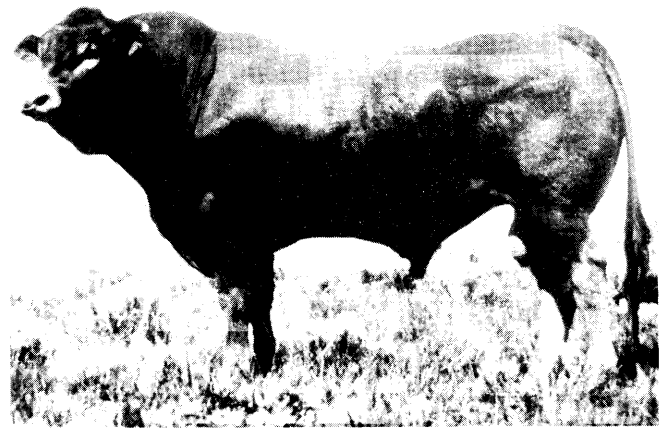
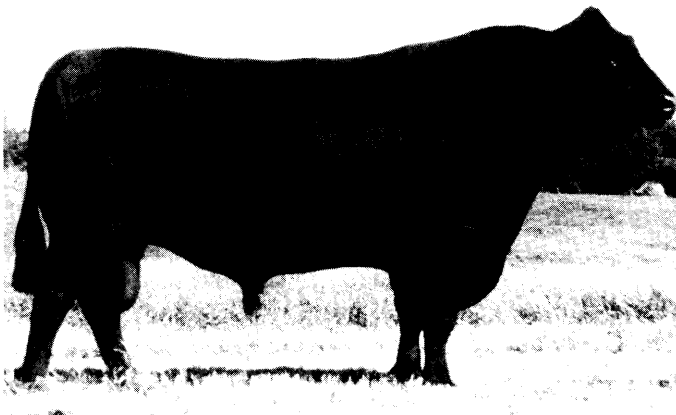
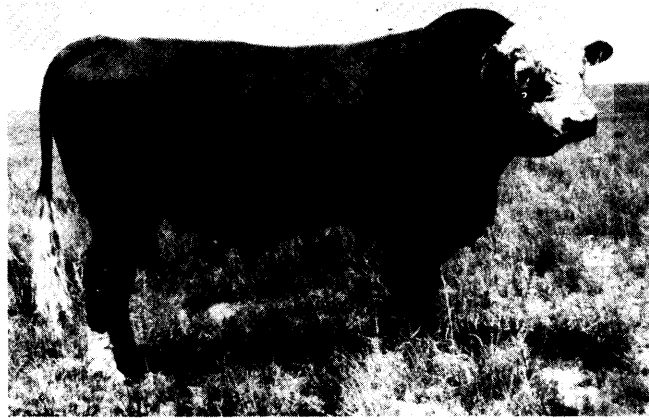

Using EPDs in a Commercial Herd

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Today, beef cattle producers have the best tools for specification production ever available. The biggest problem that cattlemen have is defining the specifications. Many traits are important when considering the production system from conception to consumption. Genetics plays an important role in some of these traits while management is more important in others.

All cattlemen, purebred and commercial, need to be conscious of the ultimate product of the production system—quality beef at a reasonable price. It all starts at conception of the calf. Reproduction failures are primarily due to management failures, most often inadequate nutrition. However, the nutrition requirements of a cow are determined by growth rate when she is young, body size that must be maintained, milk production level, the need to regain fat if she is thin, and the effective temperature she must live

in, among other factors. These factors, along with the constraints put on the ultimate product, dictate production goals.

In an environment where nutritional resources are adequate, as is the case in many areas of the U.S., production levels can be quite high. However, as production levels increase, the level of nutrition must also increase to meet the requirements. Therefore, producers should attempt to match their beef cow's genetic potential for milk and growth with their environment. However, producers should keep in mind that purchased feed is a resource that is always available and should be considered when it is economically feasible.

With these facts in mind, the producer needs to determine the production goals for his individual operation. What is the optimum level of production for each trait?

