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Working with beef cattle producers over the past 15 plus years, I have become convinced that the genetic component of beef production systems does not receive the time and consideration it should relative to the economic benefit it can provide. Over the past several years we have seen the development of EPDs (Expected Progeny Differences). EPDs are available on various traits of economic importance. They are a tool that can be used to predict an animal's genetic potential, in a relative sense, and provide the potential for directional change in these traits of economic importance.

Breed associations may differ slightly on how they present their EPD information and in what EPDs they do provide. The EPD concept has expanded to the point where some may feel overwhelmed by the amount of EPD information currently available. None-the-less, producers should give the EPD information careful consideration when selecting sires to use in their programs. Assuming replacement heifers are generated from within the production system, approximately 90% of the genetic composition of the product produced will come from sire-selection decisions. Registered breeders will have EPDs available on their females as well, to further refine their selection decisions.

This discussion will attempt to clarify some misconceptions about EPDs and offer considerations on developing priorities for selection decisions.

Points of EPD Clarification

EPDs are not the whole in themselves. They are merely a tool that can used in decision-making. Frustration and disappointment are often expressed when people try to get the EPD to do more than it is designed to do. We must constantly remind ourselves that EPDs will only do what they say they will do - predict expected progeny differences between an individual and another animal in that particular analysis. That means another animal within the same breed. There are available adjustment tables breeders can use to compare bulls of different breeds. However, due to a lack of valid numbers in existing data bases, there are differing opinions on the accuracy of these comparisons. It may be more accurate to make breed decisions based on breed comparison data and to use EPDs to make directional decisions within breeds.

Although most breeders who have been in business for any length of time probably understand what EPDs are designed to do, there are always less experienced breeders who might benefit from an example which illustrates what an EPD does. Let's assume that we are to make a decisions about the use of two Angus bulls in regard to their A.I. use on a group of replacement

heifers. Bull A has a birth weight (BW) EPD of +.2 lb and Bull B has a BW EPD of +4.2 lb. These bulls both have associated accuracy figures of .94 which suggests that these BW EPDs should be reliable and will not change greatly in future analyses. If both bulls were used on representative samples of the heifers, we would expect Bull A's progeny to exhibit birth weights on the average of approximately 4 pounds lighter than Bull B's progeny (+4.2 lb (+Bull B) - .2 lb (Bull A) = +4.0 lb). Although this does not tell you the absolute weight of the calves, Angus breeders who have monitored EPD use with within herd performance records, would probably tell you the +4.2 BW EPD is too large to be used on replacement, first-calf heifers. At any rate, it birth weight EPD was a priority in this decision, Bull A would be selected to use of these heifers to enhance calving ease.

Bull B with a +4.2 BW EPD may be very appropriate to use on older cows that can accommodate heavier birth weights. This example reiterates the fact that EPDs should not be thought of as "good" or "bad". They merely do what they say -- predict expected progeny differences.

This illustration brings up another point that should be emphasized. Within herd performance records are necessary to monitor EPD expression. EPDs do not predict absolute pounds for birth, weaning, milk, etc. Although they are expressed in the appropriate units, they do not tell you how many units you will receive. However, by keeping records and knowing how a sire's EPDs are expressed in absolute figures within your herd, you can more accurately use EPDs as a selection tool.

Another natural tendency we have as human beings is that "more is better". This isn't the case with EPDs, especially in environments with limited nutritional resources. More milk and more mature size will increase nutritional requirements and drive up costs if these animals have to be supplied additional supplemental feed in order to function within this particular environment. Using within herd records will allow you to monitor the expression of EPDs within your herd to more fine-tune selection decisions.

Another point of which we should be reminded is that EPDs are not static. They will change with subsequent analyses. The associated accuracy figure (which ranges from zero to 1.0) will give you an idea as to how much possible change might be expected. The lower the accuracy, the more potential change might be observed. EPDs with associated accuracies of >.9 would be expected to change very little in subsequent analysis. Sire summaries typically include tables which express possible potential change in values of various traits depending on their existing accuracies. Accuracy figures depend on the amount of data available on an individual and his or her relatives. The type of data will change as an individual gets older and progeny data are included. The EPDs provided by the breed association will be dependent on this data and the model used to generate the EPDs.

