

**Farm and Forestry
Production and Marketing Profile for**

Tamanu

(Calophyllum inophyllum)

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USES AND PRODUCTS

Oil

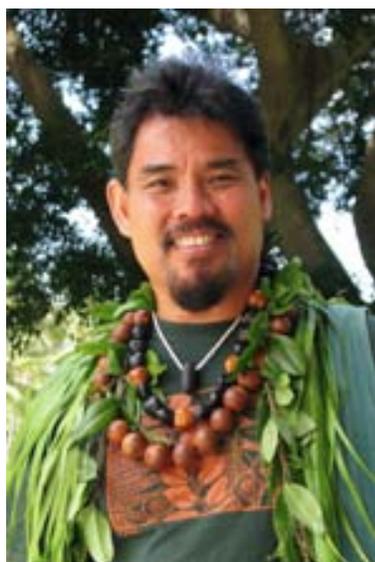
Oil extracted from tamanu fruit has been used as a traditional medicine and cosmetic in Pacific island cultures for centuries. The oil is tinted green, thick, and woody or nutty smelling and is easily absorbed into the skin. It does not solidify in cool weather as does coconut oil. Modern cosmetic products based on tamanu oil are sometimes mixed with olive oil or shea butter. Traditional and modern uses are all topical—the oil is not edible. In addition to being used as massage oil and as a skin moisturizer, tamanu oil has traditionally been used to treat various skin injuries such as scrapes, burns, insect bites, sunburn, and diseases and sores such as dry skin, psoriasis, eczema, ringworm, and even diaper rash. Tamanu oil has traditionally been used to treat rheumatism and inflammation and is believed to help heal scars. While some claims are clearly exaggerated, medical research has shown that tamanu oil has anti-bacterial prop-

erties (Yimdjo et al. 2004) and may help promote healing of scars (Dweck and Meadows 2002). Other tamanu plant extracts and chemicals derived from them have been shown to decrease the growth of tumors (Itoigawa et al. 2001) and inhibit leukemia cells in laboratory settings (Li et al. 2010). Results of some studies have even shown that inophyllums, chemicals extracted from tamanu oil, inhibit HIV reverse transcriptase in a novel way, which indicates that some day they may be used as part of a combination therapy for AIDS (Taylor et al. 1994). The main fatty acids which comprise the oil are palmitic, stearic, oleic, and linoleic acids (Adeyeye 1991). There has been at least one case documented of an allergic reaction to the oil (Le Coz 2004), so individuals should apply a small amount first as a test before using. A qualified medical professional should be consulted for serious or long-term injuries or diseases.

Tamanu oil was traditionally used as lamp oil in Polynesia (Abbot 1992) and has been proposed as a source of biodiesel (Azam et al. 2005). However, the high value of the oil in the



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Top left: A tamanu calabash turned from a log harvested from a 15-year-old planted tree in Hawai'i. Artist: David Caccia. Top middle: The large, round, tan-colored seeds are strung in leis. Top right: The thick, greenish oil extracted from the tamanu nut has traditionally been used for a skin and beauty product. Bottom left: Tamanu's wood shows a distinct ribbon grain on the tangential face. Bottom middle: Tamanu is a favorite wood for carving storyboards in Palau. Bottom right: A large inexpensive kamani platter made in the Philippines for the Hawai'i market. The smaller bowl was turned in Hawai'i.

cosmetics market today makes it unlikely that it would be burnt for energy. In addition to the fatty acids, the oil also contains up to 30% resins, and there was early interest in the use of the oil as a varnish (West and Brown 1920). Traditionally the oil was used to help waterproof *kapa* (bark cloth) in Hawai'i.

Wood

Tamanu wood is commercially available as lumber today and mostly produced in Melanesia or Polynesia.

