Development and Innovation.

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Contents

Buying bulls

Bull selection is vital to the growth and profitability of your business. The bull that you choose will directly influence 80 to 90 percent of the genetics of your whole herd for about the next 15 years. So, when you make your next bull selection decision, you are making a decision that can either improve your profits or reduce your income.

This book describes a simple process that can help you select the bull that's right for your business. It explains the importance of bull genetics and how to evaluate a bull's genetic value using tools such as Estimated Breeding Values (EBVs).

Using this book to select a bull

Before selecting a bull, review your breeding objective. Your breeding objective will depend on the requirements of your target markets and the traits that you need to consider in order to meet those requirements and the environment in which you live.

This pocket book encourages you to ...

...consider your breeding objective
Do you want to increase the pregnancy rate of your breeders? Or their progeny's growth rate? Or carcase weight? Record these objectives in your breeding objective.

...understand selection tools
This book provides information on EBVs and other useful tools to assist in selection of a suitable bull.

...research sale bulls
This book tells you how to obtain information to help you evaluate the genetic value of sale

bulls and identify a bull that will meet your breeding objectives.

...examine the bulls 'on offer'
Review bulls in the paddock, at the auction or sale. Check the bulls that you have selected for structural soundness.

...make your final decision based on the sum of all this information
EBV information, combined with physical assessment and other available information such as the BBSE, temperament assessment and DNA markers, will ensure you select the best bull for your business.

...record your purchases in the table at the back of this book
The information that you record in the bull genetic evaluation table can help you assess your purchase decisions and improve your breeding program over the longer term.

Bull genetics

the key to business success

A smart breeding strategy is crucial to your herd's long-term genetic improvement, performance and business health. Your bull's genetics are a vital component of this strategy.

But how do you evaluate a bull's genetic value? The general appearance of a bull may be a very poor indicator of his ability to positively affect your profits. Observed physical traits can be misleading as indicators, particularly if the bulls have been raised under different conditions.

To help breeders focus on an animal's genetic

value, the Agricultural Business Research Institute (ABRI) manage a genetic evaluation system called BREEDPLAN. The BREEDPLAN output is calculated using software developed by the Animal Genetics and Breeding Unit (AGBU).

Launched in 1985, BREEDPLAN is now used by most breeds of beef cattle in Australia. BREEDPLAN is also widely used in New Zealand, Canada, the United States and many other places around the world.

BREEDPLAN EBVs

BREEDPLAN uses the integrated pedigree system in addition to detailed information on the performance of individual animals, their progeny and other relatives, and uses a sophisticated computer program to combine this information with scientific knowledge on genetics and the links between genetics and animal performance and meat quality.

For each animal in its database, BREEDPLAN produces a series of EBVs. These are values that predict the animal's genetics relative to the breed's average for various genetic traits (e.g. reproductive, milking ability, growth, carcase traits).

EBVs – a key to profits

Field trials in Queensland have shown that using EBVs to select bulls can lead to big improvements in profits. More information on these trials can be obtained from the *Beef Cattle Recording and Selection* book referenced on page 21.

Which EBVs are available?

EBVs can help increase your herd's performance in four key areas:

- calving
- fertility
- growth
- carcase traits.

EBVs are published by all the major Australian breed societies in sire summary booklets or on the Breed Society websites. EBVs are also published in many sale catalogues.

Using EBVs to compare bulls

EBVs are positive or negative numbers above a base set at 0. They are expressed in the unit of measurement used for the trait. For example, a bull might have a 400–Day Weight EBV of +40, meaning a 400–Day Weight that is 40 kg greater than the base average for the breed.

For many breeds, EBV bases were set in the 1970s or 1980s. The absolute value of the EBV above or below the base isn't as important as the differences in EBVs between animals.

Information on Breed Averages for calves in the same year drop is often included in sale catalogues.

It is important to note that EBVs can currently only be used to compare animals within the same breed and that the availability of different EBVs may vary between breeds.

Sire's contribution

A calf gets half its genes from the sire and half from the dam. In other words, only half of a bull's EBV is passed on to its progeny. For example, a bull with a 400–Day Weight EBV of +40 will pass on only half (+20) of that performance to his progeny.

Should an EBV be positive or negative?

The answer depends on the trait and your

breeding objective. For example, your breeding objective may dictate that you need to focus on shorter gestation length; in this case you would select a bull with a lower or negative gestation length EBV compared to the breed average. On the other hand, to increase 200 day growth, you could select on the basis of a higher positive 200–Day Growth EBV compared to the breed average.

Which EBVs should I choose?

When using EBVs, concentrate on the traits that are important to your herd, your markets and your environment. Rank your selection criteria in priority order.

