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Shearing of Lambs

New Zealand Merino Limited

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The New Zealand Merino Company Limited contracted AgResearch to provide a balanced review of relevant literature that has examined the effect of shearing on lamb growth. The New Zealand Merino Company is obviously interested in the effects on Merino and mid micron lambs, and should note that the majority of scientific evidence is not derived from these breeds. However, the general principles should apply to Merino and mid micron lambs.

Executive Summary

The balance of scientific evidence suggests there is no guaranteed effect of shearing on lamb growth.

There are many other reasons for shearing lambs, such as avoiding grass seeds or flystrike and controlling lice. Shearing should be undertaken in a timely fashion to have the greatest effect on the most significant problem.

In some experiments, gains in wool production and carcase weight have been observed in lambs and later in hoggets, but these were mostly insufficient to recover costs at the time.

Lambs grow faster during longer days, but this is dependent on temperature and the availability of feed, shade and shelter.

Both hot and cold temperatures can depress feed intake and therefore growth.

Cool temperatures may stimulate feed intake and therefore stimulate growth, but not when feed is restricted.

The cost of shearing, and the value of the lambs wool and subsequent hogget fleece should be factored into shearing decisions.

Shearing decisions may be quite different if lambs are to be sold for slaughter rather than retained as replacements.

Stud breeders may justify shearing lambs so that ranking on hogget fleece weight is less influenced by birth date or rearing rank.

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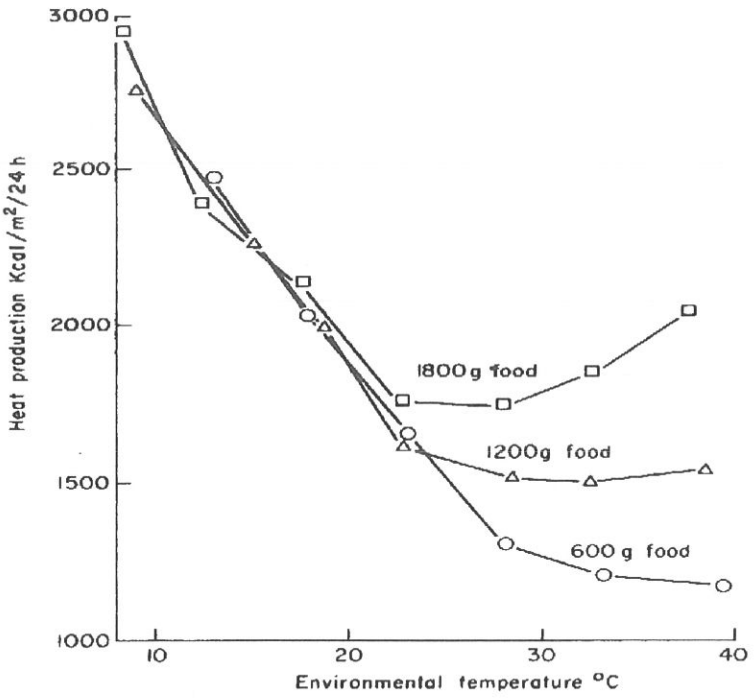
1. Introduction

A lamb must consume enough energy to survive, then if more resources are available they can grow and at higher levels of nutrition they can lay down fat. Like all warm-blooded animals, sheep have a thermoneutral zone, which is simply a range of temperatures at which they do not have to expend any energy to maintain their internal temperature. Below this range of temperatures, the animal must burn energy to maintain their core temperature, and energy use will be much higher during cold wind or rain. Sheep can use shivering to generate heat and behavioural mechanisms like hunching and huddling together to conserve heat. At temperatures above the thermoneutral zone, an animal must either use energy to keep cool or simply move to shade. Unlike other animals, sheep do not use sweating to keep cool because this would be counter-productive under a wool coat. Sheep pant to keep cool and have a complicated system of evaporative membranes in their nasal cavity to achieve this.



Heat production at different environmental temperatures of closely clipped sheep given different amounts of food.
[From Blaxter by permission of Hutchinson Co.]

Figure 1. The response of shorn sheep to environmental temperature when offered different intakes of feed.