The sapwood is white and the heartwood is a reddish-brown with distinct figure produced by interlocking grain on tangential faces (Little and Skolmen 1989). The wood is moderately dense, ranging in specific gravity from 0.6 to 0.8. Because of the grain and significant shrinkage it is somewhat difficult to work, although it turns well. The grain tends to tear out during machining and the lumber often warps. Tamanu wood is resistant to termites (Grace et al. 1996) but because of its high value, it is not often used for construction.

Tamanu wood traditionally was used for food vessels in Hawai'i because unlike koa (*Acacia koa*) and some other species there are no exudates from finished wood products that would taint food. Today, poi (taro) boards are frequently made of tamanu. Elsewhere in the Pacific, tamanu is used for canoe and boat building. In Tahiti the tamanu or *ati* tree was used to carve temple idols. Today tamanu is used for cabinet making and furniture as well as turning and carving. In Palau it is a favorite wood for carving storyboards. Bowls turned from *Calophyllum* and labeled "kamani" are imported to Hawai'i from the Philippines, where costs of production are much lower.

Tamanu seeds in the shell are sometimes cleaned, dried, and strung into leis (garlands), either alone or combined with greenery.

Other medicinal uses

Tamanu leaves have also been applied topically as a cure for wounds and skin diseases, and leaves soaked in water have traditionally been used to make a medicine for eye ailments in different Pacific islands. Only the use of the oil, however, has become popular in wider society.

BOTANICAL DESCRIPTION

Preferred scientific name

Calophyllum inophyllum L.

Named varieties

C. inophyllum var. *wakamatsui* (Kanehira) Fosberg and Sachet, a variety from Babeldaob, Palau (Fosberg and Sachet 1980).

C. inophyllum var. *takamaka*, a small-fruited variety from the Seychelles (Fosberg 1974). "Tacamahac" also refers to resins once obtained from the tree.

Family

Clusiaceae (formerly Guttiferae), mangosteen family

Common names (Fosberg 1974; Falanruw et al. 1990; Raulerson and Rinehart 1991; Friday and Okano 2006; Merlin and Juvik 1996; Merlin et al. 1996; Merlin et al. 1997; Whistler 2009)

Chuuk: *rakich, rekich, weengú*

Cook Islands: *tamanu*

English: Alexandrian laurel, ball nut, beach mahogany, beauty leaf, oil nut tree, palomaria, mastwood

Fiji: *dilo*

Guam, Northern Marianas: *da'ok, da'og, rághisch*

Hawai'i: *kamani, kamanu*

India: *poon, undi*

Kiribati: *te itai*

Kosrae: *eet*

Malaysia and Indonesia: *bintangor* (used for several *Calophyllum* spp., *bintangor laut* refers to *C. inophyllum*)

Marquesas: *tamanu*

Marshalls: *lueg, lukwej, jiro*

Nauru: *tomano*

Palau: *btaches*

Papua New Guinea: beach calophyllum

Philippines: *bitaog*

Pohnpei: *isou*

Samoa: *fetau*

Seychelles (Creole): *takamaka, tatamaka*

Society Islands: *tamanu, 'ati*

Solomon Islands: *dalo*

Tahiti: *tamanu, ati*

Tokelau: *pua*

Tonga: *feta'u*

Yap: *biyuch, fotoi*

BRIEF BOTANICAL DESCRIPTION

Tamanu is a large tree of shorelines and coastal forests. It usually grows 12–20 m (40–65 ft) in height, but open-grown trees can become wider than they are tall, often leaning, with broad, spreading crowns. Trees growing along the shoreline may reach out with trunks almost parallel to the ground. The tree can often be recognized at a distance by its large, spreading horizontal branches. The bark is gray with flat ridges and deep gray fissures. The sap is milky white and sticky. Tamanu leaves are heavy and glossy, 10–20 cm (4–8 in) long and 6–9 cm (2.4–3.6 in) wide, light green when young and dark green when older, oval in shape with rounded tips and bases. Parallel veins run perpendicular to the midrib. The scientific name *Calophyllum* comes from the Greek words meaning