EPDs are not perfect. That is another reason it is critical to use a within herd record system to monitor the expression of EPDs under your environmental conditions. There is no doubt that EPDs and their calculations will continue to be refined in the future. Gene markers may be used to enhance the prediction potential of EPDs or they may eventually take genetic

prediction and genetic improvement to an entire new level. However, currently EPDs are the most effective tool we have available to make directional change within our genetic program.

Setting of Genetic Goals

Hopefully the preceding clarifies our understanding of EPDs in general and gets us all of the "same page". To effectively use this selection tool, we must know discuss the development of goals for our breeding program. Each production system may be different depending on available resources and their marketing opportunities. Seedstock producers may have multiple goals depending on their customers' needs. Most probably the commercial and seedstock producer both have an ultimate objective of maximizing profit. Therefore, intermediate goals should be to enhance those traits that have a major influence on herd profitability. These traits will be related to the production of a high percentage calf crop of heavy calves that have a strong demand in the marketplace.

In modeling beef production enterprises, several investigators have estimated the economic importance of reproduction, growth and carcass traits to overall profitability. The majority of this research suggests that reproduction in a collective sense, is the most important contributor to profitability. It is consistently several times more important than growth. Carcass traits appear to be similar in importance to growth and in some cases, have been shown to be more important. This usually depends on how the product is to be marketed.

Calving ease is a major contributor to the reproduction complex. It contributes to profitability through lower calf losses, reduced labor and vet costs, and enhanced rebreeding performance. Calving ease EPDs may be expressed for direct effects, or the effects of a potential sire, and maternal effects, or the effect a sire exerts through his daughters. These effects may be expressed on such things as pelvic measurements, uterine environment, hormonal control, etc. Maternal calving ease data would be of no interest when selecting terminal sires since all of their female offspring would be marketed and would not be selected as replacements. Calving ease EPDs are typically expressed as a ratio relative to 100. Values greater than 100 indicate the anticipation of superior calving ease while values less than 100 indicate greater potential calving difficulty or more dystocia.

Some breed associations do not present a calving ease EPD. However, all but do present a birth weight EPD. Birth weight is fairly highly heritable and is the largest contributing factor to calving difficulty. Birth weight EPDs are considered a growth EPD since strict selection for low birth weight EPD would be expected to restrict subsequent growth potential.

Calving ease and/or birth weight EPDs should be a high priority on sires used to breed replacement heifers. And, although older cows can accommodate larger birth weights than heifers, calving ease and/or birth weight EPDs must be at acceptable levels even on sires to be used on older cows.

Scrotal circumference of yearling bulls is a valuable indicator of age of puberty and subsequent fertility in both male and female offspring. Superior scrotal circumference (SC) or an

enhanced SC EPD gives more flexibility or insurance to associated progeny in years when nutritional resources are marginal. For selection purposes, a minimum criteria might be set for SC, with the level dependent on whether getting heifers to reach puberty at the desired time is a problem within your herd.

Another EPD associated with reproduction is the stayability EPD recently generated and reported by the Red Angus Association of America. This EPD in essence, predicts longevity. Observations of success and failure are used in calculating stayability EPDs. Failure, if a cow upon entering the herd does not remain through some pre-set age which is usually five years. Or success, if she remains that long or longer. Sires with higher stayability EPDs would be expected to sire daughters with more longevity and therefore have a reducing affect on heifer development costs.

Growth traits which are generally evaluated by EPDs beside BW include weaning weight, yearling weight and mature size. Weaning weight is typically divided into a direct growth effect and a maternal effect associated with milk production. The maternal (milk) EPD is expressed as additional pounds of weaning weight in progeny due to milk production of daughters.

The milk EPD would be of interest if replacement heifers are to be kept out of a potential sire. Criteria which would set an acceptable range for milk EPDs of a potential sire would be necessary. Remember, "more is not always better" in environments with limited nutritional resources. A threshold level of milk production should be established. If offspring are marketed through a feedlot finishing program, selection emphasis on postweaning growth may be a more efficient use of nutritional resources. Total maternal weaning EPD predicts extra weaning weight to be produced by daughters of a sire resulting from genes for milk production and from genes for growth. These maternal weaning EPDs not only predict maternal production but also indicate what type of nutritional resources or requirements will be needed to support this level of production. When developing sire selection criteria, a range should be set with definite lower and upper limits for milk production.

