BENCHMARKING MATERNAL GENETICS IN THE LAMB INDUSTRY

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SUMMARY

The design and early results from the national central progeny test for maternal sires in the lamb industry are presented. Sires are mated to Merino ewes at 3 linked sites (Cowra, Hamilton and Struan/ Rutherglen) to produce >25 1stX ewe progeny. 1stX wethers are slaughtered at heavy carcass weights and 1stX ewes are mated to terminal sires over 3 years. Sire EBVs for 1stX meat traits from the first 21 sires tested in 1997 showed large variation for weight (+4.1 to -7.5 kg), fat (-6.9 to +6.0 mm GR) and muscle (+1.8 to -1.0 cm^2 eye muscle area). 1stX daughters of the 12 sires tested at Cowra in 1997 were mated to Poll Dorset rams at 7 months of age. The sire mean daughter performance varied from 4.6±3.2 to 32.9±3.7 kg for total weight of lamb weaned per ewe joined ($P<0.01$). Sires varied and rankings changed for the components, ewes lambing, litter size, lamb survival and weaning weight. These preliminary results show the large impact of maternal sire selection on lamb productivity.

Keywords: EBVs, meat, lamb production, LAMBPLAN

INTRODUCTION

Central progeny tests have demonstrated a great range in performance of lambs from different terminal sires (Banks *et al.* 1995). The industry is benefiting from using LAMBPLAN (Banks and Kinghorn 1997) and producers are paying more for high merit terminal sires (Ferguson and Fogarty 1997). Use of superior maternal genetics has the potential for even greater increases in lamb productivity and profitability. The maternal sire central progeny test (MCPT), provides genetic information to assist seedstock breeders and lamb producers to identify the best maternal genes that suit their production system. MCPT also encourages greater use of LAMBPLAN by the maternal sector of the industry.

Progeny testing is a powerful tool to:

- identify superior sires for breeding
- demonstrate variation between sires for all traits affecting profitability
- benchmark sires with others in the industry

MCPT tests the merit of maternal sires where it counts: their ability to produce crossbred lambs and ewes with superior productivity that are efficient and profitable for the producer. This paper outlines the design of the MCPT and presents growth and carcass performance from crossbred wether progeny and lambing performance from crossbred daughters mated at 7 months of age.

MATERIALS AND METHODS

MCPT design. Top maternal sires are nominated by industry breeders and mated to Merino (and Corriedale at Hamilton) ewes to test the lamb performance of their crossbred progeny. Lamb production (lambing rate, 2ndX lamb growth and carcass) and wool production (fleece weight and fibre diameter) from the 1stX ewe daughters of the maternal sires are measured, as well growth and carcass performance of their 1stX wether progeny. The 1stX ewes are retained for mating to terminal sires over 3 years to assess lambing performance and other traits in a range of production systems. Matings of maternal sires are at 3 sites over 3 years (Cowra and Hamilton, Feb/Mar 1997-1999; Struan, Jan 1998-2000) and will involve progeny testing a total of about 90 sires. Link sires allow combined best linear unbiased prediction (BLUP) analysis across sites and years. The matings aim to produce >25 1stX ewes per sire. 1stX ewes produced at Struan will be evaluated at Rutherglen.

The production systems for evaluation of the 1stX ewes are as follows: Cowra - ewes split to autumn and spring joining systems, with first joining occurring at 7 and 14 months of age respectively; Hamilton - ewes joined in autumn, with first joining occurring at 7 months of age; Rutherglen - ewes joined in spring/summer, with first joining occurring at 17 months of age.

Management. In March 1997, 21 sires (including 3 links) were mated at Cowra and Hamilton using thawed frozen semen and laparoscopic AI. The sires were from the range of maternal sire breeds now available to the sheepmeat industry (Table 1). The 1stX progeny were weaned at about 12 weeks of age and weighed postweaning at about 7 months. 1stX wethers at each site were randomly allocated within sire to 2 slaughters at average carcass weights of 21 kg and 24 kg. Hot carcass weight, fat depth (GR and C sites), eye muscle depth, width and area (depth x width x 0.8) at the 12^{th} rib were recorded.

The Cowra 1stX ewe progeny were randomly allocated within sire to autumn and spring mating groups. The autumn group was mated to Poll Dorset rams for 6 weeks from mid-February 1998. Their 2ndX progeny were weaned at approximately 12 weeks of age in November 1998.

Statistical analysis. Sire estimated breeding values (EBVs) are based on 1stX progeny performance using BLUP procedures in BVEST (Gilmour and Banks 1992) modified from LAMBPLAN. EBVs for weight (postweaning) used birth, weaning and postweaning weights of ewes and wethers and carcass weight of wethers, with adjustment for age and type of birth and rearing. EBVs for fat (carcass GR) used carcass fat depth at the GR and C sites, adjusted for carcass weight. EBVs for eye muscle area used carcass measurements for area (depth x width x 0.008), adjusted for carcass weight.

RESULTS AND DISCUSSION

EBVs for weight, fat and muscle for the 21 sires tested at Cowra and Hamilton in 1997 (Table 1) are based on 1,570 ewe and wether progeny with postweaning records and 811 wethers slaughtered with carcass records. The range in EBVs amongst the sires was 11.5 kg for weight, 12.9 mm GR for fat and 3.8 cm^2 for eye muscle area. The ranges for weight and fat in particular are considerable and provide great scope for selection in maternal sheep breeds. The variation in fat EBVs is more than twice that found in terminal sire progeny tests (Banks *et al.* 1995). This is probably because terminal sire breeders have put more emphasis on leanness in their breeding programs for several years.

