

2024 ACROSS-BREED EPD TABLE AND IMPROVEMENTS

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Across-Breed EPD (ABEPD) Adjustment Factors: National Cattle Evaluation (NCE), and the resulting Expected Progeny Differences (EPDs), have resulted in substantial genetic change since their inception in the 1970s. However, EPDs are generally only comparable within breed because of differences in the genetic base. Since 1993, the U.S. Meat Animal Research Center (USMARC) has produced a table of factors to adjust the EPDs of cattle so that the merit of individuals can be compared across breeds. Adjustment factors for carcass traits have been calculated since 2009 and carcass weight was added in 2015; to be included, breeds must have carcass data in the U.S. Meat Animal Research Center (USMARC) database and report their carcass EPDs on an actual carcass basis using an age-adjusted endpoint.

Bulls of different breeds can be compared on the same EPD scale by adding the appropriate adjustment factor to the EPDs produced in the most recent genetic evaluations for each of the eighteen breeds. Normally, the EPDs of animals from different breeds cannot be compared because many breed associations compute their EPDs in separate analyses and each breed has a different base point. The across-breed adjustment factors allow producers to compare the EPDs for animals from different breeds for these traits; these factors reflect both the current breed difference (for animals born in 2021) and differences in the breed base point. The AB-EPDs are most useful to commercial producers purchasing bulls of more than one breed to use in cross-breeding programs. For example, in terminal cross-breeding systems, AB-EPDs can identify bulls in different breeds with high growth potential or favorable carcass characteristics.

The factors are derived by estimating breed differences from the USMARC germplasm evaluation program and adjusting these differences for the EPDs of the sires that were sampled in the system. Traits for which factors are estimated are birth weight, weaning weight, yearling weight, maternal weaning weight (milk), marbling score, ribeye area, backfat depth (fat), and carcass weight (Table 1). The factors adjust the EPDs to an Angus base (chosen arbitrarily).

As an example, suppose a Red Angus bull has a carcass weight EPD of + 20.0 lb and a Hereford bull has a carcass weight EPD of + 75.0 lb. The across-breed adjustment factors for yearling weight (see Table 1) are -5.4 lb for Red Angus and -66.4 lb for Hereford. The AB-EPD is $20.0 \text{ lb} - 5.4 \text{ lb} = 14.6 \text{ lb}$ for the Red Angus bull and $75.0 \text{ lb} - 66.4 = 8.6 \text{ lb}$ for the Hereford

bull. The expected carcass weight difference of offspring when both are mated to cows of another breed (e.g., Braunvieh) would be $14.6 \text{ lb} - 8.6 \text{ lb} = 6 \text{ lb}$.

Brahman EPDs for marbling score are reported on a different scale than the other breeds with marbling score EPDs. For Brahman $400 = S1^{00}$ and $500 = S_m^{00}$ whereas for the other breeds, $4.00 = S1^{00}$ and $5.00 = S_m^{00}$ meaning the Brahman EPDs are reported on a scale that is 100 times higher. As a result, EPDs from other breeds need to be multiplied by 100 after being adjusted to Brahman, and Brahman EPDs need to be divided by 100 prior to applying the adjustment factors. For instance, to adjust a Simmental bull with a marbling score EPD of 0.15 to compare to Brahman bulls using the factors from Table 1, add the Simmental factor, subtract the Brahman factor, and then multiply by 100: $(0.15 + (-0.13) - (-0.65)) * 100 = 67$. Similarly, to adjust a Brahman bull with a marbling score EPD of 40 in order to compare to Simmental bulls using the same factors, first divide by 100, then add the Brahman factor, and subtract the Simmental factor: $40 / 100 + (-0.65) - (-0.13) = -0.12$.

One major change was implemented with this update. In the past, yearling weight EPD adjustment factors were derived using a BIF adjusted yearling weight using USMARC weight data. With this update, we analyzed BIF adjusted postweaning gain rather than yearling weight and the factors were derived as a sum of weaning weight and postweaning gain. Postweaning gain, rather than yearling weight, is used in most genetic evaluations and is desirable because the postweaning portion of yearling weight should not include maternal effects. The resulting factors are somewhat different from previous updates as a result with the largest changes being for breeds with low maternal effects. However, we believe the new factors and breed differs should more accurately represent national cattle evaluations.

It is important to note that the table factors (Table 1) do not represent a direct comparison among the different breeds because of base differences between the breeds. They should only be used to compare the EPDs (AB-EPDs) of animals in different breeds. To reduce confusion, breed of sire means (i.e., one half of full breed effect; breed of sire means predict differences when bulls from two different breeds are mated to cows of a third, unrelated breed) for animals born in 2022 under conditions similar to USMARC are presented in Table 2.

The adjustment factors in Table 1 were updated using EPDs from the most recent national cattle evaluations conducted by each of the eighteen breed associations (current as of January 2024). The breed differences used to calculate the factors are based on comparisons of progeny of sires from each of these breeds in the Germplasm Evaluation Program at USMARC in Clay Center, Nebraska. These analyses were conducted by USMARC geneticists Larry Kuehn (email: Larry.Kuehn@ars.usda.gov; ph: 402-762-4352) and Mark Thallman (email: Mark.Thallman@ars.usda.gov; ph: 402-762-4261).

