The Angus, Brahman, Hereford, Limousin and Charolais Breed Societies are currently participating in an initiative known as the Beef Information Nucleus (BIN).

The Beef Information Nucleus is a series of large, well structured progeny test programs undertaken by Breed Societies with co-funding assistance from Meat & Livestock Australia (MLA). Young bulls of high genetic merit are joined by either AI or natural mating to a commercial cow base to produce progeny which are managed commercially as one cohort and measured for a range of economically traits. The high quality performance data provides head-on-head comparison between the young sires progeny which is analysed through BREEDPLAN for the respective breed. This in turn provides high accuracy Estimated Breeding Values (EBVs) on relatively young sires which will assist in finding the up and coming “super sires” earlier than would be possible through standard performance recording undertaken in the seedstock sector.

With the recent initiation of these BIN programs and associated industry investment, it is an opportune time to look into the value of progeny tests for the wider beef industry. For this purpose, we can use the outcomes for a breed that has led the way with a similar program, being Shorthorn and the Durham Project.

**Background to the Durham Shorthorn Project**

Durham was a progeny test program initiated by Shorthorn Beef in 2000, with co-funding assistance from MLA, producing progeny each year between 2001 to 2010. It was the first project of its type in the world and importantly provided Shorthorn Beef members with an opportunity to assess the genetic value of young bulls for a range of traits that were collected on their progeny and analysed through Shorthorn BREEDPLAN.

The Animal Genetics and Breeding Unit (AGBU) supervised the project design which was focused on measuring genetic differences between sires for traits of economic importance.

An average of 11 young bulls were used each year with the aim to generate 30 progeny per bull by AI. All male progeny were castrated while females were retained for breeding purposes. All progeny were measured for the full range of BREEDPLAN traits from birth, growth, fertility, carcase and feed efficiency. All steer progeny were slaughtered and measured in the chiller for direct carcase traits.

The Durham project generated a significant amount of performance data across the range of economically important traits for the Shorthorn breed. For example, Durham has directly generated 2,187 birth weights, 1,030 600 day weights, 1,361 heifer ultrasound scans for carcase traits, 860 direct abattoir carcase measures on steers and 658 net feed intake records. Most importantly, it has contributed significantly to the collection of hard and expensive to measure traits such as the direct carcase traits and net feed intake F (i.e. feed efficiency in the finishing animal). The final two progeny cohorts are yet to complete their full recording cycle and therefore additional growth, scan, carcase and net feed intake data is still to be collected and analysed.
Analysis of Durham Performance Data and EBVs

To evaluate the benefit of the Durham Project, Animal Genetics and Breeding Unit (AGBU) scientists recently undertook a comparison study of the genetic evaluation results of Australian Shorthorn. The study compared results both with and without the performance data generated through the Durham project. The data utilised was extracted from the Shorthorn Beef database in November 2010 and analysed based on standard BREEDPLAN Version 6.1.

103 sires were flagged as Durham sires on the Shorthorn Beef database (i.e. with progeny performance recorded in the Durham projects). The performance data recorded on their progeny in the Durham nucleus or satellite herds were included in one analysis and excluded from the other. All other possible variables remained unchanged.

The progeny of the 103 Durham sires in herds other than the nucleus or satellite herds (i.e. Shorthorn Beef member herds) were not excluded from Durham excluded analysis. For some sires, many of those progeny would not have been generated if the sire had not been identified as a superior Shorthorn sire based on Durham outcomes.

Shorthorn BREEDPLAN Estimated Breeding Values (EBVs) were generated from Australian Shorthorn data both including and excluding the Durham data. From each analysis two key statistics were produced based on the 103 Durham sires being the standard deviation of EBV and mean EBV accuracy. This is presented in table 1. The standard deviation of EBV (EBV SD) is a measure of the variation in the EBV. The mean EBV accuracy is an indication of the amount of information that is being used in the calculation on the EBV and the EBV’s stability.

With the inclusion of the Durham data, the standard deviation of EBV and the mean accuracy increased for all traits measured. This is particularly apparent for the hard to measure traits such as carcase attributes and net feed intake F. For example, in the case of Carcase Eye Muscle Area (EMA) the standard deviation of EBV increased 47% and the accuracy of EBV 15% with the inclusion of the Durham data. The largest increase was for the Net Feed Intake F EBV where there was no data available outside of Durham.

