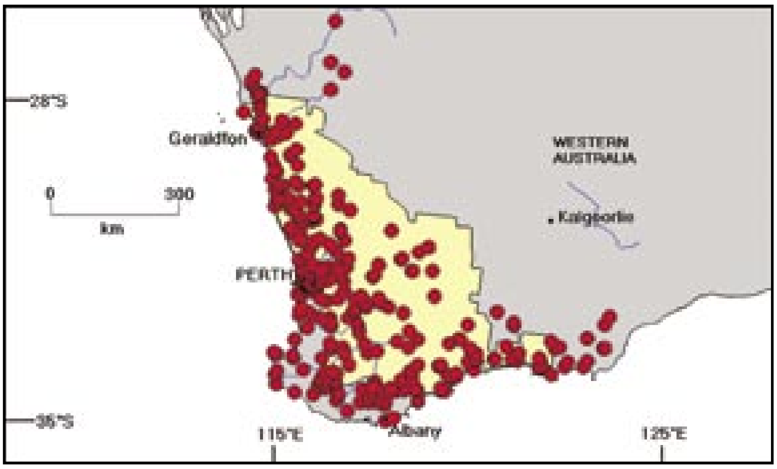
Acacia saligna (Labill.) H. Wendl.

Common Names

Coojong, Golden-wreath Wattle, Orange Wattle, Blue-leafed Wattle, Port Jackson Willow.



Map 67. Distribution of *A. saligna*.

Habit

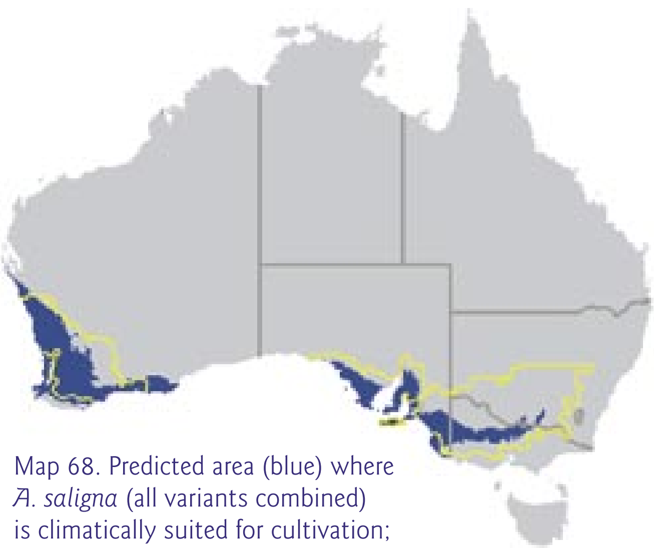
Variable shrubs or trees 2–10 m tall, either single- or multi-stemmed, mature trunks 5–40 cm dbh and straight to rather crooked, often suckering and sometimes forming thickets, in sand the main root may grow to 16 m deep (Knight *et al.* 2002) but sub-surface lateral roots are also developed (Messines 1952). See below under **Taxonomy** for further habit details.

Botanical descriptions and illustrations/photographs of *A. saligna* are provided in Maslin (1974), Costermans (1981), Simmons (1988), Tame (1992), Whibley & Symon (1992), Doran & Turnbull (1997), Maslin (2001 & 2001a) and Kodela (2002). The characteristics and uses of the species are described more fully in Hall & Turnbull (1976a), Michaelides (1979), Crompton (1992), Fox (1995) and Doran & Turnbull (1997).

Taxonomy

Acacia saligna is referable to *Acacia* section *Phyllodineae,* a diverse, and probably artificial, group of about 408 species (Maslin 2001) which are characterized by having '1-nerved' phyllodes and flowers arranged in globular heads (see Maslin & Stirton 1998 and Maslin 2001 for discussion).

As currently defined *A. saligna* is a very variable species, not only in morphological characters such as phyllodes, bark and growth form, but also in ecological and biological attributes. Understanding the complex patterns of variation and reflecting these in a taxonomic classification is considered crucial for the effective management and development of this widely-utilized species. To this end a study of the native Western Australian populations of *A. saligna* was recently commenced by the first author and others. While preliminary results indicate that most of the variation can be accommodated within four main 'variants' these have not yet been adequately characterized or their taxonomic status resolved. Indicative distributions of the four variants are shown in Map 69 and synoptic details concerning them are as follows.



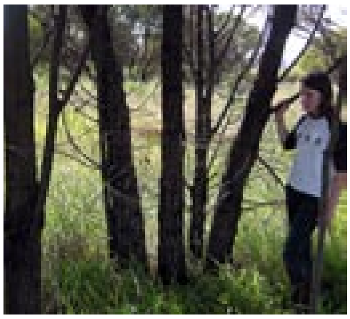
Map 68. Predicted area (blue) where *A. saligna* (all variants combined) is climatically suited for cultivation; this area is derived from a bioclimatic analysis of the natural distribution (red circles, Map 67), see also Table 5. Target area shown in yellow.