The thermoneutral zone for a sheep is complicated by feed intake and by fleece. Sheep are ruminants, and digestion of feed in the rumen generates heat. Greater amounts of feed and fibrous feedstuffs tend to generate more heat. Figure 1 which has been reprinted from Hecker (1983), shows that freshly shorn adult sheep fed 1800 g per day need to use energy to keep warm below 22°C but then again, need to use energy to dispose of heat above 28°C. Sheep fed 1200 g per day begin to use energy to keep warm at somewhere above 22°C, but do not really begin to use much energy to dissipate heat up to 40°C. When fed only 600 g, the sheep need to use energy to keep warm at around 28°C, the temperature at which sheep fed three times as much began using energy to dispose of heat generated in the rumen!

The key thing to note is that energy used to either keep cool or warm cannot be used to grow. Sheep take time to rest and chew their cud, which is productive, but if they are not ruminating, time not spent grazing will not result in growth. This may occur when seeking shelter or relief from cold or heat, or in some cases walking long distances to find food and particularly while they are yarded for shearing, crutching, drenching etc. There is also good evidence from a study at Poolburn in New Zealand to suggest that sheep are a little like camels and can accumulate heat during the day and release it during the night (Pollard, 2003). Since the temperature usually varies throughout the day, ruminants have evolved to eat during the morning and evening and use shade during the hotter parts of the day, to chew their cud or take shelter in the colder nights when rumen fermentation might keep them warm. The exceptional thing about sheep in comparison with most other animals is that they are regularly shorn, and the manager chooses when that will happen.

The fleece is a great insulator which rapidly regrows and only about 10 mm of dry wool will be sufficient to insulate against both heat and cold. Figure 1 shows the critical temperature, below which a sheep that has been freshly shorn will need to begin using energy to maintain its core body temperature when it is only fed enough to maintain weight (Hecker 1983). With 1mm of fleece, we can relate to Figure 1, yet the same animal with a full fleece will only begin using energy to maintain core body temperature when the temperature reaches -3°C. Cover combs have been so successful in reducing mortality post shearing because they leave between 6 and 13mm of wool on the sheep (Holmes *et al.* 1992). When a sheep is shorn and released into high temperatures, it may use energy to pant and keep cool, it might reduce its food intake and will also seek shade (Bottomley 1978). Sheep standing around with their head under each other are seeking shade, particularly when there may be no other shade available. Alternatively, when a sheep is shorn and released into cold temperatures it will seek shelter, shut down blood flow to its skin and shiver (Bottomley 1978). In the worst case, the sheep can die of hypothermia (Hutchinson 1968), an ever-present risk that most farmers are aware of. Experiencing cold causes the release of adrenaline and in turn thyroxine and cortisol and these hormones encourage the animal to eat

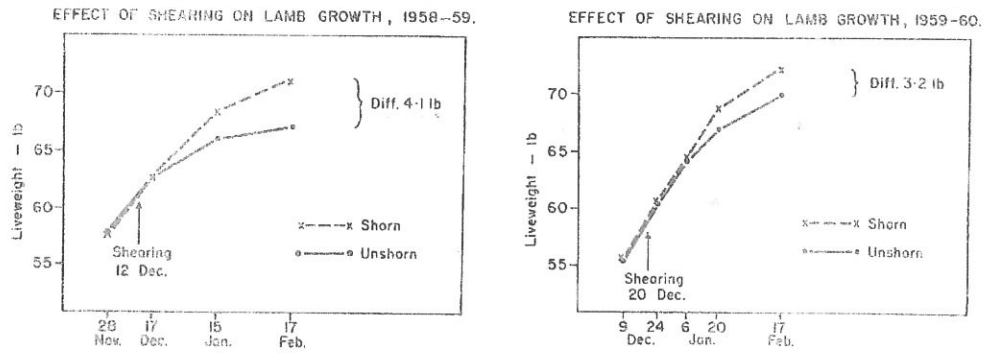
more. Over a slightly longer period, the metabolism of the sheep will adjust and this is the fundamental driver of the topic of this review. It is the outcome of this interesting interplay of the internal and external environment which is explored by this review.

