Trees on farms: why, where and how.

A guide for landholders on the North Coast of NSW

JALIIGIRR Biodiversity Alliance

Why incorporate trees into your farm plan?

Private landholders and farmers are by far the largest group of land managers in the Northern Rivers region of New South Wales, managing in excess of 58% of the total land area. These freehold areas include our most productive lands, as well as areas of high biodiversity value, and maintaining this balance between production and biodiversity is essential if we are to sustain our environment into the future. In some areas agricultural expansion has led to farmland being over-cleared, and many landholders are now trying to restore their properties through rehabilitation and revegetation works.

Revegetation of cleared areas within these mixed agricultural landscapes has the opportunity to improve biodiversity values and increase on-farm productivity. While the biodiversity values of native vegetation are easy to appreciate, there are often many production and economic benefits as well. These benefits are called ecosystem services and they can provide environmental and economic returns to both the landholder and the broader community. Areas of vegetation may provide the following ecosystem services on your farm:

- Stock shelter
- Pasture and crop protection
- Resilience to drought impacts
- Improved water quality
- Erosion management
- Beneficial insects (pollinators and natural pest control)
- Carbon sequestration
- Timber lots

How to identify areas suitable for planting?

Before you undertake a revegetation project you should look at identifying the most productive areas of your farm – these areas are unlikely to be suitable for revegetation due to their high agricultural values (See Jaliigirr Factsheet "Farm Planning: identifying your most productive land"). By classifying your land based on agricultural capabilities you will minimise your management costs while maximising yield, and you will focus your energy and resources where the best returns are.

Assessing the capabilities of your land will help you identify areas of low productivity land that may be better suited to revegetation. You are also likely to identify productive areas that may benefit from additional shade trees or shelter belts.

Established shelterbelt planting near Dorrigo providing protection to a large exposed paddock.

The Jaliigirr Biodiversity Alliance region occurs within the traditional lands of the Gumbaynggirr People. The word Jaliigirr comes from the Gumbaynggirr language and means "tree". The traditional and cultural connections of Gumbaynggirr People to this country extend over millennia and the Alliance appreciates and respects the complexity and value of these continuing practises.

Plantings for stock and pasture protection

Many landholders plant trees to protect stock, crops and pasture from climatic extremes. This includes extreme heat, strong winds (hot and cold) and extended droughts. Climatic conditions such as these can affect moisture availability in the soil profile and in turn will limit pasture and crop growth. Stock will also suffer from exposure to heat stress and cold winds, resulting in slower weight gain and reduced milk production.

When designed properly, plantings that protect stock and pasture will increase productivity, helping to offset their establishment costs, while also providing a biodiversity benefit.

Shelterbelts and windbreaks

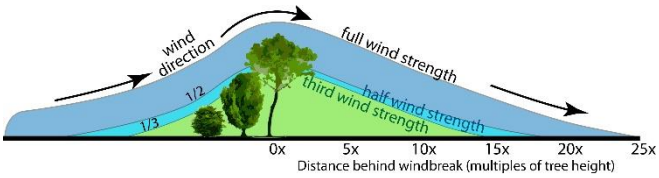
Shelterbelts and windbreaks are a particularly effective way to protect pasture, crops and livestock from infrequent, but damaging, high velocity hot winds and cold, drying winter winds. Well-designed windbreaks can also have significant biodiversity values.

Design considerations for shelterbelts and windbreaks

Species selection: A range of factors need to be considered when selecting species for a windbreak. Growth form (height, width), foliage density, flowering times (important for supporting native pollinators), and the ability to grow in an exposed site are all worth considering. Nurseries that specialise in local provenance tube-stock should be able to help you select those species that are best suited to your site.

Careful species selection will maximise your success and create a windbreak that performs well, and has maximum biodiversity value.

