TIMBER PROPERTIES AND MARKET POTENTIAL OF SELECTED WHEATBELT SPECIES
1. ROCK SHEOAK AND SWAMP SHEOAK

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SUMMARY

Rehabilitation by planting native tree species is important for salinity control in the Wheatbelt region of Western Australia, but there are advantages for the landowner if producing commercial timber products subsidises the costs of establishing trees. Rock sheoak (*Allocasuarina huegeliana*) and swamp sheoak (*Casuarina obesa*) growing in the area were the first two species assessed for their timber properties and market potential.

INTRODUCTION

Land degradation is a major problem in the Wheatbelt Region of Western Australia, with increasing salinity and erosion following extensive clearing for agriculture. Revegetation is essential for correcting these effects, but adequate levels of revegetation could not be achieved without commercial products being available to subsidise the costs of the operation.

The timber properties and market potential of the major potential species for revegetation must be assessed, because trees can be an alternative crop while providing considerable environmental benefits. This trial complements the research and development programs for eucalyptus oil, sandalwood, and tannins study being carried out in the Wheatbelt.

The current order of priority for assessing species is as follows :

Rock sheoak	(*Allocasuarina huegeliana*)
Swamp sheoak	(*Casuarina obesa*)
Brown mallet	(*Eucalyptus astringens*)
Raspberry jam	(*Acacia acuminata*)
York gum	(*E. loxophleba*)
Wandoo	(*E. wandoo*)
Swamp yate	(*E. occidentalis*)
Salmon gum	(*E. salmonophloia*)
Red morrel	(*E. longicornis*)
E. 'myriadena'	

This report discusses the initial assessment of timber properties and market potential of rock sheoak and swamp sheoak.

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METHODS

Sampling :

The basic specification for logs was :

(i) Select from farmland, with logs of known age where possible.

(ii) Reasonable form.

(iii) Minimum length 2.5 m, minimum small end diameter under bark (s.e.d.u.b.) 200 mm.

(iv) Approximately 1 m^3 of each species.

(v) Logs harvested in summer require end coating with petrolatum or an equivalent product to minimise end splitting.

(vi) All logs must be covered during transport to Harvey.

Five rock sheoak logs were harvested from the Coleman property, approximately 13 km west of Katanning, in October 1993. The estimated age of the trees ranged from 40 years to 90 years, and all were growing adjacent to a watercourse. It was recognised at the time of harvesting that there was extensive rot, but it was considered essential to commence assessment of the species.

Ten swamp sheoak logs were harvested from an 8 ha 20 year-old plantation on the Smith property 'Alton Park', about 25 km north / north east of Katanning on the Dumbleyung Road.

Sawmilling :

Log length and diameter under bark at each end were measured prior to sawmilling. Any log defects and the shape of irregularly-shaped log ends were recorded, because these factors affect sawn recoveries.

A standard quartersawing pattern was used to emphasise the rays as a feature of the boards. The training circular saw bench was used for the sawmilling operation, although the saw has the comparatively large kerf of 7 mm. The boards were milled to 28 mm thickness, with width 75 mm or 100 mm.

The recovery data were recorded as actual recovery (which was low because of the high incidence of defects) or potential recovery which could be achieved if defects such as rot were not present.

Drying :

After specimens for density and shrinkage assessment were prepared, the residue boards were stored in a holding tent under low temperature/high humidity conditions until a new charge was started in the CALM solar-assisted kilns (Chamber 2) in February. The drying schedule was standard for jarrah, based on decreasing relative humidity and increasing temperature.

Density and shrinkage :

Two sets of twenty-four specimens were prepared from each species for assessment of :

(i) Green and basic density.

(ii) Shrinkage and air-dry density.

Each specimen was 25 mm wide, docked from near the end of a board i.e. the width of the board (75 or 100 mm) became the length of the specimen.

Density was estimated using the following equations :

$$\text{Green density} = \frac{\text{green mass (kg)}}{\text{green volume (m}^3\text{)}}$$

$$\text{Basic density} = \frac{\text{oven-dry mass (kg)}}{\text{green volume (m}^3\text{)}}$$

$$\text{Air-dry density} = \frac{\text{air-dry mass (kg)}}{\text{air-dry volume (m}^3\text{)}}$$

The relationship between shrinkage and moisture content was assessed using data from regular measurements of dimensions by Vernier calipers and moisture loss by weighing. The moisture content at any time is estimated from mass at that time and oven-dry mass of the specimen.

Working behaviour :

Sawing, planing and sanding behaviour were assessed qualitatively by inspecting boards, and a rating of 1 = very poor to 5 = excellent applied.

Gluing properties :

The boards were edge-glued using urea formaldehyde adhesive ('Grasp') in an 'Orma' glue-press using horizontal pressure of 11 730 kPa (1700 psi) and vertical pressure of 5 520 kPa (800 psi), and pressing time of eight minutes.

