
THE PROCEEDINGS OF THE
NEW ZEALAND SOCIETY
OF
ANIMAL PRODUCTION
VOLUME 62 2002

Effect of lamb shearing on fine wool Merino hogget performance

S-A.N. NEWMAN, D.C. MADDEVER[1] AND R.M.W. SUMNER[2]

AgResearch, Flock House Agricultural Centre, Private Bag 1900, Bulls 5452, New Zealand.

ABSTRACT

The effect on hogget productivity and wool processing performance of shearing Merinos for the first time as lambs was investigated. A flock of 200 fine wool Merino lambs were randomly separated into two lines. One line was shorn as lambs in late summer and both lines were shorn the following spring as hoggets. There were no differences in live weight at hogget shearing or in flystrike incidence and internal parasite levels. Total wool production was greater from the twice shorn hoggets compared to those shorn only once, with the hoggets shorn twice producing about 0.4 kg more wool. However the differences in hogget wool quality, processing and product performance when lamb wool was removed and the extra wool production did not cover the discounted wool values due to shorter wool staple length and the extra costs of shearing. At current price relativies justification for first shearing Merinos as lambs must relate to management advantages pertaining to individual properties.

Keywords: Merino; lamb; hogget; live weight; wool production; processing performance.

INTRODUCTION

Current practice in New Zealand is to first shear Merino lambs as hoggets, at about one year of age. Shearing lambs of long-woolled sheep breeds is widely believed to promote faster liveweight gains, resulting in heavier hoggets (Hawker *et al.*, 1985; Donnelly, 1991). Shorn lambs are also believed to grow more wool than unshorn lambs. However, research on shearing crossbred lambs in summer generally does not support these beliefs (Sumner, 1984*a*). When this study was undertaken there was little information available on the effects of shearing Merinos as lambs.

The aim of this study was to determine the effect of shearing Merinos for the first time as lambs, rather than as hoggets, on hogget productivity and wool processing performance.

MATERIALS AND METHODS

The trial was carried out at Flock House Agricultural Centre (latitude 40°14'S, longitude 175°16'E), near Bulls, New Zealand. At Flock House average annual rainfall is 874 mm, with variation from 607 to 1067 mm/year; mean temperature is 17.4°C in mid-summer and 8.0°C in mid-winter. Animals grazed pastures which were predominantly perennial ryegrass (*Lolium spp.*) and white clover (*Trifolium repens*) and were supplemented with hay in winter.

A flock of 200 fine wool Merino lambs were randomly separated into two lines. One line was shorn as lambs in late summer (February 1993) and both lines were shorn the following spring (October 1993) as hoggets (shorn and woolly). Ram and ewe lambs were run as separate mobs. Incidence of flystrike was recorded. Internal parasite levels were monitored by determining faecal egg counts at two-weekly intervals for 20 randomly collected faecal samples. When mean faecal egg count exceeded 1500 eggs per gram all animals were faecal sampled and drenched with an anthelmintic. All sheep were weighed prior to lamb shearing and after hogget shearing.

Prior to shearing midside fleece samples were clipped from each animal, subdivided and combined within lines to provide duplicate wool samples for each shearing treatment. These samples were measured to determine washing yield, vegetable matter content, unscourable discoloration, fibre diameter, staple length, staple strength and core bulk. Individual fleeces were weighed at shearing.

At hogget shearing fleeces were combined into two lines on the basis of shearing treatment and delivered to Wool Research Organisation of New Zealand (WRONZ) for an evaluation of their processing performance. An initial assessment considered that the lines were highly variable from a processing point of view, particularly in fibre crimp. The wool was therefore classed into 5 sub-lines for processing, a fine and medium sub-line of shorn and woolly hogget wool respectively, with a fifth sub-line of tender wool from the woolly hoggets. Samples from the 5 sub-lines were tested for fibre diameter (Optical Fibre Diameter Analyzer), length after carding and carding waste.

