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If commercial beef producers were to abandon crossbreeding, there would be no need to consider Across Breed EPD's. With only one dominant breed such as the dairy industry's Holstein, sire selection would be greatly simplified. Given the diversity of production environments, management systems and market scenarios within which beef is produced, it seems unlikely that a least-cost producer will approach the business without crossbreeding as one of the tools.

As a matter of fact, Across Breed EPD's are just the most recent chapter in an ongoing evaluation of breeds and bulls. Astute commercial producers have been "going to school" on research results relative to large and important differences between breeds of cattle and between bulls within those breeds for at least 20 years. While this evaluation process has been formalized through research, Across Breed comparisons are as old as the annual ranch "branding".

NATIONAL SIRE EVALUATION/NATIONAL CATTLE EVALUATION

The use of EPD's via the proliferation of National Sire Evaluation (NSE) and National Cattle Evaluation (NCE) has been an unparalleled success in the beef industry. Virtually all beef breeds now publish National Sire Summaries and provide EPD's to their breeders. The credit for this effort is due mostly to the Beef Improvement Federation (BIF) which suggested uniform methods of sire evaluation for breed associations to utilize.

Also, most credit for the success of implementing National Sire Evaluation Programs should go to breed associations and purebred breeders, but the ultimate user, the commercial producer, was the real driving force behind this shared effort. Some breeds recognized the potential of sire evaluation and went for it, often without unanimous support of their board of directors, while other breeds took a wait-and-see approach. Regardless, without the commercial user pushing, many purebred breeders would not have embraced EPD's and National Cattle Evaluation.

Because EPD's are not perfect predictors of genetic merit, their detractors have chipped away at their use. Certainly EPD's are not available on all traits of economic interest and have other limitations but they are "light years" ahead of whatever is in second place (within herd ratios).

A QUICK REVIEW OF EPD's

An EPD predicts the transmitting ability of an individual as a parent. The EPD is one-half of the breeding value since each parent contributes a random sample half of their genes (one of each of the 30 pairs of chromosomes) to each offspring. An EPD is the difference in expected performance expected between future progeny of a parent compared to the expected performance of future progeny of all potential parents evaluated when bred to mates of equal value. EPD's are reported as plus or minus deviations from a zero base point in units of the trait. All available information is used, including individual progeny and other relatives.

A statistical technique known as Best Linear Unbiased Prediction (BLUP) is used in the actual calculation of EPD's. This technique involves solving equations for each animal and each contemporary group and sometimes for each trait. These equations are constructed by using estimates of heritability, genetic correlation among traits, genetic and environmental variances and covariances between traits. Since each breed uses data from their own breed, different heritability estimates and other parameters are often used.

Several statistical models use BLUP procedures to calculate EPD's; they include:

a. Full Animal Model - includes an equation for each animal in the data set.
b. Reduced Animal Model - includes an equation for each sire and each dam.
c. Sire-Maternal Grandsire Model - includes an equation for each sire and each maternal grandsire.

Breed Associations are currently using the Reduced Animal Model or the Sire-Maternal Grandsire Model. Also, a Maternal Effects Model is used to separate direct and maternal effects for such traits as weaning weight and calving ease. Weaning weight and calving ease are influenced by two genotypes, that of the calf (direct) and that of the dam (maternal). Analysis via the Maternal Effects Model allows producers to make this separation so that bulls can be evaluated on their potential as sires (direct) and their potential as grandsires (maternal impact through their daughters).

Since relatives have genes in common according to their degree of relationship, a matrix of relationships within a data set (breed) can provide the weightings necessary to utilize all sources of performance information. For example, a sire and his progeny share one-half of their genes in common while a grandsire shares only one-fourth of his genes in common with his grand-progeny. Since most all animals within a breed are related, even if remotely, a relationship matrix for the whole breed is possible on today's super computers. Thus, these linkages between common animals in pedigrees serve the same purpose as reference sires did in the early designed test sire evaluation programs.

