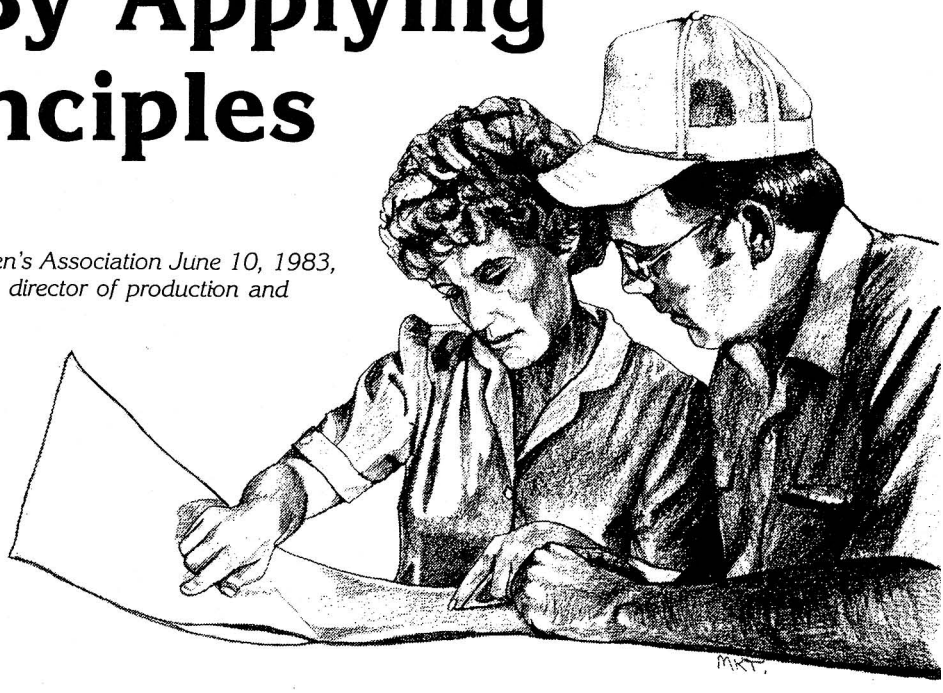
Improve Production Efficiency By Applying Genetic Principles



The following article appeared in the National Cattlemen's Association June 10, 1983, Beef Business Bulletin. Author Darrell Wilkes is NCA director of production and technical services. Wilkes was reared on a purebred Angus ranch in southeastern Wyoming. He received bachelor's and master's degrees from the University of Wyoming and a doctorate in animal breeding from Ohio State University. Wilkes has had experience in various phases of genetic improvement and cattle production.

by Darrell Wilkes

In 1982, NCA's Special Advisory Committee (SAC) published a widely read report "The Future for Beef." Among other things, the report underscored the need for many cattlemen and for the industry to improve their efficiency in order to be more competitive and in order to increase their profit opportunities.

Some persons have estimated that the integrated poultry industry now uses more than 90 percent of the available poultry production technology. The beef industry in total, it is estimated, may apply only 40-50 percent of the available technology. This means that many individuals, and the industry in total, could greatly improve their efficiency and their potential for profit.

Obviously, an estimate like this is an average; it does not apply to all individuals or to all segments of the industry, and it does not apply equally to all scientific disciplines involved in beef production. The feeding segment, for example, undoubtedly applies more than 50 percent of the available nutrition technology; the percentage may be closer to 80-85 percent.

The trend to fewer and larger operations in the feeding segment parallels the increased application of technology. If the trend continues, even greater application of technology in this segment is likely. The non-land-based nature of much of the feeding segment fosters the trend to feeding technology use and to larger operations.

In contrast, the cow-calf segment of the industry is largely land-based. As a result, there are many smaller operations whose major goal is just to make use of the land, and they adopt new technology slowly, if at all. This segment of the industry has the greatest opportunity for efficiency improvement, but it also has the greatest problems to overcome in applying new technology.

Begin with Cow-Calf Segment

Clearly, an improvement in the overall efficiency of beef production must begin with the cow-calf segment. Not only will this segment determine the **number** of cattle entering the production chain, it will also determine the **quality** of cattle available to feeders and hence to packers, retailers and consumers.

The **number** of cattle entering the chain of production is determined by (1) the number of brood cows in the nation's cow herd and (2) the calf crop percentage of the nation's cow herd. The size of the total cow herd is not a subject of this paper. Methods to raise the national calf crop average from 70 percent to some profitable level are discussed in the NCA-American Assn. of Bovine Practitioners paper published in the March 11, 1983, Beef Business Bulletin. The interested reader is referred to that article.

