# Genetics

## Unlocking Genetic Potential- Precision Breeding for a More Profitable and Sustainable Future

The red meat sector continues to demonstrate that innovation and sustainability go hand in hand. Genomics is transforming how livestock producers make decisions, giving them more accurate, faster, and targeted tools to improve breeding outcomes and reduce waste. Thanks to investment in genetic technologies like CT scanning and DNA sampling, Scottish sheep farmers are enhancing the accuracy of breeding decisions and fast-tracking gains in traits that matter – such as carcase yield, growth rate, and overall efficiency.



### Key findings:

- Genomic accuracy is higher than phenotypic data alone
- Genomic breeding values can be used even without phenotypic information, though they are less accurate then with phenotypic information
- Breeding value accuracy can increase profitability and reduce wase in commercial sheep systems

## The Power of Genomics

This approach allows producers to breed animals that finish faster, produce more valuable carcases and deliver more profit per lamb – without increasing inputs or compromising welfare.

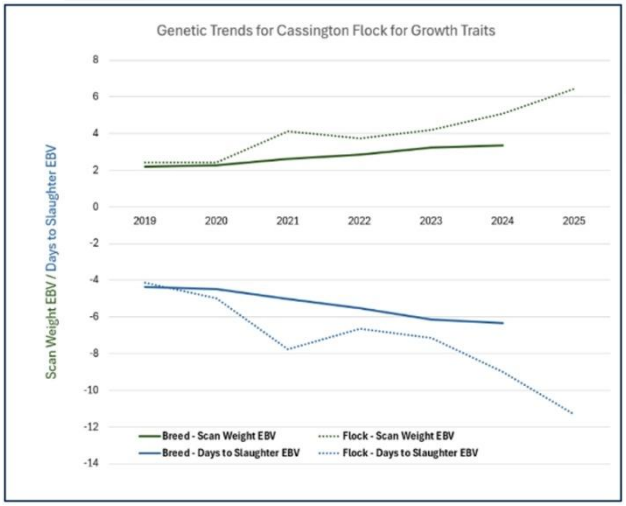
Quality Meat Scotland (QMS) in partnership with Signet Breeding has invested in cutting-edge research that shows genomic accuracy is higher than relying on phenotypic data alone. Genomic breeding values (GBVs) allow farmers to predict the genetic potential of their animals even in the absence of performance data, although the most powerful insights come when both data types are combined.

## Farm one: Targeting Faster Finishing

Matt Drummond's Hampshire Down flock is focusing on genetic improvement for growth and carcass traits has made significant strides in optimising performance. The breed is already known for its fast growth rates, but this farm is aiming to maximise the potential of these rapidly growing lambs.

Since the flock's formation in 2018, its genetic merit has increased by about 4kg at scanning time. Additionally, the genetic merit for speed of finishing has improved by approximately one week. These advancements are pivotal in enhancing the efficiency and profitability of the business.

The graph on adjacent illustrates the increase in scan weight (estimated breeding value) of the flock, compared to the national average for the breed (shown in green), as well as the reduction in days to slaughter for the flock, in comparison to the national average (shown in blue).

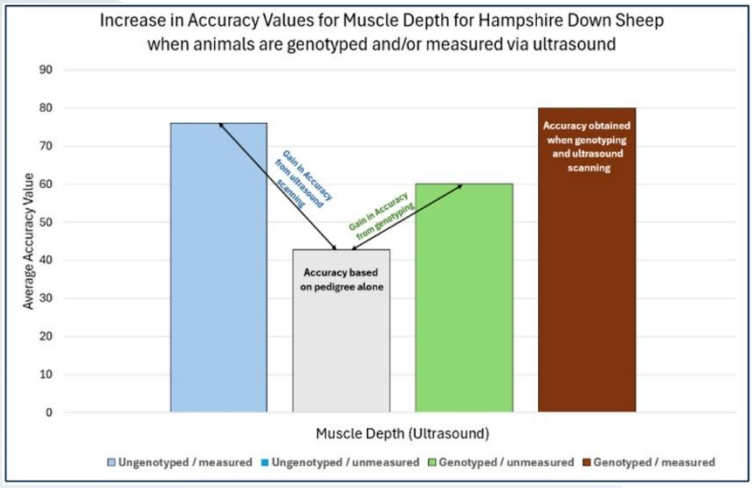


## Impact of Genomics

As part of the project, several breeding sheep from the flock were genotyped and added to the reference population of Hampshire Down sheep previously genotyped by the Hampshire Down Sheep Breeder's Association. Genotyping provides a direct assessment of the genetic variation in each individual animal, allowing for more accurate predictions of genetic merit. This is especially valuable in smaller flocks, where using Ultrasound scanning to assess carcass composition for every lamb may not be financially viable. In such cases, genomics can fill in the gaps.

The graph adjacent demonstrates how genomics can enhance the accuracy of breeding predictions for carcass traits. It includes two comparisons: the first compares animals that have had Ultrasound measurements for muscle depth with those that have not.

The blue and grey columns on the left show the accuracy improvement when animals without Ultrasound measurements are genotyped.




The green and brown bars illustrate the accuracy difference for genotyped animals with and without phenotype data. The graph highlights that the accuracy increases for genotyped animals when phenotypes are also recorded. Overall, it shows that higher accuracy can be achieved when animals are genotyped, compared to those that are not.

In summary, the Hampshire Down flock has made significant progress in genetic improvement, particularly in growth and carcass traits, through the use of genomics. Since its formation in 2018, the flock's genetic merit has increased in both scan weight and speed of finishing, leading to greater efficiency and profitability. Genotyping has further enhanced breeding predictions, especially in small flocks where ultrasound scanning may not be feasible. The application of genomics has also been instrumental in selecting potential replacement ewe lambs, enabling more accurate decision-making based on their genetic potential for over 20 traits. This approach is proving to be a valuable tool in optimising flock performance and long-term sustainability.

