FACT SHEET

Using Carcass EBVs to Change Body Composition Traits in Breeding Cows

FAST FACTS

- BREEDPLAN carcass EBVs for Rump, Rib, IMF and EMA reflect the genetic merit of body composition in Angus and Hereford cows
- Selection for increased Rump and Rib Fat, IMF and EMA EBVs in young growing animals increases ultrasound scan measurements of cow rump fat, rib fat, IMF and EMA respectively
- EMA EBV was not associated with change in observed cow rib or rump fat depth
- Producers can confidently select for changes in mature cow body composition by using existing BREEDPLAN carcass EBVs

By using BREEDPLAN Estimated Breeding Values (EBVs), producers have the ability to make substantial genetic gains in many economically important traits. However, some producers are concerned that breeding cattle to produce higher yielding, leaner carcases, by selecting to reduce Rump and Rib Fat EBVs in particular, may compromise the ability of cows to maintain sufficient energy reserves for timely rebreeding. This fact sheet reports how BREEDPLAN EBVs for carcass traits can be used to select breeding females to achieve desired body composition at pre-calving and weaning using results from the Beef CRC's maternal productivity project. Results reported in this fact sheet are for Angus, however similar results were also observed in Herefords.

Measuring cow body composition

In a long-term research project across southern Australia, the Beef CRC collected and analysed data from over 7500 pedigree-recorded seedstock Angus and Hereford cows at key times during their lives.

For each cow, weight and ultrasound measurements of rump and rib fat depth, IMF and EMA were collected at pre-calving and weaning for first and second calving cows. These data were then analysed with the cow's EBV for each of the carcass EBVs to understand the strength of association between cow body composition at pre-calving and weaning, and whether the association of EBV with body composition changed with time (pre-calving or weaning) for the first or second calf. While the relationship between EBV and observation was not strong, on average cows with higher (more positive) BREEDPLAN EBVs for carcass traits were fatter or more highly muscled.

BREEDPLAN carcass EBVs are predictive of differences in cow body composition

EBVs for Rump and Rib Fat, IMF and EMA were good predictors of cow body composition at pre-calving and weaning for first-and second-calving cows. On average, across time points, a 1mm increase in Rump Fat and Rib Fat EBV was associated with a 15% increase in observed rump fat depth and rib fat depth respectively at both pre-calving and weaning for first and second calving cows.

IMF and EMA EBVs were also strongly predictive of the corresponding cow ultrasound scan traits for Angus cows as reported in Table 1 for each of the measurement times. Another important result from this research is that genetic merit for EMA EBV was not predictive of differences in cow rump or rib fat levels.

Table 1: *Increase in cow IMF and EMA for a 1 unit (e.g. 1cm2 for EMA) increase in carcass EBV for Angus*

Parity	Time point	IMF (%)	EMA (cm²)
First Calf	Pre-calving	0.8	1.0
	Weaning	0.7	0.9
Second calf	Pre-calving	0.7	1.1
	Weaning	0.6	0.6

Use of carcass EBVs to predict cow energy reserves

Although BREEDPLAN carcass EBVs are strongly predictive of cow body composition at a particular time, for example pre-calving, they were not strongly predictive of the cow's ability to gain or change in ultrasound measurements of rump and rib fat depth, IMF and EMA between pre-calving and weaning.

As part of the maternal productivity project, Angus heifers were selected to be either genetically high for Rib Fat EBV (top 10% of breed) or genetically low for Rib Fat EBV (bottom 10% of breed). Figure 1 shows the rib fat depth of the high Rib Fat EBV (red line) and low Rib Fat EBV (blue line) of Angus cows managed at Struan Research Centre in an autumn calving herd with weaning on November 20th each year. Importantly, on average, high Rib Fat EBV cows always had more rib fat depth than their low Rib Fat EBV counterparts when managed under the same conditions. However, the genetically high and low fat lines changed in rib fat depth at similar rates. Therefore, the carcass EBVs are a good indicator of body composition at a time point, but not a good indicator of ability to gain energy reserves when feed on offer is high.
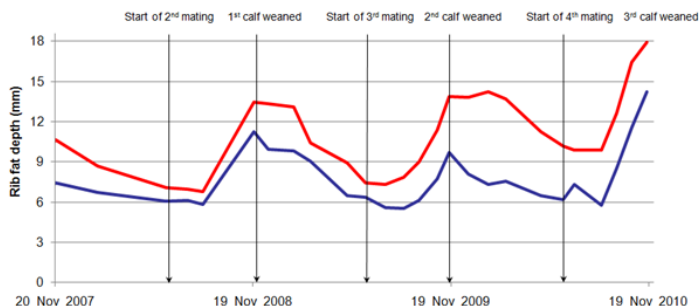

Figure 1: Rib fat depth (mm) for Angus cows that were selected for bottom 10% of Angus for Rib Fat EBV (blue line) or top 10% of Angus for Rib Fat EBV (red line).

What does this mean for Breeders

For producers, the take home message is that selection pressure applied using BREEDPLAN EBVs for Rump and Rib fat depth, IMF and EMA will have corresponding effects on cow body composition. Overall, a practical breeding strategy is to seek bulls with high $index values for a selection index that suits their production system and target market. If producers are aiming to improve reproductive performance, it is still more efficient to measure and select directly on the trait to be improved rather than relying on indirect measures such as body composition as this results in less effective pressure on the primary trait. Other factsheets in this series report the relationships between BREEDPLAN carcass EBVs and heifer conception rate. However, results on the relationship between BREEDPLAN carcass EBVs and overall herd productivity and profitability are not yet available.

BREEDPLAN carcass EBVs explained

Rib and Rump Fat EBVs are estimates of the genetic differences between animals in fat depth (mm) at the 12/13th rib and rump P8 site on a 300kg carcass (see: http://breedplan.une.edu.au/ for further info)

IMF EBV is an estimate of the genetic differences between animals in percent intramuscular fat (an indicator of marbling) on a 300kg carcass

EMA EBV is an estimate of the genetic differences between animals in eye muscle area (cm^2) on a 300kg carcass

Related Beef CRC fact sheets
Selection and Management of the Maiden Heifer

Contact details
Dr Stephen Lee
School of Animal and Veterinary Sciences
The University of Adelaide
Roseworthy Campus, SA, 5371
Ph: 0421 570 630
Email: stephen.lee@adelaide.edu.au

Research leader
Associate Professor Wayne Pitchford
School of Animal and Veterinary Sciences
The University of Adelaide
Roseworthy Campus, SA, 5371
Ph: 08 8313 7642
Email: wayne.pitchford@adelaide.edu.au