

THE AUTUMN 2005 SIMMENTAL TRANS TASMAN GENETIC EVALUATION REPORT

The information contained in this Report was compiled by the Agricultural Business Research Institute (ABRI) from data input to the pedigree and performance databases of The New Zealand Simmental Cattle Breeders Society (SCBS) and the Australian Simmental Breeders Association (ASBA). The Estimated Breeding Values (EBVs) have been calculated from the raw data as supplied by members. Neither the SCBS, ASBA nor the ABRI oversee or audit the collection of this data.

Introduction

Successful animal breeding is based on selecting animals that match breeding objectives – decisions based on economics and genetics. The Autumn 2005 Simmental Trans Tasman Genetic Evaluation gives you much of the information required for objective breeding.

Trans Tasman

This analysis combines the pedigree and performance databases of the Simmental breed in Australia and New Zealand. (Table 1).

GROUP BREEDPLAN estimates the breeding values for individual animals using all the available pedigree and performance information supplied by breeders on the animal, its progeny and its close relatives. The resulting Estimated Breeding Values (EBVs) take into account the influence of herd management, environmental effects and fixed effects (eg. sex, dam age etc).

The Autumn 2005 Simmental GROUP BREEDPLAN EBVs have been calculated using BREEDPLAN version 4.3 software. This version includes an enhanced procedure for including “foreign” EPD information ie. information on animals that have been evaluated in other genetic evaluations.

Please note that version 4.3 of GROUP BREEDPLAN software also includes:

- Improved contemporary grouping strategy for Mature Cow Weights, such that cows are now only included if they have a calf weighed at weaning;
- Revised carcass parameters – reflecting the latest research from the Beef CRC;
- Revised adjustment factor files;

- Increasing the maximum age for submission of scrotal measurements to 700 days of age;
- Reducing the minimum carcass weight from 200 kg to 150 kg.

Table 1: Summary Statistics of the Analysis

	Number of Sires	36,289	
	Number of dams	216,618	
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		RECORDS	
TRAITS	New Zealand	Australia	Total
Gestation Length	6,087	49,384	55,471
Birth Weight	83,322	128,184	211,506
200 day weight *	85,820	73,632	159,452
400 day weight *	56,581	34,415	90,996
600 day weight *	34,706	20,257	54,963
Mature weight *	162	567	729
Days to Calving *	9,225	11,375	20,600
Scrotal Size	5,749	2,932	8,681
Scan *	9,032	4,492	13,524
Carcass *	0	123	123

* animals with at least one observation

Additional features of the BREEDPLAN software are detailed below.

1. Incorporation of American EPDs

The American Simmental Association has kindly supplied EPDs on 443 sires and 163 dams for the following traits: birth weight, weaning weight, yearling weight,

milk, carcass weight, carcass rib eye area (REA), carcass rib fat (FAT) and marble score. Previously, an EPD for percent retail cuts was provided, which was used instead of REA and FAT. However, recent changes in the US carcass evaluation required that the REA and FAT EPDs now be used instead of the new US yield grade EPD. In addition, the US carcass evaluation now includes live animal ultrasound scanning records for rib eye area, rib fat and marbling. As a result, there have been some major changes in carcass EPDs for some animals.

These American EPDs are used as "starting points" for the relevant imported animals in the BREEDPLAN analysis, until sufficient local data are collected to adequately reflect the animal's performance in New Zealand and/or Australia. As a result of industry feedback, researchers at the Animal Genetics and Breeding Unit (AGBU) modified the emphasis being placed on the "foreign" information. With the new procedure, implemented in BREEDPLAN v4.3, there is a reduction in the emphasis given to information coming from the relatives of "foreign" animals.

Most sires in the analysis will be unaffected by these changes, apart from some imported sires and their progeny. Where imported sires have very high or very low overseas EPDs or if they have few (or no) progeny in New Zealand/Australia recorded for a given trait, then changes in EBVs may be significant. This is particularly true for carcass traits, given the relatively low level of recording of scan and carcass data in New Zealand and Australia, and the recent changes made in the US carcass evaluation.

2. Carcass

BREEDPLAN version 4.3 allows the use of abattoir carcass information as well as live animal scans. Where available, both the scan and abattoir data is utilised to produce a single set of carcass EBVs.