2. Literature Evidence

"Unshorn" or "woolly" are both terms that can be used to describe lambs that have been left without shearing. "Shorn" tends to be the most common term to describe lambs post-shearing, though "sheared" is sometimes noted in international literature. Whatever the term used in the original references cited in this review, lambs that have been shorn will be referred to as "shorn" while their experimental cohorts or controls that are left unshorn will be referred to as "woolly". This step has been taken to use a consistent nomenclature that cannot be confused during typing or reading or transcribing this review.

2.1 New Zealand research

One of the earliest reports (Wallace 1960a,b) from the Ruakura Farmers Conference showed there can be advantages to shearing lambs. Lambs shorn in December 1958 accumulated 1.9 kg of extra live weight after 9 weeks compared with woolly controls. Results also favoured shorn lambs in December 1959, which were 1.5 kg heavier than unshorn lambs. The figures from Wallace (1960) are presented (Figures 2 and 3). Note that this experiment was carried out in early December in the North Island with lambs from a terminal sire over Romney ewes.



Figures 2 and 3. The effect of shearing on lamb growth reported at the Ruakura Farmers' Conference by Wallace in 1960.

Perhaps the most extensive study of different farms was carried out by Sumner (1984). On Whatawhata research farm there was no difference in carcase weight in May between lambs shorn in December and again in April, February and again in April or woolly controls that were not shorn until April. This protocol was implemented on

eleven private farms across the North Island. On one farm, lambs shorn in December were significantly lighter in carcase weight (1 kg), while on another farm they were significantly heavier (1 kg). On nine farms there was no difference at all between the shorn or woolly groups! These were North Island farms running Romney, Perendale or Coopworth flocks.

Pownall *et al.* (1984) manipulated feeding levels and found a significant interaction between shorn and woolly lambs. In 1982, a trial with Romneys was run over a 105 day period, and shorn lambs grew faster and their carcases were 0.5 kg heavier than woolly lambs. In 1983, a trial with Coopworths was run over a 55 day period but the shorn and woolly groups were run on separate pastures. There was no difference in carcase weight between shorn and woolly lambs when ample feed was offered, but shorn lambs that were offered a low feed allowance produced lighter carcases (0.8kg) than unshorn lambs. These trials were run in autumn at Lincoln College in the South Island and carcase weights were modest (10 to 12 kg).

Bray *et al.* (1985) had quite a different objective. At the time, over-fat lambs were discounted at processing plants and they were examining ways to reduce fatness and improve carcase value. In two experiments with Coopworth or Southdown x Coopworth lambs they manipulated feeding levels and shearing. Small lambs (9.3 kg estimated carcase) fed on pasture for up to 7 weeks were not significantly different between shorn or woolly groups at slaughter. With larger lambs (14.6 to 16.4 kg estimated carcase) fed on pasture for 6 weeks to produce a period of weight loss, shorn lambs ended up significantly lighter and leaner.

The New Zealand Sheep Council commissioned a review of strategies to improve lamb growth rate and produced a book in 2000 "400 Plus: A guide to improved lamb growth". The book carries no recommendation on shearing lambs to improve growth rate. The book covers *in utero* effects, lactation, weaning, pastures, a comprehensive range of diseases and deficiencies but says nothing about shearing policy because the impact of shearing was found to be equivocal.

2.2 Wool quality

Without doubt, Merino and mid micron producers will want to know the effects on wool quality. Newman *et al.* (1996) shore 100 Merino lambs in February and left 100 woolly, until both groups were shorn in October. There was no difference in live weight gain or the incidence of flystrike (they claimed it was low but did not provide actual numbers!) Shorn hoggets produced 350 grams more total clean wool, which of course came in two portions (Table 1) and not surprisingly woolly hogget was longer. There was no significant difference in fibre diameter. The shorn hogget wool was significantly stronger in tensile strength, however, the method of measurement of staple strength ensures that this would be the case, and the benefit is less relevant because the shorn

hogget wool began processing at a shorter length and ended up shorter after carding! Indeed, there were "..no obvious advantages in processing performance..." and at 1996 prices, the value of the extra wool did not cover the shearing costs. Readers should note that this experiment was run at Flock House research farm near Bulls in the North Island. This is currently an unlikely place to find Merinos, though New Zealand Merino would like to see more Merinos in the North Island.