## Farm Two: Improving Shape, Not Just Size

Starting in 2012, Roy Macfarlane at West Lecropt began sending Hampshire Down lambs to the CT scanner sponsored by QMS for Scottish flocks. It was soon evident that, despite visually similar animals, there were significant differences in muscle yield and carcass shape. The Lecropt flock has a particular focus on improving the hind quarter of their rams, ensuring that growth rate improvements are paired with enhanced shape and yield.



In 2018, three ram lambs with notably deep gigots were assessed. Two of these rams were placed in pedigree flocks, while the third was provided to RamCompare, the National Progeny Test, a major research project supported by QMS. Genetic

evaluation of this ram revealed its potential to finish a week earlier, produce carcasses 0.4 kg heavier, and have breeding potential for carcass conformation that placed it in the top 5% of the breed.

Genomic breeding values combine known information about an animal, such as pedigree and phenotype records, with DNA assessments obtained through genotyping. This process enables parentage verification and the identification of traits like Scrapie resistance. When incorporated into genetic evaluations, genomics enhances the accuracy of predictions for traits that are difficult to measure across a wider population.

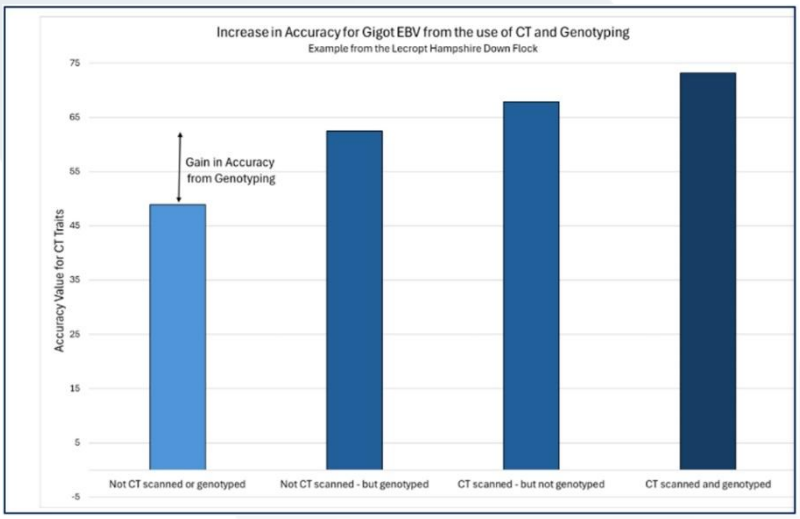
In flocks like Lecropt, where CT scanning is commonly used, even unmeasured lambs benefit from good accuracy for CT traits. By genotyping these lambs, the overall accuracy of genetic predictions can be improved by an additional 10%, even without subjecting all lambs to the CT scanner.

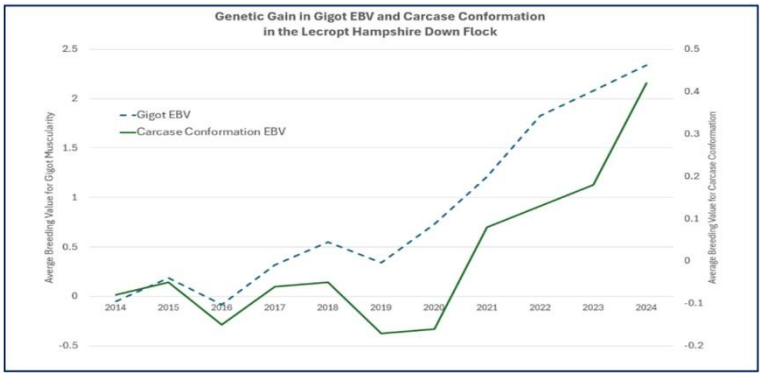
In the genomic age, it is essential that animals undergoing CT scanning are also genotyped. QMS is funding both CT scanning and supporting breeders in genotyping their animals, ensuring that genetic predictions for the wider population are more accurate.

The graph adjacent shows the increase in accuracy for genomic values as a result of both CT scanning and genotyping, highlighting that combining both methods yields the most accurate results.

The consequence of increased accuracy is a significant boost in genetic gain over time for the traits chosen by the breeder.

The graph below illustrates the remarkable genetic progress made in the Lecropt flock, showcasing the impact of improved accuracy in breeding decisions.




Farm Two has embraced genomics alongside CT scanning to enhance the accuracy of genetic predictions for its flock. Since QMS began supporting both CT scanning and genotyping, the farm has seen improved accuracy in its breeding decisions. By genotyping animals in addition to scanning them, the accuracy of genetic predictions for traits like carcass composition has been boosted by up to 10%.

This combination of technologies has led to significant genetic gains, particularly in traits such as muscle yield, growth rates, and carcass conformation. Overall, Farm Two's approach is demonstrating how genomics and CT scanning can work together to accelerate genetic improvement and improve flock performance over time.

## Supporting Progress

QMS is supporting both CT scanning and genotyping, recognising that data drives better decisions. The more animals that are genotyped, the better the predictions across the whole population – creating a powerful feedback loop that benefits all Scottish producers.

## Summary

Genomics is not just about high-tech science – it's about helping farmers breed better animals, reduce waste, and improve profits. The Scottish red meat sector is already seeing the impact:

- Increased accuracy means better breeding decisions
- Faster finishing and improved carcase quality boosts margins
- Greater genetic gain secures long-term sustainability



As we embrace innovation, Scotch Lamb producers are well placed to lead the way in responsible, efficient, and high-performing livestock production.