“beautiful leaf” and the specific name “*inophyllum*” refers to the straight lines made by the veins in the leaves. The fragrant white flowers with yellow stamens are borne on long stalks in leaf axils, with 4–15 flowers in a cluster. Fruits are round green balls (hence the common name “ball nut”) 2–5 cm (0.8–2 in) in diameter, green when immature but turning yellow then brown and wrinkled when ripe. The skin and pulp surround a thin, hard shell. A single seed kernel within the fruit is surrounded by a corky inner layer (Allen 2002). There are about 100–200 fruits/kg (45–90 fruits/lb) in shell with the skin and pulp removed. Tamanu usually fruits twice a year; in Hawai‘i fruits fall April–June and again in October–December.

Similar species

There are many other species of *Calophyllum* in the Pacific and tropical Asia, but these tend to be forest trees rather than coastal species. Among coastal species, tropical almond (or Indian almond, *Terminalia catappa*) is often mistaken for tamanu and in Hawai‘i is sometimes called “false kamani.” The leaves of tropical almond, however, are egg-shaped with the stem on the narrow end and branched veins. Tropical almond is deciduous, with leaves turning bright red before they fall. Autograph tree (*Clusia rosea*) also has egg-shaped leaves, but with yellow milky sap and round fruit that splits open along several seams when they ripen. Autograph trees usually have aerial roots which are absent in tamanu. Madagascar olive (*Noronhia emarginata*) has yellow sap and egg-shaped leaves with an indentation at the tip.



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Top left: Tamanu’s white flowers smell like orange blossoms. Top middle: The round fruit gives the tree the common English name “ball nut.” They start out green and smooth and gradually turn yellow then brown and wrinkled as they ripen. Top right: The bark of a large tree showing flattened ridges and deep fissures. Bottom left: The milky white latex has been traditionally used medicinally and as a fish poison. Bottom middle: The kernel is surrounded by a corky layer and a thin, hard shell. Bottom right: Freshly shelled kernels.



Coastal species autograph tree (left), Indian almond (middle), and Madagascar olive (right) can be confused with tamanu.

Distribution

Tamanu is native to tropical shores across the Pacific and Indian Oceans, from Madagascar to Tahiti and the Marquesas Islands. The tree is common in India, Indonesia, northern Australia, and the Philippines. Tamanu is native northwards to the Northern Marianas islands and the Ryukyu Islands in southern Japan and westward throughout Polynesia except Hawai'i, where it was introduced by the early Polynesian settlers.

ENVIRONMENTAL PREFERENCES AND TOLERANCES

Tamanu trees grow in warm, coastal areas across the Pacific and Indian oceans.

Soils

Tamanu thrives in the difficult soil conditions of many coastal sites. It generally is found on sandy soils but it may also grow on organic soils adjacent to wetlands and mangroves. It tolerates shallow soils over limestone or lava rock

Table 1. Elevation, rainfall, and temperature for Hawai'i

Elevation range	Thrives on coastal sites. While planted trees may grow at elevations of 600 m (2,000 ft), especially at the equator, natural groves are seldom found growing above 200 m (660 ft) above sea level.
Mean annual rainfall	lower: 1,000 mm (40 in) upper: 5,000 mm (200 in)
Dry season duration	4–5 months
Mean annual temperature	lower: 18°C (64°F) upper: 33°C (91°F)
Mean maximum temperature of hottest month	lower: 22°C (72°F) upper: 37°C (99°F)
Mean minimum temperature of coldest month	lower: 12°C (54°F) upper: 17°C (63°F)
Minimum temperature tolerated	8°C (46°F)

and acid to neutral soils (pH 4.0–7.4). Tamanu has a spreading but shallow root system that can survive in areas where there is a shallow or brackish water table. The tree is tolerant of wind, salt spray, and brief periods of flooding.

