



# TreeNote

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## Timber production from windbreaks in the greater than 450 mm rainfall zone of Western Australia

This TreeNote describes how to grow commercial timber in windbreaks. General information about windbreaks is contained in a separate TreeNote No. 22 'Windbreak design and management'.

### Commercial timber production

Windbreaks cost money to install, and occupy land that could otherwise be used for agriculture. However, if designed and managed well, windbreaks can produce valuable timber products, and protect agricultural production at the same time. Combined earnings from timber and agriculture can exceed earnings from agriculture alone.

All the usual requirements for producing commercial timber apply to windbreak trees:

- species must be chosen that will grow well and produce commercial products
- the trees must be managed appropriately (for example, pruning for sawlogs)
- the trees must be accessible for harvesting
- timber must be grown in large enough batches to attract harvesters and buyers
- markets must be close enough to leave a profit after paying transport costs

### Economic returns from the trees

Earnings from windbreak timber depend on many factors, such as species, type of product, growth rate and distance to market. As an example, a series of three-row tree belts (blue gum) at Jenkins' agroforestry site near Bridgetown was thinned in 1997 at age 10 years. Each kilometre of tree belt yielded 350 cubic metres of thinnings (mostly pulpwood) for a net harvest return of \$9,000. The remaining trees are expected to produce a further 750 cubic metres of logs per kilometre over the next 15 years (about half sawlogs), and return a further \$20,000 per kilometre.

### Windbreak design

#### Spacing between windbreaks

Windbreaks can produce valuable timber, often earning more per hectare than other farm enterprises. Therefore,

total farm profit can be increased by putting windbreaks closer together than the usual recommendation of 20 to 30 times tree height. Having a greater number of windbreaks than needed for wind protection alone, allows some windbreaks to be harvested from time to time without jeopardising wind protection on the farm. Windbreaks managed for timber production are likely to be harvested after 10 to 12 years (for pulpwood or posts), or 20 to 40 years for sawlogs.

#### Number of rows

Most windbreaks designed for shelter have at least three rows of trees. However, if timber production is a major aim there are several reasons why wider windbreaks may be desirable:

- financial returns are greater
- mechanical harvesting (when clearfelling pulplogs or thinning for sawlogs) is more efficient where trees are grown in five-row belts
- the severity of wind acceleration (or 'jetting') under pruned trees decreases as the number of rows increases

#### Choice of species

Many timber species are suitable for use in windbreaks. The choice depends on the type of timber products wanted and the ability of different species to grow well and provide adequate shelter on a particular site. Some examples of useful timber species for windbreaks are listed in the table on page 3 of this TreeNote.

Mixtures of species are often used in non-commercial windbreaks, but windbreaks containing single species are easier to manage for timber production.

#### Pines

Pines (*P. radiata* in higher rainfall areas, and *P. pinaster* in lower rainfall areas) make useful windbreaks because they grow well on a wide range of sites, and can grow in dense stands. Unless pruned or grazed, pines in the outer rows retain their lower branches with foliage close to the ground.

Pines can produce a range of timber products such as sawlogs, chiplogs and round posts for preservation, all

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of which have well developed markets and processing facilities in the South West.

Stock find pine needles very palatable but do not usually damage the trunks of established trees.

### *Eucalypts*

Many eucalypt timber species are suited to windbreaks because they grow quickly and reach heights of 30 m or more.

Short rotation blue gums for the export pulpwood market make ideal windbreaks on suitable sites. The trees grow rapidly, produce a large canopy of foliage, and do not need thinning or pruning before harvest at age 10 years or so.

Eucalypt sawlogs can also be grown in windbreaks. However, they are usually less dense than windbreaks of pine, or blue gum for pulpwood, because:

- Most eucalypts suitable for sawlog production shed their lower limbs and foliage (or are pruned), and leave gaps at ground level.
- Eucalypts need to be thinned out more than pines to maintain a high growth rate.

Although eucalypt sawlogs from farms are a niche product at present, they are likely to occupy a larger slice of the total hardwood sawlog market in future.

If eucalypt windbreaks will be grazed, use smooth barked species in preference to rough barked ones, as they are less likely to suffer bark damage by stock.

### *Tree Spacing*

Choose a planting layout that suits the species, site, timber products wanted, and the type of management intended. For example, to grow tall slender pines for round posts, plant them in rows 3 m apart, with trees at 2 m spacing along the rows (1667 per hectare).

Eucalypts to be harvested for pulpwood are usually planted in rows 4 m apart, with trees 2 to 3 m apart in the rows (1250 to 833 per hectare). The closer spacing is suitable for areas with rainfall over 800 mm, while the wider spacing is recommended for drier areas. No thinning is needed before harvest.

Use similar spacings when planting trees for sawlogs, but thin them early, to retain only the best trees for timber production. Thinning eucalypts to 200 per hectare and pines to 500 per hectare by age six gives a good balance of timber production and shelter. To grow sawlogs even faster, eucalypts can be thinned to 150 to 200 and pines to 200 to 400 per hectare at this first thinning, but shelter is reduced.

### *Permeability and foliage gaps*

Windbreaks work best if they have a moderate, uniform permeability to wind, without gaps. However, when windbreaks are thinned and the trees are pruned for

sawlog production, permeability increases until the remaining trees grow, reducing shelter temporarily.

