

# Value of Beef Performance Records

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Individual performance records are useful for selecting superior performing cows and bulls and for culling undesirable animals from the herd. The Missouri Beef Cattle Improvement Programs are available to beef cattle breeders through local University of Missouri Extension centers.

Flexibility of the programs helps both purebred and commercial breeders in their selection and breeding programs. The cow-calf man can use these programs as tools to check the genetic performance of each animal from birth until it is added to the herd or slaughtered. By using these programs, you can evaluate an individual animal's genetic merit within a herd. This is important since new genes are not created and herd superiority comes from measuring economic traits and selecting the most outstanding individuals.

These programs are not designed for the purpose of comparing one herd with another or one breed with another, since environmental conditions vary from herd to herd and from breed to breed.

## Of What Use Are Records?

Records may be used to:

- cull lower producing cows,
- check on management deficiencies,
- cull lower performing bulls,
- assist in selecting replacement heifers and bulls, and
- raise the average performance of your herd for those traits which affect net income.

## Objectives of Breeders

The major objective of all beef cattle breeders, whether purebred or commercial, should be to increase genetically the producing ability of each cow in the herd, and as a result, to increase profit to themselves.

The beef cattle industry contributes the largest percentage of agricultural income in the United States, and beef is highest on the priority list for the consumer's food dollar. Therefore, segmental changes should be made to improve the total industry's economy, since the producer's share of the consumer's dollar is distributed in the following manner:

- purebred breeder—2 percent
- commercial cow-calf man—40 to 45 percent
- stocker-feeder—22 percent
- feeder-finisher—33 percent

The person who gets the least amount of the consumer's dollar, the purebred breeder, probably has the greatest impact on the total industry because he determines the genetic merit of the animals to be consumed as beef. The past success of



A breeder, who is active in the Missouri on-farm beef cattle testing program, reviews records of adjusted weaning weights for his herd.

most breeds has been determined by the total number of commercial cows of the breed in the industry. This is not likely to be as great a factor in the success of a breed in the future, since there likely will be a lot more crossbreeding in the beef cattle industry. The commercial cow man can pick up a five to seven percent hybrid vigor increase in weaning weight when two or more breeds are crossed.

The purpose of individual beef cattle performance testing records is to measure differences between individuals, such as weaning weight, which may vary as much as 200 pounds within the same herd and under the same environmental conditions. These differences result from three major causes: (1) genetics, (2) environment, and (3) interaction between genetics and environment. Observed differences for each trait within a herd, a season, and a sire group are more likely to be caused by heredity since environment is standardized.

These economic, genetic differences that are medium to highly heritable in beef cattle are the sole purpose for the existence of a purebred breeder. If these differences did not exist and were not inherited, there would be no market for highly superior or outstanding purebred animals. The pedigree is essential in the beef cattle industry. However, it has also probably caused more confusion in evaluation of potential performance than any other factor because a family line may be excellent by name, but all the cattle in the line may not



be good performers.

Traits of high economic value to the industry are: ability of cattle to grow rapidly, mature early, and convert feed to meat efficiently; longevity; reproductive efficiency; structural soundness; and desirable carcass quality and quantity.

The greatest advantage for a record of performance should be in the purebred herds for the foregoing traits since purebred herds produce most herd sires. The adoption by the purebred breeder of a record of performance on each individual calf will have great impact on the beef cattle industry, and the purebred breeder needs to observe all these traits in his selection program since they are essential to the industry.

The commercial breeder probably needs to place most of his emphasis on growth and fertility. Since the cow herd is selected primarily from within the herd and the only new genetic material brought into the herd is from the sire, finding one bull that is superior in all of the traits is easier than selecting for the traits in the top 10 to 20 percent replacement heifers.

## Emphasis and Genetic Change

Beef cattle breeders can place emphasis on each trait in a selection program. Generally speaking, the percent heritability, the relative economic importance, and the genetic association with other traits determine the emphasis which should be devoted to a given trait. Traits of high heritability respond more rapidly to selection than those of low heritability, and greater attention should be given to those traits of high economic value.