Table 1. Fleece weight and fibre diameter, staple length, staple strength and colour of shorn and woolly Merino hogget and lambs wools.

	Shearing treatment				
	Woolly	**Lamb**	**Hogget**	**Pooled SED**	**Significance**
Greasy fleece weight	2.94	1.03	2.36	0.04	***
Yield %	68.9	67.7	71.3	0.2	*
Clean fleece weight	2.03	0.70	1.68	0.04	**
Fibre diameter (μm)	17.4	18.1	17.8	0.2	ns
Staple length (mm)	102	36	68	1	**
Staple strength (N/ktex)	25	-	37	1	*
Y (Brightness)	67.4	69.3	68.8	0.2	ns
Y – Z (Yelllowness)	0.2	0.4	-1.2	0.1	*

2.3 Previously unpublished research

Levy-payers funded four trials in 1993/1994 and 1995/96. These data were never scientifically published, but were reported extensively to farmers throughout Marlborough and Canterbury. This data was obtained from Alan Marshall who had stored it for the benefit of breeders, because he knew this topic would come up again.

2.3.1 Trial 1

Corriedale lambs owned by Geoff Buick at Te Rapa in the Ura Valley, Marlborough were shorn or left woolly in January, and all were shorn as hoggets in September. Shorn lambs were 33.9 kg when shorn in January and 39.8 kg when shorn again in

September. The woolly lambs were 34.2 kg in January and weighed 36.9 kg when first shorn in September. Shorn lambs grew faster and produced 300 grams more total wool from birth to September. Once shearing costs and wool value were taken into account at 1993 prices, shorn lambs were worth $0.61 per head more. During the second year of the trial, the total greasy fleeceweights of the unshorn group were 1.1 kg heavier than those that had been shorn as lambs. Live weight of the shorn group was 2.5 kg greater.

2.3.2 Trial 2

Halfbred lambs owned by Andy Fox at Foxdown in the Scargill Valley, North Canterbury, were shorn or left woolly in January and all were shorn as hoggets in November. Shorn lambs grew faster than woolly lambs and had a 1.2 kg advantage in live weight at hogget shearing. An extra 100 g of 25µm wool was harvested from the shorn group. When shearing costs and wool prices were taken into account, the woolly lambs were worth $1.90 more at 1994 prices.

2.3.3 Trial 3

Merino lambs owned by Hugh Cooper of Blairich Station, Blenheim, were shorn or left woolly. Hogget wools from Blairich were around 20 µm at the time. Much more discoloured wool was removed from the woolly group (16.3%) than the shorn group (5.2%). The shorn group produced a total of 230g more wool from the combined lamb and hogget shearings. The body weight of the hoggets was 30.4 kg for the shorn group and 30.6 kg for the woolly group. Vegetable matter contamination was very low at 0.2% in lambs, 0.4% in shorn hoggets and 0.2% in woolly hoggets. At 1996 prices, considering all the costs of shearing and value of the carcase and wool this was a commercial advantage of $1.17 per hogget in favour of the woolly group!

2.3.4 Trial 4

Merino lambs owned by Ross Beech of Stronsay in the Awatere Valley were shorn or left woolly. Hogget wools from Stronsay were around 20 µm at the time. The hogget wool from Stronsay was also measured for tensile strength and the shorter hogget wool from the shorn group was very strong at 47 N/ktex compared with that of the woolly group 30 N/ktex. Of course the shorn group had shorter wool (67mm) than the woolly group (87mm), and wool buyers consider length and strength together such that stronger short wool is not necessarily worth more. The woolly group had more discoloured fleece removed (11%) than the shorn group (5%). The shorn group produced 100g more total wool than the woolly group, but they were 200g lighter in live weight as hoggets. Vegetable matter contamination was higher at Stronsay than Blairich, at 1.4% in lambs, 0.5% in shorn hoggets and 0.6% in woolly hoggets. At 1996 prices, there was a commercial advantage of $4.20 in favour of the woolly group.

