Seed stock selection in the future

Another view, or how to select when the goals of selection have been largely achieved

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Traditionally, a major objective of breeders of beef cattle seed stock has been to maximize the rate of genetic change. This objective has served them well. Seed stock producers have been able to evaluate the progress they have made over time and thus the value of their labors by pointing to the changes that have occurred in their herds. Often these changes have been marketable, particularly if they were visible in the live animal.

Academic animal breeders have used the principle of maximizing genetic change to their advantage also. The idea has spawned myriad research projects in theoretical and applied animal breeding. By concentrating on the mechanics of increasing the *rate* of change, researchers have been able to avoid the perplexing question of the *value* of change. Both researchers and seed stock producers have used the objective of speeding change in beef cattle populations to justify their own existence, for if their role is not to change animals, what is it?

Did we make the right turn?

Maximizing the rate of genetic change can indeed be valuable, but only to the extent that selection objectives are valid. Stated another way, rapid change will be good if we are reasonably assured that such change will lead to significantly increased production efficiency. In dairy cattle, increased milk production per cow has unquestionably increased overall efficiency. The dairy industry has been blessed with a single trait so important that breeders and researchers have been justified in going all out to genetically change dairy cattle in this character.

Beef cattle are different, however. Despite a history of attempts to find single traits of overriding importance (from the comprest cattle of the 1950s to the frame craze of the 1970s and 1980s), the case for change in any single trait having a large and long-term influence on production efficiency in beef cattle has been weak. Show rings, gain tests, and sale averages have served to reassure breeders that continued selection in a particular direction was correct, but hard evidence is lacking.

The future definition of "better"

Today, in the mid-1980s, seed stock producers are becoming more appreciative of this fact. We now have a "systems perspective." We know that intermediate levels of performance for traits like milk production, birth weight, and mature size are optimal, that efficiency results from a delicate balance of many traits interacting with environmental factors, and that overall genetic merit is complex in nature and difficult to quantify. We know different animals are appropriate in different situations and that in some cases, efficiency is limited by environment, not genetics. These realizations have complicated the jobs of seed stock producers and researchers immensely. Because there's no easy way to determine how much a change in a given trait will affect efficiency, defining selection objectives has become much more difficult. Compared to the breeder of dairy cattle, the conscientious breeder of beef seed stock is necessarily less confident in his selection criteria.

There's an interesting twist to this situation, however. Precisely because intermediate levels of a number of traits are the most efficient, many cattle populations may be close to genetically optimal already. To be sure, there is always room for improvement. But in terms of overall genetic merit, many cattle—if located in the right place and used in the right way—may be about as good as cattle can get. If this is the case, we arrive at the uncomfortable conclusion that maximizing the rate of genetic change can be a waste of effort. What, then, are seed stock producers and animal breeding researchers to do? How do we select breeding cattle under these circumstances?

Selection approaches to consider

If we begin with the assumption that the major traits of growth rate (size) and milk production are near optimal levels within a herd, it follows there should be a shift in emphasis away from them. Selection emphasis should be moved toward the more subtle traits related to adaptability and convenience, the "fine points." These would include fertility, soundness, fleshing ability, calving ease, survivability, and temperament.

We will probably continue to select for growth rate. However, it will not be growth rate as we have known it in the past, but growth rate for a given mature size or birth weight. Selection will be more difficult because many of the adaptability and convenience traits are hard to measure and low in heritability. Some of them are threshold (all or none) traits, and genetic parameters for many of them are either unknown or poorly estimated. For these reasons, we can expect only slow improvement in these areas.

Despite the shift away from selection for milk and growth, these traits are still very much present and must be dealt with. There will be a fundamental change in the approach to selection, however. Breeders will be selecting from the "middle" for these traits. No longer will the eye-catching, extreme calf be the one that is kept as a herd sire. The herd sire will be relatively nondescript. Psychologically, making the transition to this type of selection may be very difficult for many breeders. There is some consolation, however, in knowing that although it

may appear only average animals are being selected, in terms of overall genetic merit, the best animals are being selected.

In real-life breeding programs, selection and marketing are highly interrelated, so as selection strategies change, so must promotional strategies. Breeders will no longer advertise how far ahead their herds or individual animals within their herds are with respect to growth or milk production.

Rather, they will stress uniformity and predictability.