The 'typical' variant is widespread in inland regions (predominantly the wheatbelt) where it extends from east of Esperance to the Murchison River (extending inland to north of Yalgoo). It grows mainly along seasonally dry water courses and around the base of granite rocks but also occurs on coastal sand dunes around Esperance (which is where

Figure 33. *Acacia saligna* '*cyanophylla*' variant

A – Large plant near Muchea, W.A. (Photo: B.R. Maslin)

B – Branched stem base.
(Photo: B.R. Maslin)



C – Un-branched stems.
(Photo: B.R. Maslin)

D – 22 month old plants in trial at Coorow. (Photo: J. Carslake)

E – Coppice regrowth following cutting of main stem. (Photo: B.R. Maslin)

F– Phyllode base with characteristic, disk-like gland (arrowed) close to pulvinus.
(Photo: comm. M. Brooker)

G (above) – Branch with large, golden heads in racemes. (Photo: B.R. Maslin)
H (right) – Stem section showing pale-coloured, low density wood.
(Photo: W. O'Sullivan)

the original specimens of the species were collected in 1792). In places this variant extends to saline drainage systems such as the human-induced salt-affected, upper catchment of the Avon River (e.g. east of Brookton). The 'typical' variant is commonly a shrub 2–4 (–5) m tall with stout, straight to sub-straight main stems about 5–10 cm dbh, however, around granite rocks it may reach 10 m tall with stems to 20 cm dbh. The bark is smooth (longitudinally fissured towards base of main stems on oldest plants) and the phyllodes green. This variant suckers vigorously.

The 'cyanophylla' variant appears to have a restricted natural distribution in the vicinity of Perth where it occurs on the Swan Coastal Plain from near Yanchep to Mandurah, a distance of around 150 km. It is this variant to which the name *A. cyanophylla* was originally applied and it is the one that is probably most commonly planted around the world. The 'cyanophylla' variant is typically found on deep sandy soil, often near swamps. Because it has been so commonly used as an ornamental, in roadside and on-farm plantings, and in various revegetation programs, it is somewhat difficult to be certain of its true natural distribution (especially on the Swan Coastal Plain south of Mandurah). The 'cyanophylla' variant grows to a shrub or tree 3–10 m tall, it is either single-stemmed or has a short main stem which branches near the base, the stems are robust, straight to sub-straight and reach about 20–40 cm dbh. The crown is dense and bushy (phyllodes commonly sub-glaucous) and the bark is smooth (but longitudinally fissured towards the base of main stems on oldest plants). This variant does sucker but seemingly not as aggressively so as the other three variants; it coppices well.

The 'forest' variant is geographically located between the above two. It grows in the Jarrah–Marri forest from near Mount Barker to Augusta and north to New Norcia but extends to the Swan Coastal Plain south of Mandurah. It occurs on a variety of soils (sand to clay, but not laterite) and is most commonly found along water courses , but does extend to the coastal dunes in places. This variant grows as a shrub or tree 3–8 (–10) m tall (spindly forms occur in places), it is single-stemmed or has a few main stems from the base, the stems are commonly sub-straight to rather crooked (sometimes straight) and reach 10–20 cm dbh. This variant seems to be most readily identified by its bark which is friable (crumbly) and breaks with a rectangular fracture. It appears to sucker very aggressively.

The 'Tweed River' variant is seemingly uncommon with a scattered distribution in the Bridgetown–Manjimup–Kojonup area. It grows to a tree 3–10 m tall with either a single-stem or with a few main stems from the base, the stems have an erect aspect, are straight to rather crooked and reach 35 cm dbh on the oldest plants. The bark is similar to that found on the 'forest' variant. This variant is most readily identified by the white pruinose stems and distinctly glaucous phyllodes that are found on juvenile plants. It suckers aggressively.

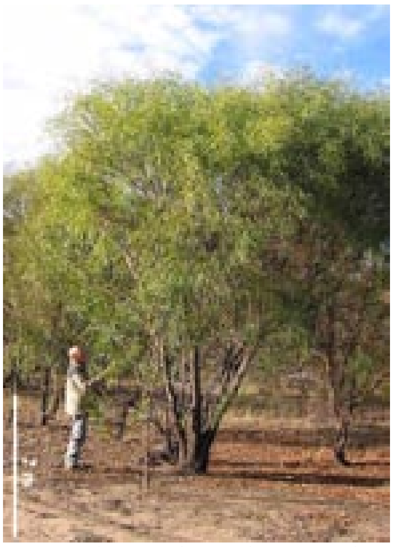
Given the current inadequate knowledge of these variants it is not possible to confidently ascribe the large body of previously published information concerning *A. saligna* to one or other of them. Therefore, the information presented below refers to *A. saligna* in the broad sense.

