Sandalwood

Santalum spicatum

The Species

Santalum spicatum is a Western Australian native plant with strong cultural and historical links to early pioneers and aboriginal people. It is a sustainable crop unequalled in Western Australia with the potential to improve economic and natural resources outcomes across regional areas of the State.

Sandalwood is a low input long-term crop requiring little in the way of herbicide and pesticide use and well adapted to be established on areas of cleared farmland on many soil types and rainfall zones.

Why plant Sandalwood

Sandalwood presents as one of the most adaptable, useful and high value tree crops available for the farmer who wants to diversify and address land degradation issues on the farm.

Well planned out and placed sandalwood plantations can have many Natural Resource Management (NRM) benefits; from use of excess water in the landscape, preventing salinity and waterlogging, reducing soil erosion from the effects of wind and water to the improvement of bio diversity and provision of long-term habitat. If you have identified any of these issues on your farm you can by using the correct type and placement of trees rectify the problem in time. Sandalwood is particularly useful in many of these situations with the added benefit that it will achieve a good price per tonne in twenty years and produce a harvest of seed in five.

Sandalwood is a hemi parasite that fixes its roots on to nitrogen fixing host roots, mainly Acacia species. Sandalwood requires no fertilisers or irrigation; as a consequence nutrients will not leach through the soil to pollute waterways thus reducing algal blooms and weed growth.

Protection of Soil from water erosion

The top few centimetres of soil is usually the most fertile and most valuable for crop and pasture production. While the loss of a few millimetres of soil during a heavy downpour or windstorm may not seem critical, the impact on farm productivity and fertiliser requirements over a generation can be devastating.

Soil erosion down drainage lines and along water-courses causes additional problems such as vehicle access, stock mustering difficulties, increased fencing costs and reduced land value. It is also unsightly and may ultimately affect property values. Solving an erosion problem generally requires more careful planning and design.

The first step is to identify the type of soil erosion you have :

- Wind Erosion – loss of topsoil from open paddocks during strong winds.
- Sheet and Rill Erosion – loss of surface soil during heavy rain from across a paddock.
- Tunnel Erosion – piping of sub-soils down steep slopes.
- Gully and Streambank Erosion – widening channels in drainage lines and along watercourses.
- Landslips – mass failure of soils on steep slopes.

Reference: Soil erosion by wind and water Planting trees to reduce water logging and salinity - ***farmforestryline.com***

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The length and steepness of a slope, the intensity of the rain, the lack of ground cover, smooth surface texture of the soil and poor structure will contribute to sheet and rill erosion by water. To slow down water flows sandalwood needs to be planted on ground above the affected erosion areas to intercept flows and use water before its cumulative effect can cause any damage further down the slope.

You can decrease slope length by planting across the slope. Sandalwood can be most effective when used in conjunction with contour or diversion banks.

Protecting soils from wind erosion

Sandalwood plantations can be used as windbreaks and shelter belts to provide a reduction in wind speeds across the farming property.

Crop yields may be reduced marginally along the edge of the tree belt but this loss is made up by the increase in the protection of crops and pastures from hot drying winds in summer and cold winds in winter.

Windbreaks should be placed at 90 degrees to the prevailing wind to be most effective. Wide windbreaks that filter the wind rather than stop it are likely to be more beneficial for shelter, habitat and timber production. If wind erosion needs to be addressed quickly, Acacia species used as hosts for Sandalwood are fast growing and will afford protection in a shorter space of time than many other species.

Protection afforded by a well-designed windbreak is effective for up to twenty times the height. This shelter has obvious benefits for livestock such as protection of lambing ewes and general improvements in the well being of all animals shown as increased weight gain.

Improved soil structure and fertility

Perennial vegetation, such as Sandalwood that grows on a host such as Acacia fixes nitrogen, enables the recycling of nutrients between the plants and the soil. Nutrients cause the breakdown of organic matter and litter into humus in the soil where it can be used by plants, earthworms and microorganisms thus maintaining the ecosystem services and fertility of the soil.

The structure and infiltration of soils is improved by robust host tree roots which penetrate compacted soils creating channels allowing water to penetrate into the soil where it can be used by the plants rather than have it run over the land. Finer roots help hold the soil together and provide habitat for soil organisms which further improve the soil structure.

As a diversity of hosts can be used for Sandalwood, a suite of species is available for differing conditions, rainfall areas and soil types.

Sandalwood, unlike many other species, maintain nitrogen levels in the leaves when they drop, thus adding further nutrients to the soil.

Reduction of Waterlogging and Salinity

Sandalwood hosts are all deep-rooted perennial species that act as pumps, keeping ground water levels low and reducing salinity and waterlogging in susceptible areas. The planting of trees and shrubs such as sandalwood and its hosts can help lower water tables in two ways: by limiting the amount of rainfall that seeps through to the water table (groundwater recharge) and by directly using groundwater for transpiration.

Generally trees are more effective in reducing ground water levels if strategically located around the land in recharge areas and if the correct species for the soil type and rainfall is selected.

