FARM

beef+lamb new zealand

FACT SHEET

MAY 2019

SHELTER

Maintaining the welfare and productivity of sheep and cattle on drystock farms

New Zealand's temperate climate means farmers produce world-class livestock from grass-based outdoor systems. High standards of animal welfare are a key part of any successful, sustainable livestock enterprise, and farmers take great pride in managing their stock in the best possible way, to produce high quality products.

Keeping grazing livestock at a comfortable temperature makes good sense for both animal welfare and productivity reasons, especially at times of the year when livestock are vulnerable to either very hot weather or cold, wet, windy conditions. This includes when animals are heavily pregnant, around lambing and calving, and immediately post-shearing.

By providing shelter or shade, the farmer can reduce adverse impacts on livestock, mitigate the risks and impacts of the weather on farm productivity and enhance the reputation of the livestock industry in the eyes of the public and consumers. Planting trees or live shelter also creates a more pleasant living and working environment, enhances biodiversity, prevents erosion, improves water quality, and improves the value of the property both in economic terms and recreational use.

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The benefits of shelter and shade
Sheltering against cold, wet and windy weather can benefit livestock productivity and welfare in a number of ways:

- Better food conversion efficiency and increased growth rates – more shelter means less energy spent keeping cool or warm
- Better survival chances for young lambs and calves
- Reduced stress on vulnerable animals, such as heavily pregnant ewes and cows, or any sheep post-shearing
- Better pasture growth and utilisation – warmer temperatures encourage growth; animals will graze more evenly over widely sheltered areas
- Reduced drying of pastures reduces moisture loss
- Better reproductive performance – rams and bulls, especially lowland breeds, will perform better in more sheltered environments.

Shade too can contribute to animal welfare and productivity, reducing the risk of heat exhaustion and sunburn.

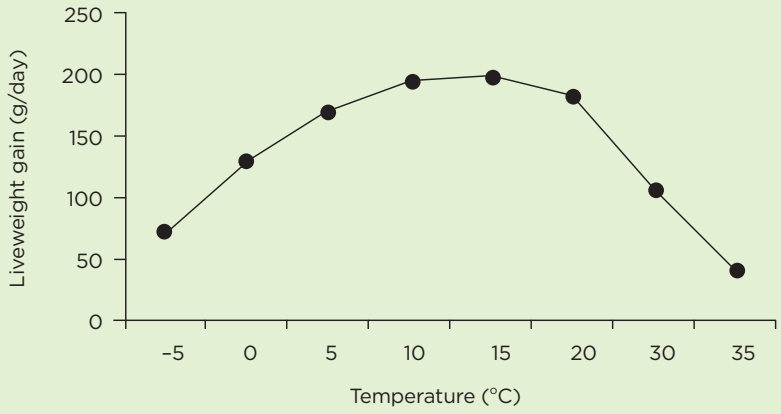
Heat balance in grazing livestock
Animals must maintain their body temperature within a comfort zone, their 'thermoneutral range', otherwise they use extra energy shivering or panting.

For most grazing livestock, the upper critical temperature is around 25-26°C. Above this temperature, productivity will decline as animals use energy trying to stay cool.

Similarly, an animal becomes 'too cold', and thermally stressed, if the air temperature falls below a certain level – its lower critical temperature. This temperature varies with species and within species at different stages of the production cycle. For example, the lower critical temperature of a mature sheep in full fleece can be as low as -20°C; for a newly-shorn sheep it can be +25°C; for a newly born lamb it is higher still. Below its lower critical temperature, an animal metabolises internal fat resources to keep warm.

Animals gain heat mainly from their internal metabolism, and from the sun. They lose heat in three main ways – by convection to the air, radiation, and evaporation.

Figure 1 The effect of temperatures on lambs kept in climate controlled rooms at constant temperatures (drawn from Ames & Brink 1977).



