Recording Performance of Genotyped Heifers

The opportunities that genomic testing has provided for improved selection of young bulls have been well documented and embraced by many breeders. In addition, the gains in accuracy of genetic evaluations due to genomics have amplified standards for selling elite genetics within Canada and internationally. Where current extension lacks is defining options for genomic testing to improve management decisions for females, such as more informed culling and selection of heifers as well as parentage confirmation or discovery, especially when conducted prior to three months of age. As breed associations and other industry partners embrace genomic technology to accentuate efficiencies in their day to day activities and bring opportunities to their members, it is equally or even more important to promote the longer term benefits of recording parentage and performance for continued herd improvement. In addition, continued wide-spread participation in performance recording programs is the fundamental foundation on which accurate genetic and genomic evaluations were built. Although traditional programs such as milk recording and classification will continue to be used by dedicated herd owners in Canada that have realize their value, some herd owners are reassessing the value of various performance recording programs, like type classification and milk recording, as important management tools in this ever evolving world of genomics.

The purpose of a recent study at Canadian Dairy Network (CDN) was to determine the extent that female evaluations could differ from being a heifer with a parent average to becoming a cow that has performance recorded (milk production and classification). To do this, cows that received their first official GLPI in either April or August 2011 and had been genomic tested on the 50K panel at least one year earlier were selected for investigation. Genomic evaluations (GPA) for LPI, Protein (PROT), Somatic Cell Score (SCS) and Conformation (CONF), as well as their traditional parent averages (PA), were retrieved to compare with their official genomic evaluation they received one year later as a first lactation cow. In total, 525 cows were included in the study and the annual genetic base update was taken into account to make all numbers comparable.

Reliability Gains Achieved

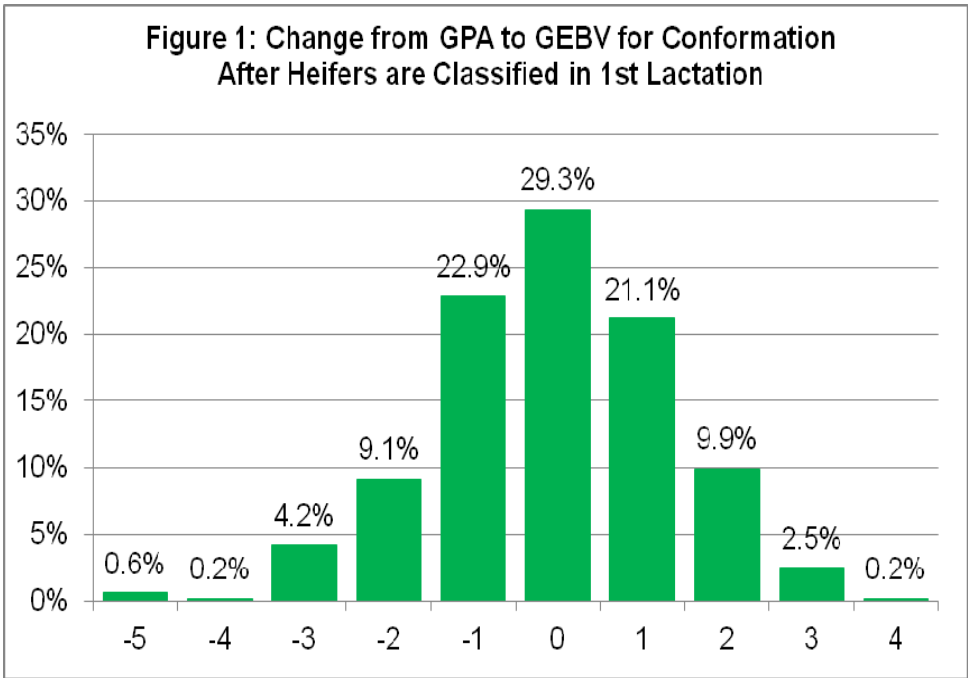
As expected, the average reliability of GPA for this group of heifers was 26 to 28 points higher, depending on the trait, than the reliability of their traditional Parent Average (39-42%). On average, the genomic LPI as a heifer was 77% accurate in terms of predicting the first official genomic LPI as a first lactation cow. If genomics were not available the traditional Parent Average (PA) for LPI would have an accuracy of 59% as a means for predicting the genetic evaluation as a cow after she is milk recorded and type classified. In this group of 525 heifers, genomic evaluations tended to be lower than their PA by 205 LPI points, 6.4 kg Protein and 0.6 points for Conformation index. Heifers that were selected for genotyping prior to August 2010 tended to be from elite cow families and generally had overestimated PAs. Therefore, genomic testing tended to remove at least some of the upward bias in their estimated genetic potential.

