FORESTS DEPARTMENT
Western Australia

SANDALWOOD 84

PRESCRIPTION FOR THE REGENERATION OF SANDALWOOD IN THE WHEATBELT AND GOLDFIELD AREAS OF WESTERN AUSTRALIA

MAY, 1984

SANDALWOOD 84

1. INTRODUCTION

This prescription describes the measures to be taken to regenerate Sandalwood (*S. spicatum*) in the wheatbelt and goldfields regions of Western Australia. The term 'goldfields' refers to the pastoral zone in Southern Western Australia.

The techniques prescribed are based on research and field trials by Forests Department staff from 1970-1984, directed by Mr. O.W. Loneregan. This work is shortly to be published in a Departmental bulletin. Sandalwood Research is not yet complete. However, it is sufficiently advanced to allow this State of the Art prescription to be issued and further field tested.

The prescription will be regularly reviewed henceforth so that new research findings and operational experience may be progressively incorporated.

Areas covered are :-

- Objectives.
- Seed collection, handling and storage.
- Regeneration techniques.
- The Wheatbelt strategy
- The Goldfields strategy
- Subsequent management
- Monitoring and review

2. REGENERATION OBJECTIVES

The objective is to establish stands of Sandalwood on suitable sites in order to :-

- Replace the species in ecosystems in which it once naturally occurred; and
- provide a future commercial crop in areas where this is an acceptable land use practice.

This objective assumes artificial regeneration of the species. Natural regeneration and its management are dealt with elsewhere.

3. SEED

Seed must be collected from the field for regeneration projects.

Later a resource may be built up in the Forests Department Seed Store. Collection of seed from State Forests or other reserves may only be done with agency approval.

3.1. Collection :

Gather fresh seed from beneath mature trees in early December. In the wheatbelt, Sandalwood may produce seed each year. In more arid areas seed may be available only after above-average rainfall years.

Approximately 4000 seeds are needed to regenerate a hectare in the wheatbelt region, approx 500 in the goldfields.

Seed should not be picked from the tree.

3.2. Seed Provenance :

Until more is known about the genetic variability in the species, local seed should always be used for a regeneration project.

3.3. Seed Handling :

Immediately after collection, remove the soft green outer coat from the nuts. This is best done by gentle tumbling in a super bag so that the nuts grind against each other.
Failure to peel the outer coat leads to subsequent storage problems.

3.4. Seed Storage :

Place peeled nuts in airtight plastic containers with Silica gel, and store in a cold room at 2 to 4°C.
This will ensure at least 50 per cent viability after five years.
Keep seed provenances separate and clearly label containers.

4. REGENERATION TECHNIQUES

Two options are available :-

i) Sowing seed directly into the soil and
ii) Planting seedlings raised in the nursery.

In research trials to date direct sowing of seed has proven to be the most simple technique. Farmers may find it more convenient to purchase seedlings in pots or trays.

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4.1. Preparing germinated seed for sowing :

Nuts are removed from storage and tested for viability. If this is satisfactory they are prepared for germination. This involves cracking each nut and removing the soft white seed from the woody kernel. Nut cracking is easy with a chainsaw link-changer.

Seeds are then laid on vermiculite in trays and covered with hessian bags. The bags are kept wet and periodically dusted with fungicide during the incubation period.

Inspect daily after 10 days.

As soon as germination commences, seeds are removed to the field for sowing. Batches of seed usually germinate over a 10-20 day period and can be sown in two or three operations.

4.2. Raising seedlings for planting :

Follow the whole procedure outlined in 4.1. (above), but transfer germinating seeds to jiffey pots containing standard nursery soil mix. Transfer potted seedlings to shaded and stock-proof nursery until ready to plant in the field.

4.3. Timing :

Seeds must be prepared three to four weeks before proposed sowing or planting date (see 5.2. and 6.2.).

