

15. *Pinus merkusii* Jungh et de Vries

Taxonomy and Commercial Grade

Cambodian name	: Sral
Scientific name	: <i>Pinus merkusii</i> Jungh et de Vries
Family	: Pinaceae
Commercial grade-Cambodia	: 2 nd Grade

Distribution and Habitat: This species occurs throughout South-East, including Myanmar, Cambodia, Laos, Vietnam, Indonesia (Sumatra) and Philippines (Luzon and Mindoro islands). *Sral* was probably introduced onto the island of Hainan (China) (Hidayat and Hansen, 2002). In Cambodia it is found in large stands or small groups, and usually in mixed deciduous or evergreen forest. The largest stands of *sral* in Cambodia are found on the Kirirom Plateau, and cover a total of 12,000 hectares (Dy Phon, 2000). The species occurs from 30-1800 m a.s.l.. It is a light-demanding, heat- and drought-tolerant tree, growing well on many different types of soil, such as sandy and red soils, and in varying climates (Hidayat and Hansen, 2002). It is slow-growing during the first five years, but grows quickly as an adult (Khorn, 2002). Experience suggests that this is one of the principal tree species to plant on bare or bushy hills, as it provides protection against erosion and land-deformation (FIPI, 1996). It is found in Kampong Thom, Koh Kong, Pursat, Kampong Speu and Mondulkiri, as illustrated on the map below.



Gene-Ecological Zones: Coastal Cardamoms (A), Northern Cardamoms (B), Central Lowlands (d), Southern Annamites (g).

Botanical Description: A large tree from 30-35 m in height (Dy Phon, 2000), producing boles from 60-80 cm in dbh. Old trees can reach to heights in excess of 45 m and produce boles to 140 cm in dbh. Sapwood and heartwood is distinctive, the former being yellowish in colour, whilst the latter is a slightly darker, heavier wood with a density of 0.88-0.96 (FIPI, 1996). Young trees have a pyramid or conical crown form, whereas old trees have a flatter and spreading crown (Hidayat and Hansen, 2002). The trunk is straight, cylindrical, and very resinous. The first year branches are brownish and glabrous. Bark is thick, reddish-brown, with deep longitudinal splits. Cones mature after 2 years, the scales of which are spineless. In the second year, the cone is cylindrical or ovate-elongate, with a pedicel about 1cm long. Scales have a rhomboid surface and a sharp margin, and across the middle of the surface two transversal, longitudinal, relieved lines. Natural regeneration is good, especially on open lands. From 15 years onwards, resin can be extracted from the tree (FIPI, 1996).

Flowering and Fruiting Habit: Male and female cones can be found throughout the year, but reproductive structures usually begin to develop from May-June, resulting in the maturation of cones in October and November of the following year. Hence development of the cones requires 11-15 months (Hidayat and Hansen, 2002).



Fruit and Seed Description: The fruit is a cylindrical cone, 5-10 cm long and 2-4cm wide, up to 10 cm wide after opening. Seeds are produced when the tree is 10-15 years of age, and normally in large quantities. However, there is variation within and between stands (Hidayat and Hansen, 2002). Seeds are dispersed by wind under natural conditions. Ovate seeds are slightly flat, bearing a thin wing (FIPI, 1996), borne at the base of the cone scales, each scale able to support two seeds. Wings are 22-30 mm long and 5-8mm wide, and attach to the seed with hooks that are connected by hygroscopic tissue in the base of the wing. The seed is firmly held while in dry conditions, favouring wind dispersal, but the wing is quickly released when moist conditions suitable for germination are encountered. There are normally 35-40 seeds per cone, and 50,000-60,000 seeds per kilo (Hidayat and Hansen, 2002).

Seed Collection: The optimal time of collection is reached when the majority of cones have changed colour from green to brownish and start to open. Maturity can be confirmed by a cutting test. The cut seed should have a white and solid endosperm filling its entire space. Seed collection is by climbing the trees and picking the cones. A special hook sharpened on both sides can be used for pulling or pushing off the cones, and avoids breaking the twigs (Hidayat and Hansen, 2002).

Seed Handling: Mature, brown cones should be stored in the shade, with good ventilation in gunny bags or on racks for at least one or two days. The cones require after-ripening before seed extraction, as immediate sun-drying of freshly collected cones sometimes causes "case-hardening", meaning that the outer tissues dry too quickly before the inner tissues can lose moisture, and the cone scales fail to open properly. Seeds are extracted by drying the cones in the sun on trays, or on canvas until they open, and during this time, the cones should be stirred to facilitate seed extraction. The common practice of seed extraction by splitting the unripe cone with a knife or cone-cutter is not recommended, as many seeds will be immature and damaged during storage leading to poor germination rates. To ease further seed processing and sowing in the nursery, the wing should be removed from the seed. For small quantities, this can be done manually by rubbing the seed between the hands, or against a screen or roughened surface, or by rubbing in a cloth bag. For large quantities of seed, mechanical methods may be used, for example, seeds can be given 10-15 minutes in a concrete mixer (without water) to loosen the wings. Then 5-10% water is added gradually by spraying, and the seed rotated for approximately 15 minutes more, before cleaning and drying (Hidayat and Hansen, 2002).

Sowing and Germination: Germination starts 7 days after sowing and often reaches 80% after 12-15 days. Seeds can be sown directly in containers (1-2 seeds per container), or

alternatively, in sowing beds to be transferred later into containers, when seedlings are 3-4 cm tall. The growth medium should be a mixture of sand and topsoil from a pine stand with a ratio of 3:1. Mycorrhizal associates are required. Seedling growth takes up to 9-10 months, hence they are slow compared to many other tropical species (Hidayat and Hansen, 2002).

Uses: The wood is used in house construction, joinery, match-making, pulp, common furniture, pit props, electricity poles, shipbuilding, chopsticks, and vehicle-building (FIPI, 1996). The species provides high resin yields and commercial tapping is often practiced. Old trees can yield 30-60 kg of crude gum per year, equalling 20-40 kg of pure resin and 7-14 kg of turpentine (Hidayat and Hansen, 2002). The resin is also used in medicine, paints, printing and the perfume industry. In Cambodia, the resin is also used to make torches. In traditional medicine, the decoction of the dried out resin is used to treat diseases such as furunculosis, abscesses, and bad blood circulation (Dy Phon, 2000). This species is often used for the rehabilitation of degraded areas due to its tolerance to fire and poor soil conditions (Hidayat and Hansen, 2002).

Current Status: As this wood is very valuable and has very high demand in markets, this species is over-exploited and in danger of extinction if adequate protection measures are not implemented. Distribution is scattered and its habits have been destroyed by forestland conversions and selective illegal logging. The number of mature trees has been reduced significantly and it is now difficult to find significant sources of germplasm.

In 2002, the second CTSP meeting on the Forest Gene Conservation Strategy defined *Pinus merkusii* Jungh et de Vries as a priority species in need of immediate conservation intervention and appropriate protection. Resin tapping (harvesting) is prohibited by Cambodian forestry law (1988) unless special permission is granted by MAFF.

References:

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