The number of traits undergoing selection limits emphasis which may be placed on a certain trait. Therefore, the greater the number of traits selected, the less intense the selection that can be practiced for any one. In evaluating the progress that can be expected, the producer figures the difference between the bull and the average performance level of the cow herd for a given trait. This difference, known as the "reach" between the sire and the cow herd average, is divided by two since the bull contributes only one-half the genetic material to the calf crop. The one-half difference is multiplied by the heritability estimate and that value is then added back to the cow herd average to get an estimate of the genetic progress in one generation of selection for a given trait.

When selecting for only one trait, the expected cow herd improvement would be based on superiority of replacements added to the cow herd. However, most breeders select for more than one trait, and this expected improvement in one trait would be equal to one over the square root of the number of total traits being selected to give an estimate of the amount of genetic progress in the cow herd that one could expect during the time a given sire is used. Research shows that when a breeder selects for two traits, only 70 percent effectiveness is obtained; selection for three traits will reduce the effectiveness to 58 percent; and selection for four traits reduces effectiveness to 50 percent.

Therefore, the factors that determine the rate of progress in a breeding program as a result of selection are: (1) heritability, (2) difference between the bull and the cow herd average on a given trait, (3) genetic association among traits, (4) amount of time a sire and cow herd are used, and (5) the number of traits selected.

Heritability estimates are obtained under controlled environmental conditions with adjustments for known sources of variation due to environment. The heritability estimate is generally defined as the portion of superiority or inferiority of an animal which will probably be passed on to offspring. Theoretically, heritability estimates for a trait may vary from zero to 100 percent. The heritability estimate or value of a given trait may be expected to vary to some limited extent

Figure 1

Example: Selection for one trait.

Sire weaning weight . . . . .	600 pounds
Cow herd average weaning weight . . . . .	400 pounds
Heritability estimate . . . . .	30%
Reach or Dif. (sire wt. minus cow av. wt.) . . . .	200 pounds

Formula:

$$\frac{1}{2}(\text{Reach}) \times (\% \text{ Heritability}) = \text{Genetic Progress}$$

Solution:

$$\frac{1}{2} \times 200 \times 30\% = 30 \text{ lbs. progress in average weaning wt.}$$

$$30 \text{ lbs. added to the cow herd average weaning wt. of}$$

$$400 = 430 \text{ lbs. expected average weaning wt.}$$

Figure 2

Example:

Same as Figure 1. Four additional traits selected for.

Formula:

$$\frac{1}{\sqrt{\text{number of traits selected}}}$$

Solution:

Traits	Sire	Dam or Avg.	Reach or Dif.	$\frac{1}{2}$ Dif.	% Herit.	$\frac{1}{\sqrt{4}}$	Progress/Generation
Weaning Weight (lbs.)	600	400	200	100	30	$\frac{1}{2}$	15.0
Postweaning Gain (lbs.)	3	1.8	1.2	0.6	57	$\frac{1}{2}$	0.17
Loin eye (Sq. In.)	15	11	4	2	70	$\frac{1}{2}$	0.7
Conformation Score (points)	14	10	4	2	30	$\frac{1}{2}$	0.3

Figure 3

Heritability Estimates

Traits	% Heritability
Fertility	10
Birth Weight	40
Cow Maternal Ability	40
Preweaning Gain	40
Weaning Weight	30
Conformation Score Weaning	30
Postweaning Gain in Feedlot	57
Postweaning Gain in Pasture	45
Yearling Weight	60
Efficiency of Gain in Feedlot	40
Slaughter Grade	45
Carcass Items:	
Dressing Percent	45
Carcass Grade	45
Thickness of Fat	40
Area Loin Eye	70
Tenderness	60
Retail Yield	60

within different herds and between breeds because it involves existing genetic variables and tolerance to a given environment.

## What Records Should a Breeder Keep?

Since profit or loss of a cow herd operation is determined by each individual cow and bull in the herd, a breeder should keep exact calf production records on each cow and bull within his herd. Often we remember only the cows that produce a highly superior calf. Many times a cow is kept that produces a superior calf only once in six or seven years and a relatively poor calf the other five or six years. Remembering





