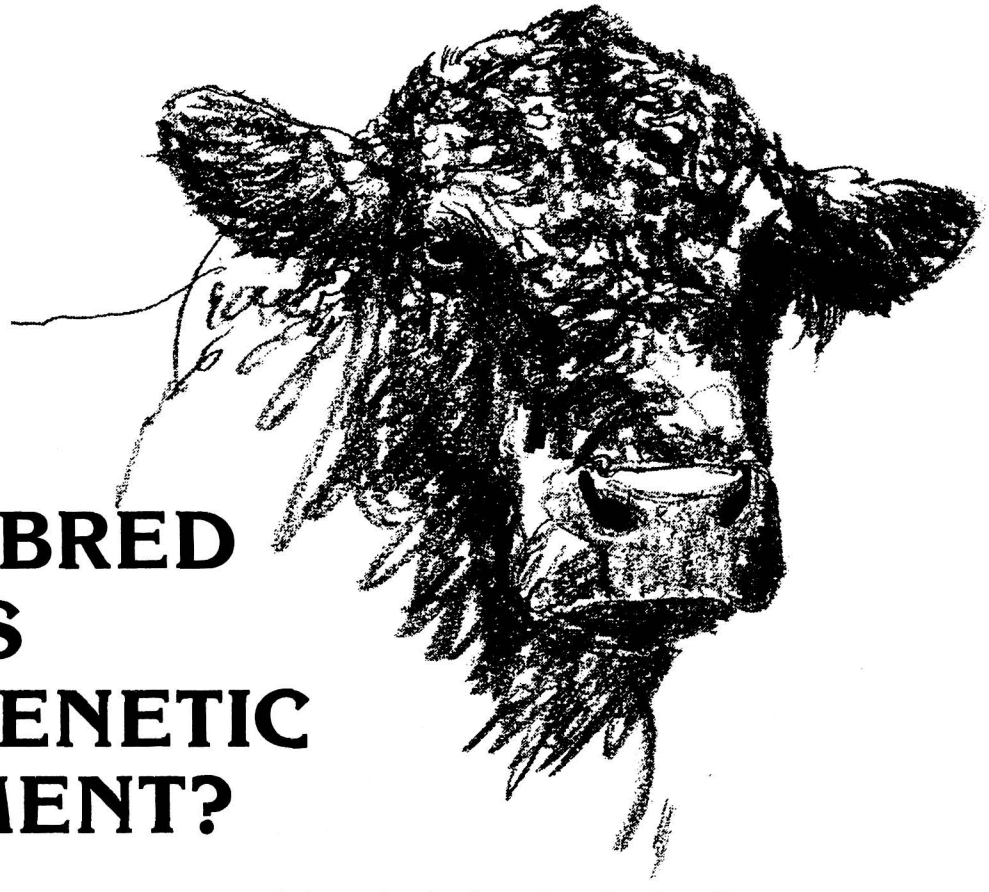

ARE PUREBRED BREEDERS MAKING GENETIC IMPROVEMENT?

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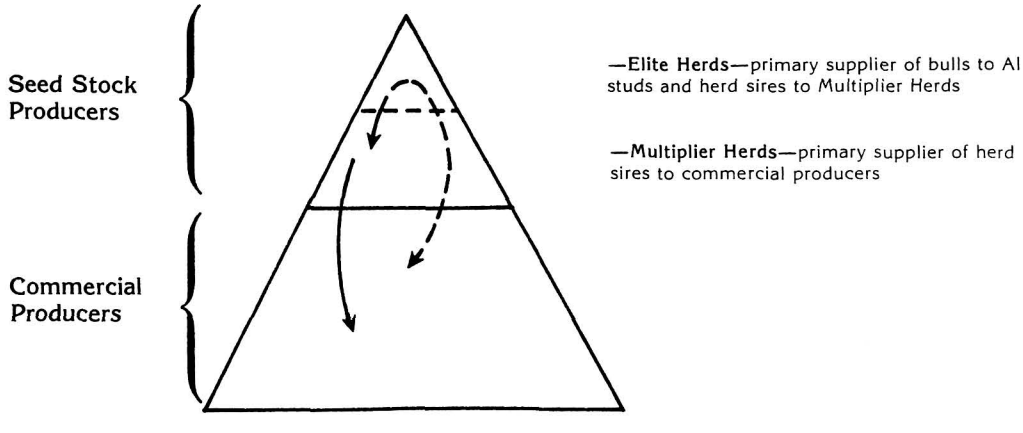
The structure of the beef cattle industry has been described as a three-tiered pyramid with elite, purebred breeders at the top and commercial producers at the bottom. This structure and a representation of gene flow is diagrammed in Figure 1. This figure clearly reveals the fact that, to a great extent, commercial cattlemen make genetic improvement only if seed stock producers are making genetic improvement.

Since the role of seed stock producers is so vital to the industry, let's examine the effectiveness of their breeding programs. Are seed stock producers making genetic improvement? To answer, let's consider breeders of Angus cattle. We will first look for progress by examining the records of the breed as a whole. Secondly, we will consider the kind of bulls these breeders are consigning to central testing stations by evaluating the sires of Angus bulls in stations in Virginia, North Carolina and South Carolina. We could have chosen any breed and testing stations in any region of the country and found similar results.