A foliage gap near the ground is common under trees that shed limbs, or are pruned for sawlog production. Wind can accelerate or 'jet' through this gap, and may cause erosion on susceptible soils. Possible solutions are:

1. In a pine windbreak, leave at least one of the outside rows unpruned. Because pines along the edge of windbreaks retain their lower branches and foliage, a high level of shelter will be maintained. However, unpruned edge trees will not produce sawlogs.
2. Plant wider windbreaks. In wide windbreaks, foliage gaps at ground level are less critical.
3. Plant an extra outer row with one or more different species of smaller bushy trees or large shrubs, to produce foliage close to the ground. Then all the timber trees can be high pruned to maximise their potential timber value without reducing the windbreak's effectiveness. Plant the shorter species on the sunnier side of the windbreak to minimise shading by the taller trees. Choose bushy species that will grow up to the final pruning height of the timber species, say 6 to 8 m.
4. Plant two types of windbreaks – permanent windbreaks of trees and shrubs that maintain low foliage, interspersed with windbreaks of commercial trees to be managed for sawlogs. A well-planned combination of these two types can give a good blend of shelter and timber production.

### *Variation in soil along a windbreak*

Tree growth rates may vary along a windbreak if it crosses a range of soil and site conditions. It may even be worth planting different tree species along a windbreak to match the changing conditions, (for example, blue gums on heavier soils and pines on sandy ridges). However, avoid having too many small plots of different species producing different products in case none is large enough to harvest and market efficiently. Harvesting contractors may be reluctant to bring their equipment on to a farm unless there are several hundred tonnes of timber to harvest.

## **Management**

You may need to do some or all of the following tasks.

- Control weeds, especially in the early years
- Maintain fences
- Thin and prune on time, to produce sawlogs
- Monitor tree growth, and add fertiliser if necessary. Trees in outer rows often gain adequate nutrients from the adjoining paddock. Inside rows are more likely to need additional fertiliser
- Monitor for pests and diseases. Treat if necessary, to minimise loss of productivity or wood quality.

## Edge trees

Trees in the outer rows of windbreaks can grow at twice the rate of trees in the centre rows, due to reduced competition for light, water and nutrients. However, they usually need more management. For example, most edge trees develop large branches which need pruning to produce sawlogs, or to be suitable for mechanical harvesting for pulpwood.

Eucalypt edge trees may also produce lower quality timber, due to curvature and growth stresses. The trees tend to grow towards the open paddock and develop curved trunks. Also, because most of the branches and foliage grow on one side, the outer side of the trunk grows more rapidly than the side facing inwards, producing elliptical growth rings. Because eucalypt edge trees are more likely to develop growth stresses, more care is needed when sawing and seasoning them, to minimise splitting and warping.

## Joint venture opportunities

Some farmers have used joint ventures to finance and manage shelterbelts on their properties. Current opportunities are:

- In areas with over 450 mm of annual rainfall, CALM offers maritime pine (*P. pinaster*) sharefarming contracts, based on a share of the timber at harvest.
- In higher rainfall districts (over 600 mm), several companies operate joint venture schemes to grow blue gums on private property. Most pay annuities to the landowner.

Although most joint venture schemes require a minimum area of trees per property, some companies are willing to plant them in belts, for wind protection. Most require shelterbelts to be reasonably wide (five rows or more), to keep management costs down.

**Table of common timber trees which may be suitable for windbreaks**

Species	Common name	Minimum rainfall (mm)	Average height (metres)	Keeps low branches	Sand, gravel	Loam	Clay	Waterlog tolerance	Salt tolerance	Frost tolerance
<i>Pinus pinaster</i>	Maritime pine	450	20 - 35	yes	yes	yes				high
<i>Pinus radiata</i>	Monterey pine	600	20 - 40	yes	yes	yes				high
<i>Lophostemon confertus</i>	Queensland box	700	30 - 40	yes	if deep	yes		slight		moderate
<i>Eucalyptus globulus</i>	Tasmanian blue gum	600	40 - 60		yes	yes				moderate
<i>Eucalyptus diversicolor</i>	Karri	900	40 - 60		yes	yes				low
<i>Eucalyptus saligna</i>	Sydney blue gum	600	30 - 50			yes				moderate
<i>Corymbia maculata</i>	Spotted gum	450	30 - 40		yes	yes	yes			moderate
<i>Eucalyptus botryoides</i>	Southern mahogany	550	30 - 40	yes	yes	yes	yes	moderate	slight	low
<i>Eucalyptus camaldulensis</i>	River red gum	150	15 - 35			yes	yes	moderate	moderate	moderate
<i>Eucalyptus gomphocephala</i>	Tuart	400	25 - 40		yes	yes			slight	moderate
<i>Eucalyptus sideroxylon</i>	Red ironbark	400	15 - 25		yes	yes				moderate
<i>Eucalyptus cladocalyx</i>	Sugar gum	380	15 - 25		yes	yes	yes		slight	low

### NOTES:

1. Tree height depends on rainfall, soil depth, fertility, and salinity. The heights in this table apply to trees on reasonably good sites with adequate rainfall.
2. *E. camaldulensis* grows in very low rainfall areas only when it has access to extra water from shallow groundwater, watercourses, or seasonal flooding.

### Further reading

A comprehensive and useful guide to selecting species for windbreaks is:

REX 96 Revegetation software. A new version (on CD) is expected in 1999 and will be available from CALM, Agriculture Western Australia, Greening Australia (WA), and Robin Road Software (SA).

'Windbreaks', by Steven Burke (1998). 130 pages. Available from NRE Information Centre, 8 Nicholson Street, East Melbourne 3002. Ph. (03) 9637 8080. Cost: \$39.95.

### Other *TreeNote* titles

Other *TreeNote* titles are available from south-west and south coast offices of the Department of Conservation and Land Management or of Agriculture Western Australia. You may also access them by internet (see front page) or by AgFax: dial 1902 990 506, and choose subject number 30899.

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