As no differences were found in fibre diameter between the fine and medium woolly hogget sub-lines, these were combined to form a sound woolly hogget sub-line. The resulting 4 sub-lines were scoured in the WRONZ pilot plant scour. Scoured wool was further measured for core bulk, colour and vegetable matter contamination.

Blending, carding, woollen spinning, yarn folding, knitting and performance testing were carried out in the WRONZ laboratories. Woollen singles yarn was spun to nominally 70 tex with 300 turns per metre twist. The folding twist was made to balance the singles twist in a 2 ply yarn suitable for machine knitting. Yarn was measured for linear density, singles twist, force and extension at

[1] Wool Research Organisation of New Zealand Inc., Private Bag 4749, Christchurch, New Zealand.

[2] AgResearch, Whatawhata Research Centre, Private Bag 3089, Hamilton, New Zealand.

break, evenness, yarn bulk and surface friction. Five hundred fibres were randomly sampled from each yarn and tested for mean fibre diameter and coeffecient of variation. Test panels were knitted in single jersey to a standard cover factor and tested for fabric weight, abrasion resistance, pilling performance, stretch and recovery, burst strength, and felting shrinkage.

Wool auction price data related to the objective specifications of the fleece wool lines were used in combination with obtained productivity data to estimate the economic impact of lamb shearing.

RESULTS AND DISCUSSION

Production and fleece characteristics

Mean preshearing live weight of the lambs was 20.1 ± 0.2 kg. There was no significant ($P<0.05$) difference between shearing treatments in post-shear hogget live weight. Mean hogget live weights were 27.1 ±0.4 kg and 27.0 ± 0.4 kg in the shorn and woolly treatments respectively. Shearing hill country lambs in the summer has been shown to have no effect on growth rate to slaughter in the autumn compared to unshorn lambs, unless lambs are growing in excess of approximately 200 g/d (Sumner, 1984*a*). However, most trials have investigated the effects of shearing on production of crossbred lambs which are slaughtered in autumn, with no information on longer-term effects on live weight. In one trial which did investigate the effect of shearing on hogget live weight, increases of up to 2 kg in live weight were observed four to five months after shearing in April and May but the live weight effect was not evident nine months after shearing (Sumner, 1984*b*).

No major differences between shearing treatments in animal health were found in this study. In April, when monitoring of internal parasites indicated that the trigger level of 1500 eggs per gram was exceeded, all animals were faecal sampled prior to drenching. There was no difference in the faecal egg counts between shearing treatments.

The overall incidence of flystrike was low, with no significant difference in incidence between treatments. A CSIRO study (Hemsley *et al.*, 1983) indicated that shearing Merinos at 5-6 months of age may have increased their subsequent susceptibility to fleece rot when compared with previously unshorn hoggets and therefore lead to an increased incidence of body strike in young animals previously shorn as lambs. However these results have not been repeated in other studies (Rogan *et al.*, 1995).

The lamb, hogget and total fleece weight for the shorn treatment and the hogget fleece weight for the woolly treatment are given in Table 1. The twice shorn treatment produced 0.45 kg more greasy and 0.35 kg more clean wool than the woolly treatment. With good quality feed available after shearing wool growth rate has been found to increase in response to increased intake in Romney hoggets and ewes, with the response equivalent to about 0.2 kg clean fleece weight at the next shearing (Sumner and Bigham, 1993).

Table 2 presents the lamb and hogget wool characteristics. Yield was 2.4% higher in wool from the hoggets shorn as lambs. No difference was found in mean fibre diameter between fleeces from shorn or woolly hoggets. A previous trial (S-A.N. Newman, Unpublished data) and Australian trials (Rogan *et al.*, 1995) also found no difference in the fibre diameter in wool from previously shorn versus unshorn Merino hoggets.

TABLE 1: Mean lamb and hogget greasy and clean fleece weight.

