Ultrasound Scanning for Improved Carcase Traits

A significant component of the breeding objective within most modern beef breeding programs is selection for improved carcase attributes and beef quality. This generally includes a focus on increased muscling and carcase yield balanced with selection for subcutaneous fat, increased marbling and improved meat tenderness.

So how can cattle producers evaluate and identify animals for use within their breeding program that have desirable genetics for the important carcase attributes? BREEDPLAN Carcase EBVs provide the best tool currently available to Murray Grey breeders.

BREEDPLAN currently produces six different Carcase EBVs for Murray Grey animals. These include:

- Carcase Weight
- Rib Fat Depth
- Rump Fat Depth
- Eye Muscle Area
- Intramuscular Fat (Marbling)
- Retail Beef Yield

These EBVs are calculated based on two main sources of information – live animal ultrasound scan information & abattoir carcase data.

Of these two sources, the best information that stud breeders can collect is the 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:

- **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 12/13\textsuperscript{th} rib site. The 12/13\textsuperscript{th} rib site is located on the longissimus dorsi muscle (eye muscle) between the 12\textsuperscript{th} & 13\textsuperscript{th} 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 12\textsuperscript{th} & 13\textsuperscript{th} rib. EMA is reported to the nearest cm\textsuperscript{2} (eg 110 cm\textsuperscript{2}). Eye Muscle Area is also referred to as Rib Eye Area.

- **Intramuscular Fat (IMF)**
  The carcase 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 12\textsuperscript{th} & 13\textsuperscript{th} ribs. Ultrasound scanning for IMF uses a longitudinal image of the longissimus dorsi muscle between the 12\textsuperscript{th} & 13\textsuperscript{th} ribs. IMF is reported as a percentage (eg 3.5\%)

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 12\textsuperscript{th} & 13\textsuperscript{th} ribs. Ultrasound scanning for IMF uses a longitudinal image of the longissimus dorsi muscle between the 12\textsuperscript{th} & 13\textsuperscript{th} ribs. IMF is reported as a percentage (eg 3.5\%).
When collecting ultrasound scan information, there are a number of considerations that stud breeders need to make to ensure that they collect effective information on their animals for genetic evaluation. These considerations are highlighted by the following “commonly asked questions” that are often raised by stud breeders when collecting ultrasound scan information.

1. Who do I get to scan my animals?

Ultrasound scanning measurements need to be 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.

2. What animals do I scan?

Animals should be 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).

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 carcase EBVs that do not reflect the true genetic merit of your animals.

3. When do I scan my animals?

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.

For example, if all animals were in very poor condition it would be expected that they would all have very similar rib & rump fat depths (ie. 1-2 mm) and negligible marbling. In this scenario, scanning would be of little benefit as a means of identifying animals that are genetically different for fat depth & genetically superior for IMF%. Effective results may still be achieved for EMA as sufficient variation is likely to exist between animals irrespective of condition.

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. The effectiveness of the current scanning machines decreases when measuring IMF levels outside this range.

It is important to note the above recommendations are only a rough guide. For example, if animals have been in poor condition and have put on the required 4 - 5 mm of fat in a relatively short period, then there may still not be sufficient variation between animals to allow genetic differences to show up, particularly for IMF.

Other factors that may also influence the time of scanning (but should not be a major determinant) include:
The availability of scanners and the cut-off date for submission of data for inclusion in GROUP BREEDPLAN analyses. Although Carcase EBVs can be recalculated in an interim analysis, it is preferable to submit data so it is included in the GROUP analysis. This will enable the updating of EBVs and accuracy values for the sires and dams.

If you are in any doubt as to when to scan your animals, please discuss your situation with an accredited scanner or contact staff at BREEDPLAN.

4. How do I submit my scanning information to BREEDPLAN?

Submission of scanning information to BREEDPLAN is the breeder’s responsibility NOT the accredited scanning technician. The main method of submitting scanning information is by sending in the recording sheet completed by the scanner at the time of scanning, however it must be presented in an acceptable format. The full Breed Society 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.

Alternatively, scanning information can be submitted electronically via either:
- a BREEDPLAN compatible herd recording computer program
- the performance submission facility offered on the MGBCS website
- the BREEDPLAN compatible Microsoft Excel template

5. Will I obtain carcase EBVs after scanning my animals?

Similar criteria apply to the reporting of carcase EBVs as to the reporting of weight EBVs. In general, Interim carcase EBVs will be available for an animal following the submission of scanning information (providing either the animal or both of its parents were included in the last GROUP analysis). An exception to this would be herds with a short scanning history where carcase EBVs may not be available until the next GROUP analysis due to low accuracy of the EBVs. If you are in any doubt as to whether an animal will receive carcase EBVs, please do not hesitate to contact BREEDPLAN staff.

6. Can I record more than one scan on each animal?

BREEDPLAN currently only analyses one EMA, one rib fat, one rump fat & one IMF measurement on each animal. While these measurements are typically measured on the same day, BREEDPLAN can analyse the scanning performance for an animal when the individual traits have been recorded at different times.

Conclusion

Objectively measuring carcase traits by live animal ultrasound scanning and submitting this information to BREEDPLAN to produce Carcase EBVs provides valuable information on the genetic differences between breeding animals for economically important carcase traits. This information is the best information currently available to enable selection for improved carcase attributes and beef quality in modern beef breeding programs.

Further information on the collection and submission of ultrasound scan data for genetic evaluation and the interpretation of BREEDPLAN Carcase EBVs can be accessed from the SBTS website (http://sbts.une.edu.au) or by contacting Andrew Byrne, SBTS Technical Officer on (02) 6773 3357.
Ultrasound Scan Image of an Eye Muscle Area (EMA)

Article compiled by Andrew Byrne for inclusion in Murray Grey Beef Cattle Society Annual, 2010