



SANDALWOOD (*SANTALUM SPICATUM*) GUIDE FOR FARMERS

INTRODUCTION

Aromatic timber from plantation grown WA sandalwood (*Santalum spicatum*) is emerging as a small tree-farm industry in the Wheatbelt, Western Australia. Sandalwood trees produce valuable fragrant oils within the heartwood of the stems, roots and butt. Powdered sandalwood can be used to make incense sticks, while the extracted oils are used in perfumes, soaps, cosmetics and in therapeutics.

Currently, sandalwood harvesting occurs almost exclusively from natural stands. However, the Forest Products Commission (FPC) has been conducting research and field trials on sandalwood on cleared farmland from Northampton through to Albany over the past 16 years providing the necessary knowledge for commercial plantation establishment. In the last 5-10 years over 5000 ha of sandalwood has been planted in the Wheatbelt by private companies, the FPC and farmers.

Being a root hemi-parasitic tree, sandalwood is planted with a nitrogen-fixing host species such as jam (*Acacia acuminata*) and both being native species they make an important contribution to biodiversity values, with a variety of native fauna making use of these plantings for food and habitat.

COMMERCIAL PLANTATIONS

The FPC offers commercial partnerships with farmers to grow sandalwood in the Wheatbelt and some other areas of the State with a minimum average annual rainfall of approximately 400 mm. Commercial plantations provide a renewable resource that can provide both environmental and economical benefits to the Western Australian community.

Trials conducted by the FPC in the Wheatbelt and Midwest regions have determined the most appropriate host species, effective stocking rates and fertiliser treatments as well as helping to establish the best provenances for optimum sandalwood performance. Harvesting in these conditions takes place when the plantation sandalwood trees are about 20 years of age.

The FPC advises farmers where to plant the trees, carries out the planting, manages the plantation and harvests it when mature. A financial package provides landowners with a choice of up-front payments, annuities, profit sharing, or a combination of these.



Six-year-old sandalwood plantation established by FPC near Narrogin, W.A.

GUIDE TO ESTABLISHMENT TECHNIQUES

SUITABLE SITES

Soil type will greatly affect survival and growth of both host and sandalwood. The preferred site to grow sandalwood in the Wheatbelt is a sandy-loam over clay, duplex soil type. However, sandalwood will also grow on some loamy-gravels, yellow sands and red sands. The site should be water gaining but well drained. Deep white sands, saline soils, waterlogged or heavy clay soils are generally not suitable.

HOST SPECIES

It is important to select host species that are suited to both the soil type and climatic conditions of the site. Extensive trials have shown that jam (*Acacia acuminata*) is an excellent long-term (15-30 years) host for sandalwood. Jam will grow on a variety of soils, but generally performs best on the loamy sands over clay duplex soils. Jam is also quite variable and suitable selection for the conditions is important. In the western Wheatbelt (annual rainfall 400-600 mm), *A. acuminata* typical variant has shown to be a good host. However, in the eastern Wheatbelt (annual rainfall <400 mm) trials have shown that sandalwood performs better near *A. acuminata* narrow-phyllode variant.

Rock sheoak (*Allocasuarina huegeliana*), wodjil (*Acacia resinimarginea*) and mulga (*Acacia aneura*) can also be useful long-term host species, but should generally be planted in combination with at least 50 % *A. acuminata* on suitable soil types.



Germinating sandalwood seed,
2 cm in diameter.

HOST ESTABLISHMENT

The site should be ripped in rows spaced 4-5 m apart and to a depth of 0.4 m. Depending on the soil type, the rows can also be mounded or scalped. In early winter, spray the rows with a knock down and residual herbicide to control weeds for the first year. Two weeks after spraying, plant six-month-old host seedlings along the rows at 1.6-2 m intervals (1000-1250 stems per ha). Approximately 50 g of NPK fertiliser can also be applied next to each host to promote growth.

SANDALWOOD ESTABLISHMENT

A very economic and efficient method to establish sandalwood is by direct seeding. Sow the sandalwood seeds when the host trees are 1-2 years of age. For good root connections, the host trees should be approximately 1 m tall before introducing the sandalwood. In April, plant 2-3 sandalwood seeds approximately 0.4 m from every second host (500 sowing spots per ha). Sow the seeds along the rip line, because the host roots will be more concentrated in this region. Plant the sandalwood seeds 2-3 cm below the surface. On hard-setting surfaces, the soil may need to be loosened with a hoe or spade, before seeding. Farmers can purchase seeds and host seedlings from FPC Manjimup (see Contacts), or from private suppliers.

Approximately two weeks after the break of the season (e.g. early June), spray each sandalwood planting spot (in a 0.5 m radius) with a knock down herbicide. Ensure no spray touches the host plants. Weed control is very important before the sandalwood seedlings emerge as weeds can reduce survival and growth. Sandalwood seeds take 4-8 weeks to germinate after good rains in late autumn or early winter. Sandalwood seedlings normally emerge during June-August.



