Acacia mangium

Willd.

Fabaceae - Mimosoideae

brown salwood

LOCAL NAMES
English (sabah salwood,mangium,hickory wattle,brown salwood,black wattle); Filipino (maber); Indonesian (tongke hutan,nak,mangge hutan); Malay (mangium); Polynesia (arr); Spanish (zamorano); Thai (krathin-thepha,kra thin tepa); Trade name (brown salwood)

BOTANIC DESCRIPTION
Acacia mangium is a single-stemmed evergreen tree or shrub that grows to 25-35 m in height. Young trees have smooth, greenish bark; fissures begin to develop at 2-3 years. Bark in older trees is rough, hard, fissured near the base, greyish-brown to dark brown, inner bark pale brown. Bole in older trees branchless for up to 15 m, fluted, up to 90 cm in diameter; branchlets acutely triangular.

Phyllodes are large up to 25 cm long and 3.5-10 cm broad, 2-5 times as long as wide, straight or straight along 1 side and curved along the other, with 4 (max. 5) main longitudinal veins, secondary veins finely anastomosing; glaborous, pulvinus 6-10 cm long. A gland (extra floral nectary) is conspicuous at the base of the phyllode.

Inflorescence is composed of many tiny white or cream flowers in spikes. Flowers are quinqeufloral; the calyx is 0.6-0.8 mm long, with obtuse lobes; corolla 1.2-1.5 mm long. Peduncles are canescent and pubescent, about 1 cm long; rachis is also canescent and pubescent.

Pods are broad, linear and irregularly coiled when ripe. They are membranous or slightly woody, inconspicuously veined. 3-5 mm wide and 7-10 cm long. Ripening pods change from green to brown, stiff and dry. Seeds are black and shiny with shape ranging from longitudinal, elliptical, ovate to oblong, 3-5 mm by 2-3 mm. The seeds are arranged longitudinally and attached to the pods by an orange to red folded funicle.

The generic name acacia comes from the Greek word ‘akis’, meaning a point or a barb.
This acacia was originally described as Mangium montanum Rumph. in Herbarium Amboinense (1750) but changed to an Acacia in 1806. The specific name is an allusion that this tree resembled 'mangge' (mangroves in Indonesia).

BIOLOGY
A. mangium flowers precociously, and viable seed can be harvested 24 months after planting. From the onset of flower buds to pod maturity is about 6-7 months. The tree is a hermaphrodite and generally outcrosses, with a tendency towards selfing. Pollinators are generally insects, Trigona and Apis spp. being the active pollen vectors. A. mangium starts to flower and produce seeds 18-20 months after planting. Mature fruits occur 3-4 months after planting period. In its native range in Australia, flowers are present in May and the seeds mature in October-December. The fruits mature in July in Indonesia and late September in Papua New Guinea.

A. mangium, 2 year old with splitting of stem at fork. (David Boshier)

A. mangium, provenance trial, 9.5 years old, San Carlos, Costa Rica. (David Boshier)

A. mangium, seedlings in nursery showing emergence of phyllodes. (David Boshier)

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ECOLOGY

A. mangium is a species of the humid, tropical lowland zones. It tolerates pH levels between 4.5 and 6.5. It occurs behind mangroves in seasonal swamps, along streams and on well-drained flats, low ridges and mountain foothills. A. mangium occurs in the Aru Islands, Irian Jaya, Seram, the Sula Islands of Indonesia; Western Province of Papua New Guinea; and northeastern Queensland, Australia. It is sometimes found dominant in primary and secondary forest, forest margin, savannah, grassland, savanna woodland, on poorly drained floodplains and along fringes of mangrove forest, where it is sometimes associated with Melaleuca and Rhizophora species. In Papua New Guinea, it often prefers slightly higher and drier sites than other Acacia species growing in the same area. This species has been successfully planted on abandoned areas of shifting cultivation colonized by Imperata cylindrica grass, but does not tolerate waterlogging and soils derived from ultrabasic rocks.

