

Understanding Carcase EBVs

Selection for increased carcase yield and carcase value has become an increasingly important objective for breeders of cattle. So how do cattle producers evaluate and identify animals for use within their breeding program that have desirable genetics for the important carcase attributes? Visual appraisal is challenging as it is difficult to “see” many of the carcase traits and selection on raw scans alone is limited as no account is made for non-genetic factors such as age and nutrition. Thankfully, there are a range of BREEDPLAN Carcase EBVs available which provide producers with a useful tool when trying to answer this question.

What Carcase EBVs are Available ?

BREEDPLAN currently produces seven Carcase EBVs:

- Carcase Weight
- Rib Fat Depth
- Rump Fat Depth
- Eye Muscle Area
- Intramuscular Fat (Marbling)
- Retail Beef Yield
- Shear Force (nb. Trial EBV only)

(i) Carcase Weight

Carcase Weight EBVs are estimates of the genetic differences between animals in hot standard carcase weight (as defined by AUSMEAT) at 650 days of age. Carcase Weight EBVs are expressed in kilograms (kg).

Larger, more positive, Carcase Weight EBVs are generally more favourable. For example an animal with a Carcase Weight EBV of +40 kg would be expected to produce progeny with heavier slaughtered carcasses at 650 days of age than an animal with a Carcase Weight EBV of +30 kg.

Carcase Weight should not be confused with yield. The Carcase Weight EBV is an indication of the animal’s carcase weight and not an indication of the animal’s yield percentage.

(ii) Eye Muscle Area (EMA)

Eye Muscle Area EBVs are estimates of the genetic differences between animals in eye muscle area at 12/13th rib site in a 300kg steer carcase. EMA EBVs are expressed in square centimetres (cm²).

Larger, more positive, EMA EBVs are generally more favourable. For example, a bull with an EMA EBV of +4 cm² would be expected to produce steer progeny with a greater degree of muscle expression than a bull with an EMA EBV of +1 cm².

(iii) Rib Fat

Rib Fat EBVs are estimates of the genetic differences between animals in fat depth at the 12/13th rib site in a 300kg steer carcass. Rib Fat EBVs are expressed in millimetres (mm).

More positive or more negative Rib Fat EBVs may be more favourable, depending on your breeding goals relating to the finishing ability of your animals. A bull with a Rib Fat EBV of -0.4 mm would be expected to produce leaner calves than a bull with a Rib Fat EBV of +0.4 mm.

(iv) Rump Fat

Rump Fat EBVs are estimates of the genetic differences between animals in fat depth at the P8 rump site in a 300kg steer carcass. Rump Fat EBVs are expressed in millimetres (mm).

More positive or more negative Rump Fat EBVs may be more favourable, depending on your breeding goals relating to the finishing ability of your animals. A bull with a Rump Fat EBV of -0.6 mm would be expected to produce leaner calves than a bull with a Rump Fat EBV of +0.6 mm.

Stock with positive fat EBVs are likely to produce progeny that are fatter, or more earlier maturing, on average than stock with lower or negative fat EBVs. Increasing fat depth leads to a decrease in retail beef yield, however most market specifications require a minimum fat depth. Breeders aiming to breed leaner, higher yielding cattle may select for lower fat EBVs. Breeders wishing to finish their animals earlier may tend to select animals with moderate fat EBVs. Caution should be placed on selecting for extremely low fat EBVs for replacement females as this may indicate females that are more difficult to get in calf.

Differences between Rib Fat EBVs and Rump Fat EBVs can indicate differences in fat distribution among animals.

(v) Retail Beef Yield (RBY)

Retail Beef Yield (RBY) EBVs are estimates of genetic differences between animals in boned out retail beef yield in a 300kg steer carcass. RBY EBVs are reported as differences in percentage (%) yield.

Larger, more positive, RBY EBVs are generally more favourable. For example an animal with a RBY EBV of +0.9% would be expected to produce progeny that would yield higher percentages of saleable beef in a 300 kg carcass than an animal with a RBY EBV of +0.1%.

