

Using EPDs

EXPECTED PROGENY DIFFERENCES

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Selecting breeding animals to go into the cattle herd is one of the most important decisions a cattle operator can make. Making decisions based on the genetic merit of the animal and not just on the outward appearance is critical to the long-term performance of the herd.

Introduction

For decades genetic improvements in beef cattle were made primarily through selection within the herd. Producers raised potential replacements under similar conditions and selected the highest performing calves. It was virtually impossible to compare the genetic worth of your calf crop to that of your neighbor's because the calves were raised in different environments. Even cattle within your herd born in different years could not be compared until they produced offspring under similar conditions.

In order to make comparisons across herds, central bull tests were implemented and heavily promoted. These tests allow across herd comparisons, but only for the traits measured during the test period (primarily post-weaning average daily gain). Since pre- and post-weaning growth are genetically correlated, buying top performance tested bulls can result in genetic progress for growth to weaning. However, this progress is generally slow, and comparing bulls for birth weight and maternal traits is not possible using central bull test information.

The next logical step was to develop procedures that would allow a comparison of all traits across herds and years. This required using high tech computers and implementing various statistical procedures. The resulting technique is now in place and is known as Expected Progeny Differences (EPDs).

What are EPDs?

EPDs are indicators of the genetic worth of an individual animal as a parent when compared to another individual of the same breed. EPDs are always reported in the unit of measurement for that trait (for example: weaning weight—pounds; scrotal circumference—centimeters; marbling—degrees).

The procedures involved in calculating EPDs include any information available on the individual and on its relatives. The procedures also eliminate the effects of environment, which allows comparison of animals born in different years and under entirely different conditions. For these reasons, EPDs provide much more information for comparing animals than the animal's actual measurement when making selection decisions.

What EPDs CAN Do

1. Use EPDs to **compare two animals of the same breed** in terms of their genetic merit for that trait. The actual measurement of an animal is controlled by many factors such as management, environment, and genetics. When comparing two animals, their EPD differences indicate the differences you would expect to see in their progeny due to genetics.
2. Use EPDs as a **tool to increase, decrease, or maintain any trait** for which they are calculated. It is important to realize that maximums or minimums are not always the right choice when making selections.
3. Use EPDs as **one of several selection criteria**. The first decision should be to decide which breed will benefit your operation the most. Then choose animals within that breed that are physically and reproductively sound. Use EPDs in your selection decision only for those traits for which they are calculated. If you are concerned about other traits, then actual measurements and visual appraisal are still the best alternatives.

What EPDs CAN NOT Do

1. **EPDs can not compare animals of different breeds** at the present time.
2. **EPDs can not predict outcome**. A 40 lb weaning weight EPD does not mean that an additional 40 lb will be added to the weaning weight of your calves.

3. A zero EPD does not mean the animal is average for the breed. Each breed association sets an arbitrary year as their base; a zero EPD is the breed average for that year. For example, Polled Herefords use 1975 as the base year, so a bull born today with a zero pound Birth Weight EPD has the same genetic potential for birth weight as the average Polled Hereford bull in 1975.

4. EPDs are not constant. As more information is obtained on an animal, the EPDs may change, particularly as progeny information is recorded. This does not mean that the bull's genetic make-up changes as he ages, but that the ability to predict the bull's EPDs is improved as more information becomes available. Therefore, it is impossible to predict whether an animal's EPDs will go up or down.

5. EPDs do not make up for poor management. Calves sired by a bull with a lower weaning weight EPD can weigh heavier at weaning than calves sired by a bull with a higher weaning weight EPD if they are exposed to a more favorable environment (better nutrition program, bred to heavier milking cows, etc.). Just because your bull has higher EPDs but your neighbors calves are heavier does not mean the EPDs are wrong.

Traits for which EPDs are Calculated

Each breed has a set of traits for which EPDs are calculated. Most breeds calculate EPDs for birth weight, weaning weight direct, weaning weight milk or maternal milk, and yearling weight (these are explained below). Some breeds calculate EPDs for other traits including mature weight, scrotal circumference, carcass traits, and calving ease. Development of EPDs for additional traits is continuing.

