Establishing a Shelterbelt on your Farm

A recently planted seven-row shelterbelt

How do shelterbelts work?

Shelterbelts reduce wind speed and provide sheltered areas on both sides of the belt. Shelterbelts largely deflect wind over the top and around the end of the line of trees, although some wind goes through the shelterbelt, depending on its permeability. Permeable shelterbelts, which contain shrubs as well as trees, work by filtering and slowing the force of the wind, while still allowing air movement through the shelterbelt.

The change in wind speed and turbulence caused by the shelterbelt results in changes to the microclimate around the belt, including air and ground temperatures, humidity and carbon dioxide concentration. These changes mostly occur in the leeward zone, and can be present at a distance up to 20 times the height of the tallest trees downwind of the shelterbelt.

What should I consider when designing a shelterbelt?

Location

When deciding on the location of a shelterbelt, consider: location of existing and planned infrastructure, movement of stock and machinery, the purpose of the shelterbelt, local weather conditions (eg if you want to protect stock or crops from hot drying winds), and site features (eg any soil or drainage issues, and existing vegetation or fences that can be incorporated).

Height

The shelterbelt height determines the area of influence, with taller trees protecting a greater area. If shelter is your primary objective, tall trees should form the spine of the belt. This will lift the wind more gently, and reduce eddying effects (or turbulence).

Length and continuity

The density and species used have a major influence on air flow around and through the shelterbelt. Mixtures of trees, shrubs, grasses, herbs and forbs are best for providing shelter, and can also create additional benefits for integrated pest management, biodiversity and habitat.

Wind deflected around the ends of a shelterbelt increases turbulence, meaning that a shorter belt may not have the desired shelter effects. Discontinuous belts (ie belts with gaps within them) may also result in wind being channelled through them, which markedly reduces the effectiveness.

Longer and continuous belts are the best option to minimise these ‘end-effects’. The desired length is sometimes given as 12 times the mature height of the shelterbelt trees.

An additional way to reduce end-effects is to design the belt in an ‘L’ or ‘U’ shape.

Width

The width of a shelterbelt should be at least 6 rows, approximately 2-3 m apart. This allows for plants that may die, and also improves the habitat value. Spacing will be dependent on individual species used and site characteristics such as rainfall, weed burden and soil fertility. But as a general rule, aim for spacings between trees of 5 -10 m, shrubs of 1-4 m and herbs/forbs/grasses of around 1 m.

Orientation

Shelterbelts provide the best protection when orientated at 90 deg to the prevailing wind. Since wind direction can be variable, greater protection may be provided by L or U shaped belts, or having a grid of belts of different orientation. Factors such as stock movements, crop locations, topography and potential camping effects also need to be considered.

How do I establish a shelterbelt?

The principles of establishing a shelterbelt are similar to crop or pasture establishment, with a focus on weed control, placement and moisture.

Shelterbelts can be established by direct seeding which, when using a machine, is quicker and cheaper than other methods. It requires good seedbed preparation and weed control while native species establish. It may not be suitable for rocky sites or small/light seeds.

The most common establishment method is the use of tubestock. This technique has the advantage that it can give a more natural look than the straight lines of machine seeding.

The benefits of shelterbelts

Shelterbelts can:

- Provide shelter for livestock, preventing heat stress through shading and protection from high humidity, and preventing cold stress by reducing wind speeds. Stock provided with shelter have shown improved fertility, reduced mortality of new-born lambs / calves, reduced energy losses, improved live-weight gain, and improved milk / wool production.

"Shelterbelts can improve pasture & crop production"

- Improve pasture and crop production by providing protection from physical damage, reducing soil moisture loss, and reducing transpiration in crops and pastures
- Reduce wind speeds, resulting in a decrease in chemical spray drift, and reduced topsoil loss from wind erosion
- Provide a physical barrier, helping stop the spread of weeds and fungal spores
- Provide habitat for native wildlife and connect with other areas of native vegetation
- Help control groundwater recharge and salinity
- Reduce stream sedimentation and eutrophication, improve water quality, and reduce soil and nutrient run-off from paddocks (when located along watercourses).

Negative impacts of shelterbelts

The basic costs of a shelterbelt are the loss of the land from production, and the resources involved in establishing the shelterbelt.

Shelterbelts may impact negatively on yield or growth of crops and pastures immediately adjacent to the belt, through competition for moisture and nutrients, and possible shading effects. There is also a risk that shelterbelts may harbour pests. However these impacts are typically more than offset by improved yields a short distance away from the shelterbelt.

While shelterbelts can help protect farm infrastructure from bushfires by reducing wind speeds, there is also the potential for a line of trees to have a 'wick' effect. To minimise this risk:

- Choose species that have low flammability, or are capable of growing after fire
- Manage the understorey to reduce fuel loads, and maintain the vegetation in a green stage to help reduce fire intensity, through grazing or mowing (however try to avoid undertaking these practices when plants are vegetative or post-seeding, to reduce impacts on persistence).

This Fact Sheet is one of a series produced through the Murrumbidgee Landcare project "Cross Property Planning to Balance Production and Conservation". This project was assisted with funding from the NSW Environmental Trust's "Community Bush Regeneration" program, and the Australian Government.

MURRUMBIDGEE Landcare INCORPORATED

Australian Government

NSW GOVERNMENT

NSW Environmental TRUST