Understanding and Using Sire Summaries

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Sire summaries are produced and published by breed associations to provide current genetic evaluations on progeny-proven sires within their breeds. While the sire summary formats may vary among breeds, they all are designed to use best linear, unbiased prediction procedures to produce expected progeny with legitimate performance records. An EPD is always the best estimate of an animal's genetic worth given the data available for analysis; so EPDs provide a genetic description of an animal for the traits included in the analysis. Sire summaries are, in a sense, similar to a parts catalog where goal-oriented producers can go to find the cattle or lines of cattle with the genetic parts, or "pieces," necessary to help them attain their goals.

Expected Progeny Differences (EPDs)

EPDs provide a tool for genetic comparisons of cattle that can be used by both purebred and commercial cattle producers alike. Expected progeny differences are expressions of the relative genetic merit of beef cattle for various traits. EPDs are used to compare the predicted progeny performance between two bulls (or females) within a breed, regardless of age or herd location.

EPDs are expressed in the actual units of measure for a given trait. In other words, EPDs for traits such as birth weight (BW), weaning weight (WW), and yearling weight (YW) are expressed in pounds, whereas EPDs for scrotal circumference are in centimeters and EPDs for hip height are in inches.

EPDs are used to compare two bulls (or females) within a breed. The difference in the EPDs for those bulls would be the predicted differences in the average performance of those bulls' progeny. For example, consider the EPDs for the bulls
in Table 1.

Table 1. Birth weights and growth EPDs for two bulls.			
	EPD, lb		
Bull	BW	WW	YW
A	+4	+20	+30
B	-2	+5	+20
Difference	6	15	10

These EPDs do not mean that Bull A would increase a herd's birth weights by 4 pounds and add 20 pounds to the calves at weaning and 30 pounds to the calves as yearlings. They simply allow us to predict the difference

between the average weights of the two bulls' calves if they were mated to the same group to cows. When compared to Bull B, we can expect calves from Bull A to average 6 pounds heavier at birth, 15 pounds heavier at weaning, and 10 pounds heavier as yearlings.

In addition to the numerical EPD, an accuracy value (.00 to 1.00) for that EPD will also be calculated during the breed's genetic evaluation program. Accuracy is a measure of confidence that the EPD reflects the true genetic merit of an animal. EPDs are calculated from individual performance, performance of ancestors and siblings, and progeny performance. As the amount of information that goes into an EPD increases, the accuracy of that EPD increases. EPDs with low levels of accuracy (.10 to .30) are likely calculated with no progeny information included and are thus more susceptible to change during the next evaluation when more data (progeny) are included in the analysis. On the other hand, EPDs with high levels of accuracy (.80 to .99) already have included a relatively large number of progeny and are less susceptible to dramatic change.

Contemporary Groups

Proper contemporary grouping is the cornerstone of accurate genetic evaluation. A contemporary group is simply a group of cattle of the same sex raised in the same environment and weighed under the same conditions. When comparing the actual performance of cattle, cattle producers should only compare cattle from the same contemporary group. To compare across contemporary groups, more sophisticated evaluation procedures are required. Breed evaluation programs accomplish this by evaluating a large number of contemporary groups that have more than one sire represented and then crosslinking these groups by common sires. The increased use of artificial insemination has improved the ability to crosslink these various contemporary groups and has had a significant impact on improving the accuracy of genetic evaluations.

Cattle producers must correctly form and identify contemporary groups in their within-herd performance programs to ensure accurate across-herd comparisons. The following guidelines should be used when forming contemporary groups: (1) animals of the same sex, (2) animals of similar age (not more than 90-day spread in birth dates), and (3) animals managed together and given equal opportunity to perform (same pasture time, same feed, same weight dates, etc.).

Trait Listing and Definitions

The main part of a sire summary is the listing of sires with their EPDs and accuracies. Since some breeds analyze different traits and present their EPDs in a different format, a sample listing of EPDs along with their explanations is usually presented at the beginning of the sire summary. An example with traits commonly found in a sire summary is shown in Table 2.

