Project 08.2
Evaluation of a range of options for protecting off -shears sheep from chill stress.

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The Problem

Choice of shearing time on the Monaro is perhaps a more vexed question than at any other location in Australia. The vast majority of merino ewes are joined to lamb in the late winter – spring period and in order to avoid the discounts associated with low tensile strength and mid break many of these flocks also shear pre-lambing so placing the point of break in the weathered tip of the staple. The practise also has the advantage of reducing the risk of pregnant animals falling and not being able to regain their feet as well as encouraging the ewes to seek sheltered areas more conducive to survival of new born lambs.

The downside to this management technique is the potentially serious weight loss of ewes prior to lambing and its impact on the lambing process and in extreme weather events the serious risk of ewe losses to hypothermia. The impact of inclement weather can be dramatic. Table 1 shows the relative performance of merino ewes subject to chill stress. A clean shorn animal is clearly subject to extreme stress and dramatic weight loss compared to animals with even minimal wool length.

Table 1. Modelled performance of 54kg (FS 3) merino ewes in various lengths of wool grazing typical winter pastures[1] 115 days from the start of joining.

Wool Length cm	Chill Effect [2] MJ/day	Live-weight change grams/head/day	Maternal weight change grams/head/day	Supplement [3] to maintain fat score grams/head/day
Bare Shorn	6.8	-208	-277	990
1	3.4	-99	-168	620
1.5	1.3	-33	-102	430
2	0.3	-4	-74	350
3	0.0	1	-69	350

Source: GrazFeed

1) 500kg Green DM/ha @ 70% digestibility plus 2000kg dead DM/ha @ 45% digestibility
2) Extra energy required to maintain body temperature (8°C max temp, -3°C min temp, 5mm of rain and 20km/h wind)
3) Animals fed wheat at 13 MJ/kg DM.

Animals with at least 2cm of wool length do not suffer any additional stress due to chill but bare shorn animals (about 0.5cm of wool length) can experience a huge increase in energy allocation to thermo-regulation and suffer dramatic weight loss if feed intake cannot increase in line with this demand. There is also a significant risk that under extreme weather conditions animals cannot maintain core temperature and may die from hypothermia.

In more benign conditions (10°C max temp, -3°C min temp, no rain and 10 km/h wind) the weight loss of bare shorn animals is similar to that of animals with 1cm

wool length in the more extreme conditions (168g/h/d maternal weight loss). Assuming the animals survive the direct effects of chill then the maternal weight loss by lambing time could be at least 7 kg (approximately 1 fat score)

The solution

In terms of the energy balance the solution to the problem lies in either increasing the energy intake of the animal (supplements) or reducing the chill effect. In extreme conditions to maintain fat score of bare shorn ewes would need an extra 640 g/h/d of wheat compared to the requirements of an animal with 2cm wool length. Averaged over the 35 days (good days and bad) until lambing starts this could amount to an additional 14kg of grain per head which would cost $4.90 ($350/tonne).

As an alternative to feeding more, various methods have been employed to reduce chill stress. The use of "snow combs" in order to maintain greater wool length off shears, the use of sheep coats and more recently the application of Thermoskin have been tried. All these technologies seek to prevent animals getting wet, reduce skin exposure to wind or increase the level of insulation. The question is just how effective are they at reducing the level of chill and reducing weight loss without additional nutritional input.

The various techniques have been assessed before but never in a direct comparison and often in a more benign environment. For example coating trials at Condobolin showed no difference in animal performance in the winter months (Hatcher *pers comm*) but the Condobolin environment is considerably more benign than a Monaro winter. The Thermoskin product has been trialed on farms by its inventor Henry King and results of one trial reported in the Land (15/8/07).

Local trials boasted a post shearing weight gain in pregnant ewes of 4.07 kg (vs 0.78kg in control animals) over just 15 days. While this is a dramatic response it equates to a daily gain of 271g/h/d which is beyond the physiological capability of fine-wool ewes already weighing 56kg bare shorn. The GrazFeed model predicts a maximum possible live weight gain at pasture (including conceptus growth) of around 204 g/h/d in the absence of any chill stress. Although when grazing a more typical late winter pasture (1200 kg Green DM/ha at 70% digestibility) a live weight gain in the order of 100 g/h/d is more likely. This gives some cause to question the trial results and the scale of the weight gain figures suggests significant confounding by gut fill.