Wool characteristic	Shearing treatment: Shorn as lamb			Not shorn as lamb	SED	Shearing effect[1]
	Lamb	Hogget	Total	Hogget		
Greasy fleece weight (kg)	1.03	2.36	3.39	2.94	0.04	***
Clean fleece weight (kg)	0.70	1.68	2.38	2.03	0.04	**

[1] Comparison of total wool produced under each treatment.

TABLE 2: Mean lamb and hogget wool characteristics

Characteristic	Shearing treatment: Shorn as lamb		Not shorn as lamb	SED	Shearing effect[1]
	Lamb	Hogget	Hogget		
Yield[2] (%)	67.7	71.3	68.9	0.2	*
Fibre diameter (µm)	18.1	17.8	17.4	0.2	NS
Staple length (mm)	36	68	102	1	**
Y (Brightness)	69.3	68.8	67.4	0.2	+
Y-Z (Yellowness)	0.4	-1.2	0.2	0.1	*
Staple strength (N/ktex)	-	37	25	1	*
Position of break (%)					
Tip	-	4	4	1	NS
Middle	-	78	60	1	*
Butt	-	18	36	1	*

[1] Comparison of shorn hogget and woolly hogget fleeces.
[2] Schlumberger dry.

TABLE 3: Mean fibre properties of classed greasy sub-lines of shorn and woolly hogget wool.

Greasy fibre properties	Shearing treatment					95% CI
	Shorn as lamb		Not shorn as lamb			
	Fine	Medium	Fine	Medium	Tender	
Greasy weight (kg)	83	104	29	79	102	-
Fibre diameter (μm)	17.4	18.5	17.5	17.7	17.1	0.3
CV diameter (%)	22	21	20	21	22	2
Card waste (%)	5	6	6	6	5	1
Hauteur (mm)	45	45	40	48	45	-
CV hauteur (%)	68	72	82	80	80	-
Barbe (mm)	65	69	67	79	73	3

CV – coefficient of variation.

The two wool characteristics influenced by shearing which most affect price are staple length and colour, with staple length having the greatest effect on price. Staple length was 34 mm shorter for the shorn compared to the woolly hogget wool. Wool colour was better in the shorn treatment, although colour of both treatments was acceptable. Unscourable discolorations, which are usually yellow, develop in the spring when warm humid conditions prevent rapid drying of the fleece. In some years wool colour problems may arise by the time hoggets are shorn in October, particularly in longer stapled woolly hoggets.

Tensile strength was greater for wool from the shorn than from the woolly hoggets, 37 versus 25 N/ktex. There was a significant difference between the position of break for the shorn and woolly hogget wool. Although most breakage occurred in the middle for both treatments, a higher proportion of the breakage occurred at the base in the woolly treatment. Wool prices tend to be discounted when strength falls below 30 N/ktex (Hunter, 1980).

Processing performance

A significant ($P<0.05$) mean fibre diameter separation between sub-lines was achieved when classing the shorn hogget wool. Diameter separation of over one micron in the shorn hogget sub-lines can make classing an economic proposition, given the average price premiums applying during the season (A.J. Marshall, Personal communication). However, the woolly hogget line separated into sub-lines significantly different in length, rather than fibre diameter. The tender sub-line of woolly hogget wool was finer than the other lines and intermediate in length (Table 3).

Although the shorn hogget wool had a shorter staple it was found to have a similar length after carding value to the woolly hogget wool (Table 3). This was probably due to increased breakage associated with the lower staple strength of the woolly treatment. Since fibre tip is known to be lost in processing (Walls, 1963), removal of the lamb tip wool by shearing as lambs may increase processing yields and have little effect on the final product. However the test for carding waste showed no significant difference between lines.

Scoured wool tests of bulk and colour gave no differences. The two vegetable matter contamination results for the shorn hogget lines differed from the woolly hogget lines (Table 4). This vegetable matter result contradicts the earlier greasy result (Table 1). For woollen processing, the observed difference in vegetable matter contamination in the scoured wool could affect the visual appearance of the final product, however the type of contamination is far more important than the weight of the contaminant.

