Better Polled Cattle

This is the sixth article in a series of brief progress reports on the application of the science of genetics to commercial agriculture.

practical plan for gradual change-over from horned to polled herd offered established breeders

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California cattlemen could save approximately a million dollars annually if a breed of polled Herefords could be developed that would be equal to horned Herefords in conformation, efficiency of feed utilization, and carcass quality.

Horns are a menace in the breeding herd, in the feed lot, and in shipping. Among horned animals in the feed lot, gains are less uniform. Packers know from experience that carcasses from lots of horned animals show more bruises and blemishes than from lots of polled or dehorned animals. Since the value of the carcass is decreased, the packer or feeder protects his interest by paying slightly less for horned animals.

The dairyman uses caustic to eliminate horns, but it is more difficult for the commercial beef producer to dehorn with caustic, and he resorts to other methods. Dehorning is costly. Labor is only a small part of the expense. Dehorning interferes with normal weight increase. There is the ever present danger from fly strike which, when it occurs, causes additional labor output, a longer period of weight loss, and an occasional complication that results in death. The commercial cattleman that uses a horned breed takes a substantial loss from horns whether he dehorns or not.

Although the consensus is that polled Herefords are better adapted to the range or valley conditions, most commercial cattlemen object to them on the ground that they are inferior to horned Herefords in conformation and other beef qualities.

If commercial cattlemen could obtain true breeding polled bulls whose progeny were equal to the progeny of horned bulls in conformation, economy of gain, and quality of carcass—at a cost not greater than that of comparable horned sires—there would be an immediate switch to polled sires.

The inheritance of the polled or horned condition is relatively simple. Only one pair of major factors—genes—is involved, although there may be modifying genes that condition the scurs—small kernel-like bits of horn tissue attached to the skin of the horn pit of a polled animal.

The genetic control of the polled character itself is easy and offers no great problem. It is the efficient utilization of feed, conformation, and quality of carcass that complicates the problem genetically. These characteristics—necessary for desirable beef animals—are conditioned by multiple factors. It is this phase of the problem that makes the breeding program difficult. The problem is to transfer the polled factor to the superior conformation of the horned breed.

The majority of cattlemen hold the opinion that the beef qualities of the polled Herefords are inferior to those of the horned Herefords.

If it is assumed that the cattlemen are correct, there are at least three reasons for the inferiority:

1. The original polled mutants did not occur in individuals that had the best conformation and beef qualities;

2. In order to increase the number of polled animals in the early years there was very little selection among polled animals for superior beef qualities; and

3. If the assumption that horned Herefords are superior in beef qualities is correct, the mating system generally used in the crossing of polled and horned Herefords was not conducive to rapid improvement of the beef qualities of polled Herefords.

The polled herds throughout the country are now in various stages of development. There are few polled herds that compare favorably in quality and conformation with the better horned breeds. Since there is a great difference in the progress of the development of polled herds, it is impossible to recommend one breeding program that would suit the needs of all polled breeders.

A polled breeder that has developed his breed to a state of perfection near that of the better horned herds should not necessarily use the same mating system that the owner of a relatively poor polled herd should use.

The judicious selection of bulls coupled with progeny tests and careful culling might be all that breeders of well-developed polled herds need to do. Perhaps it would be unwise to place too much emphasis upon homozygosity—true-to-type—for the polled character until conformation is well fixed in the herd.

As the number of better polled herds increase, breeders of registered horned cattle will be compelled to change their horned herds to polled. All registered horned herds that are average or higher in the perfection of beef characteristics can make substantial contributions in the production of a polled breed of superior beef qualities. It is most essential, therefore, that none of the good horned animals that are registered be sacrificed.

Genetic Problem

All that is necessary is for the breeder to substitute the polled factor for the horned factor in the horned herd. This is, in reality, a complicated genetic problem, but it can be reduced to a relatively simple genetic problem by using the backcross mating system. It is best suited to a problem in which the objective is to transfer a single gene of one population to another population in which the character of primary importance is conditioned by a multiple factor complex that breeds relatively true. The desirable genetic constitution of the multiple factor complex is automatically fixed by using the parent that possesses it as the recurrent parent in the backcrossing program.

Since pure lines do not exist in animals, the problem of transferring the polled factor to a horned herd of superior conformation and beef qualities can never be reduced to such simple terms as—for example—that of transferring a rust or smut resistant gene into a susceptible commercial variety of wheat that possesses the other desirable qualities. By use of the backcross method, however, it is possible to reduce the complexity of the problem sufficiently so that it can be approached by backcrossing.

It is possible for a breeder of a registered horned herd that is better than average to gradually change over to a polled herd that is equal to the horned herd in the perfection of beef characteristics. At the same time, the breeder can maintain essentially the same economic structure and amount of income from his herd during the transition period.

Breeding Program

A plan of procedure is outlined in the accompanying table which is a practical way for an established breeder of horned cattle to proceed.

It should be noted that horned cows—Herd A—of superior beef qualities are to be mated to polled bulls possessing su-

perior beef qualities and the best F_1—first generation—polled males are then mated back to the horned cows—Herd A—that are used as the recurrent parent in subsequent generations.