This graph shows lambs grew faster when reared at moderate temperatures in indoor trials. When farmed outdoors, shelter is one way to reduce wind chill and therefore the impact of extreme hot or cold weather.

REQUIREMENTS OF THE ANIMAL WELFARE ACT

The Animal Welfare Act 1999 establishes the fundamental obligations relating to the care of animals in New Zealand. These 'duty of care' obligations are described in more detail in the associated Codes of Welfare.

The Animal Welfare (Sheep and Beef Cattle) Code of Welfare 2018 sets the minimum standards and recommended best practice for shelter, including:

Minimum Standard No. 6 – Shelter

a. All sheep and beef cattle must have access to shelter to reduce the risk to their health and welfare caused by exposure to cold.
b. Sheep and beef cattle giving birth must be provided with an environment affording the newborn protection from any reasonably expected climatic conditions likely to compromise their welfare and survival.
c. Sheep and beef cattle must be provided with means to minimise the effects of heat stress.
d. Where animals develop health problems associated with exposure to adverse weather conditions, priority must be given to remedial action that will minimise the consequences of such exposure.

Mature animals and bad weather

Mature grazing livestock are generally very well-adapted to maintain a comfortable body temperature regardless of the weather. In winter, as long as they remain well-fed, and have good body condition, their body metabolism produces enough heat for them to withstand cold or wet weather over prolonged periods. Breeds with thick coats or fleece are insulated against heat losses; mature animals also instinctively seek shelter if it is available.

But even mature livestock can be seriously affected if bad weather coincides with times when they are already under stress – for example, immediately after shearing or in the last few weeks of pregnancy. The weather in the weeks leading up to lambing can be just as important as the weather during lambing in determining lamb survival rates. This is because the ewe experiences very high metabolic demands in late pregnancy, especially if carrying multiple lambs. She may also reduce her feed intake at this time, and have to mobilise fat reserves to maintain her heat balance. If also exposed to cold, wet, windy weather, the ewe may come under significant thermal stress, and will shift resources away from her lambs in a bid to keep herself warm. So while a well-fed ewe is considered 'the best shelter a lamb can have', protecting ewes from bad weather before lambing will contribute significantly to the chances of good lamb birth weights and survival.

Particular care may also be required for dairy animals overwintering on your property, as these may not be as 'thick-skinned' as other stock classes.

Why newborn lambs are vulnerable to starvation and exposure

Newborn lambs are challenged by exposure and the risk of starvation from the moment they are born. A newborn lamb has to endure the stress of birth; some 17-27% of lamb losses are due to dystocia (difficult birth). Once born, a lamb has to increase its internal heat production markedly - by an estimated 15 times - to maintain its body temperature. The colder the external air temperature, the greater the immediate stress on the lamb.

It's important for a lamb's survival for its mother to bond with it, lick it dry, and suckle it as soon as possible after birth. If the lamb is too cold or weak to suckle early in life, or if it is mismothered, its metabolic rate declines, and it becomes even weaker as its very limited body reserves are depleted. If a lamb is wet from amniotic fluid and/or rain and snow, it will lose yet more heat through evaporation.

Windchill – a major threat to livestock welfare and lamb survival

The ambient temperature experienced by a newborn lamb depends on the air temperature and also the windchill, which is directly determined by wind speed. The greater the windchill, the greater an animal's heat loss.

Any type of shelter slows the wind speed and reduces windchill. Critical extra minutes of a lamb's life may be gained, during which time a ewe could return to her lamb and get it to suckle, or a shepherd could intervene to help it survive.

Even at very mild temperatures, a wet, hungry newborn lamb will be thermally stressed. But once on its feet and suckling, a lamb can follow its mother, use her for shelter, and continue to suckle to replace heat losses.

