Carbon value from Sandalwood

Their story

The Mount Marshall Sandalwood project commenced in September 2011 involving farmers in the Mount Marshall Shire (the 'Sandalwood Shire') and surrounding areas. It focuses on restoring 'biodiverse sandalwood systems' to the deep acid Wodjil sands that are generally only marginally productive for agriculture. Native vegetation on Wodjil soils is usually dominated by Acacia tree and shrub species. Other vegetation restored to the sites may include Allocasuarina, Casuarina and Hakea species and WA native sandalwood (*Santalum spicatum*), which has been commercially harvested from native vegetation for over 150 years.

Much of the stimulus for the Mount Marshall Sandalwood project came from the pioneering work of Bob Huxley who has been establishing sandalwood on his Gabbin farm since 2000. Bob and Ros Huxley have actively encouraged many other farmers to establish biodiverse sandalwood plantations, particularly through the Mount Marshall Sandalwood project. These farmers recognise the many benefits of sandalwood systems, including protection of erosion-prone soils, reduction of recharge to saline seeps, and wildlife conservation such as habitat for mallee fowl. However, importantly for farmers striving to make a living from their land, sandalwood is also a high value wood product with the prospect of additional revenue from sale of carbon credits.

Group name:	**Mount Marshall Sandalwood**
Participating farmers:	**Many farmers in the Mt Marshall Shire and surrounding areas**
Annual rainfall:	**300 mm**

Expected carbon revenues from sandalwood planting projects in the Central Wheatbelt are modest. They are unlikely to make such planting financially viable from the carbon revenue alone.

However, combined with returns from sales of sandalwood and other on-farm benefits of the plantings, revenue from carbon credits can make sandalwood planting a more valuable farm enterprise.

Government of Western Australia
Department of Regional Development

ROYALTIES FOR REGIONS

wheatbelt natural resource management

Department of Agriculture and Food
GOVERNMENT OF WESTERN AUSTRALIA

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Plantation designs

Sandalwood is a hemiparasite, meaning that it must be grown in association with suitable host plants. In the biodiverse sandalwood systems established in the Mount Marshall Sandalwood project the host species are a mix of local native tree and shrub species that would have grown on the sites naturally. However, there are other designs in use on WA farmlands that include sandalwood with a single host species, most commonly Jam (*Acacia acuminata*). Alternatively, a handful of host species (two to five) may be established for the sandalwood. In the Mount Marshall area these could be Old Man Wodjil (*Acacia resinimarginea*) and the faster-growing, but shorter-lived Silver Wattle (*Acacia lasiocalyx*).

Which design will provide the most sandalwood value? Dr Geoff Woodall is a revegetation ecologist who has been growing and promoting sandalwood planting in WA for over 20 years and who has been an active mentor for the Mount Marshall Sandalwood project. Geoff believes that the 'two to five host species' option will often be best for sandalwood production, but there will also be situations where biodiverse systems or a single host species may give the best yields of sandalwood. Once the central Wheatbelt sandalwood plantations are ready for harvest, which Geoff expects at around 25 - 30 years, the relative sandalwood value of the different plantation designs should become clearer.

Measurements to indicate carbon value

Figure 1 shows some measured values of carbon accumulation in sandalwood plantations on farmlands around Wickepin and surrounding areas, with average annual rainfall around 400 - 500 mm. A standard shape plantation forest growth curve has been fitted indicating carbon accumulation by 25 years of age of around 145 t CO2-e/ha. Although projection from such limited and variable data will be unreliable, this indicates an approximate upper limit to carbon accumulation by 25 years of age with average annual rainfall around 300 mm.

Note: Carbon credits are usually paid per tonne carbon dioxide equivalent (t CO2-e). One tonne (1000 kg) of carbon = 44/12 = 3.67 t CO2-e.

