New Zealand Society of Animal Production online archive

This paper is from the New Zealand Society for Animal Production online archive. NZSAP holds a regular annual conference in June or July each year for the presentation of technical and applied topics in animal production. NZSAP plays an important role as a forum fostering research in all areas of animal production including production systems, nutrition, meat science, animal welfare, wool science, animal breeding and genetics.

An invitation is extended to all those involved in the field of animal production to apply for membership of the New Zealand Society of Animal Production at our website www.nzsap.org.nz

View All Proceedings

Next Conference

Join NZSAP

The New Zealand Society of Animal Production in publishing the conference proceedings is engaged in disseminating information, not rendering professional advice or services. The views expressed herein do not necessarily represent the views of the New Zealand Society of Animal Production and the New Zealand Society of Animal Production expressly disclaims any form of liability with respect to anything done or omitted to be done in reliance upon the contents of these proceedings.

This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License.

You are free to:

Share— copy and redistribute the material in any medium or format

Under the following terms:

Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

NonCommercial — You may not use the material for commercial purposes.

NoDerivatives — If you remix, transform, or build upon the material, you may not distribute the modified material.

http://creativecommons.org.nz/licences/licences-explained/

Background effects on ewe lambing and weaning performance in well recorded breeding flocks

P.R. AMER[1], J.A.SISE[1], N.B. JOPSON[1] and A.R. BRAY[2]

[1]AbacusBio Ltd., P.O. Box 5585, Dunedin 9058, New Zealand
[2]Meat and Wool New Zealand, P.O. Box 121, Wellington 6140, New Zealand

ABSTRACT

Results of analyses of Sheep Improvement Ltd. (SIL) data (27 flocks and 128,203 lambings) showed a substantial impact of ewes being scanned pregnant but failing to rear a lamb (wet-dry), on weight of lamb weaned at the next lambing. Compared to ewes that reared a lamb at the previous lambing, 'wet-dry' ewes had 0.3 to 0.5 less lambs born per ewe lambing, lamb survival rates were lower by 60 to 70 percentage points and weaning weights up to 0.5 kg lighter per lamb weaned. These effects compounded into 30 to 40 kg less weight of lamb weaned per ewe. The failure to rear part of a litter, such as one lamb of a set of twins, had less effect on performance at next lambing and weaning, than loss of the whole litter. Those ewes that previously gave birth to three lambs weaned 4 kg less lamb weight than ewes that previously gave birth to singles, after allowing for their higher genetic drive for prolificacy. A modest but significant effect of previous litter size was observed on weight of lamb weaned within each litter size category. Lamb survival was observed to be 2% lower ($P < 0.01$) for twin ewes that had failed to rear one of their two lambs, compared with those that had reared both in their previous lambing.

Keywords: ewe; litter size; lamb survival, prolificacy, weaning.

INTRODUCTION

Performance records taken by New Zealand sheep breeders are collected with the primary purpose of identifying genetically elite rams for breeding purposes. However, the detailed data collected also provide an opportunity to investigate variation in the performance of individual sheep, and how much this variation is influenced by non-genetic factors. Potentially, this knowledge could be used to identify improved management practices that could lead to higher performing and more robust sheep flocks.

In a previous study, differences were observed among flocks in the degree to which high performing ewes with high litter size, were able to maintain their litter size in subsequent years (Amer *et al*., 2007). The less than expected follow up litter sizes for ewes with large previous litters was attributed as being due to 'burn-out' effects. Ewe 'burn-out' is highly topical in the New Zealand sheep industry as flocks increasingly push towards higher performing levels through both genetics and management.

An electronic search of the Proceedings of the New Zealand Society of Animal Production suggests substantial recent scientific interest in the effect of different ewe feeding regimes during gestation on lamb performance (e.g. Kenyon 2008). One must go back to at least the early 1990s to identify research that investigates ewe management and condition prior to mating on ewe performance (Rattray *et al*., 1980 and Thompson *et al*., 1990), and this research was restricted to identifying effects on ovulation rate.

In this study, the primary objective was to analyse data to evaluate the effect of an earlier litter size on subsequent litter size, lamb survival and lamb weaning weight. This included ewes that were identified as pregnant in mid-pregnancy by ultrasound scanning but failed to rear any lambs and ewes that lost part of a litter. Ewes that lose their complete litter are termed 'wet-dry'. Additionally, we investigated whether early environmental effects on the ewe such as her birth-rearing rank and the age of her dam had any effect on the weight of lamb she weaned.

METHODS

Data were provided by Sheep Improvement Ltd. (SIL) for individual flocks and breeder groups who had provided written permission for their data to be used in the study. Data included age of dam, pregnancy scanning results, litter size, sex, birth date, birth-rearing rank, lamb survival (scored 0 for dead and 1 for alive) and lamb weaning weight. After edits to remove obvious anomalies and data inconsistencies, we had data from 128,203 lambings for sheep from 27 flocks identified uniquely within the SIL data base.