Multiple births usually result in lighter lambs. These lambs are particularly vulnerable to heat loss; they have lower fat reserves than heavier lambs, and a high surface area to body weight, increasing heat loss. Lighter lambs are therefore also likely to maintain their suckling drive for a shorter time than heavier lambs, reducing the time available for successful mothering up. Providing shelter for ewes known to be carrying multiple lambs should therefore be a priority, both to protect the ewes before lambing, and to give the lambs a better chance of survival once born.

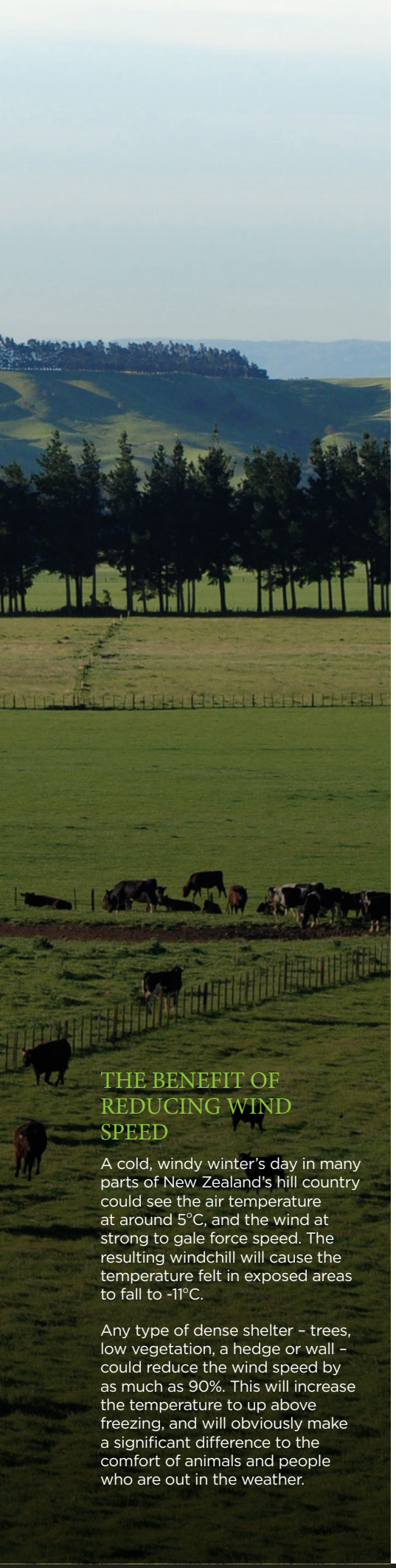
A whole-farm approach to sheep and beef cattle welfare

Good livestock management revolves around an understanding of complex land, climate, and animal interactions, combined with the objectives of the farmer. Understanding these interactions is just good sense to most farmers – choosing the right breeds of animal to suit the farm, the right lambing and calving dates to coincide with grass growth and market objectives, and so on.

Using different parts of the farm to maximum advantage at different times of year is another 'common sense' aspect of livestock management. For example, moving scanned ewes known to be carrying multiple lambs to more productive, sheltered parts of the farm is common practice for farmers who understand the energy demands being placed on these ewes in late pregnancy.

When cold, wet, windy weather strikes, having shelter of any description can make a big difference to livestock welfare at critical times. Some paddocks are well-sheltered from prevailing and problem winds thanks to topography and aspect. Natural vegetation such as tussocks, rushes and regenerating scrub can provide excellent low, localised shelter simply by reducing wind speed directly in their lee. They also provide other advantages such as access to feed and shelter in adverse events such as a snow storm, whereas flat, non-sheltered areas can trap stock without food during a snow storm. The addition of well-designed shelter plantings can greatly increase the sheltered area available.

The majority of New Zealand's sheep and beef farms have geographical features and natural or planted vegetation that afford shelter to livestock.



THE BENEFIT OF REDUCING WIND SPEED

A cold, windy winter's day in many parts of New Zealand's hill country could see the air temperature at around 5°C, and the wind at strong to gale force speed. The resulting windchill will cause the temperature felt in exposed areas to fall to -11°C.