At present it is not possible to ascertain with certainty any close relatives for *A. saligna*. There are, however, some indications that the species may not be too far removed taxonomically from certain members of the *A. bivenosa* group (see Chapman & Maslin 1992 for review of this group) or to *A. blakelyi* and *A. scirpifolia*. It may superficially resemble, and is sometimes confused with, *A. pycnantha* (see profile above) but these two species are not particularly closely related (Maslin 2001).

Distribution and habitat

Acacia saligna is widespread and often locally abundant in southwest Western Australia where it extends from near Kalbarri southeast to near Mount Ragged; there are outlying populations about 200 km east-northeast of Kalbarri on Meka, Murgoo and Jingemarra Stations. Much of this distribution falls within the target area. See above under **Taxonomy** for discussion of the distribution of the four variants currently recognized within this species (indicative distributions of these variants are shown in Map 67). *Acacia saligna* is naturalized (and often weedy) in parts of eastern Australia and also in some countries abroad (see below under **Weed potential**). This species has been introduced to Chile, Libya,

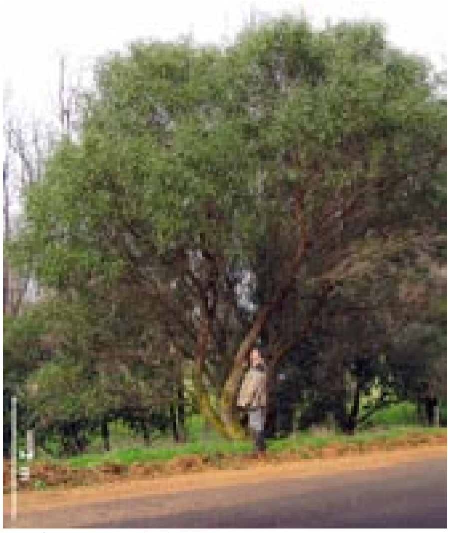
Figure 34. *Acacia saligna* variants

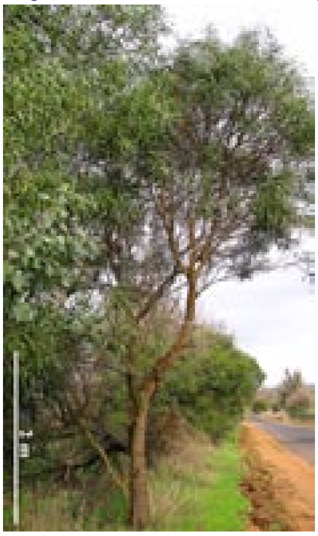

A – 'typical', Muntadgin Rock, W.A., multi-stemmed.


B – 'typical', Muntadgin Rock, W.A., single-stemmed.


C – 'typical', dry site near Mingenew, W.A., more shrubby than A & B.


D – 'typical' showing vigorous root suckering

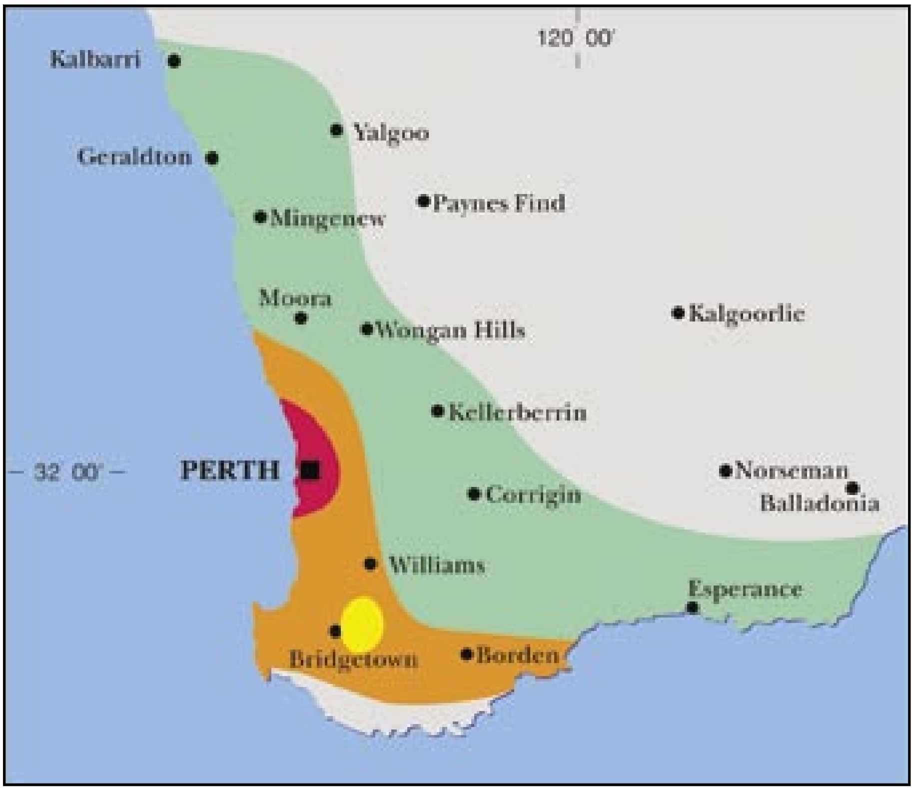

E – 'forest', crooked stems.