(vi) Intramuscular Fat (IMF)

Intramuscular Fat (IMF) EBVs are estimates of genetic differences between animals in intramuscular fat (marbling) at the 12/13 rib site in a 300kg carcass. IMF EBVs are reported as differences in percentage (%) IMF.

Larger, more positive, IMF EBVs are generally more favourable. For example an animal with an IMF EBV of +0.8% would be expected to produce progeny that would express more marbling in a 300 kg carcass than an animal with an IMF EBV of +0.1%.

For markets where marbling is important (eg. Japanese B2/B3 market, restaurant trade, etc.), higher IMF EBVs can contribute significantly to carcass value. Recent research would suggest that 1 marble score is equivalent to approximately 1.5% intra-muscular fat so the variation shown between sires is not that large. This relationship still needs more data to confirm the conversion from marble score to intra-muscular fat.

(vii) Shear Force

Trial Shear Force EBV^Ms are estimates of genetic differences between animals in meat tenderness. Trial Shear Force EBV^Ms are expressed as differences in the kilograms of shear force that are required to pull a mechanical blade through a piece of cooked meat and are calculated from shear force measurements (ie. objective abattoir measures of meat tenderness), gene marker information and flight time records.

Lower, more negative, Trial Shear Force EBV^Ms are more favourable. That is, lower EBVs indicate that less shear force is required and hence the meat is more tender. For example, a bull with an EBV of -0.90 would be expected to on average produce progeny with meat that required a shear force of 1 kg less than a bull with an EBV of +1.10.

Using Carcass EBVs

As a practical guide to the use of Carcass EBVs, please consider the following bull buying exercise. In this exercise, you need to advise two bull buyers on which bull would most suit their operation from a list of four bulls.

Please note, for the purpose of this exercise:

- ❑ All bulls were assumed to be structurally sound and fertile.
- ❑ All EBVs are GROUP BREEDPLAN EBVs for bulls of the same breed.

Answers to the exercise and provided on the back page

BULL	400 DAY WEIGHT	600 DAY WEIGHT	RUMP FAT	EMA	RBY	IMF
A	+58	+83	+1.3	+0.3	- 0.2	+0.3
B	+50	+74	- 0.2	+2.0	+0.1	- 0.1
C	+55	+80	- 0.7	+4.1	+0.4	+0.1
D	+56	+78	+0.8	+2.0	+0.1	- 0.2
Breed Av	+52	+68	+0.2	+1.6	0.0	0.0

Buyer 1 - Sells yearling steers to a feedlot which is long-term feeding for Japan and has been advised to increase size and growth to 2 years, reduce fatness, maintain or improve muscularity and improve marbling.

Buyer 2 - Breeds yearling steers, from European x Dairy cross cows. She has difficulty in finishing yearling steers and seeks to improve this.

Recording Information for Carcase Traits

BREEDPLAN currently calculates EBVs for the carcase traits based on two main sources of information – live animal ultrasound scanning & abattoir carcase data.

Of these two sources, stud breeders are most likely to collect live animal ultrasound scanning information. The abattoir carcase data is generally only of value to the BREEDPLAN analysis if it is collected through structured research or progeny test trials.

Live animal ultrasound scanning is a non-invasive technology that allows the seedstock or commercial beef producer to assess the carcase merit of an individual animal whilst still alive as opposed to the collection of carcase data in the chiller. The carcass attributes most commonly measured by ultrasound scanning include:

❑ Rump Fat Depth

Rump Fat Depth is measured at the P8 rump site. The P8 rump site is located at the intersection of the line from the high bone (third sacral vertebrae) with a line from the inside of the pin bone. Rump Fat Depth will be reported to the nearest mm (eg 10 mm).

❑ Rib Fat Depth

Rib Fat Depth is measured at the 12/13th rib site. The 12/13th rib site is located on the longissimus dorsi muscle (eye muscle) between the 12th & 13th rib. Rib Fat Depth will also be reported to the nearest mm (eg 7 mm).