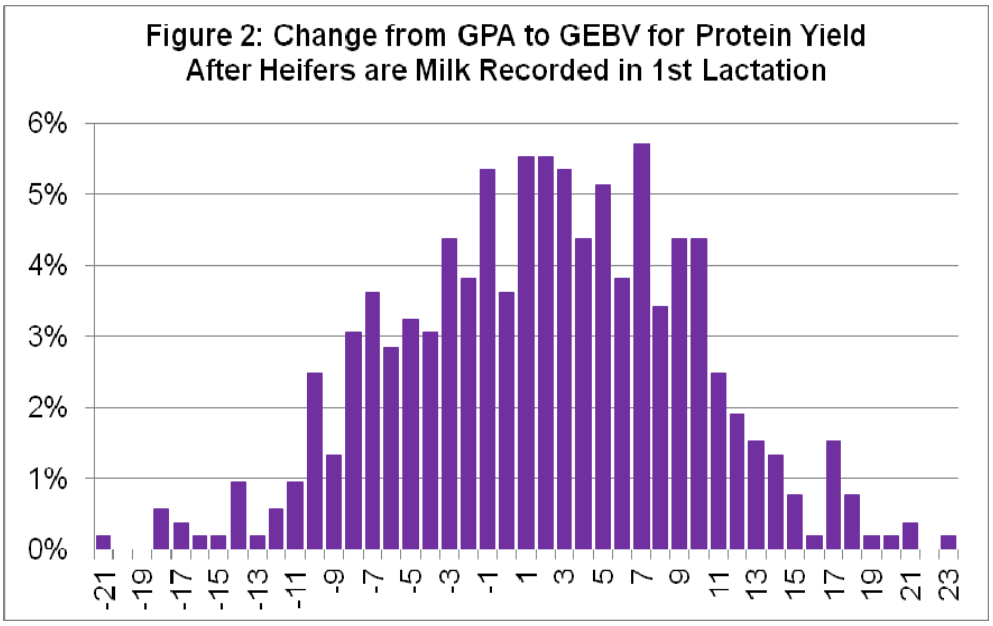
In order to receive an official GLPI in April or August 2011, this group of females would have started lactating and been classified after November 2010. If these heifers had not been genotyped, initial stages of performance recording would have traditionally increased the reliability of their first official LPI by 10 percentage points more than their PA to an average of 50%. Evaluation for Protein would be 15% points more reliable and Conformation 10% points higher following recording of initial performance. As cows complete several lactations and have daughters and granddaughters that also have recorded performance data, reliability of traditional LPI can reach as high as 75-80%.

Average reliability for GPA LPI for this group of heifers was 66%, which is only 9-14% points lower than the reliability achieved in a lifetime of traditional recording for most cows. However, with genomics this gain is achievable almost at birth when testing is conducted prior to three months of age. It was discovered that when the genomic tested heifers included in this study had performance recorded in first lactation, GLPI reliability averaged 69%, which is nearly 4% points higher than heifer genomic evaluations for LPI. In fact, a majority of the heifers (95%) had their GLPI reliability increase by 2-5%.

Changes in Genomic Evaluation Due to Performance Recording

More crucial than a moderate increase in reliability is the resulting changes that can occur to genetic evaluations when heifers become cows and have their performance recorded. Figures 1 and 2 show the change in genomic evaluation once heifers are classified and milk recorded, respectively. Once classified (Figure 1), a heifer's Conformation index can deviate by up to ±4 points compared to her Parent Average genomic evaluation. For 27% of the heifers, adding their first lactation classification score changed the published genetic evaluation by more than 1 point for Conformation. When heifers are milk recorded (Figure 2), their Protein evaluation deviated by more than ±20 kg compared to their GPA. The range in change for GLPI was ±700 points and more than 40% of the heifers changed by more than 250 LPI points when their first lactation production and classification information was included.





Summary

On average, heifer Parent Average (PA) decreased when genomic information was added to their estimate of genetic merit. This result reflects the overestimation of PA in the elite heifers that were submitted for genomic testing prior to August 2010. Genomic evaluations for heifers are much better predictors of GEBV for cows, compared to traditional methods to predict EBV from PA. Recording a cow's first lactation performance for production and type classification can increase reliability of heifer genomic evaluations by 2-5 percentage points. Of the 525 heifers recently studied by CDN, 27% changed by more than one point for Conformation and over half the heifers changed by more than 5 kg of Protein by having their performance recorded in first lactation. Forty percent of the heifers changed by more that 250 LPI points by including their own performance data. Genomic testing can provide many opportunities to increase accuracy of genetic selection and make more informed management decisions in any herd. However, these novel tools should never replace dedicated participation in robust breed improvement tools such as milk recording and type classification, which can also serve to justify the genomic predictions that are calculated early in an animal's life. Using a combination of both traditional breed improvement tools and genomics helps minimize risk.

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