In a multiple trait analysis, two or more traits are evaluated simultaneously and an equation for each trait for each animal is included in the model. If two traits are correlated, information on one trait is helpful in predicting the other; a good example is the correlation between weaning and yearling weights. A genetic correlation between two traits simply means that some of the same genes are influencing the two traits. The use of calving ease and birth weights to predict first-calf calving ease are also good examples of the power of multiple trait analyses. Multiple trait analysis is also being used to remove bias in yearling weight EPD's caused by sequential culling at weaning which results in a smaller contemporary group of selected animals at yearling time. Without Multiple Trait Analysis, differential culling of sire progeny groups would bias yearling weight EPD's.

Another feature of today's superior genetic evaluation programs is their ability to account for bias in matings. The Reduced Animal Model includes equations for both sires and dams, thus accounting for the genetic worth of mates and removing bias due to selective mating.

Accuracy values ranging from 0 to 1 are calculated for each EPD based on the number and distribution of performance records available. The accuracy value can be thought of as reflecting the amount of risk associated with an EPD that has been removed. Progeny data increases accuracy rapidly, especially where such data comes from widespread use of a sire across many herds (contemporary groups). For example, yearling bulls generally have accuracy values for weaning weight around .30 while older widely used A.I. sires may have an accuracy of .90 or higher. The best use of accuracy is as a gauge of the amount of information available. A breeder would be wise to stay focused on the EPD's and use accuracy to temper the extent to which bulls are used. Large herds which purchase groups of bulls are less likely to be concerned about the risk of large changes in EPD's as might be the case with a small operator purchasing one bull.

GENETIC BASE

All EPD's are calculated relative to a base within a breed. The choice of a base is arbitrary but once it is set, the distribution of EPD's relative to that base is established. Although the <u>difference</u> between two EPD's does not change because of the base, changing the base can affect the magnitude and even the sign of an animal's EPD.

We have properly told ourselves in the past that EPD comparisons can only be made <u>within</u> a breed. Breeders, however, often raise question why the distribution of EPD's vary so much between breeds. In some breeds, almost all of the EPD's are large and positive while the same trait in another breed seems to have a distribution around zero with as many negative as positive EPD's. Part of the explanation for these differences lies in understanding the differences in genetic base used by various breeds. The genetic base can be defined as a group of arbitrarily defined animals whose EPD's average zero. They could be born in or producing in the first year that data was available, the most recent year data was available, or any year that data was available. The base could be defined by birth year of bulls or cows or both.

The choice of genetic base does not affect the <u>ranking</u> of animals based on their EPD's, because the <u>difference</u> between EPD's does not change. However, the base chosen may affect the <u>perception</u> of their value and thus affect genetic change. The genetic base can be fixed or floating or a combination of the two. A fixed base sets the EPD's for a given birth year to zero every time the evaluation program is run with new records added. As examples, the base for the Angus breed is 1977. Thus for Angus, when all available records are analyzed, the average EPD's for animals born in 1977 are forced to equal zero. The result of setting EPD's to zero for a long-past year is that young animals will have mostly positive EPD's if much selection pressure has been applied. The perception is that all these young animals are superior! In reality, the ranking of animals based on EPD's has not changed. <u>Zero is not the average</u> of current breeding animals but of long-dead animals, relative to their superior descendants. The opposite situation results from the use of a recent year as the base. About half of the young animals will have positive EPD's, since the average EPD will likely be near zero. Certainly, a perception and marketing problem might result, but again the base does not change the ranking of the animals, only the magnitude of the EPD. A floating base is changed every year or two so that about half the EPD's of live animals are greater than zero and about half are less than zero.

A fixed base is best for tracking genetic trend of the whole population (breed) but the breeder requires knowledge of the average EPD of the breed to know where they stand relative to other breeders. A floating base tends to hide genetic trend since the average EPD always hovers near zero, but the breeder can quickly gauge progress relative to other breeders.