SANDALWOOD-TO-HOST RATIO

At age five years, the parasitic requirements of sandalwood trees greatly affect the survival and performance of the host. A sandalwood-to-host ratio of 1:1 will place too much stress on the host. At sandalwood age two years, the sandalwood-to-host ratio should be 1:2 or 1:3. Therefore an area with 1000 jams per ha should have no more than 400 sandalwood. This may require selective thinning of sandalwood throughout the area to achieve the right balance.

GRAZING & FIRE

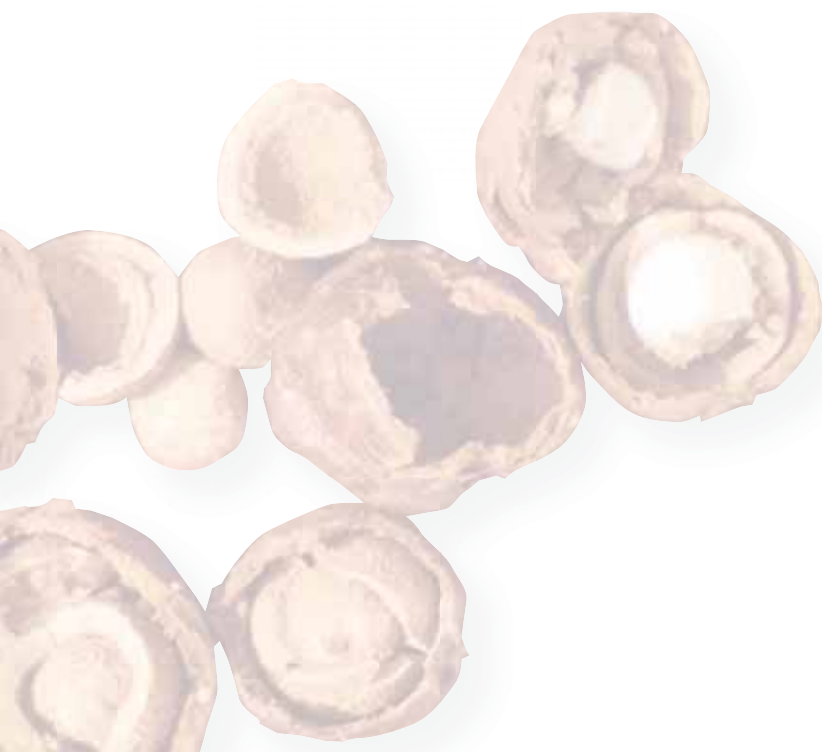
Sandalwood is readily grazed by domestic and feral herbivores. Generally, the site should not be adjacent to large native bush areas, due to high grazing pressure. Prevent sheep, cattle, goats, kangaroos and rabbits grazing the sandalwood. Sheep can be introduced when the sandalwood are age 5-10 years. Parrot numbers also need to be monitored because they can ring-bark seedlings. Sandalwood trees are not fire tolerant and the plantation will need a fire-break.

FRUITING

Sandalwood trees produce flowers during January-April. The flowers are very small (3-5 mm wide) and produce nectar that attracts flies, bees, wasps, ants and native cockroaches. The flowers develop into single fruits that mature during August-December. The mature fruit consists of a brown leather-like skin that encloses a hard smooth, round nut. The nut is 15-25 mm in diameter. The nut has a hard shell, and within the nut is a white edible kernel, similar in composition to almonds, peanuts and macadamias.



Mature sandalwood fruit, with brown cardboard-like skin enclosing the round nut.





CONTACTS

The information contained in this establishment guide is up-to-date at the time of printing. Farmers interested in tree farming or the latest developments on sandalwood matters please phone **FREECALL 1800 241 688** or contact:

FPC Head Office

Forest Products Commission
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Albany

Forest Products Commission
120 Albany Highway, Albany WA 6330
Ph: (08) 9845 5630, Fax: (08) 9842 5279

Collie

Forest Products Commission
20 Throssell St, Collie WA 6225
Ph: (08) 9735 1000, Fax: (08) 9734 5649

Gnangara

Forest Products Commission
695 Gnangara Road, Lexia WA 6065
Ph: (08) 9302 7488, Fax: (08) 9302 7499

Harvey

Forest Products Commission
64 Weir Road, Harvey WA 6220
Ph: (08) 9729 2888, Fax: (08) 9729 2499

Katanning

Forest Products Commission
10 Dore Street, Katanning WA 6317
Ph: (08) 9821 3208, Fax: (08) 9821 3332

SALES

Sandalwood seed can be purchased from
FPC Seed Technologies Centre
Ph: (08) 9772 0309, Fax: (08) 9772 1305

HOST SEEDLINGS CAN BE PURCHASED FROM

FPC Nursery Manjimup
Ph: (08) 9772 0377, Fax: (08) 9772 1305