For analysis, the following variates were defined; number of lambs born, lamb survival, adjusted weaning weight, and adjusted total raw weight of lamb weaned. Adjusted weaning weights were taken as the residual estimates of weaning weight after adjustment using multiple least squares regression for birth date, birth rank, mob, sex, age of dam and birth-rearing rank. Each of the variates defined above were then tested using multiple linear regression to determine the effects of previous birth-rearing rank status of the ewe, the age of the ewe's dam at birth, and the ewe's own birth-rearing rank. The age of the ewe's dam was categorised such that two-tooth mothers, three to five year-old mothers and greater than five year-old mothers were evaluated as three separate categories. Birth-rearing rank status groups were 10, 11, 20, 21, 22, 30, 31, 32 and 33 where the first digit denotes birth rank, and the second digit denotes rearing rank. Observations were omitted when rearing rank exceeded birth rank. Birth and rearing ranks greater than three were recoded as three. Ewe management mob for the most recent lambing season, as recorded in the SIL database, was also fitted in the models as an adjustment. Estimates of these effects were not included as part of the interpretation of model results.

Following Amer *et al*. (2007), the analyses for number of lambs born, and total adjusted weight of lamb weaned were repeated with the SIL estimated breeding value for numbers of lambs born included in the model. This analysis was an attempt to disentangle the genetic effects associated with inherent prolificacy from the non-genetic effects of interest. Individual results for each flock were collated and combined in a single meta-analysis, weighted by standard errors of individual estimates, to gain an insight into the typical effect of the effects examined over all flocks tested.

RESULTS

Table 1 describes results from the analyses of effects of each ewe's previous birth and rearing status on litter size at birth, lamb survival and total weight of lamb weaned. The most prominent results were the very poor performances of ewes with a previous rearing rank of zero on all of the component traits resulting in 30 to 40 kg less of total weight of lamb weaned. Largest component effects were on lamb survival (60 to 70% lower), and litter size (0.2 to 0.4 less lambs born per ewe lambing). More modest effects on adjusted weaning weight were for ewes that had lost both twins who subsequently weaned lambs approximately 0.5 kg lighter. There were no significant effects on adjusted weaning weight for ewes that had lost a single or all three triplets. When compared across individual flocks, there was considerable variation in the drop off in the subsequent weight of lamb weaned for ewes that had failed to rear a lamb, but in all flocks it was statistically significant with an affect of at least 10 kg (P.R. Amer, Unpublished data).

Birth-rearing rank effects for ewes that previously reared at least one lamb successfully were much more modest (Table 1). Previous litter size effects on ewe current litter size, and total weight of lamb weaned were reversed when a ewe's estimated breeding value was included in the model to account for differences in the ewe's genetic drive for prolificacy.

Lamb survival was notably higher by 2% for ewes lambing twins previously if they had successfully reared both lambs previously, as opposed to rearing just one of the lambs previously. This translated into a modest improvement in the weight of lamb weaned by approximately 1 kg. Ewes that had a triplet litter previously performed equally for component traits, irrespective of whether they had successfully reared 1, 2 or 3 lambs. There was some suggestion that triplet lambing ewes that lost a lamb would wean 1 to 2 kg less total weight of lambs subsequently than ewes that reared all three of their lambs.

No clearly consistent statistically significant effects of the ewe's age of dam at birth, nor of her own birth-rearing rank, were observed for any trait

TABLE 1: Summary of effects of a ewe's previous birth and rearing status relative to ewes that previously reared triplets, on their maternal performance in the following season. Standard errors in brackets.

Previous birth-rearing status[1]	Litter size	Litter size B[2]	Lamb survival	Adjusted weaning weight	Adjusted total weight weaned
10	-0.541 (0.024)	-0.017 (0.019)	-0.615 (0.014)	0.15 (0.17)	-33.5 (0.8)
11	-0.178 (0.012)	0.252 (0.010)	0.014 (0.004)	0.23 (0.07)	-2.1 (0.4)
20	-0.499 (0.020)	-0.164 (0.015)	-0.713 (0.010)	-0.54 (0.16)	-38.9 (0.6)
21	-0.137 (0.013)	0.125 (0.011)	-0.001 (0.004)	-0.01 (0.08)	-3.0 (0.4)
22	-0.175 (0.009)	0.113 (0.008)	0.021 (0.003)	0.03 (0.06)	-1.9 (0.3)
30	-0.356 (0.030)	-0.269 (0.024)	-0.712 (0.013)	-0.38 (0.27)	-40.1 (0.8)
31	0.000 (0.025)	0.011 (0.021)	-0.016 (0.008)	-0.17 (0.15)	-1.8 (0.7)
32	-0.012 (0.016)	-0.001 (0.014)	-0.009 (0.005)	-0.31 (0.10)	-1.4 (0.5)

[1]First digit denotes birth rank and the second digit denotes rearing rank.