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**TABLE 1: JANUARY 2024 ADJUSTMENT FACTORS TO ADD TO EPDs OF EIGHTEEN
DIFFERENT BREEDS TO ESTIMATE ACROSS BREED EPDs**

Breed	Birth Wt. (lb)	Weaning Wt. (lb)	Yearling Wt. (lb)	Maternal Milk (lb)	Marbling Score ^a	Ribeye Area (in ²)	Fat (in)	Carcass Wt.(lb)
Angus	0.0	0.0	0.0	0.0	0.00	0.00	0.000	0.0
Hereford	0.8	-11.9	-26.6	-11.1	-0.30	0.06	-0.073	-66.4
Red Angus	2.1	-17.4	-20.8	1.5	-0.01	0.31	-0.033	-5.4
Shorthorn	3.9	-19.1	-25.1	0.2	-0.07	0.35	-0.038	-0.4
South Devon	3.0	-32.9	-58.0	10.8	-0.08	0.41	-0.063	-8.5
Beefmaster	3.2	27.5	10.0	4.0				
Brahman	8.3	61.9	18.8	6.5	-0.65	0.17	-0.156	-34.5
Brangus	2.9	26.1	15.4	13.7				
Santa Gertrudis	4.4	42.9	47.4	18.2	-0.42	0.21	-0.072	2.3
Braunvieh	1.4	-16.6	-43.1	17.7	-0.07	0.43	-0.071	-7.4
Charolais	7.1	6.6	-12.9	-2.5	-0.31	0.85	-0.190	8.7
Chiangus	2.5	-16.4	-30.6	0.0	-0.40	0.47	-0.113	-28.9
Gelbvieh	3.0	-7.5	-16.3	7.2	-0.48	0.73	-0.104	-14.4
Limousin	1.5	-3.3	-16.3	-5.4	-0.38	0.72	-0.080	-5.3
Maine-Anjou	1.7	-25.5	-41.4	-7.9	-0.46	0.97	-0.169	-34.4
Salers	2.1	-11.4	-20.8	5.3	-0.25	0.60	-0.077	-7.7
Simmental	1.8	-10.6	-18.9	1.2	-0.13	0.52	-0.064	-0.2
Tarentaise	2.2	28.5	8.3	17.8				

^aMarbling score units: 4.00 = SI^{00} ; 5.00 = Sm^{00} . Note that Brahman EPDs for marbling are reported on a scale where 400 = SI^{00} and 500 = Sm^{00} . When converting sires from other breeds to a Brahman basis, the adjusted EPD should be multiplied by 100. Likewise, when Brahman EPDs are adjusted to other breeds, the EPD should be divided by 100 before adding the adjustment factor.

**TABLE 2: BREED OF SIRE MEANS FOR 2021 BORN ANIMALS
UNDER CONDITIONS SIMILAR TO USMARC**

Breed	Birth Wt. (lb)	Weaning Wt. (lb)	Yearling Wt. (lb)	Maternal Milk (lb)	Marbling Score ^a	Ribeye Area (in ²)	Fat (in)	Carcass Wt.(lb)
Angus	84.7	540.6	980.8	521.4	6.26	13.72	0.664	922.4
Hereford	87.0	517.9	926.8	509.7	5.34	13.52	0.598	872.4
Red Angus	83.8	522.2	947.1	521.9	5.92	13.51	0.637	888.9
Shorthorn	89.0	499.5	903.7	516.6	5.42	13.72	0.532	869.0
South Devon	87.2	502.7	897.9	521.2	5.39	13.73	0.508	855.1
Beefmaster	87.0	529.2	920.8	507.7				
Brahman	94.1	558.4	923.0	506.3	4.86	13.54	0.504	859.2
Brangus	86.9	523.8	924.2	516.4				
Santa Gertrudis	88.0	528.2	926.2	512.0	5.15	13.29	0.577	871.7
Braunvieh	87.2	509.0	889.7	527.1	5.47	14.24	0.479	849.0
Charolais	89.4	542.0	961.5	515.8	5.32	14.58	0.472	901.9
Chiangus	88.4	508.2	909.2	509.4	5.44	13.95	0.518	870.4
Gelbvieh	86.4	537.1	955.5	524.6	5.33	14.31	0.527	887.9
Limousin	86.0	537.4	949.5	514.0	5.28	14.57	0.530	895.1
Maine-Anjou	86.4	491.6	880.8	506.7	5.18	14.31	0.457	849.8
Salers	85.4	518.2	923.0	518.7	5.25	14.23	0.501	868.2
Simmental	86.7	541.5	961.6	518.3	5.54	14.43	0.515	898.2
Tarentaise	86.1	517.3	897.9	513.6				

^aMarbling score units: 4.00 = S1⁰⁰; 5.00 = S5⁰⁰