1. Birth weight—an extremely important EPD, particularly when selecting a bull to breed to replacement heifers. As cows mature, their ability to have larger calves without complication increases, and restrictions on birth weight EPDs can be relaxed to some degree.

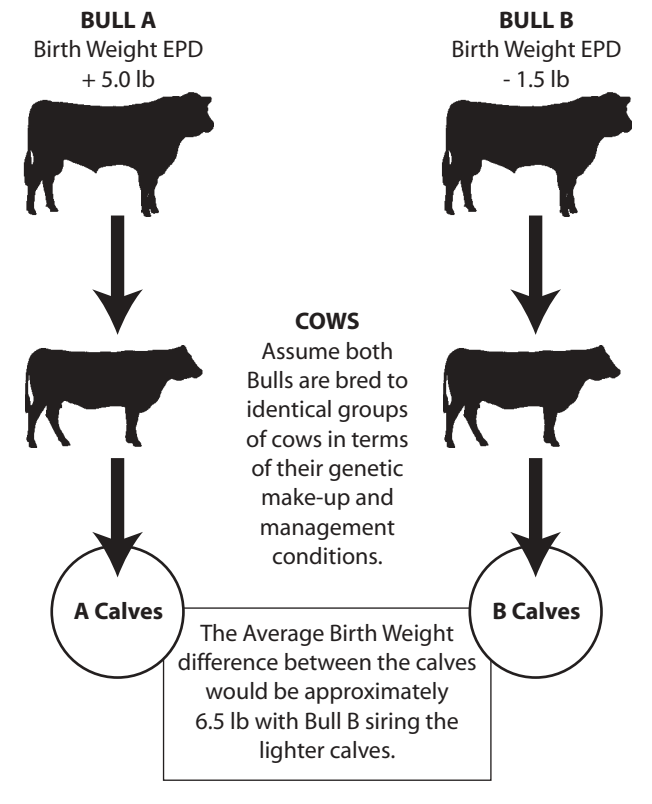
Implications: Birth weight is genetically correlated to growth in cattle. When birth weights are decreased you can generally expect a decrease in weaning and yearling weights. Therefore, it is not advisable to simply buy the bull with the lowest birth weight EPD you can find (this is particularly true when breeding cows that are not first calf heifers). Instead, within the desired breed, find a birth weight EPD that you are comfortable with, and do not buy a bull above this level.

2. Weaning weight direct—this EPD measures the genetic contribution of the parent to weaning weight with no consideration to milk. In other words, it indicates the genetic potential of the calf to grow to 205 days.

Implications: Weaning weight direct is genetically correlated with birth weight and milking ability. As weaning weight direct goes up, birth weight usually goes up and milking ability usually goes down. However, yearling weight is usually increased.

How to Use EPDs—An Example

Assume Bull A has a birth weight EPD of +5 lb and Bull B has a birth weight EPD of -1.5 lb. If these bulls were bred to an identical set of cows (in terms of genetics and environment), you would expect a difference of 6.5 lb in the average birth weight of their progeny. Therefore, from a practical standpoint, if selecting one of these bulls to breed to a set of heifers (with birth weight being the major concern), Bull B would be the sire of choice.



3. Weaning weight maternal—this EPD measures the expected milking ability of a parent's daughters in pounds of weaned calf. Bulls with higher weaning weight maternal EPDs would sire daughters with an advantage in milking ability.

Implications: Milking ability is genetically correlated with growth traits. As milking ability goes up the genetic potential for growth often goes down.

4. Yearling weight—measures genetic differences in weight at 365 days. This EPD becomes more important than the weaning weight EPD when the marketing endpoint is at yearling age or beyond.

Implications: Yearling weight is unfavorably correlated with birth weight and milking ability. Yearling weight is also highly correlated with mature weight. The mature size of your cow herd will increase if you select for increased yearling weight and retain replacement heifers.