There are four considerations when using trees to help lower water tables:

- The area planted with trees as a percentage of the catchment;
- The arrangement of trees within the catchment (alleys, blocks, wide spaced, etc);
- The location of trees within the catchment (soil type, recharge or discharge area, low or high in the landscape, etc);
- The tree species selected (water use, leaf area index, growth habit, etc).

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Any revegetation to control salinity will depend on the processes occurring within the catchment as indicated by the:

- Discharge capacity of the aquifer;
- Size of the groundwater systems (local, intermediate or regional);
- Spatial distribution of recharge (localised to particular sites or covering a wide area);
- Salinity levels in the groundwater;
- Frequency and timing of recharge events (seasonal or only after particular rainfall events).

*Reference planting trees to reduce water logging and salinity - **farmforestryline.com/pages/2.4.2.1_planting.html)***

Where to plant trees

Knowing where to plant trees to have an effect on the processes causing problems within a catchment can be a major challenge.

In many cases large areas of tree may be required on many farms across a region. In some cases in the Wheatbelt growing sandalwood is an attractive diversification option for farmers who will convert large areas to grow this tree crop. In other cases the location where the trees are grown to control soil erosion or salinity the land may be of low value, with establishment problems, difficult access, or the risk of drought and salt accumulation.

Apart from salt affected areas sandalwood is a good option for all these difficult areas and is well adapted to cope with drought. In difficult conditions other options such as establishing sandalwood in belts across the slope to intercept subsoil drainage, mixing trees with agriculture in belts, and establishing blocks of trees over shallow watertable may be used.

Climate change

Climate change is likely to bring higher temperatures and a reduction in winter rains, decreasing soil cover in annual systems and the increased likelihood of summer storms making farming properties more susceptible to soil erosion. Sandalwood is well adapted to these changing conditions and is able make use of summer rain while protecting the soil and providing diversity for the farmer.

Grower experience has shown that bio diverse planting of hosts and sandalwood act together as a plant community does in nature; this makes the planting more robust and resilient to the effects of climate change, pests and diseases. A minimum area of 10m wide with a block of at least 1ha in area is required for assessment for carbon credits.

Improving bio diversity and sustainability of your farm

Sandalwood grows as part of a range of vegetation associations across the Wheatbelt. Sandalwood plantations often have bio diverse host species chosen to match local conditions of soil type and rainfall. Sandalwood plantations create habitat and can be used as linkages to connect other areas of remnant vegetation. Sandalwood plantations protect and conserve existing remnants when used as buffer plantings.

Some of the host species support large populations of small insects that provide food and shelter for small birds. Many of these small insectivorous birds are in decline in Wheatbelt due to lack of understorey plants. Other species such as Hakeas and Grevilleas provide food for honeyeaters and other nectarivores, while the seed of these species are a food source for endangered species such as the Carnabys cockatoo.

Increased populations of bats and spiders are important in reducing numbers of flies and mosquitoes. Other species such magpies feed on cutworms and other soil pests.

To maintain environmental services and improve the sustainability of farms, the aim is to achieve 10% perennial vegetation integrated into farming properties, this is achievable by including the fencing off of remnants, planting of riparian areas and shelter belts as well as including planting for commercial, aesthetic and farm production goals.

Sandalwood can be used along with other tree species to achieve these aims. The goal of 10% will ensure that the farm will retain its traditional productivity of cropping or pastures, and if sold, it will still appeal to those wanting to farm the property.

(Reference - Rowan Reid, Balancing Trees and Agriculture, Town and Country Farmer, Autumn 2008)

To maintain and improve the NRM benefits of Sandalwood plantations and the environmental credibility of the sandalwood industry no remnant vegetation should be cleared to accommodate sandalwood plantations. Establishment should be on cleared land. Where sandalwood is incorporated into existing remnant vegetation areas, this needs to be well documented to ensure that trees can be harvested in the future.

While some host species such as Acacia saligna and some eastern state Wattles have the potential to become weeds, Sandalwood itself is a native plant which will never become a weed. By choosing host species native to your area you will not create a weed problem, hosts will be pre adapted to conditions at your site and therefore have the best chance of survival.

Sandalwood can be successfully grown on sandy soils prone to wind erosion.

Sandalwood Plantations as a green framework around your farm protecting your soils.

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References and further information

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Trees for controlling dryland salinity and water-logging - ***www.mtg.unimelb.edu.au/publications/des_ch2.pdf***
Planting trees to reduce water logging and salinity - ***farmforestryline.com/pages/2.4.2.1_planting.html***
Design principles for Farm Forestry
Trees for soil conservation & capturing multiple benefits of farm forestry - ***www.mtg.unimelb.edu.au/publications/des_ch3.pdf***
Balancing Trees and Agriculture, Rowan Reid, Town and Country Farmer, Autumn 2008)
privateforestry.org.au
Australian Sandalwood Network (ASN) website - ***www.sandalwood.org.au*** ph: 9574 5882
Industry Development Plan - ***www.fpc.wa.gov.au/content/plantations/industry_plans/plans.asp***

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