Avoiding an over-emphasis on certain traits and achieving a balanced overall performance is important to the long-term profitability of your herd.

EBV accuracy

Individual EBVs are published with an accuracy level (shown as Acc. % in sale catalogues) that indicates how reliable the figures are.

When BREEDPLAN has extensive information on an animal, his progeny and other relatives, the EBVs have a higher percentage of accuracy and are more reliable. The accuracy of an EBV also depends on how heritable a genetic trait is.

Higher percentage values indicate higher accuracy. As a guide, if you are evaluating a two-year-old bull for a trait with moderate heritability then you can expect to have an accuracy level of between 50% and 65%.

EBVs with low accuracy levels are more likely to change as an increasing amount of information becomes available for a particular animal.

BreedObject – balancing EBVs the easy way

BreedObject is a computer program that allows breeders to combine a mix of EBVs in the best way for a given situation. The result is a dollar index ($ index) that estimates the economic value of a bull's genetics for specific market conditions.

Most breed societies have developed standard indexes targeting particular markets.

For example, a Jap Ox index has been developed for the Brahman breed.

BreedObject can be customised to meet your own breeding objectives. For more information visit the BREEDOBJECT website. (see contact information at the end of the booklet).

How Harry used this book

Consider how Harry, a fictional producer from Charleville, used this book to help select a bull using a very specific trait. The same principle applies across all traits as embraced in the $ Index EBV.

Harry's steers were having trouble making Jap Ox weights and he knew he needed more growth. In his business plan, Harry's breeding objective was for his herd to increase their 600–day weight.

Before the next sale, Harry selected two bulls that met his breeding objective based on EBV information provided in the sale catalogue. Harry researched his selections further by contacting the vendors to find information about the bulls breeding soundness evaluation (BBSE), whether any temperament assessment had been conducted or DNA

marker information collected. Harry listed the EBVs for his selected bulls as follows.

Bull	EBV			
	200-day milk	200-day weight	400-day weight	600-day weight
A	-8	+17	+28	+48
B	+7	+10	+15	+30

At the sale, Harry assessed the bulls for conformation, structural soundness and phenotypic temperament.

While the two bulls appeared very similar, the EBV table made Harry's selection easier. Harry chose Bull A, because the average performance of this bull's calves for 600-day growth would be expected to be 24 kg relative to the base, compared to 15 kg for Bull B. Harry considered the animal's EBV by trait relative to the average in that year. This selection decision corresponds with Harry's breeding objective of increasing 600-day weight to meet the Jap Ox market weight requirements.
(Remember that the bull contributes half the progeny's genes. Half of 48 = 24).

Calving EBVs

Easy calving improves economic performance by reducing calf and heifer mortality, reducing labour and veterinary expenses at calving time, and improving the re-breeding performance of female cattle.

EBVs that affect calving are listed below. Your choice of EBV will depend on your breeding objective and the EBVs available for your breed of interest. For example, to reduce the

incidence of calving difficulty and subsequent mortalities, you might select a bull with a small to moderate Birth Weight EBV.

Calving Ease (DIR) (%)

The Calving Ease Direct EBV estimates the direct genetic difference in the ability to calve unassisted as a result of the sire.

The EBV is reported as differences in the percentage of unassisted calvings. Larger, positive EBV values are more favourable.

Calving Ease DTRS (%)

The Calving Ease Daughters EBV indicates the genetic differences for calving ease for an animal's daughters.

The EBVs are reported as differences in the percentage of unassisted calvings. Larger, positive values are more favourable.

Birth Weight (kg)

Birth Weight EBVs are estimates of genetic differences between animals in kilograms of calf birth weight.

Small, or moderate EBVs are more favourable.

Birth weight information is not collected for every breed. In cases where information is not collected, Birth Weight EBV can be calculated using genetic correlations, but these values will have a lower accuracy.

Fertility EBVs

Fertility indicators such as gestation length, days to calving and scrotal size play a vital role in your business management. A shorter gestation length means cows may calve more

frequently, in a shorter time frame, putting more money in your pocket. It may also mean lower calf birth weight, decreasing the incidence of calving difficulty. Scrotal size is an indicator of the age at puberty in progeny. Increased scrotal size is associated with younger age at puberty of male and female progeny — meaning, once again, more calves on ground, earlier.

Gestation Length (days)

This EBV estimates the genetic difference between animals in the number of days from the date of conception to the calf birth date.

Lower or negative EBV values are generally more favourable. This EBV is only available when the mating (i.e. artificial insemination) and calving dates are known.

