



# **Looking ahead: Sandalwood markets in 2040**

A market study forecasting the global market future for Sandalwood in 2040

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## Executive Summary

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The global sandalwood market remains buoyant, with current sales of *Santalum album* oil at USD 1,750 (unlicensed production through Dubai) to USD 2,100 (licensed production from India), up to USD 2,500 per kg (some Quintis sales). The heartwood of *S. album* is mostly being traded at more than USD 100 per kg. The markets for Pacific sandalwood species have remained strong: in fact, they have increasingly strengthened since the first Pacific Islands sandalwood began to be exploited and exported to China over two hundred years ago. The price paid for *S. austrocaledonicum* essential oil is USD 1500-1750 per kg (similar to the current *S. album* oil price). The 'village-gate' price for Fiji's *S. yasi* heartwood has steadily increased to USD 50 per kg in 2019 (which is similar to the price paid for exported *S. austrocaledonicum* heartwood).

Sandalwood has several quite distinct, high value end uses which underpin its price and maintain demand in different market segments and regions: these include as an ingredient in fine perfumes, exclusive natural body care products and new pharmaceuticals especially for European and North American markets; for solid furniture, carvings, traditional medicines and religious uses in China, Korea and Japan; for attars, funeral pyres and chewing tobaccos in India and for customary uses in the Middle East.

Quintis (formerly Tropical Forestry Services/TFS), has overcome major liquidity problems (since being shorted by Glaucus in 2017/18) and remains the globally dominant sandalwood plantation and processing company. Quintis – restructured and recapitalised in October 2018 and majority owned by USA investment company BlackRock – owns and manages a vast *Santalum album* plantation resource (c. 5.5 million *S. album* trees covering 12,564 hectares) in northern Australia. Looking ahead it is estimated that Quintis will harvest 1,400 ha of its *S. album* plantations in 2030 yielding 13,230 MT of heartwood and generating 260 MT of oil for export – this equates to more than half of the entire world market demand for *S. album*. However Quintis production costs for sandalwood are high compared with those of smallholders in Fiji, Vanuatu and Tonga. For example, Quintis had establishment fees of c USD 55,000 per ha coupled with an annual fee and rent of USD 4,600 per ha over 15 years. Other Quintis/northern Australian sandalwood production costs are also high cf. Pacific Islands smallholder sandalwood growers, notably harvesting and processing fees of USD 11,000 per ha.

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<sup>1</sup> The latter may include oils produced from *yasi* which meets the EI Sandalwood standard (and is next to indistinguishable)



Furthermore, the quality of the plantation album oil from NW Australia is significantly lower than the wild harvested album and while Quintis are now harvesting the trees at 15 years old, they ought to be delaying harvest by another 5-15 years. Due to the cost of maintaining these album plantations and investor contracts, Quintis cannot afford to keep them for 20-30 years. The planted sandalwood industry in northern Australia is expected to contract over the next few years: it is noted that there have been no new MIS schemes by Quintis since 2016. A reduction in the area of sandalwood plantation in Australia (including no new plantings of *S. album* and *S. spicatum*) will be advantageous for the stability of global sandalwood markets going forward.

The lower costs of Pacific smallholder sandalwood growers place them in a highly competitive market position - given the sandalwood diverse products/end uses and markets - and opportunities to develop forward contracts. However it is essential that sandalwood smallholder growers use the best genetic materials of native sandalwood species in its new, and optimally designed and configured agroforestry plantings. The outputs of ACIARs Pacific Sandalwood Research projects (FST/2016/158 and earlier ACIAR sandalwood projects in Vanuatu), in terms of improved genetic stock of native species, advanced agroforestry systems and informed policy advice to Pacific Islands Governments will be essential for the Pacific planted sandalwood industry to flourish and provide economic benefits to the respective countries and smallholder livelihoods, including for Pacific peoples living on remote islands which have very few other viable cash-income generating options.