F – 'forest', crooked stems.


G – 'forest' variant, vigorous root suckering


H – 'forest', vigorous root suckering


I – 'Tweed River', mature tree (right) & adolescent plant (left).
(All photos: B.R. Maslin)



Map 69. Indicative distribution of *A. saligna* variants: 'typical' – green *'cyanophylla'* – red 'forest' – orange 'Tweed River' – yellow

Tunisia, Iran, Morocco, Algeria, Egypt and elsewhere (see CAB International 2000 for details). Maslin (2001) provides maps of both the native and naturalized distributions of A. *saligna* within Australia.

As noted by Doran & Turnbull (1997) A. *saligna* occurs on many soil types, especially poor and calcareous sands, but also on moderately heavy clays and a range of podzolics; in its natural habitat the species is normally found near water courses and other wet areas. Simmons (1987) reported that it is tolerant of alkaline and saline soils. Marcar *et al.* (1995) advise to expect reduced growth at EC_{se} about 5 dS/m when growing A. *saligna* on saline soils. House *et al.* (1998) report 80–100% survival at age 4.5 yrs at soil salinity up to 20 dS/m EC_{se}.

Details of the ecology of A. *saligna* is provided in Hall & Turnbull (1976a), Fox (1995), Doran & Turnbull (1997) and CAB International (2000).

Flowering and fruiting

In southern Australia A. *saligna* flowers mostly from late July to October; plants can flower precociously, within 2–3 years of planting (Maslin *et al.* 1998). Mature seeds are present between November and January. In southern Australia A. *saligna* sets moderately heavy seed crops in most years; in cultivation it sets profuse seed crops from about 6 years of age (Goor & Barney 1968). The mature pods can be rapidly harvested manually by shaking/threshing, and the seeds readily detach from the mature pods. For further details on seed production see Maslin *et al.* (1998) and Fox (1995).

Toxicity

The seeds of A. *saligna* contain protease inhibitors (Kortt 1985), but such compounds are common to many grain legumes and can be deactivated by heat treatment or cooking.

Biological features

Acacia saligna is a hardy, fast-growing species that tolerates drought, waterlogging, light frost, alkalinity and salt (Simmons 1987). It is a relatively short-lived species with a life span of about 10–20 years.

This species is usually reported as suckering very readily. Preliminary field observations in Western Australia confirm that suckering occurs in all four variants; it is particularly vigorous in the 'typical', 'forest' and 'Tweed River' variants but appears to be less vigorous in the 'cyanophylla' variant (plants of this latter variant are often seen in plantations without suckering). It is not known if factors other than root disturbance promote suckering (perhaps some plants are genetically more disposed to suckering than others; it is not known if non-suckering provenances/plants exist). It is probable that all four variants coppice, however, coppicing may possibly be more vigorous in the 'cyanophylla' variant.

Plants of *A. saligna* nodulate with certain strains of *Rhizobium* (Roughley 1987). In common with many other acacias, they form associations with VA mycorrhizal fungi (Reddell & Warren 1987). Their efficiency in fixing atmospheric nitrogen as well as mycorrhizal associations is under investigation in Tunisia (Nasr 1986 cited in El-Lakany 1987). Nakos (1977) found that the ability of *A. saligna* to fix nitrogen was greatly reduced by drought, water-logging, shading or defoliation.

See Fox (1995) for further details on the biology and growth characteristics of *A. saligna*.

Genetics

Acacia provincialis was described from cultivated material and was said by its original authors to represent a hybrid between *A. retinodes* and *A. cyanophylla* (= *A. saligna*); having inspected these original specimens they appear to be *A. retinodes* 'swamp' variant (see species profile above) ; it very unlikely that hybrids between *A. retinodes* and *A. saligna* would occur.

Cultivation

The following information on the silviculture of *A. saligna* is taken largely from Doran & Turnbull (1997). Fox (1995) provides some additional information.

