forestry INTEGRATION TOOL

*Connecting farms, forestry and future fibre for our communities*

**Guidance Note 3.0** | **Extra Details – Seedling**

**IN THIS HELP SHEET**

*This help sheet provides extra information on seedling selection and on-farm forestry integration.*

# Seedling Selection & Planting

## Quality

You want to select seedlings with:

- No insect, fungal, or structural damage
- A stem height between 25-40cm
- A ratio of stem height to stem diameter between 50:1 to 65:1
- A root collar diameter of 5-8mm
- Decent quality soil adhering to roots
- A dry weight root:shoot ratio of 1:3.

## Timing

You should order seedlings in November the year prior to planting. This then enables early June to mid-August planting. However, on sites that have potential to dry out quickly, it is best to plant trees before the middle of July. On the other end of the scale, very wet sites can be left until the end of August to minimise stress of seedlings from waterlogging.

## Volume

The number of seedlings you will need is determined by your stocking rate. Radiata pine is generally planted at a rate of 1300-1400 stems/ha (3m stem spacing and 3m row spacing). Blue gum is generally planted at a rate of around 1000 stems/ha (2m stem spacing and 4m row spacing).

Not all stems will succeed. A mortality rate of around 5-10% is typical. Infill planting in Year 1 is done to attempt to maintain the targeted stocking rate.

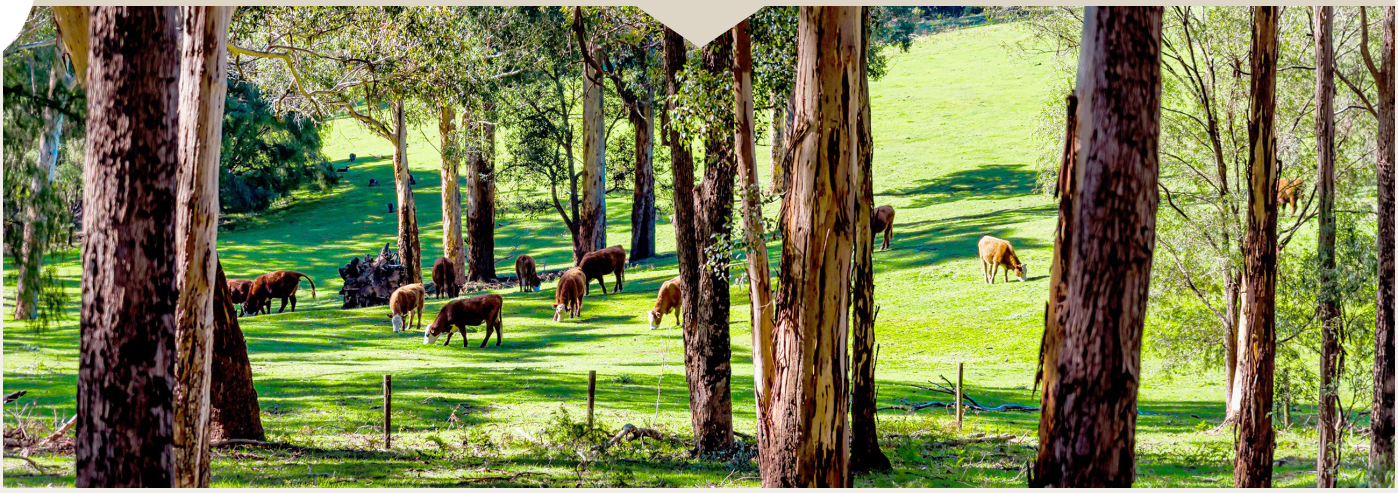
Australian Government
Department of Agriculture, Fisheries and Forestry

Green Triangle Forest Industries Hub

GIPPSLAND FORESTRY HUB
Promoting the Forestry Industry

The Ultimate Renewable

# On-Farm Forestry Integration



## Impacts

Farm sheltering reduces wind speed (up to 50%) which favourably improves the local microclimate and increases agricultural yield. Specific benefits include:

**Livestock**

- Reduced stock losses during breeding
- Reduced energy for homeostatic and other biological maintenance
- Less winter feed required
- Faster growth to target weight

**Crops & Pasture**

- Less soil erosion and nutrient loss
- Conservation of soil moisture
- Reduced need for irrigation
- Extended growing season
- Reduced physical damage

**Other**

- Protection for buildings and work areas
- Reduced evaporation from dams
- Assists in grass fire control
- Habitat for wildlife and predatory birds/insects

*Table 1: Anticipated benefits from well-managed shelterbelts at maturity.*[1]

| Factor | Shelterbelts 500m apart | Shelterbelts 250m apart |
|---|---|---|
| Windspeed | -33% | -50% |
| Plant growth | +10% | +20% |
| Maintenance energy for stock | -10% | -17% |
| Lamb survival | +5% | +5% |

Maximum beneficial effects of a shelterbelt are experienced at a distance of about four shelterbelt heights downwind from the shelterbelt. Benefits then diminish with distance from shelter and are generally lost between 20 and 30 shelterbelt heights downwind (see Figure 1).

[1] Patrick R. Bird, G.A. Kearney, D.W. Jowett, Trees and Shrubs for south west Victoria (Agriculture Victoria 1996) as cited in Peter Austin, The Economic Benefits of Native Shelter Belts Report (Basalt to Bay Landcare Network 2015), Issue 3, https://www.landcarevic.org.au/assets/Uploads/The-economic-benefits-of-native-shelter-belts-2015.pdf.

