

The Potential of Gaharu as a Plantation Species



A 17-year old *Aquilaria malaccensis* at Sook with a DBH of 31.1 cm and height of 19 meters. Photo by Julius Kodoh.

Background

Gaharu (Malay word for agar wood) is the most expensive wood in the world. It is valued in many cultures for its distinctive fragrance, and used extensively in incense and perfumes. Gaharu is the occasional product of two to four genera in the family *Thymelaeaceae*, with *Aquilaria agallocha*, *Aquilaria crassna* and *Aquilaria malaccensis* being the three best known species. The name of the species is derived from the latin word "aquila" meaning eagle. Gaharu is known throughout many Asian countries and at least 15 species of *Aquilaria* trees are known to produce the much sought-after agar wood. The valuable wood has been traded for thousands of years throughout Asia. It used to be commonly found in many tropical countries, from India to Indonesia (Angela Barden et. al., 2000).

A. malaccensis has been trial planted by the Sabah Forestry Department in experimental plots at Sook, Keningau, Segaluid Lokan and Sungai Daling, Sandakan and thus, this report shall focus on *A. malaccensis*. The earliest planting is at Sook which was planted in 1990 with seeds collected locally from various forest reserves.

Aquilaria malaccensis Lamk

Aquilaria malaccensis, also known as Agallochum (trade name), belongs to the *Thymelaeaceae* family. It occurs from north-eastern India through Myanmar to Peninsular

Malaysia, Sumatra, Bangka, Borneo and the Philippines. The tree can grow up to 40 meters in height and reach a diameter of 60 cm. The tree usually grows straight, but is sometimes fluted or with thick (10 cm) buttresses up to 2 meters high. *A. malaccensis* is commonly found in primary and secondary forests, mainly in plains but also on hillsides and ridges up to 750 meters altitude. *A. malaccensis* yields a soft, lightweight hardwood with a density of about 400 kg/m³ air dry (Chakrabarty et. al., 1994)

Silvicultural Requirement

A. malaccensis grows best in undulating terrain from 200-700 meters, with an annual rainfall of 1500-6500 mm, a mean annual maximum temperature of 22-28°C and a mean annual minimum temperature of 14-21°C. *A. malaccensis* prefers heavy soils developed from gneiss and other metamorphic rocks, but it also grows well on sandy loams developed from sandstone. *A. malaccensis* is propagated by seed. Fruits harvested for seeds should be collected when mature but still green. Fruits are dried in the shade for about 2 days. They then burst and release the seed. Seeds should be sown immediately, as it remains viable for only about 1 month. Germination starts after 10-12 days and is normally complete after 1 month. Seedlings are pricked out into polythene bags 40-45 days after germination when they are 3-5 cm tall, and are kept under shade. They are ready for transplanting when 30-35 cm tall and 10-12 months old (Mabberley, D J, 1997). Transplanting bare rooted seedlings has been tried successfully in Malaysia.

Field Performance of Locally Grown *A. malaccensis*

A. malaccensis planted at plot no. 90A Sook reveals a mean diameter of 19.94 cm and a mean total height of 13.58 meters at the age of 17 years old, representing an MAI diameter of 1.25 cm per year and an MAI total height of 0.85 meter per year.

Oyen L P A and Nguyen X D (1999) reported that, in a plantation in Malaysia, 67 year old trees of *A. malaccensis* reached an average height of 27 meters and a diameter of 38 cm. However it was not reported where in Malaysia the trees were planted!

Formation of Gaharu

Gaharu or agar wood formation is a pathological process taking place in the stem or main branches where an injury has occurred. Fungi are involved in the process, but the process itself is not yet fully understood. Damage by boring insects is often associated with the infection. It is believed that the tree is first attacked by a pathogenic fungus, which causes it to weaken. Infection by a second fungus causes the formation of agar wood, but it is unclear whether it is a product of the fungus or the tree. The fungus implicated in the formation of agar wood in *A. malaccensis* is *Cytosphaera mangiferae*, while *Melantos flavolives* is assumed to play a similar role in *A. sinensis*. *A. malaccensis* forms an association with endotrophic mycorrhizal fungi. In natural forests, only 7-10% of the trees are infected by the fungus (Ng. et al, 1997). A common method in artificial forestry is to inoculate the trees with the fungus.