In summary: a) The method used to set the genetic base does not change the ranking of animals; b) A fixed base set many years back results in mostly positive EPD's and perhaps less breeder incentive to select the high EPD's; c) A floating base forces the EPD average to zero with equal numbers of plus and minus EPD's which may provide more breeder incentive to select the high EPD's. The Beef Improvement Federation (BIF) has voted (1992) to recommend that all beef breed associations use a fixed base in their National Cattle Evaluation (NCE) programs and that each breed use the year of their choice as the base year.

ACROSS BREED EPD'S

Increasingly, commercial producers have quickly adapted to the use of within breed EPD's. Their desire to purchase seedstock for specific roles and production scenarios has led them to ask the logical question, "Why not calculate Across Breed EPD's?" Notter (1989) listed the following needs for such a comparison: 1) breed constants for each breed, production environment and mating system being considered; 2) knowledge of the genetic base for each breed; 3) sire EPD's for prediction of crossbred performance; and, 4) adjustments to account for different levels of heterosis.

Ideally, breed constants would come from designed breed evaluation studies or industry crossbreeding programs. One such program is the Germ Plasm Evaluation (GPE) program at the U.S. Meat Animal Research Center which has evaluated many breeds via large numbers of A.I. sires with currently available EPD's. Use of sires with EPD's is an advantage since the data can then be adjusted for sampling of sires within the breeds being compared.

The genetic base differs for most of the beef breeds. Before within breed EPD's can be linked to breed mean differences, the base used to define the within breed EPD's must be specified. Breeds don't have to use the same base, but an adjustment for the difference in base must be made.

Regarding the use of within-breed sire EPD's for the prediction of crossbred performance, Notter (1989) concluded the use of within-breed EPD's for prediction of the relative performance of sires in crossing with dam breeds appeared reasonable. Thus, EPD's can be viewed as predictive of average progeny performance in straight breeding and crossbreeding programs. Insufficient data exists to confirm the above conclusion outside of Bos taurus beef breeds, thus a different result is conceivable in Bos indicus (Zebu) and dairy breed crosses.

General heterosis effects for many traits have been estimated for most Bos taurus beef breeds. Average expected heterosis estimates could be calculated to predict crossbred performance for most breeds. It is well known that more heterosis is expressed in crosses involving Bos indicus breeds, thus a separate table of heterosis values might be desirable for such crosses.

ACROSS BREED EPD'S EVOLVE

Based on the thinking outlined above, Notter and Cundiff (1991) undertook a major re-analysis of the MARC data to calculate the constants necessary to estimate Across Breed EPD's. This analysis was repeated in 1992 by Nunez-Dominguez, Cundiff and VanVleck (1992) and by the same authors in 1993. At the 1992 BIF meeting the Genetic Prediction Committee decided to publish each year a breed table adjusting breed means for genetic trends and sire sampling using current EPD's. Cundiff (1993) reported at the BIF conference in May, 1993 on the latest analysis for 12 breeds using current EPD's to adjust breed comparisons to a 1991 all animal (non-parent) basis.

The following text and discussion of Tables 1-4 is a condensed version of Dr. Cundiff's paper.

Birth weight (4,272 records), 200-day weaning weight (4,099 records), and 365-day yearling weight (3,842 records) obtained on F_1 calves by 11 or 12 sire breeds mated to Hereford and Angus dams produced in the Germplasm Evaluation Program (GPE) at the U.S. Meat Animal Research Center, Clay Center, Nebraska were analyzed. Although, twenty six breeds have been evaluated to date in the GPE program, only breeds with current national genetic evaluations were included in the analysis. Also, only progeny of sires with EPD's available from the most recent 1993 genetic evaluations for each respective breed were included in the current analysis. Data on 200-day weaning weight of 6,315 three-breed-cross calves produced by mating 1,486 F_1 females to unrelated sire breeds were used to estimate breed differences adjusted for genetic trends in maternal weaning weight and net maternal (milk) EPD's.

