Shelterbelts and shelter for multiple outcomes on farms

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Revegetation design for shade & shelter to achieve multiple outcomes

Revegetation can be undertaken in the following ways:

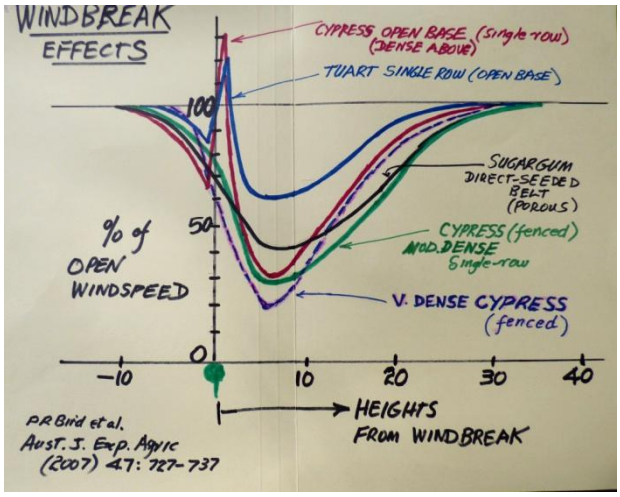
- Shelterbelts
- Planting of clumps of trees & shrubs
- Planting spaced individual trees – preserving the original landscape in some areas

Shelterbelts – there is a great volume of information currently available on this topic (e.g. see *Trees for Shelter: a guide to using windbreaks on Australian farms* by Helen Cleugh (2003), a JVAP publication through RIRDC). However, there are still a few problems with advice from other sources that is sometimes given to landholders. One concerns the question of shelterbelt density and its impact on the resulting shelter downwind from the belt. There is NO good evidence that very dense belts result in a lesser shelter zone behind the belt, or a smaller reduction in the windspeed there, than would occur with more 'porous' belts.

The work in Victoria [PR Bird, TT Jackson, GA Kearney, A Roache in *Aust. J. Experimental Agriculture* (2007) **47**: 727-737] with a range of shelterbelts of varying species, heights and densities can be summarised as follows:

1. For moderately dense or very dense windbreaks, the porosity of the belt had no effect on the extent of wind abatement beyond the belt.
2. Very dense belts provided a greater wind reduction than occurs with more porous belts.
3. Very dense belts tended to have the position of greatest shelter closer to the belt.
4. Very dense belts with a gap near ground level had increased windspeed through the belt and immediately to the lee but very good protection beyond. (Keep browsing livestock out!)
5. Very open belts (with more open base) had increased windspeed through the belt and immediately to the lee. The shelter benefit (wind reduction) further afield was also much less than with dense belts.
6. The most effective shelter is obtained from tall, dense windbreaks.

Some of these windbreak effects can be seen in the following sketch from the Victorian windbreak studies.



It follows that if you require intense shelter (e.g. for lambing ewes or newly-shorn sheep) then you should consider a dense belt with no gaps at the base. How you get that result depends on:

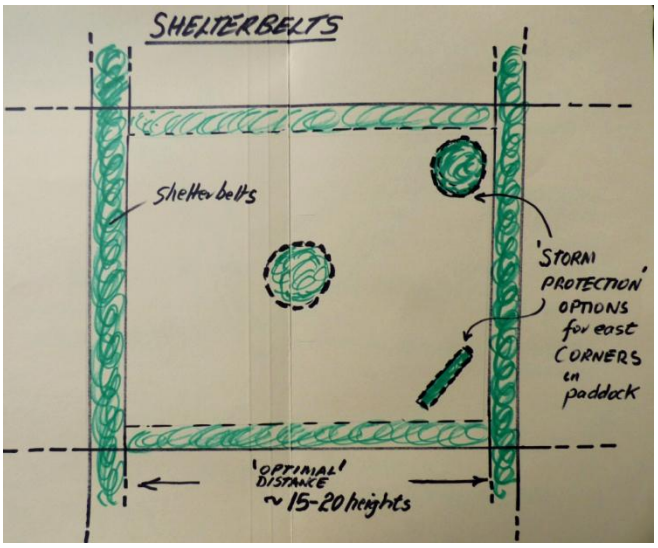
- Number of rows in the belt
- The spacing of trees and shrubs
- The species used
- Fencing livestock out.

