

## **An assessment of the benefits of utilising Inverdale-carrying texel-type rams to produce crossbred sheep within a Welsh context**

### **Introduction**

Less than 60% of all lambs sold in the UK meet mainstream buyer requirements, and the situation is worse than this within Wales because of the high proportion of hill and upland flocks. This is partially attributed to poor carcass quality of the longwool crossing breeds, such as the Bluefaced Leicester and Border Leicester, used extensively for crossing onto poor carcass quality hill breeds for the production of Mule and Halfbred ewes. Indeed, these longwool crossing breeds contribute 19% of genes to all slaughtered lambs in the UK. As well as resulting in Mule/Halfbred ewes of modest carcass quality for crossing with rams of the terminal sire breeds in lowland flocks, the (by-product) wether lambs arising from Mule/Halfbred production are themselves of poor carcass quality. Improving the carcass quality of these wether lambs, and also the crossbred ewes which dominate the lowland sector of the UK sheep industry, is therefore a priority.

As farm incomes come under pressure, farmers who can both improve productivity and more closely meet market requirements should see a substantial increase in their gross margins. Introduction of the Inverdale gene in the heterozygous condition, a sex-linked gene carried on the X-chromosome and first identified in New Zealand, increases ovulation rate and the number of fertilised eggs implanted, and hence offers the potential to facilitate an improvement in lambing percentage as long as lamb survival can be maintained. If it is incorporated into an appropriate sire breed, it could offer Welsh Hill/Upland farmers a mechanism for generating replacement crossbred females for sale to lowland producers that produce terminal sire-cross lambs better able to meet market requirements. These Inverdale-cross ewes should therefore have added value and command a price premium compared with the standard Mule/Halfbred ewe. In addition, this crossbreeding strategy will have the added advantage of providing (by-product) wether lambs with improved carcass quality and value. Both of these benefits could significantly affect the finances of an enterprise when introduced as part of a managed breeding programme.

Within the UK, the Inverdale gene has now been introgressed into Texel sheep, a breed with high carcass quality. By supplying Inverdale carrier [ $X_1Y$ ] rams (the presence of the gene can be determined from a blood sample using a simple patented gene probe) to upland producers for crossing onto non-carrier draft hill ewes [ $XX$ ], all resulting female progeny will carry a single copy of the Inverdale gene [ $X_1X$ ]. All resulting wether lambs will be non-carriers [ $XY$ ], but should have improved carcass quality attributes by being Texel x Hill types.

The effect of the Inverdale gene on ewe fecundity is superimposed on the normal quantitative variation in ovulation rate and litter size typical of non-carrier animals. The development of an appropriate nutritional management strategy is therefore essential to avoid hyperprolificacy that can result in low lamb birth weights and compromise lamb viability. Preliminary data from New Zealand suggest that this can be achieved through negative flushing and precise step feeding after mating. Such strategies are well within the capability of well managed lowland flocks (e.g. those flocks supplying lambs into the Waitrose scheme within Wales). However, there is first a need to evaluate the extent of the lift in ovulation rate and litter size when the Inverdale gene is incorporated into crossbred ewes of UK origin produced by crossing an Inverdale-carrying texel-type ram onto ewes of UK hill breeds. Furthermore, there is also a need to quantify the benefits on carcass weight and carcass quality of (by-product) wether lambs when using an Inverdale-carrying texel type ram rather than a Bluefaced Leicester ram crossed onto hill ewes.

This development project therefore aimed to provide preliminary data on the performance which can be achieved by using the Inverdale technology in a Welsh context. It involved evaluation of contemporary wether lambs (Inverdale texel-type-x and BFL-x) out of hill ewes reared in the upland crossbreeding situation, as well as evaluation of contemporary Inverdale texel-type-x and BFL-x ewes and their progeny maintained in a lowland environment. Essentially, the use of contemporary Welsh Mules (both wethers and ewes) is to provide the necessary benchmarking of performance of Inverdale-carrying animals against the industry standard which underpins the UK stratified crossbreeding structure.

## Aim and Objectives

The overall aim of this development project was to benchmark the performance of sheep carrying the Inverdale gene against the traditional Mule.

There were two parts to this initial development activity, each with their own specific objectives:

- (i) An assessment of the performance (growth and carcass quality) of wether lambs out of hill ewes when sired by either Inverdale texel-type or Bluefaced Leicester rams;
- (ii) An assessment of the biological performance of crossbred ewes, carrying one copy of the Inverdale gene, and their terminal sire cross lambs, compared with Welsh Mule ewes.

## Results

### *(i) Assessing the performance of wether lambs out of hill ewes*

375 Hardy Speckle Faced and Welsh Mountain ewes were randomly allocated to be mated (through a combination of AI and natural service) to Inverdale texel-type and BFL rams, with all ewes being kept under common management thereafter. The resulting progeny were assessed for survival, growth and u/s measures of carcass composition (both sexes), with carcass weight and classification data also being collected on wether lambs. This approach was repeated for the 2006 mating season, and the results from both years will then be combined for detailed statistical analysis. This report therefore provides interim information based on data from wether lambs collected at slaughter.