Table 1 shows the number of sires and progeny used in the analysis of birth weight, and the time period when breeds were used in the GPE program. Twelve breeds were included in the analysis for birth weight. Maine Anjou EPD's were available only for birth weight and weaning weight. For the analysis of maternal weaning weight, the number of maternal grandsires, F_1 dams and three-breed cross progeny by each breed of maternal grandsire, and the period of time when these breeds were used in the GPE program are shown in Table 2.

Pooled within breed regressions (response in lb/lb EPD) were 1.08 for birth weight, .89 for weaning weight (direct) and 1.45 for yearling weight. These results are reasonably close to the theoretical expectation that one pound of performance in F_1 crosses will result from each one pound of EPD of the sire, especially for birth weight and weaning weight.

Mean 1991 EPD's (all animal non-parent) from the most recent (1993) genetic evaluations of each breed shown in Table 3. Breed averages for progeny produced at MARC and the 1991 average EPD for each breed (Table 3) using the appropriate pooled within breed regression coefficients and equations. Thus, the breed means presented in Table 4 for birth weight, weaning weight, yearling weight, total maternal weaning weight (.5 direct + milk), and net maternal weaning weight (milk) compare breeds on a 1991 basis. The year, 1991, was chosen as the base because yearling weight data were available on calves born in 1991 in the most recent genetic evaluations for each breed. Use of a more recent birth year would require extrapolation to a time when data were not yet available for yearling weight.

When sire breed means for birth weight, weaning weight and yearling weight were adjusted to a 1991 basis, the differences between breeds were smaller than estimates made earlier in the 1970's. For example, the range in birth weight between Hereford-Angus and Charolais crosses by original sires used in the seventies was 11.2 lb, but the difference between current Hereford-Angus and Charolais crosses by sires born in the mid 1980's was 6.1 lb. The latter estimate corresponds very closely to estimates adjusted to a 1991 basis (Table 4) between Charolais and the mean of Hereford and Angus sired progeny (6.8 lb). Similar trends have resulted for weaning weight and yearling weight. These results are consistent with genetic trend estimates for EPD's within breeds which indicate that breeds formerly of smaller size have placed primary emphasis on growth to weaning and yearling ages while breeds of largest size have placed relatively more emphasis on reducing increases in birth weight to improve calving ease. Pooled within breed regressions (lb/lb) of calf weaning weight on direct weaning weight, and milk EPD's were .50 and 1.10, respectively. These estimates are also remarkably similar to the expected values of .5 for direct weaning weight, 1.0 for milk.

The present estimates (1993) are more consistent with expectations based on previous experimental results than the estimates reported at the BIF meeting a year ago (Nunez et al., 1992) or those reported earlier by Notter et al. (1991). The present estimates involve a much larger data set for most breeds.

TABLE 1. NUMBER OF SIRES WITH EPD's FOR BIRTH WEIGHT, PROGENY PER SIRE BREED, AND TIME PERIODS WHEN THESE BREEDS WERE USED IN THE GPE PROGRAM

	Number		Cycle				
Sire Breed	Sires	Prog.	I (1970-72)	II (1973-74)	III (1975-76)	IV (1986-90)	V (1992-94)
Angus	61	675	X[a,b]	X[a]	X[a]	X[a,e]	X[e,f]
Brahman	19	195			X[d]		X[d,f]
Charolais	57	523	X[b]			X[e]	
Gelbvieh	25	382		X[c]			
Hereford	36	516	X[a,b]	X[a]	X[a]	X[a,e]	X[e,f]
Limousin	20	378	X[b]				
Maine Anjou	15	174		X[c]			
Pinzgauer	11	394			X[d]	X[e]	
P. Hereford	27	262	X[a,b]	X[a]	X[a]	X[a,e]	X[e,f]
Salers	27	184				X[e]	
Shorthorn	25	178				X[e]	
Simmental	28	411	X[b]				
Total	351	4,272					

[a]Reference sires used in Cycle I, II, III and IV.
[b]Sires used for first time in Cycle I.
[c]Sires used for first time in Cycle II.
[d]Sires used for first time in Cycle III.
[e]Sires used for first time in Cycle IV.
[f]Sires used for first time in Cycle V.

