

Cocos nucifera L.

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ARECACEAE (PALM FAMILY)

Palmas cocos Miller

Coco, coco de aqua, coco-palm, coconut, cocotero, niu, palma de coco (Little and Skolmen 1989)

The genus *Cocos* is monotypic. *Cocos nucifera* is believed to have originated in the Old World tropics, but the natural range is unknown and the origin of the species is the subject of considerable debate (Harries 1978, Parrotta 1993). Dispersal by humans has played a major role in the naturalization of the species on tropical and subtropical shores throughout the world.

Cocos nucifera is a medium-sized to large palm, typically ranging from 10 to 20 m tall, though sometimes reaching almost 30 m. Its trunk can reach 40 to 50 cm in diameter at the enlarged base and 20 to 30 cm d.b.h. The trunk may be straight but is often curved, probably due to the effects of storms or near constant exposure to coastal winds. The tree tolerates a wide range of site conditions, but develops best on deep, well-drained sandy loam soils with a pH between 5.5 and 8.0. Although it often grows on nutrient-poor sands and occasionally in wet, brackish sites, frequently waterlogged sites are unsuitable. Although it will grow at elevations of up to 1200 m near the equator and 900 m at higher latitudes, *C. nucifera* is primarily a coastal species and is most productive at elevations of 600 m or less (Parrotta 1993). The mean annual temperature in its native and introduced ranges is between 27 and 35 °C, with little diurnal variation (Opeke 1982, Parrotta 1993). *Cocos nucifera* grows well in areas receiving between 1000 and 5000 mm of rainfall, but excessive humidity may lead to decreased fruit production and increased incidence of disease (Parrotta 1993, Thampan 1981).

Many varieties of coconuts exist, including dwarf and tall forms and varieties with differing fruit characteristics (Thampan 1981, Woodroof 1979). Harries (1978) and Buckley and Harries (1984) describe two primary types of coconuts, a wild-type (niu kafa) with a long, angular fruit and thick husk, and a type derived by selection (niu vai) that is more spherical, with a thinner husk and a greater amount of endosperm. Both types are cultivated and intermediate types

have arisen through introgressive hybridization (Buckley and Harries 1984).

Cocos nucifera ranks as one of the most useful trees in the world (Haas and Wilson 1985, Parrotta 1993, Woodroof 1979). Its large fruits are used in innumerable ways. The watery liquid of both green and mature fruits can be consumed and is nutritious and refreshing. The fleshy part of the seed (the endosperm) can be eaten raw, shredded and used for cooking, or dried. A liquid often referred to as coconut milk can be expressed from the grated endosperm (Falanruw 1997). In dried form (copra), the endosperm is processed for the manufacture of soaps, coconut oil, and other products. The endocarp of the fruit has been made into utensils, containers, small drums, handicrafts, and fuel. The trunks can be used for fenceposts and poles, although untreated wood is not very durable. It can also be processed into products such as small-dimensional lumber, flooring boards, plywood, pulp, or charcoal. Wood quality varies considerably along the length of the stem and from the interior to the exterior. Generally, only the outer part of the butt portion of the trunk is sufficiently strong to produce lumber. Specific gravity typically ranges from 0.30 to 0.90 in the outer third of the stem radius and from 0.10 to 0.35 for the inner third of the stem radius (Parrotta 1993). The wood is difficult to saw due to its high silica content but can be readily processed using saws with tungsten carbide teeth.

Flowering occurs throughout the year. New flower clusters (panicles) develop at the rate of about one per month. Clusters are approximately 90 to 120 cm long and contain both male and female flowers. The female flowers occur at the base of the inflorescence and, depending on variety, may open later or overlap with the opening of the male flowers. Cross-pollination may be predominant in tall varieties (Henderson 1988), but self-pollination is reportedly common in dwarf varieties (Thampan 1981). Flowering may begin in trees as young

as 4 to 5 years in dwarf varieties and 7 to 8 years in tall varieties. The fruit is egg-shaped or elliptical, bluntly three-angled or nearly round, and about 20 to 30 cm long. It has a light brown, fibrous husk, an inner brown fruit containing a whitish layer of stored food, and a large central cavity containing watery or milky liquid (Little and Skolmen 1989). The inner fruit, or nut, has 3 round spots (eyes) on one end. About 30 to 90 nuts per tree are produced each year, depending on variety and growing conditions (Thampan 1981, Timyan 1996) and yields of up to 150 nuts are not uncommon (Parrotta 1993).

About 12 months after pollination, mature nuts can be picked by hand from the tree or collected from the ground. Harvesting can also be accomplished with harvesting hooks (Opeke 1982). Immature fruit drop is common and may reach levels of 65 to 70 percent (Opeke 1982). Solid, heavy, and almost round nuts with relatively thin husks should be selected from healthy, high-yielding trees. Fully mature nuts are usually dull brown in color. When mature nuts are shaken, it is possible to hear liquid sloshing around inside (Opeke 1982, Parrotta 1993). Freshly harvested nuts should be stored in the shade or indoors at room temperature for 3 to 4 weeks before sowing. Properly stored seeds remain viable for at least 8

months, although planting after 3 to 4 weeks is recommended.

Pretreatment of the nuts by soaking in water for 1 to 2 weeks is simple and highly effective (Thampan 1981), but the nuts can also be pretreated by other means, such as cutting the husk from the bottom end of the nut (Opeke 1982).

In sowing, the nuts are most often embedded, but not completely buried, horizontally in seedbeds of loose, friable soil. Some recommend that the eyes, which are on the side where the nut was attached to the pedicel, be raised to near the soil line (Timyan 1996, Woodroof 1979). Seedbeds should be kept moist and protected from rodents and termites. Germination typically takes about 8 to 10 weeks, and seedlings may be ready for outplanting in 6 to 8 months (Parrotta 1993, Timyan 1996). Seedlings should be outplanted in holes at least 45 cm deep and 45 cm wide, and even larger holes are recommended for hard soils or soils with deep water tables (Thampan 1981). Mixing compost or other organic matter into the planting holes is recommended. Spacing between seedlings on coconut plantations is typically about 9 m. Seedlings should receive considerable post-planting maintenance because they are vulnerable to rodents, drought, and competition from weeds during the first few years.