Table 1. EBVs for weight, fat and muscle for 21 sires tested in 1997

Sire code[A]	Breed	Stud	Tag	Weight (kg)	Fat GR (mm)	Ema (cm^2)
BL1	Booroola Leicester	Struan	922047	1.74	3.89	-0.63
BL2	Border Leicester	Johnos	950137	3.58	-0.92	-0.28
Fi3	Finnsheep	Yamba	940001	-0.29	-1.60	0.02
Cr4	Corriedale	Maluka	940364	-6.13	-4.64	1.74
Cp5*	Coopworth	Oaklea	940449	0.33	1.04	0.07
EF6	East Friesian	Silverstream	940B21	-0.37	**-6.91**	0.49
Fi7*	Finnsheep	Warrayure	930057	4.00	0.06	-0.30
BL8	Border Leicester	Inverbrackie	950181	1.62	6.01	-0.99
Fi9	Finnsheep	Warrayure	935010	-1.31	0.38	-0.74
WS10	White Suffolk	Leachim	910058	3.25	-0.87	**1.78**
Cr11	Corriedale	Coora	930097	-7.49	-0.10	-0.14
BL12*	Border Leicester	Kelso	94S291	**4.05**	1.85	-0.25
BL13	Border Leicester	Inverbrackie	950246	1.16	6.77	-0.39
Ro14	Romney	Claymour	930146	-1.10	-2.00	-0.26
BL15	Booroola Leicester	Struan	924287	0.87	4.57	0.31
Cp16	Coopworth	Narrambla	930069	-0.43	1.00	0.89
Fi17	Finnsheep	Gippfinn	950054	1.84	0.60	0.28
Cp18	Coopworth	Oaklea	920421	-4.29	0.29	0.26
EF19	East Friesian	Silverstream	940B26	3.96	-6.83	-0.99
Cr20	Corriedale	Stanbury	880491	-5.67	-1.48	-0.13
Fi21	Finnsheep	UNSW	960002	0.27	-1.09	-0.73

[A]sires 1-12 at Cowra, sires 13-21 at *link sires at Hamilton; Bold EBV is top for each trait

Overall maternal performance of the 1stX daughters is assessed as total weight of lamb weaned per ewe joined. There was considerable variation in lamb production from daughters of the 12 sires tested at Cowra ($P<0.01$), when they were mated to Poll Dorset rams at 7 months of age in autumn 1998 (Figure 1). The only adjustment to results in Figure 1, is for sex of the 2ndX lambs (1.4 kg added to ewe lambs), so they include the weight advantage of older lambs for those ewes that lambed early and reared twins. The sire mean daughter performance ranged from 4.6±3.2 to 32.9±3.7 kg for total weight of lamb weaned per ewe joined. Weight of lamb weaned is a composite trait, combining the proportion of ewes lambing, litter size, lamb survival, lamb growth and time of lambing. The range in performance amongst the 12 sire groups was 17-94 % for ewes lambing, 1.0-2.1 for litter size, 44-90 % for lamb survival and 29.4-37.2 kg for weaning weight, adjusted for age (90d), sex and rearing, so the maternal environments provided by the ewes are comparable.

These lambing results are based on half the ewe progeny (mean 17.8 per sire group), joined at 7 months of age. Similar numbers of ewes from each sire were joined for the first time in spring 1998. Evaluation of the sires will also include the results from this mating and another 2 lambings from

both groups, combined with results from other sites and intakes of sires. However these early results show very large differences in lambing performance of 1stX ewes sired by different rams.

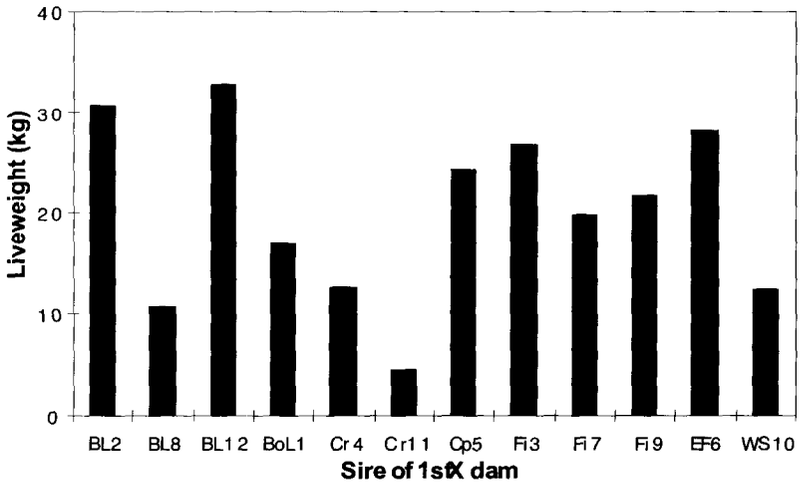

Figure 1. Total weight of lamb weaned per ewe joined at 7 months.

The final evaluation of the maternal sires will include growth and carcass merit of their 1stX and 2ndX progeny, and wool production as well as lambing performance of their 1stX daughters. The results have already highlighted the varying performance of sires for different traits. Different sires were trait leaders for growth, fat and muscle amongst the 1stX meat EBVs. Sires also varied in their ranking for component traits of 1stX lambing performance. This highlights the need for lamb producers to carefully consider the production traits that have the greatest impact on their enterprise profitability and ensure that the sires of their dams have high genetic merit for these traits. It is also important for lamb producers to exert greater control over the selection of sires (and dams) of their lamb dam flock. Contract mating using selected sires is an avenue to achieve this.

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