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Some recommended tree species for windbreaks

Note 1: figures in brackets are the likely heights of the mature trees in metres

Note 2: species recommended for a particular rainfall can also be used in an area with a higher rainfall, but not the reverse

1. Trees that retain their foliage to ground level

1.1. Light Soils

300-400mm rainfall

Acacia pendula – Weeping myall (8)
Eucalyptus burracoppinensis – Burracoppin mallee (3-6)
E. dongaraensis – Dongara mallee (3-8)
E. ebbanoensis – Sandplain mallee (3-6)
E. platypus var heterophylla – Coastal moort (5)
Tamarix aphylla – Tamarisk (8)

400-500mm rainfall

Eucalyptus cladocalyx var nana – Dwarf sugar gum (8)
E. platypus var heterophylla Coastal moort (7)
Pinus canariensis – Canary pine (12)
P. halepensis – Aleppo pine (12)
Tamarix aphylla – Tamarisk (10)

500-600mm rainfall

Casuarina obesa – Swamp oak (10)
Eucalyptus conferruminata – Bushy yate (10)
E. todtiana – Coastal blackbutt (6)
Melaleuca lanceolata – Rottnest ti-tree (6)
Pinus pinaster – Maritime pine (12)
Tamarix aphylla – Tamarisk (10 +)

More than 600mm rainfall

Agonis flexuosa – Peppermint (10)
Eucalyptus cinerea – Mealy stringybark (12)
Melaleuca nesophila – Western tea myrtle (5)
Pinus pinaster – Maritime pine (17)
P. radiata – Radiata pine (20 +) only on yellow sands

1.2. Heavy Soils

300-400mm rainfall

Acacia pendula – Weeping myall (10)
Casuarina cristata – Black oak (10)
Eucalyptus diptera – False gimlet (6)

400-500mm rainfall

Casuarina obesa – Swamp oak (10)
Eucalyptus gardneri – Blue mallet (10)
E. platypus – Moort (6 +)
E. spathulata – Swamp mallet (6 +)

More than 500mm rainfall

Agonis flexuosa – Peppermint (10) above 600mm rainfall only
Casuarina obesa – Swamp oak (10)
Pinus radiata – Radiata pine (20 +)
Tristania conferta – Queensland box (10) above 600mm rainfall only

2. Trees that shed their lower branches

(to be used in combination with shorter, bushy species that retain their branches to ground level)

2.1. Light Soils

400-500mm rainfall

(No recommended species for less than 400mm)
Eucalyptus camaldulensis – River gum (15) but only in drainage lines where extra moisture is available
E. cladocalyx – Sugar gum (18)

More than 600mm rainfall

Eucalyptus botryoides – Bangalay (20)
E. gomphocephala – Tuart (25)
E. maculata – Spotted gum (25) on yellow sands only

2.2. Heavy Soils

300-400mm rainfall

Eucalyptus brockwayi – Dundas mahogany (18)
E. dundasii – Dundas blackbutt (12)
E. flocktoniae – Merrit (12)
E. gracilis – Snap and rattle (12)
E. oleosa var oleosa – Giant mallee (10)

400-500mm rainfall

Eucalyptus kondininensis – Kondinin blackbutt (12)

500-600mm rainfall

Eucalyptus crebra – Narrow-leaved red ironbark (16)
E. melliodora – Yellow box (20)

More than 600mm rainfall

Eucalyptus diversicolor – Karri (40)
E. globulus – Tasmanian blue gum (30)
E. maculata – Spotted gum (25)
E. muellerana – Yellow stringybark (30)
E. nicholii – Nichols gum (20)
E. patens – W.A. blackbutt (30)