Direct Calving Ease

Direct calving ease (the calf's ability to be born) is negatively correlated with birth weight, weaning weight, yearling weight and mature size. Since heavier weaning and yearling weights are generally more profitable, each producer needs to determine the lowest level of direct calving ease that he can tolerate. Currently, only the Gelbvieh and Simmental breed associations produce EPDs for this trait. The Simmental breed presents this information as an EPD in terms of percent of unassisted births from Simmental cows. The Gelbvieh presents the same information in terms of a ratio with 100 being the base and deviations above and below. Only first calf two-year-olds are evaluated since very few older cows have dystocia. However, this evaluation is extended to what would be expected in mature cows. A producer who has small mature size cows will probably want a higher level of direct calving ease than one with larger cows.

Birth Weight

Birth weight is negatively related to direct calving ease but positively related to weights later in life. A producer who desires heavy weaning and yearling weights would want as heavy a birth weight as possible without causing dystocia problems. The EPD for birth weight is presented in pounds of calf as a deviation from the average in the year each breed has selected as their base year. Each cow herd will have a certain threshold where heavy birth weights will cause trouble and the producer must determine this level.

Weaning Weight and Yearling Weight

Weaning weight and yearling weight EPDs are presented in pounds of calf and heavyweights are often desired. However, the weight must match the level of nutrition available to both the cow and calf. Cattle with extremely large weaning or yearling weight EPDs will not express their genetic potential for growth with inadequate feed. The nutrition level of the herd needs to be evaluated when determining the optimum EPD levels for that herd. Another factor that needs to be reconsidered is the age at which calves are marketed. If the producer sells calves at weaning, the weaning weight EPD becomes more important than the yearling weight EPD. However, if the producer retains ownership of his calves through the feedlot to the packer, yearling weight EPDs become more important.

Maternal Calving Ease

Maternal calving ease EPD (the cow's ability to have a calf) are presented by the Simmental and Gelbvieh breeds and expressed in the same unit as direct calving ease. Maternal calving ease is positively related to cow size and pelvic area. Larger cows with a big pelvic area can have a given size calf with less trouble than a small cow. Generally, a large maternal calving ease EPD is desirable, however mature cow size must be kept in mind when selecting the extremes.

Milk

Milk EPD is presented in terms of calf weaning weight that is caused by milk. Calves with higher weaning weight EPDs can utilize more milk than those with less genetic ability for growth. Producers need to remember that more milk takes more cow feed! Cows with the genetic ability for high milk production but who don't have sufficient nutrition for that level of milk production will use stored body fat and become too thin to rebreed. This results in open cows, not because of poor reproduction but because the genetic ability for milk production is too high for the nutrition level provided. This has been a particular problem with crossbred Simmental and Gelbvieh cows when fed at the same level as British breed cows. Research has shown that Simmental and Gelbvieh cows give considerable more milk than most other beef breeds. The optimum milk EPD for these breeds in many commercial herds may be negative unless adequate nutrition is provided.

Maternal Weaning Weight

Maternal weaning weight EPD is a combination of the weaning weight and milk EPDs. It provides a convenient index to indicate the expected pounds of weaning weight due to both sources. This EPD maybe more important to commercial producers than either weaning weight or milk EPD separately.

Scrotal Circumference

Yearling scrotal circumference of bulls is an important trait for several reasons. The Hereford breed presents EPD for this trait in centimeters. Bulls with larger yearling scrotal circumference tend to produce more volume of semen than those with smaller scrotal circumferences. The Society of Theriogenology has established a minimum yearling scrotal circumference of 30 centimeters for satisfactory breeding. However, perhaps even more important is the relationship of yearling scrotal circumference to rate of maturity. Bulls with larger yearling scrotal circumferences produce daughters that reach puberty earlier and obtain a larger percent of their mature size at an earlier age. This could be an advantage to both replacement heifers and finishing cattle in the feedlot. Scrotal circumference is a highly heritable trait and, therefore, selection can result in rapid change. However, there is an optimum level with this trait also. There is little advantage of heifers reaching puberty before they are weaned and there may be a severe disadvantage if the heifer becomes pregnant while nursing her dam. The Simmental, Gelbvieh and Angus tend to be early maturing breeds.

Frame Score

Frame score is a trait that has received considerable attention during the past 40 years, from very small to very large. The Hereford breed presents EPD for yearling height in inches. When the desired carcass weight and mature cow size are taken into consideration, most research indicates that a frame score of at least 5 and less than 8 are usable in commercial production systems.

Frame score is a highly heritable trait and the individuals own frame score is a reasonably good indicator of its genetics for this trait.