The MFS Trial Design

A trial supported by Monaro Farming Systems was conducted on the property of Colin Murdoch at Ando to compare the impact of various treatments on off shears live weight and fat score of late pregnant merino ewes. The treatments included a Control, Snow Combs, Sheep Coats and Thermoskin. On the first of July 230 ewes were scanned (singles, multiples and dries), weighed and fat scored then grouped on birth type before allocating 50 ewes equally across treatments according to bodyweight and fat score.

Fat scoring allowed the of the impact of treatments on maternal body weight to be assessed and provided back up to the measured live weight in the event of confounding effects such as changes in gut fill. Fat scoring is an assessment of the fat depth at the GR site on the $12^{th}/13^{th}$ rib 110mm down from the back bone. Fat score

was assessed on a continuous scale (mm of tissue depth) in order to increase the measurement resolution compared to assessing in full fat score increments (5mm per fat score). 30 ewes were discarded from the trial on the basis of extreme body weight or fat score or because they were not pregnant.

The animals were run together until shearing when they were re-weighed and fat scored off shears as the basis against which to judge treatment differences. Thermoskin and coats were applied on the day of shearing.

Table 2. Average weight and GR fat depth at scanning (1/7/08) and shearing (28/7/08) Tri

Treatment	1/7/08		28/7/08	
	Wt	FS	Wt	FS
Control	53.3	13.6	49.4	12.9
Snow comb	53.5	13.8	48.9	13
Coats	53.8	13.8	49.6	12.9
Thermoskin	54.5	13.9	50.4	12.5

It can be seen that between scanning and shearing the animals lost about 1mm of GR fat depth which should equate to about 1.4 kg of maternal weight. No comparison can be made between dates based on live-weight since fleeces were not weighed and this difference cannot be accounted for. Moreover there will also have been some compensating increase in live weight due to increasing conceptus weight. Overall the ewes performed well between scanning and shearing and with no further maternal weight loss would lamb at fat score three.

The ewes were run together from shearing until the 18th of August (a total of 21 days) when they were again weighed and fat scored to determine any differential performance between the treatments. Due to the harsh conditions and concern for the Control animals the mob were fed some corn gluten pellets during the trial period with all groups having equal access.

Results

Raw means of the treatment group live weights and GR fat depths are shown in Table 2. Over the 21 day trial period the control group gained on average 4 kg of live weight but lost 2.7mm of GR fat depth. While weight gain and fatness are normally positively correlated in late pregnant ewes it is common for live weight to increase while the animals fall in condition due to the allocation of energy toward foetal growth rather than maternal body maintenance. This relationship is reinforced by data in table 3. which shows that independent of treatment twin bearing ewes gained more live weight but lost a greater depth of GR fat than single bearing ewes. Differences in live weight change were not significant but the difference in assessed GR fat depth between twins and singles was highly significant ($P<0.001$). Despite this the difference is too large to be explained fully by this factor and it is also likely that the measured live weight has also been affected by differences in gut fill since the time in curfew was longer at the shearing measurement than was practical at the final weighing, just 10 days from the start of lambing.

Table 2. Treatment means for live weight and GR fat depth for each measurement date and the mean difference relative to the control during the treatment period.

Treatment	Randomisation			Date: 28/07/2008		Date: 18/08/2008		Mean Difference		Effect relative to Control	
	Wt.	Fat	lambs /ewe	Wt.	Fat	Wt.	Fat	Wt.	Fat	Wt.	Fat
Control	53.1	13.6	1.36	49.4	12.9	53.4	10.2	4.0	-2.7		
Coats	53.8	13.8	1.34	49.5	12.9	54.5	11.8	5.0	-1.1	**1.0**	**1.6**
Snow Combs	53.5	13.8	1.34	49.1	13.0	54.8	11.1	5.7	-1.9	**1.7**	**0.8**
Thermoskin	54.6	13.8	1.34	50.2	12.5	50.9	10.6	4.4	-1.9	**0.4**	**0.8**