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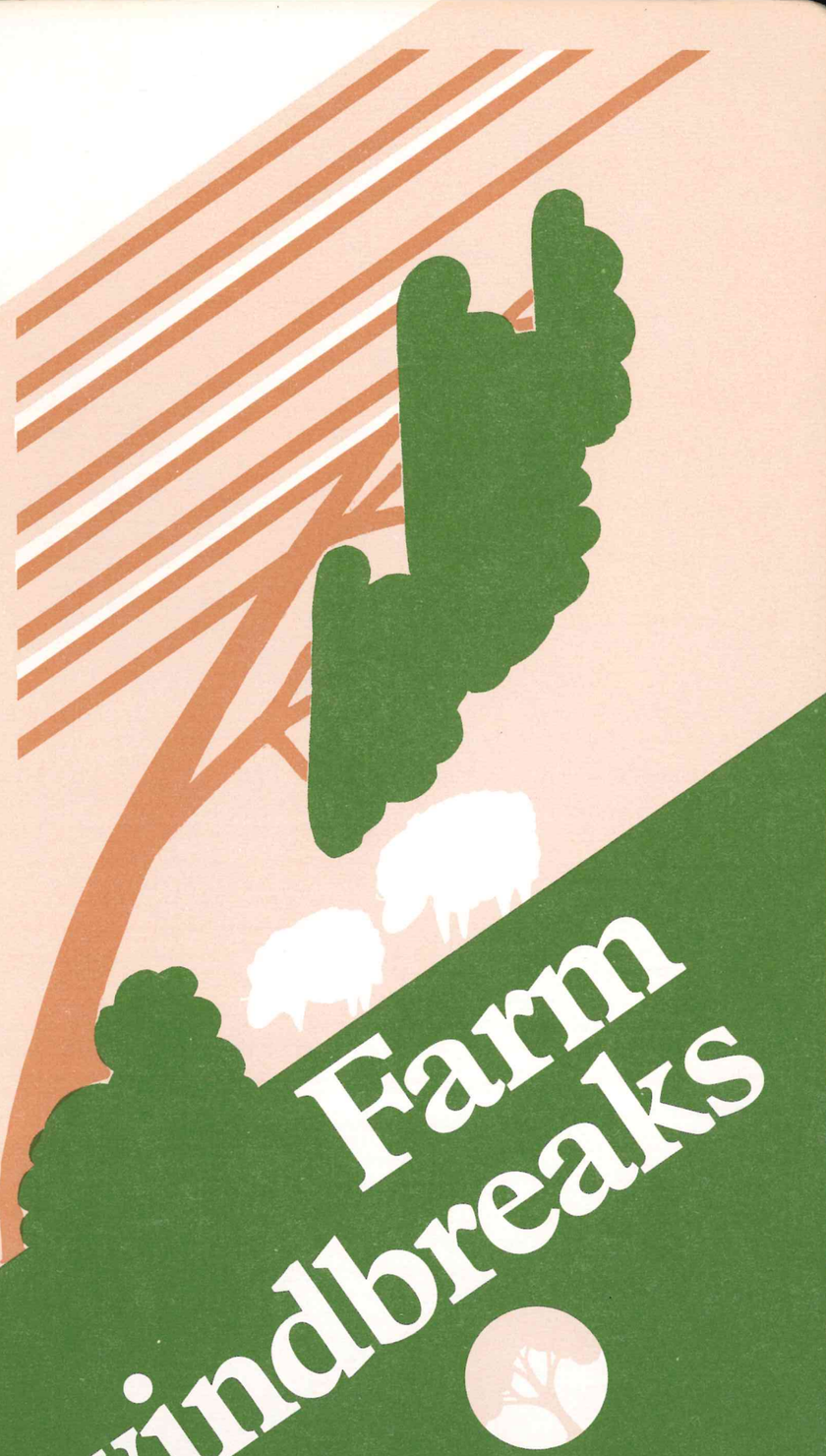
Further information

If you would like to know more about windbreaks for your particular situation, you can contact the following:

i) Your local Department of Agriculture office
ii) Information Branch
Department of Conservation and Land Management
50 Hayman Road, Como 6152
Phone (09) 367 6333
iii) Department of Conservation and Land Management
Hannan Street
Kalgoorlie 6430
Phone (090) 21 2095
iv) Department of Conservation and Land Management
Hough Street
Narrogin 6312
Phone (098) 81 1444



Farm windbreaks

Introduction

Windbreaks are belts of trees aligned so as to reduce the speed and damaging effects of wind. They are capable of providing substantial benefits when correctly designed and located.

Benefits recorded from users of windbreaks in Western Australia include:

- protection from sand blasting and soil erosion
- 'silt traps' to catch windblown sand
- a reduction in chilling deaths of newborn lambs

Evidence from Eastern Australia indicates that windbreaks can also provide:

- increases in crop and pasture production
- increases in animal production (particularly sheep)
- a reduction in chilling deaths of newly-shorn sheep

In areas prone to soil erosion windbreaks should be used in conjunction with anti-erosion agricultural practices such as stubble mulching, direct drilling, the avoidance of over-grazing, and maintaining a rough soil surface when cultivating.

Windbreaks are a long term project. It will take some years for the trees to reach a height where they will provide substantial shelter. However, once they reach this height they will last many years.

The protection given by windbreaks

The effect of a windbreak depends on its height. The distance over which it affords protection is expressed in multiples of its height. Figure 1 shows the reduction in windspeed downwind from a windbreak.