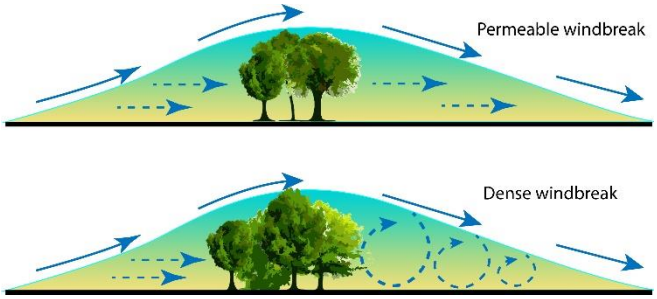
Height: Taller windbreaks protect a larger area when compared to lower windbreaks. As a general guide, a windbreak will provide protection from wind over an area equal to 25 times the height of the windbreak.



A well-designed shelterbelt provides shelter up to 25 times its height downwind and 5 times its height upwind.

If protection from wind is one of your main objectives, then you should consider including at least one or two rows of tall trees within a 4-row windbreak.

Density and permeability: Density, like height, has an effect on the area protected by the windbreak. Dense windbreaks tend to give a higher level of protection over a shorter distance, whereas less dense windbreaks give a more moderate level of protection over a longer distance. Density should also be even throughout the windbreak because gaps will funnel the wind and create an area of increased wind velocity.



Permeable windbreaks (A) allow some wind through at ground level but result in minimal turbulence.
Very dense windbreaks (B) allow no wind through at ground level but result in turbulence both upwind and downwind of the planting.

The biodiversity benefit of a windbreak is also influenced by the density of the planting. Structurally complex windbreaks with plants occurring in the canopy, mid- and ground layers are better suited to providing habitat and protection to native animals, particularly birds. Dense plantings also provide better competition to weed species and often shade out weeds earlier than sparse plantings.

For larger trees in your centre row(s) spacings of 7-10m between each tree should be adequate. If you are planting two rows of tall trees alternate the spacing so that the first row is offset from the second. Shrubs and small trees can be planted on

the outside rows with spacings of 2m between plants. A 4 row windbreak with 2 rows of shrubs (2m apart) and 2 rows of trees (10m apart) will need 1400 plants per kilometre. A 3 row windbreak with only 1 row of tall trees will need 900 plants per kilometre.

Length: Longer windbreaks are also more effective than shorter windbreaks because wind can funnel around the end of short windbreaks, negating any benefits.

Width: Wide windbreaks often perform better than narrow windbreaks because it is often easier to achieve a uniform density throughout the windbreak when there are multiple rows of vegetation. When windbreak width is increased, the biodiversity value of the windbreak also increases. Generally, a minimum width of 10–15m over 4 or 5 rows of plants is recommended for a biodiverse windbreak.

Orientation: Windbreaks should be positioned at right angles to the prevailing wind, or the particular problem wind that has the largest effect on pasture and livestock health (e.g. a hot, drying wind). If shading of pasture is an issue, windbreaks should be positioned on a north–south axis. This will still provide adequate shade for stock but will also allow sufficient light for good pasture growth. When possible, windbreaks should be planted along existing fences, as this will minimise the amount of fencing that will be needed to protect the planting.

A newly planted windbreak in Eastern Dorrigo to protect stock from a cold south-westerly wind.

Fencing: New windbreaks will need to be fenced on properties with livestock. At a minimum, fencing will need to be in place until the planting is mature enough that stock browsing and rubbing no longer damage the plants (typically 4–10 years, depending on the species and site conditions). If possible, permanent, wildlife-friendly fencing should be considered because stock exclusion will allow for the development of a windbreak with a uniform density and a well-developed understorey and ground layer. This will also result in a windbreak with better biodiversity values and less on-going weed management issues.

Paddock trees

While larger areas of vegetation are often preferred, individual trees within a cleared paddock should also be protected and encouraged.

Why are paddock trees important?