## **1. Introduction**

From the beginning of the nineteenth century European traders were exploiting the valuable sandalwood resources of the Pacific to supply the market for incense in the Buddhist temples of China. By 1865 the supplies of sandalwood throughout the Pacific were exhausted and the boom era of trade had virtually come to an end. Since then the supply of sandalwood has fluctuated within Pacific Island nations and over the last decade it has averaged about 270 tonnes per year, equivalent to less than 10% of the levels of cut during the early nineteenth century. Throughout the Pacific Islands, there are few remaining, accessible mature sandalwood trees with reasonable quantities of the sought-after heartwood. Over the past decade, there has been a scramble to source the remaining wild sandalwood in Fiji, Tonga and Vanuatu, principally for oil distillation. This has sometimes led to unsanctioned and illegal activities such as sandalwood theft (typically individual mature trees), wasteful cutting of immature trees and an associated undocumented trade, presumably at a low level, in sandalwood products. Over the next year or two, it is expected that sandalwood production from the Pacific Islands will be reduced, perhaps to only 100 MT per annum from all sources, and dominated by the traditionally better regulated supply of *S. austrocaledonicum* from Vanuatu and New Caledonia. After about 2020, the supply of



sandalwood from the South Pacific Islands will gradually increase as a result of planted sandalwood stocks attaining maturity in Vanuatu, then Fiji and elsewhere.

## 2. Santalum – the genus

The genus *Santalum* includes about 16 described species and 14 varieties, and 1 extinct species, distributed throughout India, Indonesia, New Guinea, Australia and the Pacific islands.

The main species of international commerce are:

***S. album*** (East Indian Sandalwood) – native to Indonesia and India, and presumed naturalized in the Top End of northern Australia. Historically, *S. album* has been generally the most highly regarded sandalwood species in international commerce. The species is now commercially extinct in its native habitats, with most of the future supply coming from plantations in northern Australia (and also from plantations being established in many tropical countries in Asia).

***S. spicatum*** (Australian sandalwood) – native to south-western Australia. The dominant traded sandalwood in recent decades due to more sustainable management by WA authorities: not highly regarded for its oil which has low percentages of santalols and high levels of E,E farnesol, but well suited to incense sticks, carving wood and alike.

***S. austrocaledonicum*** (sandalwood) – native to New Caledonia and Vanuatu. Quality of oil varies with some populations (such as Santo and Malekula in Vanuatu and Isle of Pines in New Caledonia) having extremely high quality oils similar in profile to East Indian sandalwood oil. The progenitor of *S. austrocaledonicum* most likely arrived in New Caledonia by long distance seed dispersal from Australia (approximately 3 million years ago) and after evolving into *S. austrocaledonicum* was later dispersed by birds to Vanuatu. *Santalum austrocaledonicum* is most closely related to *S. leptocladum* Gand. which until recently was considered to be the southerly populations of *S. lanceolatum* (Harbaugh and Baldwin 2007, Harbaugh 2007).

***S. yasi*** (yasi or 'ahi) – native to Fiji, Tonga and Niue. Usually produces an excellent quality heartwood and oil, which meets ISO standards for East Indian sandalwood, although limited analysis suggests an E,E Farnesol level of around 2-3% in its oil: this rather dubious skin allergen may limit use of *S. yasi* oil in Europe for perfume and body care products.

***S. paniculatum*** ('iliahi) – native to Hawai'i. Overall oil quality satisfactory – some chemotypes very good.

Minor species which have been important at different periods in the history of sandalwood exploitation and trade include:



*S. ellipticum* ('iliahi alo'e or coastal sandalwood) – native to Hawai'i. Overall oil quality satisfactory – some chemotypes very good.

*S. macgregorii* (PNG sandalwood) – native to Papua New Guinea. Generally has a poor quality oil profile with the exception of the Western Province population (which may be a different species and much closer to Cape York *S. lanceolatum*)

*S. insularum* (Eastern Polynesian sandalwood) – native to French Polynesia and the Cook Islands. Overall oil quality satisfactory – some chemotypes excellent.

*S. lanceolatum* (northern sandalwood) – native to northern Australia. Generally has a poor quality oil profile with the exception of some Cape York Populations which may be similar to East Indian sandalwood.

*Santalum album* and *S. yasi*, despite the large geographic disjunction in their distributions, are closely related species and are presumed to have arisen from a common ancestor in northern Australia about 3 million years ago. Accordingly it is not surprising that they freely hybridized when these grown together in Fiji and Tonga. Interesting the quite distantly related *S. album* and *S. austrocaledonicum* also hybridize readily as first observed by the consultant in Mangaia, Cook Islands.