Polled bulls of the best conformation and beef qualities should be chosen to mate to the horned cows in each generation. By using this procedure, the genetically complicated characteristics of conformation and beef qualities can, for the most part, be fixed automatically by backcrossing. All that is necessary to do is to select polled bulls possessing the most desirable conformation and beef qualities. By using these procedures, a greatly complicated genetic problem is largely reduced to a monohybrid—a hybrid whose parents differ in a single character—status which is the simplest type of genetic problem.

Since conformation and beef qualities are more difficult to fix into a true breeding state than polled, all polled animals in the generation prefixed by a Roman I—in the table—will not breed true for the polled character. This is unavoidable but is not serious.

The breeder can sell breeding stock from the outset and his general mode of operation should not be materially changed.

Under this plan, replacements of the horned cows—Herd A—during the first few generations are not to be obtained from Herd A. When there has been sufficient grading up by backcrossing, replacement females for Herd A may be safely used from the backcross generations—see IBC_3. When heterozygous—not true-to-type—polled bulls of generation IBC_N are mated to heterozygous cows, 25% of their progeny will breed true for the polled condition.

Each polled bull of the best conformation and beef quality produced from this type of mating should be mated to at least 15 horned cows. From this test mating, it is possible to identify animals that breed true for the polled condition.

After they become available, bulls of desirable beef type that breed true for the polled condition are to be used on cows of Herd A. All of their progeny will be polled.

By using proven homozygous polled bulls two or more generations, the frequency of the polled gene will be so high, that if random matings—with respect to the polled gene—are used—the $IIBC_3$ generation—only one horned calf out of 256 animals would be expected.

This program is sound from a genetic standpoint. It can be adjusted to the individual needs of a breeder of registered horned Herefords so that the income from the purebred cattle enterprise need not be reduced at any time. It is possible that the net income may actually be increased at the outset and that the margin of profit may be increased as the program advances.

A Mating System Designed to Substitute the Polled for the Horned Gene in a Horned Herd in which the Beef Qualities Are Highly Developed. The Estimations Are Based upon a Breeding Herd of 100 Cows with an 80 Per Cent Calf Crop Weaned.

One hundred horned cows possessing superior beef qualities (Herd A) x Polled Bull (P_P)

Generation	Classes of Animals and Approximate Numbers Expected in the Generations			
IF_1	20 Polled Bulls Castrate poorest in conformation. Save best two to backcross to the horned cow herd A. Sell remaining bulls as herd sires or range bulls.	20 Horned Bulls Castrate poorest in conformation. Sell others as range bulls.	20 Polled Cows Cull poorest for beef 1. Sell for commercial beef production. 2. Sell for registered breeding stock. 3. Use best as foundation for polled herd.	20 Horned Cows 1. Sell for commercial beef production. 2. Sell for registered breeding stock.
IBC_1	20 Polled Bulls Select as in IF_1	20 Horned Bulls Select as in IF_1	20 Polled Cows Select as in IF_1	20 Horned Cows Select as in IF_1
IBC_2	20 Polled Bulls Select as in IF_1	20 Horned Bulls Select as in IF_1	20 Polled Cows Select as in IF_1	20 Horned Cows Select as in IF_1
IBC_3	20 Polled Bulls Select as in IF_1	20 Horned Bulls Select as in IF_1	20 Polled Cows Use best heifers as replacements for herd A.	20 Horned Cows Select as in IF_1
IBC_4	20 Polled Bulls Select as in IF_1	20 Horned Bulls Select as in IF_1	20 Polled Cows Use best heifers as replacements for herd A.	20 Horned Cows Select as in IF_1
IBC_N	More than 20 Polled Bulls One fourth of the offspring of polled females sired by a polled male will breed true for the polled condition. The best of the polled bulls should be mated to about 15 horned cows each to determine which breed true for the polled condition. True breeding polled bulls will now be used.	Less than 20 Horned Bulls Select as in IF_1	More than 20 Polled Cows Select as in IF_1	Less than 20 Horned Cows Select as in IF_1
				PROPORTION OF HORNED CALVES THAT WOULD OCCUR IF RANDOM MATINGS ARE ALLOWED
$II\ F_1$	40 Polled Bulls Castrate poorest, save best to mate to horned cows to identify bulls that breed true for polled character. Use best of these bulls on A herd. Sell remaining as herd and range bulls.		40 Polled Cows Cull poorest for beef. Use best to go in herd A. Sell others for breeding stock.	1 out of 4
$II\ BC_1$	40 Polled Bulls Select and manage as in IIF_1		40 Polled Cows Select and manage as in IIF_1	1 out of 16
$II\ BC_2$	40 Polled Bulls Select and manage as in IIF_1		40 Polled Cows Select and manage as in IIF_1	1 out of 64
$II\ BC_3$	40 Polled Bulls Select and manage as in IIF_1		40 Polled Cows Select and manage as in IIF_1	1 out of 256
$II\ BC_4$	40 Polled Bulls		40 Polled Cows	1 out of 1,024

Random matings so far as the polled gene is concerned may be used about the $II\ BC_3$ generation.

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