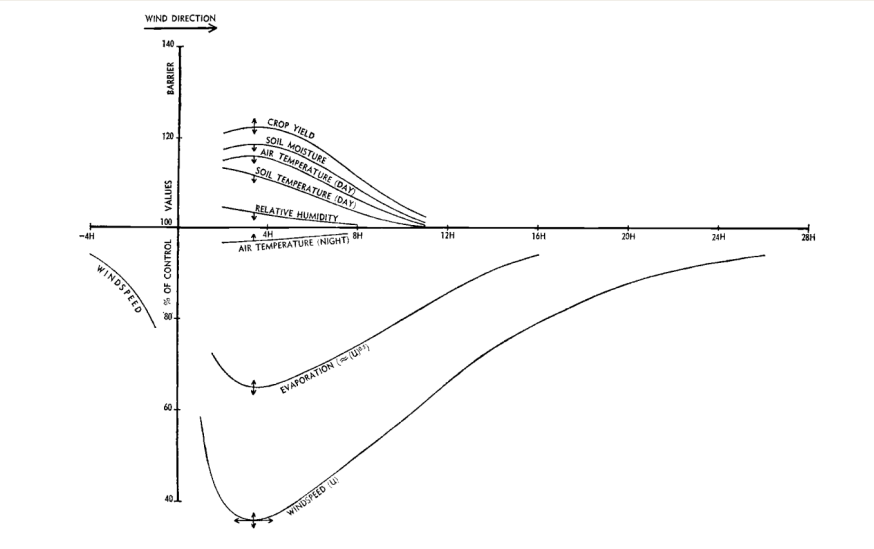



*Figure 1: The effect of a shelterbelt on microclimate.*[2]

Although shelter provides significant benefit, it can have some negative effects. Trees produce shade, compete with neighbouring crops for water and nutrients, and create warmer, more humid environments in some environments significant enough to increase incidence of fungal disease. Trees may also attract unwanted birds/insect pests. The balance of benefits to negative effects is shown in Figure 2.

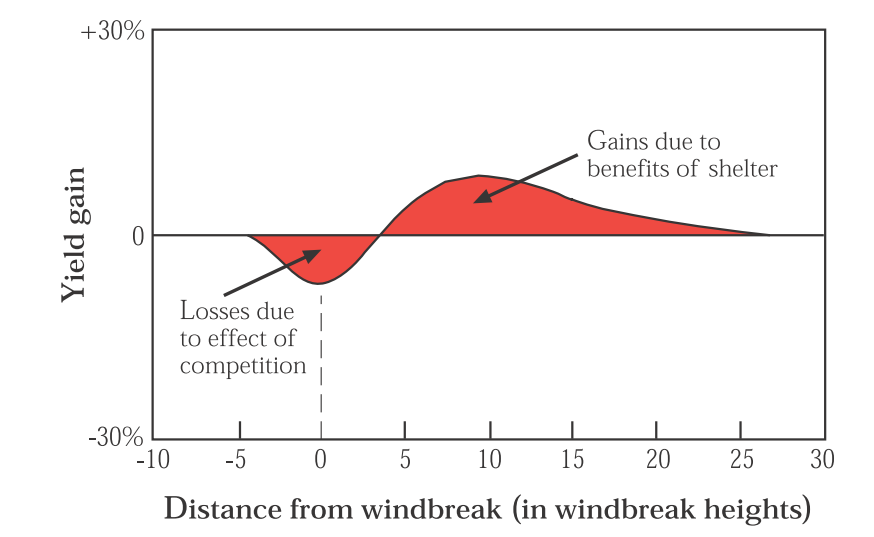



*Figure 2: The relative effect of a shelterbelt on crop/pasture yield where the benefit occurs on the leeward side.*[3]

## Shelter Design

The effectiveness of forest shelter depends on:

- **Permeability** – shelterbelts that filter and break the force of the wind are most effective. They should allow 30%-50% of the air to pass through. Dense shelterbelts produce on a narrow band of still air behind the trees.
- **Orientation** – shelter should be perpendicular to damaging or prevailing winds.
- **Height** – determines the size of the sheltered area bother upwind and behind the shelter. Maximum shelter occurs at 5-12 times tree height.
- **Length** – should exceed 12 times the mature tree height. A 20m high shelter should be at least 240m in length to minimise wind sweeping around the ends. In areas of variable wind direction, longer shelter, in the order of 20 times the mature tree height, maintains benefit as it is able to obstruct wind from broader angles.
- **Width** – should not exceed 3 times the mature tree height. Commonly 2-7 rows are used to provide optimal permeability. Seven rows in the narrowest from which reasonable quality logs can be expected.
- **Gaps** – should be avoided as they cause wind funnelling (increased localised wind speeds).
- **Trapping** – shelterbelts should be placed so as not to trap cold air descending downslope or create frost pockets.

Maximum benefits from shelterbelts are achieved if about 10% of the farm is planted with strategically located belts. This balances benefits and optimal spacing, while retaining land for other farm enterprises.

[2] James K. Marshall, "Summary diagram of the effect of barriers on micrometeorological factors" in "The effect of shelter on the productivity of grasslands and field crops," *Field Crop Abstracts* 20, no.1 (1997): 1-14.

[3] Nick Abel, Jenny Baxter, Alex Campbell, Helen Cleugh, John Fargher, Robert Lambeck, Roslyn Prinsley, Miles Prosser, Rowan Reid, Grant Revell, Carmel Schmidt, Richard Stirzacker and Peter Thorburn, *Trees for Shade and Shelter in Design Principles for Farm Forestry* (Rural Industries Research and Development Corporation 1997), chap. 4, https://www.agroforestry.net.au/edit/pdfs/design%20principles%20shade%20and%20shelter%20chapter%204.pdf.


ACKNOWLEDGEMENT OF FUNDING: This report was commissioned by the Gippsland Forestry Hub and the Green Triangle Forest Industries Hub with funding from the Australian Government, Department of Agriculture, Fisheries and Forestry.