Light

Tamanu prefers full sun and only tolerates light shade. Seeds may germinate in the shade but need full sun to grow well. Tamanu's own canopy casts a dense shade and does not let much light in for understory plants.

GROWTH AND DEVELOPMENT

Tamanu seedlings grow moderately rapidly, increasing in height at about 1 m (3 ft) per year for the first few years in good conditions. Diameter growth of young trees may be 1–1.2 cm (0.4–0.5 in) per year. Trees thinned from a 15-year-old planted stand on the island of Moloka'i in Hawai'i were large enough to be turned into bowls. While trees exposed to winds along coastlines tend to lean, sheltered trees or trees grown in a forest or plantation setting grow straight and tall.

SILVICULTURE

Most tamanu products come from wild groves and there is little information on plantation management. Since the trees are large with spreading crowns, trees should be spaced at least 3 × 3 m (10 × 10 ft), giving 1,111 trees/ha (436 trees/acre). If trees are being grown for timber, a close spacing such as this helps promote early crown closure and shedding of lower branches. Wider spacing of 4 m or more between trees encourages more production of fruit for oil.

PROPAGATION

Tamanu is usually propagated by seed. Because seeds germinate irregularly over a period of several weeks, they are usually sown into seedbeds and transplanted to containers when they germinate. The large seedlings require relatively



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Top left: Tamanu trees growing along the coast in Puna, Hawai'i. Top middle: Trees growing along the shoreline may reach out with trunks almost parallel to the ground. Top right: Seeds that have washed up on sandy beach in Palau. Center left: Seedlings sprout up naturally on beaches if they are not washed away by the tide. Center right: Tamanu's dense canopy lets in little light for understory crops. Bottom left: A year-old seedling planted in an upland clay soil on Guam. Bottom right: An 8-year-old tamanu plantation being grown for timber in Puna, Hawai'i.



Top left: Seeds are sown into seedbeds for germination. Bottom left: Wildlings may often be found growing under existing groves. Right: Large seedlings require relatively large containers.

large containers about 25–36 cm (10–14 in) deep and over 6 cm (2.4 in) in diameter. Good nursery practices should be followed, including the use of soil-less potting media to reduce diseases and forestry-specific containers to train root development. Seeds are usually collected locally as they fall. Seeds are recalcitrant; they may be stored for a few months if kept cool and dry but not longer. There are 100–200 fruits/kg (45–90/lb) and fresh seeds may have a 90% germination rate. Before planting, ripe fruit (with yellow or wrinkled brown skin) may be cleaned by soaking overnight and cleaning off the skin and husks. Germination is improved if the shells are cracked with pliers or a mallet just before sowing (Wilkinson and Elevitch 2004). In one study, germination averaged 3 weeks for fully shelled seeds but 5 weeks for seeds with cracked shells and 8 weeks for unshelled fruit (Parras, no date).

Young seedlings prefer partial shade but should be grown under full sun after 1–2 months. Seedlings take up to 6 months in the nursery before reaching a height of 25–30 cm (10–12 in) when they may be outplanted (Wilkinson and Elevitch 2004).

Wildlings (seedlings that have germinated naturally) may often be found growing under existing groves, and these may be used to start new stands if they can be uprooted without too much damage to the roots.

STAND MANAGEMENT

Periodic thinning of young stands encourages rapid diameter growth in crop trees and allows the selection of the best trees for timber. If the logs cut from thinned trees can be sold for craft wood, even early thinning might yield some income. Pruning of lower branches might be beneficial, but only branches which have already been shaded out should be pruned. No more than $\frac{1}{3}$ of the crown should be cut in any pruning operation.

Known varieties

The South Pacific Regional Initiative in Forest Genetic Resources (SPRIG) and the UN FAO have identified *Calophyllum inophyllum* as a priority species for genetic research in recognition of its importance in the region (Sigaud et al. 1999).