2.4 Skin values

Shearing lambs can cause shearing cuts in the skin. The cuts reduce the value of skins following slaughter (Holst *et al.* 1997; Scobie *et al.* 1998). Merino lambs are more likely to receive shearing cuts because their skin is softer and more wrinkly. The more times an animal is shorn, the greater the chance of skin cuts, so woolly lamb pelts are generally more valuable than shorn lambs. Shearing cuts become infected and the body must then use protein and energy to fight infection, which will reduce weight gain and in the worst case, persistent infections may lead to carcase trimming.

Although there is no permanent discounting in place for shearing scars in skin, companies have occasionally used this as reasons to discount the total value of lambs. The presence of wrinkles also reduces the value of lamb pelts. Unfortunately there are also clear signals to shear lambs before slaughter to keep wool length below 50 mm, because this reduces carcass contamination (Biss and Hathaway 1996). Shearing 7 days, 3 days or immediately before slaughter had no significant effect on microbial contamination of lamb carcases in Norwegian slaughter plants (Hauge *et al.* 2011), although New Zealand processing methods may be different.

The effect of lamb shearing on pelts and carcase contamination are confusing, so the simplest advice is that people finishing lambs should discuss their shearing policy with the company who processes their lambs. Breeders should also understand that Merino lamb skins have valuable wool and low value pelts, and crossbred lambs have valuable pelts and low value wool, but mid micron lambs can have skins that are valuable for woolskin production. Raw skins suitable for woolskin products can be more valuable than the wool and pelt separately, but may have exacting requirements for wool length (Scobie *et al.* 1997).

2.5 Australian research

A number of experiments in Australia have never been published scientifically and some of the following information was obtained from personal communications or leaflets such as those handed out at field days or workshops. They are summarised briefly here, and readers should note that temperature, weather and feed conditions vary widely across Australia within years at different sites and between years.

Drinan and Ferguson (1966) found a live weight advantage in "crossbred" lambs (New Zealanders would call these "Halfbred") shorn at 4 months and slaughtered at 7 months. Donnelly (1991) showed it was $A5 per head more profitable to leave lambs woolly until they were 12 months old, rather than shear them at 5 months and 12 months of age. Experiments at the NSW Department of Agriculture found that although lambs shorn in January grew 200 grams more total wool, there was no difference in liveweight in the following December when both the woolly and shorn hoggets were shorn, and leaving them woolly was $A10 per head more profitable. The NSW

Department of Agriculture also cited experiments at Condobolin in 1988 and 1989, where leaving lambs woolly was $A4.54 per head more profitable. In Victoria, Taylor (1989) found that shearing at weaning and again at 14 months cost $A5 to $A8 per head more, compared with shearing at 14 months alone. Comeback (¾ Merino) lambs (19µm) in Hamilton Victoria in 1989 and again in 1990 exhibited no difference between live weight or fleeceweight when they were shorn at 3, 6, 12 or 15 months of age. In Gippsland, it was $A5.34 per head more profitable to leave lambs woolly, because shorn lambs lost 1.4 kg after shearing, while woolly lambs gained 630 grams. On balance, these brief reports suggest that shearing lambs was unprofitable in Australia.

Rogan *et al.* (1995) shore lambs at weaning or left them woolly, and then shore both groups again at 10 and again at 16 months of age at Trangie in NSW. The core purpose of this experiment was to examine the repeatability of production measurements at 10 months and 16 months, to determine the accuracy of selection on fleeceweight or fibre diameter. In the group that was left woolly at weaning, there was a poor repeatability of fleeceweight ranking, whereas in the group that was shorn at weaning the relationship between fleeceweight at 10 and 16 months of age was twice as high. For stud breeding and selection purposes, lamb shearing removes the wool grown from birth to weaning, which could feasibly range up to two months more wool for older lambs, and would naturally result in heavier fleeces. This did improve the accuracy of selection of rams on fleeceweight. In contrast, shearing lambs had little effect on fibre diameter ranking. There was a commercial advantage of $A2.36 per head to leaving the lambs woolly, considering only commercial production parameters and shearing costs (700g live weight and 100g extra wool). However, six lambs suffered flystrike on the body, all had been shorn as lambs, a flystrike rate of 4% in this group. Work at the CSIRO in Armidale (Hemsley *et al.* 1984) had also shown that shorn lambs were more susceptible to fleece rot and flystrike than woolly lambs. It is possible that shearing equipment could transfer fleece rot organisms or change the architecture or temperature of the fleece to make it more conducive to the development of fleece rot under NSW conditions.