In conjunction with performing the Angus sire evaluation for 1982, Berger and coworkers at Iowa State University analyzed Angus Herd Improvement Records for the period 1964 to 1979 to determine the genetic trend in the breed for growth traits. Results of the analysis are shown in Table 1. These results show a steady, positive trend, indicating breeders are genetically moving toward heavier animals at both weaning and one year of age. Although birth weights do show a slight upward trend, the genetic change in birth weight has been minimal. These trends represent the improvement

Figure 1. Structure of Beef Industry



over the entire breed with more than 333,000, 712,000 and 298,000 records analyzed for birth weight, weaning weight and yearling weight, respectively.

These numbers are condensed in Table 2 to the average change per year in the three traits and the cumulative change in each trait over the 16-year period. The average increases have been .07, 1.09 and 2.56 lb. per year for birth weight, weaning weight and yearling weight, respectively.

To put these increases in perspective, compare them to the maximum amount of genetic improvement that could be made if **all** producers were selecting for only **one** trait—either weaning weight or yearling weight. The maximum increases expected per year are shown in Table 3 along with the correlated responses that result in other traits. Correlated responses occur because these growth traits are all genetically correlated at rather high, positive levels.

Interestingly, actual improvement is about one-third of the expected maximum for either weaning or yearling weight. This is remarkably good progress considering the diversity of selection programs used by breeders across the country.

Now, let's turn our attention to the quality of the bulls in central testing stations. The kind of bulls consigned to these stations is a reflection of the selection and breeding programs being practiced on seed stock farms.

The percentage of bulls consigned that are

Table 1. Genetic Trend in the Angus Breed From 1964 to 1979[a]

Birth Year of Sire	Trends for Growth Traits		
	Birth Wt.	Weaning Wt.	Yearling Wt.
1964	+ .15	-5.2	-12.1
1965	- .01	-5.6	- 7.2
1966	+ .34	-5.5	-10.2
1967	+ .11	-5.7	- 9.9
1968	- .07	-4.5	- 6.8
1969	+ .17	-2.9	- 3.9
1970	+ .11	-2.4	- 2.0
1971	+ .23	- .9	+ 1.6
1972	+ .16	+ .4	+ 4.0
1973	+ .29	+1.9	+ 7.0
1974	+ .47	+3.5	+11.5
1975	+ .60	+4.6	+12.3
1976	+ .70	+6.2	+17.1
1977	+ .81	+6.5	+19.7
1978	+ .88	+7.6	+22.2
1979	+1.47	+9.3	+24.4

[a]From 1982 Angus Sire Evaluation Report.

Table 2. Annual and Cumulative Genetic Trends of the Angus Breed From 1964 to 1979[a]

	Birth Wt.	Weaning Wt.	Yearling Wt.
Regression (pounds/year)	+ .07	+ 1.09	+ 2.56
Cumulative change (sum of pounds)	+1.12	+17.44	+40.96

[a]From 1982 Angus Sire Evaluation Report.

Table 3. Expected Maximum Direct and Correlated Responses per Year From Selection

Correlated Trait	Trait Selected For		
	Birth Wt.	Weaning Wt.	Yearling Wt.
Birth Wt.	.72	.60	.42
Weaning Wt.	1.68	3.28	2.72
Yearling Wt.	3.32	3.88	7.74

(Direct responses in pounds are shown on the diagonal, and correlated responses in pounds are on the off-diagonals.)

Table 4. Average EPDs[a] (Expected Progeny Differences) and Maternal Breeding Value Ratios for Angus Bulls in Central Testing Stations

Station	No. Angus Bulls on Test	% Sired by Progeny Tested Bulls	Average EPD of the Sires			Average Maternal Breeding Value Ratio
			Birth Weight	Weaning Weight	Yearling Weight	
		NORTH CAROLINA				
Rocky Mount	28	61	5.5	33.8	58.9	100.5
Salisbury	39	54	3.9	27.3	50.9	100.2
Waynesville	23	57	2.8	28.3	50.8	102.9
		VIRGINIA				
Culpepper	108	55	4.2	30.1	57.2	102.5
Red House	128	33	4.8	27.8	52.0	103.2
Wytheville	52	38	4.7	30.2	59.4	101.0
		SOUTH CAROLINA				
Clemson	31	64	3.2	25.7	50.0	101.1
OVERALL	409	47	4.3	29.0	54.6	102.2

[a]EPDs from 1982 Angus Sire Summary reported in October 1982 issue of ANGUS JOURNAL.

sired by progeny tested sires and average EPDs (Expected Progeny Differences) for birth, weaning and yearling weights and average maternal breeding values for Angus bulls on test in Virginia, South Carolina and North Carolina are shown in Table 4.

Of the bulls on test in these three stations, 47 percent were sired by progeny tested bulls. The percentages ranged from 33 to 64 percent. Additionally, a large portion of the remaining bulls on test were sired by performance tested sons of progeny tested bulls. Overall, sire EPDs averaged 4.3, 29.0 and 54.6 for birth, weaning and yearling weights, respectively. Maternal breeding value averaged 102.2.

Evidence from a study of both the records for the breed as a whole and for testing stations in these three states is quite convincing that Angus seed stock producers are very concerned about genetically improving their cattle. I might reiterate an earlier statement that similar patterns may be observed for other breeds and testing stations in other states.

Certainly, these findings are reassuring to the beef industry as a whole. Seed stock producers in particular are to be congratulated on their acceptance and usage of performance testing and their active involvement in achieving this degree of genetic progress. Those findings should also give the commercial producer added confidence in those upon whom he depends for genetic improvement. AJ