TABLE 4: Mean fibre properties of scoured sub-lines of shorn and woolly hogget wool.

Scoured fibre properties	Shearing treatment				95% CI
	Shorn as lamb		Not shorn as lamb		
	Fine	Medium	Sound	Tender	
Core bulk (cm^3/g)	28	26	27	25	2
Vegetable matter (%)	0.2	0.2	0.4	0.4	0.1
Y (Brightness)	68	66	67	66	2
Y-Z (Yellowness)	-0.5	0.8	0.3	0.8	0.8

TABLE 5: Mean yarn properties from sub-lines of shorn and woolly hogget wool.

Yarn properties	Shearing treatment				Average 95% CI
	Shorn as lamb		Not shorn as lamb		
	Fine	Medium	Sound	Tender	
Linear density (tex)	135	140	154	160	6
Force to break (N)	5.0	5.7	5.2	5.6	0.6
Max. extension (%)	18	14	17	19	4
Evenness (CV%)	13	12	13	13	2
Bulk (cm^3/g)	16.0	15.4	16.5	16.2	0.6
Coefficient of friction (μ)	0.29	0.31	0.31	0.32	0.02

CV – coefficient of variation.

Yarn results (Table 5) show large variation, with the woolly hogget sub-lines measuring heavier for no apparent reason. The consequences of this real difference in yarn weight is a heavier knitted panel that performed better in abrasion, burst strength and non-recoverable stretch tests. Similar performances were observed in pilling and felting, except that the tender line felted less, possibly due to more count and twist variability in that line (Table 6). Mean diameter and coefficient of variation of diameter in the yarns was not significantly different for any of the lines. Calculated yarn tenacity (strength to weight ratio) showed the shorn hogget sub-lines to be superior: shorn hogget fine 37 N/ktex, shorn hogget medium 41 N/ktex, woolly hogget sound 34 N/ktex and woolly hogget tender 35 N/ktex.

TABLE 6: Mean knitwear performance of panels manufactured from shorn and woolly hogget wool.

Knitwear performance	Shearing treatment				Average 95% CI
	Shorn as lamb		Not shorn as lamb		
	Fine	Medium	Sound	Tender	
Wt/area (g/m²)	272	270	281	315	13
Abrasions (cycles to end)	20750	23500	31000	26875	2000[1]
Pilling (1-good, 5-poor)	3/4	2/3	3	3	-
Burst strength (kg/cm²)	3.3	3.7	4.0	4.1	0.5

[1] Range about the mean of 4 results.

Economic evaluation

During the five wool selling seasons 1990/91 to 1994/95, approximately 1% of wool finer than 21 µm sold by auction in New Zealand was described by Wools of New Zealand valuers as lamb and 17% as hogget. Of the hogget wool approximately 2% was classified as shorn hogget and the reminder as woolly hogget. Over the same period price relativities between equivalent type Merino lamb, shorn hogget and woolly hogget wool were 60: 85: 100. In view of the small amounts of Merino lamb and shorn hogget wool presently traded in New Zealand the price differentials should be treated with caution.

Calculated for a clean price of 800 cents/kg clean for woolly hogget fleece wool, assuming 15% oddments returning a 30% lower price, fleece weights equivalent to those recorded in this trial and current price relativities, total gross wool returns would be $14.12 per head for the shorn treatment and $15.52 per head for the woolly treatment. A price relativity of 75: 90: 100 between the three wool types would be necessary for there to be an equivalent gross wool return from the two treatments. Economic returns reported in other studies are also unfavourable for twice shorn compared to single shorn lambs (Donnelly, 1991; Little *et al.*, 1993; Rogan *et al.*, 1995).