Days to Calving (DC) (days)

Days to Calving (DC) EBVs are estimates of genetic differences in fertility, expressed as the number of days from the start of the joining period until subsequent calving.

Lower, or negative EBVs are more favourable.

Scrotal Size EBVs (cm)

Scrotal Size EBVs estimate the genetic differences between animals in scrotal circumference at 400 days of age.

Larger, or positive EBVs are more favourable.

Growth EBVs

Many breeding plans call for faster growth to achieve faster turn-off and greater profits. Currently EBVs exist for five growth traits.

200-Day Milk (kg)

200-Day Milk estimates the calf weight gain resulting from the genetic influence of the sire on his daughters' milking ability. This EBV represents the proportion of growth that is due to the mother's milk, rather than to the calf's own growth genes.

The 200-Day Milk EBV must be considered with caution in northern environments as high milking cows can struggle to re-conceive due to poor body condition. Accuracies tend to be lower for this trait due to the need to have female progeny recorded.

Larger, more positive values indicate higher milking.

Mature Cow Weight (kg)

This EBV estimates the genetic differences in cow weight. Larger/heavier cows require more nutrition to enable them to maintain condition and produce calves. Extremely heavy cows are more susceptible to droughts.

Mature cow weight is recorded at the time the calf is weaned and averaged over a maximum of five calvings. It is an indication of the mature weight of the breeders and should be related to the nutrition available on the property.

Weight EBVs

200-Day, 400-Day and 600-Day

Use these EBVs to select a growth profile that matches your target market requirements. Bear in mind that higher growth is genetically correlated to higher birth weights, which can lead to calving difficulties.

200-Day Weight (kg)

This EBV estimates the genetic weight differences between animals at 200 days of age.

Larger, positive EBV values are generally more favourable.

400-Day Weight (kg)

This estimates the genetic weight differences between animals at 400 days of age.

Larger, positive EBV values are generally more favourable.

600-Day Weight (kg)

This estimates the genetic weight differences between animals at 600 days of age.

Larger, positive EBV values are generally more favourable.

Carcase EBVs

By managing your herd's vital carcase statistics, you can meet the specifications of your target market and increase income per carcase. The following carcase trait EBVs are currently available.

Carcase Weight (kg)

These estimate the genetic differences between animals in hot standard carcase weight (HSCW) at 650 days of age.

Larger, positive EBV values are generally more favourable.

Eye Muscle Area (EMA) (cm^2)

EMA EBVs are estimates of the genetic differences between animals in eye muscle

area (cm^2) at the 12/13th rib site on a 300 kg carcase.

Larger, positive EBV values are generally more favourable.

Rib Fat and Rump Fat EBVs (mm)

Rib Fat EBVs are estimates of the genetic differences between animals in fat depth (mm) at the 12/13th rib site, on a 300 kg carcase. Rump fat EBVs are estimates of genetic differences between animals in fat depth at the P8 rump site on a standard 300 kg carcase.

Rib Fat and Rump Fat EBVs are used to change progeny fat levels relative to target market specifications.

Retail Beef Yield (RBY) (%)

The RBY EBVs estimate genetic differences between animals in percentage retail beef yield in a 300 kg carcase, with a 2–3 mm fat trim, adjusted to 85% chemical lean. Larger, positive EBV values are generally more favourable.

Intra-Muscular Fat (IMF) (%)

IMF% EBVs are estimates of genetic differences between animals in percentage intra-muscular fat (marbling) in a 300 kg carcase.

Whether you choose to include IMF % in your breeding objective will depend on your target market. For example, if you are supplying to the Jap B3 market, higher, more positive IMF % EBVs are more favourable.

Other tools to streamline your breeding plan

Three other tools can further enhance the strength of your breeding plan by assisting in the decision making process:

- bull breeding soundness evaluation (BBSE)
- temperament assessment
- DNA markers.

An EBV for Net Feed Intake (NFI) is also under development to identify animals that are more efficient converters of available feed to kilograms of liveweight gain.

A description of these tools follows. After you assess a bull's EBVs, you can use these tools to further refine your selection.

Bull breeding soundness evaluation (BBSE)

This evaluation was developed by the Australian Cattle Veterinarians to standardise bull fertility testing and to provide a consistent way of describing bull fertility.

A BBSE report is sometimes included in sales catalogues. If not, ask the vendor whether the information is available.

The BBSE report indicates whether a bull has met a set of standards for the five bull fertility components listed below. Although these components do not guarantee fertility, they indicate whether a bull has a high probability of being fertile at the time of testing.

