Tracking Breed Change in Economics of Yield

by Jack McAllister

A breeding program is a long-term venture; always looking to the future and wondering how the next generation of offspring will perform. Turning generations takes time. A successful breeding made today, if it results in a heifer calf, won't generate any milk income for almost three years. It will be another two years, if she calved with a heifer calf, until that heifer calves. Thus it takes a minimum of 5 years to turn two cow generations. Given average cow lifetimes, that stretches it to about 12 years. Bull generation intervals are much longer. Young AI bulls are usually five years old when their first daughters are born. A proven AI bull who is selected as a sire of a prospective AI young bull will probably be at least 7 years old when those sons are born and can be siring sons for several years after that.

The nature of dairy breeding with AI bulls is that most herds will have a combination of generations of females and at least two generations of AI bull being used to breed the herd. Thus to try to measure genetic change by comparing the averages of consecutive generations can be difficult. Another option available to us is to compare females in the herd on the basis of their year of birth. Genetic trend is the term used for change in the average breeding value of cows over a period of birth-year groups.

The Animal Improvement Programs Laboratory (AIPL) at USDA publishes the genetic trends for the yield, productive life (PL) and somatic cell score (SCS) traits when new sire and cow evaluation runs are completed each quarter of the calendar year. These data by breed for all cows of that breed getting a genetic evaluation provide insight into the genetic trend for each of those traits for that breed. A comparison of those trends across the five major dairy breeds can also be made. Cows born in 1995 are being used as a benchmark and the current genetic base.

In August 2000 AIPL began calculating and publishing the net merit (NM$) index for lifetime profit. Included in that index are: milk yield, fat yield, protein yield, productive life, somatic cell score, udder composite, feet and leg composite and body size composite. The traits were combined and weighted by their estimated economic value to arrive at the overall NM$ index value.

Table 1 lists the change between 1995 and 2000 for the production traits analyzed by AIPL which are included in the NM$ calculation. These traits include: yield, PL and SCS traits for each of the dairy breeds. Milk yield change was greatest for Holstein followed by Brown Swiss, Jersey, Guernsey and Ayrshire. Average change per year ranged from 193 pounds for Holsteins to 96 pounds for Ayrshire. Brown Swiss achieved the greatest change in fat yield of 41 pounds followed by Holstein, Guernsey, Jersey, and Ayrshire. Change in protein yield favored Holstein with 37 pounds followed very closely by Brown Swiss and Jersey and much less by Guernsey and Ayrshire. Productive life changed positively for all breeds. Jersey had the greatest increase at .71 months slightly ahead of Holstein and Brown Swiss and well ahead of Guernsey and Ayrshire. Brown Swiss achieved a lowering of SCS by -.08 far ahead of Ayrshire. Jersey saw no change in SCS and Holstein and Guernsey actually increased.

Table 1. Changes in cow breeding value for production traits for cows born from 1995-2000.

Breed	Milk (lb)	Fat (lb)	Protein (lb)	Productive Life (mo)	Somatic Cell Score
Ayrshire	574	18	16	.39	-.01
Brown Swiss	996	41	32	.58	-.08
Guernsey	872	34	24	.46	.03
Holstein	1159	36	37	.61	.01
Jersey	926	33	32	.71	0

The application of economic value to the genetic changes highlights the economic importance of selection for these traits. Results given in table 2 show selection for milk yield resulted in a $20.90 increase for Holsteins on the upper end for the breeds down to $10.33 for Ayrshire. Obviously the value of changes in fat yield followed the amount of change in each breed with Brown Swiss being the greatest at $87.70 and Ayrshire the least at $38.50. Protein yield generated the single greatest economic benefit of any trait. Genetic change for Holstein was $176.10 followed by Brown Swiss and Jersey at $152.30 with Guernsey and Ayrshire at $114.20 and $76.20, respectively. The values of changes in productive life were in the range of those for milk yield. Brown Swiss had the largest economic benefit from change in SCS of $12.30. Changes in other breeds were negligible. Adding the economic value of change for milk, fat and protein shows that Holstein and Brown Swiss and Jersey had average economic gains of $45, $43 and $40 per year, respectively and were well ahead of gains for Guernsey and Ayrshire.

Table 2. Economic values of genetic change 1995-2000 for production traits in the Net Merit index.

Breed	Milk	Fat	Protein	Productive Life	Somatic Cell Score	Milk + Fat + Protein
Ayrshire	$10.33	$38.50	$76.20	$10.90	$1.50	$125
Brown Swiss	$17.90	$87.70	$152.30	$13.70	$12.30	$258
Guernsey	$15.70	$72.70	$114.2	$16.80	-$4.60	$203
Holstein	$20.90	$77.00	$176.10	$16.20	-$1.54	$274
Jersey	$16.70	$70.60	$152.30	$17.40	0	$240