# Building the Genetic Potential of Your Herd

Why do some herds have such high indexing cows and heifers compared to others? How can I improve the genetic potential of my herd? Is my herd making the genetic progress needed to improve my status provincially and/or nationally? To help answer these questions often asked by producers, Canadian Dairy Network (CDN) recently conducted an analysis to identify areas of commonality amongst the highest LPI herds in Canada.

Top LPI Herd List

Since May 2003, CDN has routinely published the list of Top LPI Herds within each dairy breed based on the average of official LPI values for active cows for herds with at least 20 such cows. This list compliments the reports listing the top individual cows by LPI and the top individual heifers based on Parent Average LPI. For herds to rank among the top in the breed for the average LPI of their cows, there must be a solid genetic improvement plan in place that takes advantage of all tools and opportunities available within the Canadian dairy industry.

Analysis of Whole Herd Average LPI

CDN computed and analyzed the average LPI on a whole herd basis for over 7,500 herds that had at least 20 active cows with an LPI and minimally 20 heifers with a PA LPI. These herds were grouped into ten categories, each of roughly 750 herds, based on their average LPI. Figure 1 shows the average LPI for the top 10 percent of the herds at 858 points and the range within this group was from 724 to nearly 1500 LPI. This compares to the overall average of 441 LPI points across all herds analyzed.

Figure 1: Whole Herd Average LPI by Percentile Rank Category
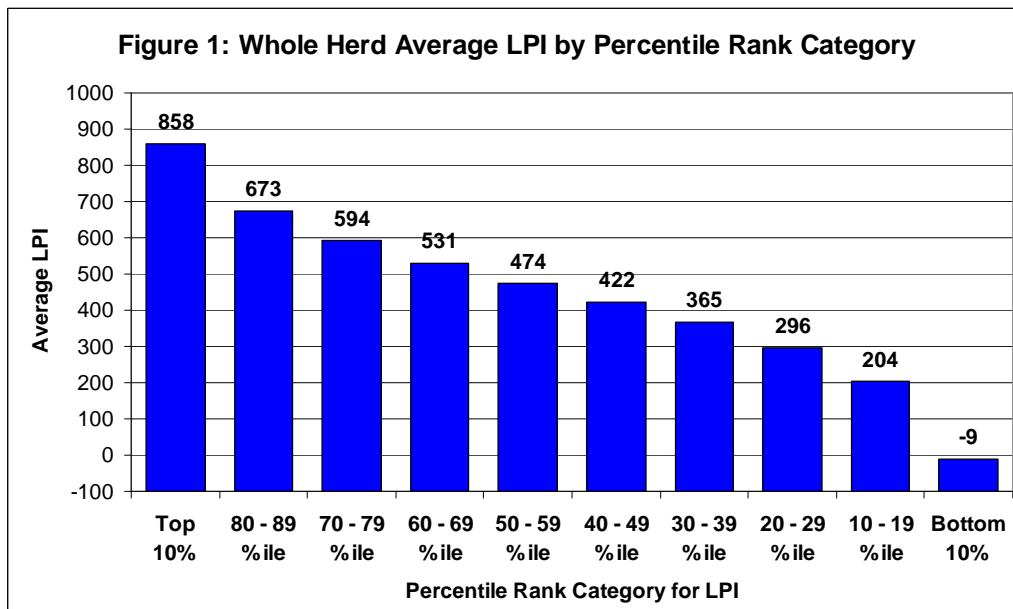
As expected, average herd LPI decreases fairly consistently for each group of 750 herds although herds in the Top 10 percentile stand out with a significant advantage over the next group, with a superiority of 185 LPI points, and the herds in the bottom 10 percent are also significantly inferior, averaging only -9 LPI and 213 points lower than the second lowest group.

High Quality Sire Selection is Critical

Genetic progress in a dairy herd is mainly achieved by two selection pathways, namely the selection of sires to produce the next generation of replacement heifers and the selection of dams to produce these replacements. In dairy cattle breeding, the traditional approach is to breed most, if not all, cows and heifers that are reproductively fit with the hope that they all get pregnant and produce a living calf. On average, half of the resulting calves born will be males so it is only by chance that the best dams produce a replacement heifer. In scientific terms, this means that there is a very low intensity of selection on the pathway for choosing dams to produce replacement heifers. In this area, the use of technologies such as embryo transfer and/or sexed semen, increase the likelihood of getting heifers from the <u>genetically superior</u> cows and heifers in the herd, and therefore increases the resulting rate of genetic progress.