The research from Australia therefore suggests that shearing lambs was uneconomic. For stud breeding purposes, shearing at weaning is justifiable to improve the accuracy of selection on fleeceweight. The flystrike observed in shorn lambs is counter-intuitive yet not an isolated report. The author does not believe this would occur in the New Zealand environment, yet has nothing but anecdotal evidence to justify this belief and could easily be proved wrong.

2.6 International research

In Canada and the United States, many lambs are grain fed in feedlots to carcase weights much higher than average slaughter weights in New Zealand. Under feedlot conditions, the weight of carcase per kilogram of feed is key to financial performance.

Lane and Kemp (1990) fed crossbred wether lambs which were 35 kg at the beginning of their experiment for an additional 40 to 55 days and achieved a 384 g per day average live weight gain. Whether those lambs were shorn as they went into the feedlot, shorn after 3 weeks in the feedlot or left unshorn for the period of feeding made no difference to live weight gain. However, lambs that were shorn at the start of the feeding period ate more and therefore had a poorer feed conversion. The lambs were lot fed in the Midwestern United States during the summer when day time temperatures were often over 30°C.

Changes in environmental temperature are inextricably linked to changes in day length. Forbes *et al.* (1979) put lambs into controlled environment chambers at 19°C and exposed them to either 16 hours of light or 8 hours of light and found that the lambs in the longest light period grew significantly faster. They also found that woolly lambs produced significantly heavier carcases (1 kg) under these conditions, without a significant difference in feed intake. These lambs weighed 22 kg live weight at the beginning and 40 kg at the end of a 16 week feeding period. Readers may wonder why day length might be important. Well, the rise and set of the sun is very predictable anywhere on the earth, whereas New Zealanders can well appreciate that temperature can vary radically from one day to the next. Decreasing day length is a good indicator that winter is coming and on average temperatures will be cold, whereas a bitterly cold southerly might occur in late spring during increasing day length with summer approaching. Animals have evolved to use day length to track seasons, and use behavioural, postural, physiological and appetite mechanisms to compensate for short term changes in temperature. Deer for example have been shown to eat less in winter and more in summer regardless of how much they are offered. No evolutionary mechanism can prepare a sheep for the time of year a farmer might make the decision to shear it.

2.7 Other reasons for shearing lambs

Flystrike and grass seeds can severely reduce lamb growth, wool quality, pelt quality and may even result in death or carcase downgrading (Campbell *et al.* 1972; Shugg and Vivian 1973; Warr and Thompson 1976; Holst *et al.* 1996; Tozer *et al.* 2008, Scobie 2010). Lice are less life-threatening, but may reduce growth rate, reduce wool quality and cause cockle on lamb pelts (Heath *et al.* 1995; Scobie 2010). Timely shearing can dramatically reduce the impact of any of these. In districts where fine and mid micron sheep are farmed, grass seeds tend to be a problem in late spring and early summer, while flystrike tends to be more prevalent in late summer and autumn. On the other hand, lice populations are worst during winter. The choice of timing should therefore be based on the predominant challenge. Shearing to combat grass seeds is less likely to be useful in late born Merino lambs, because they will be small and have very short wool. It may be a useful strategy in older mid micron lambs with longer wool.

2.8 Possible reasons for variable results

2.8.1 Why might scientific trials yield variable results?

In a scientific experiment the ultimate goal is to eliminate all other variables apart from the one under study. In this case the only tolerable difference between the "treated" group and the "control" group would be that the treated group would be shorn. The shearing itself would be organised months in advance, and would only be postponed in the face of a cyclone, since snowfall is unlikely around the time of lamb shearing. Following shearing the shorn and woolly lambs would be fed the same allowance.

