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G85-755 How to Set Goals for Your Breeding Program

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Keown, Jeffrey F., "G85-755 How to Set Goals for Your Breeding Program" (1985). *Historical Materials from University of Nebraska-Lincoln Extension*. 529.

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How to Set Goals for Your Breeding Program

This NebGuide describes how to determine which trait(s) to select for, and how multiple trait selection affects genetic progress.

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Dairy producers are often concerned with placing emphasis on different production traits in their breeding program. Selecting on only economically important traits should be the objective of every producer. The use of artificial insemination (A.I.) sires is the most economical and productive way to increase the genetic potential of the herd.

A cow's record is a measure of her genetic potential, which is modified by the environment in which she is kept. Environmental factors that directly influence a cow's record include types of housing, milking equipment, feeds and feeding, veterinary care, mastitis treatment, and climatic conditions. Only through control of these factors can the true genetic ability of a cow be expressed.

All environmental factors are in a constant state of change. Therefore, most changes made in the environment that influence production traits are not permanent. These factors must be monitored and adjustments made daily to maintain optimal production. Unlike environmental changes, genetic changes are permanent. You need only to breed to a top production A.I. sire to make genetic gain that is permanent throughout a cow's lifetime. The investment is made only once when breeding your herd.

One way to look at genetics is to consider it the key that unlocks the door to efficient production. Efficiency of production is truly the name of the game. In today's dairy economy, any increase in efficiency without incurring significant added costs is a program that should be followed.

Evaluate Your Selection Goals

If you choose to follow an A.I. breeding program, there are a series of questions that need to be

addressed. Two of the most important ones are:

1. How many traits (such as pounds of milk, fat, or protein) should you select for?
2. Which traits are the most important?

The first question is rather simple to answer. Select for as few traits as possible. There is a direct relationship between the number of traits in a selection program and the amount of progress that can be made. *Table I* shows the amount of progress that can be made in a given trait when selecting for one or more traits.

Table I. Amount of genetic progress in primary selection trait possible when selection is also carried out on secondary traits.	
Number of Traits Selected	Progress in Primary Trait
1	1.00
2	.71
3	.58
4	.50
5	.45
6	.43
8	.35
10	.32

Let's suppose that your main objective is to increase the genetic potential for milk production. If this is the primary goal, and it probably should be, then you should select solely for milk production. If you put emphasis only on milk production in a breeding program, then you will make maximum progress for this trait. If, however, you select for two traits at the same time, you have lowered your progress in milk production (the primary trait) to 71 percent of the maximum. Likewise, if you select on 10 traits, you have seriously reduced your potential increase in milk production to only 32 percent of its maximum.

It is not difficult to include more than 10 traits in a selection program. The economic traits most often selected for are the production traits of pounds of milk, fat, or protein. Many producers place additional emphasis on what are termed functional traits--feet, legs, udder support, or teat placement among others.

There are additional traits placed in selection programs that are purely cosmetic in nature--rumps, heads, strength, and topline, to name a few. If a selection program contained all of these traits, the progress that would be made in the economic (production) traits would certainly be minimized. Always remember this basic genetic principle: *The more traits selected for, the less progress made in the primary trait or traits of importance.*

An excellent method to use in deciding which traits to select for consists of identifying all of the traits in your breeding program and listing the corresponding income generated from selecting for each trait. If there is no income generated from a trait, delete it from your list. An example of using a list to decide which traits are the most important in an individual's breeding program is given in *Table II*.

Table II. Example of making a list to decide which traits are most important in designing a breeding program.

Trait	Income (\$) Generated from Trait
Milk	
Fat	
Protein	
Solids Not Fat	
Somatic Cell	
Feet and Legs	
Teat Placement	
Rump	
Front End	
Topline	
Strength	
Head	

The sole purpose of any breeding program is to generate income for the dairy enterprise. If you do not sell cattle, or just sell an occasional heifer, then the cosmetic traits should immediately be deemphasized. The estimation of cosmetic traits or type traits are subject to considerably more human error than are production traits. Progress in type traits is less likely to be made and if progress is made, it will be slower than for the production traits.

If a producer wishes to include non-production traits in a breeding program, they should be added in a way that does not seriously jeopardize the emphasis placed on the production traits. Selection should first be placed on the production traits and then mating of individual cows can be based on the non-production traits of those sires of interest. If you initially select sires on non-production traits, it can seriously affect income in the form of decreased production. Always select on the traits that generate the most income.

Every producer should make a list of income-generating traits yearly so that the true value of each trait in the breeding program can be objectively evaluated. The failure to justify your selection goals based on income can jeopardize the financial future of your dairy enterprise. One fact soon learned from this exercise is the great emphasis that should be placed on the production traits. Over 95 percent of dairy producers will come to the conclusion that selecting solely on the production traits is the way to maximum income.

Maximizing Genetic Progress

The amount of progress that can be gained from an A.I. program can be divided into four specific areas as shown in *Table III*. Most progress is made in selecting sires to produce the next generation of bulls, with 43 percent of the total genetic progress in this area. The second most influential factor in genetic progress comes from selecting dams of future bulls (33%). Selecting a group of sires to breed your cows accounts for 18 percent of the total genetic progress, whereas the selection of dams to produce cows is

the least important, accounting for only 6 percent of the total.

Table III. Optimum percentage of genetic progress associated with sire	
Source of Progress	Percentage Possible
Sires of bulls	43
Dams of bulls	33
Sires of cows	18
Dams of cows	6

Selecting sires and dams to produce the next generation of A.I. sires accounts for over 3/4 of the potential genetic progress (43 + 33%). Since there are millions of cows and hundreds of sires to select from, this area should receive the most attention when selecting. By selecting the top genetic potential dams and sires, we can greatly increase genetic progress. If you plan to use an A.I. program, it is important for you to know what type of sire program is being used by the A.I. organization to be certain that the organization is maximizing this 76 percent in terms of your goals.

An A.I. organization should base its sire program on the traits that will increase income to the producer. All A.I. organizations should assess their selection goals in relation to the traits that are important to the majority of their members rather than those traits that are easiest to sell or that can be merchandized at high prices. Once these goals are objectively evaluated, a sound genetic program can emerge. If the A.I. organization you are using has a sound genetic program, 76 percent of the genetic progress you can make is being taken care of for you. You then only need to worry about the remaining 24 percent, 18 percent of which is accomplished by choosing a group of sires available from the A.I. organization that fits your selection goals. The remaining 6 percent involves the selection of cows to produce replacements. The genetic progress from the selection of cows to produce replacement is low because a producer has a limited number of cows to use to produce heifers, thus greatly limiting genetic progress.

Conclusions

When designing a breeding program, the relative importance of each trait in the selection program must be evaluated. A dollar figure should be placed on each trait so that its economic importance can be evaluated. Eliminate any trait in a selection program that does not significantly affect income. Genetic progress is permanent while environmental progress must be monitored daily if maximum income is to be generated. Genetic potential is the key that unlocks the door to efficient production through proper feeding and management. Genetic progress is controlled by two groups--the A.I. organization and the producer. Seventy-six percent of optimum progress is controlled by the A.I. organization; 24 percent is in the hands of the producer. A genetically sound A.I. young sire program is essential to continued genetic progress.

File G755 under: DAIRY

B-4, Breeding & Reproduction

Issued June 1985; 12,000 printed.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Elbert C. Dickey, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.

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