Young, proven, nonparent, or super sire...

A Bull's Future Rides on the "Stats"

by Roy Wallace, Chairman, Beef Programs, Select Sires Inc.

Since the beginning of domesticated animal breeding, animal breeders have tried to predict the true genetic worth of animals. For many years the animal breeder and stockman evaluated the animal's genetic merit based on its phenotype or how it looked. Every animal is the result of a combination of its genetic make-up and environment. Likewise, differences between animals are caused by both their genetic merit and environment.

The biggest problem with phenotypic selection is that it is impossible to separate differences between animals into genetic effects and environmental effects.

A big step forward in cattle evaluation came about in the 1950s and 1960s when cattlemen began using individual performance to compare animals within contemporary groups. This procedure increased the accuracy of selection over that achieved through phenotypic selection. While individual performance records increased the accuracy within a herd, they did little to assist the breeder trying to select bulls from the total population. Within herd comparisons generally work fine for selection of replacement females within the herd, but breeders wanting to make maximum genetic progress need to be able to compare and select superior bulls from the entire population.

Since the beginning... animal breeders have tried to predict the true genetic worth of animals.

With the American Angus Assn.'s past procedures for sire evaluation data analysis, it was possible to rank bulls across the population only if they had sufficient progeny records. Procedures for past sire evaluation data analysis provided the incentive to develop procedures to make the next big step in beef cattle genetic evaluation —the ranking of young nonparent bulls and heifers in the total population. The new procedure initiated by the American Angus Assn. for the 1986 analysis is called the "Reduced Animal Model." From this procedure, bulls with progeny, cows with progeny, and all nonparent bulls and females with legitimate records have predicted performance EPDs calculated.

Nonparent bull and female EPD calculations are based on their individual performance and ancestral and relatives' performance. Primary ancestral information going into young nonparent EPD calculations comes from the animal's sire and dam. Procedures for these calculations are very complex and difficult to understand for anyone other than those who work in this high-tech field. We as producers should not worry about the formulas for the calculations but should look at and be willing to use results from the formulas. Use of data generated by the formulas will work. It has been tried and proven in the dairy business for many years.

As stated before, young nonparent bulls with legitimate AHIR records now have EPD values. Breeders should note that accuracy values for EPDs on nonparent bulls will not be as high as EPD accuracy values on bulls with progeny. Because the EPD accuracy values are lower for nonparent bulls, breeders should accept and expect EPDs for young bulls to change after progeny are produced and processed through AHIR. Thus, breeders should avoid selecting one top young bull in a particular trait but should look for groups of young bulls superior in the trait of interest.

For example, a young bull that has the following data:

Birth Weight		Weaning Weight		Yearling Weight		Maternal Milk	Maternal Total	
EPD	ACC	EPD	ACC	EPD	ACC	EPD	EPD	ACC
+4.0	.35	+35	.35	+60	.35	+10.0	+27	.35

This young bull appears as though he should be one of the great bulls of the breed for growth. Remember, however, that with the low accuracy value for his predicted EPDs, there's a good chance that these EPDs could change greatly when he becomes progeny proven.

Standard error estimates for the various traits for nonparent cattle are:

Trait	Standard Error
Birth Weight	± 3.0 lb.
Weaning Weight	± 15.0 lb.
Yearling Weight	± 23.0 lb.
Milk	± 10.0 lb.

These standard errors tell us that the actual EPDs for a nonparent bull may change considerably when the bull is finally progeny proven. The above standard errors for nonparent bulls tell us that, if we select a group of these bulls to use, 68 percent of those bulls when progeny proven will be within a plus or minus range of one standard error of the predicted EPD and almost all (95 percent) of the bulls would be within a plus or minus range of two standard errors of the EPDs when progeny proven.

In short, what we need to realize is that predicted EPDs for nonparent animals on an individual basis have the possibility of changing when the animal is progeny proven.

