



Coorong Tatiara

Sustainability, Agriculture & the Environment



Fact Sheet #4 Forage shrubs as shelter belts and windbreaks

Sandy dune-swales are the dominant feature of the Upper South East and the Murray Mallee. Without adequate plant cover, the soils in these landscapes are easily eroded by wind. Soil erosion has been reduced by conservative cropping and reduced grazing pressure. Shrubs have also been planted in belts, alone or with trees and herbaceous pasture plants, to reduce erosion. To use forage shrubs as a windbreak requires careful planning and management. Some aspects of shelterbelt design affect forage use.

Shelter belt diversity

Species choice and planting density determine the height and porosity of the belt, along with forage production. A windbreak's height and porosity determine its effectiveness. Porosity is the ease with which wind can move through the break. Wind can move easily through an open, porous shelter belt, or over a short one, without slowing substantially. Current thinking suggests that a less porous barrier is more effective.

There is a range of forage shrub species of contrasting height, width and foliage density that can combine as a near impermeable wind barrier. These species vary from low, ground-hugging species such as ruby saltbush (*Enchyleana tomentosa*) and river saltbush (*Atriplex amnicola*), to intermediate shrubs such as old man saltbush and taller shrubs such as wattle (*Acacia ligulata*) and sheoak (*Allocasuarina verticillata*).

Our demonstrations suggested that total shrub intake increased where sheep had a choice of more than one species. So, more diverse shrub stands, planted as a more complete wind shelter, may increase shrub use efficiency. Greater variety also allows different shrub traits to be included, such as the potential worming action of tar bush (*Eremophila glabra*). It may be less stressful for an animal to detoxify plant secondary compounds from a variety of plants, rather than large amount of one plant secondary compound. Animals that graze a selection of shrub species may be exposed to a range of plant secondary compounds, each requiring different mechanisms for detoxification. This may be less stressful on the animals than detoxifying large amounts of just one plant secondary compound.

Shelter belt shape

The broad shape of the shelter planting and its orientation to the most damaging winds are an important design element, as is the distribution of shrubs in the planting area. The width of the alley between shelter belts is affected by the number of shrub belts per hectare, the number rows in a shrub belt and the number of shrubs per metre of row. Shelterbelt spacing influences the way in which it can be accessed and its productivity.

Key points:

- The effectiveness of a shelterbelt is determined by its species composition and planting design.
- In highly erodible areas, grazing may compromise a shelterbelt's effectiveness in stopping wind erosion.
- The presence of alley pastures can increase the effectiveness of a shelterbelt.

Alley spacing

The effectiveness of an individual shrub belt to reduce wind speed and soil movement falls as the leeward distance from the belt increases. Wind speeds are slowed most effectively on the leeward side within the distance equivalent to 10 times the height of the shelter belt. Beyond this point, the wind speed increases until it approaches the windward speed at a distance equivalent to 20 times the maximum height of the shrub belt. In our demonstrations, the tallest old man saltbush plants were approximately two metres. Thus, the wind speed is slowed most within 20 m downwind of the shrub belt. Over the next 20 m, the wind speed accelerates, attaining its original speed 40m downwind.

We aimed to make the total area of the shrub

planting not only productive but also diverse nutritionally. So we planted pastures in alleys between rows of shrub belts. Future use and access need to be considered when planning the arrangement of the shrubs. We also wanted to have the opportunity to re-seed pastures in the future. The alley widths were seven metres, which was wide enough to allow a pass of a conventional pasture seeder. The minimum width should allow the passage of a mustering vehicle. Larger vehicles, tractors and wider equipment will require wider plantings. As the distance between the shrubs belts increases, other considerations come into play.

At wider alley spacings, there are fewer shrub belts. Shrub production per hectare (kgDM /ha) will fall unless the number of rows per shrub belt is increased or the shrubs are planted closer together. Research conducted by Jason Emms (SARDI) under the Enrich project has shown that shrub forage yield does not increase beyond that achieved by planning 1,100 shrubs per hectare. For smaller shrubs such as river saltbush, the plantings are denser



Grazing frequency

As the distance increases between the belts, the production from the alley pastures is a larger portion of the total feed-on-offer (FOO). Frequent grazing during late winter, spring and early summer will increase the feed use efficiency. During this time, sheep will preferentially graze pasture plants more heavily than shrubs. Grazed shrubs can recover from moderate grazing up until spring. Many, such as old man saltbush, grow most actively in the warmer months.

In the lucerne-veldt grass pastures adjacent to the Coomandook demonstration, more frequent grazing appeared to result in more productive and nutritious pasture than in the infrequently-grazed alleys in the demonstration plots. More intensive grazing does increase the risk of reduced total feed-on-offer in autumn. However, the reduced mass of feed-on-offer from more frequent grazing was compensated by the pastures apparently being higher quality in late autumn.

Preventing erosion

Our experience suggests that, on easily eroded soils, dual use of forage belts as wind breaks and a significant forage source **may compromise their effectiveness as shelters**. Within a shrub stand, livestock remove significant amounts of herbaceous plants before browsing the shrubs. Further heavy grazing of the shrubs themselves will remove most leaf and stalks narrower than 3mm, leaving the basic branch architecture with reduced ground cover. Soil protection then relies on the bare shrub stems, their roots, and the tussocks of robust pasture species, such as veldt grass. The level of soil protection offered by these residues has not been determined, but there does appear to be a heightened erosion risk.

Keeping the soil covered with plant litter is essential to reduce the risk of wind erosion on the sandy soils. It may help maintain adequate ground cover in the alleys if livestock browse shrubs. An indirect effect of grazing in shelter belts is more frequent camping, along with higher traffic volumes that disturb the coherence of the soil surface.

In the dune-swales, apart from the over-all soil type, the position of the shrub belts in the landscape can strongly influence the risk to soil stability posed by grazing. In dune-swale systems, the undulating landforms can complicate the airflows over the landscape, particularly where dunes succeed one another over relatively short distances. Wind speed on dunes changes with slope position. Wind speed at the base (toe) of the slope slows but becomes more turbulent and can stir up soils. Beyond the dune toe, wind speed increases to a maximum at the dune crest. Exposed soil surfaces of the mid to upper slopes are critical points in the landscape that are particularly susceptible to wind erosion. On the leeward side, the airflows are very complicated.

The most recent research suggests that shelter belts should be placed at the dune crest. In these most-sensitive upper areas shelterbelts may best be left ungrazed. It is not clear where shelterbelts should be placed on the leeward side as the dune itself provides shelter.

We are more confident suggesting that forage shrubs be used as shelter for livestock on less easily eroded soils, and at slope positions where they are not going to compound the erosion risk if they

More information

Trees for Shelter: A guide for using windbreaks on Australian farms by Helen Cleugh

Perennial forage shrubs providing profitable and sustainable grazing – key findings of the Enrich Project, published by Future Farm Industries CRC