<table>
<thead>
<tr>
<th>Trait</th>
<th>Durham Excluded</th>
<th>Durham Included</th>
<th>Diff SD</th>
<th>%Change SD</th>
<th>Diff Acc.</th>
<th>% Change Acc</th>
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<tbody>
<tr>
<td>Gestation Length</td>
<td>1.3 70.6%</td>
<td>1.7 75.4%</td>
<td>0.4</td>
<td>31%</td>
<td>8.8%</td>
<td>12%</td>
</tr>
<tr>
<td>Birth Weight</td>
<td>1.4 83.9%</td>
<td>1.6 89.3%</td>
<td>0.2</td>
<td>14%</td>
<td>5.4%</td>
<td>6%</td>
</tr>
<tr>
<td>200 Day Weight</td>
<td>7.5 85.0%</td>
<td>7.7 88.8%</td>
<td>0.2</td>
<td>3%</td>
<td>3.8%</td>
<td>4%</td>
</tr>
<tr>
<td>Milk (200 Day Mammal)</td>
<td>4.9 67.0%</td>
<td>4.9 70.0%</td>
<td>0</td>
<td>0%</td>
<td>3.0%</td>
<td>4%</td>
</tr>
<tr>
<td>400 Day Weight</td>
<td>10.8 83.0%</td>
<td>11.6 87.3%</td>
<td>0.8</td>
<td>7%</td>
<td>4.3%</td>
<td>5%</td>
</tr>
<tr>
<td>600 Day Weight</td>
<td>14.5 82.4%</td>
<td>16.5 86.6%</td>
<td>2</td>
<td>14%</td>
<td>4.2%</td>
<td>5%</td>
</tr>
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<td>Mat. Cow Weight</td>
<td>19.6 72.2%</td>
<td>21.3 76.6%</td>
<td>2.3</td>
<td>12%</td>
<td>4.4%</td>
<td>6%</td>
</tr>
<tr>
<td>Scrotal Size</td>
<td>0.8 74.4%</td>
<td>0.8 74.7%</td>
<td>0</td>
<td>0%</td>
<td>0.3%</td>
<td>0%</td>
</tr>
<tr>
<td>Carcase weight</td>
<td>10.1 73.7%</td>
<td>11.9 81.1%</td>
<td>1.8</td>
<td>18%</td>
<td>7.4%</td>
<td>10%</td>
</tr>
<tr>
<td>Carcase Rib Fat</td>
<td>1.2 69.3%</td>
<td>1.4 76.7%</td>
<td>0.2</td>
<td>17%</td>
<td>7.4%</td>
<td>13%</td>
</tr>
<tr>
<td>Carcase P8 Fat</td>
<td>1.7 69.3%</td>
<td>1.9 78.0%</td>
<td>0.2</td>
<td>12%</td>
<td>8.7%</td>
<td>13%</td>
</tr>
<tr>
<td>Carcase EMA</td>
<td>1.0 60.2%</td>
<td>2.5 69.5%</td>
<td>0.8</td>
<td>47%</td>
<td>9.3%</td>
<td>15%</td>
</tr>
<tr>
<td>Carcase IMF</td>
<td>0.6 62.5%</td>
<td>0.6 74.1%</td>
<td>0</td>
<td>0%</td>
<td>11.6%</td>
<td>19%</td>
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<tr>
<td>Retail Beef yield</td>
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<td>1.5 74.3%</td>
<td>0</td>
<td>0%</td>
<td>7.8%</td>
<td>12%</td>
</tr>
<tr>
<td>Net Feed Intake*</td>
<td>0.1 8.9%</td>
<td>0.1 8.8%</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

* Single trait analysis results. Net Feed Intake P is a measurement of feed efficiency in the post-weaned, growing animal. Net Feed Intake F is a measurement of feed efficiency in the finishing animal.

Table 1: Standard Deviation of EBVs (EBV SD) for 103 Durham Sires and the Mean Accuracy of EBVs for BREEDPLAN Traits with Durham Data Included and Excluded
Value of Durham - Increased Rate of Genetic Progress for Australian Shorthorns

One of the main outcomes the Durham project has delivered has been a major influence on an increase in the rate of genetic progress, in dollar ($) terms, being achieved in recent years in the Australian Shorthorn population.

**Figure 1. Genetic Progress Trend for the Australian Shorthorn Export Maternal Index for the 1991 to 2010 Calving Years.**

The trend for the Australian Shorthorn Export Maternal Selection Index shows a pronounced increase from the time the Durham project produced its first calves in 2001. In the 10 year period prior to this, being 1991 to 2000, the average change in Selection Index value was $0.21 per cow mated per year. Following the introduction of Durham, being 2001 to 2010, the rate of genetic progress increased fivefold to $1.07 per cow mated per year.

Another way to interpret this is in the 10 year period of 1991 to 2000 the average value of Australian Shorthorn genetics based on the Export Maternal Index increased $1.90 per cow mated. This value increased to $9.30 per cow mated in the 10 year period of 2001 to 2010 following the introduction of Durham.

A similar, but less pronounced trend is observed in the Australian Shorthorn Domestic Selection Index.

To understand how this outcome has been achieved, following is a basic equation that outlines the factors that drive genetic progress in a population of animals such as Australian Shorthorns:

\[
R = \frac{i \times r \times \sigma_g}{L}
\]

Where:
- \( R \) = Response to Selection (or genetic change)
- \( i \) = Selection Intensity
- \( r \) = Accuracy of Selection
- \( \sigma_g \) = Genetic Variation
- \( L \) = Generation Length

The AGBU analysis revealed an increase in standard deviation of EBV and an increase in mean accuracy resulting from the Durham project data. This is therefore having a positive impact on increasing accuracy of selection (r).

Also in relation to genetic progress, the AGBU analysis discovered that there was a trend for the higher Export Maternal Indexing Durham sires to be used by more Australian Shorthorn herds and have more progeny recorded than the lower Indexing Durham sires. This was very apparent for sires used in phase 1 with a positive correlation of 0.34 to 0.75 (depending on the sire intake year) between Index value and the number of herds using the sire. The correlation between Index value and progeny recorded was 0.49 to 0.68 for the same period.