TABLE 2. NUMBER OF MATERNAL GRANDSIRES WITH EPD's, DAMS AND PROGENY BY BREED OF MATERNAL GRANDSIRE, AND TIME PERIOD WHEN CALVES WERE BORN

	Number			
Breed	Maternal Grandsires	Dams	Prog.	Birth Year of Calves
Angus	39	248	1083	1972-82, 1988-92
Brahman	6	37	186	1977-82
Charolais	50	175	724	1972-79, 1988-92
Gelbvieh	25	142	592	1975-82
Hereford	34	210	861	1972-82, 1988-92
Limousin	20	150	766	1972-79
Maine Anjou				1975-82
Pinzgauer	11	112	471	1977-82, 1988-92
P. Hereford	21	109	443	1974-82, 1988-92
Salers	25	85	232	1988-92
Shorthorn	22	66	161	1988-92
Simmental	27	152	796	1972-79

TABLE 3. 1991 ALL ANIMAL NONPARENT MEAN EPD'S FROM MOST RECENT EVALUATION (SPRING 1993) FOR EACH BREED

Breed	Birth Weight	Weaning Weight	Yearling Weight	Maternal Weaning Weight	Maternal Milk
Angus	3.20	22.2	38.2	18.8	7.7
Brahman	0.49	4.2	7.5	4.9	2.7
Charolais	0.94	2.5	3.6	-.6	1.8
Gelbvieh	0.30	4.4	8.2	4.2	2.0
Hereford	2.17	25.3	40.3	19.5	6.9
Limousin	0.60	3.6	7.4	1.9	.1
Maine Anjou	0.50	4.3	7.3	*	*
Pinzgauer	-1.10	-.5	-1.0	-.5	.3
P. Hereford	3.30	21.0	33.8	11.1	.6
Salers	0.70	6.6	10.8	6.5	3.2
Shorthorn	1.80	11.1	18.3	7.5	2.0
Simmental	0.50	5.8	10.0	2.7	.2

*EPD's not available.

TABLE 4. SIRE BREED MEANS ADJUSTED TO 1991 MEAN EPD

Breed	Birth Weight lb	Weaning Weight lb	Yearling Weight lb	Maternal Weaning Weight lb	Maternal Milk lb
Angus	77.6	441	810	480	-8
Brahman	87.8	447	744	517	26
Charolais	86.0	458	819	494	-3
Gelbvieh	87.3	465	822	523	22
Hereford	81.4	442	800	473	-16
Limousin	83.1	450	798	480	-13
Maine Anjou	87.8	458	826	*	*
Pinzgauer	82.4	440	783	487	-1
P. Hereford	80.3	450	806	453	-40
Salers	80.9	464	830	505	6
Shorthorn	83.5	461	832	506	8
Simmental	86.0	471	860	523	20

*EPD's not available.

EPD ADJUSTMENT FACTORS

The means presented in Tables 3 and 4 can be used to estimate across breed EPD's adjusted to a genetic base of 1991. Adjustment factors can be added to EPD's of individuals in any given breed to compare directly to EPD's of some base breed. The adjustment factors can be calculated as follows:

EPD Adj. Factor = ($Mean_x$ - $Mean_{Base}$) - (EPD_x - EPD_{Base})

Where:

$Mean_x$ = 1991 mean for breed x (Table 4)
$Mean_{Base}$ = 1991 mean for base breed (i.e., Angus, Table 4)
EPD_x = Average 1991 EPD for breed x (Table 3), and
EPD_{Base} = Average 1991 EPD for base breed (i.e., Angus, Table 3)

For example, in the case of birth weight, using Charolais as breed x and Angus as the base breed:

EPD Adj. Factor = (86.0 - 77.6) - (0.94 - 3.20)
= 10.7

Thus, the value of 10.7 should be added to Charolais EPD's to compare directly to Angus EPD's for birth weight.

