



Understanding Percentile Rank for the LPI Subindexes and Other Traits

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- National Selection Index

Knowing where an animal ranks in relation to the rest of the population is fundamental for dairy cattle genetic improvement. Selecting top ranked animals will increase the genetic quality of your herd. Percentile rank (%RK) values are published alongside an animal's genetic evaluation for a given trait and help breeders identify elite animals. The recent launch of the modernized Lifetime Performance Index (LPI) and its six subindexes presents an opportunity to revisit the concept of percentile ranks.

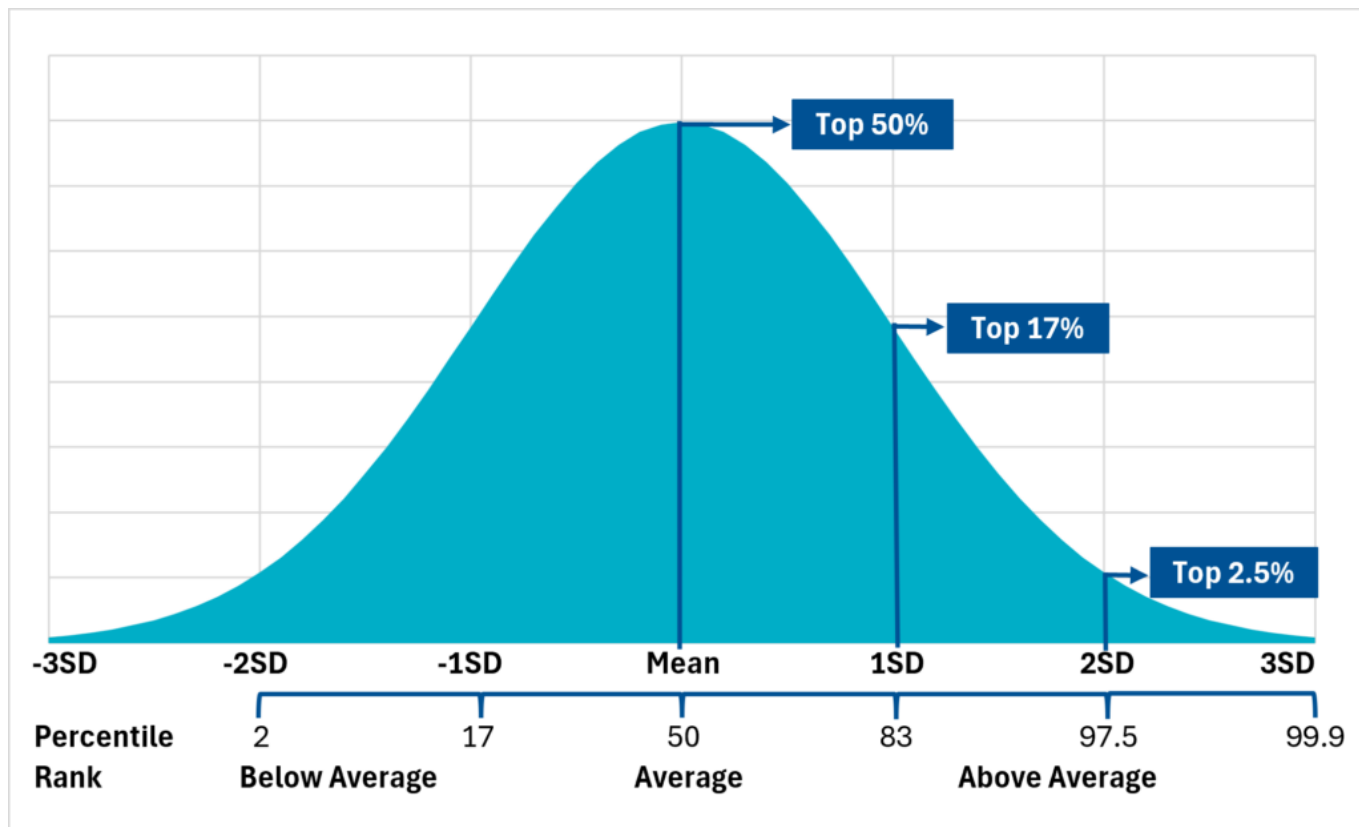
What is a Percentile Rank?

In general, a %RK tells you how an individual score compares to the rest of the group's score. For example, if you scored in the 80th percentile on a math test, it means you scored higher than 80% of your classmates. This same concept of %RK can be applied to dairy cattle genetic evaluations.

When calculating %RK, the first step is to define the reference population. For bulls, the genetic base definition is used, which includes proven sires born in the most recent complete 10-year period. For females, the reference population includes all active cows on milk recording and that have an official evaluation for the trait of interest. Once a reference group is defined, a minimum genetic evaluation value can then be selected for each percentile rank from 99 to 1, where 99 indicates the top 1%, 50 corresponds to the average, and 1 is the bottom 1%.