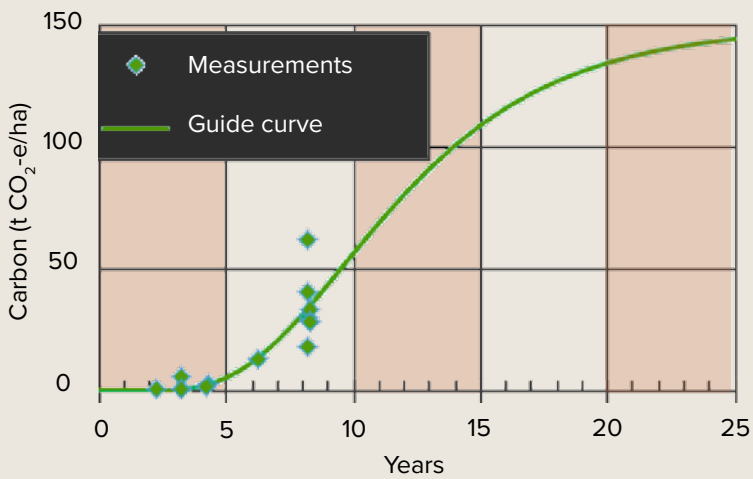

Figure 1. Measured carbon accumulation in sandalwood plantations around Wickepin, with fitted growth curve

Model estimates to indicate carbon value

FullCAM (Full Carbon Accounting Model) is the model used by the Australian Government for carbon accounting and reporting. It is available to projects to estimate and claim ACCUs (Australian Carbon Credit Units) from tree planting projects such as the Mount Marshall Sandalwood project plantings. However, under the current 'FullCAM method', harvest and sale (commercial harvest) of any tree products is not allowed in the 'Crediting Period', i.e. 25 years from plantation establishment. Within 25 years, some of the sandalwood or other trees and shrubs may be removed (thinned) but not sold. If the 25 years 'Permanence Period' option is selected then commercial harvest is allowed after 25 years. This option may suit sandalwood growers who do not wish to harvest and sell any sandalwood products in the first 25 years.

Forest growers who would like the option of harvesting and selling sandalwood products or other forest products before age 25 years, will need to wait for a variation of the 'FullCAM method' currently being developed, that may allow commercial harvest in the first 25 years. It is likely that this method will place a limit on the carbon credits that can be claimed equal to the Predicted Project Average Carbon Stocks (PPACS) over 100 years, i.e. same as the limit in the 'Measurement-based Farm Forestry method'.

For example, Figure 2 shows predicted carbon stocks and the PPACS over four rotations of sandalwood for a site on the Huxley farm, near Gabbin. It was assumed that within each rotation there would be a commercial thinning of some of the sandalwood after 15 years. And that all remaining sandalwood would be commercially harvested after 25 years, with the host species cleared and any material left on site heaped and burnt prior to re-planting, excluding roots. Of course, a model must be used to project carbon stocks forward over 100 years as measurements are not possible.

Figure 3 shows predicted carbon accumulation over 25 years for two scenarios – 'No thin' without thinning, and 'Thin' with the commercial thinning option of sandalwood from Figure 2. The PPACS from Figure 2 is also shown as this provides a limit on the carbon credits that can be claimed in the 25 year crediting period.

From Figure 3, carbon accumulation to age 25 years is 128 t CO2-e/ha in the 'No thin' option. Based on current carbon credit values of around $10 - $15 per tonne CO2-e, gross carbon revenue over 25 years would be $1,280 - $1,920/ha.

