Genetic Trends in Canadian Dairy Breeds

Introduction

Genetic improvement concepts and theories are widely used in the dairy industry for production and conformation traits of dairy cattle. Profitability in the industry is based on milk price and longevity of the producing animals. In Canada, producers and industry partners believe in a balanced breeding approach to achieving progress for both production and longevity. Genetic evaluations are key to producing improved animals and increasing profitability for the future. To understand how to achieve future goals, genetic information from the past should be examined to determine trends. These trends allow a measure of progress indicating performance achievements and the impact on national genetic inventories over a set time period. Understanding trends in genetic progress will allow future genetic direction to be established by defining specific goals for breeding profitable balanced cattle.

Methodology - How it's all calculated

Genetic trends are derived by comparing the average genetic level of the cow population within each year. Average genetic levels within each year of birth are calculated by using all cows with official production and type indexes which are expressed as Estimated Breeding Values (EBV) in kilograms for production and EBV units for conformation. Conformation indexes are based on the first lactation classification of each cow. Production components considered for comparison are milk, fat and protein yield as well as fat percent and protein percent. Conformation components include overall conformation, mammary system, feet and legs, dairy strength and rump. These traits all come together in the Lifetime Performance Index (LPI) and Pro$ when this index is available for the breed.

Average annual trends are expressed in five-year and ten-year periods, where the value is the overall difference for the five-year and ten-year period respectively, averaged over the number of years to determine an annual rate of progress. This indicates the trend and changes of improvement over the different time periods. If the five-year rate of progress is higher than the ten-year rate, then the population is making progress at an increasing pace. Individual annual differences can also be compared against the five-year and ten-year trend values which can be useful in determining the effects of changes in genetic sources (i.e.: introduction of foreign genetics from countries having a different genetic focus).

In addition to genetic progress, new and improved feeding and management strategies also contribute to increased production. Actual production (phenotypic), expressed in kilograms Mature Equivalent (ME) and genetic trends for production are determined by grouping cows according to birth year and calculating yearly averages based on all first lactation two-year-old records used in genetic evaluations. This comparison illustrates actual production trends and the contribution genetics have made to the level of production in the population, expressed in kgs. These trends are tabulated nationally and provincially by breed. It is important to note that genetic trend information based solely on production differs slightly from the trends based on cows with official production and type indexes because some cows on milk recording are not type classified.

Results

Annual genetic averages can be viewed nationally and provincially in table format. Tables and plots are breed specific, with plots only available for national subsets. The tables list data for the last ten-year period followed by annual trends over five-year and ten-year periods and footnotes. Values are relative to the current genetic base. The values in these tables should be viewed as differences between the annual values (i.e.: the EBV difference between 2014 and 2015). These differences can be compared to the five-year and ten-year average annual rates for each trait and interpreted that more or less genetic progress has been achieved within a specific year. Comparisons in graph format are also included in the following pages. In these graphs, production is represented by protein kg EBV on the left vertical axis and type is represented by conformation EBV units on the right axis. Birth year is plotted along the bottom. The scale for production and conformation are minimum and maximum values for the specific trait represented so that an equality in scales is reached for sake of comparison across traits. Genetic level for the oldest year is set to zero as the ten-year reference point, with values for all other years representing the amount of change relative to cows born in that year.

Conclusion

Genetic trends are a very useful tool for shaping the future of breed improvement in Canada. Lactanet Canada offers this tool to producers and industry partners in order to measure progress and performance of past breeding concepts and practices. Improvement of breeds means improvement of the dairy cow population in Canada and the direct benefit is more profitable animals. It is important to note the number of animals used in trend calculations both nationally and provincially. If the dairy industry in Canada continues to use genetic information, it is essential to maintain and increase participation in identification, milk recording and classification programs. These programs are the source of data used by Lactanet Canada to produce the genetic evaluations on which genetic improvement is based.