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Generationengerechtes Wirtschaften



DOSSIER

Sengon Laut

Lat. *Paraserianthes falcataria* / *Albasia Falcata*

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1. Biological and Technical Characteristics

"*Paraserianthes falcataria* is a fairly large tree, up to 40 m tall; bole branchless for up to 20 m; grows to 100 cm or sometimes more in diameter, with a spreading flat crown. Leaves alternate, bipinnately compound, 23-30 cm long, with rusty pressed hairs and slender angled axis bearing gland above base; leaflets paired, 15-20 pairs on each axis, stalkless, small, oblong, 6-12 mm long, 3-5 mm wide, short-pointed at the tip, topside dull green and hairless, underside paler with fine hair. Inflorescence axillary consisting of paniculate racemes, the spikes sometimes arranged in panicles; flowers bisexual, 12 mm long, regular pentamerous, subtended to bracts; calyx hairy, valvate, gamosepalous, tubular to cup or bell shaped; corolla sericeous all over, gamopetalous, funnel or bell shaped, cream to yellowish. Fruit a chartaceous, flat, straight pod, 10-13 x 2 cm, not segmented, dehiscent along both sutures and winged along ventral suture, puberulous but glabrescent, many seeded (15-20); seed subcircular to oblong, 6 mm long, flat to convex, without aril, dull to dark brown, with a thick sclerified exotesta, not winged; endosperm absent; cotyledons large."¹ The wood specific gravity on average is 0.33 and includes a durable grade IV – V.²



2. Diseases and Pests

"Nursery seedlings are susceptible to damping-off caused by fungi of *Rhizoctonia*, *Sclerotium*, *Fusarium*, *Pythium* and *Phytophthora*. Sterilizing the soil before sowing and applying fungicides to soil and seeds may control the disease. The fungus *Corticium salmonicolor* causes a disease known as pink canker or salmon canker. Light brown lesions appear on the bark of young trees, they gradually enlarge and develop cracks, the colour turns to pale salmon or pinkish, and mycelium mats appear around the lesions. The disease may seriously damage plantations. Plantations can also suffer from other fungal diseases like red root caused by *Ganoderma pseudoferrum*. An anthracnose seedling disease caused by *Colletotrichum* species has been observed in Sumatra. In 1988 and 1989, gall rust disease caused by *Uromycladium tepprianum* provoked severe damage in Bukidnon Province (Mindanao, the Philippines). The government banned the transport of logs in and out of Bukidnon Province, and planting was suspended. Plantation pests in Indonesia, Malaysia and the Philippines include stem borers such as the longicorn beetle *Xystrocera festiva* and the red borer *Zeuzera coffea* (a cossid moth). Leaf-eating caterpillars (e.g. *Eurema blanda*, *E. hecabe* and *Semiothisa emersaria*) may

¹ AgroForestryTree Database: *Paraserianthes falcataria*.

<http://www.worldagroforestrycentre.org/sea/products/afdbases/af/asp/SpeciesInfo.asp?SpID=171>
08/11/2013

² <http://www.nneenergy.com/en/plantation/sengon/> 21/10/2013

attack seedlings and trees. Aphids have on occasion been a problem. Insecticides are commonly used in controlling these pests. The small bagworm *Pteroma plagiophleps* is a serious pest in Sumatra.”³

3. Suitable Environment

Altitude: Sengon grows from sea level up to 800 or 1.200 m, dependent on which research is cited. Given that the potential areas in Kalimantan are between sea level and 100-200m altitude, this is a less important question.

Temperatures: Mean annual temperatures are optimal in the mid twenties, with one source providing the span between 18-27 °C, another 22-29 °C.

Rainfall: A mean annual of 2 000-4 000 mm. averaging 2 800 mm is found in the natural habitats of *Paraserianthes Falactaria*.

Sengon plants can grow well in soil regosol, alluvial, and latosol-textured sandy loam or clay dust with soil acidity around pH 6-7.4 Sengon prefers alkaline to acid soils.⁵

4. Carbon Storage Capacity

In an example from Jambi, Sumatra, Sengon monocultures stored up to 52,69 t Carbon Dioxide per ha.⁶

5. Effect on Soil

“Erosion control: Pure stands give a good protective cover to prevent erosion on slopes and are recommended in the Philippines for this purpose on catchment areas sheltered from typhoons. [...]Reclamation: Plantations of *P. falcataria* have been established even on tailings left after tin mining. It is planted extensively for reforestation and afforestation of denuded and eroding land.