Although all cattle in the data set are analyzed and receive EPDs, it is common practice for breed associations to publish only current or active sires with minimum levels of accuracy in the sire summary. In addition to this "main" listing, many breeds publish a supplemental listing of young sires that don't meet the accuracy requirements.

Table 2. Example listing and trait definition.

Sire Information[1]	Birth wt[2]		Weaning wt[4]		Milk[5]		Maternal weaning wt[6]	Yearling wt[7]	
	EPD	ACC[3]	EPD	ACC	EPD	ACC	EPD	EPD	ACC
Bull A	+5.0	0.95	+28.0	0.90	+10.0	0.70	+24.0	+46.0	0.85
Bull B	+1.5	0.70	+20.0	0.60	+3.0	0.15	+13.0	+34.0	0.50

[1]**Sire information:** Sires are listed according to their registered name. Other information such as registration number, birth date, sire, dam's sire, breeder, and current owner are also presented.

[2]**Birth weight:** Birth weight is related to calving ease. Larger birth weight EPDs generally indicate more calving difficulty. Progeny of Bull A can be expected to weigh 3.5 pounds more than progeny of Bull B.

[3]**Accuracy:** Accuracy is an indication of the reliability of the EPD. Bull A's higher accuracy indicates more progeny records have been collected.

[4]**Weaning weight:** Weaning weight EPD reflects preweaning growth. Progeny of Bull A can be expected to average 8.0 pounds more at weaning time than Bull B.

[5]**Milk (pure milk)(maternal milk):** Milk EPD reflects the milking ability of the sire's daughters expressed in pounds of calf weaned. The milking ability of daughters of Bull A should contribute 7 pounds more to the weaning weight of their calves (maternal milk) when compared to daughters of Bull B.

[6]**Maternal weaning weight:** Maternal weaning weight EPD predicts the difference in weaning weight of the sire's daughters' progeny due to the combination of growth genetics and milking ability. It is equal to one half of the weaning weight EPD plus the milk EPD. Calves from daughters of Bull A can be expected to average 11 pounds heavier at weaning than calves from daughters of Bull B (4 pounds from growth and 7 pounds from milk).

[7]**Yearling weight:** Yearling weight EPD reflects differences in adjusted 365-day weights for progeny and is the best estimate of total growth. Progeny of Bull A can be expected to average 12 pounds more as yearlings than progeny of Bull B.

Possible Change Tables

You must realize that an EPD is a prediction of an individual's genetic transmitting ability for a given trait. As with any prediction, there is a margin of error, or possible change, associated with an EPD. When the accuracy is low, this margin of error is high. As more information (i.e., progeny data) becomes available, the margin of error becomes smaller.

Many breed associations publish a table of possible change values for their breed in the front of their sire summaries similar to the abbreviated example from the Limousin summary shown in Table 3.

What this table tells us is that 67 percent of the sires are expected to have average actual progeny differences that fall within the range of the EPD plus or minus the possible change value and 95 percent are expected to be within the range of the EPD plus or minus twice the possible change value. For example, if a Limousin bull has a weaning weight EPD estimate of +12 pounds with an accuracy of .50, we are 67 percent certain that his actual EPD is between 3.2 and 20.8 (12±8.8). If he has an EPD of +12 with .90 accuracy, then we are 67 percent certain that his actual EPD is between 10.2 and 13.8 (12±1.8).