The carcass EBVs reported include:

- Carcass Weight
- Eye Muscle Area (EMA)
- Rib Fat
- Rump Fat
- Retail Beef Yield % (RBY)

- Intramuscular Fat % (IMF)

Carcass weight is reported to a 650 day standard age and is strongly correlated to the weight EBVs.

The other carcass EBVs are reported to a standard carcass weight of 300 kg. This definition reflects market specifications and breeders interpretation of how the EBVs relate to the final product - meat.

The EMA EBV expressed to a standard weight gives a better indication of visual muscling of the animal. Hence, a larger EMA EBV now means more muscling.

Retail Beef Yield (RBY) is expressed as a percentage of the retail cuts compared to total carcass weight. While no direct data was available for this run, RBY is strongly correlated to the EMA, fat and weight EBVs.

Intra Muscular Fat (IMF) is the percentage of fat to muscle in the eye muscle. Direct data can be from either an abattoir measure or a live animal scan done by an accredited technician. While only a few Simmental animals have IMF scans, it is expected that this will increase in the next few years as meat quality issues begin to dominate industry discussions.

3. Sire by Herd

There is potential for a small but significant variation in the way progeny of a particular sire perform in different herds. This variation is called the Sire by Herd effect (SxH). For example, sires used in only one herd may not fully reflect their industry wide EBVs because of the way that particular sire combines with the cows and management in the single herd.

BREEDPLAN v4.2 makes allowance for the SxH with the result that sires with progeny in only one herd may now have EBVs closer to zero than they had last year. While this is only a small effect (usually less than 5%), it is important to allow for it in an across herd genetic evaluation.

4. Heterogeneous Variance

This is a technical term that describes standardising the amount of variation observed in a trait. This enhancement mainly applies to the fat traits where you can get only a small amount of variation on measured animals. The actual difference observed between animals may be magnified to some extent in the EBVs where the calves do not show much variation in the actual fat scans.

5. Mature Weight

The mature weight EBV is based on the cow weight when the calf is weighed for weaning. The mature weight EBV is strongly correlated to the 600 day weight EBV. While waiting for the results of the research on feed efficiency to be finalised, the mature weight EBV can be used as an indicator of potential maintenance costs of the cow in the breeding herd. In the absence of other data, cow maintenance requirements will be roughly proportional to the Mature Weight EBV. Obviously, feed efficiency or feed intake measures should be used when these become available.

The mature weight EBV can also be used by steer breeders wishing to grow animals out to a larger weight.

The Base

EBVs do not describe what a particular animal looks like in the paddock. Rather, EBVs are a method of ranking animals based on the various traits in the analysis. The EBVs have been set to an arbitrary base of zero for the 1990 drop calves.

The Analysis

Developed at the University of New England in Australia, GROUP BREEDPLAN is an advanced implementation of the Best Linear Unbiased Prediction technology (BLUP) for across-herd genetic evaluation of beef cattle. This evaluation is based on a wide range of information including the performance of the individual and its relatives for a number of traits, the genetic relationships between the traits and the pedigree links between animals and between herds. GROUP EBVs can therefore be compared across herds and across years.

The Report

The Sire Summary listing reports GROUP EBVs for sires for up to 17 traits. To be eligible for reporting in this listing a sire must have progeny born in the last three years, at least 10 progeny performance recorded and an accuracy of at least 75% for one of 200-Day growth, 400-Day weight or 600-Day weight.

Sire trait leaders are also highlighted in the Sire Summary list by boxing the EBVs for which the animal is a trait leader. To qualify as a sire trait leader the sire must have at least 80% accuracy for the trait (except for Calving Ease and Days to Calving, which require only 65% accuracy). Having met this criterion, sires are reported as trait leaders if their EBV for the trait is within the top 10% of the breed (top 5% of the breed for birth weight, 200-Day Growth, 400-Day Weight and 600-Day Weight). No trait leaders are reported for Mature Cow Weight, EMA, Rib Fat, Rump Fat, IMF or RBV.

The trait leader listing DOES NOT attempt to identify the best animals for use in YOUR breeding program. You must determine the best possible combination of EBVs an animal should have to fit into your breeding program. Similarly, you don't need to use all 17 traits to select animals.

To select an animal for your breeding program you should consider the animal's performance overall for the traits that are important to you. Then take all its EBVs into consideration and use these figures to predict how that animal will improve your herd.