**Conclusion**

The Durham project has provided many and ongoing benefits to Shorthorn Beef members and the broader Australian beef industry. The most important of these is the increase in the rate of genetic progress, in dollar ($) terms, that has been observed in the Australian Shorthorn population since the introduction of Durham. It is envisaged that similar outcomes will be emulated in the breeds that have recently initiated Beef Information Nucleus programs. Other potential benefits for industry include the formation of phenotypic databases for the calibration of genomic tests and information required for proof of concept/profit when using EBVs and Selection Indexes in selection.
Higher Pre-Joining Rib Fat Depth Leads to Increased Heifer Conception Rate

Selection for low Rib Fat Estimated Breeding Values (EBVs) to boost carcase meat yield is associated with a reduction in maiden heifer conception rate by more than 8% according to results from the Cooperative Research Centre for Beef Genetic Technologies’ (Beef CRC) Maternal Productivity project. This is critical for cow-calf producers given the role reproductive rate has in both enterprise profitability and also the efficiency with which beef is produced.

With the development of BREEDPLAN EBVs for a wide range of traits that impact on the profitability of the beef value chain, producers are faced with challenges to implement these tools in a balanced way to ensure that selection is targeted at both pre- and post-farm gate profitability. For traits such as Rib Fat EBV, the challenge is to apply a breeding objective that is appropriate for both the target market and also the environment that the cattle are raised in.

Maternal Productivity Project Research Centre Design

As part of the Beef CRC Maternal Productivity project, 391 Angus heifers specifically selected to be divergent in Rib Fat EBV were monitored for reproductive performance at two research centres, Struan in the south east of South Australia, and Vasse in south west Western Australia.

The average Rib Fat EBV for the high Rib Fat EBV line of heifers was +0.84 mm, compared with the average for the low Rib Fat EBV line of -1.65 mm. Both lines were substantially different to the Angus breed average, which is -0.2 mm for 2009 born calves. They represent approximately the highest 10% and lowest 5% of the Angus breed for Rib Fat EBV.

At both Struan and Vasse, the two heifer lines were managed together during mating and throughout the year to ensure they experienced the same nutritional and environmental conditions. Any differences in conception rates could therefore be attributed to genetic factors. Heifers were joined for 9 weeks with pre-joining weight of 360kg and 363kg for the high Rib Fat EBV and low Rib Fat EBV lines respectively (Table 1). Despite the lines being nearly identical in weight (360kg vs. 363kg), the high Rib Fat EBV heifers had 0.9mm more rib fat (4.5mm vs. 3.6mm) as measured by ultrasound scanning.

Conception rate

The high Rib Fat EBV line had an average conception rate of 91.2% compared with 83.0% for the low Rib Fat EBV line when considered at an equivalent age. Importantly, the 0.9mm difference in pre-joining rib fat depth between the lines explained much of the difference in conception rate. Overall, when adjusted for rib fat depth, the difference in conception rate between the high vs. low Rib Fat EBV lines reduced from 8% to 5% and was no longer statistically significant.
A second key finding from the Beef CRC results is the very strong association between heifer rib fat depth at joining and conception rate (Figure 1). Heifers with higher pre-joining rib fat depth had higher conception rates. The greatest increases in conception rate were observed at low levels of pre-joining rib fat depth. For example, an increase in pre-joining rib fat depth from 2mm to 3mm was associated with an increase in conception of more than 5% (79% vs. 85%). In contrast, an increase in pre-joining rib fat depth from 8mm to 9mm was associated with a less than 1% increase in conception rate.

Implication for management and selection

For the first time, the Beef CRC studies clearly show that heifers with a very negative Rib Fat EBV (that is bottom 5% of the breed) have a greater likelihood of reduced conception rate at their first joining.

Ensuring maiden heifers have sufficient energy reserves prior to their first joining leads to higher conception rates. Cattle breeders therefore need to carefully think about the importance of fat in their cattle, particularly for heifers, and develop strategies to ensure that body energy reserves are adequate to achieve high conception rates.

Importantly, an animal’s genetic merit for Eye Muscle Area (EMA) as assessed using EMA EBVs was not related to heifer conception rate. In terms of breeding, a practical strategy would be to seek bulls with high values for a selection index that suits their current production system and the target market. Producers still need to focus on carcass traits, including retail beef yield, and not just adopt selection strategies that focus on Rib Fat EBV in isolation.

For seedstock producers the message is to continue to use an overall selection index that incorporates weaning rate. This strategy allows for animals with the best combination of all traits to be identified, including animals that can sustain heifer calving under tight feed conditions even though they may be leaner.

This research has demonstrated that genetically fatter heifers have higher conception rates. However, data on overall reproductive rate, group feed intake and progeny performance is still being analysed to determine whether this higher initial conception rate translates into higher long-term on-farm productivity or supply chain profitability. Results for overall system efficiency and profitability will be reported in future SBTS articles.