Table 3. Possible change in values (±) for Limousin EPDs.				
Accuracy	**BW EPD**	**WW EPD**	**YW EPD**	**Milk EPD**
0.10	2.9	15.9	23.8	15.6
0.30	2.2	12.3	18.4	12.1
0.50	1.6	8.8	13.1	8.7
0.70	1.0	5.3	7.9	5.2
0.90	0.4	1.8	2.8	1.7

The possible change table provide an excellent risk management tool. While you can never guarantee a certain minimum or maximum EPD for a given trait, you can reduce the risk that the EPD will shift outside of your acceptable range. For example, if you were evaluating bulls with .70 accuracy and wanted to be 95 percent certain that the milk EPD would not fall below 0.0, you need to use bulls with a minimum milk EPD of +10.4 pounds (twice the possible change of 5.2). To get the same risk management with a .90 accuracy bull, the minimum milk EPD would be +3.4 pounds.

Genetic Trend

As the breeders within a breed emphasize various traits in order to build upon their breed's strenghs or overcome a perceived weakness, a breed direction or genetic trend is established. Many breed associations show their genetic trend in the front of their sire summary by either giving the average EPDs by birth year in a table (example in Table 4) or plotting these averages in a graph. Evaluation average EPD genetic trends for the past several generations can be very useful when determining future directions, since these trends indicate where a breed has been, where it is headed, and how fast it is moving.

Table 4. Polled Hereford EPD trend by birth year.				
Year	**BW EPD**	**WW EPD**	**YW EPD**	**Milk EPD**
1975	0.0	0.0	0.0	0.0
1980	0.6	5.5	8.6	0.6
1985	1.8	12.9	20.7	0.8

1990	3.2	20.3	32.9	0.3

From the table, you can see that from 1985 to 1990 Polled Hereford breeders increased birth weight EPD by 1.4 pound, weaning weight EPD by 7.4 pounds, yearling weight EPD by 12.2 pounds, and decreased milk EPD by .5 pound. This would indicate fairly intense selection pressure on growth with little or no emphasis on milk during that time.

Breed Average EPDs

Most breed associations publish the average EPDs of the sires of their breed at the front of their sire summary. Realize that 0.0 EPD does not mean breed average. Differences in genetic trend and differences in the base point for calculating the EPDs have moved the average EPD for some traits in some breeds well away from zero.

For producers who are evaluating cattle in more than one breed, you must realize that the EPDs are not comparable across breeds. A high breed average EPD for a trait does not indicate breed superiority for that trait. It is more a reflection of the genetic trend and the base point of calculation for that breed.

In addition to the sire averages, several breed associations also publish the breed average EPDs for the last calf crop year or the nnparent cattle. This will allow a producer that is looking only at young, nonparent cattle to more readily determine how they compare to cattle of similar age. For instance, if a young Angus bull with a weaning weight EPD of +8 pounds is compared to all Angus sires (average EPD =7.4), he would appear to be about breed average for preweaning growth. However, when the same bull is compared to the other young, nonparent Angus cattle (average EPD = 20.0), he is considerably below the average EPD of the other bulls of his age that might be available.

Distribution and Percentile Rank

Another tool that several breed associations include in their sire summary for producers to use in evaluating potential sires are tables (or graphs) of EPD distribution or percentile rank. These tables allow a producer to quickly evaluate where a bull ranks within the breed for a given trait (top 1 percent, top 5 percent, top 20 percent, etc.). The percentile rank table is also an excellent tool for use in multiple trait selection. For example, if a producer wants to place heavy emphasis on birth weight (Calving ease) and milk production while maintaining at least breed average growth, they could use the table to identify the EPDs necessary to rank in the top 5 percent of the breed for birth weight EPD and milk EPD and the top 50 percent of the breed for weaning and yearling weight EPDs.

Summary

Sire summaries provide accurate and reliable information on which to base selection. These summaries provide producers an excellent tool for comparing the estimated genetic merit of progeny proven bulls and thus serve as an excellent aid in selecting A.I. sires. The sire summaries also provide valuable information for identifying genetic lines of cattle for producers that use natural service sires. Both purebred and commercial producers canuse the EPD listings and supporting statistical information to reduce the risk associated with sire selection decisions. Sire summaries can be obtained by contacting your national breed association office.

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