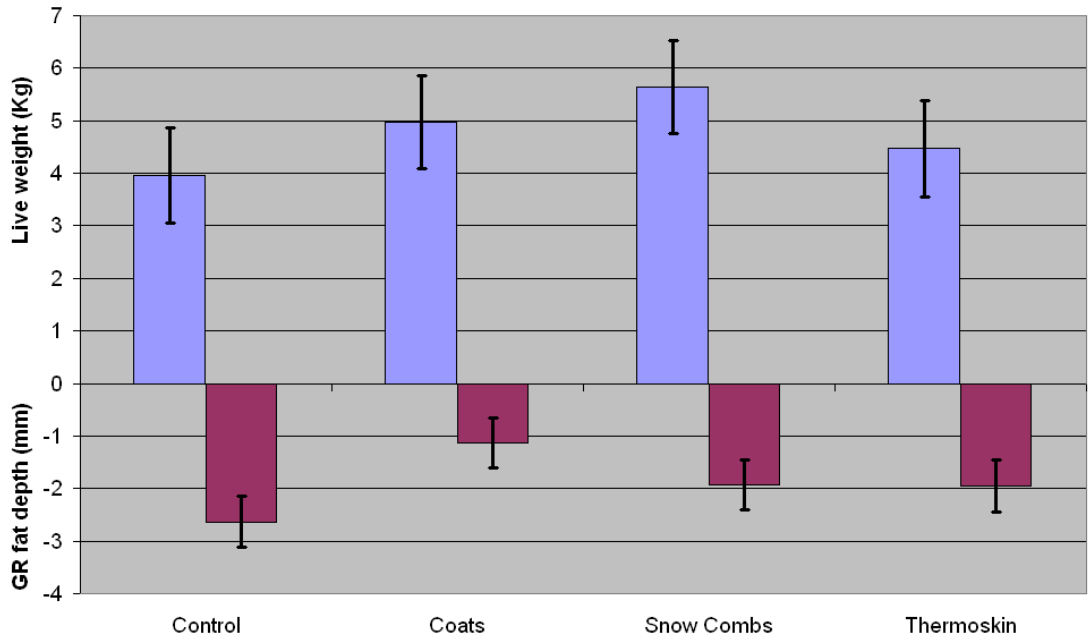
Wt. = Live weight in Kg.
Fat = Palpated GR fat depth.

Compared to the control all treatments gained more live weight and lost less GR fat depth. Statistical analysis reveals that none of the live-weight differences were significant while only the coated sheep lost significantly less fat than the Control.

Table 3. Live weight and GR fat change for all Twin and Single bearing ewes measured across the treatment period (28/7/08 – 18/8/08).

	Live weight Change (Kg)	GR fat Change (mm)
Twins	5.2	-2.5
Singles	4.5	-1.6

Figure 1. Average weight and GR fat depth change showing 95% confidence intervals for each treatment



Discussion

In practical terms the live weight differences are small and not significant but may be of practical importance. Under the climatic conditions during this trial and in consideration of the condition of the animal the costs of using any of the treatments is unlikely to be economic. This is especially true in light of the fact that differences were not statistically significant and so these differences may not be repeatable.

Sheep coats reduced the loss of GR fat depth by 1.6 mm which was significant. At 7kg per fat score this amounts to a reduction in maternal weight loss of 106 g/h/d. For the 40 days between shearing and the middle of the first lambing cycle (lambing in coats) they may reduce maternal weight loss by more than 4kg and ewes would lamb half a fat score higher. The use of snow combs or Thermoskin would result in half this advantage although the difference is not statistically significant the difference is not reliable.

Advantages resulting from reduced ewe losses to hypothermia could not be assessed as no ewes perished in the course of the trial.

Conclusion

The advantage of applying the range of off shears protective treatments lead to improvements in both live weight and fat score but for most of the treatments the improvements were not significant. For ewes in fat score 3 or above at shearing, it is unlikely the reductions in maternal weight loss would lead to an economic return since they are not likely to improve either lamb performance or survival. If ewes were at or below 2 score at shearing then the impact of coating to maintain higher fat score through to lambing is likely to increase lamb performance and survival and the cost of taking protective measures may give economic returns. It should be noted that while coating is labour intensive the capital cost can be amortised over many seasons since they may only be in use for a maximum of 2 months per year.

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