Establishment

Acacia saligna can be propagated from seed or cuttings (Elliot & Jones 1982). Direct seeding (750 g pre-treated seed/ha) has been used to establish plantations on better quality, well-cultivated soils in Cyprus (Michaelides 1979). In southwest Western Australia forage plantations of *A. saligna* also have been established by mechanised direct seeding and more recently from bare rooted cuttings. This species has been successfully micropropagated in tissue culture (Jones *et al.* 1990).

The seed requires a boiling or hot water treatment to break dormancy (see Fox 1995 for details of seed viability and germination techniques). There are 45 700 viable seeds/kg with an average germination rate of 74%. Seeds should be planted to a depth of 0.5 cm and the optimum temperature for germination is in the range of 15–20°C (Doran & Turnbull 1997). Raising seedlings in the nursery and field establishment presents few problems; a nursery phase of 10–12 weeks is recommended by Doran & Turnbull (1997). Although it may be grown under light-moderate shade, plants prefer full sun and seed production will be maximised under such conditions. Young plants require protection from grazing animals.

Management

The plants respond well to light pruning and may coppice strongly, but are rather short-lived, typically 10–20 years. At least some forms of the species regrow vigorously when pollarded at about 50 cm above ground level. It may be possible to rejuvenate declining stands by coppicing and/or shallow ploughing to induce root-suckering; Michaelides (1979) has recommended a short rotation of 5–10 years duration, with regeneration by coppicing. According to Hass (1993) irrigation can double height growth over the first 17 months from planting. *Acacia saligna* plants may be damaged by a wide range of insect pests and diseases (see below). Broad-scale cultivation of *A. saligna* in southern Australia may be expected to result in a build-up of one or more of these diseases. Such anticipated problems may be minimised by establishing mixed and/or dispersed small-scale plantings, and by maintaining plants in a healthy condition, e.g. by planting at wide spacing on more difficult sites.

Trials

Assessment trials of this species were recently established in plots on farmland at various locations in south-western Australia by the "Search" project (see Acknowledgements). At age 10 months plants of the best performing provenance of *A. saligna* showed an average survival of 66% and an average height of 106 cm. The 'best' plot was located on a downslope site with light soil on the Esperance Plains IBRA region, with plants averaging 178 cm high. In other trial plots, 22 month old plants of this species showed an average survival of 61% and an average height of 156 cm; the 'best' plot was located on an upslope site with light soil in the northern Avon Wheatbelt IBRA region, with plants averaging 311 cm high.

In trials in a subtropical area in southeast Queensland, *A. saligna* attained an average height of 6.2 m after only 41 months but slowed down substantially in the following year, averaging 6.7 m at 4.5 years (Ryan & Bell 1989, 1991). Further details of growth performance of this species in pot and field trials is summarized in Fox (1995).

Yield

As summarised by Doran & Turnbull (1997) *A. saligna* grows quickly in favourable conditions, often reaching 8 m tall with a spread as great as its height in 4–5 years. Annual wood yields vary from 1.5–10 m^3/ha (National Academy of Sciences 1980). In the arid zone of Tunisia and Libya, *A. saligna* produces fuelwood at a rate of up to 3500 kg dry-wood/ha/year in deep sandy loam alluvia receiving an average of 150 mm annual precipitation and some runoff (El-Lakany 1987). Annual harvesting for biomass production was found to be optimal in drip-irrigated trials near Cairo where production of foliage was 12–13 t/ha in the first year and increased with age (El-Lakany 1988). The wide variability between trees suggested that useful gains might be obtained through breeding.

Pests and diseases

As summarised by Doran & Turnbull (1997) older plants of *A. saligna* are susceptible to gall rust, *Uromycladium tepperianum,* and various gall-exploiting insects. In parts of Western Australia more than 90% of plants bear conspicuous woody galls (Berg 1978, Gathe 1971). The natural insect enemies of *A. saligna* in Western Australia have been studied by Berg (1980, 1980a and 1980b) in order to establish the importance of natural enemies with a view to biological control of these wattles in South Africa. Larvae of 36 species of *Lepidoptera* (moths and butterflies) were found on *A. saligna*. Those damaging the phyllodes were the most common. Adults or larvae of 55 species of *Coleoptera* (beetles and weevils) and adults and/or nymphs of 40 species of *Hemiptera* (cicadas, plant hoppers, plant lice, scale insects, and bugs) were also recorded. Those feeding on sap and twigs were most abundant. Plants of *A. saligna* have extrafloral nectaries at the bases of the phyllodes. These attract ants which are believed to reduce the numbers of leaf-eating insects (Majer 1978). Rodents sometimes attack the roots. Termites may cause serious problems in tropical countries (Michaelides 1979). The species has been shown to be susceptible to locust attack in trials in Western Australia (J. Carslake, pers. comm.).