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The **quality** of cattle entering the chain of production is determined primarily by their genetic make-up, of which the breeders, both purebred and commercial, have control. The success of the breeders in providing a genetically improved population will not only affect their profit, but will affect the profit of the feeders and packers as well. The impact of genetic merit, or lack of it, on the profitability of a beef cattle enterprise is reflected in the thesis of one breeder which states that "good ones always make money and poor ones always lose money."

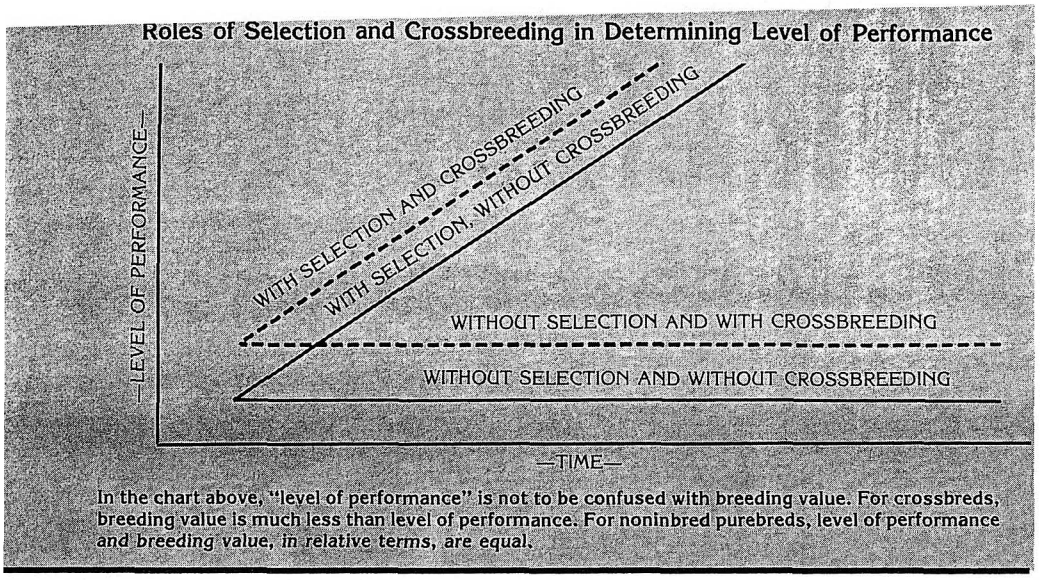
Probably one-fourth of the calves born each year are of such poor genetic value that they will not produce profits for any of their owners—producer, feeder or packer. This is a tremendous drain in the overall efficiency of the beef industry, and it is a severe blow to the producer who produces 90 percent losers. In the absence of an integrated system, the producers who breed the winners will be penalized by cautious cattle buyers who have been saddled with some poor cattle previously. As a result, everyone in the industry pays for the poor ones, whether they produce them or not.

There is a tremendous opportunity to improve production efficiency through the application of genetic principles. The technology is available, but adoption of this by breeders has been and continues to be very slow. While most breeders agree that genetic improvement is good, a very small percentage of them are truly committed to genetic improvement programs.

Reasons for Lack of Commitment

There are several reasons for this lack of commitment, some of which are very reasonable and some which aren't.

(1) Lack of economic incentive. The current marketing structure makes it difficult for the average commercial cow-calf producer to justify the investment in a genetic improvement program. That is, most weaned calves will sell for $.XX/lb. regard-



In the chart above, "level of performance" is not to be confused with breeding value. For crossbreds, breeding value is much less than level of performance. For noninbred purebreds, level of performance and breeding value, in relative terms, are equal.

less of the merit of their sire or dam.

Most of the benefits from raising genetically improved cattle will be realized by the feeder and packer rather than the breeder. Until the industry develops a marketing channel for genetically improved calves, the average cow-calf producer will not commit resources to a genetic improvement program.

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(2) Poor management or poor environment. Good cattle and good management go hand-in-hand. Without good health and nutrition programs, an investment in a genetic improvement program is futile. Naturally, some environments are better than others for the purposes of raising cattle. However, with good management, genetic improvement is possible.

(3) Long term. Genetic improvement is a long-term activity. Many breeders become discouraged upon beginning a genetic improvement program because the results are sometimes less than expected. One bright spot is that those with the very poorest herds can make the most rapid changes in the first few years of a program. For these producers, a few extra dollars spent on good bulls will be returned many times over in a short period of time.

(4) Tradition. Resisting a genetic improvement program because it conflicts with tradition is the poorest reason of all. Unfortunately, many breeding "programs" are held as family heirlooms, bound by tradition and not likely to change despite their demonstrated failure to produce profitable cattle.