The adjustment factors obtained in this manner are useful only for adjusting EPD's to a common breed base. The adjustment factors alone cannot be used to compare breeds, because the base (within breed EPD = 0) for different breeds is fixed in different years. However, if the adjustment factors are added to the mean EPD of each breed (e.g., 1991 means in Table 3). The differences between breeds will equate to the differences between corresponding breed means in Table 4. This procedure was used to obtain the final adjustment factors used to estimate across breed EPD's in articles in "Beef Today" (Effertz 1993a, 1993b) and more recently in "Beef" (1993). This final adjustment table is reproduced here as Table 5 and uses Angus as the base breed although any breed could be used as the base.

TABLE 5. ACROSS-BREED FINAL ADJUSTMENT FACTORS USING ANGUS AS THE BASE BREED

Breed	Birth Weight EPD	Weaning Weight EPD	Yearling Weight EPD	Maternal Weaning Weight EPD	Maternal Milk EPD
Angus	0.0	0.0	0.0	0.0	0.0
Brahman	12.9	24.0	-35.3	50.9	39.0
Charolais	10.7	36.7	43.6	33.4	14.5
Gelbvieh	12.6	41.8	42.0	57.6	35.7
Hereford	4.8	-2.1	-12.1	-7.7	-7.2
Limousin	8.1	27.6	18.8	16.9	2.6
Maine Anjou	12.9	34.9	46.9	*	*
Pinzgauer	9.1	21.7	12.2	26.3	15.0
P. Hereford	2.6	10.2	0.4	-19.3	-24.9
Salers	5.8	38.6	47.4	37.3	18.5
Shorthorn	7.3	31.1	41.9	37.3	21.7
Simmental	11.1	46.4	78.2	59.1	35.9

*EPD's not available.

EXAMPLES OF ACROSS BREED EPD's

Across breed EPD's can be produced by adding the final adjustment factors from Table 5 to the within breed EPD of any breed you wish to compare. The following is an example calculation of Across Breed EPD's for various bulls adjusted to an Angus Base.

Breed	Birth Weight EPD	Weaning Weight EPD	Yearling Weight EPD	Milk EPD
Angus EPD (QAS Traveler 23-4)	.1	21	45	18
Angus Adjustment (Table 5)	0	0	0	0
Across Breed EPD	.1	21	45	18
Hereford EPD (WS DHR Duke 8430)	6.2	51	84	3
Hereford Adjustment (Table 5)	4.8	-2.1	-12.1	-7.2
Across Breed EPD	11.0	48.9	71.9	-4.2
Gelbvieh EPD (Pacific Prospector 449x)	-8.1	11	19	7
Gelbvieh Adjustment (Table 5)	12.6	41.8	42	35.7
Across Breed EPD	4.5	52.8	61	42.7
Limousin EPD (Bild Satellite)	1.5	14.6	29.3	4.8
Limousin Adjustment (Table 5)	8.1	27.6	18.8	2.6
Across Breed EPD	9.6	42.2	48.1	7.4
Simmental EPD (DS Pollfleck 809)	.3	17.6	29.3	2
Simmental Adjustment (Table 5)	11.1	46.4	78.2	35.9
Across Breed EPD	11.4	64	107.5	37.9

The result is a list of bulls from different breeds that can be fairly compared.

Breed	Bull	Across Breed EPD's Birth Weight EPD	Weaning Weight EPD	Yearling Weight EPD	Milk EPD
Angus	QAS Traveler 23-4	.1	21	45	18
Hereford	WS DHR Duke 8430	11.0	48.9	71.9	-4.2
Gelbvieh	Pacific Prospector 449x	4.5	52.8	61	42.7
Limousin	Bild Satellite	9.6	42.2	48.1	7.4
Simmental	DS Pollfleck 809	11.4	64	107.5	37.9

Kansas State University scientists have developed a computer software program (EPD.AnvEPD Comparison Program) to quickly calculate the EPD's for bulls from various breeds which would be equivalent to a current bull(s) in use. Eight breeds are included in the program (Angus, Charolais, Gelbvieh, Hereford, Limousin, Polled Hereford, Saler and Simmental) and equivalent EPD's are generated for each for three breeds at a time in each run.