Weed potential

Acacia saligna has become naturalized in temperate parts of southern and eastern Australia, from South Australia, Victoria, Tasmania, New South Wales and southeast Queensland. Virtue & Melland (2002) regard this species as posing a significant weed risk in parts of the agricultural region of South Australia. It is considered to be an invasive weed in Chile (Stephen Midgley pers. comm.), Spain and Portugal (De la Lama 1977, cited in Fox 1995), Cyprus (Pambos Christodoulou, pers. comm.) and, as discussed by Henderson (2001), in South Africa where it is a Declared Invader (category 2) species. Until recently *A. saligna* was regarded as the most important invasive weed in the Cape Fynbos floristic region of South Africa. However, the gall rust *Uromycladium tepperianum* has been used there with high success as a biological control agent (Selincourt 1992, Morris 1999). Unfounded concerns regarding possible negative social and environmental impacts of removing large stands of *A. saligna* in South Africa are discussed by Morris (1999). Interestingly, *A. saligna* is not considered a significant weed in north Africa, despite the fact that it has been grown there for about 100 years (for soil stabilization and fodder) and where there currently exists over 200 000 ha in cultivation (Le Houerou 2002).

Wood

The wood is described by Fahn (1959) as diffuse-porous with growth rings absent. Basic density values ranges from 469 kg/m^3 to 735 kg/m^3 (mean 596 kg/m^3) based on analyses of 38 wood samples by CALM's NHT-supported 'Search' project (unpublished data). Note: This study preferentially sampled young and adolescent plants. Anatomical details of wood structure are summarised by Fox (1995).

Utilisation

Acacia saligna is a versatile hardy plant that has been widely cultivated, not only in Australia but also abroad, for a variety of purposes (Crompton 1992).

The following information on the utilisation is largely taken from the summaries provided in Doran & Turnbull (1997) and CAB International (2000). Fox (1995) provides some additional information.

Wood

Acacia saligna can be used for fuelwood or charcoal; this species was amongst a group of acacias assessed as being reasonably satisfactory for these purposes by Hall (1939). The group gave a charcoal yield of 24% and had medium specific gravity and low tar yield (13.5–17%). According to Sale (1948) a firewood harvest can be taken from dune plantings of *A. saligna* at 10–15 years. It is likely, however, that many other species of *Acacia* would produce a better-quality fuelwood than this one. *Acacia saligna* wood has been successfully converted into particle board in Tunisia (El-Lakany 1987) and in the Mediterranean region it is used for vine stakes and for small agricultural implements (Michaelides 1979).

Fodder

Acacia saligna appears to have fairly good potential as a fodder plant if lines of higher potential feeding value are selected. The phyllodes, young shoots, pods and seeds, whether fresh or dry, are protein-rich and non-toxic and palatable to both sheep and goats (Anon. 1955, Michaelides 1979, Dumancic & Le Houerou 1981). El-Lakany (1987) summarised the results of fodder studies by Le Houerou and others, and reported that the composition of *A. saligna* was within the following ranges: dry matter (50–55%), crude protein (12–16%), crude fibre (20–24%), crude fat (6–9%), and ash (10–12%). Although the phyllodes are reported to have a high protein content, the presence of secondary compounds, including condensed tannins, may limit feeding value. They apparently have low or moderately low digestibility, at least in some situations (this matter requires further investigation, see Howard *et al.* 2002). For example, trial plantings of *A. saligna* in southeast Queensland showed its phyllodes to have high levels of crude protein (18.3%) but a very low predicted in vivo digestibility (36.5%) (Vercoe 1989). Over 200 000 ha of *A. saligna* has been planted in north Africa and a few thousand in West Asia and southeast Spain where the species is highly valued as food for sheep and goats (El-Lakany 1987, Crompton 1992, Le Houerou 2002: this last reference is particularly informative and is well illustrated with colour photographs). However, there are indications that the response of animals to grazing *A. saligna* is variable, depending upon breed. For example, based on work in South Africa, it appears that some breeds of sheep have a greater ability to digest *A. saligna* than others, possibly due to differences in gut flora (Lefroy, pers. comm.). Also, under trial conditions in Cyprus goats lost weight when fed on *A. saligna* only (Fox 1995). According to Lefroy *et al.* (1992) the advantage (in Western Australia) of using *A. saligna* is that it is easily established at relatively low cost, but a disadvantage is that the plants have to be cut regularly to make the foliage available to the animals; this study suggests that *A. saligna* is most effective as a fodder when used in combination with other plants such as Tagasaste (*Chamaecytisus palmensis*) and/or perennial grasses. Crushed seeds have been fed to a concentration of 95% of total ration to sheep without ill effects (but results with poultry were not encouraging) (Anon. 1955).