Overall the comparative processing performance of shorn and woolly Merino hogget wools in this trial are suggestive that the price relativity for these types should be closer to 100: 100. Similarly, processing results obtained with Merino lambs wool (Madeley, 1994) have shown this wool type to be a speciality fibre with a particularly soft handle. Enquiries have been made in New Zealand by wool buyers as to the availability of Merino lambs wool. If more wool growers were to adopt a Merino lamb shearing policy, thereby increasing the supply of this specialist fibre and of shorn hogget wool, it would be reasonable to expect the price relativities to change to levels similar to those currently applying for crossbred wool. Such a change would result in a significant financial advantage of up to 15% from shearing Merino lambs as long as they can be sufficiently well fed after shearing to solicit a consistent wool growth response.

CONCLUSIONS

There was no advantage in this trial in live weight at hogget shearing from shearing Merinos as lambs.

Total wool production was greater from twice shorn hoggets compared to those shorn only once, the hoggets shorn twice producing about 0.4 kg more wool. The shorn hogget wool, whilė obviously shorter, had similar length after carding and improved staple strength and yarn tenacity but no obvious advantages in processing or product performance compared to the once shorn woolly hoggets. At current wool returns the extra wool production of the twice shorn group did not cover the discounted wool values due to the shorter staple length at shearing and the extra costs of shearing.

Justification for first shearing Merinos as lambs currently must therefore relate to management advantages as they apply to each farm property. It is anticipated price relativies may change in the future to encourage Merino lamb shearing.

ACKNOWLEDGEMENTS

Thanks to Wools of New Zealand for supplying wool auction price data, especially S.E. Britland and A.J. Marshall.

REFERENCES

Donnelly, F.B. 1991. Shearing Merino sheep with significantly less than twelve months growth - some field experiences. *Wool Technology and Sheep Breeding*, **39:** 40-42.

Hawker, H., Crosbie, S.F., Barber, M. and Andrews, R.N. 1985. Effects of shearing and herbage allowance on the intake, liveweight gain and wool growth of Romney ewe hoggets in spring-summer. *Proceedings New Zealand Society of Animal Production,* **45:** 141-145.

Hemsley, J.A., Jackson, N. and Marshall, J.T.A. 1983. Weaner shearing may increase fleece rot susceptibility. *Wool Technology and Sheep Breeding*, **31:** 146-148.

Hunter, L. 1980. PhD. Thesis, SAWTRI.

Little, D.L., Carter, E.D. and Ewers, A.L. 1993. Live weight change, wool production and wool quality of Merino lambs grazing barley grass sprayed to control grass or unsprayed. *Wool Technology and Sheep Breeding,* **41:** 369-378.

Madeley, A.J. 1994. The physical properties and processing of fine Merino lambs wool. PhD thesis, University of New South Wales, Australia.

Rogan, I.M., Atkins, K.D. and Coelli, K.A. 1995. Shearing Merino ram weaners - is it worth it? *Wool Technology and Sheep Breeding,* **43:** 56-68.

Sumner, R.M.W. 1984a. Effect of shearing on meat and wool production from lambs reared on hill country. *Proceedings New Zealand Society of Animal Production,* **44:** 45-48.

Sumner, R.M.W. 1984b. Effects of shearing on flock productivity. 'Coloured Sheep and Their Products', pp 289-294. New Zealand Black and Coloured Sheep Breeders Association, Masterton, New Zealand.

Sumner, R.M.W. and Bigham, M.L. 1993. Biology of fibre growth and possible genetic and non-genetic means of influencing fibre growth in sheep and goats - a review. *Livestock Production Science*, **33:** 1-29.

Sumner, R.M.W., Bigham, M.L., Knight, T.W., McMillan, W.H. and Wiggins, L.K. 1982. Shearing - its effects on production. *Proceedings Ruakura Farmers Conference,* **1982:** 31-34.

Walls, G.W. 1963. Distribution of staple tip in worsted processing of some Merino wools. *Journal Textile Institute,* **54:** T79-T87.