REVEGETATION OPTIONS FOR GILLINGARRA
(Supplementary Species component of the Maritime Pine Project)

Report to: **Gillingarra Landcare Group**
Report by: **Dan Huxtable, CALM Farm Forestry Unit**
Date: **June 27, 2000**

Background:
In 2000/2001, the Gillingarra Landcare group is planting a combined total of some 1500ha of Maritime Pine under share-farming agreement with CALM.

As a component of the scheme, pine growers are also receiving funding assistance of $70/ha (of pines planted) to be used for supplementary species plantings and biodiversity protection.

At the group meeting on March 21, 2000 a number of farmers expressed interest in using this funding to plant native species that have a commercial value. The group members were keen to coordinate their revegetation efforts, in order to develop a combined resource of commercial, native species. This would greatly improve the marketing prospects for any future products.

The purpose of this report is to outline a number of options for integrating native species with commercial potential into farming systems in Gillingarra. This will help the Gillingarra Landcare Group to develop implementation plans for supplementary species plantings in the area.

Revegetation designs which can enhance biodiversity:

Without compromising other objectives, revegetation projects can make an important contribution to biodiversity enhancement through one or a combination of the following:

- Adding to existing populations of **local, native species** in the landscape.
- By using a **mixture of species**, to provide varied structure and habitat for wildlife.
- Increasing the **effective size** of areas of remnant vegetation
- Improving **linkages** between areas of remnant vegetation.
- Reducing **threats** to remnant vegetation (*eg* mitigation of rising watertables).

The main revegetation designs which can enhance biodiversity are:

- **Expanded remnants**: Increase the "effective" size of remnants by minimising the perimeter /area ratio of the remnant (*ie* make irregular remnants as square or circular as possible).
- **Buffer zones around remnants (or pines):** Suggested minimum width of 20m.
- **Corridor Linkages:** To connect areas of remnant vegetation or revegetation (including pines). Could be planted along fence lines, drainage lines, drive ways, road reserves *etc*. Suggested minimum width of 40m, linking remnants >5ha and spanning a distance <1000m.
- **Riparian Zone Plantings:** suggested minimum width of 20m either side of creek/drainage line.

Other benefits of Revegetation:

- Reduced wind erosion through strategically positioned windbreaks
- Reduced recharge to groundwater systems. This can potentially help to alleviate "localised" waterlogging and salinity problems on some sites.
- Improved aesthetic value of farm and wider landscape.

The Commercial Prospects for Native Species

There are a variety of ways in which revegetation can benefit farming systems and the wider landscape. These include:

Excess water utilisation
Erosion control (wind or gully erosion)
Improved farm aesthetics
Use of unproductive land (*eg* deep sands or saline land)
Enhanced biodiversity and nature conservation values.
Commercial products

At the present time, very few native species are grown exclusively to produce commercial products for the simple reasons that it is not economically viable or markets do not exist. The main exception to this is the purpose-grown wildflower industry. A significant research and development effort has been put into oil mallee's over the past 8-10 years, such that this industry is nearing becoming a viable commercial prospect.

As a result, it is recommended that revegetation using native species should not target commercial products alone, but seek to incorporate other benefits such as water use, erosion control and biodiversity enhancement. The potential commercial value of native species should be viewed as a bonus.

Despite this, it is important that the commercial potential of native species is enhanced through appropriate planting configurations and ongoing management.

Five species options are discussed in the next section. These are:

- Brown mallet for sawlogs
- Spotted gum for sawlogs
- Sandalwood
- Wattles for edible seed
- Oil mallee's

It is important to note that there is significant uncertainty about how to optimally grow and manage these species for commercial products, or to predict what they will be worth in the future. The five options are seen as "best bets" and are intended to serve as an initial guide to help farmers make decisions rather than as strict prescriptions. Sources of extra information have been provided for each option.

Option 1: Brown Mallet (Eucalyptus astringens)

Description of plant (adapted from REX 96):
Medium sized tree, occurs on gravel hills and breakaways in the southern wheatbelt and southern coastal areas from Moora - Narrogin - Mt. Barker and eastwards to Corrigin and Ravensthorpe.

Adaptable to most well-drained soils in full or filtered sun.

Moderately lime tolerant . Waterlogging sensitive.

Very fire-sensitive. Life span > 75 years.

Light red-brown to dark grey-brown heartwood, with reddish streaks has a fine texture, straight or interlocked grain and is very hard, strong, tough and moderately durable. It has low shrinkage and is easily dried. It machines well and has a beautiful sheen when polished.

When in contact with the ground, timber must be treated to prevent termite attack.

There is anecdotal evidence from farmers in the Narrogin district that brown mallet is unpalatable to sheep.