Recent studies by Howard *et al.* (2002) have examined the value of *A. saligna* as a fodder plant in Western Australia (see also Dynes & Schlinck 2002). The feeding value of Acacia is a function both of the amount of the material an animal will eat (voluntary feed intake) and the efficiency with which the animal can utilise nutrients. Being a leguminous plant, *A. saligna* will usually contain sufficient crude protein for grazing ruminants (minimum 6% CP). However the presence of secondary compounds, including tannins may limit voluntary feed intake through both preingestive (taste) and post ingestive (toxic) effects. Tannins suppress food intake by reducing macronutrient digestibility and cause illness. Tannins are potentially beneficial at low levels (<6%) but voluntary feed intake declines rapidly as tannin concentrations increase above that level.

The variability in predicted digestibility of *A. saligna* requires further research. Forage digestibilities of about 50% or higher are usually required for maintenance of liveweight in ruminants. Howard *et al.* (2002) found digestibility of 30–40% in their first experiment while in a second line of *A. saligna* digestibilities exceeded 50%. Digestibility differences probably accounted for most of the differences in animal performance. To have potential as a fodder, lines must be selected with phyllode digestibility exceeding 50%. Lower digestibility material may have a role in survival feeding, however, as Howard *et al.* (2002) reported, at very low digestibilities sheep will consume very small amounts of *A. saligna*, with little benefit.

Land use and environmental

Because *A. saligna* is highly variable in its growth form and displays a wide range of ecological tolerance it has excellent potential for use in salinity and soil erosion control, as a windbreak, visual screen and for shade and shelter for both stock and wildlife. In Australia it has been widely used for coastal sand dune stabilisation, and for minesite rehabilitation, for example, on Stradbroke Island and Saraji (north-east of Clermont) in Queensland and at Worsley and Collie in Western Australia (Barr & Atkinson 1970, Langkamp & Plaisted 1987). In southwest Western Australia it is a successful farm tree for reduction of water tables and mitigation of salinity, provision of shade and shelter and reduction in farm nutrient run-off. It is suited to heavy somewhat saline and waterlogged clay soils where it gives fast growth, excellent survival and large crown growth (Bennett & George 1993). *Acacia saligna* has been successfully established by direct sowing in regions with annual rainfall as low as 350–500 mm (Scheltema 1992). Wilcox *et al.* (1996) recommend its use for a variety of soil types in the Midlands and northern wheatbelt regions of the Western Australian wheatbelt, Clarke (1998) regards it as being suited to revegetating drainage lines in these areas and Lefroy *et al.* (1991) recommend its use for 'Grevillea' country (i.e. upland sandplain areas characterized by deep yellow, neutral to acidic sand over deep yellow sandy clay) in the central wheatbelt region. The tree is used extensively for coastal and inland sand dune fixation in North Africa, the Middle East and South Africa and for gully erosion control in Uruguay (see Fox 1995 for further details).

Human food

Acacia saligna is one of the promising species suggested by Maslin *et al.* (1998) for trialling in southern Australia as a source of seed for human food. The seeds had reportedly been consumed by Aborigines (Cherikoff & Isaacs 1989); they were probably ground into flour and eaten with pounded root bark from various eucalypts (P. Bindon, pers. comm.). As already noted, *A. saligna* seed contains protease inhibitors but these are deactivated by heat treatment or cooking.

Physiological stress or mechanical damage to the bark may induce copious gum flows: the acid-stable gum may have use in certain foodstuffs (Michaelides 1979). An analysis of the gum has been provided by Charlson *et al.* (1955) and Kaplan & Stephen (1967, cited in Anderson & Bell 1976).

Tannin

Acacia saligna was at one time the principal source of tan bark in southwest Western Australia, with a yield of nearly 30% tannins (Maiden 1889). It was also previously a major source of tannin in South Africa before being replaced by superior tanbarks (of *A. mearnsii*) (Boucher & Stirton 1980).

Other uses

This species has been widely cultivated (both within Australia and abroad) as an ornamental. Its phyllodes can be used to dye wool to a lemon yellow colour using an alum mordant (Martin 1974).

Potential for crop development

Acacia saligna is one of the most promising of all the species included in this report. It is ranked as a category 1 species and would seem suited to both a phase and coppice crop (Table 6). It is a fast growing, hardy, adaptable species that is drought tolerant, grows on a wide range of soils, generally develops a good growth form, produces good quantity of woody biomass and coppices well. However, as noted below there is variation for most of these attributes and not all are equally expressed in each of the four variants that are provisionally recognized for this species. Therefore, the selection of the appropriate provenance for utilisation will be an important factor in the development of *A. saligna* as a crop plant.

Acacia saligna has had a long history of multipurpose utilisation, both within Australia and abroad. It is widespread and common throughout its range in southwest Western Australia and is currently used in that region for revegetation and in a few agroforestry trial plantings. This species is therefore already quite well 'known' to people, some of whom are very enthusiastic about its potential for lowering water tables and its potential as a fodder plant. However, it is probably true to say that some of this enthusiasm is based on anecdotal or as yet unsubstantiated evidence.