Using a standardized scale to express trait evaluations can further help with the understanding of %RK. Looking to the normal distribution in Figure 1, the mean represents the average of the reference group and a %RK of 50. This means every animal ranked higher than the 50th %RK is above average compared to the reference group. A sire with an evaluation between the average and one standard deviation (1SD) will have a %RK between 51 and 83. Therefore, the top 17% of sires fall above 1SD. To achieve a %RK of 97.5, or in other words a sire that is in the top 2.5%, would need a rating of at least 2 standard deviations above the average.

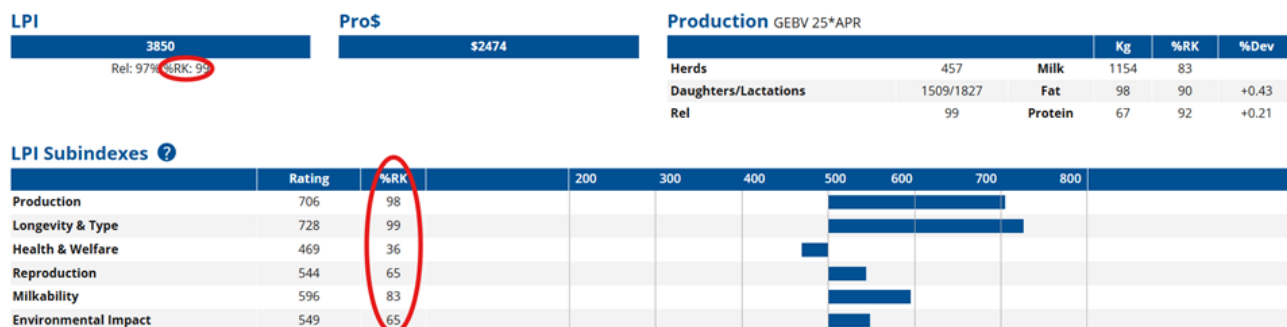
Figure 1: Illustration of Percentile Rank



Percentile Rank and the LPI Subindexes

If we apply this figure to the six LPI subindexes namely Production (PI), Longevity & Type (LTI), Health & Welfare (HWI), Reproduction (RI), Milkability (MI), and Environmental Impact (EI), the average is 500 (%RK of 50) and the standard deviation is 100. Therefore, 1SD above the mean is equal to a rating of 600, 2SD corresponds to 700 and so on. A bull with a rating of 600 would thus have a %RK around 83, while a rating of 700 corresponds to a %RK of 97. To achieve a %RK of 99 for any of the subindexes the bull would need a rating of 730 or more.

The %RK value is always published alongside the LPI and each of its subindexes on an animal's "Genetic Evaluation Summary" page via LactanetGen.ca. Regardless of which number you refer to, you can identify where each animal ranks for the subindexes that matter most to you, helping to make informed breeding decisions.



Percentile Rank for Other Traits

This same concept can be applied to all traits including production, type, and functional traits. The %RK value for production and type traits are also published on each animal's "Genetic Evaluation Summary" page, while for functional traits the %RK value can be found on the "Functional" page. At each official genetic evaluation release, the percentile ranks and corresponding ratings for LPI, Milk, Fat, Protein, and Conformation can also be found on the [Genetic Evaluations - Reports & Data Files](#) page. Table 1 shows the percentile rank that corresponds to type and functional trait ratings for bulls. As a reminder, the type traits have an average of 0 and standard deviation of 5 and the functional traits have an average of 100 and a standard deviation of 5. Therefore, to achieve a %RK of 99 a sire would need an evaluation of 12 on the type scale or 112 on the functional scale for the particular trait of interest.

Table 1: Bull Percentile Ranks for Type and Functional Trait Ratings

Percentile Rank	Type Trait Rating	Functional Trait Rating
99	12	112
98	10	110
95	8	108

Percentile Rank	Type Trait Rating	Functional Trait Rating
92	7	107
89	6	106
84	5	105
79	4	104
73	3	103
66	2	102
58	1	101
50	0	100
42	-1	99
35	-2	98
27	-3	97

Summary

To achieve maximum rates of genetic progress towards your breeding objectives, it is ideal to focus on using the best sires and dams possible. For all dairy cattle evaluated in Canada, Lactanet publishes a Percentile Rank (%RK) value for each trait, including LPI and its subindexes. For traits expressed on a standardized scale, it is easier to understand the relative ranking of each animal. However, regardless of the trait or index, %RK provides you with the opportunity to see where an animal ranks in relation to the average and is an important part of genetic selection and mating decisions.



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