

## ACHIEVING GENETIC IMPROVEMENT IN BEEF CATTLE

T. D. Rich

American Polled Hereford Association

Improving the efficiency of food production from cattle is one of the greatest challenges facing the beef industry. The beef animal operates under some extreme handicaps in comparison to other meat protein sources. Beef cattle in comparison to fowl and swine, have a lower reproductive rate, lower edible carcass yield and longer time period from birth to slaughter. On the other hand, beef animals have distinct advantages in that labor requirement is much lower and cattle have the ability to efficiently convert non-human consumable energy sources into food. Beef has a bright future if production efficiency is improved from its current level.

Probably the most basic principle in beef production is the equation: PHENOTYPE = GENOTYPE + ENVIRONMENT. Some theorists would argue that we should also include the addition of Genotype x Environment interaction, and I agree, but the interaction is less important than the genetics of the animal and management placed upon the animal. In simple terms, what you see, produce, sell and consume is a function of what the animal is capable of doing with its genetic make-up and the effectiveness of your management. Both genotype and environment can be largely (although not completely) controlled by man.

Only the genetic portion of phenotype is passed on to the next generation. Genotype will reproduce itself. Environment will have an influence on phenotype only as long as the environment exists. Quit doing whatever is increasing production efficiency and the response quits.

Other speakers involved in this clinic will address the environmental issues. I have been given the challenge of discussing methods of achieving genetic improvement. There are several methods available for both commercial and seed-stock breeders.

### 1. PERFORMANCE RECORDS:

The keeping of performance records does not necessarily make cattle improve genetically. How you use performance records controls the direction of genetic drift of a herd.

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Presentation to the National Beef Symposium and Oklahoma Cattle Feeders' Seminar, March 10-12, 1982, Oklahoma State University

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Performance records is merely a recording of observations (breeding dates, calving dates, weights, etc.) during the productive life of an animal. A record remembers a lot longer and more accurately than a busy mind.

All of the major breed associations have a computerized records program service available to its members. Also, most of the breed associations will process the records of commercial cattle for a very nominal charge.

Some breeds have now expanded their ancestral certificate to include performance records for birth, weaning and yearling weights. Also included are maternal trait measurements of progeny's calving and milking ability. These are major advancements in adding value to the pedigree and value of using registered bulls.

Research and practical experience has taught us that selections for the economical traits, based upon use of performance records, has been effective in genetic progress.

## 2. SELECTION PROGRAMS:

Growth and carcass traits are economically important, differences can be measured and are moderately to highly heritable; therefore when accurately selected, genetic improvement in cattle can be made through selection. Reproductive traits are less heritable primarily because of the extreme effects of environment and less improvement will be made through selection for reproductive traits than growth or carcass traits. On the other hand, infertility and sub-fertility are more highly heritable and a herd can decline in genetic fertility very rapidly if a producer ignores reproductive soundness traits. Examples would be double muscling, small testicles, heavy birth weights and late maturity.

Selection programs must be defined and adhered to over long periods of time. They will be effective if followed. The key to selection is accurately identifying genetic superiority for the trait you are wanting to select for. If the difference between two animals is genetic, then selection will be ineffective. If the difference between animals is environmental then response to selection will be nil. This fact illustrates why the most accurate selections are made when animals are raised in similar environments and/or treated alike.

National Sire Evaluation Reports are now available for several breeds. As bulls are used in several herds in comparison to other bulls it provides a way of ranking bulls within a breed for various traits. These reports will make a great contribution to genetic improvement of a breed.

Central Bull Test Stations are an attempt to place animals from different herds (hence different environments) into a common environment after weaning so as to rank bulls across herds. It has limitations but is effective selection.

### 3. ARTIFICIAL INSEMINATION:

The use of AI has been responsible for as much, if not more, genetic advancement in cattle breeding as any other single management tool. This is true strictly because of the greater use of superior sires. One of the biggest problems with this method of genetic advancement is identification of superior bulls. Growth rates can be measured but progeny tests are the real proofs of a sire's value. It takes time to generate a progeny proof but it then becomes the most accurate appraisal of a bull's breeding value. Within a breed association, it is not uncommon to find one superior sire that will have 2000+ calves sired by him registered each year. This would compare to maybe 75-100 maximum per year with only natural service. His genetic superiority is distributed directly over a population rather than restricted to a few herds and filtered across the breed through his sons and daughters.

### 4. EMBRYO TRANSPLANT:

Embryo transplant (ET), when used properly, can have the same impact as artificial insemination. Realistically the impact of ET will probably never be as great as AI because the number of progeny from a cow through ET will not be as great as through AI with a bull.

ET currently is making very little positive genetic advancement because it is so new that too many breeders are abusing the tool by using it promotionally rather than genetically. This will change as the new wears off and breeders learn more of how to use ET.

The embryo transplant industry is on the verge of storing frozen embryos. It has already been done on a limited basis. Within the very near future it will be possible to impregnate a cow with an embryo resulting from a mating with no relationship to the cow being impregnated. It will be routine to purchase an embryo of a specific mating.

### 5. PERSONAL DEDICATION:

This method of genetic advancement does not have any theory behind it but rather it is just common sense. Those breeders that define a breeding program by setting objectives, develop plans to meet those objectives and then stay with their game plan will progress. Those breeders who keep swapping horses every so often will end up losing direction

and not get very far in the race for genetic advancement. Sound programs that are followed get results. Shoddy programs with a wishy-washy approach survive on luck which can only be good or bad which cancels out to no change.

#### 6. HONESTY AND INTEGRITY:

Performance records and ancestral records can be of no greater value than the honesty and integrity of the breeder. A vast majority of the breeders are honest and insist on accuracy because of its value to them and their customers. A few individuals are not honest and those have done great damage to the purebred industry.

My recommendation for commercial cattlemen is to find seedstock breeders that they trust and have faith in, who also have a solid selection and breeding program based upon performance records for economically important traits. Tie onto their program and make genetic advancement with them. For those commercial cattlemen utilizing crossbreeding systems will need to find seedstock breeders of this quality in each breed they are working with. There are good breeders and good cattle in all breeds.

For the beef industry to survive, we must become more efficient and genetic advancement is the only permanent advancement.