



## Ram Compare NI: The effect of sire muscle EBV on lamb performance and carcass quality





## AFBI Research Team:

Naomi Rutherford, Tara Meeke and Aurélie Aubry

June 2021

## Acknowledgements:

RamCompareNI was funded by the Department of Agriculture, Environment and Rural Affairs (DAERA), AgriSearch and Dunbia, with support from AHDB, Sheep Ireland and LMC.

Thanks go to the staff at the Livestock Production Sciences and Food Sciences branches for their assistance with this work.



# Foreword

---



**Edward Adamson**  
Chair  
AgriSearch Sheep  
Advisory Committee

The use of genetics provides an important pathway for sheep producers to improve the performance of their breeding flock. Genetic improvement is also permanent and cumulative, with improvements made in one generation added to those made in previous generations. Internationally, the adoption of estimated breeding values into flock breeding programmes has been shown to increase both animal performance and the rate of genetic gain within sheep populations, leading to significant improvements in flock productivity. Economic analysis has also demonstrated that breeding programmes can prove extremely valuable despite the associated higher purchasing costs of high genetic merit rams.

AgriSearch has been a partner in the AHDB led RamCompare project since its inception in 2016. The RamCompare project is designed to trial strategies for capturing commercial data collected from slaughter lambs in the UK sheep industry. It is similar to central progeny tests that are taking place in Australia, New Zealand and Ireland.

As part of the most recent phase of the RamCompare programme AgriSearch in partnership with AFBI and Dunbia and with the support of AHDB and Sheep Ireland undertook a research project co-funded by DAERA under the Research Challenge Fund. This project set out to evaluate the effect of sire EBV for muscle (low versus high) and finishing diet on progeny performance, net feed efficiency and meat quality and examine the dynamics of net feed efficiency in finishing lambs. The results of this project are contained within this booklet.

These results clearly prove that EBVs are an invaluable tool for all farmers to use to achieve their desired breeding objectives. Regrettably the uptake of breed performance recording and the use of EBV in the NI sheep sector is relatively small in comparison to the mainland UK and the Republic of Ireland (ROI). Genetics play a crucial role in improving a flock's production efficiency, which in turn strongly influences the economic and environmental sustainability of the farm. Given the extent of the economic and environmental challenges facing the agricultural sector farmers can ill afford to ignore the benefits of using EBVs. A very well fed ram does not pass the bucket on to his progeny.

On behalf of AgriSearch I would like to thank AFBI, Dunbia, AHDB and Sheep Ireland for their contributions to this project. I would also like to thank DAERA for their financial support through the Research Challenge Fund without which this project would not have been possible.



Suffolk and Texel recorded rams were used in the study

# Introduction

Genetic improvement in commercial sheep flocks is mainly achieved through the purchase of breeding rams. However, when it comes to purchasing rams, there is often a strong emphasis placed on the visual appearance of the animal, together with the local reputation of breeders. As such, it has been reported that only 40% of UK sheep producers use estimated breeding values (EBVs) to select rams. EBVs are calculated based on the animal's own performance, as well as that of its relatives and progeny. The values assigned to an animal are then used to predict how its progeny will perform in relation to the breed average. EBVs are available for a range of performance traits and thus, are a valuable tool in ram selection, allowing producers to invest in the most suitable ram to achieve the desired breeding objectives of their flock. Through the use of clear and targeted breeding objectives, a flock is able to progress its rate of genetic gain and associated level of performance.

AFBI have been involved in a three year research programme called RamCompare NI, which is aligned with the wider RamCompare UK programme to evaluate the use of EBVs in sire selection and flock performance. As part of this research programme, AFBI have undertaken experimental work with the primary objective of evaluating the performance of lambs bred from rams of a high and low genetic potential (or EBV) for muscle depth.

EBVs for production traits such as muscling, growth and fat depth have become more widely available within the UK and Ireland. Muscling EBV provides an assessment of the depth of the loin muscle and therefore is an indication of lean meat yield. Furthermore, in the last number of years the implementation of genetic improvement schemes in the UK have led to significant improvements in lean growth potential. Therefore, it is important to have a better understanding of the impact of muscling EBV on overall lamb performance and carcass quality.