However, uncontrolled variables would creep in. Ideally the shorn and woolly animals would be run together as one mob, but this gives the shorn lambs scope to eat more. The reason for this is a hormonally based sense of urgency which increases the rate of biting and chewing grass. In contrast, if the two groups were run separately, the shorn lambs might utilise the feed more or less efficiently depending on the weather. These two situations were set up by Pownall *et al.* (1984), as described above. Shorn lambs were restricted to the same amount of feed as the woolly group by grazing them separately. Shorn lambs gained less weight and ended up with lighter carcases, whereas when they grazed both groups together, the shorn lambs gained more weight because they ate more.

Finally, the weather is variable and uncontrollable and there is a very limited window in which a response to shearing might be observed. Crossbred lambs shorn with a very thin comb and given ample nutrition following shearing will grow sufficient wool to have an insulating effect within a month. Within three or four days of shearing, the skin, the hormonal system, circulatory system and digestive system will all have changed dramatically to a new equilibrium to compensate for the changed environment. Many of the experiments described above reported hogget live weight and fleeceweight, yet the differences would have been established during a short period after shearing. Summer shearing of crossbred lambs tends to deliver improvements while autumn shearing may not, but then we must remember that only summer pasture is available following the earlier shearing and it is not uncommon for lambs to perform poorly on autumn pasture whether shorn or not. The weather and pasture are both very variable between years in autumn.

If the weather in the brief period following shearing is warmer, rather than cool, the woolly group may reduce feed intake due to heat stress and will use energy to pant and help thermoregulate. Meanwhile the shorn lambs will happily continue eating. On the other hand, if the weather turns colder, the shorn sheep will be penalised, and stand around with empty stomachs and arched backs for long periods using energy to keep warm. In this context, warmer and colder simply refer to the period prior to shearing and the relative expectations of environmental temperature surrounding the experiment, when it was designed months previously. Throughout any normal year

animals continuously adjust their thermoregulatory response. Other species use the growth and shedding of the winter coat, while sheep cannot do this.

2.8.2 Why might producers observe improvements?

Producer beliefs arise from observation, but in this context observation is seldom without response. Producers generally do not run treatment and control groups, and if they do, they are subject to the vagaries of the weather in the same manner as scientific experiments. So in the producers "experiment", the lambs are shorn. Merely because they are in the yards some other treatment is often imposed. For example they might be given a drench or dipped for lice – either of which could deliver a growth response by alleviating a parasite burden. Producers are often surprised to see lambs looking leaner than they had imagined them to be off shears. Whatever the cause, they will be given more attention than un-yarded woolly lambs might receive, or conversely woolly lambs might be mustered more frequently for dagging and fly-strike treatment and therefore experience more disease stressors like pink eye and pneumonia.

Shorn lambs would seldom be returned to the same pasture, and given the factors outlined above will be stimulated to eat more. If inclement weather arrives, shearing would be postponed. Following shearing the lambs would be given shelter if bad weather followed. They probably should be provided shade if hot sunny periods follow shearing, but sadly shade is not readily available on some farms. Furthermore, lamb shearing is often done during autumn when the temperature is cooling, and sheep enjoy cooler temperatures. It is also a season when rainfall is likely and this might bring better quality pastures. Shearing may indeed stimulate growth, but these other factors may have a greater influence on live weight gain.

3. Summary

In summary, shearing Merino or mid micron lambs in New Zealand may induce a short term increase in appetite, feed intake and therefore an increase in live weight gain and wool production. On the balance of the experiments reviewed here, the most optimistic live weight increase we could expect to see is about 1 kg, or less than 500 grams of carcase. Shearing may improve total wool harvested depending on the choice of season and the difference might be up to 200 grams, but this will come in two short lengths as "lamb" and "shorn hogget" compared with "woolly hogget" and the relative value of these wool types varies. Shearing lambs will increase shearing scars on pelts, but may reduce the incidence of flystrike on lambs, and cockle or grass seed damage to pelts, yet there is no consistent discounting for pelt damage.

