MULTIBREED EBVS

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First Australian multi-breed EBVs

In BREEDPLAN, all breeds currently have their own bases, hence within breed EBVs of one breed cannot be directly compared with EBVs of another breed. Many breeders have sought improvement of this situation, in effect asking for 'multibreed EBVs' or ways to put breeds onto a common base.
With MLA funding support, work at the Animal Breeding and Genetics Unit(AGBU), early in 2003 has allowed the development of the first conversion table for BREEDPLAN multi-breed EBVs. The AGBU geneticists used 2,500 records from the Victorian Multi-breed EBV project. (Hereford, Angus, Limousin and Simmental over Hereford and Angus cows) and 1,800 records from the Beef CRC1 Northern Crossbreed Project (9 breeds over Brahman cows, see detail p2). This has produced sufficiently accurate comparisons of four breeds for some birth, growth and carcase weight traits. It was hoped that conversions for more breeds and traits would be possible, but the required accuracy was unfortunately not available from current data. This is however a sound start on which to add further traits/breeds as new data becomes available.

An adjustment table based on the above data is AGBU's initial move towards development of full multi-breed BREEDPLAN EBVs. This table gives adjustment factors to add to within breed EBVs, making them comparable across breeds. Table 1 gives these adjustments for gestation length, birth weight, the growth traits and carcase weight, for Angus, Poll/Hereford, Limousin and Simmental. Currently, only these EBVs can be compared across these four breeds. Further research is underway to add more traits/breeds to this table and to develop methodology for the preferred outcome of multi-breed EBVs by analysing combined breed datasets.

Table 1: Multibreed EBV Adjustment Table (March 2003)

To produce multi-breed EBVs, add to an animal's existing within breed BREEDPLAN EBV for each trait, the amount listed in this Table. (This is not a breed comparison table. See table 2)

	TRAITS					
	Gest. length	Birth Wt	200d Wt	400d Wt	600d Wt	Carcase Wt
Angus	0	0	0	0	0	0
Poll/Hereford	1.1	2.8	9	21	16	8
Limousin	9.2	6.4	13	25	17	20
Simmental	6.4	8.7	31	63	71	n/a

n/a - Insufficient data at present

Using this table: To compare an Angus bull with a birth weight EBV from Angus BREEDPLAN with a Limousin bull with its Limousin BREEDPLAN birth weight EBV, you would add from Table 1, 0 to the Angus EBV and 6.4 to the Limousin EBV. This is further illustrated in Table 2 where **average** within breed EBVs for 2001 born animals have been converted to multi-breed EBVs by this method.

Note the date in the heading of table 1 – March 2003. Like EBVs the adjustments may change over time, so check the date of such tables to see if a more recent table has been produced.

* David Johnston, Research Geneticist AGBU. BREEDPLAN and GROUP BREEDPLAN results are calculated using software developed by the Animal Genetics and Breeding Unit (AGBU), a joint Institute of NSW Agriculture and the University of New England. Ph 0267732055 Web HTTP://WWW.AGBU.UNE.EDU.AU AGBU receives considerable funding for its BREEDPLAN R & D from Meat & Livestock Australia.

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.Table 2: Examples of Multibreed EBVs (adjustments from Table 1 added to breed average within breed BREEDPLAN EBVs for 2001 born animals).

Breed	Gestation Length EBV			Birth WT EBV			400 d WT EBV			Carcase WT EBV		
	Breed Av.	Adjust. factor	Multi-Breed	Breed Av.	Adjust. factor	Multi-Breed	Breed Av.	Adjust. factor	Multi-Breed	Breed Av.	Adjust. factor	Multi-Breed
Angus	-1.3	+0.0	**-1.3**	4.0	+0.0	**4.0**	52	+0	**52**	33	+0	**33**
Poll/Hereford	0.0	+1.1	**+1.1**	4.0	+2.8	**6.8**	32	+21	**53**	27	+8	**35**
Limousin	-0.5	+9.2	**+8.7**	1.3	+6.4	**7.7**	19	+25	**44**	16	+20	**36**
Simmental	-0.2	+6.4	**+6.2**	1.7	+8.7	**10.4**	23	+63	**86**	*n/a*	*n/a*	*n/a*