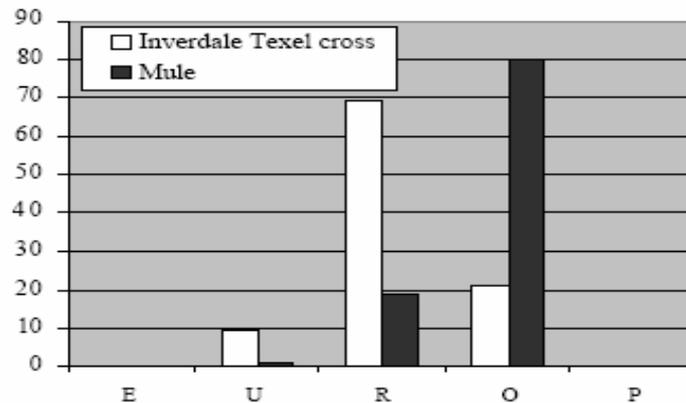
The results in Table 1 and Figure 1 show that Inverdale Texel-cross wether lambs had an average carcass weight of 16.70 kg, with most lambs (79%) having a conformation score of R or better and with the majority (87%) in the target fat class of 2/3L at slaughter. While Mule lambs had a slightly higher carcass weight of 17.35 kg, 49% were in fat class 3H or more, and most of the lambs (80%) had a conformation score of O at slaughter. The differences in fat class indicate that Mule lambs were significantly more mature at slaughter than their Inverdale Texel-cross counterparts. Had both breeds been slaughtered at the same target fat class of 2/3L, which was the intention, then the differences in carcass weight would have been much smaller and the differences in conformation even greater. With the greater number of lambs available when the data from the 2007 lamb crop are available it will be possible to statistically adjust carcass weights to a constant level of finish to investigate this effect more fully.

The average market price paid was £40.78 for Inverdale Texel-cross lambs and £38.20 for Mules, a difference of £2.58 in favour of the Inverdale Texel crosses. This takes into account the premiums and penalties determined by their carcass conformation grade, fat class and carcass weight. These results confirm that, at least as far as the wether lambs out of hill ewes are concerned, the Inverdale Texel has significant benefits for upland flocks in Wales and provides a carcass far better suited to market requirements than Mule wethers.

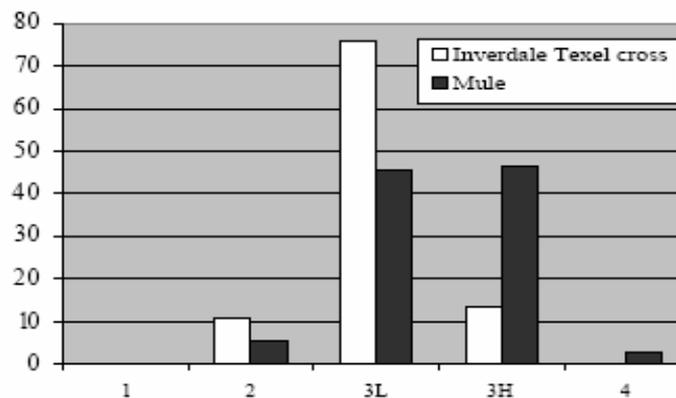
**Table 1.** Measurements of carcass traits of Inverdale Texel-cross and Bluefaced Leicester-cross (Mule) wether lambs out of hill ewes

	Inverdale Texel-cross lambs	Bluefaced Leicester-cross (Mule) lambs
Carcass Weight (kg)	16.70	17.35
Conformation grade		
% E	0	0
% U	9.5	1.0
% R	69.3	18.7
% O	21.2	80.3

% P	0	0
Fat class		
% 1	0	0
% 2	10.8	5.6
% 3 L	75.8	45.4
% 3H	13.4	46.4
% 4	0	2.6



**Figure 1a.** Percentages of Inverdale Texel-x and Bluefaced Leicester-x wether lambs in each conformation class



**Figure 1b.** Percentages of Inverdale Texel-x and Bluefaced Leicester-x wether lambs in each fat class

**(ii) Assessing the performance of Inverdale Texel-x-hill ewes and their terminal sire-x progeny**

Approximately 80 Inverdale Texel x Scottish Blackface second crop ewes, 20 non-carrier Inverdale Texel x Scottish Blackface ewes and a contemporary group of second crop Welsh Mule ewes were mated with Charollais rams in the autumn of 2005, and were mated again in autumn 2006. The Inverdale Texel-x ewes were acquired by Innovis following their takeover of Britbreed and the associated acquisition of the Inverdale franchise from Inverdale Europe.