PESTS AND DISEASES

Young leaves may be attacked by thrips, which cause them to roll up. No treatment is necessary and healthy trees will rapidly recover. Mature trees have been infrequently subject to attack from pathogenic fungi including *Fomes* and *Trichocomma* spp. (Orwa et al. 2009).

DISADVANTAGES

Tamanu trees are very large and spreading and need room to grow. If planted near streets or sidewalks, the spreading roots may buckle pavement. The prolific fruits may need to be frequently raked up from streets or sidewalks. Tamanu does not tolerate cold weather or frost. Tamanu lumber is susceptible to warping.

INVASIVE POTENTIAL

Tamanu is unlikely to become a problem invasive species if introduced into new areas. The tree spreads by seeds that are transported along coastlines, in flowing water, and by fruit bats. Tamanu has naturalized in areas where it was introduced. The large seeds limit the rate of spread, and local control of undesired plants should be simple. Although tamanu was introduced hundreds of years ago in Hawai'i, there is no evidence of it becoming a weed or displacing native vegetation. Tamanu is rated "evaluate" in the University of Hawai'i's Hawai'i-Pacific Weed Risk Assessment System (Daehler and Denslow, no date).

AGROFORESTRY USES

Because tamanu tolerates wind and salt spray so well, the tree's main agroforestry use is as a windbreak in coastal areas. Tamanu is a good alternative to *Casuarina* for a beach windbreak in areas where *Casuarina* is non-native and invasive. The dense canopy allows little sunlight through and limits tamanu's use in multistory systems, although the tree has been planted as part of multi-species agroforestry gardens in the Solomon Islands and elsewhere in the Pacific (Yen 1976).

ENVIRONMENTAL SERVICES

Tamanu is an excellent tree for beach stabilization and erosion control. Tamanu trees provide shade on beaches and picnic areas. Because the tree shades out grasses it has potential as a firebreak and is being planted to reclaim fire-prone grasslands on Guam, although it is not fire-tolerant itself. The tree tolerates pruning well and is not susceptible to injuries common in urban settings. The tree's resistance to salt, wind, and poor soil conditions make it a popular street tree in many tropical urban areas, although its large size limits its use to wide avenues and parks.

COMMERCIAL PRODUCTION

Tamanu lumber is mostly produced in Melanesia and Polynesia. The trade name "bintangor" applies to several species of *Calophyllum*, although usually not *C. inophyllum*, and a batch of lumber may contain wood from several species. Forest-grown species of *Calophyllum* such as *C. neo-ebudicum* (syn. *C. vitiense*) are taller and straighter and therefore better suited to produce lumber. Wood is harvested for local crafts and carving in Hawai'i, Palau, and throughout the Pacific. In Hawai'i retail prices for lumber range from \$5.00 to \$15.00 per board foot when available. Wood of both *C. inophyllum* and other *Calophyllum* species is currently imported into Hawai'i from elsewhere in the Pacific.

Commercial production of tamanu oil primarily takes place in the South Pacific, including Tahiti, Fiji, and Vanuatu. There is also some production in Guam and the Northern



Top: Tamanu trees shade Marine Drive in Guam. Bottom: Tamanu tree (at center of photograph) grows together with breadfruit (*Artocarpus altilis*), papaya (*Carica papaya*) and kukui (*Aleurites moluccana*) at 460 m (1,500 ft) elevation in Kona, Hawai'i.

Marianas Islands. Some retailers have sourced the oil from Madagascar, where the tree is also native.