You should also use EBVs to monitor your herd – even for traits that you do not feel are relevant to your breeding objectives. For example, you should monitor the calving ease and birth weight EBVs even if you do not have a calving ease problem.

Accuracy (Acc) of EBVs

By definition EBVs are estimated breeding values. It is impossible to predict with 100% certainty the genetic merit of an animal and therefore the genetic merit of the progeny of a particular mating.

The accuracy of an EBV depends on two major factors:

1. The heritability of the trait, this being the proportion of an animal's superiority that is passed on to its progeny; and

- The amount of performance information available on an animal and its relatives.

The accuracy of an EBV increases as more performance information on an animal and its relatives becomes available. The following examples indicate how accuracy is related to progeny numbers and relatives. If the only information available is a bull's own performance for one trait with a heritability of 30%, the accuracy will be 55%. If information is also known on about 10 paternal half sibs and 2 maternal half sibs, then accuracy increases to 61%. Animals with parents of high accuracy could have higher accuracy than those shown in Table 2.

Table 2: Accuracy of EBVs for a trait with heritability of 30% (400-Day weight).

Information Available	Accuracy
Individual	55
Individual + 10 PHS* + 2 MHS**	61
Individual + 20 PHS* + 4 MHS**	64
10 Progeny	67
Individual + 10 PHS + 2 MHS + 10 Progeny	77

* PHS = Effective paternal half sibs.

** MHS = Effective maternal half sibs.

Accuracy for a particular trait and heritability for that trait can be used to calculate confidence intervals for EBVs. For various accuracy levels the possible changes in EBVs (standard errors) for each trait are shown in Table 3.

Highly accurate EBVs are very reliable; there is little risk that the progeny performance of an individual with high accuracy will, on average, be much different than the EBVs indicate. For example, the possible change in a 200-Day growth EBV reported with 99% accuracy is only 1.7kg. Lower accuracy EBVs may change more with the addition of new performance compared to higher accuracy EBVs.

Comparing animals on performance using EBVs

EBVs are a tool that will help you to make more "educated" decisions when you are choosing breeding stock. In this Report you have access to EBVs for up to 17 important traits. The best way to make use of this information is first of all to decide on YOUR breeding goals and secondly to select animals with EBVs that

match those criteria. Try to combine the EBVs for all of the important traits for YOUR breeding program into your selection AND always remember to consider the many other important traits such as structural soundness and breeding soundness.

1. Use the EBVs of a sire and dam to predict the outcome of the mating

It is easy to do. Take a bull with an EBV of +30kg for 600-Day weight for example. On average he will pass half of his genes for 600-Day weight (equivalent to +15kg) on to his progeny. The dam will also contribute to half of the calf's genetics. If the dam's EBV for 600-Day weight is +10kg then the calf will get +5kg from her. In this example, the calf would be expected to be: $(15+5) = +20\text{kg}$ above the fixed base for the Simmental breed at 600 days of age.

Table 3: Possible Change in EBVs at different levels of Accuracy.

EBV	Accuracy (%)					
	50%	60%	75%	85%	90%	99%
Gestation Length	2.0	1.9	1.5	1.2	1.0	0.3
Birth Weight	2.4	2.2	1.9	1.5	1.2	0.4
200-Day Growth	10.4	9.6	8.0	6.3	5.2	1.7
400-Day Growth	16.0	14.7	12.2	9.7	8.0	2.6
600-Day Weight	18.6	17.2	14.2	11.3	9.4	3.0
Mature Weight	30.0	27.7	22.9	18.2	15.1	4.9
200-Day Milk	7.8	7.2	6.0	4.7	3.9	1.3
Scrotal Size	1.1	1.0	0.8	0.7	0.5	0.2
Days to Calving	4.9	4.5	3.7	3.0	2.5	0.8
Carcase Weight	13.8	12.8	10.6	8.4	7.0	2.3
Eye Muscle Area	2.1	2.0	1.6	1.3	1.1	0.3
Rib Fat	1.3	1.2	1.0	0.8	0.6	0.2
Rump fat	1.7	1.6	1.3	1.1	0.9	0.3
IMF%	0.8	0.8	0.6	0.5	0.4	0.1
RBY%	1.3	1.2	1.0	0.8	0.7	0.2

2. Compare EBVs to estimate the difference in output from two sires

Sire 1 has an EBV for 600-Day weight (the age of selling your cattle) of +40kg and Sire 2 an EBV of +10kg for the same trait. The difference is 30kg. Half of

this is passed on to the progeny. That is, calves from Sire 1 would be expected to be +15kg on average heavier than those from Sire 2 if used on dams of similar genetic value, run under similar conditions. Over a single year's drop of 30 calves this amounts to a production difference of 400kg live weight.