Gestation Length

Gestation length has a .26 correlation with dystocia score, probably caused by the fetus growth rate during the last few weeks of gestation. The Gelbvieh breed presents an EPD for this trait, based on animals with known breeding and calving date. Selection for shorter gestation length will allow a longer postpartum interval between calving and rebreeding as well as some reduction of dystocia.

Carcass Traits

Several breeds are actively accumulating carcass data to produce EPDs. The Angus breed, for example, presents EPDs for carcass weight, marbling and ribeye area. Most breeds have only limited data available, however this will probably change in the near future. Several breeds have active programs to collect carcass data and the new NCA Carcass Data Collection Service should help in these efforts.

Other Traits

Many other traits have varying degrees of importance in commercial production, including structure soundness of feet, legs, udder, etc., horned-polled, disposition and others. Some AI firms and individual ranches have developed physical trait evaluation programs for many of the structural traits, however at this time only progeny averages for specific bulls are available. Most of these traits also have an optimum level for satisfactory production rather than desiring the maximum or minimum levels. In addition, some producers may desire certain characteristics that have little or no influence on efficient production of desirable beef.

Breed Selection

After a commercial producer has established his goal for production it is time to select the bulls. The first choice is to select the breed or breeds. There are over 70 breeds of cattle from which to select. A major consideration should be which breeds provide the information needed to make a wise choice. EPDs should be a necessity and reduces the number of breeds considerably. The accuracies of the EPDs on young bulls that commercial producers usually buy are going to be low. However, EPDs are still a much more accurate evaluation of an animal than the individuals own performance. This is because the individuals own performance for that trait is taken into consideration as well as the individuals performance in correlated traits and the performance of relatives. The average of progeny from a group of bulls will be very close to the average of the EPDs of that group.

The strengths and weakness of the breeds should be considered. Table 1. is based on research at the USDA Meat Animal Research Center, Clay Center, NE, and compares the average animals born in 1991 adjusted to the average EPD for the breed.

Table 1. Comparison of Average Weights by Breeds Adjusted to 1991 Birth Year Average EPD.

Breed	Birth Wt.	Wean. Wt.	Year. Wt.	Milk	Maternal Wean. Wt.
Angus	77.6	441	810	-8.0	480
Brahman	87.8	447	744	26.0	517
Charolais	86.0	458	819	-3.0	494
Gelbvieh	87.3	465	822	22.0	523
Hereford	81.4	442	800	-16.0	473
Limousin	83.1	450	798	-13.0	480
Maine Anjou	87.8	458	826	*	*
P. Hereford	80.3	450	806	-40.1	453
Pinzgauer	82.4	440	783	-1.0	487
Salers	80.9	464	830	6.0	505
Shorthorn	83.5	461	832	8.0	506
Simmental	86.0	471	860	20.0	523

* EPDs are not available

As an example, the average Simmental born in 1991 would be expected to produce daughters with milking ability for 28.0 lbs more calf weight at weaning than the average Angus born in 1991 (20.0 + 8.0). The average Angus born in 1991 would be expected to produce calves that are 8.4 lbs lighter (86.0 - 77.6) at birth than the average Simmental. The average Gelbvieh would be expected to produce calves 3 lbs heavier (822 - 819) at yearling than the average Charolais born in 1991.

Because of the genetic trend within most breeds and the selected base year which is set to zero, the average of calves born in the current year will usually not be zero. Almost all breeds have increased in size (birth, weaning and yearling weights) over the last 20 years. Several breeds have also increased the average level of milk production. Therefore, depending on where the base is set, the average EPD of calves born in a particular year will not be zero. Table 2. gives the average EPD of calves born in 1991 for several breeds.

Table 2. Average EPD of Calves born in 1991 by Breed

Breed	Birth Wt.	Wean. Wt.	Year. Wt.	Milk	Maternal Wean. Wt.
Angus	3.2	22.2	38.2	7.7	18.8
Brahman	.5	4.2	7.5	2.7	4.9
Charolais	.9	2.5	3.6	-1.8	-.6
Gelbvieh	.3	4.4	8.2	2.0	4.2
Hereford	2.2	25.3	40.3	6.9	19.5
Limousin	.6	3.6	7.4	.1	1.9
Maine Anjou	.5	4.3	7.3	*	*
P. Hereford	3.3	21.0	33.8	.6	11.1
Pinzgauer	-1.1	-.5	-1.0	-.3	-.5
Salers	.7	6.6	10.8	3.2	6.5
Shorthorn	1.8	11.1	18.3	2.0	7.5
Simmental	.5	5.8	10.0	-.2	2.7

Across breed EPDs can be calculated by taking the difference between each breed and the breed chosen as the base from Table 1., and subtracting the average difference between EPDs of each breed and the chosen base breed from Table 2. (see appendix I).

