



Lifetime performance of crossbred ewes in the hill sheep sector

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Introduction (1)

- 57.3% breeding ewes in Northern Ireland are found in Severely Disadvantaged Areas (SDAs)

(DARD, 2005)

- Output from hill flocks is often constrained by:
 - ❖ Poor reproductive performance in ewes
 - ❖ Low growth rates of lambs
 - ❖ Lamb carcass conformation often fails to meet market requirements (R grade or better)

(Carson et al., 2001)

- Improvements in production efficiency and market returns are needed to ensure hill sheep production remains economically and environmentally sustainable

Introduction (2)

- Hill sheep systems in the UK are dominated by purebred ewe genotypes, mainly the Scottish Blackface (BF)

(DEFRA, 2004)

- Crossbreeding can be used to introduce complementary traits and exploit heterosis

- Retaining Lleyn X BF or Texel X BF females increased lamb output at weaning by up to 10% compared with purebred Blackface ewes

(Speijers et al., 2007)

- Longevity is a key issue for hill flocks, therefore need to consider lifetime performance of the crossbred genotypes



Aims of study

To investigate the relative merits of Scottish Blackface (BF) versus crossbred hill ewe genotypes on:

1. Lifetime lamb output
2. Ewe longevity
3. Main reasons for disposal

Materials and Methods (1)

- Crossbreeding study carried out on 6 hill flocks across Northern Ireland
- On each farm 400 Blackface ewes (200/year) crossed with Blackface, Cheviot, Swaledale, Lleyne and Texel rams
- F1 females retained for breeding at 18 months old
- F1s mated to Texel, Suffolk, Lleyne and Dorset rams in single sire mating groups, balanced for ewe live weight, genotype, BCS and age
- F1 performance assessed over a 5-year period (November 2003-August 2008)



Materials and Methods (2)

- Barren ewes culled after scanning (except 1st parity ewes)
- Ewes with functional abnormalities culled at weaning and the reason(s) for culling noted

Recordings

- Ewe live weight and body condition score
(mating, 6 weeks pre-lambing, 6 weeks post-lambing, weaning)
- No. & condition of permanent incisors
- Lambs born & weaned
- Lambing difficulty score
- Mothering ability
- Colostrum score
- Lameness score
- Lamb sex & weights at birth, 6 weeks old and weaning
- Lamb growth rate to weaning
- Timing of death or disposal
- Reason for death/disposal, where possible

Statistical Analysis

- Total lifetime output determined from the product of:
 1. Proportion of productive ewes at each parity
 - estimated from a binomial model, including fixed effects for farm, year of birth and breed
 2. Mean productivity (per ewe lambed) at each parity
 - estimated using REML analysis, including fixed effects for farm, breed, parity, breed x parity and breed x farm interactions
- Ewe survival was analysed by regression analysis using a Cox Proportional Hazard model, including factors for farm, year of birth and breed
- Culling data were analysed using a binomial model with fixed effects for farm, year of birth and breed

1. *Effects of hill ewe genotype on lifetime (5-year) lamb output per ewe*

	<i>Total lambs born</i>	<i>Total birth weight (kg)</i>	<i>Total lambs weaned</i>	<i>Total weight weaned (kg)</i>
Blackface	4.91 ^a	18.4 ^a	4.13 ^a	123 ^a
Swaledale X BF	5.81 ^c	22.1 ^b	4.88 ^b	148 ^{bc}
Cheviot X BF	5.35 ^b	21.4 ^b	4.57 ^b	141 ^b
Lleyn X BF	5.76 ^{bc}	21.7 ^b	4.92 ^b	150 ^c
Texel X BF	5.37 ^b	21.5 ^b	4.64 ^b	143 ^b
s.e.d	0.212	0.856	0.199	6.0
Sig.	*	*	*	*

2. Effects of hill ewe genotype on the prop. of productive ewes at each parity (Base = Year 0)

	Parity				
	1	2	3	4	5
Blackface	0.87	0.80 ^a	0.67 ^a	0.54	0.32
Swaledale X BF	0.92	0.87 ^b	0.80 ^b	0.62	0.36
Cheviot X BF	0.91	0.84 ^{ab}	0.69 ^a	0.55	0.43
Lleyln X BF	0.92	0.87 ^b	0.69 ^a	0.55	0.38
Texel X BF	0.91	0.87 ^b	0.70 ^a	0.52	0.39
s.e.d	0.027	0.033	0.042	0.052	0.075
Sig.	NS	*	*	NS	NS

3. Effects of hill ewe genotype on ewe survival

	<i>Hazard ratio</i>	<i>95% CI</i>	<i>Probability</i>
Blackface	1.000	–	–
Swaledale X BF	0.694	0.540 – 0.891	0.004
Cheviot X BF	0.776	0.610 – 0.986	0.038
Lleyn X BF	0.902	0.720 – 1.129	0.368
Texel X BF	0.852	0.680 – 1.067	0.163

4. Effects of hill ewe genotype on ewe mortality

<i>Dam breed</i>	<i>Prop. ewes dead or missing</i>	<i>Time of death</i>				
		<i>Pre- scan</i>	<i>Pre- lamb</i>	<i>Post- lamb</i>	<i>Pre- wean</i>	<i>Post- wean</i>
Blackface	0.37	0.13	0.24	0.18	0.15	0.31
Swaledale X BF	0.36	0.06	0.22	0.18	0.27	0.26
Cheviot X BF	0.29	0.15	0.16	0.19	0.17	0.31
Lleyn X BF	0.32	0.15	0.15	0.18	0.15	0.35
Texel X BF	0.35	0.08	0.23	0.20	0.16	0.33
s.e.d	0.042	0.049	0.063	0.063	0.062	0.073
Sig.	NS	NS	NS	NS	NS	NS

5. Effects of hill ewe genotype on culling rates and the primary reason for culling

Dam breed	Prop. ewes culled	Reason			
		Barren	Udder	Teeth	Feet
Blackface	0.28 ^b	0.45 ^b	0.17	0.24 ^b	0.04
Swaledale X BF	0.16 ^a	0.41 ^{ab}	0.18	0.09 ^a	0.03
Cheviot X BF	0.28 ^b	0.46 ^b	0.18	0.19 ^{ab}	0.00
Lleyn X BF	0.31 ^b	0.27 ^a	0.24	0.16 ^{ab}	0.05
Texel X BF	0.25 ^b	0.32 ^{ab}	0.26	0.17 ^{ab}	0.04
s.e.d	0.039	0.055	0.073	0.064	0.032
Sig.	*	*	NS	*	NS

Conclusions

- Significant increase in lifetime (5-year) lamb output of hill ewes can be achieved by substituting pure Scottish Blackface ewes with crossbreds:
 - ❖ +0.44-0.79 lambs weaned/ewe
 - ❖ +18-27 kg weaned lamb/ewe
- Greatest improvement in lifetime lamb output achieved with Lleyn X BF and Swaledale X BF ewes due to their higher fertility
- Crossing with a second hill breed (Swaledale, Cheviot) produced replacement females with improved longevity
- Crossbreeding to produce replacement females should be adopted more widely on UK hill flocks

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