Uses

Agar wood is the rare and famous, resin containing heartwood produced from old and diseased trees of several *Aquilaria* species of which *A. malaccensis*, *A. crassna* and *A. sinensis* are most important. The fragrance produced by the burning agar wood has been highly valued for thousands of years, and its use as incense for ceremonial purposes in Buddhism, Confucianism and Hinduism is widespread throughout eastern and southern Asia. The wood is only partly saturated with resin but still fragrant, and occasionally, the wood remaining after distillation, is made into sticks called 'joss sticks' or 'agarbattis' which are burnt as incense. Agar wood oil is an essential oil obtained by water and steam distillation of agar wood, which is used in luxury perfumery. The incense is also used as an insect repellent and for medicines. The timber of undiseased trees, known as 'karas', is very light and is only suitable for making boxes, light indoor construction and veneer [Angela Barden et al (2000)].

Market

Agar wood has become a precious commodity. According to Angela Burden et al (2000), based on available trade data, Indonesia and Malaysia appear to be the main sources of agarwood (from all species) in international trade. CITES reported that exports of *A. malaccensis* from Indonesia topped 920 t from 1995 to 1997, although CITES argue that it might include other species of *Aquilaria*. Over 340 t of *A. malaccensis* were reported as exported from Peninsular Malaysia during the same period. Angela Burden et al (2000) also reported that according to Sarawak's CITES Management Authority, nearly 530 t of *A. malaccensis* were exported from Sarawak alone in 1998. Although overall trade volume may appear small in "timber trade" terms, but they are not small in monetary terms. Most of agarwood in international trade is destined for consumers in the Far and Middle East, with key final export destinations from 1995 to 1997 being Saudi Arabia, the United Arab Emirates, Hong Kong and Taiwan.

Chakrabarty et al (1994) stated that the lowest grade of Malaysian agarwood (not necessarily *A. malaccensis*) could be obtained for USD19/kg in the Middle East. The high grades, normally reserved for exclusive buyers, can cost up to USD9589/kg. More expensive grades are also available and can sell for as much as USD27400/kg.

The *A. malaccensis* tree is comparative to gold and is becoming very rare in the wild due to illegal extraction. Thus, the species has been CITES listed in Appendix II. The listing subjects the species to limited commercial use and stringent monitoring through a permit system. Under CITES rules, the Management Authority will issue CITES Export Permit to exporters of gaharu which originate from Malaysia, CITES Import Permit to importers of gaharu, and CITES Re-Export Certificate to traders of this species which originate from other countries. The Importers are requested to furnish the CITES Export Permit from the exporting country before the Management Authority can issue the CITES Import Permit.

Prospects

The extremely high prices paid for high quality agar wood and for the essential oil and the indiscriminate felling of diseased and healthy trees threaten natural stands of *Aquilaria* including *A. malaccensis* to extinction. Research into possibilities of artificial induction and stimulation of agar wood formation is therefore urgently required and



Nine year old *Aquilaria malaccensis* planted at Sook, Keningau. (Photo by Julius Kodoh)

may offer high economic returns, especially as trials indicate that management of plantations presents no great difficulties. Unless such methods are developed, *A. malaccensis* may soon be extinct.

Today, gaharu is becoming more popular in Malaysia. Projects are currently underway in some countries in Southeast Asia to infect cultivated *Aquilaria* trees artificially to produce gaharu in a sustainable manner. In Malaysia, various Research Institutions are conducting research and development on *Aquilatria* trees. The Forest Research Centre of the Sabah Forestry Department has recently undertaken a collaborative project to artificially inoculate gaharu trees to induce the formation of agarwood in one of the planted Gaharu plots. What remains to be seen is the success of this project, but if it proves to be successful, it will be a breakthrough in terms of its socio-economic potential as well as in protecting the remaining gaharu trees available in the wild.

References

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