### **3. Global sandalwood market report (uses, raw material sources – wild and plantation, demand)**

The global demand for sandalwood and sandalwood oil remains strong, with demand generally outstripped supply over the past two decades and prices increasing for East Indian (*S. album*) sandalwood oil (Figure 1). The price for legally sourced *S. album* oil is USD 2,100 - 2,500 per kg. Over the past 2-3 years the international market place and price for *S. album* oil has gone through an unsettled period due to problems with Quintis, including 'dumping' of oil by Quintis to generate cash to meet pressing loan repayments.

Information on the main centres of sandalwood production and markets is given in Table 1. It is evident that a major shift is underway in almost all traditional areas of sandalwood production, such that planted trees will replace wild-harvested sandalwood resources. This is due to the commercial extinction of sandalwood in almost all of its native occurrences, the main exceptions being *S. spicatum* in Western Australia and *S. austrocaledonicum* in New Caledonia due to a better regulated and monitored environment based on a realistic sustainable yield. At the same time, and over the past 25 years, there has been a considerable R&D effort to determine and document best practices in the cultivation of sandalwoods (propagation, establishment, host species, pruning regimes etc). Planted sources of *S. album* and *S. austrocaledonicum* have overtaken and supplanted wild sandalwood resources of the same species: likewise this pattern will be repeated for *S. spicatum* and *S. yasi* over the next 10-15 years.



There is a real threat to the stability of the sandalwood oil supply and pricing in the near future. If the growing companies (notably Quintis) continue with their current harvesting schedules, there will be a significant oversupply of album oil in the market by 2022. Accordingly there is expected to be a further reduction in the price of plantation album oil possibly to below USD 1,800 in 2022. While the current issues of fluctuating and increased supply of plantation album oil work their way through the marketplace, it is possible that the minimum price might temporarily fall as low as USD 1,200 per kg. Nevertheless, the long term market outlook and prices for sandalwood of high quality, i.e. with high levels of santalols, remains very strong.

A whole range of new uses (and products) for sandalwood will be developed and traditional uses re-established once more reliable and consistent supplies of high quality sandalwood oil are generated through sustainably managed plantations. For example, there remains a major unmet demand to include sandalwood oil in high- and mid-range perfumes, body care products, aromatherapy, traditional eastern medicines, new pharmaceutical products, and top of the range solid furniture. Such uses and associated increased demand from China, India and other Asian economies will underpin the price of better grades of sandalwood oil for the foreseeable, medium and long-term future. It is, however, quite possible that species with inferior oil quality, such as *S. spicatum*, will struggle to maintain their market share in future. Lower grades of *S. album* products (including spent charge) and plantation *Aquilaria* are likely to displace some of the *S. spicatum* currently used in agarbatti.