Postharvest handling and processing

Tamanu nuts are usually harvested from the ground beneath wild stands. The nuts are harvested when the husks are partially or wholly rotten but the kernels are still fresh. While processing is done by hand in most locations, simple machines used to extract kernels from macadamia nut (*Macadamia* spp.) or kukui (candlenut) could also be adapted to work for tamanu. The kernels need to be dried to produce the oil. Sun drying takes 1–2 months, but nuts may also be dried in homemade solar driers similar to those used to dry fruit or coffee. Kernels may also be dried in an oven at 37°C (98.6°F). In former times, nuts were baked on hot rocks from a fire (Seemann 1865). Some kernels will develop mold during the drying process, and these need to be removed daily or they will ruin the whole batch. Wood-fired copra driers are sometimes used to dry tamanu kernels on islands where there is a copra industry, but this lends a smoky odor to the oil (Kilham, pers. comm.). Kernels may be cut in half to speed the drying process. Processing begins when the kernels turn deep golden brown and an oily film forms on the surface (Kilham 2004). The kernels are then ground in a food grinder and cold-pressed to extract the oil. Extraction of the oil in boiling water is not recommended as heating may change the chemical properties of the oil. Tamanu oil is usually sold in pure form but it may also be mixed with olive oil or shea butter. It has a shelf life of about a year.

Value added processing

The value of tamanu oil lies not just in its physical and healing properties, but with the connection consumers make with the Pacific islands. For Western users, it allows an escape from the daily routine and the chance to try something exotic. For consumers in Hawai'i or Polynesia, using tamanu oil allows them to connect with a cultural tradition. Tamanu oil is seen as a treat or an indulgence rather than something for everyday use. As currently sold, the oil is packaged in very small bottles, usually only 30 ml (1 oz) and seldom more than 60 ml (2 oz) with labels evoking Hawai'i or the South Pacific. For the Hawai'i market (or for marketing to those who have visited Hawai'i) the oil is labeled "kamani oil" using the Hawaiian name but for the rest of the world it is more commonly labeled "tamanu oil" using the Tahitian name. Although the oil is now also sourced from Madagascar, the marketing emphasizes the connection with Tahiti or Hawai'i rather than Africa. Value is added to the product not so much by processing as by packaging and marketing. Some oil is marketed as being USDA certified organic, although it is unlikely that pesticides or chemical fertilizers are used to any great extent for tamanu. Tamanu wood is likewise prized in Hawai'i, Tahiti, and elsewhere in



Bottles of tamanu (or kamani) oil for sale in Hawai'i.

the Pacific because of its cultural connections. A kamani bowl in Hawai'i echoes the *'umeke* or wooden food containers which were used every day in ancient Hawai'i and which were elevated to an art form in the 19th century Hawaiian kingdom. A vessel carved of another attractive wood such as monkeypod (*Samanea saman*) will be valued much less than a kamani vessel. As with any art form, the value of the raw material is only a small fraction of the value of the finished product. A skilled turner will turn a block of wood worth \$50 into a bowl worth hundreds of dollars. Nonetheless, on islands such as Tahiti and Hawai'i, where there is a local wood turning industry and where wild groves of tamanu are threatened, turners are limited by the lack of raw material and forced to use other woods.

YIELDS

Rotation length (the length of time until the final harvest of the trees for timber) depends on what size timber the local market demands. Trees growing at 1 cm (0.4 in) diameter per year would be large enough for sale as craft wood after only 20 years but would not be large enough for canoes for decades.

Yields of fruit for oil depend on the age and size of the tree and the location. Annual yields of 20–100 kg/tree (44–220 lb/tree) of whole fruits have been reported (National Council of Applied Economic Research 1965; Venkanna and Venkataramana Reddy 2009). Trees begin to bear significantly after 4–5 years. The nut kernels contain 50–70% oil (Azam et al. 2005; Adeyeye 1991; Hemavathy and Prabhakar 1990), and a mature tree may produce 1–10 kg (2–22 lb) oil per year, depending on both the productivity of the tree and the efficiency of the extraction process.

Oil yield per unit land area has been reported at 2,000 kg/ha (1,780 lb/acre) (Srivastava 1985). Others have not attempted to calculate the oil per unit land area yield because tamanu trees are not normally managed as a monocrop. Azam et al.



Ripe tamanu fruits in a basket.