Farm Shelter Options

1. **Shelterbelt grids** – the objective is to reduce windspeed over the landscape by providing a network of shelterbelts. The rough rule of thumb is that the grid should be spaced at 15-20 heights of the windbreaks when mature (e.g. for 20H this would be 400 m for a 20 m tall belt). This distance should provided protection across the paddock (there is a degree of wind abatement at least 5H out from the windy side of the belt).Where it is not feasible to plant on a grid pattern, then consider from which direction the severe winds come and plant accordingly to block those winds.

   At Melville Forest in SW Vic [PR Bird, TT Jackson, GA Kearney & KW Williams *Aust. J. Experimental Agric* (2002), **42**:809-830] we measured wind direction, windspeed and rainfall from April to December and concluded that most rain was associated with moderate to strong winds from the SW, W, NW and N. No single windbreak would solve the problem.

   "Storm Protection" options include fenced tree clumps – circles or rectangular bars placed in the centre and far corners (NE & SE) of paddocks where sheep that are driven there will find protection.



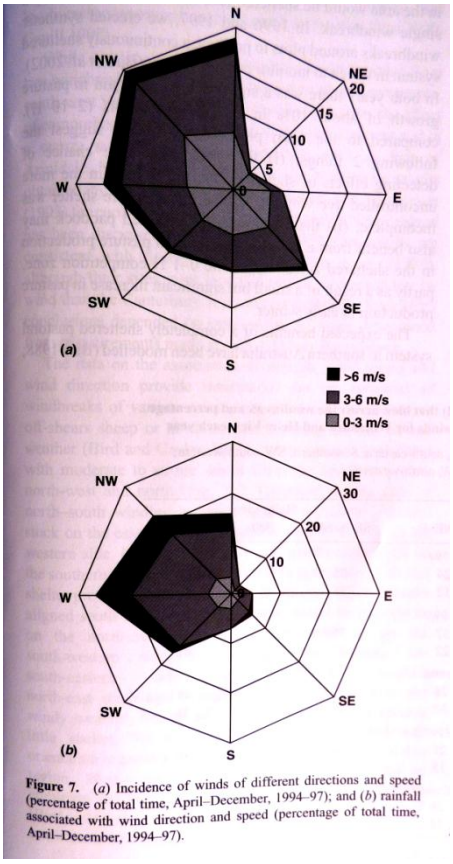
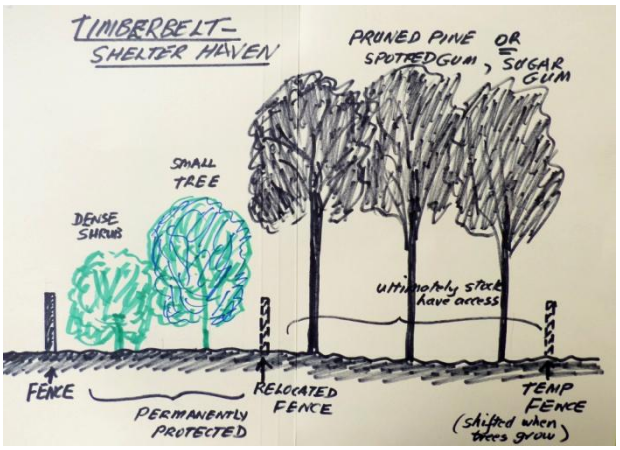


Figure 7. (*a*) Incidence of winds of different directions and speed (percentage of total time, April–December, 1994–97); and (*b*) rainfall associated with wind direction and speed (percentage of total time, April–December, 1994–97).

Timberbelt-Shelter Havens – this is a design that can provide multiple benefits. It consists of a 2-row belt of dense shrubs and small trees, with 2-5 rows of tall timber species on the lee side.