[2]Trait names marked with a B show results where estimation models evaluate the effect of previous birth-rearing status while at the same time accounting for the ewe's most recent estimate of genetic merit for prolificacy.

(P.R. Amer, Unpublished data). There was a weak tendency for ewes born as triplets to be slightly more prolific with approximately 0.02 more lambs per lambing than ewes born as singles or twins. There was also a tendency for single and twin born ewes reared as a single to have a slightly lower total weight of lamb weaned of 0.5 to 1.5 kg, than their contemporaries.

DISCUSSION

This study has identified a substantial and previously unidentified inferiority in performance for wet-dry ewes in their subsequent litter. Both performance recording sheep breeders, and commercial sheep farmers should seriously review their policies for giving wet-dry ewes a second chance. While being wet-dry is a common cause of culling, it is not uncommon for ewes to be given a second chance following exceptional health or weather events, or when there is pressure on the flock manager to build or maintain breeding ewe numbers. This is particularly so for younger ewes (S. Glennie, Personal communication). Results of this study suggest that it will seldom be worthwhile to retain wet-dry ewes for a subsequent lambing. The moderate reductions in future weight of lamb weaned when ewes have lost only a subset of the litter present an additional opportunity but it is currently impractical to identify these ewes on commercial farms.

This study has confirmed that the ewe 'burn-out' effect on litter size reported by Amer *et al.* (2007) carries over to a modest 'burn-out' effect on total weight of lamb weaned of 1 to 3 kg. In other words, ewes that previously lambed triplets weaned less weight of lamb than might be expected based on their genetic drive for prolificacy relative to ewes that previously lambed twins. Relative to ewes that previously raised twins, they weaned 1 to 3kg less lamb weight and relative to ewes that previously raised singles, they weaned 4 kg less. These effects are more important when considered in the context of results of nutritional studies examining feeding effects during pregnancy on ewe maternal performance. The review by Kenyon (2008) suggests that during gestation, the key is to avoid sub maintenance feeding, particularly in late pregnancy. However as multiple bearing ewes have higher maintenance feed requirements late in pregnancy, some preferential treatment of multiple bearing ewes is justified at that point. Provided reasonable levels of nutrition can be maintained through pregnancy, the results of this study suggest that additional preferential treatment of high performing ewes might be better focussed on the weaning to mating period.

In practical terms, the benefits of preferential treatment between weaning and mating will manifest themselves in two ways. Firstly, the opportunity cost of feed is typically lower in summer and autumn, compared with winter when gestation occurs. Secondly, any extra nutrition has the opportunity to manifest benefits from increases in ovulation rate, as well as body reserves that can be used to support gestation and lactation subsequently. There appears to be a dearth of recent research on the effects of recovering ewe live weight post-weaning on subsequent ewe maternal performance, particularly involving high performing triplet lambing ewes. Research in this area might be more productive than the recent focus on nutritional management during gestation. On-farm trials exploiting electronic identification, linked weighing scales, where a subset of the flock are identified for preferential management from weaning to mating, might be a highly cost effective and practical approach to this problem.

The absence of any detrimental effects on maternal performance for ewes born and reared in triplet litters, or those out of two-tooth dams might be a reflection of relatively high levels of feeding in performance recording flocks. Kenyon's (2008) review indicates that in many studies, the genes for prolificacy inherited by multiple born ewe lambs cancel out or over-ride, any adverse effects that might result from the more challenging nutritional environment they have experienced as a lamb.

ACKNOWLEDGEMENTS

We are very grateful to Meat and Wool New Zealand for financially supporting this study, and to Sheep Improvement Limited for facilitating the transfer of data from their database. We are also very grateful to the 27 sheep breeders including the AgResearch Woodlands Recorded Coopworth flock who agreed to make their data available for this study.

REFERENCES

Amer, P.R.; Jopson, N.B.; Cocks, J.; Scarlett, A. L. 2007: Impact of early age litter size on subsequent litter output in ewes. *Proceedings of the New Zealand Society of Animal Production* **67**: 39-43.

Kenyon, P.F. 2008: A review of in-utero environmental effects on sheep production. *Proceedings of the New Zealand Society of Animal Production* **68**: 142-145.

Rattray, P.V.; Jagusch, K.T.; Smith, J.F.; Winn, G.W.; MacLean, K.S. 1980: Flushing responses from heavy and light ewes. *Proceedings of the New Zealand Society of Animal Production* **30**: 115-124.

Thompson, K.F.; Sedcole, J.R.; O'Connell, D.; Geenty, K.G.; Sykes, A.R. 1990: Spring and summer pasture feeding and ewe reproduction and wool growth. *Proceedings of the New Zealand Grasslands Association* **52**: 123-127.