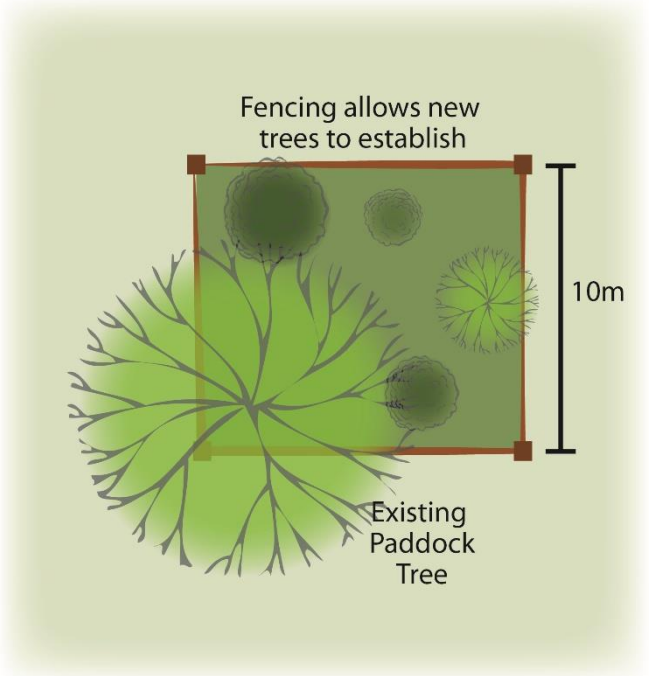
Isolated paddock trees and small patches of vegetation within a grazing system provide valuable shade and protection for stock. They can also reduce wind speeds across a paddock which in turn improves pasture growth.

Paddock trees are also important for the management of biodiversity across the landscape. Many animals, particularly birds, bats and insects, rely on the food and nesting resources that these keystone structures provide. Paddock trees can also contribute to the viability of entire plant and animal populations by increasing the connectivity between remnant patches of vegetation.

Managing paddock trees on your property

The biggest long-term threat faced by existing paddock trees is a lack of recruitment. This means that when an isolated paddock tree dies, there are no younger trees to replace it. The best way to address this problem is to erect a fence around existing paddock trees to allow for natural regeneration.

These fenced areas should be a minimum of 10 m x 10 m to allow for the development of an understorey, and to allow younger trees to establish under the canopy of the existing tree. To maximise the stock shade provided by the tree this fenced area can be offset from the established tree (see figure on next page). The control of weeds within the fenced area will also be required, although this need should decrease as the native vegetation establishes.



By off-setting fences around paddock trees, you can maximise the amount of shade created for stock.

By protecting plants regenerating around the paddock tree, a number of potential replacement trees will be available when the main tree dies. Although many trees are long-lived, planning for their replacement is an important part of managing the biodiversity on your property and maintaining the production benefits provided by paddock trees.

Establishing new paddock trees on your property

If you want to establish new paddock trees on your property a similar approach can be used to that outlined above. In general, new paddock plantings should be placed in an area that will maximise future shade potential, while also limiting any production impacts. Many properties will also have areas of unproductive land, for instance boggy spots or areas with large exposed rocks. These areas are often good areas to revegetate as the production benefits more easily outweigh any potential production losses.

Plantings for erosion control and soil protection

Steep lands can provide specific challenges to landholders, especially on land that was previously cleared to grow bananas. Due to changes in the industry, many farmers are now moving from growing bananas to growing blueberries, and in this process there are often areas of very steep land that are abandoned from future production. The steep slopes, combined with our erosive soils and seasonally heavy rainfall, can lead to severe erosion and landslips on these abandoned sites.

Steep land sites are often eroded and highly degraded. Revegetation projects need to take into account site conditions and focus on hardy, fast growing species (Photo – Pia Dollmann).

Revegetation is often the best way to address these issues in the long term, but steep slopes and harsh conditions mean that revegetation techniques often need to be modified to be successful.

There are a few key considerations when planning a steep land revegetation project.

1. **Plant at lower densities (up to 1 plant per 25m^2) and put more effort into each plant.** The time and effort needed to plant on steep slopes in thin rocky soils means that it is often better to plant a lower number of hardy plants with the aim of improving site conditions before future plantings.
2. **Prior to planting, spray a 1-2m diameter area of all weeds and grasses, and allow plant material to break down (4-6 weeks) before planting your tree seedling.** Competition from aggressive grasses and weeds will rob your plants of valuable water and nutrients. By spraying early you will remove this source of competition and create an excellent mulch for your tree seedlings.