Nitrogen fixing: Nodulates and fixes atmospheric nitrogen. [Nitrogen fixation is a process by which atmospheric nitrogen is converted to ammonium in the ground. Ammonium in turn is excellent fertilizer. In short, Sengon Laut trees are improving the agricultural potential of the soil. *Annotation by FVW*]

Soil improver: “The natural drop of leaves and small branches contributes nitrogen, organic matter and minerals to upper layers of soil. The plant’s extensive root system further improves soil conditions by breaking up soils to provide channels for drainage and aeration. Ornamental: Suitable as an ornamental, although its brittle branches can be a problem in windy areas.”⁷

³ AgroForestryTree Database: *Paraserianthes falcataria*.
<http://www.worldagroforestrycentre.org/sea/products/afdbases/af/asp/SpeciesInfo.asp?SpID=17108/11/2013>

⁴ <http://www.nneenergy.com/en/plantation/sengon/21/10/2013>

⁵ AgroForestryTree Database: *Paraserianthes falcataria*.
<http://www.worldagroforestrycentre.org/sea/products/afdbases/af/asp/SpeciesInfo.asp?SpID=17108/11/2013>; <http://www.nneenergy.com/en/plantation/sengon/21/10/2013>.

⁶ Ginoga et al: Economic Assessment of some Agroforestry Systems and its Potential for Carbon Sequestration Service in Indonesia. In: Journal of Forestry Research. Vol. 1,1 (2004), p. 31-49.

6. Potential Combinations with other Trees and Crops

“Shade or shelter: The plant is extensively planted in Southeast Asia as a shade and nurse crop for coffee, cocoa, tea, other crops and young timber plantations. Its fast growth and good shading properties outweigh the disadvantages of its sensitivity to strong winds and its relatively short life.”⁸

7. Plantation Management

“Propagation methods: *P. falcataria* requires great amounts of light and regenerates naturally only when the soil is exposed to sunlight. In the forest, wildings sprout in abundance only when the canopy is open and when soil is cleared from the undergrowth. Wildings can be successfully collected and potted for planting but are delicate and must be carefully handled. The species can be planted from seedlings, direct seeding or stump cuttings. Small seeds are difficult to collect from the ground and are usually collected by cutting down branches bearing ripe, brown pods. Untreated seeds germinate irregularly; germination may start after 5-10 days but is sometimes delayed for up to 4 weeks. To hasten and ensure uniform germination, soak in boiling water for 1-3 minutes or immerse in concentrated sulphuric acid for 10 minutes followed by subsequent washing and soaking in water for 18 hours. Germination rates can be as high as 80% to almost 100%. Seeds of *P. falcataria* are usually sown by broadcasting, pressed gently into the soil and then covered by a layer of fine sand up to 1.5 cm thick. The soil in the seedbed must be loose and well drained; application of a surface layer of mulch is advisable, and excessive shading should be avoided. Seedlings can be transplanted when they have reached a height of 20-25 cm with a woody stem and a good fibrous root system; this stage can be reached in 2-2.5 months. Container plants are often transplanted into the field when 4-5 months old. Seed tissue has been successfully used in the Philippines for propagation by tissue culture. Seedlings have epigeal germination.

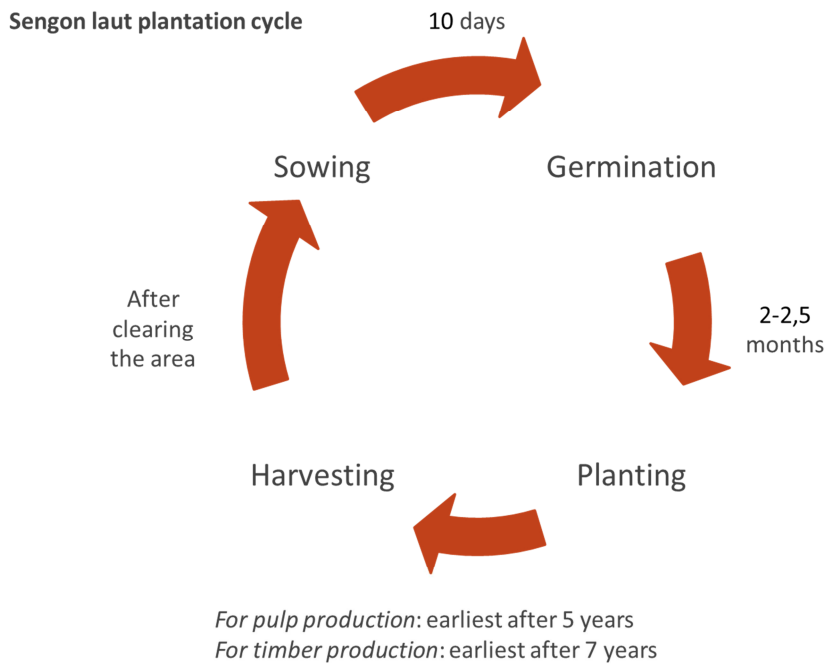
Tree Management: *P. falcataria* grows so fast that it is sometimes called the ‘miracle tree’. It is even mentioned in the Guinness Book of Records as the world’s fastest growing tree. On good sites it can attain a height of 7 m in just over a year. Trees reach a mean height of 25.5 m and a bole diameter of 17 cm after 6 years, 32.5 m high and 40.5 cm diameter after 9 years, 38 m high and 54 cm diameter after 12 years, and 39 m high and 63.5 cm diameter after 15 years. *P. falcataria* coppices although coppicing vigour is highly variable. It has been found that growth at 2 x 2 m spacing is significantly faster than at 1 x 1 m. If sawn timber is desired, stands can be thinned to 6 x 6 m at 6-8 years and harvested at 15 years. *P. falcataria* is commonly used in agroforestry systems, usually in a cutting cycle of 10-15 years, in combination with annual crops in the 1st year and grazing animals in subsequent years. When planted, it can grow on comparatively poor sites and survive without fertilizer. However, it does not thrive in poorly drained, flooded or waterlogged soils. Growth of young trees in a phosphorous-deficient soil is promoted by inoculation with mycorrhizal fungi *Gigaspora margarita* and *Glomus fasciculatum* in combination with *Rhizobium*. Nitrogen-fixing nodules containing leghaemoglobin are found on roots. *P. falcataria* plantations should be kept weed free during the 1st few years.