❑ Eye Muscle Area (EMA)

Eye Muscle Area is measured as the cross sectional area of the longissimus dorsi muscle between the 12th & 13th rib. EMA is reported to the nearest cm² (eg.110 cm²). Eye Muscle Area is also referred to as Rib Eye Area.

❑ Intramuscular Fat (IMF)

The carcass benchmark for intra-muscular fat is the chemical extraction of all fat from a meat sample taken as a slice off the longissimus dorsi between the 12th & 13th ribs. Ultrasound scanning for IMF uses a longitudinal image of the longissimus dorsi muscle between the 12th & 13th ribs. IMF is reported as a percentage (eg 3.5%)

The following section outlines the main points that breeders should consider when collecting live animal ultrasound information:

- ❑ Scan information will only be accepted by BREEDPLAN if it has been recorded by an accredited scanner. A list of accredited scanners can be accessed from the “Accredited Technicians” page within the Technical area of the BREEDPLAN website (<http://breedplan.une.edu.au>) or by contacting staff at BREEDPLAN.
- ❑ BREEDPLAN can analyse the scanning performance from animals that are between 300 – 800 days of age when measured. Subsequently, it is important to scan your animals when they are within this age range. The majority of animals are scanned as rising 2 year olds (ie. around 600 days of age).

- ❑ Condition of stock should be the most important consideration when making a decision about when to scan your animals. To obtain effective results from scanning, it is recommended to scan your animals when they are in as good a condition as possible. This ensures that there will be sufficient variation between animals to allow genetic differences to show up. As a rough guide, if you are particularly interested in fat depth and IMF, animals require a minimum average rump fat depth of 4–5 mm (or a minimum average rib fat measurement of 3 mm) for it to be worthwhile scanning. Results for IMF will be further optimised if the majority of animals have between approximately 2 – 8% IMF when scanned.
- ❑ While bulls are most commonly scanned, it is recommended that breeders also scan their heifers and steers if possible. Heifers provide valuable data for marbling as they mature earlier than do the males. Scanning steers will provide useful information for their sires and dams.
- ❑ It is important to try and scan as many of your animals within each management group as possible. Submission of scan data for only a selection of your calves (eg. only submitting the scanning performance of your sale bulls rather than the entire bull drop) may result in data biases and the subsequent calculation of carcass EBVs that do not reflect the true genetic merit of your animals.
- ❑ While more than one set of scanning measurements can be recorded for an individual animal, BREEDPLAN is only analysing the first set of scanning information for each animal at this stage.

Scanning information should be submitted directly to the BREEDPLAN office at ABRI. Importantly, the submission of scanning information to BREEDPLAN is the breeder's responsibility NOT the scanners.

The main method of submitting scanning information is by completing the BREEDPLAN “scanning forms”. These forms are similar to the normal “performance recording forms” that you will be familiar with and can be requested by contacting staff at BREEDPLAN. Alternatively, the recording sheet completed by the scanner at the time of scanning can be submitted to BREEDPLAN, however it must be presented in an acceptable format. The full Breed Society/Association ident of each animal must be provided (not just tattoo) and sheets must be submitted in a clear and clean manner. It is also critical to ensure that management group information is included on the scanning sheets. Data submitted in the incorrect format will be returned to the breeder for re-submission.

Alternatively, scanning information can be submitted electronically via either:

- ❑ a BREEDPLAN compatible herd recording computer program
- ❑ the performance submission facility offered on some Breed Society/Association websites
- ❑ the BREEDPLAN compatible Microsoft Excel template

For more information regarding Carcass EBVs, please contact staff at BREEDPLAN

Answers

Buyer 1 - Bull C (Fat EBV is negative, eye muscle, retail beef yield and IMF EBVs are positive
600 day weight EBV is also high)

Buyer 2 - Bull A (Fat EBV is positive, 400 day weight EBV is the highest)