## Key Messages

1. Estimated breeding values (EBVs) are a valuable tool in implementing targeted breeding objectives
2. EBV's are becoming more widely available for production traits such as muscling, growth and fat depth
3. Selecting rams with a high muscling EBV resulted in lambs reaching target slaughter weight 10 days earlier than lambs sired by low muscling EBV rams
4. Lambs sired by high muscling EBV rams were leaner at slaughter, but carcass conformation was similar to those sired by low muscling EBV rams

# The Study

This research programme was conducted over two breeding years (2017 and 2018 mating years). Composite ewes from the AFBI flock were bred using artificial insemination and a total of 22 sires of Suffolk or Texel breed were used over the two years. Sires were all performance recorded by either Sheep Ireland or Signet breed evaluation systems, and were classified into one of two groups; high muscling EBV or low muscling EBV.

All other EBVs from the selected sires were kept as constant as possible, so that the only difference in EBVs between selected rams was that for muscling.

A total of 808 lambs were monitored

from birth to slaughter, with lambs being weaned at an average age of 14 weeks and slaughtered at a target live weight of 45kg. Over the course of the study lambs were weighed fortnightly from 6 weeks of age. Lambs were also ultrasound scanned at 14 weeks of age to measure muscle and fat depth. A subset of lambs were also scanned using X-ray computer tomography (CT) at 16 weeks of age. At slaughter, live weight, carcass conformation, carcass fat class, kill out percentage and days to slaughter were recorded for all lambs. In addition, the saleable meat yield of 272 lambs was evaluated to determine the total quantity of meat, fat and bones in each third of the carcass.



RamCompareNI lambs

# Outcomes

**Table 1:** Live weight performance of lambs sired by rams of a high or low muscling EBV

	High Muscling EBV	Low Muscling EBV
Birth weight (kg)	4.8	4.9
Wean weight (kg)	<b>36.1</b>	<b>35.0</b>
Slaughter weight (kg)	44.3	44.1
ADG birth - weaning (g/d)	<b>274</b>	<b>265</b>
ADG birth - slaughter (g/d)	<b>199</b>	<b>192</b>

\*ADG = Average Daily Gain

*Results in bold are statistically significantly different*

Table 1 summarises the statistical findings of the study in terms of live weight performance of lambs in this study, and demonstrates that muscling EBV had no impact on lamb birth weight. However, it was from birth to weaning that lambs sired by rams of a high muscling EBV outperformed those sired by a low muscling EBV ram.

As a result, high muscling sired lambs were 1.1kg heavier at weaning, with a greater average daily gain (ADG) during this time. All lambs were drafted for slaughter at a target weight and therefore slaughter weight was very similar for the two groups of lambs. Yet, ADG from birth to slaughter was still slightly, but significantly greater

for high muscling EBV sired lambs.

CT scanning was used to determine the weight of muscle, fat and bone in each third of the lamb.



Lamb in CT scanner

The results in Table 2 show that in all three sections of the lamb, those of a high muscling EBV had a greater muscle weight and a lower fat weight than lambs of a low muscling EBV. These findings indicate that

high muscling EBV sires produce a leaner lamb with a greater proportion of muscle. No significant effects were detected when analysing the ultrasound scanning data.

**Table 2:** Weight of muscle, fat and bone in lambs at 16 weeks of age, determined by CT scanning

	High Muscling EBV	Low Muscling EBV
<b>FORE</b>		
Total weight (kg)	6.16	6.09
Muscle weight (kg)	<b>4.13</b>	<b>3.96</b>
Fat weight (kg)	<b>1.01</b>	<b>1.13</b>
Bone weight (kg)	0.99	0.99
<b>SADDLE</b>		
Total weight (kg)	4.80	4.69
<b>Muscle weight (kg)</b>	<b>3.42</b>	<b>3.22</b>
Fat weight (kg)	<b>0.74</b>	<b>0.86</b>
Bone weight (kg)	0.66	0.64
<b>HIND</b>		
Total weight (kg)	5.79	5.73
Muscle weight (kg)	4.45	4.34
Fat weight (kg)	<b>0.52</b>	<b>0.57</b>
Bone weight (kg)	0.82	0.82

*\*Results in bold are statistically significantly different*

In Table 3, the impacts on carcass characteristics are presented. These show that the two groups of lambs had similar carcass weights and kill out percentages.

Despite the CT scanning showing that high muscling EBV lambs had a greater proportion of muscle, this trend was not detected by the current EUROP carcass grading system, as carcass grade was unaffected by sire EBV. However, fat class score was lower for high muscling EBV sired lambs, which further confirms their tendency to produce a leaner carcass.