Possible products:
- Sawn Timber
- Posts (also good for electric fence droppers)
- Firewood

Suggested Site Type At Gillingarra:
Gravels and shallow sands over gravel, on hilltops and upper slopes. Gravels must be penetrable by roots.

Suggested Planting Configuration:
To achieve the straightest tree form, mallets should be planted at high density (3m between rows and 2-3m along rows – this will give a density of 1100 to 1650 stems per hectare). Block plantings, or wide belts (10 rows) are preferable the recommended configurations.

The sites should be deep ripped in April/May and weeds controlled prior to planting after the break of season. Mounding is probably unnecessary on most sites. Scalping may be an option on sandier sites.

It may be possible to direct seed this species.

Seed provenance is likely to have a strong influence on growth rates and tree form, which may warrant trials of several "best bet" varieties being established.

Management inputs required:
Establishment: Ripping, Weed and pest control, Planting, Fencing (may not be required – damage by stock needs to be assessed).

Silviculture:
It is difficult to predict the silvicultural requirements for brown mallet at Gillingarra with much precision. Individual site factors, such as soil type and water availability, will influence these requirements. As with growing crops, it is essential that sufficient time is allocated to tree management and that required works are done on time.

The following table shows a simplified, "generic" management regime which is believed to be suitable for growing sawlogs in the <600mm rainfall zone. This has been included to give an indication of inputs required by the farmer.

Potential Sawlog regime.

Year After Planting (depending on growth rates)	Task	Description	Time of year
4-6	Form Prune	Correct double forks, cull poorest trees.	June-Sept
6-10	Prune and Thin	Thin to 150 SPH (approx), prune crop trees to half tree height.	June-Sept
8-11	2nd Prune	Prune to half tree height.	June-Sept
30+	Harvest	Clear fell stand	

The cost effectiveness of fertilising is unknown but is worth investigating.

"Ballpark" Returns:
Sawlogs:
Estimated number of crop trees = 150/ha
Estimated stumpage (value of standing tree) = $20-50/tree
Estimated Gross Return per hectare = $3000-7500/ha

It may be possible to utilise the thinnings for firewood or fence posts at year 5-8. The crown wood generated at the final harvest could also be used for firewood.

Brown mallet is a good firewood. There is scope to sell it in bags as kindling for the Perth market.

Other species options:
Silver Mallet (*Eucalyptus argyphea*) is a similar species to brown mallet but tends to have faster growth rates. The timber qualities are believed to be similar for posts and sawn timber, but not for tool handles.

Powderbark wandoo (*Eucalyptus accedens*) may also be worth trying on similar sites. It produces a hard, good quality timber.

Key Issues to Consider:
- Growing trees for timber is a long term objective. To attain trees of sawlog size is likely to take in excess of 30 years. **The main advantage of brown mallet is that it is suited to gravelly hills that are unsuitable for most other tree species.**
- Marketing – possibly the best way to market brown mallet timber would be as a "specialty" product to niche businesses (tool handles, paneling, floorboards, furniture). Considerable effort would be required to source/develop such markets. Being able to guarantee a continuity of supply is a critical factor to consider. A co-operative approach by farmers would help to achieve this.
- Value adding (*eg* through on farm milling) – depending on markets and time available, may be cost effective for farmers.

Extra Information:
Tree Notes series
"*On site processing for farm forestry*", RIRDC publication #98/79 – contact 02 6272 4539 to purchase a copy.

Option 2: Spotted Gum (Corymbia maculata)

Description of plant (adapted from REX 96):
Occurs on coastal plains and hills from Bundaberg in Qld, south along NSW coast, with disjunct occurrence in the Mottle Range north-west of Orbost in eastern Victoria. Altitude ranges from near sea level to 950 m.

Hardy. May be frost tender when young. Adaptable to most well-drained soils in full or filtered sun. Moderately drought tolerant. Moderately lime tolerant .

Hard, strong, moderately durable, light to dark brown heartwood, often with an interlocked grain and gum veins, and occasionally having an attractive "fiddleback" figure. Wide band of sapwood (up to 8 cm) is very susceptible to Lyctus borer attack, particularly if trees are stressed.

Possible products:
- Sawn Timber
- Posts
- Firewood

Suggested Site Type:
Well drained sands/sandy loams where soil profile depth >3m, on mid-lower slopes. Preferable to have clay at depth.

Suggested Planting Configuration:
For block planting, spotted gum should be planted at a density of about 1250 stems per hectare (4x2m spacing).

Planting in belts is also considered to be feasible. Belts widths could range from 2-10 rows, although >5 rows is recommended to improve crop tree selection.