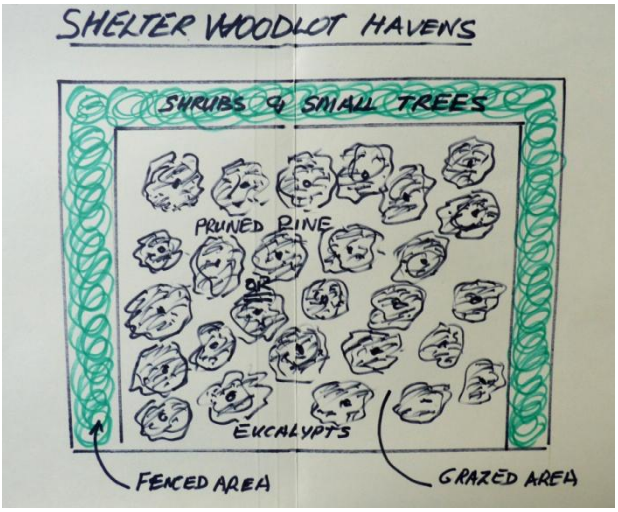
The timber species may be *E. globulus* (for pulpwood), Sugar Gum (for firewood), Spotted Gum (clearwood-pruned) or *Pinus radiata* (clearwood-pruned).

The fence beyond the timber line is shifted to the lee of the shelter row at about year 5-10 (depending on likely stock damage to the timber trees when access is allowed). Advantages are improved fire resistance, provision of shade and protection of recently off-shears sheep from rain as well as wind.



2. **Shelter Woodlot Havens** – this concept from New Zealand aims to have several havens placed strategically around the farm so that when a severe storm event coincides with shearing or lambing there is somewhere to push a mob in without a huge disruption to the farm routine.

   Each haven may be 1-2 ha in area, three sides sheltered by fenced dense belts of shrubs/small trees. The central block has spaced timber trees of pruned pine or eucalypt. The canopy of the timber trees prevents wind dropping down into the haven and it provides some protection from rain. The central area should cater for any stock enclosed there for a day or so.



Economic benefits of shelterbelts

Over the years from 1968-1980 in eastern Australia (Armidale, Hamilton 7 Caramut) 6 studies found that effective shelter reduced losses of newborn lambs by 50%. In August 2003 at PVI, Hamilton, about 800 lambs died in one wet, cold and windy week. Such losses are sporadic but costly and inevitable. Every lamb born on a cold, very wet and windy day is likely to die unless there is adequate shelter.

Sheep less than 2 weeks odd-shears are also susceptible – losses can be associated with extreme weather events that occur in summer or autumn, when adaptation to cold has not been redeveloped. Extreme events in 7/12/1982, 21-22/3/1983 and 1/12/1987 resulted in publicised losses of over 250,000 sheep. Some farmers lost 1,000 but there were few losses where shelter was available. Severe weather events are regular but not frequent so the tendency is to just accept the risk. Animal welfare considerations alone should over-ride that attitude.

Some years ago I modelled a situation where an economic assessment of the long-term costs and benefits of sheltering a farm was made. Perhaps the most accessible form of that paper is in *Trees and Shrubs for SW Victoria* [PR Bird, GA Kearney & DW Jowett (1996) Agriculture Victoria, Tech. Report series No.205]. A range of assumptions were made as to likely shelter benefits (from pasture growth, decreased animal energy expenditure for maintenance, reduced lambing losses and reduced loss off-shears) and the result indicated that 10% of the farm could be profitably devoted to shelter. Subsequently, we found that our assumption of a 10% increase in pasture production was likely to be too high but our estimation of 10% reduction in energy was probably too low, meaning that our conclusion was probably still valid.

The economic effect of shelter on cattle productivity is less clear, although many studies have shown some benefit. Dairy cattle certainly respond to shade in hot and humid weather. Cold, wet and windy weather also increases energy expenditure and that may not be made up by increased intake of feed. Even if it did, the efficiency of energy use to produce meat or milk would still be reduced.

Animal welfare considerations should demand that shade and shelter be provided for all farm animals. It may be that domestic and overseas markets may one day demand animal products from farms that have a genuine animal welfare policy.