The Inverdale Texel and non-carrier rams used by Inverdale Europe to produce the crossbred ewes for this part of the study were early generation animals following initial introgression of the Inverdale gene through crossbreeding with New Zealand Romney sheep followed by backcrossing to Texels. They therefore still contained a significant proportion of Romney blood. While this may impact on carcass traits, their Inverdale carrier status, confirmed using DNA tests, still allowed some preliminary comparisons of reproductive performance and management between these Inverdale crossbred ewes and their Welsh Mule contemporaries.

Evidence from commercial farms using sheep carrying the Inverdale gene in New Zealand have highlighted the need to negatively flush the ewes over the pre-mating period to avoid too high a proportion of triplet births. This is quite different from the UK practice of positively flushing Mule ewes over the same period to maximise their litter size. In 2005 the negative flushing of the Inverdale Texel-x ewes was achieved by maintaining them on poor quality Tir Gofal grazing land at Lovesgrove, while in 2006 they were maintained on a limited area of quality grassland at Penglais Farm. In both years the Mule ewes were flushed conventionally on abundant quality grassland at Penglais Farm.

Because the ewes are only now lambing for the second time and lambing data are not yet available following the 2006 matings, the comparative information for the Inverdale crossbred and Mule ewes presented in Table 2 is limited to the scanning information.

**Table 2.** Distribution of litter sizes and predicted lambing % for the three different ewe breeds

	Number ewes				*
	Barren	Single	Twin	Triplet+	Lambing %
<b>2005/06</b>					
Inverdale Texel x hill <sup>†</sup>	5	26	45	19	186
Texel x hill	0	12	6	0	133
Mule	1	22	62	4	178
<b>2006/07</b>					
Inverdale Texel x hill	4	12	49	29	214
Texel x hill	0	5	9	0	164
Mule	0	17	62	7	188

\* Predicted lambing % from scanning data

<sup>†</sup> There was evidence of mild enzootic abortion in some ewes

As expected, the results clearly show the high prolificacy of the Inverdale Texel-x-hill ewe compared with the non-Inverdale Texel-x-hill ewes. Furthermore, the predicted lambing % of the Inverdale Texel-x-hill ewes was higher than that for Mule ewes in both years of study. While the Mule ewes were flushed in the conventional manner over the pre-mating period in both years which resulted in similar predicted lambing % figures, the Inverdale Texel-x-hill ewes and the Texel-x-hill ewes that had been subjected to negative flushing on limited grazing of better quality pastures in 2006 had a far higher predicted lambing % than when they were negatively flushed on poor quality pasture in 2005. These differences highlight the need for further research to investigate optimum management of the Inverdale crossbred ewes over this critical period to avoid a high incidence of triplet+ births, with all of their attendant management problems. However, what is already clear is that the management of the Inverdale crossbred ewe over the pre-mating period will need to be substantially different from that of the conventional Mule. Furthermore, it will be important to compare the actual rather than just the predicted lambing % from the different breeds, but this will only be possible once the 2007 lamb crop have been reared and sent for slaughter.

The carcass data from the terminal sire lambs out of the Inverdale-x and Mule ewes from the 2006 lamb crop are presented in Table 3. The progeny out of the Inverdale-x ewes were on average 0.8kg lighter than those out of Mule ewes. It is also clear that, for both breed crosses, all or nearly all of the lambs were slaughtered at the desired fat class of 2/3L.

**Table 3.** Carcass characteristics of the 2006 born terminal sire-x lambs out of Inverdale Texel-x-hill and Mule ewes

	Charollais x Inverdale Texel- cross lambs	Charollais x Mule lambs
Carcass Weight (kg)	17.5	18.3
<b>Conformation grade</b>		
% E	1.9	0.9
% U	27.1	9.9
% R	67.3	79.3
% O	3.7	3.7
% P	0	0
<b>Fat class</b>		
% 1	0	0
% 2	36.4	27.9
% 3 L	63.6	67.6
% 3H	0	4.5
% 4	0	0

However, while there was a clear advantage in conformation for the progeny of the Inverdale-x ewes (29.0% E/U conformation) compared with the progeny of Mule ewes (10.8% E/U conformation), it is notable that in both breeds 96.3% of the lambs achieved a conformation grade of R or better.

It is evident that the carcass quality differences for the progeny of Inverdale-x compared with Mule ewes is much smaller than for the wether lambs sire by Inverdale texel-type and Bluefaced Leicester rams out of hill ewes presented in part (i) above. However, there have been a further four generations of backcrossing of Inverdale Texels to high index Texel sheep to supply the rams used for part (i) compared with the rams used to sire the Inverdale-x ewes used for part (ii). It is highly likely that this will have accounted for the both the lower carcass weights of the progeny out of the Inverdale-x ewes and their smaller conformation advantage compared with the wether lambs out of the hill ewes. The ewe lambs produced from the matings in part (i) above have been retained for breeding, and will be mated for the first time in 2007. It will therefore be very interesting to investigate whether the far larger carcass conformation advantages seen for the wether lambs out of the hill ewes are sustained through to their terminal sire-cross lambs.