The reality, however, in dairy cattle breeding is that sire selection is the single most critical ingredient to genetic success in the herd. As evidence of this, Figure 2 shows the average LPI in August 2009 of the sires of the heifers and cows in the herds within each category of percentile rank for herd LPI. The females in each herd were divided into five groups by age, as shown in Figure 2, and within each age category there is a clear trend in terms of the average LPI of sires used and the herd superiority for average LPI. Not surprisingly, within each age group of heifers and cows, the average LPI of the sires used was significantly higher for the genetically superior herds compared to all other herds, and the opposite was clearly true for the herds in the bottom ten percent. Simply stated, more genetic progress is expected and achieved in herds that use higher quality sires. In this analysis, the resulting heifers have an average sire LPI of 1600 (top 10 percentile herds) versus 1100 LPI (bottom 10 percentile herds).

Figure 2: Average Sire LPI by Percentile Rank for Herd LPI Within Heifer or Cow Age Group
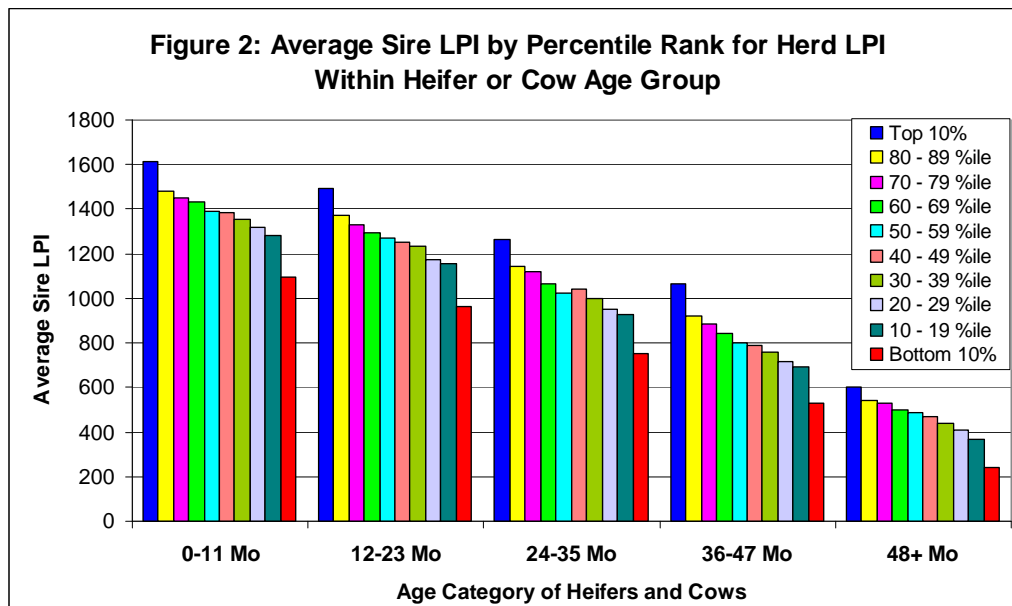
Looking at this trend in further detail, while it is generally consistent across the various age groups of the females in the herds, the highest LPI herds increase their selection intensity on sires more over time compared to the poorest LPI herds. For example, the increase in the average sire LPI for heifers under one year of age versus cows that are at least 4 years of age is 1000 LPI points for the highest LPI herds but only 788 points for the herds in the bottom 10 percent. In other words, to continue to be among the highest LPI herds, sire selection must continually focus on only the highest LPI sires.

Another distinction between the highest LPI herds and the lowest is the type of sires being selected. For herds ranking in the top 30 percent for average LPI, at least 65% of the sires used have an official progeny proof in Canada, another 20 to 30 percent are young sires and roughly 10 percent are foreign sires with a MACE evaluation in Canada. When selecting among the proven foreign sires to use, the highest LPI herds apply significantly higher criteria and generally limit semen purchases to only the elite ones. High genetic criteria are also applied when selecting domestically proven sires and young sires to use in their herds. The herds with the lowest average LPI use poorer quality sires from all categories (i.e.: domestically proven, young sires and foreign sires) and tend to use equal levels of young sires and proven sires in the herd.

Summary

CDN studied over 7,500 Holstein herds with at least 20 active cows and 20 active heifers and found average LPI to range from a high near 1500 points to a low of -700. While LPI does not represent the breeding goal for every Canadian Holstein breeder, this range is very significant and previous research has shown an association between average LPI and herd profitability. Herds within the top 10 percentile group maximize genetic gains through intense sire selection. This is achieved by combining the use of elite proven sires from Canada at roughly 65%, with a 10% use of the most elite proven sires from other countries and then young sires for 20 to 30% of the matings. In addition, these herds tend to be early adopters of technologies to produce more replacement heifers from genetically superior dams, including embryo transfer, sexed semen and more recently genomic testing.

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