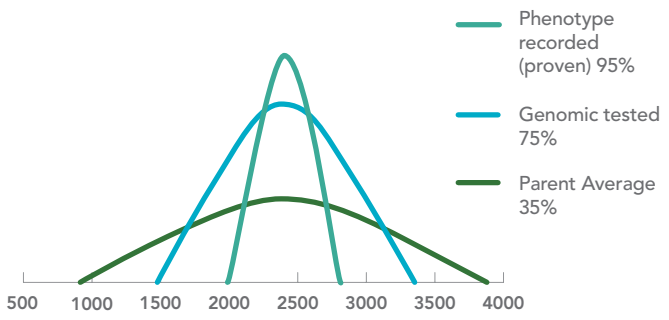
Increasing reliability with genomics to achieve your goals

SINCE THE COMMERCIAL LAUNCH of genomic testing in 2009, the rate of genetic gain has increased drastically. The two main factors allowing for this increase are higher reliability predictions along with shorter generation intervals. In simple terms, genotyping has allowed breeders to select for better animals to be the parents of the next generation at a younger age, and with higher accuracy. Along with reproductive technologies (IVF, ET, sexed & beef semen), genomics has drastically accelerated genetic gain on the female side. Each producer has the opportunity to increase their odds of selecting the best heifers to create future replacements from. This results in more profitable options for what to do with the rest - breed to beef, or even cull and save on feeding and housing costs. On the male side, the utilization of young bulls rapidly increased to record levels because breeders have recognized the opportunity to improve rates of genetic gain.

Starting from the basics: what is reliability and what does it represent?

In genetics and breeding, we say that the reliability of a trait increases once the animal is genotyped compared to Parent Average (PA). Simply, the reliability percentage is a measure of the accuracy of the prediction with higher values indicating greater reliability. Genotyping an animal allows you to be more confident in the prediction as we remove as much of the environmental influence as possible from our predictions, focusing on the DNA. The graph below is a visual representation of what a Pro$ prediction of $2400 means for different reliability levels. We see the range of values shrink as we add reliability to our predictions. Genomic testing a calf at birth eliminates roughly half of the range in her expected profitability over the first 6 years of her life, allowing more precise decision making for her future.

Phenotypic Pro$ range for 9 out of 10 animals with $2400 prediction according to different reliabilities