Any type of dense shelter – trees, low vegetation, a hedge or wall – could reduce the wind speed by as much as 90%. This will increase the temperature to up above freezing, and will obviously make a significant difference to the comfort of animals and people who are out in the weather.

Trees for shelter and shade

Planting trees is an option available to almost all farmers who want to mitigate the extremes of heat, and cold, wet and windy weather. Shelterbelts, woodlots, widely spaced trees and even individual trees all have potential to protect animals from cold or heat. Most farmers agree that having trees on the farm makes for a more pleasant working environment, and well-planned plantings with shelter and/or shade objectives have the potential to bring other benefits to the farm such as timber or firewood production, reduced soil erosion, habitat for wildlife, nectar for bees and fodder during droughts.

Conversely, badly designed plantings can cause long-term problems including increased incidence of disease, reduced pasture growth, and drainage and shade problems. The costs of establishing trees, which include lost grazing, fencing, planting and young tree maintenance can be significant. Other risks to consider include fire or wind throw damage. When considering tree planting, good planning and design are therefore important, and must take into account:

a. the objectives of the farmer
b. the prevailing land and climatic conditions
c. the current land-use (and any likely changes in future)
d. the needs of livestock for shade and shelter at critical times.

Understanding how wind interacts with trees, and how the interactions change the microclimate around the trees, can go a long way in ensuring that the right trees are planted in the right place to achieve the farmer's objectives.

The two most important characteristics determining the area and intensity of shelter created by trees are:

1. the height of the planting – the higher the trees, the greater the sheltered areas on both the windward and leeward sides of the planting
2. the porosity of the planting – the more porous the planting, the more air will filter through the trees, which up to a point results in a greater, but less intensely sheltered zone in their lee. Dense plantings have short, very well sheltered zones, but turbulent air beyond; if a shelterbelt becomes too porous or has gaps, wind speed on the leeward side can even increase as the air funnels through the gaps.

Good design will result in plantings which provide the desired shelter intensity over as much of the target area as possible. Factors like species choice and size and location of the planting will depend on each individual situation.

Figure 2 The flow of wind across a dense shelter planting (0–40% porosity).

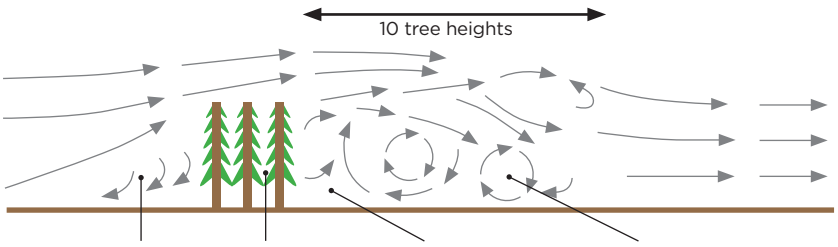
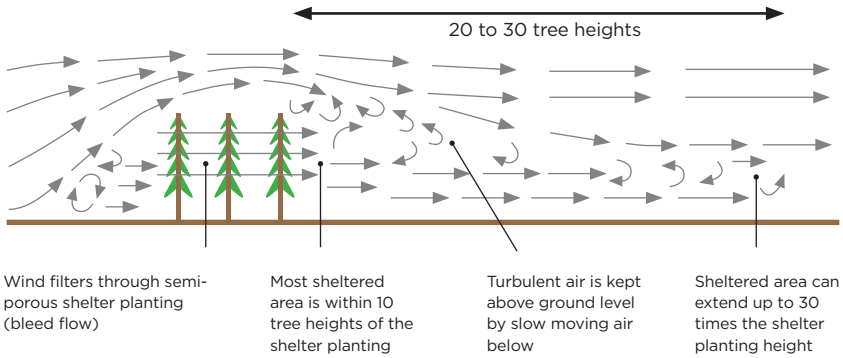


Figure 3 The flow of wind across a medium density shelter planting (40–60% porosity).



