Photograph taken during Nicola Fetherstone's visit to Blackdale Stud, Riverton, New Zealand, as part of the Walsh Scholar International Training Programme 2019.

Can the Irish sheep industry benefit from New Zealand genetics?

TEAGASC research investigated the possible benefits of using elite maternal genetics in the Irish sheep industry.

The transfer of germplasm between countries occurs frequently across the beef and dairy industries. However, such practices are limited in sheep, with the exception of animals traded between a small number of countries such as Ireland, the United Kingdom and France, with animals tending to be traded based on their physical attributes rather than their genetic potential. Recent research findings from the INZAC flock in Teagasc Athenry have highlighted the potential genetic and economic benefits that can be achieved within the Irish sheep industry through the use of genetically elite maternal genetics sourced from either Irish or New Zealand flocks. The use of foreign genetics has been shown as a suitable method to accelerate genetic gain achievable within the domestic industry in both the beef and dairy industries. Given the potential benefit of incorporating elite maternal genetics into the Irish sheep industry, the most appropriate source of these genetics, coupled with the methods of disseminating them, must be investigated. Therefore, the objective of this research was to assess, using a gene flow model, whether the Irish sheep industry would benefit from the use of elite maternal genetics, sourced from either Irish or New Zealand flocks, and if so, how best to incorporate those genetics into the industry in order to maximise genetic gain.

Gene flow models

A gene flow model can be used to identify optimal breeding strategies that maximise the economic and genetic benefits, while allowing for the gradual improvement in the rate of genetic gain to be achieved over time. Previously, gene flow models have been used across the sheep, beef and dairy industries to quantify the impact of performance recording, genomic selection, genetic evaluations, or the use of foreign genetics on genetic improvement.

For this study, data used to generate the gene flow model was retrieved from the Sheep Ireland Replacement and the New Zealand Maternal Worth Indexes, as well as data generated from the INZAC research flock in Teagasc Athenry. The model predicted the genetic improvement, in economic merit, for future generations of commercial sheep as a consequence of the

widespread implementation of alternative breeding strategies. Various subpopulations were used within the model to demonstrate the current structure of the Irish sheep population. They included: conservative breeders who select animals based on physical attributes rather than genetics; progressive breeders who are actively performance recording and select animals based on genetics; foreign breeders who supply superior foreign genetics directly to commercial farmers; and, commercial farmers who are the end users of the domestic and/or foreign genetics.

In this study, three contrasting scenarios were investigated. A Base scenario was firstly modelled, which predicted future performance of the Irish sheep industry assuming no change to current breeding strategies. A Progressive Irish scenario modelled the impact of the shift of market share away from conservative breeders towards progressive breeders who use domestic maternal genetics. Finally, a New Zealand scenario investigated the impact of the direct use of elite New Zealand maternal genetics, whereby New Zealand rams were imported every five years.

For each scenario the economic and genetic benefits to the Irish sheep industry were calculated over a 20-year time frame. For the three modelled scenarios, the greatest economic and genetic gains were achieved by the Progressive Irish scenario, which had the potential to increase economic gains four fold over the base scenario (**Figure 1**). When a strategy including the widespread implementation of imported New Zealand genetics within the Irish sheep industry was investigated, the annualised cumulative benefit was almost three times greater than the Base scenario after the same time frame, but was less than that generated by the Progressive Irish scenario. Lambs born as a result of the implementation of the New Zealand import scenario benefit from an initial boost due to the superiority of the foreign genetics over domestic genetics. However, the long-term impacts of the New Zealand scenario are hampered by the foreign population having a low long-term genetic trend, and therefore benefits plateau faster than the Progressive Irish scenario.

Implications

Results from this research demonstrate that it is possible to substantially increase the genetic and economic benefits to the Irish sheep industry over time, without the use of foreign genetics, but through the strategic use of progressive domestic genetics. Essential to the success of this breeding strategy is a shift in the market share away from conservative breeders towards progressive breeders, therefore requiring Irish sheep breeders to become more engaged with the national breeding programme and select high genetic merit animals to become parents of the next generation. However, the use of foreign genetics, such as New Zealand genetics, may play a key role in triggering this shift. The gene flow model developed as part of this study now provides a roadmap for a future breeding strategy of the Irish sheep industry, and acts as a template for other scenarios or even industries to quantify their genetic and economic benefits as a result of foreign genetics, regardless of country or species.

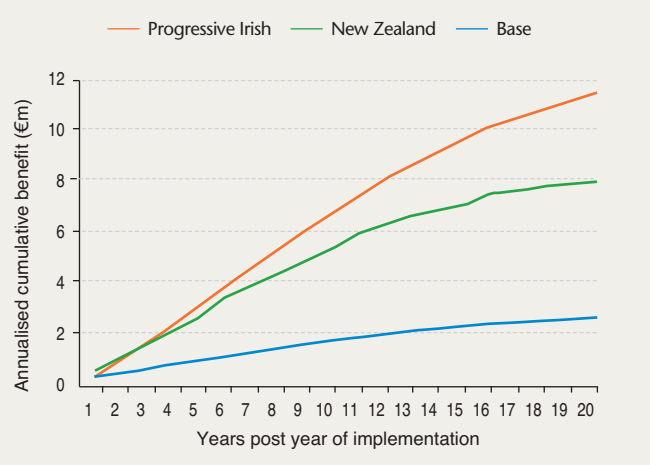

FIGURE 1: Annualised cumulative benefit (expressed in € millions) from year 1 to 20 post implementation of the Base, Progressive Irish and New Zealand scenarios.

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