Dry cleavage tests were carried out to assess gluelines, using the specifications of Australian Standard AS1328-1987 (Standards Association of Australia 1987).

Visual appeal :

The timber was rated for colour by using the Methuen Book of Colour, using two observers.

Wood quality :

Dried dressed boards were assessed graded using the FIF(WA) Industry Standard, which separates 'Prime' and 'Standard' grades.

RESULTS AND DISCUSSION

Sampling :

In this trial, opportunistic sampling will be an important factor. The security of the species to be assessed means that standard methods of random sampling for research purposes cannot be applied. However, the species that are assessed will provide useful data or wood properties and hence market potential of commercial products, to complement the environmental advantages of growing trees on properties in the Wheatbelt Region.

The research undertaken here is complementary to the Goldfields Timber Research Project, which involves the Department of Commerce and Trade, the Goldfields - Esperance Development Authority and the Department of Conservation and Land Management, with a major input by the Goldfields Specialty Timber Industry Group. Species such as York gum, salmon gum and red morrel are common to both Wheatbelt and Goldfields Regions.

Sawmilling :

Sawing was done to measure the proportion of quartersawn boards to backsawn to emphasise the rays of the two species.

The mean s.e.d.u.b. of the five rock sheoak logs was 370 mm, and of the ten swamp sheoak logs was 180 mm. The latter included some logs which were below specification for minimum diameter, but which were considered suitable for providing some data on wood properties and recoveries.

The actual recovery and potential recovery of green sawn and dry dressed timber are given in Table 1. As explained in the Methods, the potential recovery is that achievable without the extensive occurrence of rot which occurred in the rock sheoak.

Table 1
Sawn recoveries of rock and swamp sheoak

Species	Σ log volume (m^3)	GREEN SAWN		DRY DRESSED	
		Mean actual %	Potential %	Mean graded %	Potential %
Rock sheoak	1.32	16.6 (5.9)*	28.9 (4.4)	2.5	23.5
Swamp sheoak	0.62	32.9 (8.2)	38.2 (8.2)	2.8	27.4

* Standard deviation of recoveries in green sawn were based on data from individual logs. Identity was not maintained with dry dressed material.

The rock sheoak logs had lower recoveries than the swamp sheoak, although the logs were larger. This can be attributed to two factors - log shape and form (Photograph). The comparatively low shrinkage of the sheoaks is an advantage.

Drying :

Initial mean moisture contents of rock sheoak and swamp sheoak specimens were 57.0 per cent (S.D. 11.7 per cent) and 71.8 per cent (S.D. 5.8 per cent) respectively.

Storing boards in the holding tent at low temperature and high relative humidity did result in moisture loss, although there was no drying degrade. Sample boards of the rock sheoak were a mean 29.0 per cent when the bundles were placed in the kiln on 7 February, and twenty-on days later moisture content was reduced to 16.0 per cent. The swamp sheoak dried from 23.0 per cent to 13.8 per cent in that time. The drying rates are similar to those for jarrah.

Density shrinkage :

The mean green, basic and air-dry densities for the two species are given in Table 2.

Table 2
Mean green, basic and air-dry density of rock sheoak and swamp sheoak (kg m^{-3})

Species	GREEN		BASIC		AIR-DRY	
	Mean	S.D.	Mean	S.D.	Mean	S.D
Rock sheoak	1130	65	720	40	895	30
Swamp sheoak	1115	45	650	30	820	30

The green density values are similar to jarrah but less than karri (Shedley and Challis 1984). The air-dry density values are of greatest interest, and swamp sheoak is the same as jarrah at 820 kg m^{-3} while rock sheoak is similar to karri i.e. 895 kg m^{-3} compared to 900 kg m^{-3}.

Shrinkage values are given for all specimens from boards, where the orientation of the growth rings can vary (Table 3). In addition, the data from the selected specimens which had growth rings parallel to the face were extracted to give true tangential and radial shrinkage values.

The data indicated that these two sheoak species have greater shrinkage than W.A. sheoak (*Allocasuarina fraseriana*). The normal ratio of tangential : radial shrinkage is approximately 2:1, and the data show that boards would shrink by approximately the same percentage in width and thickness, which would be the result of grain orientations varying relative to faces and edges..

Working behaviour :

The following ratings were given to the major working properties of rock sheoak and swamp sheoak (Table 4).