Bull Selection Within a Breed

After a commercial producer has determined the goals for his production system, more than one breed can be selected to use in a cross breeding system. As an example, consider that you have been using Angus bulls with the average EPDs shown in Table 3. Perhaps you want to use either Simmental or Gelbvieh bulls that would increase milk, yearling weight and maternal calving ease with little change in birth weight.

Table 3. An Example of Comparing Bulls for a Crossbreeding Program

Trait	Current Angus Bulls Average	New Gelbvieh Bulls	New Simmental Bulls
Direct Calving Ease(H) *		98 to 102	-2 to 2
Birth weight	4	-9 to -4	-7 to -2
Weaning weight	30	8 to 18	4 to 14
Yearling weight	40	38 to 53	2 to 17
Maternal Calving Ease(H) *		100 to 105	3 to 9
Milk	10	-6 to +4	-6 to 4
Maternal Weaning Weight	25	-8 to 2	-9 to 1

* Calving ease EPDs are not available for the Angus breed.

When the average differences between breeds (Table 1.) and the differences in the base to which they are set (Table 2.) are taken into consideration, the new Simmental or Gelbvieh bulls would cause an increase milk production from their daughters to produce from 20 to 30 lbs. heavier calves at weaning. The yearling weight of the calves sired by the new bulls should be increased by 40 to 55 lbs., yet birth weight would increase no more than 5 lbs. Maternal calving ease is not available for Angus, but the range, 3 to 9 percent more unassisted calves in Simmental and 100 to 105 in Gelbvieh, encompass the average of calves born in these breeds in 1991. When comparing the desired EPD of the new Simmental or Gelbvieh bulls to the average animal born in 1991, the negative birth weight EPD is slightly below the average animal born in 1991 in both breeds and weaning weight EPD is slightly above. The maternal weaning weight encompass the averages, however the yearling weight EPD is above the average born in 1991 for both breeds. The milk EPD is below the average in both breeds.

If the bulls were to be used on heifers the cattlemen may want to sacrifice some growth for greater direct calving ease and smaller birth weight EPDs. Bulls with low birth, weaning and yearling weight EPDs of any breed, selected to breed heifers for calving ease, should be considered as terminal sires and no replacement heifers kept, since the calves will probably lack the desired growth. After the desired EPD ranges are determined,

then the price of the bulls to obtain the set level of genetics from different breeds needs to be considered in an effort to make an economic decision.

The Future is Now

Today's commercial cattlemen have the best tools ever available to make selection decisions. The biggest job each individual producer has is to determine the optimum production level to produce the desired product at a reasonable price. Many different breeds could be incorporated into a systematic crossbreeding program, however, it is best to keep it simple by using only two or three breeds, or using an F₁ bull, if EPDs are available. The strength and weakness of each breed need to be considered, and then determine the EPD ranges needed for each breed for the specific herd. There is a lot of diversity both between and within breeds. When the genetic levels have been determined it is extremely important to match the management (especially nutrition) to the genetics for profitable production of that desired product.

APPENDIX I

Across breed EPDs can be calculated by taking the difference between each breed and the breed chosen as the base ($M_i - M_b$) from Table 1, and subtracting the average difference between EPDs of each breed and the chosen base breed ($E_i - E_b$) from Table 2.

$$\text{across breed EPD} = (M_i - M_b) - (E_i - E_b)$$

Where:

M_i = the average values for each breed from Table 1.

M_b = the average value for the breed chosen as the base from Table 1.

E_i = the average EPD of calves born in 1991 for each breed from Table 2.

E_b = the average EPD of calves born in 1991 for the breed chosen as the base breed from Table 2.

For example, if Angus were chosen as the base breed, then Hereford bulls with birth weight EPDs of zero should sire progeny with the same expected birth weight as an Angus bull with a birth weight EPD of 4.8 [$4.8 = (81.4 - 77.6) - (2.2 - 3.2)$].

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