Further information
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Fast Facts
- Rib Fat EBVs are indicators of genetic differences in rib fat depth (mm) if measured on a standard 300kg carcass
- Heifers with high Rib Fat EBV had higher pre-joining rib fat depth
- High Rib Fat EBV Angus heifers had higher conception rates than low Rib Fat EBV Angus heifers
- On average, Angus heifers with 4mm of rib fat at joining achieved 89% conception rate
- Eye Muscle Area EBV was not associated with heifer conception rate
- Using an overall selection index identifies animals that have high genetic value for a range of traits including reproductive rate and carcass quality
Woodbourn Murray Grey and Angus Stud, Cressy, Tasmania recently hosted what can only be described as a successful “Closer to Your Clients” field day. Supported by both the Tasmanian Angus and Murray Grey Breed Promotion Groups and presented by the Southern Beef Technology Services (SBTS) team, this was the first time a field day of its kind has been conducted in Tasmania.

Approximately one hundred and twenty beef producers keen to learn more about cattle selection and the use of BREEDPLAN when buying bulls enjoyed early cups of coffee before Andrew Byrne and Christian Duff from SBTS started the day at Woodbourn on the 21st of October.

‘It was so good to see so many people here at Woodbourn and great to have the Angus and Murray Grey groups working together to hold this day’ said stud principal Charles Wallace. ‘It seemed appropriate to hold the day at Woodbourn as we already had the facilities set up for such presentations, because of the Angus and Murray Grey sales we hold here each year.’

The day was divided into three sections which saw participants with all levels of understanding when it comes to the use of genetic technologies such as BREEDPLAN, being put through their paces throughout the day.

Interactive discussions and presentations were delivered throughout the day covering topics such as the traits of importance in a commercial beef operation, different selection methods, the use and interpretation of both EBVs and selection indexes, and how to use the internet to source the right genetics.

Two hands on, practical sessions were also presented with the highlight being the mock helmsman auction conducted after lunch. Participants were broken into two groups with one competing for a group of 15 Angus bulls and the other a group or 15 Murray Grey bulls. In syndicates of 3 or 4, participants were asked to purchase bulls during the mock auction using a set scenario and budget. This was a very interesting session with much interaction and debate, particularly regarding which syndicate received the best value for money from their purchase.

‘Holding a ‘Closer to Your Clients Day’, was something I have been wanting to do for a number of years,’ Mr Wallace said, ‘The day far surpassed my expectations in both the interest shown by participants and the willingness of the sponsors to take part, and finally the professional and interesting presentations by the SBTS team who mixed well the interactive practical discussions with the yard demonstrations and group exercises.’

The day was a very interesting one with good comments from the participants as they left shortly after 4pm.

Peter Parnell, CEO of the Angus Society and Gail Menegon, Tasmanian Director on the Murray Grey Board were present as were representatives from the five sponsors for the day, Greenhams, Elders, NAB, Roberts, and Pfizer as well as members of the Tasmanian Angus and Murray Grey Groups.

The Woodbourn field day followed another equally successful day that was held at Hazeldean Angus at Cooma during July. Any members or groups of members interested in hosting a “Closer to Your Clients” day on their property should contact staff at SBTS or TBTS to register their expression of interest.
REEDPLAN currently produces two EBVs that specifically relate to herd reproduction and fertility, being Scrotal Size and Days to Calving.

While many producers manage reproductive performance using different management strategies, in particular the culling of females that fail to get in calf, research has shown that fertility is influenced considerably by the genetics of the breeding herd. Consequently, Scrotal Size and Days to Calving EBVs provide a useful tool that breeders in both northern and southern Australia can use to improve the genetics of their herd for fertility, in association with their routine management and culling strategies.

Scrotal Size EBVs are estimates of the genetic differences between animals in scrotal circumference at 400 days of age. In addition to providing an insight into a bull’s ability to cover a normal mating load, the scrotal circumference of a bull provides an important indication of his genetic merit for several important fertility traits. Increased scrotal circumference is associated with earlier age at puberty, increased semen production and improved semen quality. Increased scrotal circumference also has a favourable relationship with female fertility, both in terms of earlier age at puberty, earlier return to oestrus and shorter days to calving.

Breeders interested in Scrotal Size EBVs need to record scrotal circumference measurements on their bulls. Scrotal measurements should be recorded in centimetres by pulling the testes firmly down into the lower part of the scrotum and placing a measuring tape around the widest point. Scrotal circumference measurements can be taken by anyone. They do not need to be taken by an accredited technician. Scrotal measurements should be recorded when bulls are between 300 – 700 days of age (ie. 10 – 23 months), however the recommended time is when bulls are reaching puberty. In most circumstances, this will mean recording scrotal measurements in association with the 400 day weights for the bulls.

A variety of scrotal circumference measuring devices are commercially available from agricultural supply stores or organisations such as the Australian Cattle Veterinarians. At the time of writing, the Australian Limousin Breeders Society were also offering a measuring tape for sale. Metal scrotal measuring tapes are more reliable than cloth tapes as they are not prone to stretching.

Days to Calving EBVs are estimates of genetic differences between animals in time from the start of the joining period (ie. when the female is introduced to a bull) until subsequent calving. The Days to Calving EBV identifies sires whose daughters calve earlier in the season compared to those that calve later, or do not calve at all. Variation in days to calving is mainly due to differences in the time taken for females to conceive after the commencement of the joining period. Females with shorter Days to Calving EBVs also tend to be those that show early puberty as heifers and earlier return to oestrus after calving.