However, the data also tells us that if we select a group of young bulls, say 10, with average EPD values the same as the single bull above, when progeny proven as a group, the group of bulls will average +4.0 lb. for birth weight, +35 lb. for weaning weight, +60 lb. for yearling weight and +10.0 lb. for milk.

After a bull sires calves and those calves are processed through the AHIR program the accuracy of the predicted EPDs goes up dramatically. Increased accuracy values tell us the standard error or the amount the EPDs will change goes down. Progeny provide a better estimate of the bull's true breeding value. For example, if a bull had the following data:

Birth Weight		Weaning Weight		Yearling Weight		Maternal Milk	Maternal Total	
EPD	ACC	EPD	ACC	EPD	ACC	EPD	EPD	ACC
+3.9	.90	+30	.90	+60	.90	+10.0	+25.0	.80

The accuracy values for the above EPDs tell us that this bull has a much better evaluation and more accurate prediction of the EPDs than is the case of the nonparent bull. With accuracy values like this bull has, we can form a standard error table as follows:

Trait	Standard Error
Birth Weight	± 0.4 lb.
Weaning Weight	± 2.5 lb.
Yearling Weight	± 3.5 lb.
Milk	± 2.2 lb.

Once bulls produce a number of progeny with performance records the EPD values for that bull have higher accuracy and lower standard errors. With the example already discussed, we can see that if this progeny proven sire was used further and his future EPDs changed by as much as two standard errors, they would remain very close to the EPDs already estimated.

The main reason for going through the above, and it may seem a little complicated, is that it emphasizes the fact that EPD values for young bulls can change and when considering young bulls you must look at a group of bulls.

Within that group of young bulls some are going to be better than their EPD estimates, and some not as good as their estimates, but on the average will equal their EPD estimates. Purebred breeders and commercial cattlemen alike should understand and remember this concept and anyone selecting young bulls needs to think in terms of groups of young bulls.

Grouping young bulls can be better shown by looking at the data on the two bulls with the following data:

	Birth Weight		Weaning Weight		Yearling Weight		Maternal Milk	Maternal Total	
	EPD	ACC	EPD	ACC	EPD	ACC	EPD	EPD	ACC
Bull A	+2.0	.35	+20	.35	+45	.35	+5.0	+15.0	.35
Bull B	+1.8	.35	+18	.35	+40	.35	+4.5	+13.5	.35

If one considers the standard error of the estimated EPDs for young bulls, you have to consider these two bulls to be genetically very similar and price would dictate which one of the two bulls to purchase.

Breeders who want to group young bulls for growth should do so on yearling weight and should group them in 10 lb. increments. Grouping young bulls for maternal should be done on 5 lb. increments.

The new "Reduced Animal Model" that the Angus breed now uses for sire and breed evaluation explains a great deal about 575,404 Angus cattle in the population with predicted EPDs. From this total number of Angus, there were 8,224 Angus bulls born in 1984 with sufficient data to estimate their yearling EPDs. The average EPD for these 8,224 Angus bulls born in 1984 was as follows:

Trait	Average
Birth Weight	+ 2.7 lb.
Weaning Weight	+16.84 lb.
Yearling Weight	+30.24 lb.
Milk	+ 1.0 lb.
Total Maternal	+ 9.42 lb.

These averages help one to look at the total breakdown of these 1984 bulls for yearling weight in 10 lb. increments. This breakdown is as follows:

Yearling Weight EPD	No. of Bulls		Percent of 1984 Bull Population
+60 or greater	82	=	1.0 percent
+50 to 60 lb.	474	=	5.7 percent
+40 to 50 lb.	1,346	=	16.3 percent
+30 to 40 lb.	2,264	=	27.5 percent
+20 to 30 lb.	2,241	=	27.2 percent
+10 to 20 lb.	1,329	=	16.2 percent
0 to +10 lb.	436	=	5.3 percent
−10 to −0 lb.	48	=	.58 percent
−20 to −10 lb.	4	=	.04 percent

We also can look at the breakdown for pure milk in the 1984 bulls, and we have 20,725 bulls that pure milk was calculated on.

