
Improving the Carcase

During the 1990's, the beef industry experienced a shift in emphasis from selection purely on growth and adaptation to concentrate more on the genetics of carcase and beef quality. During this phase selection for increased muscling and carcase yield became an increasingly important objective for cattle breeders. More recently there has been a swing in industry to place more weighting on the fat traits while still selecting for muscling. This has occurred for two reasons being 1) marbling has emerged as an economically important trait in some markets and 2) subcutaneous fat levels impact on the fertility of the cow herd (i.e. higher condition scores equates to more cycling cows) and selecting on muscling alone will lead to decreased subcutaneous fat levels. Carcase specifications for most markets also require a minimum subcutaneous fat level.

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” the genes that a breeding animal is carrying for carcase traits due to what we see being a combination of environment and genetics. Selection on raw scan figures alone is limited as no account is made for non-genetic factors such as age, nutrition or past management differences. To assist cattle breeders in making effective selection decisions on carcase traits there are a range of BREEDPLAN Carcase Estimated Breeding Values (EBV) available.

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 carcase attributes most commonly measured by ultrasound scanning include:

- 1) Rump Fat Depth
- 2) Rib Fat Depth
- 3) Eye Muscle Area (EMA)
- 4) Intramuscular Fat (IMF)

The following section outlines the main points that breeders should consider when collecting live animal ultrasound information to submit for genetic evaluation:

- Scan information will only be accepted by BREEDPLAN if it has been recorded by an accredited scanner. A list of accredited scanners can be found on the internet (http://breedplan.une.edu.au/accredited_scannersausnz.htm) or by contacting the BREEDPLAN office.

- 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, particularly for the fat traits. 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 for genetic evaluation. 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 subcutaneous fat and marbling as they mature (develop fat deposits) 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.

What Carcass EBVs are Available ?

Based on live animal ultrasound scans, abattoir carcass data and relationships with other traits (e.g 600 day weight) BREEDPLAN can currently produce six Carcass EBVs:

(i) Carcass Weight

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

Larger, more positive, Carcass Weight EBVs are generally more favourable. For example an animal with a Carcass 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 Carcass Weight EBV of +30 kg.

Carcass weight should not be confused with yield. The Carcass Weight EBV is an indication of the animal's genetics for carcass weight and not an indication of the animal's genetics for 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 carcass. 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 higher, more 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 alone 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 sires with extremely low, negative fat EBVs to breed replacement females as this may indicate that his daughters are more difficult to get in calf due to reduced cycling prevalence, particularly in times of limited nutrition.

(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 currently shown between sires by IMF EBV is not that large. This relationship still needs more data to confirm the conversion from marble score to intra-muscular fat. The IMF EBVs may also spread if more data is collected for this trait.

Conclusion

Objectively measuring carcass traits by live animal ultrasound scanning and submitting to BREEDPLAN for analysis provides valuable information (in the form of EBVs) on the genetic differences between breeding animals for economically important carcass traits. To collect effective data for genetic evaluation through BREEDPLAN it is recommended to follow the points listed in this article.

Further information on collecting/submitting ultrasound scan data for genetic evaluation and interpreting BREEDPLAN carcass EBVs can be accessed from the SBTS website (<http://sbts.une.edu.au>) or by contacting Christian Duff - SBTS Technical Officer (02) 6773 2472.

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