For many commercial producers, weaning weight EPDs will closely correlate to sale weights of their calves. Yearling weight EPDs are calculated from direct weaning weight EPDs plus the postweaning gain EPD of the sire. Depending on the subsequent marketing scheme of offspring, yearling EPD may also relate directly to pounds sold. Since all growth traits tend to be positively correlated, selection for increased weaning and yearling weight will also increase mature size. To help minimize this effect on mature size, limits on mature size EPDs (if available) can be imposed. Another possibility would be to select replacements out of the middle portion of potential heifer candidates based on weaning and yearling within herd ratios (i.e., you may consider selecting replacements from heifers ranging from 95 to 105 in weaning and yearling ratios).

In the last few years, interest in carcass traits have grown and breed associations are now generating EPDs for such things as carcass weight, ribeye area, marbling and fat thickness at a given endpoint. The emphasis given to carcass EPDs in sire selection will depend on how the resulting offspring are marketed. However, even though a producer is not retaining ownership on

the calves produced through finishing, he should be aware of consumer targets. His product should be able to attain these targets at their finished endpoint. If a breeder does become involved with finishing his own calves, then marbling, ribeye and fat thickness may take on greater significance due to their effect on value of the finished product. However, an equally important initial step would be to collect carcass data on some of your calves to determine where your starting point is and what direction change needs to be imposed, if at all.

Purebred producers may produce lines featuring calving ease, growth, carcass or maternal traits. In each instance, the featured trait is a priority for selection while the remaining traits are of secondary significance and may be given threshold levels. Their emphasis will be determined by the needs of their customers and market demand.

Final Analysis

In summary, producers should use appropriate record programs to determine the current level of their genetic program. Based on the goals of their program, they should then use EPDs for traits of economic importance to make directional change and to fine-tune their genetic component to better fit their environmental resources, with the ultimate goal being to optimize production while maximizing net return. Under this scenario, those traits which affect the reproduction complex are of greatest economic importance.

Producers should know the breed average EPDs for the various traits. They should set specific EPD criteria for traits that affect the demand for their product. In a program where heifer replacements are produced, a balanced set of EPDs will be stressed, emphasizing calving ease/birth weight priorities and those traits that influence reproduction. Growth may be given some restriction to produce a moderate-sized cow. Carcass traits may not be a selection priority although male offspring may find their way to the rail.

On the other hand, when selecting terminal sires to use on mature cows, those traits affecting reproduction, except direct calving ease and birth weight EPDs, are of no significance. However, growth and carcass traits are a much higher priority, the latter especially if the breeder is retaining ownership to finish.

Each producer must take inventory of their available resources and develop goals for their breeding program. These goals should be set after first accessing where their program is at using within herd performance records. After careful analysis, they can then develop EPD selection criteria for each trait. In general purpose and maternal lines, traits affecting reproduction will be a priority and should be given stringent criteria or limits. Since herds can not exist with single trait selection, producers must decide what trade-offs they will accept in terms of non-priority traits.

When selection decisions are made, producers are encouraged to develop a “genetic shopping list.” With ample time to give thought and consideration to the criteria, list those traits that influence profitability and demand for your product. Not all EPDs may be of concern to you. After you have made the list, utilize your “within herd” records to identify the level of each trait

currently where you are at, prioritize these traits of importance. Then, list minimum and maximum EPD level that you are willing to accept for these traits. Let this information direct your selection decisions. In other words, use this information and stick to your convictions. If correctly done, the final result will be enhanced profitability.

For a small fee, breed associations will send you a printout of potential A.I. sires based on your developed criteria. You would also need to furnish your accuracy requirements, depending on how much variation you are willing to accept.

Finally successful cattle breeders will install a continual evaluation and adjustment process to take into consideration changes in available resources as well as changes in consumer or customer demands over time.

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