



# FACT Sheet

FACT 99-05

quick guide to multipurpose trees from around the world September 1999

---

## *Gmelina arborea* : A popular plantation species in the tropics

---

*Gmelina arborea* Roxb. (family Verbenaceae) is a fast growing tree frequently planted in plantations to produce wood for light construction, crafts, decorative veneers, pulp, fuel, and charcoal. The species is also planted in *taungya* systems with short-rotation crops and as a shade tree for coffee and cacao. It is commonly called gmelina and white beech (English), melina (Spanish), gamar in Bangladesh, melina/gambar in India, gemelina in Indonesia, yemane in Philippines and soh in Thailand, and it has many regional names (Brandis 1906, F/FRED 1994).

### Botany

*Gmelina arborea* is a medium-sized deciduous tree up to 40 m tall and 140 cm in diameter, but usually smaller than this (Jensen 1995). The tree form is fair to good, with 6–9 m of branchless, often crooked trunk and a large, low-branched crown. The bark is thin and gray. Leaves are simple, opposite, more or less heart-shaped, 10–25 cm long, and 5–18 cm wide. The yellow or brown flowers are arranged in paniced cymes 15–30 cm long, which appear after leaf-fall. The trumpet-shaped flowers are 4 cm long and are hairy and short-stalked. The fruit is a drupe 2–2.5 cm long and contains 1–4 seeds (Khan and Alam 1996). The number of seeds per kilogram varies from 700–1400 (Evans 1982) to 2500 (Katoch 1992).

### Ecology

*Gmelina arborea* is found in rainforest as well as dry deciduous forest and tolerates a wide range of conditions from sea level to 1200 m elevation and annual rainfall from 750 to 5000 mm. It grows best in climates with mean annual temperature of 21–28°C (Jensen 1995). *Gmelina* grows best on deep, well drained, base-rich soils with pH between 5.0 and 8.0. Growth is poor on thin, highly leached acid soils (F/FRED 1994).

### Distribution

*Gmelina arborea* originated in an area of South and Southeast Asia from Pakistan and Sri Lanka to Myanmar. It has been widely planted in Southeast Asian countries

including Bangladesh, Myanmar, Thailand, southern China, Vietnam, Indonesia and the Philippines (Jensen 1995). It has



been planted less widely in tropical African and Latin American countries (Evans 1982).

### Uses

**Wood.** The wood is yellowish or grayish-white, even-grained, and very useful for planking, paneling, carriages, furniture, and carpentry of all kinds (Khan and Alam 1996). The wood specific gravity is 0.42–0.64 (Davidson 1985). It is easily worked, readily takes paint or varnish, and is very durable under water (Gamble 1922). The wood is used for light construction and pulp as well as for fuelwood and charcoal. Fuelwood provides 4400–4800 Kcal/kg (Davidson 1985). The wood is used in Myanmar for carving images and canoes (Gamble 1922), and is excellent material for match manufacture, packing cases, and all ornamental work. It is also used for making quality toys and picture frames.

---

Prepared by Dr. Mohammed Kamal Hossain, Associate Professor,

Institute of Forestry and Environmental Sciences, Chittagong University, Chittagong, Bangladesh.

A publication of the Forest, Farm, and Community Tree Network (formerly the Nitrogen Fixing Tree Association)

Winrock International, 38 Winrock Drive, Morrilton, Arkansas 72110-9370, USA

Phone: 501-727-5435; Fax: 501-727-5417; E-mail: forestry@winrock.org; www.winrock.org/forestry/factnet.htm

**Other Uses.** The leaves and fruits of gmelina are used as fodder in many parts of India (Mukherjee 1884, Benthall 1933, Laurie 1945). A number of the plant's parts have medicinal value. It also produces good quality honey.

### Silviculture

**Propagation.** The species can be propagated by seeds, cuttings, and stumps (Alam et al. 1985). Under natural conditions germination takes place in the rainy season soon after fruits fall from the tree. The germination rate for fresh seed is 65–80%. Fresh seed can be stored at room temperature for about 6 months. Seed stored at 4°C will remain viable for about three years. The seed should be soaked in cold water for 24 hours before planting. Seeds should be planted in germination beds with a mixture of sand and loam and covered with a thin layer of sand or compost. Seeds germinate in 2–3 weeks and are ready for transplanting to polybags when the first pair of leaves appears. A 10 x 15 cm polybag is widely used in Bangladesh. Root pruning and hardening off of the seedlings are beneficial for maximum field survival. The bare-root seedlings should have a minimum base diameter of 1 cm with a well balanced shoot-root ratio. Seedlings are ready for planting in the field when they reach a height of 30–45 cm, usually in 6 months.

For stump planting, seeds should be sown at the rate of 90 seeds per square meter. Seedlings are usually ready for stump preparation in 7–8 months and should have a root-collar diameter of at least 2.5 cm. The stem and roots of seedlings should be pruned back to 5 cm and 20 cm, respectively. Stump planting is not widely practiced due to high mortality (50% mortality is common).