Germplasm Management: Seed storage behavior is orthodox. There is no loss in viability during 1.5 years in air-dry storage at 4-8 deg. C. For storage, seeds are air dried for 24 hours and then packed in polythene bags. When stored at 4-8 deg. C, the germination rate after 18 months may still be 70-90%. There are 38 000-44 000 seeds/kg.”⁹

⁸ AgroForestryTree Database: *Paraserianthes falcataria*.
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⁹ AgroForestryTree Database: *Paraserianthes falcataria*.
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Growth cycle:



Graphic by FVW, contents based on Krisnawati et al.

Growth rates: According to Krisnawati et al., mean average increment of Sengon plantations is up to 67m³ per hectare and year for the years 2 to 6 of the growth cycle, afterwards the growth slows down, although it remains still comparatively high until year 10. Those are, of course, values for optimal environments, but even in less suitable conditions Sengon Laut reaches an MAI of around 40m³ on average over a 10 –year growth cycle.¹⁰ FVW's research in Central Java confirms those numbers.

Work input (in person days) per hectare: 2 days are needed for the preparation of the seedlings, 17 days for planting, 17 days for maintenance, 10 days for monitoring, and 384 days for harvesting and post-harvest handling. These numbers are derived from plantation maintaining a (8 year growth cycle).¹¹

8. Usages

Fodder: An activated tree metabolism at the beginning of the wet season synthesizes a complex polysaccharide that increases palatability for cattle of the bark. Leaves are used to feed chickens and goats.

Fuel: Widely used for fuelwood and charcoal production in spite of its low density and energy value.

Fibre: *P. falcata* trees coppice fairly well, an advantage for pulpwood production. The wood is suitable for pulping and papermaking. It can be used to produce good-quality pulp by mechanical, semi-chemical or chemical processes. Because of its light colour, only a little bleaching is required to achieve good white paper. The neutral, semi-chemical process produces pulp with excellent strength properties. It has also been used for the manufacture of viscose rayon.

¹⁰ Krisnawati, H. et al.: *Paraserianthes falcata* (L.) Nielsen. Ecology, silviculture and productivity. CIFOR, Bogor, Indonesia 2011. http://www.cifor.org/publications/pdf_files/Books/BKrisnawati1103.pdf 08/01/14

¹¹ Ginoga et al: Economic Assessment of some Agroforestry Systems and its Potential for Carbon Sequestration Service in Indonesia. In: *Journal of Forestry Research*. Vol. 1,1 (2004), p. 31-49.

Timber: The comparatively soft timber is suitable for general utility purposes, such as light construction, furniture, cabinet work, lightweight packing materials and pallets, and chopsticks. Because the wood is fairly easy to cut, *P. falcataria* is also suitable for wooden shoes, musical instruments, toys and novelties, forms and general turnery. *P. falcataria* is an important source of veneer and plywood and is very suitable for the manufacture of particleboard, woodwool board and hardboard and has recently been used for blockboard.

Tannin or dyestuff: The bark of *P. falcataria* has tanning properties.”¹²

According to FVWs observations and research, Sengon Laut is a tree species of growing importance in Indonesia. In the Temanggung area of Central Java, 10.000 smallholders grow Sengon Laut trees and a processing industry has grown with around 100 companies producing for the local and international market. The main products are barecore, blockboard and plywood. One example is PT Albasia Bhumiphala Persata seated in Temanggung, a producer of Plywood that purchases up to 2.000m³ of Sengon Laut daily and produces among others plywood and blockboard.¹³

Product examples:



¹² AgroForestryTree Database: *Paraserianthes falcataria*.

<http://www.worldagroforestrycentre.org/sea/products/afdbases/af/asp/SpeciesInfo.asp?SpID=171>
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¹³ <http://www.abpindonesia.com/profil> 09/01/14

9. Sources

Albasia Bhumiphala Persata

<http://www.abpindonesia.com/profil> 09/01/14

AgroForestryTree Database: Paraserianthes falcataria.

<http://www.worldagroforestrycentre.org/sea/products/afdbases/af/asp/SpeciesInfo.asp?SpID=171>

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Ginoga et al: Economic Assessment of some Agroforestry Systems and its Potential for Carbon Sequestration Service in Indonesia. In: Journal of Forestry Research. Vol. 1,1 (2004), p. 31-49.

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