3. Compare Sires with the Current Simmental Genetic Level

The current genetic level for the breed can be determined from the average EBVs for all calves born in 2003 (Table 4). If you are interested in using a sire with a 200-Day Growth EBV of +20 then comparison to the averages in Table 4 will show you that the sire is above the current average genetic level for the breed for 200-Day Growth. By then comparing the sire's EBVs to the full set of percentile bands, you can determine where that sire ranks in relation to the genetic level of the 2003 drop calves.

Table 4: Average GROUP EBVs for the 2003 drop calves analysed in the AUTUMN 2005 Simmental Trans Tasman GROUP BREEDPLAN

CE Dir.	Dtrs	Gestation Length	Birth Weight	200-Day Growth	400-Day Weight	600-Day Weight	Mat.ure Weight	200-day Milk
-0.5	-0.3	-0.2	+1.8	+15	+24	+25	+24	+8

Scrotal Size	Days to Calving	Carcase Weight	EMA	Rib Fat	Rump Fat	Retail Beef Yield	IMF%
+0.2	-0.6	+15	+0.8	+0.0	+0.0	+0.3	+0.0

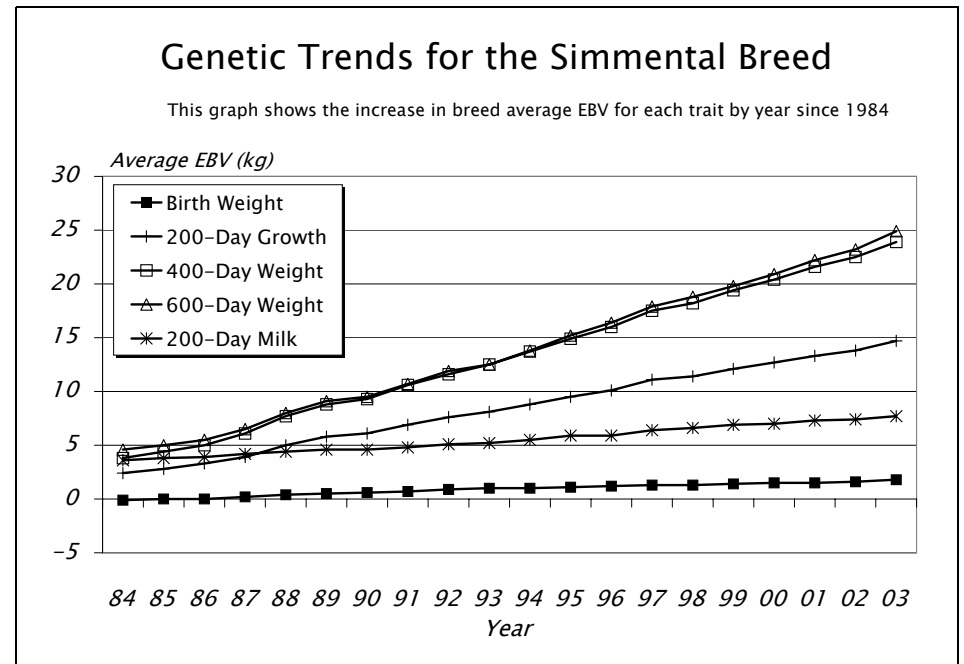
Herd Linkage

Pedigree links between herds allow across-herd comparisons. Linkage can occur through both sires and dams although sires generally contribute most (usually by AI). Linkage is calculated during the GROUP BREEDPLAN analysis and is dependent upon the information available at that time.

Genetic Trends

The average Estimated Breeding Value for calves in each year is shown in Figure 1 as an estimate of genetic trends for the breed.

Figure 1: Average EBVs for Calves (1984-2003)



Simmental Trans Tasman BREEDPLAN EBVs are calculated using software developed by the Animal Genetics and Breeding Unit, a joint venture of NSW Agriculture and the University of New England, Armidale, NSW 2351 Australia. BREEDPLAN development is supported by funding from Meat and Livestock Austral