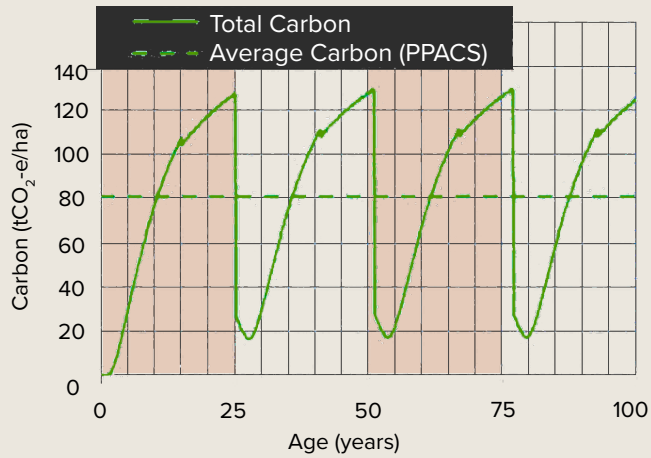

Figure 2. Model predictions of carbon stocks over four rotations of sandalwood and host plants in the Mount Marshall area

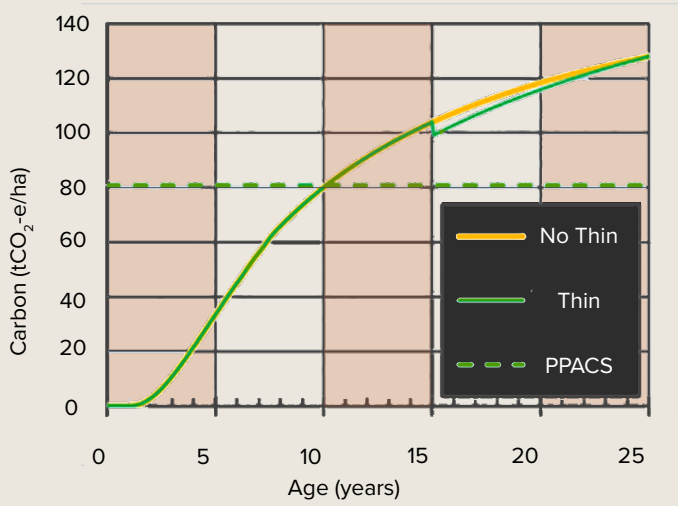

Figure 3. Carbon accumulation over 25 years for the 'No thin' and 'Thin' options, with PPACS transferred from Figure 2

The revenue would accrue over the 25 years, averaging around $51 -$77/ha/year. In the 'Thin' option, carbon accumulation to age 25 years (prior to the clearfell harvest operation) is also around 128 t CO2-e/ha. However, the limit imposed by the PPACS (Figure 2) of around $81 t CO2-e/ha is reached just after age 10 years. Therefore, for carbon credit values of around $10 - $15 per t CO2-e, gross carbon revenue would be around $810 - $1,215, all of which would accrue in around the first ten years. Hence, the average gross carbon revenue over 25 years would be around $32 -$49/ha/year.

Are carbon credits worth the effort?

From the above, a reasonable expectation for gross carbon revenue from sandalwood plantings at the Huxley site is around a total of $1,280 - $1,920/ha over 25 years without commercial thinning, or $810 - $1215/ha with commercial thinning.

If the plantation is to be established for sandalwood production, then the establishment costs need not be deducted from the gross carbon revenue. Any carbon revenue will be additional to revenue from sandalwood sales.

However, there are transaction costs (accounting, reporting, auditor fees, etc.) that need to be considered by farmers before they start their own carbon project. Most find it necessary to engage an aggregator who will bundle many projects together to achieve 'economies-of-scale' and cover all costs of implementing the aggregation projection. As a rough guide, a farmer in an aggregation project can expect to receive net carbon revenue of half to two thirds of the gross carbon revenue from their plantings.

Therefore, net carbon returns over 25 years to an individual with a sandalwood plantation at around 300 mm in the Mount Marshall area may be around $30-$45/ha per year without commercial thinning, or $20-$30/ha with commercial thinning.

Are those carbon returns worth chasing? Most landowners would say not if carbon revenue is the only return from the planting. However, as an additional revenue source to those from sandalwood sales, a modest return from carbon revenue can make the project financially viable or more profitable.

Acknowledgements

Forest Products Commission WA provided the measurement data used to compile Figure 1. However, this factsheet may not represent the views of the FPC WA.

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