The sites should be rip/mounded in April/May and weeds controlled prior to planting after the break of season.

Seed provenance is likely to have a strong influence on growth rates and tree form, which may warrant trials of several "best bet" varieties being established.

Management inputs required:
Establishment: Ripping, Weed and pest control, Planting, Fencing

Parrot Control: Likely to be an ongoing requirement until sufficient tree height is obtained. The target bole length (pruned trunk of tree) would be 5+ meters for this species.

Silviculture: The silvicultural requirements for spotted gum at Gillingarra will be influenced by individual site factors, such as soil type and water availability. As with growing crops, it is essential that sufficient time is allocated to tree management and that required works are done on time.

The following table shows a simplified, "generic" management regime which is believed to be suitable for growing sawlogs in the <600mm rainfall zone. This has been included to give an indication of inputs required by the farmer.

Potential Sawlog regime.

Year After Planting	Task	Description	Time of year
3-4	**Form Prune**	**Correct double forks, cull poorest trees.**	**June-Sept**
5-8	**Prune and Thin**	**Thin to 150 SPH (approx), prune crop trees to half tree height.**	**June-Sept**
8-10	**2nd Prune**	**Prune to half tree height.**	**June-Sept**
20-30	**Harvest**		

The cost effectiveness of fertilising is unknown but is worth investigating.

"Ballpark" Returns:
Sawlogs:
Estimated number of crop trees = 150/ha
Estimated stumpage (value of standing tree) = $40-60/tree
Estimated Gross Return per hectare = $6000-9000/ha

It may be possible to utilise the thinnings for firewood or fence posts at year 5-8. The crown wood generated at the final harvest could also be used for firewood.

Key Issues to Consider:

- Marketing – possibly the best way to market spotted gum timber would be as a "specialty" product to niche businesses (panelling, floorboards, furniture). Considerable effort would be required to source/develop such markets. Being able to guarantee a continuity of supply is a critical factor to consider. A co-operative approach by farmers would help to achieve this.
- Value adding (*eg* through on farm milling) – depending on markets and time available, may be cost effective.
- Parrot damage – parrots have the potential to ruin the value of a spotted gum plantation. The risk at Gillingarra needs to be further assessed.
- Drought stress – Spotted gum naturally occurs in higher rainfall areas. Good site selection and sufficient thinning is required to ensure that the water available at the site is sufficient to sustain a 20+ year rotation.

Other species options:

A range of other trees species have potential to be grown for sawlogs, as per the above recommendations for spotted gum. These include Sugar Gum *(Eucalyptus cladocalyx),* Red Ironbark *(Eucalyptus sideroxylon)* and for wetter sites Southern Mahogany *(Eucaluptus botryoides).*

However, in order to maximise the potential resource, it is recommended that the group selects one preferred species.

Extra Information:

Tree Notes series
"*On site processing for farm forestry*", RIRDC publication #98/79 – contact 02 6272 4539 to purchase a copy.

Option 3: Sandalwood (*Santalum spicatum*)

Description of plant:
Sandalwood is a parasitic tree that occurs naturally in the southern half of WA and western SA. It has a fragrant timber, which is used predominantly in South East Asia for incense sticks.

Possible products:
- Specialty timber
- Nuts (for seed or bush tucker).

Suggested Site Type:
Gravels and shallow sands over gravel or clay, on hilltops and upper-lower slopes. Gravels must be penetrable by roots.

Suggested Planting Configuration:
Host plants needed to be established 1-2 years prior to (Jam *Acacia acuminata* is the preferred host species, rock she-oak and *Acacia saligna* could also be used in combination with jam).

The sandalwood is planted as seed in the following Autumn.

2-4 hosts are required for each sandalwood, to ensure good growth and survival of the sandalwood over an 18-25 year rotation.

Site preparation required includes deep ripping, weed/pest control and host establishment at 500-825 stems per hectare. Further knock down weed control is needed prior to sandalwood seed planting.

Sandalwood plots could be established as blocks or belts (2+ rows).

Management inputs required:
Establishment: Ripping, Weed and pest control, Planting, Fencing.

Seed harvesting: August to November, after about year 5.

Final harvest (whole tree removal) at year 18+.

"Ballpark" Returns:
A stocking rate of 200-300 sandalwood trees per hectare could be expected to yield about 2-3 tonnes of commercial timber at harvest.

Approximate value of timber = $6,000/tonne.

Estimated gross return = $12,000-18,000/ha

The seeds have potential to provide a source of income during the rotation. Possible markets for the seed require further investigation.