Selection Based on EPDs

	Birth Wt	Weaning Wt	Yearling Wt	Milking Ability	Calving Ease	Mature Size
BW EPD	+	+	+	0	-	+
WW EPD	+	+	+	-	-	+
YW EPD	+	+	+	-	-	+
Milk EPD	0	-*	-*	+	0	0

+ as EPD goes up, this trait also tends to increase

- as EPD goes up, this trait tends to decrease

0 no relationship

* Increased milk EPDs result in decreased growth rate for the first generation. Due to added milk production, offspring of first-generation females have increased WW and YW.

Accuracy Values for EPDs

EPDs are never perfect, and as more information is obtained on an animal, the EPD value may change, either up or down. Accuracy values indicate how much the EPD may change with new information, and they also indicate how much confidence can be placed on whether the EPD is the true genetic value for that trait. EPDs, regardless of their accuracy values, are the best available estimate of an animal's genetic merit.

Accuracy values range from .00 to 1.00 and can be classified into three basic categories:

- low (.00 - .50)
- moderate (.51 - .70)
- high (.71 - 1.00).

As accuracy increases, the amount of possible change in an EPD related to added information becomes smaller. These ranges of possible change are both trait and breed specific. For a correct range of possible changes in EPDs, you need to obtain a sire summary for the breed you are interested in.

Unless using artificial insemination is an alternative, accuracy values are usually of little concern to commercial producers. Young bulls (which always have low accuracy) are usually purchased, and any offspring produced are crossbred or non-registerable calves. Therefore, the bull's accuracy will likely always remain low.

Certain management practices will help to eliminate problems associated with low accuracy bulls. Since we realize the bull's EPD may not be completely accurate, young bulls should be mated with a limited number of females. If there is a problem with his EPDs, it won't have a major effect on the herd. Low accuracy bulls are a fact of life for most commercial producers, but their EPDs are still the best available indicator of their progeny's performance.

Implications of Selection Based on EPDs

Because several economically important traits are unfavorably correlated, it is very important that you know what your production goals are before trying to make selection decisions. Often, too much effort is spent trying to find the complete beef animal—one that combines growth, maternal ability, easy calving, reproductive efficiency, and high carcass quality and yield. Since it is virtually impossible to find this package, it may be more advantageous to focus on making improvements in a key area.

Purebred producers whose primary objective is to provide seed stock for commercial producers have several options available depending on their consumers' demands. They can provide bulls that are reasonably balanced for several traits (typically not excelling in any trait), or they can provide bulls that fit specific purposes (low birth weight, high growth, etc.). Regardless of the approach, EPDs can be used to help achieve these objectives.

For example, if a genetically balanced animal is desired, then mate cows with high birth weight, direct weaning weight, yearling weight, and low maternal weaning weight EPDs to a bull with low birth weight, direct weaning weight, yearling weight and high weaning weight maternal EPDs. Or, if you want to provide bulls to fit a specific purpose, then mate bulls and cows with desirable EPDs for that trait (such as low birth weight bulls to low birth weight cows). You would expect the EPDs of offspring from specific matings to be very close to the average of the parents for all traits.

Commercial producers should decide which breed of bull is going to best suit their production goals and then use EPDs within that breed to compare bulls for the traits of concern. Use the breed of bull that fits your long-term needs. For example, if replacement heifers are a major emphasis, use a maternal type breed; if weaned pounds are of primary concern, use a high growth breed. Once these decisions are made, then fine tune the selection using EPDs. For example, if breeding heifers to calve as 2 year olds, low birth weight EPD bulls may be desired; if keeping or selling replacement heifers, maternal weaning weight EPDs may be of importance.

Genetic changes come slowly; this means that if the wrong changes are made, it will take a long time to correct them. So it is important not to take selection decisions lightly. When you are considering a breeding plan within your herd, it is important to have your long-term goals in mind and make selections toward those goals. Understanding and using EPDs can be an extremely valuable tool in this process.

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