Breeders interested in the Days to Calving EBV need to record all ‘events’ associated with the joining of their females from the start of the mating period in each breeding season through to when the subsequent calves are born. Presently,
only information from natural joining programs is included in the calculation of Days to Calving EBVs. This includes those females that have only been joined naturally within a breeding season and have not previously been included in artificial insemination/embryo transfer programs or artificially induced to cycle prior to joining with the bull outside of such programs.

Broadly, the information to be collected for Days to Calving EBVs should include:

a) Joining details of all females naturally mated within the herd. This includes details of the bull/s the female was joined to and bull in and out date/s.

b) Details of all calves (dead or alive) that are born as a result of these joinings.

c) Details of all females disposed of from the herd, particularly those present at joining that were no longer within the herd by the time of the subsequent calving. A set of approximately 20 disposal codes are available from BREEDPLAN.

Importantly, while the details of all calves born should be recorded with your Breed Society, the joining and female disposal information needs to be submitted directly to the BREEDPLAN office. Any joining and female disposal information submitted to your Breed Society will not be included into the calculation of Days to Calving EBVs.

Further information regarding the collection and submission of information for Scrotal Size and Days to Calving EBVs are available from the tip sheets “Recording Scrotal Circumference Measurements” and “Recording Days to Calving Information” in the Technical area of the BREEDPLAN website (http://breedplan.une.edu.au).

Note: Research is now underway to determine whether details from artificial insemination (AI) and embryo transfer (ET) programs could be utilised by BREEDPLAN. Breeders interested in submitting details of their AI & ET programs to assist this research are advised to download a copy of the “Collecting Better Female Fertility Data” tip sheet from the Technical area of the BREEDPLAN website.

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**Beef CRC Set to Deliver DNA Tests to BREEDPLAN**

The Beef CRC will deliver genomic predictions that identify animals genetically superior for carcass and beef quality, feed efficiency and female fertility traits to BREEDPLAN in April 2012.

“This is one of the main outcomes of this CRC and we are on track to deliver these predictions, which have been validated in independent cattle populations,” said Beef CRC CEO Dr Heather Burrow. The new genomic predictions were developed using Illumina’s new 700K SNP chips and their accuracy will be improved over coming months before they are delivered to BREEDPLAN and genomics companies operating in Australia. Beef CRC Chief Scientist Professor Mike Goddard said the new 700K chips measured more than 700,000 unique genetic variations (SNPs) within an individual animal’s genome, and across the genomes of multiple animals, to identify the unique genetic attributes linked to the most important production traits.

The genomic predictions are hoped to explain 15% of the genetic variance for each trait, which is the equivalent of an EBV with 40% accuracy. To make the most use of the genomic predictions, they will be incorporated into BREEDPLAN to improve the accuracy of the current estimated breeding values (EBVs) which are based on extensive phenotypic records and pedigree information. The exact timeframe for incorporation of the genomic predictions into the routine GROUP BREEDPLAN analyses is unclear, however it is hoped it will be prior to the end of 2012.

Dr Burrow said the greatest value of the genomic predictions will be for young animals that do not yet have any measurements on them or their progeny or for the very hard or expensive to measure traits that are generally not recorded by industry. “That is where you have greatest ability to improve the accuracy of predicting that animal’s performance,” she said.
Introducing the ‘Completeness of Performance’ Herd Rating System

In order to maintain the ongoing integrity of BREEDPLAN EBVs, staff at the Animal Genetics & Breeding Unit (AGBU) and Agricultural Business Research Institute (ABRI), in association with both Southern Beef Technology Services (SBTS) and Tropical Beef Technology Services (TBTS), are currently working together on the development of a range of quality assurance products. The first of these scheduled for release is the “Completeness of Performance” herd rating system.

The “Completeness of Performance” herd rating system will be offered to Breed Societies during December 2011 and assesses the quantity of pedigree and performance information being submitted to BREEDPLAN by an individual seedstock herd and is comprised of two major components.

(i) Annual distribution of “Completeness of Performance” reports to each individual BREEDPLAN member
(ii) Production of a “Completeness of Performance” star rating for each individual BREEDPLAN member

The “Completeness of Performance” reports will be provided electronically from the “Download Files” area on the BREEDPLAN website and provide a summary of the information that the member has submitted to BREEDPLAN. A range of statistics are provided within the reports including details of the pedigree, weight, carcase, birth and fertility information that has been recorded. Members unable to access the reports from the “Download Files” area will be able to request a hard copy from the BREEDPLAN office.

The “Completeness of Performance” reports aim to more routinely allow members of BREEDPLAN to double check that the performance information that they have collected on their animals has been recorded with BREEDPLAN, while importantly enabling members to identify areas in which additional performance information could potentially be recorded on their animals. One of the key factors underpinning the accuracy of EBVs is the quantity of performance information that has been recorded with BREEDPLAN and these reports allow members to assess how “complete” the information is for their animals.

The “Completeness of Performance” star rating is an extension of the reports and will be implemented at the discretion of each Breed Society. The star rating is calculated based on the proportion of calves within the herd born in a fixed 5 year period that have performance recorded for each trait. Different criteria are used within each individual breed depending on the traits for which EBVs are calculated within the breed. Each herd receives a star rating on a 0 – 5 scale (including half stars) that assesses the “completeness” of their performance information. Herds with a star rating of “5” are considered to be gold standard and are recording “complete” performance information for all traits of which EBVs are available.