Using these EBVs People will have a variety of uses, some of which are now discussed:
* Stud breeders may be interested to compare their stock with other breeds and perhaps review selection priorities.
* Crossbreeders and composite developers will better be able to select breeds and sires to use.
Note that in crossbreeding situations, the multibreed EBVs only hold if the bulls being compared are to be mated to the same, unrelated breed. For example if breed average 2001 drop Simmental and Angus bulls were to be mated to say Shorthorn cows. From Table 2, we would expect the Simmental/Shorthorn cross calves to be 3.2kg heavier at birth(half the difference between their respective multibreed EBVs of 10.4 and 4) than the Angus/Shorthorn crosses. At 600 days the Simmental crosses are predicted to be 17kg heavier(86-52/ 2).
*Another way of using multibreed EBVs is to find the equivalent within breed EBVs for a bull in another breed. For example, an Angus bull with a within breed Birth weight EBV of 5.0 would produce the same birth weight calves as a Hereford bull with a within breed EBV of 2.2. (5-2.8 from table 1). Similarly, an Angus bull with a carcase wt EBV of +30 would produce the same carcase wt in 650day old steers, as a Limousin bull with a carcase wt EBV of +10(30-20 from table 2).

Methodology used to develop the table
Data for the analyses came from:
1. The MLA supported Victorian multi-breed project, which used 22 sires from each of Angus, Hereford, Limousin and Simmental, mated to Angus and Hereford cows in Southern Australia in 1997 and 1998, across 19 herds. All sires had BREEDPLAN EBVs and represented a spread in the 400d weight EBV of their breed. Sires with extreme birth weight were not used. 2566 calves were generated and their management and performance recorded for numerous traits.
2.The Beef CRC design involved 9 sire breeds joined to Brahman cows in 1993, to 1995 in 2 herds in sub-tropical central Queensland. Progeny of the 8 sire breeds with BREEDPLAN analyses were considered in this work; Brahman, Belmont Red, Santa Gertrudis, Angus, Hereford, Shorthorn, Charolais and Limousin. Calves were generated by AI and natural mating and at weaning allocated to grow-out treatment groups, comprising market weight and finishing regimes. Sires per breed ranged from 8 to 15. There were 7 sires in common across the 2 projects.

A first step in AGBU's use of this data involved adjusting it to the BREEDPLAN definitions, accounting for known environmental effects, then estimating sire breed differences for each trait. The average BREEDPLAN EBVs of the sires used in the projects for each trait, were then obtained. These two pieces of information were used to compute adjustment factors to add to within breed EBVs to make them comparable across breeds.

Some cautions
* There are currently no conversions for traits other than those in Table 1 e.g. calving ease, milk, carcase EBVs etc, are not yet comparable across breeds. Therefore, care should be taken when using current multi-breed EBVs not to ignore the EBVs for the other very important traits.

* Remember EBVs are not absolutes. They give a best possible estimate of the expected differences between animals for a particular trait. The same applies for multi-breed EBVs, which can be used to predict the expected difference in the progeny of animals from different breeds. There is, however, an additional consideration with multi-breed EBVs as the expected difference is also dependant on the cow breed used. (crosses generate hybrid vigour in the progeny). There are a couple of scenarios that should be explained. Firstly, if we use the multi-breed EBVs from 2 bulls, an Angus and a Hereford, both joined to a third breed (e.g. Shorthorn) hybrid vigour is expected to be similiar and therefore the EBVs predict the difference in the progeny. However, if the cow breed was Angus then the Angus progeny would exhibit no hybrid vigour but the Hereford cross progeny would. Therefore, in this case the expected progeny difference predicted by the Multi-breed EBV would need to include an estimate of hybrid vigour.

* Adjustments in Table 1 are estimates and therefore may change with additional breed comparison data or as the breeds continue genetic change at varying rates. The accuracy of a Multi-breed EBV is therefore lower than when the EBV is used within a breed.