CASE STUDY 1

Andy and Tinks Pottinger, Anerley, Tinui Valley, Wairarapa

Farm overview: 1150ha rolling to steep highly erodible hill country (880ha grazing land). 10000 stock units, 85% sheep; 5300 Highlander high performance ewes

Annual rainfall: 1300-1400 mm, 75% falls in winter. Snow very rare.

Prevailing wind: North-westerly **Problem wind at lambing time:** Cold southerly off the coast

Shearing: Once a year in summer **Scanning:** For multiples **Lambing:** Late August onwards **Target docking percent:** 145%

"Our land is highly erodible, but we stabilised some of our most erodible faces by planting widely spaced trees. Wide spacing means there is still plenty of pasture underneath the trees, and there is shelter for stock in rough conditions.

One year we had a spell of shocking weather at lambing time. But in one particular paddock we docked around 25% better than any other paddock. When I came to analyse this, I realised it was due to the trees: about half the paddock has spaced tree cover which provides really good shelter. I've walked though that paddock at docking time when it's been blowing a gale, and it's calm, and the sheep are settled under the trees. It's a complete contrast to some of our more exposed land.

Scanning has made a huge difference to how we manage our sheep. Ewes carrying multiples are fed differentially and we lamb them on easier, more sheltered country. Having sheltered land means we can maximise the benefits of scanning. Trees are an integral part of the way we farm. My father started planting trees in the 1950s: different species for shelter, shade, soil conservation and aesthetics. Now when you fly over this farm it's a picture."

Shelter for lambing
If the key objective is to provide shelter in a lambing paddock then a relatively dense shelterbelt, oriented to counter problem winds (usually southerlies or south-easterlies), is one good option. This type of shelterbelt will reduce wind speed by up to 90% in a short zone (three to five times its height) in its lee.

Problems with dense shelter include pre-lambing ewes camping close to the trees, forcing ewes about to lamb to seek isolation in more exposed places. Also there is the risk of sheep being caught in snow drifts in front of the belt; dense plantings can also cast heavy shade causing frosts to lie and problems with pugging.

Shelter for grazing animals
In contrast, if the key objective is to create a more benign environment for grazing animals pre-lambing or calving, and post-shearing, then a semi-permeable shelterbelt oriented to counter prevailing winds, or widely-spaced trees, may be worth considering.

A shelterbelt which is 40-60% porous throughout its height will reduce wind speed by 20-70% over an area up to 15-20 times its height, depending on porosity and distance from the trees. This results in an extensively sheltered area within which livestock can continue to graze; in an ideal situation, the paddock will also have plenty of dry lambing sites along with more dense, localised shelter such as tussocks or scrub for new-born lambs.

BENEFITS OF A SEMI-PERMEABLE SHELTERBELT

A semi-permeable shelter planting of a tall fast-growing species such as poplar or eucalypt could easily reach a height of 5 metres within five years of planting, and perhaps 25 metres within 15-20 years. The sheltered area will extend to some 75-100 metres out from the planting within a few years, and around 500 metres at maturity.

Even on a relatively mild day, with air temperatures around 10°C, a moderate breeze will mean the temperature felt drops to 3°C. A semi-permeable shelterbelt could reduce the wind speed by 50%, increasing the ambient temperature in the sheltered zone by around 5°C. This will not only improve conditions for livestock, but improve pasture growth as well.

Spaced plantings of tall grasses such as native toetoe can provide shelter from winds from any direction and isolation for lambing ewes.

Widely-spaced trees can reduce wind speed for livestock grazing under them if plantings are well-designed; this type of planting has the added advantage of providing shade in summer, and, depending on species, an overhead canopy in winter, reducing radiative losses on cold, clear nights.

Poplar and willows are often recommended for widely spaced plantings on erosion-prone hill country; careful choice of species will include some that retain their leaves well into the autumn and/or flush early in spring, increasing the time that the trees provide protection.