While the display may differ slightly between each Breed Society, it is envisaged that the “Completeness of Performance” star rating will be provided to each herd within their “Completeness of Performance” report, plus displayed on the member enquiry facility within each breed’s online database system. Users would also have the ability to limit animal and EBV searches based on a herd’s star rating.

Subject to the outcomes of discussions with each Breed Society, the “Completeness of Performance” rating system is scheduled for release in January 2012 with the distribution of “Completeness of Performance” reports to all BREEDPLAN herds in Australia. It is hoped that herd star ratings will be displayed on the member enquiry system several months later, possibly in March/April 2012.

For further information about the “Completeness of Performance” herd rating system, please contact staff at SBTS or TBTS.

“Each individual member of BREEDPLAN will be provided with a star rating on a 0 - 5 scale that assesses the “completeness” of their performance information.
Recent analysis of some 67,000 mature cow weights that have been recorded with BREEDPLAN during the past 10 years for the Angus, Hereford, Shorthorn, Charolais & Limousin breeds has revealed that the mature weights of animals have increased on average by approximately 30 kg. Whilst this increase can be attributed to changes in both management and genetics, the clear message is that the weight of mature cows in southern Australia has increased quite considerably during this period. Reports also suggest similar changes have occurred in northern Australia.

One question worth asking is “what impact is this increase in the mature weight of cows having on the overall profitability of commercial beef businesses in southern Australia?” To answer this question, it is important to consider how the weight of mature cows influences the costs and returns in a commercial beef enterprise. Primarily, mature cow weight will affect:

- **Cow Feed Requirements** - In general, heavier cows will eat more, have higher feed requirements and be more expensive to maintain. The effect of increasing mature weight in a commercial enterprise is therefore either an increase in the amount of feed that needs to be produced to meet the requirements of the female breeding herd, or a decrease in the number of females that can be carried from the same amount of feed.

- **Cull Cow Values** - The income from the sale of surplus females can make up a significant proportion of the total income of a beef breeding business with the major determinant in the value of surplus cows being live weight. Heavier cows will produce higher income from surplus cow sales, but at what cost?

- **Relationship with Progeny Weight** - In general, heavier cows will tend to have calves that have higher growth genetics, particularly if progeny are being turned off at older ages (e.g. greater than 24 months). However, this relationship is not 1:1 and producers will be aware of females within their herd that “bend the growth curve” and consistently produce heavy calves but only have moderate mature weight themselves.

- **Relationship with Weaning Rate** - While heavier cows tend to have heavier progeny, there is some evidence to suggest that the number of calves weaned decreases with an increase in mature weight, particularly when combined with a decrease in fat levels.

Achieving an appropriate balance in the weight of the female breeding herd is consequently an important consideration for cattle producers. In a commercial situation in which the objective is to maximise profit, the optimal cow weight (light, moderate or heavy) will depend on the long term cost of producing or purchasing additional feed, the long term value (c/kg) for surplus cows and the advantage of having more or heavier progeny at sale. In situations where there is limited feed (or the cost of producing additional feed is high) and surplus cow values are low, a breeding objective of moderating or reducing average cow weight is most likely to be more profitable. In situations of abundant, low cost feed and high cull cow values, the most profitable breeding objective may be to breed for heavier weight cows.

Given the impact that mature cow weight has on the profitability of a commercial beef enterprise, BREEDPLAN currently produces Mature Cow Weight EBVs. Mature Cow Weight EBVs are an estimate of the genetic difference in cow weight at 5 years of age and are calculated within the GROUP BREEDPLAN analysis that is conducted for each breed in Australia, except Belmont Australia.

Mature Cow Weight EBVs enable producers to carefully monitor the genetics of their animals for mature weight, while selecting for increased growth and therefore an earlier age of turnoff in their sale progeny. Irrespective of what is the desired cow weight, it is important to be mindful that if mature weight is not considered and selection is focused simply on increased growth (i.e. high 200, 400 or 600 Day Weight EBVs) then the mature weight of the female breeding herd will increase due to the relationship between these traits.

Breeders interested in having Mature Cow Weight EBVs calculated for their animals need to collect weight information of their cow herd, with BREEDPLAN currently analysing
mature cow weights if the cow has a calf with a weight recorded within 2 weeks of when the mature weight was taken and further, the calf was between 80 – 330 days of age when it was weighed.

Therefore, in layman’s terms, seedstock producers interested in Mature Cow Weight EBVs should take a weight on their cows when they are recording the 200 day weights for their calves. BREEDPLAN currently analyses up to 4 mature weights on an individual cow and so cows should be weighed each year.

Recording mature cow weights is also a good way of increasing the accuracy of 600 Day Weight EBVs in a herd if a significant proportion of calves have already left the herd by 20 months of age (eg. sale bulls, steers, surplus heifers).

Mature cow weight information should be submitted directly to the BREEDPLAN office at ABRI in a similar fashion to other performance information.

Further information regarding the collection of mature cow weights is available from the “Recording Mature Cow Weights” tip sheet that can be downloaded from the Technical area of the BREEDPLAN website (http://breedplan.une.edu.au) or by contacting staff at SBTS or TBTS.