The following are example printouts from the KSU - EPD program.

TABLE 6. COMPARING BULLS FOR A CROSSBREEDING PROGRAM

	Current Angus Bull(s) (EPD)	Charolais (EPD for Equivalent Performance)	Hereford	Simmental
Birth Weight	6.2	-4.5	1.4	-4.9
Weaning Weight	35	-2	37	-11
Yearling Weight	66	22	78	-12
Milk	8.0	-6.5	15.2	-27.9
Maternal Weaning Wt	25	-8	33	-34

NOTE: Above uses Angus as base breed and the Angus bull Scotch Cap as the current bull.

Table 6 says that if a breeder had been using Scotch Cap and was looking for an equivalent bull (using yearling weight as an example); a Charolais bull would need to be at least +22 (Charolais EPD) to be equivalent to Scotch Cap while a Hereford bull would have to be at least +78 (Hereford EPD) to be equivalent to Scotch Cap; however, a Simmental bull could be as low as -12 (Simmental EPD) and still be equivalent to Scotch Cap.

TABLE 7. COMPARING BULLS FOR A CROSSBREEDING PROGRAM

	Current Simmental Bull(s) (EPD)	Angus (EPD for Equivalent Performance)	Charolais	Gelbvieh
Birth Weight	0.3	11.4	0.7	-1.2
Weaning Weight	18	64	27	22
Yearling Weight	29	108	64	66
Milk	2.0	37.9	23.4	2.2
Maternal Weaning Wt	11	70	37	12

NOTE: Above uses Simmental as base breed and Simmental bull DS Pollfleck 809 as the current bull.

Table 7 also demonstrates the KSU-EPD program but with a Simmental base. Note that an Angus bull could have as much as 11.4 lbs of birth weight EPD (Angus EPD) and be equivalent to Pollfleck; however, such an Angus bull would need 108 lbs of yearling weight EPD (Angus EPD) to match Pollfleck.

The KSU-EPD program can be purchased for $10 by contacting: Dr. Keith Zoellner, Extension Animal Science, 214 Weber Hall, Kansas State University, Manhattan, Kansas 66506-0201, Phone: 913/532-1221.

LIMITATIONS OF ACROSS BREED EPD's

The critics of Across Breed EPD's have been quick to point out their shortcomings. In general, the limitations cited are; 1) low accuracy due to limited number of cattle/sires per breed, 2) all data collected under MARC conditions which may not be representative, 3) may jeopardize understanding and use of within breed EPD's, 4) bulls used at MARC were not representative of their breed, 5) the five traits involved are too narrow to adequately describe and choose breeds.

These concerns are taken seriously and additional numbers of sires/maternal grandsires in the most recent analysis makes the estimates much more reliable, but certainly not perfect. The "representative bull" question should not be a relevant question either, since the bulls used in the MARC study had EPD's within their respective breeds and adjustments were made for their deviation from their breed mean EPD.

LOOKING AHEAD

Without doubt it would be nice to have a dozen "MARC's" located around the U.S. to generate crossbred progeny from sires with known EPD's to further validate the estimates from Across Breed EPD's currently being used. A more realistic source of needed records will likely come from breeders themselves. Agreements between breed associations to share data from F_1 animals involving their respective breeds will be vital. Recognition of F_1 calves out of purebred Gelbvieh, Limousin, Red Angus and Simmental dams but sired by bulls of other breeds will contribute an important pool of data.

This "field data" approach (assuming it happens!) will give Across Breed EPD's the numbers they need similar to what happened 20 years ago when sire evaluation shifted from designed test programs to breed association field records.

I hope that Across Breed EPD's become "thought tools" that help the commercial beef producer to do their best to fit genetic resources to feed, labor and capital resources in order to meet production and marketing goals. Description of cattle today in terms of biological type is more meaningful than simply using breed. Identification of equivalent bulls of different breeds but within a given biological type should be very useful to commercial producers who design breeding programs to optimize heterosis and production.

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