A buyer will be impressed not so much by the size of a seed stock producer's cows and calves, but by the consistency of the cow herd and calf crop. Breeders will not necessarily be limited to producing just one kind of animal. They may produce more. But each type should be identifiable and predictable.

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This emphasis on uniformity implies a reduction in genetic and phenotypic variability, something which traditionally makes geneticists shudder. We have to remember, however, the reason for maintaining variability is to allow rapid genetic change. Under these circumstances, however, change is not required. Geneticists can take comfort in the fact that variation among herds should still be substantial.

Breeders will become much more aware of the concept of "genetic risk."

In the days when cattle were far from optimal for size and milk production, risk was a small consideration. Breeders were willing to gamble on promising, but untested bulls in the hopes of making rapid advance. They had a lot to gain and little to lose.

But when herds are near optimal for the major traits and the emphasis is on uniformity of product, breeders must think in terms of genetic damage control. They have little to gain by using the untested bull and a lot to lose. Selection differential and generation interval—concepts stressed so heavily by breeders and academics in the past—will be obsolete. Now, the key word is "realiability."

Implications for sire evaluation

Sire evaluation will become even more important in the future, not because it provides a means of identifying trait leaders, but because it's a powerful tool for reducing genetic risk. From a genetic standpoint, sire selection is by far the most speculative part of beef cattle breeding simply because a single sire can have such a large genetic impact on a herd. This risk can be minimized by using well-evaluated, high accuracy sires. In the case where rapid genetic change is all important, it can be argued accuracy values should be ignored; breeders should choose the best bulls on expected progeny differences (EPD) alone, and mistakes will be compensated by pleasant surprises. However, when consistency—not change—is the goal, accuracy of evaluation becomes critical. This implies heavier use of older bulls. Selection differentials can be expected to decline and generation intervals increase.

As breeders turn their attention to the "fine points," the adaptability and convenience traits, sire evaluation should shift its focus also. A first step will be to complete the spectrum of major traits by adding a category for mature size. Following that, researchers should concentrate for the most part on traits related to soundness and reproduction.

Because the information required to evaluate animals for these traits is often poorly recorded or not recorded at all in field data, breed associations will necessarily have to be more demanding of their breeders in the type of data supplied. It is not inconceivable that new organizations of those breeders willing to supply this information will develop within or apart from existing breed associations.

The sire summary will be a much more complete document than it is today, and breeders will use it differently. Bulls will be cross-referenced by level of expected progeny performance in the major traits of size and milk production. Breeders will first identify sires which have acceptable accuracy values and fit in an appropriate major trait category. They will then choose among those bulls on the basis of EPD and accuracies for adaptability and convenience traits.

In other words, breeders will do a coarse sifting of the bull population by setting bounds for performance in major traits and will then compare individual sires for the fine points.

The range of possibilities

As breeding objectives for the major traits are reached, beef cattle selection will require a whole new way of thinking. Rapid genetic change will no longer be important. We will enter a period of "new conservatism" where extremes are avoided, increasing attention is paid to accuracy of evaluation, and primary emphasis is on preventing mistakes. The genetic change that does occur will be in the areas of adaptability and convenience and can be expected to be slow.

How soon this era will arrive is debatable. To a certain extent, it's here already. On the other hand, there are forces working against its coming. A major impediment is the nature of purebred promotion. Just as it is difficult for a show judge to pick a winner from the middle of a class, it can be difficult for a seed stock producer to market average animals. Moreover, breeders want to have the type of proprietary advantage made possible by owning cattle that are unique in some easily identifiable way. They promote uniqueness with the use of such advertising phrases as "genetic lead time." But when genetic change is of less concern, so is genetic lead time. The proprietary advantage is lost.

Many people will probably find the prospect of a period of little change in beef cattle rather discouraging. It sounds stagnating and boring. In fact, cattle breeding in this time should be more challenging than ever. Seed stock producers will no longer be pressured to keep up in a mindless race for single trait superiority. Instead, they will have to use their knowledge and creativity to develop a blueprint for the animal most appropriate for their market and they must deal with new traits and new measurements.

Researchers will have plenty to do also. Sire evaluation will be more important than ever (breed associations should be pleased), and there will be a whole new array of traits to study.

Editor's note: Dr. Bourdon's 12-part series on beef cattle breeding appeared in the ANGUS JOURNAL during November 1984—August, 1985. For a breeder perspective on this subject, read the Larry Leonhardt—Shoshone Angus experience elsewhere in this issue. AJ