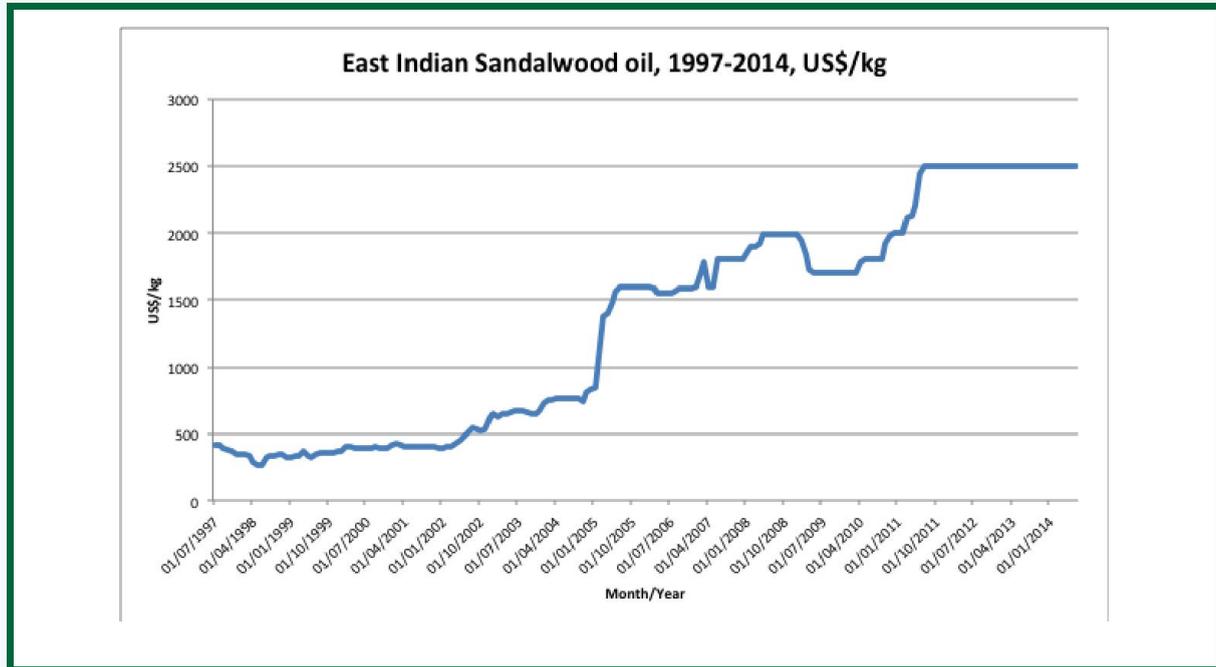


Table 1. Production and markets for sandalwood by country and region (historical, current and predicted future situation in 2040)

Production	Uses, Markets & Predicted Trade Situation in 2040
<p><b>India</b></p> <p>The main source of <i>S. album</i> sandalwood since ancient times (supplying E Asia and the Middle East). During the early 1980s one of the two main producer states (Tamil Nadu) was producing approx. 2000 MT of heartwood per year. The amount of wood being auctioned declined to 1400 MT in 2003 and further to 300 MT in 2013. During the 1970-90s most of the sandalwood heartwood from south India was processed into oil/attar in the northern city of Kannauj (Uttar Pradesh): about 200 MT of oil was being produced (with half being exported) at its peak in the late 1980's and early 1990s. In recent years perhaps up to 90% has been through illegal harvesting. Padmanabha (2013) states that the estimated annual official harvest of sandalwood is currently about 400 MT, yet</p>	<p>Traditionally sandalwood has had major domestic uses – in attars (traditional perfumes), in pan masala &amp; chewing tobacco and for funeral pyres, as well as exported in both unprocessed and processed (mainly oil) forms to East Asia and Middle East. The export of oil is limited, e.g. about 5 MT of oil in 2009. Export of unprocessed sandalwood from India is currently prohibited. It is entirely reasonable to expect that the market for sandalwood products will grow considerably in India, especially for products for which there is already considerable unmet demand, notably for chewing tobacco and attars. Highly priced and high status sandalwood products will be increasingly demanded by India's burgeoning and increasingly wealthy middle and upper class. In 2040 India's population will have doubled to more</p>



total production is approximately 2,000 MT per annum, with the difference of approximately 1,600 MT due to illegal harvesting. The sustainable harvest from wild sandalwood stands in Tamil Nadu, Karnataka and Kerala is likely to be modest (e.g. 2000 MT of heartwood per year, but more likely only 1000 MT). There has been recent (over the past decade) private sector interest in developing sandalwood plantations in India including in more northern locations, such as Andhra Pradesh, Gujarat, Madhya Pradesh, Maharashtra and Rajasthan where the species does not naturally occur and which are free from sandalwood spike disease (a mycoplasma organism). The area currently planted to sandal is estimated to have grown dramatically to an estimated 30,000 ha in 2019 (in both agroforestry configuration and plantations), with the majority of the plantings in Gujarat and Karnataka States, through an initiative of Karnataka Soaps and Detergents Ltd. The estimated yield is 8 MT heartwood per ha on a 25-30 year rotation. It is possible that if silviculture can be improved and spike disease controlled that India could once again become a major producer of album, but at least initially most of the wood would go into the domestic market.

than 1.5 billion from that in 1990 when it consumed approximately 100 MT of *S. album* oil (and exported another 100 MT of *S. album* oil). It is considered that in 2040 India will have become a major importer of sandalwood in two main forms, viz. oil for attars and chewing tobacco and heartwood for carvings and funeral pyres.