Designing windbreaks

Design Principles

For maximum protection the windbreak must be permeable to wind to some degree. Trees with very dense foliage form poor windbreaks. Trees that provide a barrier that is 35% to 45% permeable to the wind are the most effective.

Foliage must extend to ground level or strong winds will penetrate the base of the break.

The windbreak need only be narrow, forming a rather abrupt obstruction to the wind. The zone of protection may be greatly reduced if the belt of trees is too broad, when it tends to act like a solid barrier creating eddying winds of high velocity.

Alignment

Alignment of the belt of trees should be ideally at right angles to the direction of the damaging wind. For example, to give protection from a northerly or southerly wind requires a break to be aligned east to west. However, the alignment of the break may vary up to 45 degrees either side of a right angle to the wind with no loss in effectiveness, provided the break is long enough.

Also to be considered in alignment is the shading of adjacent crop or pasture by the belt of trees. Shading is minimised by aligning breaks to north or south.

Length

A minimum length of 20 times the height of the trees is recommended. This should be increased to at least 30 times height for breaks that are not at right angles to the damaging wind.

Planting pattern

The simplest form of windbreak is a single row of trees of a type that retain their foliage to ground level. Tamarisk and some species of pine fulfil this requirement. However, due to the risk of losing some trees and a gap forming in the break, a minimum of two rows of trees is recommended.

Most of our taller eucalypts shed their lower branches leaving a bare trunk. If you use this type of tree in your windbreak, it is essential to plant a second row of shorter trees. The species selected for the second row must retain its foliage to ground level. To avoid gaps caused by the loss of trees in this case, two rows of each of the two types of trees should be established.

These planting patterns are illustrated in Figure 2.

Gaps and the ends of windbreaks

Windspeeds are higher than normal through gaps in a windbreak, and round the ends of the break.

Gaps are to be avoided. If access is needed through a windbreak, a gap can be avoided by forming a track diagonally through the break as shown in Figure 3.

An alternative solution is to locate access through the windbreak on an area of soil that is not liable to erode.

Similarly the ends of the windbreak should be located where there is minimal risk of soil erosion.

Distance between windbreaks

In planting a series of parallel breaks to protect a large area of land from the wind, the distance between each break will depend on the height of the trees and the windspeeds you need to combat.

Reference to figure 1 shows that for maximum benefit windbreaks should be no further apart than 10 to 12 times their height. Such close spacings are likely to be uneconomic except for the protection of high-value horticultural crops.

A more realistic spacing for the broad-acre farmer is 20 to 30 times their height. Even those spacings may be extended if a mild level of soil erosion is acceptable, and if the windbreak system is accompanied by anti-erosion agricultural practices.

Some indication of the downwind depth of protection can be gauged from remnants of native vegetation remaining in or on the borders of paddocks subject to wind erosion. If the height of the vegetation is measured, and also the depth of the protected (non-eroded) area downwind of it, the figures will give a guide to the spacing needed between windbreaks.

The location of windbreaks in hilly country

Extra care is needed in siting windbreaks in hilly country. Some broad principles that need to be followed are:

- they follow the contour on hill slopes
- they cross the contour in valleys
- they need to be spaced more closely on the windward side of the hill, and on the upper leeward side of the hill
- they can be spaced further apart on the lower leeward side of the hill

Farmers wishing to establish windbreaks in hilly country should seek advice from the sources listed at the end of this pamphlet.

Establishing windbreaks

Belts of trees for breaks can be established by planting seedlings, or a cheaper alternative, by direct drilling tree seed.