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**Key Facts**

- Mature cow weight has a considerable impact on the profitability of a commercial beef enterprise
- Mature Cow Weight EBVs enable the genetics for mature weight to be considered as part of the selection program
- Breeders interested in having Mature Cow Weight EBVs calculated for their animals should collect weights on their cows
- Cows should be weighed when the 200 day weights are taken for their calves
- Cows should be weighed every year

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**Young Animal Genotyping Pipeline Project**

The CRC for Beef Genetic Technologies, in conjunction with Meat and Livestock Australia, started last year the process of genotyping industry animals to validate genotypic prediction equations for BREEDPLAN traits which are being developed by the CRC and to assist in generating a base for the National Beef Genomic Database for the most important beef breeds in Australia.

The genotyping of some 1480 industry sires with the 50k Illumina SNP chip has now been completed and CRC scientists are currently analysing the data. While this is happening the CRC together with MLA is planning the next and for the CRC final step in setting up an industry acceptable pipeline for the application of genomic technology to the seedstock industry.

As part of this project, the CRC is supporting the genotyping of 3000 young animals across the Angus, Brahman, Charolais, Droughtmaster, Hereford, Limousin, Murray Grey, Santa Gertrudis, Shorthorn and Simmental breeds. This represents a unique opportunity for seedstock producers in these breeds to road test the utilisation of genomic technology within their breeding program in preparation for the scheduled delivery of genomic prediction equations by the Beef CRC for all BREEDPLAN traits in April 2012.

Once DNA samples have been collected for the 3000 animals, the Animal Genetics Laboratory at the University of Queensland will extract DNA from the samples for genotyping with the 50k Illumina SNP chip. The genotypes will be stored in the National Beef Genomic Database and genomic breeding values (GBVs) will be calculated using the best available CRC prediction equations for all BREEDPLAN traits. These GBVs will be submitted to ABRI to be included in BREEDPLAN. In circumstances where DNA samples are available for the sires of the calves, the sires will also be genotyped and the calves sire verified.

Details regarding the process that members need to follow to participate in this project will have already been circulated. For further information, please contact either your Breed Society or staff at SBTS or TBTS.
Collecting ‘Effective’ Performance for BREEDPLAN

One of the key priorities when recording performance information for BREEDPLAN should be to ensure that any performance that is collected can be used "effectively" by the BREEDPLAN analysis.

BREEDPLAN analyses cattle in contemporary groups to take out the influence of as many of the non-genetic effects as possible (eg. differences in feeding, years, seasons). The underlying principle is that only the performance for animals that have had an equal opportunity to perform are directly compared together within each contemporary group.

If the contemporary groups are not correctly formed, the EBVs calculated will be less accurate and possibly misleading. History has shown that most of the problems that breeders encounter in "believing" their BREEDPLAN EBVs can be traced back to incorrect contemporary grouping – either calves being fragmented into isolated groups of only one or few animals (and thereby virtually eliminating those calves from any comparison with their peers) or by not differentiating between calves that have had different levels of management or feeding.

What is an Effective Contemporary Group?

The effectiveness by which BREEDPLAN can use an individual animal’s performance record is determined by the number of animals represented within the same contemporary group.

When there are no other similar animals to which the animal’s performance can be compared (ie. a single animal contemporary group), the performance is not effective and does not contribute to the animal’s EBVs. When the animal is in a contemporary group of 2, the performance is 50% effective, in a contemporary group of 3, 67% effective, in a contemporary group of 4, 75% effective and in a contemporary group of 5, 80% effective. After 5 to 10 animals are represented in a contemporary group, the increase in effectiveness diminishes quite rapidly with increasing group size, although the objective for seedstock members should be to maximise the contemporary group size. This increase in the effectiveness by which BREEDPLAN can analyse an animal’s performance record is illustrated in Figure 1 (See above).

The next consideration is the effectiveness by which BREEDPLAN can use the performance records of progeny when calculating the EBVs for an individual sire. If all calves in the contemporary group are by the same sire, then the performance records may be effective when calculating EBVs for the calves themselves, but have no effectiveness when calculating the EBVs for the sire. This results because there are no calves by other sires to which their performance can be compared. The key is therefore to have as many sires represented per contemporary group.

For example, if a contemporary group has 10 animals but only 2 sires are represented (5 progeny each) then the total number of effective progeny records for each sire is only 2.5 (or 50% effectiveness). By comparison, if there were 5 sires represented (2 progeny each), there would be 1.6 effective progeny records per sire (or 80% effectiveness). In a similar way, if there are 10 sires each with 10 progeny and you have to have them in 10 groups then the optimal design for effectiveness of records for a sire’s evaluation will be to have 1 progeny per sire per group. This configuration would yield a total of 9 (out of a possible 10) effective progeny per sire.

Maximising the Size of Contemporary Groups

It is therefore imperative that breeders try to maximise the number of their calves represented within each contemporary group to optimise the results from their performance recording. There are a number of strategies that can be implemented to achieve this:
Selection Index Update

A number of Breed Societies have either recently updated or are in the process of updating the selection indexes that are produced for animals within their breed.

- **Brangus** has developed selection indexes for the first time. Two indexes have been developed, namely a Domestic Steer and Export Steer selection index. The selection indexes were implemented into the October 2011 Brangus GROUP BREEDPLAN analysis.

