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GUIDE

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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

Control Control (Editor)	A 19	legadir.	r chart.	27.7%	Marie Ar				
		Figure	1						
Example: Selection for	or one	trait.							
Sire weaning wei Cow herd averag Heritability estin Reach or Dif. (si	e wean				4	00 pounds 00 pounds 0% 00 pounds			
Formula:						No.			
½ (Reach) x (% I	Ieritab	ility) = (Genetic	Progr	ess				
Solution:									
½ x 200 x 30% =	30 lbs.	progre	ss in a	verage	weanin	g wt.			
30 lbs. added to 400 = 430 lbs						of			
Example: Same as Figure 1. Fo	ur addit	Figure 2		ed for		The second second			
Formula: Same as Figure 1 + V		1							
Solution:		Reach	1/						
Traits Sire	Dam Avg.	or Dif.	1/2 Dif.	% Herit.		Progress/ Generation			
Weaning Weight (lbs.) 600	400	200	100	30	1/2	15.0			
Postweaning Gain (lbs.) 3	1.8	1.2	0.6	57	1/2	0.17			
Loin eye (Sq. In.) 15	11	4	2	70	1/2	0.7			
Conformation Score (points) 14	10	4	2	30	1/2	0.3			
						建			
	F	igure 3							
	Herita	bility E	stimate	s					
Traits					% не	eritability			
Fertility						10			
Birth Weight						40			
Cow Maternal Ability Preweaning Gain						40			
Weaning Weight						30			
Conformation Score W						30			
Postweaning Gain in F						57 45			
Postweaning Gain in Pasture 45 Yearling Weight 60									
Efficiency of Gain in I Slaughter Grade	Feedlot					40			
Carcass Items:						45			
Dressing Percent						45			
Carcass Grade Thickness of Fat						45 40			
Area Loin Eye						70			
Tenderness Retail Yield						60 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 the exact past performance of each animal in a herd is nearly impossible, yet the breeder must have this information if he is to improve his herd and the breed.

Because of inflation in fixed production costs during the last half decade, a commercial breeder must wean at least 50 pounds more beef of the same quality to obtain the same net income. These records should be a permanent record on each cow: weaning weight, grade, yearling weight, adjusted height at 205 and 365 days, plus additional carcass information if obtainable. Without actual adjusted performance records, a breeder may cull superior producing cows with poor conformation without knowing it.

An Important Single Weight

The most important single weight to both the purebred and commercial breeder would likely be the yearling 365-day weight. It has a heritability estimate of approximately 60 percent and there is a good genetic association between yearling weight, weaning weight, and birth weight. The yearling weight, however, has very little meaning in selecting herd bulls from different herds unless the bull has been pushed

to his maximum growth potential.

In some herds where bulls are grown out but not fattened, their yearling weight would be much lower than in another herd where the bulls are allowed to make maximum growth. In many cases, the bull placed on a growing ration and allowed to reach only 75 percent of his growth potential may be genetically superior to the bull permitted to make maximum growth.

To evaluate bulls for replacements, select bulls based on their superiority to the average performance of the herd.

Weight and Height Association

There is a high positive correlation between height and weight for bulls on full feed from 180 to 440 days. Data indicate that for each pound increase in on-test weight, height increases .010 to .016 of an inch, while for each inch increase in on-test height, weight increased 29 to 33 pounds.

What Determines Breeding Value?

The best indication of a young bull's breeding potential is his own individual performance while maturing. Once the bull

PLAN A—Calf Crop Record

The Plan A data form includes all pre-weaning information for the entire herd. Forms can be obtained from area livestock specialists or your local Extension center.

AHE Form No. 2 P.R. (Rev.) 75

												Cot	mty & Are	ea:		
Name	:						Address	3:				Specialis	st:			
Date	of We	aning V	Veight	:												
Sex ¹ :		Ind	licate	Manager	ment Co	de ² :		Breed:								
Calf			Age of	Birth	Birth	Weaning Age in	Weaning Wt. 160-250 Days of	205- Day	205-day Wt. Adj. for Age of Dam ³	Adj.	Adj. W. W.	Actual Height Adj.	Feeder Grade Tes- ticle Size	Frame Muscle Score	Trim- ness 1-5 Sound- ness	
			Dam	Date	Wt.	Days	Age	Wt.		A. D. G.	Ratio	Height	(cm.)	1-5	1-5	
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	
			v													

Use separate form for each sex.

²Management Information; (1) Creep. (2) Noncreep. (3) Other See Missouri Beef Cattle Improvement Programs, MP 474

has produced progeny, however, they are the true measure of his breeding ability. Therefore, without performance testing records on a bull's offspring showing a high weaning weight, yearling weight, frame, and conformation score in comparison with offspring from other bulls that you might have to select from, predicting breeding merit is impossible.

Four essential tools in selecting this herd bull are (1) pedigree, (2) individual performance, (3) records of collateral relatives, and (4) progeny performance. In most cases the latter would not be applicable since most breeders select young herd bulls. If you can get the pedigree plus individual performance and collateral records, these three out of four evaluations on a prospective herd bull insure a more reliable selection than pedigree alone.

How to Performance-Test a Cow Herd

- 1. Contact your local University Extension center or your respective national breed association for information and forms.
- 2. Identify each cow and each calf within the herd with a permanent number.
 - 3. Record the birth date of each calf.
- 4. Arrange for scales to weigh each calf between 160 and 250 days of age. This means you need to determine the average age and weigh the calves when most of them are between 190 and 210 days of age.
- 5. In purebred herds, record yearling weights, heights, muscle score, trimness, soundness, and conformation grades between 350 and 440 days of age.

PLAN B—Post-weaning Record

The Plan B data form includes essential Plan A data for computation of post-weaning information plus individual animal performance data. This data is optional; a breeder only keeps it on selected replacement animals after weaning. Forms can be obtained from area livestock specialists or your local Extension center.

AHE Form No. 3 P. R. (Rev.) 74 Specialist's Signature: County & Area:										Year:				
Breeder:					Address:						:			
Calf No.	Birth Date	Age of		Adj. 205-day Weight * Weight Ratio	Actual Weaning Weight ** Date Weaned	Final Weight ** Date of Final Weight	Total Gain Post- weaning Days	Post-weaning A. D. G. Post-weaning Adj. to 160 days	365-day Adj. Weight Wt. Ratio Adj. for Contem- poraries	Height Inches *** Adj. 365-day Height	Adj. Frame Score Muscle Score 1-5	Trim- ness 1-5 Sound- ness 1-5	Conf. Score	Com- ments
<u> </u>														

^{***}Days under $365 \times .033$ + actual height = Adjustment; days over $365 \times .025$ - actual height = Adjustment



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^{*}Ratio figured on sire group if there are 10 or more calves within sex management code; otherwise, figured on herd average for season (December through May) (June through November)

^{**}Minimum of 140 days between weaning weight and final weight.