All of the factors listed above contribute to a national calf crop which is, on the average, of such poor genetic merit as to reduce or erase any chance of profit by any segment of the industry. If one compares the level of breeding technology applied in beef cattle business to that in the poultry industry, there is little doubt as to one reason why chicken is so competitive in the supermarket.

Basic Genetic Principles

There are those who would have us believe that genetics involve some sort of magic. Some people are dubbed as "masters," with the connotation that they possess some innate quality which allows them to produce the good ones when no one else can. Actually, the principles of genetic improvement are simple; the hardest part is to keep it simple.

There are two basic principles which direct every genetic improvement program: Selection and mating systems.

Selection is the primary tool for genetic improvement. Simply defined, selection refers to the decision by a breeder to keep some animals as parents and to cull others. In order for selection to be effective, a breeder **must** have an accurate system for identifying superior animals. This requires that superiority be judged by some objective measurements taken for specific, important traits which are heritable.

Since nobody has a perfect memory, a record keeping system is absolutely essential. Before the principles of genetics were even known, a 19th century breeder, Robert Bakewell, was advocating that every serious animal breeder should keep records and then use those records to mate "the best to the best." Today, in the midst of the most productive animal agriculture society in the world, there are still many producers, including purebred breeders, who do not measure important economic traits and who do not keep records except for items such as birth date, sire, dam and sex. Hence, the most basic and most simple tool for genetic improvement is not being used effectively by many of those people who are supposedly in the business of supplying genetically improved seed stock to the commercial segment.

All of what the purebred breeder can accomplish is done through selection. The elaborate technologies now being used by some purebred breeders—such as embryo transfer, artificial insemination, embryo splitting, selection indexes, performance testing, linebreeding, etc.—are tools to help improve the accuracy and effectiveness of selection. By using A.I., for instance, the average purebred breeder can effectively select a herd bull from the national herd rather than being restricted to the herd bull prospects within his own fences. These technologies aid in the development of others, such as a "national sire summary" which most breeds are now providing.

Most of what the commercial producer can accomplish is also done through selection. Nearly 100 percent of the improvement through selection will come through sire selection. Since most sires are purchased from purebred breeders, the commercial producer is at the mercy of his purebred colleagues. More and more commercial producers are insisting that their purebred suppliers keep records and make these records available. This practice is quickly eliminating (or converting) those purebred breeders who were slow to pick up on existing technology.

Mating systems represents the second tool available to a breeder to enhance the genetic potential of his cattle. Simply defined, mating systems refer to the way in which the selected parents are mated together. Hence, a mating system is secondary to a selection system. Some examples of mating systems are inbreeding, linebreeding, crossbreeding, etc. The most important of these, in terms of commercial production, is crossbreeding.

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Crossbreeding has become widely accepted as a means of utilizing heterosis and also to take advantage of breed complementarity. The backbone of crossbreeding is the existence of genetically superior purebreds. Crossbreeding has received bad reviews from many breeders simply because they failed to realize that selection was still important. Some carelessly written research reports in the early years of crossbreeding led some to believe that they no longer needed to buy good bulls—they simply had to buy a bull of a breed different from that of their cows. The critical point to remember is that crossbreeding is not an antidote to poor heredity. If anything, crossbreeding makes the

production of good purebred cattle all the more important.

The relative importance of selection and crossbreeding in providing genetically superior cattle is best illustrated by the accompanying graph.

From the graph it is clear that the genetic value of the purebreds, as influenced by selection, will determine the base level of performance. With crossbreeding, one can add a certain increment to the level of performance by realizing heterosis, but this amount is limited. Hence, if the industry is to enjoy a systematic, improved trend in the level of performance, the purebred breeders must have effective genetic improvement programs.

Predictions for the Future

The realization of what can be accomplished through genetic improvement will lead to a greater utilization of technology in this area. An innovative group of producers will develop systems for marketing genetically improved calves—possibly through retained ownership, joint ventures,

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cooperative agreements and so on. As this develops, greater pressure will be put on the purebred breeder to produce more top-quality bulls. This is likely to strengthen the purebred segment by eliminating the marginal breeders and rewarding the top ones. All survivors in the purebred segment will be more receptive to the latest advances in technology.

The need for improved cattle will likely create a new group of breeders, completing the transition to a more coordinated breeder-grower structure.

In addition to the purebred segment, there will be a new group of commercial seed stock breeders who will provide commercial F_1, or "composite" cows to growers who will simply serve as multipliers. This will allow growers to utilize a terminal crossbreeding program, taking advantage of maternal and individual heterosis, without the problems of maintaining several different herds. This structure will allow cattlemen to specialize in their chosen area, thereby improving efficiency. Feeders will benefit from more uniform sets of cattle, and packers and retailers will enjoy a more uniform and consistent product. AJ