BIOPHYSICAL LIMITS

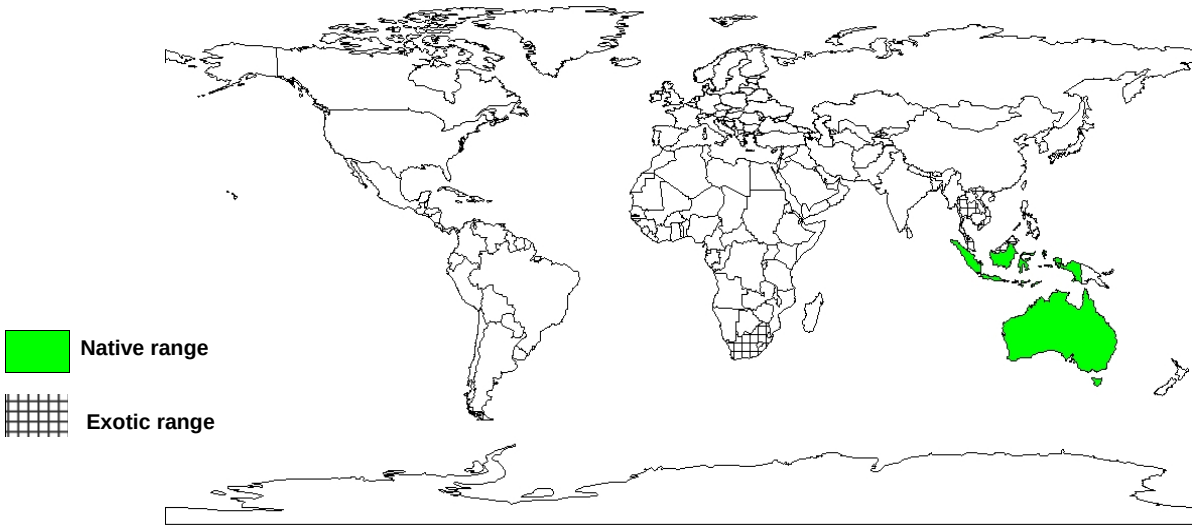
Altitude: 0-800 m, Mean annual temperature: 18-28 deg. C, Mean annual rainfall: 1 500- 3 000 mm

Soil type: Deeply weathered or alluvial soils.

DOCUMENTED SPECIES DISTRIBUTION

Native: Australia, Indonesia, Papua New Guinea

Exotic: Malaysia, South Africa, Thailand, Vietnam



The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to your planting site.

PRODUCTS
Food: The germinating seeds can be cooked and eaten as a vegetable.

Fodder: Young shoots and leaves are browsed by buffalo and cattle. Studies indicate they are high in crude protein content but with low in vitro dry matter digestibility.

Fuel: With a calorific value of 4 800-4 900 kcal/kg, A. mangium provides good quality charcoal and is suitable for the manufacture of charcoal briquettes and artificial carbon.

Fibre: The pulp is readily bleached to high brightness levels and is excellent for papermaking. The neutral sulphite semi-chemical pulping of A. mangium gives yields of 61-75%. It is currently grown primarily for pulp and paper in Sabah, Sumatra and Vietnam. Wood also makes excellent particleboard.

Timber: A. mangium is an important source of wattle timber; the wood is used for construction, boat building, furniture and cabinet making, and veneer. It makes attractive furniture and cabinets, mouldings, and door and window components. Conversion into veneer and plywood is feasible with no specific processing requirements. It is unsuitable for timber because it contains knots and flutes, has a high incidence of rot and is subject to termite attack. Its density is (min. 450) 530-690 kg/cubic m at 15% mc.

Tannin or dyestuff: It has high tannin content (18-39%), justifying commercial exploitation of tannins.

Other products: A. mangium sawdust provides a good quality substrate for the lucrative production of shiitake mushrooms.

SERVICES
Erosion control: A. mangium is employed in soil conservation.

Shade or shelter: With its dense foliage, retained throughout the year, A. mangium makes a useful shade tree, screening and soil cover crop. It has been used experimentally in Sabah to shade cocoa. It can also be planted as a wind or firebreak.

Nitrogen fixation: A. mangium trees form a symbiosis with soil bacteria of the genus Rhizobium, leading to root nodules, in which the bacteria transform free nitrogen into organic and inorganic compounds containing nitrogen.

Ornamental: In Malaysia, A. mangium is a widely planted roadside tree, and in Thailand, it is recommended for wider use in urban forestry.

Intercropping: Experiments have shown that it has potential in some intercropping combinations, such as with maize or peanuts.