Ahead of any extensive utilisation of *A. saligna* it is essential to develop a better understanding of its patterns of variation. This applies not only to well-known variable characters such as phyllode shape and size, but also to economically important biological attributes such as growth form, biomass production, suckering, coppicing propensity and fodder value which have a direct bearing on its utilisation potential. As discussed above preliminary taxonomic research indicates that four main variants can be recognized within the species, namely, the 'typical', 'cyanophylla', 'forest' and 'Tweed River' variants. Each of these variants has its own set of morphological, ecological and biological attributes, and a better understanding of these will provide a sounder basis for the effective management and utilisation of *A. saligna* worldwide. Taxonomic resolution of *A. saligna* and documentation of the variants will permit a more judicious selection of provenances for trialling as potential crop plants for large volume wood production.

All the variants of *A. saligna* are capable of producing a good growth form but they all have the capacity to develop an untidy, spreading shrubby habit. Furthermore, the 'forest' variant very often has crooked stems and branches and, along with the 'typical' variant in particular, may become very spindly under certain conditions. A similar range of variation is found among the variants for wood biomass production. The wood of *A. saligna* is pale coloured and its low basic density places it within the range of being suitable for reconstituted wood products. As noted above basic density values range from 469 kg/m^3 to 735 kg/m^3 so there is clearly variation for this character.

It is reported that *A. saligna* can flower within 2–3 years of planting and it is independently reported that plants set profuse seed crops from about age 6 years (see under **Flowering and fruiting** above). The age at which plants first set large seed crops has implications for their management as a phase crop because fruiting precocity may result in the creation of a soil seed bank which could lead to the species becoming a weed in adjacent and subsequent crops. One strategy for avoiding this weed problem is to harvest plants before they set seed, however, for this to be a viable strategy the plants will need to have produced sufficient wood biomass by that stage. A possible alternative is simply to treat the regenerating seedlings as a form of green manure. The propensity for *A. saligna* to root-sucker in nature may or may not be advantageous in cultivation, it depends whether or not this attribute is required (or expressed) for the system in which it is placed. Preliminary observations suggest that the 'cyanophylla' variant has the lowest suckering propensity of the four variants of *A. saligna*; indeed, in plantings of this variant sucker growth is rarely (if ever) seen. However, suckering propensity in this species requires further careful study.

Acacia saligna is reported to have a strong coppicing ability and we have observed this ourselves in a number of plantings. While all four variants probably have the potential to coppice most previous records are likely to have been derived from plants of the 'cyanophylla' variant. Unfortunately there is no reliable trial information available on coppicing in *A. saligna.* Therefore it is not known if resprouting occurs with sufficient frequency or vigor to sustain the species as a viable coppice crop, or indeed, which of the variants is most suited to such a regime. Research into this important attribute is recommended.

Additional benefit that might be derived from *A. saligna*, apart from its wood biomass production and use in landscape amelioration, may be its fodder potential and its provision of seed for human food. Apart from advantages that might accrue in Australia from using *A. saligna* the possibility of economic returns from exporting knowledge (and verified/improved seed) to overseas users should not be overlooked.

An issue associated with any development of *A. saligna* as a crop is its potential weediness. Under normal circumstances the species produces large quantities of seed and some plants at least display strong root suckering. *Acacia saligna* is reported to be an environmental weed in places outside its natural range in Australia (eg. South Australia, see Virtue & Melland 2002) and in a number of countries abroad (especially South Africa, see Henderson 2001). Therefore caution must be exercised in any wide-scale use of *A. saligna*, and such use must be accompanied by a thorough weed risk assessment. The potential weed risk associated with this species may constrain its use to its native geographic range (see also discussion on other possible weed reduction strategies under **Weed potential of *Acacia* in target area** in the introduction to the report).

The area predicted to be climatically suitable for the cultivation of *A. saligna,* based on its natural climatic parameters, is shown in Map 68. This analysis indicates that *A. saligna* has the potential to be grown throughout the winter rainfall zones in both the eastern and western target areas. However, because the analysis was based on rainfall seasonality in the species natural habitat, uniform and summer rainfall parameters were not included. Were these included then the area predicted as being climatically suitable for growth would be considerably larger, particularly in the eastern target area. Under cultivation in uniform and summer rainfall zones during the past 50 years, *A. saligna* has demonstrated vigorous growth performance. Considerable ecological plasticity and provenance variation is apparent in this species suggesting that it has the potential for cultivation on most soil types and a range of landforms throughout the entire target area.

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More information on *AcaciaSearch* can be found at http://www.worldwidewattle.com/infogallery/utilisation/acaciasearch.php.