- **Brahman** has released a new selection index in association with the results from the November 2011 Brahman GROUP BREEDPLAN analysis titled the Live Export selection index. The Live Export Index estimates genetic differences between animals in net profitability per cow joined for an example self replacing commercial herd (run in a tropical environment) targeting steers for the live export markets. Steers are assumed to be pasture grown until entry to overseas feedlots and then feedlot finished for 120 days before being slaughtered at 470 kg liveweight at around 26 months of age.

- **Simmental** has conducted a complete review of their selection indexes. The existing Self Replacing Supermarket and Japan (Terminal) indexes have been replaced by four new indexes, namely the Domestic Maternal, Export Maternal, Northern Terminal and Vealer Terminal indexes. The new indexes will be implemented in December 2011.

- **Shorthorn** has reviewed their selection indexes and decided to cease calculating the SB3 Carcase Index as it was deemed to no longer be relevant to Shorthorn breeding programs. The existing Heavy Domestic and Export Maternal indexes will be retained unchanged. It is envisaged that this change will be implemented towards the end of 2011.

- **Limousin** has scheduled a review of their selection indexes during late 2011 or early 2012 to ensure that they are still relevant to current production systems and markets.

Complete details of the new or updated selection indexes will either have been sent or will be sent to all BREEDPLAN members from the respective breed at the time of implementation. Information is also available from the tip sheet page in the Technical area of the BREEDPLAN website (http://breedplan.une.edu.au).
After a long and distinguished career, Dr Arthur Rickards has recently retired as Managing Director of the Agricultural Business Research Institute (ABRI). Across Arthur’s 40 year career at the helm of ABRI he has had many achievements such as developing financial benchmarking of farm businesses, establishing Australia’s International Beef Recording Scheme, introducing electronic selling of livestock and commercialisation of genetic evaluation systems (i.e. BREEDPLAN) both domestically and internationally.

Arthur has also played a pivotal role in the formation of both the SBTS and TBTS projects. This included his continued support as Managing Director of ABRI and as Executive Director of the Australian Registered Cattle Breeds Association (ARCBA). Additionally, he was Chairman of the TBTS Management Committee from its inception in 1998, only standing down in June 2011.

While Arthur has retired as Managing Director, he is still actively involved in ABRI through his new role as Business Development Consultant. The Managing Director role has been filled by Murray Scholz. Murray is a long term employee of ABRI with previous involvement on a management level in the Software Support/Programming Division and as an Associate Director of ABRI.

Staff Departures

The SBTS & TBTS team has bid farewell to both Philip Mann and Ashlee Austin, with Philip taking up an opportunity that has arisen within his family’s beef cattle operation, while Ashlee has increased her time within the Breed Secretariat Division of ABRI moving into a role as Executive Officer of the Australian Brangus Cattle Association.

Philip has been a Technical Officer within TBTS since September 2008 and has played a key role in the delivery of beef genetics extension services throughout Northern Australia over the past 3 years. In particular, Philip has been instrumental in the development and delivery of the two webinar courses that were presented by SBTS & TBTS during 2010 & 2011. Ashlee has been a Technical Officer within SBTS since January 2010 and has primarily been responsible for providing technical support to the smaller stakeholder breed societies within the SBTS project.

The SBTS & TBTS team would like to sincerely thank both Philip and Ashlee for their valuable contributions and wish them both the very best with their future endeavours. At the time of writing, interviews were being conducted for replacements to both of these positions and it is hoped that two new staff members will join the SBTS & TBTS team early in the new year.
New Genetic Parameters Included in Limousin BREEDPLAN

The genetic parameters and adjustment factors utilised within the Limousin GROUP BREEDPLAN analysis have been re-estimated by the Animal Genetics & Breeding Unit (AGBU). The genetic parameters include the heritability of each trait and the correlations between the different traits. The adjustment factors are the adjustments that are made to the performance records to remove the non-genetic effects of age and age of dam.

The new genetic parameters and adjustment factors were introduced into the September 2011 Limousin GROUP BREEDPLAN analysis with the effect on the EBVs minimal for some traits but significant in others. The accuracies of EBVs were also affected, due to changes in trait heritabilities and the revised influence of correlated traits. For further information regarding the effect of the revised genetic parameters, please contact Alex McDonald on (02) 6771 1648.

Monthly GROUP BREEDPLAN Analyses for Limousin and Droughtmaster

The Australian Limousin Breeders Society (ALBS) and Droughtmaster Stud Breeders Society (DSBS) have joined the Angus, Brahman, Brangus, Charolais, Red Angus and Santa Gertrudis breeds in upgrading the software used to manage their pedigree and performance database to ABRI’s new generation of breed registry software known as ILR2. The new software includes several new features such as the running of monthly GROUP BREEDPLAN analyses and production of enhanced BREEDPLAN reports. This will significantly enhance the BREEDPLAN service that is provided to members of Limousin and Droughtmaster BREEDPLAN.

It is anticipated that other Breed Societies will progressively upgrade to the ILR2 software over the coming years, with several breeds scheduled for implementation during 2012.
Accessing Support in Application of Genetic Technologies

For support and assistance in the use and understanding of the different genetic technologies that are available, such as BREEDPLAN, BreedObject Selection Indexes, Internet Solutions, TakeStock & DNA based tools or to discuss any of the information included in this edition of the SBTS & TBTS Update, please contact:

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