The five bull breeding soundness criteria are:

Scrotum

Scrotal circumference/size (SS) in centimetres (cm) where testes shape is within normal range. The current recommendations for tropically adapted bulls are a minimum scrotal size of 32 cm (average is 34–36 cm) for a two-year-old bull. This minimum size may increase with some individual breed society standards.

Physical

Within the constraints of a standard examination, there is no evidence of any general physical/structural condition or of a physical condition of the reproductive tract indicating sub-fertility or infertility. This evaluation will identify structurally unsound bulls in legs, feet, sheath, penis and general structure.

Semen

Crush-side assessment indicates that the semen is within normal range for motility, colour and percent progressively motile and is suitable for laboratory evaluation.

Morphology

Semen examination of percent normal sperm using high power magnification to ensure minimum standards for normal function are achieved.

Serving

The bull is able to serve normally as demonstrated in a standard test and shows no evidence of fertility limiting defects.

The serving capacity test indicates a bull's ability to mount and serve a cow/heifer and includes both reproductive and structural soundness (legs, feet, penis and overall anatomy). It measures the sex drive (libido)

or eagerness of a male to seek out a female on heat. It also offers an indication of the subsequent pregnancy rates achieved following a restricted mating period.

In a sale catalogue, these elements will be presented in a table similar to the one shown in Figure 1.

Figure 1. Bull breeding soundness evaluation summary table

Bull no./name	Age yr/mth		Scrotum	Physical	Semen	Morphology	Serving
AACV Top of the rack	2.02		37.0 cm	✓	✓	P	Nt

✓: For this component, the bull met the fertility standards as published by the Australian Association of Cattle Veterinarians

×: The bull did not meet the standards for this fertility component

Nt: This fertility component was not fully tested/evaluated

Na: Not Applicable, e.g. certificate not required to indicate status for this fertility component

P: (for Morphology only). The samples taken do not meet the full standards but indicate that the bull is very likely to be fertile under natural mating P=›50% and ‹70% N. Seek advice from your cattle vet. A ✓ = ›70% Normal

In addition to this summary, a full BBSE report that identifies the bull and records the following is also provided:

- the date of testing
- the person performing the testing
- the place where the testing occurred
- specific comments associated with each test.

Temperament assessment

The progeny of genetically docile bulls have a higher probability of being quiet, having higher growth rate, transporting better and produce more tender meat.

Temperament can be measured using 'flight time' or scored using a crush or yard test. The flight time measure provides a more accurate and heritable measure of the trait to modify herd performance. The slower the flight time the more docile the animal.

Temperament EBVs are currently under development in some breeds and available in others. However, some breeders are conducting temperament assessments, so ask the vendor whether this information is available.

DNA markers

This is a developing science that will provide a key for the future. DNA marker technology has great potential but will not provide its fullest benefit until markers are able to explain more of the variation within a trait.

Various markers are available worldwide from different organisations. One Queensland company currently has seven markers available to the beef industry — three for marbling and four for tenderness. These diagnostic tests have been commercialised by Genetic Solutions and are marketed as GeneSTAR® Marbling 3 and GeneSTAR® Tenderness 4. Other gene markers are being researched.

The presence of markers in an animal is reported using a star rating. For each marker, it is possible to obtain a result of 0, 1 or 2 stars. This is because one allele (i.e. half the marker) is inherited from the sire and one allele from the dam. If the animal has inherited no allele it scores 0; if it has inherited one (from either the sire or the dam), it scores 1; and if it has inherited two copies (one from the sire and one from the dam) it scores a 2.

The more stars, the more likely an animal is to exhibit the trait. For example, 0 stars means an animal carries none of the favourable forms of any of the trait markers. An animal that has 1 star carries one of the favourable forms. Multiple stars means multiple favourable traits.

Useful contacts

Beef Cattle Recording and Selection
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Using the bull genetic evaluation table

You can use the table at the back of this book to compare potential bull purchases in advance of the auction. After the auction, record the price against the bulls you have purchased in the tables, and keep these records for future reference and selection comparisons to ensure genetic progress and profitability.

Bull genetic evaluation table

Year: _____

Bull ID	Bull Breeding Soundness Evaluation					Fertility			Growth (EBVs)			Carcase (EBVs)			Temperament*	Markers	
Ident, name, lot number, age/DOB, stud, breed	Scrotal Size (cm)	Physical	Semen	Morph % normal	Serving	Dam age 1 st calf (yr)	Dam calv. interval–dy	SS (EBV)	200-Day	400-Day	600-Day	EMA	Marbling	IMF%		Tenderness	Fat (Rib/P8)
Comment																	
Comment																	
Comment																	
Comment																	
Comment																	
Comment																	

* Temperament scored 1-5, 1 being docile and 5 cranky.