TREE MANAGEMENT
A. mangium grows fast; it can achieve a mean annual diameter increment of up to 5 cm and a height of up to 5 m in the 1st 4-5 years. It is reported to grow 3 m tall in the 1st year in Sabah and Sumatra, and in the Philippines it reached an average height of 8.3 m and diameter 9.4 cm after a further 2 years. However growth declines rapidly after 7 or 8 years. Except under ideal conditions or over periods of more than 20 years, the tree will probably not exceed 35 cm in diameter and 35 m in height. In Sabah, 14-year-old trees were 30 m tall and 40 cm in diameter. Provenances from Papua New Guinea consistently show better growth in height and diameter and superior form.

Optimal growth of trees is achieved most effectively if vesicular arbuscular mycorrhizal fungi such as Glomus fasciculatus and Gigaspora margarita are present in combination with Rhizobium. Technologies for the commercial production of rhizobial and VAM innoculants are now available in Southeast Asia. The ectomycorhizal fungus Thelephora ramaroides has been identified in association with A. mangium.

Acacia species are pioneers that demand full light for good development; in shade, A. mangium growth is stunted and spindly. Trees are renowned for their robustness and adaptability, which makes them good plantation species. Survival after planting out A. mangium is high: 60% when planted as a windbreak in Imperata grassland and over 90% when planted on more favourable sites. Plantation canopy cover occurs after 9 months to 3 years, depending on soil fertility, weediness and initial spacing. In Sabah in a plantation with an initial spacing of 3 x 3 m, the canopy closed in 1 year. In the 1st year, the plantation should be protected from livestock, as they browse the trees, and it should be weeded, taking particular care to remove climbers, creepers and vines. A. mangium has been found very sensitive to herbicides.

As trees have a tendency to produce multiple leaders from the base, singling is carried out at 4-6 months after planting. Persistem branches are pruned out only in plantations where the objective is to produce quality saw or veneer logs. Usually pruning is done twice; the 2nd time the branches are pruned out farther up the trunk, often to a height of 6 m. Pruning out branches with diameter of 2 cm or more makes the tree susceptible to infections, especially heart rot. Trees are very responsive to extra growing space. The thinning carried out in plantations for pulpwood production is aimed at achieving a final stock of 600-700 stems/ha from the 1 250 trees/ha planted. It is executed after 18 months. These plantations are clear felled after 6-8 years. In plantations producing quality logs, the initial number of trees is generally thinned, reducing them from 900 ha to 100-200/ha in 2 or 3 thinnings. The 1st thinning is done when trees are 9 m tall, that is, before 2 years of age. The rotation is 15-20 years. In Papua New Guinea, plantations grown on a 7-8 year rotation for pulpwood are not thinned. Trees are felled for pulpwood 6-7 years after planting; for sawn timber the rotation is 15-20 years.

The productivity of trees has been found to be closely related to ‘total’ soil potassium levels in Kalimantan (accounting for 50% of the variation in data) and phosphorus levels in Malaysia.

GERMPLASM MANAGEMENT
For the production of seedlings, the pods should be processed as soon as possible after harvesting. Pods and seeds should not be left long to dry in the sun, as temperatures exceeding 43 deg. C reduce viability. Seed storage behaviour is orthodox. There is little loss in viability (6%) after 1-2 years storage at 4-5 deg. C. There are about 66 000-120 000 seed/kg.

PESTS AND DISEASES
A. mangium is affected by heart rot caused by white fungi. The rot is confined to small pockets in the heartwood but occasionally is found throughout the length of bole, especially in older trees. Pink disease, caused by the basidiomycete fungi Corticum salmonicolor, has been known to infect 17% of A. mangium in Malaysia. Leaf spot lesion and occasional dieback have been observed, but there have been no reports of any serious outbreaks. The leaf-feeding bagworm, Pteroloma plagiophleps and grasshopper Valanga nigricornis has been recorded in many Indonesian plantations. The sap-sucking bug Helopeltis spp. Is the prinicipal pest in Sumatra.

Several insect pests attack A. mangium, including carpenter ants, pinhole borers and subterranean termites. The economically important pests of the tree include the termite Coptotermes curvignathus, the beetle Sinoxylon anale, and the larvae of 2 borer species, Sternocera aequisignata and Zeuzera coffea.

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