(2005) calculated oil yield to be 4,680 kg/ha (4,175 lb/acre), under the assumptions that 400 trees are planted per hectare and each tree produces 11.7 kg of oil. Kukui, a tree similar in size to tamanu, would be planted at a population density of 198 trees/ha (80 trees/acre) (Wilcox and Thompson 1913). If the kukui population density were used for tamanu, the calculated oil yield would be 2,317 kg/ha, not far from the 2,000 kg/ha reported by Srivastava (1985).

MARKETS

Tamanu oil is traded internationally, from wholesale producers to bottlers and retailers. Retail prices advertised on the Internet for pure tamanu oil range from \$4.00 to \$40.00 for a 30 ml (1 oz) bottle. Shelf prices for tamanu oil in Hawai'i are about \$10 for a 30 ml bottle.

Opportunities exist to produce and market locally grown tamanu oil for local sale in resort locations rather than producing bulk tamanu oil for the wholesale market. In Hawai'i, consumers might prefer oil produced in Hawai'i from trees grown in Hawai'i, and a grower would be able to realize more income from local retail sales than from wholesale sales (Fleming 2005).

Similarly, bowls and wood carvings produced locally from locally-grown wood might find a better market than imported woodworks. In Hawai'i, the Hawai'i Forest Industry Association (HFIA, no date) promotes the "Hawai'i's Wood™" brand to label wood products made in Hawai'i from Hawai'i-grown woods.

The University of Hawai'i publishes a guide to assist small business in marketing agricultural products (Hollyer et al. 1996).

ECONOMIC ANALYSIS

Most tamanu oil comes from nuts collected from wild stands, so economic data on plantations for nut production

are not available. The major costs for oil production are the labor costs of collecting and processing the nuts. A cost-of-production spreadsheet available from the University of Hawai'i for macadamia nut production (Fleming 1999) might be adapted for tamanu nut production with inputs of local costs. Simple, homemade machines for husking and cracking the nuts could partially reduce the labor costs.

Tamanu has not been grown in plantations for timber, and potential rotation ages and yields per acre are unknown. A spreadsheet framework for financial analysis of tree farms is available from the University of Hawai'i (Friday et al. 2000) and could be adapted for production of tamanu timber if local costs were entered and reasonable yields were assumed.

FURTHER RESEARCH

While preferred growing conditions and propagation methods for tamanu are well known, little information is available on productivity and yield of tamanu for fruit or oil. Trials at different locations and with trees from different populations could provide information as to the best growing conditions and differences, if any, among genotypes. Although many researchers have analyzed the chemistry of tamanu oil, there have been no studies comparing oil from trees in different populations. If different trees do differ in the quantity and quality of oil produced, a selection program for the best-producing trees could supply superior stock to growers.

Small-scale technologies could be adapted to facilitate the processing of the oil for the cosmetics and medicinal markets. Other, large-scale harvesting and processing technologies would be needed if tamanu oil is ever to be produced as a source of biodiesel.

While there is extensive documentation of traditional uses of tamanu oil and many modern anecdotes of healing attributed to it, few rigorous clinical trials have been done. Clinical trials of the efficacy of the oil in treating various diseases would validate its traditional uses.

GENETIC RESOURCES

Despite harvesting and loss of habitat, wild populations of tamanu are healthy and the species is listed on the IUCN "Red List" as a species of least concern (Stevens 1998). There are no current breeding or selection programs.

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INTERNET RESOURCES

- AgroForestryTree database, World Agroforestry Centre: <http://www.worldagroforestry.org/sea/Products/AFDbases/AF/>
- Canoe plants of ancient Hawai'i: <http://www.canoeplants.com>
- Native Plant Network Propagation Protocol Database: <http://www.nativeplantnetwork.org/Network/Search.aspx>

Specialty Crops for Pacific Island Agroforestry (<http://agroforestry.net/scps>)

Farm and Forestry Production and Marketing Profile for Tamanu (*Calophyllum inophyllum*)

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