3. **For very steep sites, or sites with access issues, fire may be used to reduce initial grass cover, followed by the broadcasting of suitable native tree seeds.** The combination of fire and direct seeding can be risky, but may be suitable on extreme sites where other options are likely to be cost prohibitive or likely to fail.
4. **Follow-up weed control and watering will most likely be required on steep land sites.** Watering plants in the first month or two after planting, and controlling competing weeds over the first year or two, will result in better survival and growth rates for your plants. When considering plant densities, factor in the requirement for on-going maintenance and only plant those trees that you are able to maintain.

Species selection for steep land sites

Hardy, fast growing species are best used on steep land sites. A project trial completed in Coffs Harbour in 2001 suggested the following species for highly eroded upper slope sites:

Common name	Species name
Grey gum	*Eucalyptus punctata*
Forest Oak	*Allocasuarina torulosa*
White Mahogany	*Eucalyptus acmenoides*
Green Wattle	*Acacia irrorata*
Blackwood	*Acacia melanoxylon*

Hardy, fast growing species suitable for exposed steep land sites (D. Merrikin, DLWC 2003).

Plant protection

Plant protection needs to be considered for all plantings if browsing from wallabies or livestock is likely to occur.

Livestock

Protection from livestock can range from a temporary electric fence to a permanent 5 strand fence. It is recommended that you erect permanent fencing around your entire planting, as livestock will simplify the developing understorey, browse regenerating seedlings, and lead to compaction in areas where they camp. Design advice for wildlife friendly fencing is available at: http://www.wildlifefriendlyfencing.com/

Wallaby browsing

Protection from wallaby browsing can be done around individual plants or around the perimeter of the entire planting.

Perimeter fencing: Perimeter fencing should consist of a combination of mesh and one or two strained plain wire, giving a total fence height of >1.2m. Locking mesh wires, such as Waratah *Stockgrip*™, perform best as wallabies may push through some non-locking meshes.

Perimeter fencing can be cost effective for larger, block plantings (Photo: Waratah Fencing).

Individual tree guards: Individual trees can also be protected with high (1.2m) plastic mesh guards. Mesh guards should be sturdy and self-supporting and held up with at least two hardwood stakes.

Individual mesh tree guards provide a high level of protection on this open site.

Further Reading

A Guide to Species Selection for Revegetation Projects in the Coffs Harbour LGA
Craig Stehn, 2015. Coffs Harbour City Council.
http://www.coffsharbour.nsw.gov.au/our-environment/Pages/Resources.aspx

Nambucca Valley Vegetation and Planting Guide
Nambucca Valley Conservation Association and Nambucca Valley Landcare, 2007.
http://www.nvlandcare.org.au/downloads/dlVegPlantGuide.pdf

Mid-Lower Clarence River Riparian Plants – a Guide to Selection for Revegetation Projects
Julie Mousley, 2012. Clarence Landcare Inc.
http://www.clarencelandcare.com.au/wp-content/Brochures/riparianplants.pdf

Guide to Native Tree Planting on the Mid-North Coast of NSW
Colin Matthews, Bellinger Landcare Inc.
http://bellingerlandcare.org.au/documents/publications/Hand-outs/tree%20planting.pdf

Wildlife Friendly Fencing Project
Information on wildlife friendly fencing design.
http://www.wildlifefriendlyfencing.com/

Paddock Trees
NSW NPWS, 2001.
http://www.environment.nsw.gov.au/resources/research/pt-paddock-trees.pdf

Weeds of the North Coast of NSW
Pia Dollmann, 2013. Coffs Harbour Regional Landcare.
http://coffsharbourlandcare.org.au/wp-content/uploads/2013/06/Introduction.pdf

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For more information on the Jaliigirr Biodiversity Alliance go to:

http://www.greateasternranges.org.au/our-partners/ger-regional-partnerships/jalliigirr-biodiversity-alliance/

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