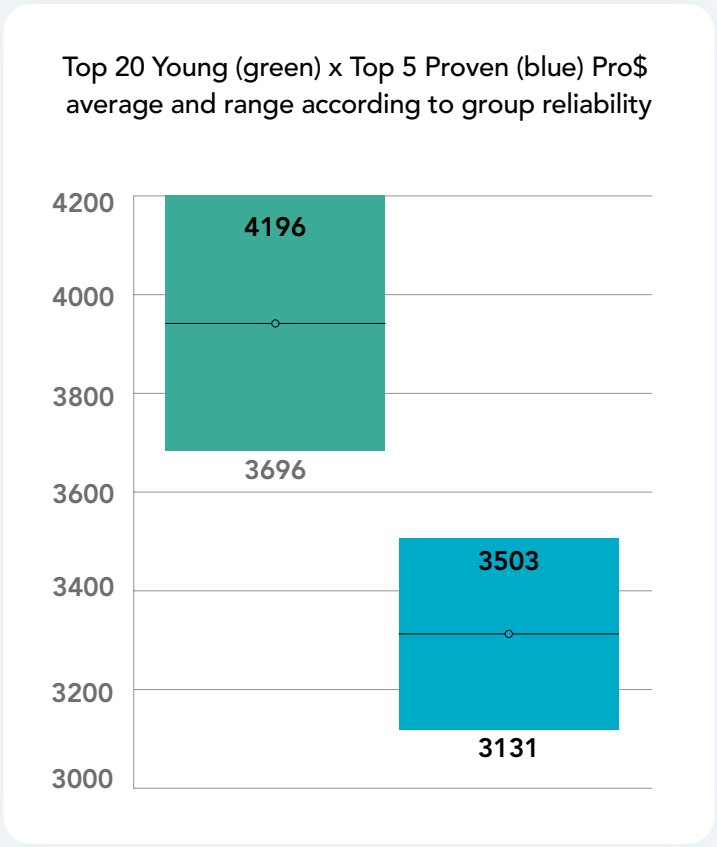


Building a strategy for your herd – do not put all your eggs in one basket

You may remember when AI companies would sell semen from young sires at a substantially discounted rate and also incentivize the classification of their daughters. This was common because the reliability of a bulls PA was low (30 to 35%). With a PA that low, the risk of 'putting all your eggs in one basket' became too high. Once these young sires' daughters started to calve, we would frequently see those sires removed from AI because their progeny were subpar. Now, the reliability gap between the predictions for a young genomic sire and a newly proven sire is much smaller. This is good news, as you can confidently take advantage of young bulls superior genetics in a safe way, by following this simple and essential strategy: Hedge your risks when using lower reliability genomic bulls by using a greater number of them. This means you are not going to breed all your cows to one or two bulls for half of the year, but use a group of bulls instead. Lower reliability means that the actual performance can be further from the prediction (higher or lower). You will find some genomic bulls may deliver some daughters below average, while others overperform. In the end, the reliability for the group average is high, which means that the average performance for the group of daughters is close to the prediction. This table helps to illustrate the idea; the reliability for a group of 3 bulls is similar to one recently proven bull. So, as a rule of thumb, for every proven bull that you would select in the past, aim for 3 or 4 young genomic bulls.

Number of young bulls in the group	Group Reliability (75% average individual)
3	91.6%
4	93.8%
5	95.0%
10	97.5%

You are already familiar with setting genetic criteria that a bull must reach in order to be included in your breeding program. Now consider adding a minimum group size for young genomic bulls to increase reliability! In the past, if you were comfortable using 3 or 4 proven bulls at any time, increase that number to around 10 young genomic sires at any one time. This allows you to take full advantage of young bulls superior genetics, while



controlling risk at levels comparable to highly proven bulls.

If you are looking at top tier genomic young sires, the gain achieved from selecting a group of these with higher potential (but slightly lower reliability) will outperform the top proven sires. The graphs illustrates this well – if you were to use the current top 20 young sires for Pro$, the average sire contribution would be between $3696 and $4196, while the sire contribution of the top 5 highest proven Pro$ sires would be between $3131 and $3503.

You can still take advantage even using just proven bulls

We talked a lot about young genomic sires without mentioning the female side. It is easy to blame the sire for a subpar heifer (or cow), but you must keep in mind that it is about the mating. A not-so-good dam will drag a good bull's progeny down, and even two good parents may not result in the best offspring. In consequence, this is often a reason producers completely stop using young bulls – sometimes, personal beliefs play a role too. If you are skeptical about using young genomic sires, the good news is that you can still benefit from genomic testing, by using it as a tool for different purposes.

One tool, several possibilities

The essential recommendation for everyone using genomic testing is to define clear goals to build a strategy around. In that sense, we see producers with several different approaches. Some producers use genotyping on heifers that fall in the "mid-pack" to re-rank them and potentially find a cutoff point to select the ones not to raise. This method has a clear and immediate economic impact especially for herds that have an excess of replacement heifers. This strategy is limited in that the full value of genomic testing is not realized on the best heifers that are going be used to create replacements. More and more we see producers extending genomic testing to larger groups of animals with the goal of not only deciding which animals to keep, but also to make better breeding decisions. This may include selecting heifers for sexed semen, beef semen, or to do ET/IVF. The benefits of genomic enhanced breeding values, correcting parent errors, haplotype and genetic recessive statuses benefit your best animals the most, as they drive the future of your herd.

A broad breeding strategy based on genomic results is a profitable, long term investment and has the ability to drastically increase your herd's profitability. This is due to two main factors: more accurate selection of the dams of the next generation; and more reliable and detailed information on traits that need to be emphasized in your breeding program. Breeding heifers solely based on the observed weaknesses of their dams is not optimal because these weaknesses may be environmental and not at all genetic, and the reliability of the parent average is low. The table helps illustrate how the higher conformation prediction translates into better scores in the first lactation; roughly, every 1-point increase on the Conformation EBV results in 0.5 higher average final score.

EBV Confirmation	0	2	4	6	8	10	12
Final Score Average	79.6	80.5	81.4	82.3	83.2	84.0	84.6

Take home messages

Altogether, the greatest impact of genomics is increasing the reliability of genetic predictions, which is proven to translate to faster genetic gains. You have seen it is possible to keep your risk very low with changes to old strategies. Even for those more skeptical about young genomic sires, there are impactful ways to use this profitable tool. We must always remember that one mating is not the solution for all of an animals weaknesses, and the dam is as important as the sire. There is no zero-risk investment, but a simple, well-designed strategy can hedge your risks while selecting the sires and dams of your future replacements based on genomic predictions to increase your herds long term profitability and longevity.