Shelter plantings may need regular maintenance over their lifetime to maintain the optimum porosity for the desired type of shelter.

CASE STUDY 2

Michael and Michelle Anderson, Lyndale Farm, Hokonui, Southland

Farm overview: 490ha rolling country. 3300 ewes, 1100 hoggets

Annual rainfall: 1050 mm, at least two significant snow falls a year

Prevailing wind: North-westerly **Problem wind at lambing time:** South and south-westerly spring fronts

Shearing: Once a year in summer **Scanning:** For multiples **Lambing:** Early August to Labour Weekend **Target docking percent:** 155-160%

"Because we lamb hoggets I use every paddock on the farm for lambing, and I've made sure every paddock has shelter. The sheep will always choose to go to the higher, more exposed places to lamb so I use electric fences to keep them off the high points and bring them down into more sheltered areas.

Recently I bought another 100 hectares with no shelter, and the difference between this land and my sheltered land is really obvious. So I've planted five shelterbelts. I mainly planted a eucalypt – Eucalyptus cordata. It grows fast but keeps its low branches so gives good low shelter. And eucalypts that flower in autumn are full of tui and bellbirds all singing away, which is a real bonus.

I have been able to quantify the benefits of shelter in one way: we have a very good lambing shepherd who lambs our sheep on both the new, unsheltered land and our more sheltered land. Everything – the sheep, the system – is the same, but the lambing percentage is 15% lower in the twinning paddocks on the new land. Just keeping lambs out of the wind, rain and snow is the difference."

Local sources of further information and advice about lambing, animal welfare, and shelter plantings:

1. NZ Farm Forestry Association: some 27 branches throughout New Zealand. Members of your local branch have experience and are happy to share their knowledge at field days and through other information resources. nzffa.org.nz; 04 472 0432
2. Regional /district authorities: land management staff at your local authority may be able to provide shelter planting advice; some also provide financial assistance for plantings
3. Ballance Farm Environmental Award winners: many environmental award winners have showcase plantings of trees integrated with livestock management.
4. Your local vet – the NZVA can help on 04 471 0484.
5. Beef + Lamb New Zealand: Your local Extension Manager - visit beeflambnz.com/contact-us and filter under region

Sources/useful information to download from beeflambnz.com:

Making Every Mating Count, (B+LNZ)

Snow Guidelines, (B+LNZ)

Reviving Newborn Lambs, (B+LNZ)

Rearing Orphan Lambs, (B+LNZ)

The Poplar and Willow Research Trust has a wealth of information about using trees on farms: poplarandwillow.org.nz

Animal Welfare (Sheep and Beef Cattle) www.mpi.govt.nz

Lamb survival: Coping with adverse spring weather - Preparation is the key. John Smart, Clutha Vets (2012). cluthavets.co.nz

Management Guidelines to Improve Lamb Survival. MPI Sustainable Farming Fund project 05/104 (Project manager: Dr Julie Everett-Hincks, AgResearch, Invermay). Outputs available on the Sustainable Farming Fund website: http://maxa.maf.govt.nz/sff/about-projects/search/05-104/

The Principles of Using Woods for Shelter. Forestry Information Note 81, UK Forestry Commission, Edinburgh, Scotland (2006) forestry.gov.uk/pdf/fcin081.pdf/$FILE/fcin081.pdf

Trees on Farms videos –a short video featuring NZ farmers talking about the value of shade and shelter trees on their farms. http://nzffa.org.nz/farm-forestry-model/resource-centre/trees-on-farms-videos/videos-by-category/trees-for-shade-and-shelter/

Fisher, M. (2007). Shelter and welfare of pastoral animals in New Zealand. NZ Journal of Agricultural Research, Vol 50: 347-359.

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Ministry for Primary Industries
Manatū Ahu Matua

NZVA New Zealand Veterinary Association

NEW ZEALAND FARM FORESTRY ASSOCIATION