Age at slaughter was where the largest impact was observed, with high muscling EBV sired lambs reaching target slaughter

weight 10 days earlier than low muscling EBV sired lambs.

In the context of this study, muscling EBV did not show any impact on saleable meat yield or instrumental meat quality, assessed on loin samples in terms of colour and tenderness.



**Table 3:** Carcass characteristics of lambs sired by rams of a high or low muscling EBV

	High Muscling EBV	Low Muscling EBV
Carcass cold weight (kg)	20.8	20.6
Conformation grade	3.31	3.31
Fat class score	<b>2.63</b>	<b>2.71</b>
Kill out %	46.6	46.5
Age at slaughter (days)	<b>218</b>	<b>228</b>

*\*Conformation grades were scored as 1 to 5 ( 1 = P to 5 = E)*

*Fat classes were scored as 1, 2, 2.75, 3.25, 3.75, 4.25, 5 (corresponding to 1, 2, 3L, 3H, 4L, 4H and 5)*

*Results in bold are statistically significantly different*

# Practical Considerations

This experiment demonstrates the improvements that can be achieved in lamb performance through the use of sire selection based on EBVs. Here, through the selection of just one EBV, days to slaughter was reduced by 10 days. This is a direct saving for farmers, through a reduction in production costs and increased production efficiency.

Furthermore, in this study both high and low rams were performance recorded, and thus if a comparison had been conducted with commercial, unrecorded stock rams, then even greater improvements in lamb performance may have been achieved. Therefore, farmers could see a substantial return from implementing a targeted breeding strategy using EBVs, with the potential for even greater improvements by selecting for more than one EBV.

In relation to carcass composition, differences in the proportions of muscle and fat were detected at 16 weeks of age using CT scanning. Although lambs of a high muscling EBV had a slightly lower fat class, carcass conformation was unaffected by muscling EBV. This could be due to a number of factors including the time lag between CT scanning and slaughtering, or it may be due to a lack of sensitivity in the current grading system, which did not detect differences in carcass composition to the same extent as CT scanning. This is an area that will require further research.



# Other Sources

## AgriSearch Booklets:

1. The Effects Of Genetics Of Lowland Cross-Bred Ewes And Terminal Sires On Lamb Output And Carcass Quality. You can read this at the AgriSearch website [here](#).
2. Developing Low Cost 'Natural-Care' Systems Of Sheep Production. You can read this at the AgriSearch website [here](#).
3. Future Proofing Sheep Farming: Breeding For Performance Roadshow. You can read this at the AgriSearch website [here](#).
4. Future Proofing Sheep Farming: Lamb Finishing Roadshow. You can read this at the AgriSearch website [here](#).
5. Diagnosis And Treatment Of Lambness In Sheep. You can read this at the AgriSearch website [here](#).

## Sheep Ireland

"Sheep Ireland" is the trading name of Sheep Database CLG and was formed in 2009 after a period of extensive consultation with the sheep industry. They are responsible for increasing the rate of genetic gain in the Irish sheep sector by identifying and promoting the use of rams with more profitable and sustainable genetics.

More information can be found on their [website](#).

## AHDB Beef and Lamb

AHDB beef and lamb published the final results from the first stage of the RamCompare project, which spanned the 2015 - 2017 breeding seasons.

You can read the results from this study [here](#).

## Signet Breeding

The latest RamCompare results were released on 20th May 2021.

You can read the published results, and more, on the Signet [website](#).

## College of Agriculture, Food & Rural Enterprise (CAFRE)

The Northern Ireland Sheep Programme was launched in May 2019 at Balmoral Show. The programme is a joint collaboration between CAFRE, Dunbia and the Irish Farmers Journal.

For more information, visit the [CAFRE website](#).

## DISCLAIMER

The Northern Ireland Agricultural Research and Development Council (AgriSearch) has provided funding for the RamCompareNI project but has not conducted the research. AgriSearch shall not in any event be liable for loss, damage or injury suffered directly or indirectly in relation to this report or the research on which it is based.



Innovation Centre  
Large Park  
Hillsborough  
County Down  
Northern Ireland  
BT26 6DR

T: 028 9268 1539  
E: [info@agrisearch.org](mailto:info@agrisearch.org)

[www.agrisearch.org](http://www.agrisearch.org)