**Management.** Outplanting starts at the onset of the rainy season and the spacing of the plantations depends on the objectives of the plantation and the end-uses. A spacing of 2 x 2 m is commonly used for plantation programs, and a spacing of 4.5 x 4.5 m is used for agroforestry. Under favorable conditions the growth of the seedlings is rapid, particularly from the second year onward. Because gmelina is shade-intolerant and sensitive to competition, 3–4 weedings are required during the first two years of growth. Rotations for pulpwood and sawnwood are usually 6 and 10 years, respectively. Rotations of 5–10 years are common for fuelwood. Stands on 10-year rotations are thinned to 50% at five years and another 50% at seven years. The second rotation is usually produced by coppicing. Seedlings and stumps are planted for a third rotation.

The growth of the species is remarkably fast and on good sites can reach 20 m height in 5 years. The tree attains more than 30 m in height with about 60 cm dbh at maturity. Form of the tree is fair to good, with 6–9 m of clear bole. Some trees can reach 3 m after a year from planting and 20 m after 4.5 years.

In Nigeria, the yield of gmelina is 84 m<sup>3</sup>/ha at age 12 in poor sandy soils, 210 m<sup>3</sup>/ha at age 12 in clay or lateritic soils, and 252 m<sup>3</sup>/ha at age 10 in favorable alluvial soils—all volumes are underbark to 7.5 cm top diameter (Adegbehin et

al. 1988). In Sabah, Indonesia, gmelina produces an average volume of about 25 m<sup>3</sup>/ha/year on clayey loam soils with adequate moisture (Wong and Jones 1986).

### Tree Improvement

In an evaluation of international trials containing 39 provenances of *Gmelina arborea* averaging 13 years of age, Lauridsen et al. (1995) concluded that in most regions the best results in terms of survival, health, and production can be achieved through selection from local landraces. An exception is Latin American landraces, which generally performed below average. The authors further recommend the inclusion of specific natural provenances from northern and northeast India. Some good provenances were identified in north, central-eastern, and southwest India, and Thailand-Malaysia. Provenances from central-north and central-west India are inferior.

Faster growing provenances have 2–3% lower wood density than average, corresponding to a weight decrease of approximately 12 kg/m<sup>3</sup> (Lauridsen et al. 1995).

### Limitations

*Armillaria mellea*, *Ceratocystis fimbriata*, *Ganoderma colosum*, *Gnomonia* spp., and *Poria rhizomorpha* are some of the fungi that cause serious damage to gmelina. The species is heavily infested by mistletoe, *Scurrula gracilifolia*. The insect *Craspedonta leayana* causes serious defoliation in Bangladesh (Khan and Alam 1996).

### Selected References

- Adegbehin, J.O., J.O. Abayomi, and L. B. Nwaigbo. 1988. *Gmelina arborea* in Nigeria. Commonwealth Forestry Review, 67(2):159–166.
- Alam, M.K., N.A. Siddiqi, and S. Das. 1985. Fodder trees of Bangladesh. Bangladesh Forest Research Institute, Chittagong, Bangladesh. 167 p.
- Davidson, J. 1985. Assistance to the forestry sector of Bangladesh. Species and sites—What to plant and where to plant. Field Doc. No. 5, UNDP/FAO/BGD/79/017. 50 p.
- Evans, J. 1982. Plantation forestry in the tropics. Clarendon press, Oxford, UK. 472 p.
- Forestry/Fuelwood Research and Development Project (F/FRED). 1994. Growing multipurpose trees on small farms, module 9: Species fact sheets (2nd ed.). Bangkok, Thailand: Winrock International. 127 p.
- Jensen, M. 1995. Trees commonly cultivated in Southeast Asia; Illustrated field guide. RAP Publication: 1995/38, FAO, Bangkok, Thailand. p. 93.
- Lauridsen, E.B., E.D. Kjaer, and M. Nissen. 1995. Second evaluation of an international series of *Gmelina* provenance trials. DANIDA Forest Seed Centre. Humlebaek, Denmark. 120 p.
- Troup, R.S. 1921. The silviculture of Indian trees. Clarendon Press, Oxford, UK. Vol. 2, p. 769–776.
- Wong, C.Y., and N. Jones. 1986. Improving tree form through vegetative propagation of *Gmelina arborea*. Commonwealth Forestry Review, 65(4):321–324.



# FACT Sheet

FACT 99-05

quick guide to multipurpose trees from around the world September 1999

---

## ***Gmelina arborea* : A popular plantation species in the tropics**

---

*Full set of references is available from FACT Net*

---

Prepared by Dr. Mohammed Kamal Hossain, Associate Professor,  
Institute of Forestry and Environmental Sciences, Chittagong University, Chittagong, Bangladesh.  
A publication of the Forest, Farm, and Community Tree Network (formerly the Nitrogen Fixing Tree Association)  
Winrock International, 38 Winrock Drive, Morrilton, Arkansas 72110-9370, USA  
Phone: 501-727-5435; Fax: 501-727-5417; E-mail: [forestry@winrock.org](mailto:forestry@winrock.org); [www.winrock.org/forestry/factnet.htm](http://www.winrock.org/forestry/factnet.htm)