Table 3
Shrinkage of rock sheoak and swamp sheoak

Species	TANGENTIAL		RADIAL	
	Mean %	S.D. %	Mean %	S.D. %
All specimens				
Rock sheoak	4.5	1.0	5.3	2.2
Swamp sheoak	6.5	4.0	6.6	2.3
Selected specimens				
Rock sheoak	6.4	1.6	3.3	1.7
Swamp sheoak	9.2	2.1	3.2	1.5

Table 4
Working properties of rock sheoak and swamp sheoak
(Rating 1 = very poor to 5 = excellent)

Species	Sawing	Sanding	Planing
Rock sheoak	4	4	4
Swamp sheoak	4	4	4

Gluing properties :

The results of the dry cleavage tests indicated that the rock sheoak had better quality gluelines than the swamp sheoak with the conditions of pressing described in the Methods. The wood failure percentages for the two species were 76.4 per cent (S.D. 3.4 per cent, n = 28) and 25.2 per cent (S.D. 34.9 per cent, n = 25) respectively. In the latter species, ten gluelines out of the twenty-five assessed had complete glueline failure, and these results would not be acceptable under the requirements of AS 1328-1987 (Standards Association of Australia 1987).

Consequently the swamp sheoak panels have been ripped to enable a further assessment of gluing with different pressing conditions. Although both species are sheoaks, it was noticeable that the surface tension effects with rock sheoak rays resulted in a thicker layer of adhesive on the edge of the boards. Moisture content will be remeasured and the boards reduced to below equilibrium moisture content before reglueing.

Visual appeal :

The colour of the two species was compared to the standard Methuen Book of Colour. The closest colours were 7D5 for rock sheoak and 2A2 for swamp sheoak, selected by two observers.

The rock sheoak is a deep red colour, with very pronounced rays, and has undoubted aesthetic appeal. The swamp sheoak is more straw coloured to creamy-brown and

comparatively nondescript. However, the features provided by the extensive occurrence of knots resulted in a more marketable product.

Wood quality :

As discussed previously, the major problem with the rock sheoak logs was the extensive occurrence of rot. In addition, there was considerable insect damage, and the size and shape of galleries suggested *Tryphocaria* species and cossid moth (*Xyleutes* spp) attack.

Grading to the Industry standard for seasoned, sawn and skip-dressed W.A. hardwoods' (FIF (WA) 1993) resulted in very low recoveries.

The graded recoveries for rock sheoak and swamp sheoak were 2.5 per cent and 2.9 per cent respectively. Many boards had multiple defects, and the occurrences in rock sheoak are listed below in decreasing importance :

Rot	-	92.2%
Wane	-	35.9%
Insect attack	-	34.4%
Splits	-	21.9%
Knots	-	12.5%

The comparative results for swamp sheoak are :

Knots	-	95.0%
Wane	-	52.5%
Splits	-	50.0%
Included bark	-	12.5%
Decay	-	2.5%

While rot was the major defect in rock sheoak and knots in swamp sheoak, both occurring in over 90 per cent of the boards, the high occurrence of wane indicated the problems of milling small logs with poor stem form.

The features and characteristics of the two sheoak species are sufficiently different to those of the commercial eucalypts, particularly jarrah and karri, to justify a separate specification.

General :

The rock sheoak and swamp sheoak have distinct potential for commercial use if grown in the Wheatbelt region. The former species has definite aesthetic advantages and has good working and gluing behaviour. The major advantage for the latter is from the environmental viewpoint - it is one of the few potentially commercial species that can tolerate saline conditions. At the same time, it does have aesthetic appeal and good working properties, but the gluing aspects have to be resolved.

A combined report on the wood properties and potential markets for products from these selected Wheatbelt species will be prepared after several have been assessed.

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Standards Association of Australia (1987). Glued laminated structural timber. AS 1328-1987.

Table 1
Summary of wood density (kg/m^3) of Australian native species
(CALM Wood Utilisation Research Centre 1985 – 1995)

Species	Green Density		Basic Density (WURC)	Air-dry Density	
	(WURC)	(Bootle 1983)		(WURC)	(Bootle 1983)
Acacia acuminata	1260	-	940	1075	1100
A.aneura	1265	1200	975	1175	1100
Allocasuarina decussata	1190	-	635	845	-
A. fraserana	-	-	610	725	720
A. huegeliana	1130		720	940	-
Casuarina obesa	1115	-	650	915	-
Callitris columellaris	-	800	-	780	670
C. glaucophylla	860	-	655	775	-
Eucalyptus astringens	1130	1120	865	1095	980
Corymbia calophylla *(Regrowth)* *(Mature)*					
E. diversicolor *(Regrowth)* *(Mature)*					
E. dundasii					
E. globulus ssp globulus					
E. grandis					
E. loxophleba					
Corymbia maculata					
E. marginata *(Regrowth)* *(Mature)*					
E. microcorys					
E. muellerana					
E.obliqua					
E. patens *(Regrowth)* *(Mature)*					
E. pilularis					
E. regnans					
E. resinifera					
E. saligna					
E. salubris					
E. transcontinentalis					
E. wandoo *(Regrowth)* *(Mature)*					