Increased growth is also more likely in longer days associated with summer than short days in winter. The effect may come from alleviation of heat loading, although this is

more likely in the North Island or Central Otago summer, in Australia or internationally and particularly where shade is available. On the other hand cooler temperatures may stimulate feed intake and therefore production of shorn lambs. Very cold temperatures may suppress feed intake and at worst lead to hypothermia and death without shelter. Whatever the potential for a physiological boost to live weight gain, if there is no scope to increase feed intake, then shearing will actually cause live weight loss. A good deal of work from Massey University on improving lamb survival and lamb growth using mid pregnancy shearing of ewes warns of the same limitations. You only see improvements in productivity if the ewes have sufficient grass to be able to harvest more. Don't forget, if a lamb is held in the yards for a day, that is a day during which it will not grow, but will use rumen reserves of feed and body reserves of energy. Make sure those lambs go back out on feed and then return them to the shed if the weather is unfavourable.

We are therefore left with some choices for quality of meat, wool or ease of management:

a) **Shear lambs to suit meat processor requirements at any given time of year**.

Woolly lambs, particularly in the early season, suffer less bruising and produce better pelts, while shorn lambs, especially in the autumn and winter, deliver lower carcase contamination. Shear slaughter lambs within the period set by lamb processors or to meet the staple length criteria they set. Shear store lambs as the purchaser dictates, or on observed price differences at store sales.

b) **Shear lambs to control fly-strike**.

Shear lambs just prior to the annual risk period, or when fly numbers begin to increase in traps. Alternatively one could wait until fly-strikes are actually observed in lambs in environments where the risk period, fly species or fly numbers in traps vary dramatically between years.

c) **Shear lambs to control grass seed contamination of the fleece and carcase**.

Shear lambs just prior to the annual risk period. Grass seed set will be more predictable than flystrike challenge. Consider chemical and management methods to control grass seed populations or create seed-safe paddocks where terrain permits.

d) **Shear lambs at the optimum for wool quality**.

In environments that suffer little from fly-strike or grass seeds, it should be possible to minimise the cost of shearing and manage wool length to maximise value. Shearing replacement lambs late in autumn can reduce the value of the hogget fleece.

e) **Don't shear lambs**.

The bulk of scientific trials do not support shearing lambs on a financial basis. This must be balanced with the cost of prevention of fly-strike.

4. Recommended Practice

To make the most appropriate decision **each year**, producers should:

- Observe ripgut brome and barley grass populations or prepare grass seed safe paddocks.
  [Action may be required well before weaning to manage grass seed damage.]
- Develop a feed budget for the farm

If feed is in short supply, **do not shear** lambs. [Other action may be necessary]

If there is sufficient feed available to deliver a growth response and it is not required for other classes of stock, then decide on the number of lambs to be retained as replacements and the number to be sold. The decision to shear may be different for male and female lambs, different for those that are to be sold prime or store, and may be different again for female lambs that are retained as replacements. Decide how you will manage your replacements through autumn and winter. If fly strike risk is high, shearing will bring peace of mind. Long wool may become very muddy on crops.

At weaning:

- Determine grass seed burden on the lambs, and shear lambs to relieve stress of high grass seed burden.
- Determine the live weight of the lambs. From the feed budget and live weight, estimate the dates sale lambs might reach slaughter weight.

Speak to your lamb processor to obtain projections/contracts around those dates for:

- Value of 1kg of carcase weight
- Premium for shorn lambs (if any)
- Value of woolly pelts and shorn pelts

If and only if feed is available, calculate whether shearing is profitable based on an optimistic expectation of 100g of extra hogget wool on replacements, 500g of extra live weight and the appropriate pelt value. Subtract the cost of shearing and add the premium for shorn lambs.

Shearing lambs usually proves uneconomic, but to maximise the value of the exercise obtain:

- Projected values of appropriate woolly hogget, lamb and shorn hogget wools from Merino New Zealand
- The cost of shearing lambs from contractors

- The cost of crutching or chemical protection from flystrike

If you must shear lambs for grass seed or flystrike choose the appropriate time of year and be prepared to revise that as conditions change. If you shear for winter management, try to optimise the value of both lamb and hogget wool.

Provide shelter following shearing at any time of year. In the heat of summer ensure that water and shade are available. As autumn progresses and winter comes on, it becomes less likely there will be a live weight benefit. If flystrike protection by crutching or chemical is as expensive as shearing, or conditions become very conducive to flystrike when chemical protection wears off, be prepared to revise the decision to retain woolly lambs.

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