5. ESTABLISHMENT PROCEDURE IN THE WHEATBELT

5.1. Site selection :

Although ~~Saldalwood~~ Sandalwood can utilize a great range of species as host plants, the best in the wheatbelt region are Jam, Manna Wattle, Sheoak, Wandoo and York Gum. Proposed planting sites should always be well occupied by these species (i.e., about 50 per cent crown cover or more).

The best sites are slopes and lowlands near granite. Avoid areas subject to flooding.

Do not attempt to regenerate areas which cannot be maintained totally free from fire or grazing by domestic or feral animals. (Grazing by native fauna is generally not a problem).

5.2. The Sowing/Planting Season :

Sowing or planting should commence after the opening rains in mid to late April and be completed by mid-June.

5.3. Selection of Niche :

It is essential to select the optimum niche in the best site. This is under the crown, or at least within 1-2 metres of the stem of a well established host plant and on the south side of the plant.

Do not cultivate or burn before planting. The former disturbs the host root system and the latter removes leaf litter which is useful later to protect and mulch the young Sandalwood plant.

5.4. Sowing :

Aim to sow about 1000 spots per hectare.
At each spot excavate a small hole with a spade or mattock about 4-6 cms deep. Place four pregerminated seeds in each hole and refill with soil Press gently with foot to leave a slight depression and replace leaf litter.

Spots are 3-4 metres apart.

5.5. Planting Seedlings :

Select site and niche as for sowing. Plant seedlings firmly in the soil so that the root system is properly buried.
Plant only one seedling per spot.

5.6. Fertilizer application :

Do not apply fertilizer. This aspect is subject to current research trials.

5.7. Survival Count and Refilling :

Survey regeneration areas in the January-February following planting/sowing. If the stocking of seedlings is unsatisfactory, plan a refilling operation in the succeeding months.

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6. ESTABLISHMENT IN THE GOLDFIELDS

6.1. Site selection :

It is essential in this region to select areas which are:
(i) not subjected to grazing by sheep, cattle or goats; and
ii) on water-gaining sites.

In the arid region it is a total waste of time to try to establish Sandalwood on grazing areas or on harsh uplands or free draining stony slopes. Conditions may only occur about once every 100 years in which Sandalwood can be established on such areas.

Select areas on reserves or areas securely fenced against sheep, cattle or goats; within these areas select lowlands, soaks, lake edges, and outwashes from granite outcrops.

All Sandalwood regeneration areas must carry mixed stands of host species, notably Mulga, Jam and the other native Acacias.

6.2. The Planting/Sowing Season :

Sowing should commence as early in the year as possible, provided normal opening rains fall in January. Sowing should commence in February and be completed by mid-April.

Planting of seedlings can be done between May and June.

6.3. Selection of Niche :

As for 5.3.

6.4. Sowing :

As for 5.4., but sow four seeds per spot in only 500 spots per hectare.

6.5. Planting :

As for 5.5, but plant only 500 seedlings per hectare.

6.6. & 6.7. Fertilizer & Refilling :

As for 5.6 and 5.7

7. SUBSEQUENT MANAGEMENT

Irrespective of whether Sandalwood is being grown for ecological or commercial reasons, three management procedures are essential for at least the first 30 years after regeneration. :-

7.1. No grazing by sheep, cattle or goats. ~~Sheep in particular~~ Any Stock can completely eliminate Sandalwood from these ecosystems.

7.2. No fire. Hot fires kill Sandalwood of all ages. Mild creeping fires destroy regeneration, but older trees (>25 yrs) can withstand their effects.

7.3. Rabbits need to be controlled if present in plague proportions, especially while the Sandalwood is still a small seedling.

In commercial Sandalwood plantations, subsequent fertilizer application may improve growth rates, but this has not been studied.

Without fertilizer, Sandalwood grows to commercial size in about 50 45 years in the wheatbelt zone and about 75 years in the goldfields zone.

8. MONITORING AND REVIEW

Application of this prescription will be monitored by Forests Department research and divisional staff at Narrogin and Kalgoorlie.

It will be reviewed in July 1985.

Comments from any interested research personnel or others interested in Sandalwood regeneration will be welcomed.