Weaning Weight-Maternal Pure Milk EPD	No. of Bulls		Percent of 1984 Bull Population
+20 to +25 lb.	4	=	.02 percent
+15 to +20 lb.	62	=	.3 percent
+10 to +15 lb.	614	=	2.9 percent
+ 5 to +10 lb.	3,423	=	16.5 percent
0 to +5 lb.	8,351	=	40.3 percent
0 to −5 lb.	6,114	=	29.5 percent
−10 to −5 lb.	1,829	=	8.8 percent
−15 to −10 lb.	308	=	1.5 percent
−20 to −15 lb.	18	=	.08 percent
−25 to −20 lb.	2	=	.01 percent

Breeders who want to maximize growth in the cattle they produce and want to use young bulls must select bulls that are 50 lb. or higher for their yearling weight EPD. Selection of those young bulls forms a group of bulls, and it's really a very small percentage (6.7 percent) of the population. While most breeders want to rank bulls, this 1984 population of Angus bulls clearly shows why bulls should not be *ranked* but should be *grouped.* The selection differential and breed improvement available to registered Angus breeders who use the top 6.7 percent of the young bulls of the breed in their breeding program is almost unlimited. Any young bull with a yearling EPD of 50 lb. or more is one of the elite bulls of the breed for yearling weight. These are the bulls that should be sampled in purebred programs, because they are the young bulls with the best chance of being the super sires of the future.

The next group of bulls below 50 lb., but above 20 lb. for yearling EPD will as a group increase growth in the nation's average commercial cattle population and can be used by the commercial industry to improve weight production.

The last group of bulls, those below 20 lb. EPD for yearling weight are below average for yearling weight EPD and should not be sold as breeding animals to either registered or commercial cattlemen. Comparing this group to the average, they will decrease growth and will not increase the efficiency of cattle production.

As you analyze the milk data it begins to show that the Angus breed has made essentially no progress in milk production since the AHIR program began. As one can see from the breakdown 39.89 percent of the bulls in the population born in 1984 were below the average of all Angus cattle that have records processed since the beginning of AHIR.

The task of selection becomes more difficult when you start to look at more than one trait. In looking at the bulls born in 1984 that were 60 lb. or higher, if we said we would like them to have also a pure milk EPD of +10 lb. or higher, there would be seven bulls in the total national calf crop that would have this kind of data.

The grouping of young bulls and the standard error of the EPD predictions for young bulls and progeny proven bulls as explained above should help point out several things.

First, breeders who are only using one or two bulls in their breeding program and want to make positive genetic advancement have the best chance to do so by utilizing the proven bulls with higher accuracies. With the larger standard error associated with nonparent bulls, smaller breeders using only one or two bulls can have a train wreck in the traits they are selecting for by sampling such a small group of young bulls. This is true as well for A.I. non-owner use on unproven bulls.

Angus breeders, the ball is now in your court...

Breeders whose herds are large enough to permit the use of several young bulls along with some proven bulls should be the ones who sample most of the elite and of the young bulls.

Data made available to Angus breeders from the "Reduced Animal Model" analysis provides the opportunity to make more accurate selections for birth weight, weaning weight, yearling weight and maternal ability than has ever been available before to the industry. While the estimated EPD accuracy values for nonparent bulls appears to be low, their estimates are more accurate than within herd ratios or breeding values.

In closing, it's important to emphasize one very important point in all this data analysis.

As Angus breeders, you now have the information to make the most accurate selection of Angus breeding cattle that has ever been available. The chance and opportunity for breed improvement is directly on the breeders. Breeders who put together the right bulls with the right cows will be the breeders of the successful program and will be the breeders who move the breed forward. The only way a breed can move ahead is by getting a high percentage of the cows within that breed bred to superior bulls. No genetic improvement can come about if the breed does not use a wide scale of top bulls in the population.

Angus breeders, the ball is now in your court—make the most of it. AJ