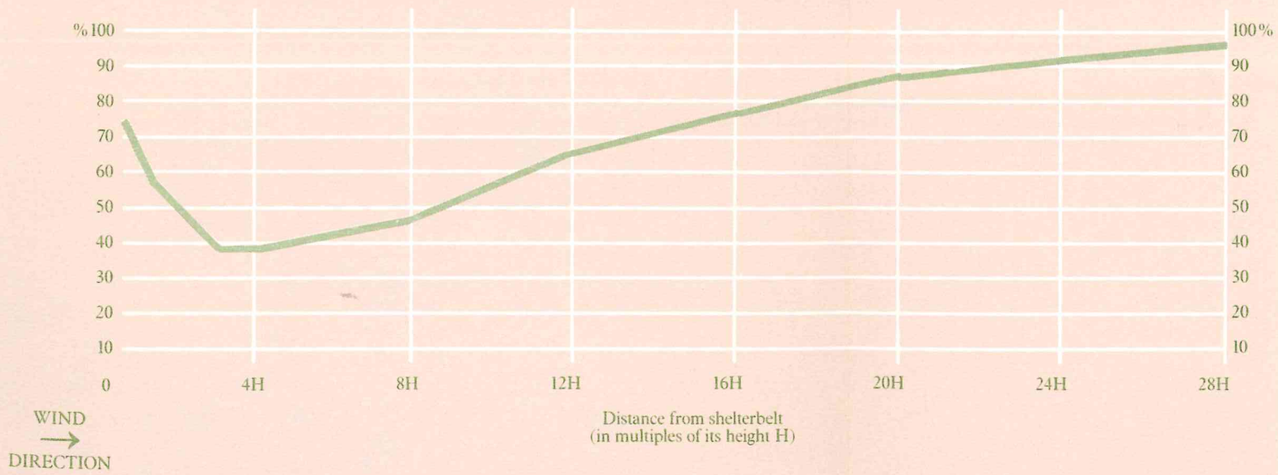
Recommended spacings for planted seedlings are 4 metres between trees and between rows in areas with average annual rainfall exceeding 500mm. For areas of less than 500mm average rainfall the spacing should be extended to 5 metres.

Direct drilled belts should be thinned to roughly these spacings if necessary.

Fencing

If you carry stock it is highly desirable to keep windbreaks permanently fenced. Stock will otherwise browse the lower branches and destroy the important shelter near ground level.

FIGURE 1
WINDSPEED BEHIND A SHELTERBELT
(EXPRESSED AS A PERCENTAGE OF UNCONTROLLED WINDSPEED)



Maintaining windbreaks

Tree windbreaks require little maintenance once they are established.

Weeds

Weeds in fenced-off windbreaks may pose a fire hazard, particularly when the trees are young. Provided the trees have reached a height of 1.5 to 2 metres, weeds can be controlled by "crash" grazing with sheep. Care must be taken to remove the sheep as soon as they start to seriously browse the trees.

The robbing of crops and pasture

The robbing effect of tree roots extending far into adjacent crop or pasture can be reduced by root pruning (ripping) along the edges of the windbreak. If this practice is to be followed, ripping should start when the trees are no more than 5 years old, and be repeated annually.

New-land development

Farmers developing new land may wish to consider leaving strips of native vegetation to act as windbreaks. This is a cheaper alternative than planting or drilling trees. However, if the strips are to be effective, they will need to be tall enough to provide shelter, and they will need fencing to exclude stock.

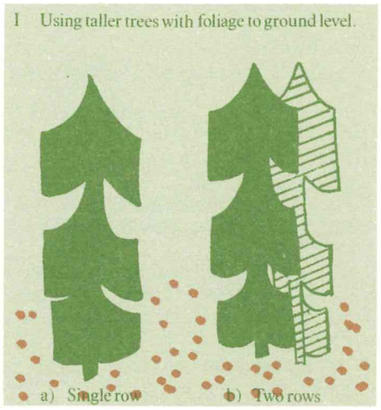
Should you plant windbreaks?

Broad-acre farmers may consider the cost to total farm protection by windbreaks to be too high, or uneconomic due to the productive land taken up by the trees. If this is your situation, you might consider using them to protect special areas on the farm:

- areas especially prone to erosion
- lambing paddocks
- to protect holding yards
- to protect dams and roads from filling with windblown sand.

Farmers in areas of more than 750mm average rainfall have the option of combining timber production with shelter from the trees in windbreaks. Special techniques are required to manage breaks for this purpose. These can be explained to you by Advisory Officers of the Department of Conservation and Land Management.

FIGURE 2



SHELTERBELT PROFILES

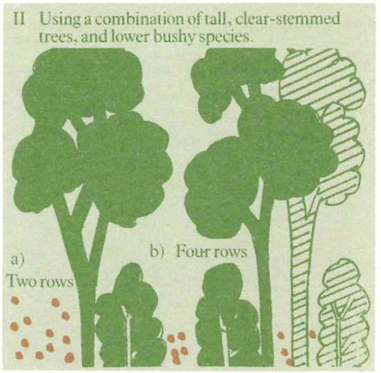
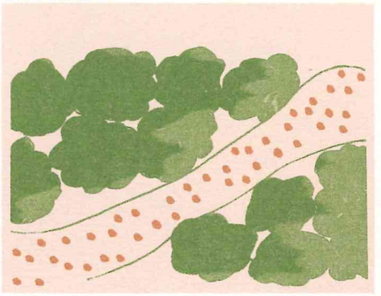


FIGURE 3



TRACK PASSING THROUGH SHELTERBELT