Key issues to consider:
- A market for sandalwood already exists, based on wild stock harvested under license from the Goldfields.
- The timber is a high value product.
- Based on present day assumptions, this option offers the greatest potential return to the farmer.
- There is some scope for using a number of the edible wattle seed species (option 4) as hosts, although sandalwood parasitism would reduce their production potential.

Extra Information:
Sandalwood Information Sheet – Issue 1 (CALM, 1999).

Option 4: Wattles for bushtucker

Description of plant:
The wattles comprise a diverse group of species (the *Acacia's*), not all of which produce edible seed.

Species that may have potential for edible seed production in the Gillingarra area include:

- *Acacia murrayana*
- *Acacia victoriae*
- *Acacia scirpifolia*
- *Acacia blakelyi*
- *Acacia saligna*

Most of these species are fairly short lived (10-20 years).

Possible products:

- Edible seed
- Firewood

Suggested Site Type:
Sandy gravels and sands (upper-lower slopes), valleys which do not get waterlogged.

Suggested Planting Configuration:
The wattles should be spaced 3-4m apart to allow maximum growth and seed production. Either a block (4x4 spacing) or belt configuration (*eg* 2-4 row windbreak) would be suitable.

Direct seeding may be a cost effective option for wattle establishment.

Otherwise, seedlings can be planted into riplines or scalplines.

Management inputs required:
Establishment: Ripping/scalping, Weed and pest control, Planting, Fencing.

Seed harvesting (December): Seed would be expected to be produced after about age 4-6 years. The seed currently is harvested by hand, a labour intensive task.

Wattle seed requires no treatment prior to storage, only needing to be cleaned of contaminants prior to wholesale. It requires roasting and grinding into a flour during manufacturing.

"Ballpark" Returns:
Possible returns from edible wattle seed are difficult to even "guestimate"

As a rough guide, a study of the feasibility of growing bush food in western Queensland estimated the following returns for *Acacia victoriae* grown in that region (Source - *"The feasibility of a sustainable bushfood industry in Western Queensland", RIRDC Research paper #97/11):*

Time to maturity = 4 years
Yield = 1.5 kg/plant
Farm gate value = $5.00/kg
Return = $7.50 per plant per annum.

The estimated return (minus operating costs) for a stocking of 625 stems per hectare was about $1000/ha per annum. Harvesting costs were estimated to be $1200/ha.

Key issues to consider:

- The market is small and based solely on one species at present (*A.victoriae*). As such, the food value of the other species is untested.
- This is a higher risk option in that future returns are highly uncertain.
- The multiple benefits of wattles (windbreaks, sand stabilising, fodder value) should not be overlooked.
- To my knowledge, there are no producers of wattle seed in WA. This suggests that there is opportunity to create a local supply chain.
- Value adding opportunities, through on farm or local processing, are worth exploring.

Extra information:
"*Edible Wattle Seeds of Southern Australia*" B.R.Maslin et al 1998, CSIRO Publishing – available from CALM Como Office (Ph 9334 0333).

Option 5: Oil Mallees and *Melaleuca's*

Description of plant:
A range of mallee eucalypt and *Melaleuca* species are believed to have good commercial potential. These are being developed by the Oil Mallee Association (OMA), in conjunction with CALM.

Possible products:
- Cineole (Oil)
- Biomass for electricity generation
- Activated carbon
- Brush fencing material (*Melaleuca's* only)

The likely market for oil mallee's is as a feedstock for integrated processing facilities, which are able to produce multiple products thereby improving economic viability.

Suggested Site Type:
A range of species are available, suited to a range of sites, are potentially available.

Some *Melaleuca* species may be able to tolerate waterlogged sites lower in the landscape.

The hedgerow configuration is the design commonly advocated by the OMA (twin rows 2m apart with trees planted 1.5m along the rows). This allows integration of trees with cropping and pasture enterprises, in the form of belts. Block plantings are also possible.

The Oil Mallee Association can provide guidance with matching species to sites.

Suggested Planting Configuration:
As per Oil Mallee Association recommendations.

Management inputs required:
As per Oil Mallee Association recommendations.

"Ballpark" Returns:
A recent economic analysis by Alan Herbet from AgWA summarises the latest thinking on this subject ("*Economics of oil mallees*", Alan Herbet, April 2000 - Ph AgWA 9368 3333 on to obtain a copy).

The main findings of this study are:

- Assuming first harvest at age 4 years and then every second year thereafter, and a farm gate biomass value of $15/tonne, oil mallees are financially attractive for planting into paddocks which have a current agricultural production value of $79/ha or less.
- The profitability of oil mallees is significantly less on lower biomass yield sites, where mallees are initially harvested at age 5 years and then every third year thereafter.

Further information:
Contact Max and Angela Water's from the Oil Mallee Association – ph 9666 2131