#### 2040 production

Plantings - 1000 ha @ 25-30 years or 8000 MT heartwood @ 2.5 % oil (=200 MT oil)  
Wild Stands - 2000 MT @ 5 % oil (= 100 MT oil)

#### 2040 demand

At least 250 MT of oil. It is likely that the local album plantation wood will be mainly used domestically for agarbatti and funeral pyres (rather than oil production) and some oil, especially for soaps/attars. Therefore India will likely be an importer of sandalwood heartwood and/or oil in 2040 but it is difficult to predict by what quantity due to uncertainties in the production, quality and maturation times of its recent plantations in non-traditional sandalwood growing areas (and impacts of spike and other pests and diseases).

### Indonesia & Timor Leste

Major source of *S. album* sandalwood since ancient times (supplying E Asia), at its peak production supplying up 30% of the world trade of sandalwood and oil. Heartwood production has fluctuated considerably over the past century, e.g. 49 MT per year in 1930-31, up to 1400 MT per year in 1967-68, to 400-800 MT per year through 1970s and 1980s, averaging 829 MT per year from 1987-1997 and 363 MT per year from 2001-2007. Towards the end of the 1960's approximately 30 MT of oil per year was exported from Timor but this had declined to 19-22 MT of oil per year in 1987-88 and then to 10-13 MT of oil from 1989-1992 (despite Indonesia's ban on export of unprocessed sandalwood in 1978-79). The main production islands are Timor and Sumba in western

Traditional use in religious ceremonies, especially amongst Balinese Hindus, but mainly valued for exports in both processed (oil) and unprocessed forms.

#### 2040 production

Plantings - No recent inventory has been undertaken, but currently likely to have less than 1000 ha (equivalent) of planted *S. album* (mainly of low quality and in agroforestry settings). The estimated yield from plantings is 6 MT per ha at 30 years. By 2040 it is estimated that 40 ha would be harvested (@ 30 years) or 240 MT @ 3% oil content (or 7.2 MT oil).  
Wild stands - 250 MT @ 3 % oil (or 7.5 MT oil)



<p>Indonesia, and quite unexpectedly a new small population of sandalwood recently discovered growing in north Sumatra. Indonesia has vast areas of land potentially suitable for sandalwood cultivation. However, the current and projected future sandalwood production is likely to be limited, partly due to previous Government laws which meant that all sandalwood belonged to the Government, and the longer rotation periods to produce worthwhile quantities of heartwood (cf. northern Australia and Pacific Islands).</p>	<p><b>2040 demand</b> Local demand for sandalwood and oil expected to remain modest, such that Indonesia (and Timor Leste) will export most of its production, i.e. 400 MT of album heartwood.</p>
<p><b>China including Taiwan</b></p>	
<p>No native sandalwood. PRC has considerable areas of land potentially suitable for sandalwood cultivation in its southern, near coastal frost-free zones. New <i>S. album</i> sandalwood plantations have been developed in southern China (including in Guangdong and Hainan Island) but to date the development of heartwood has been modest according to Chinese researchers (Research Institute of Tropical Forestry) and private sector developers. The current <i>S. album</i> plantation area in southern China is 2,000 ha (mainly interplanted with <i>Dalbergia</i> which may cause problems later due to its heavy shading). The Sandalwood Forest (Qingyuan) Co Ltd in NW Guangdong, established in 2012, has planted 200,000 trees with plans to establish six million seedlings (and more) – the company is well organized and capitalised, but the plantations are expected to develop heartwood slowly and be stressed by annual frosts (and possibly killed back to ground level in case of paradoxical predicted increase in cold winter extremes in northern Asia). In summary, there is considerable uncertainty as to whether PRC will be able to develop commercial substantial plantings of sandalwood producing worthwhile quantities of sandalwood,</p>	<p>Traditionally the major market for sandalwood products, especially for carvings, furniture (cabinets and chests), incense sticks, perfumes and medicines. China is a major importer of sandalwood, in the form of entire logs/butts/roots, sandalwood powder/spent charge and processed incense. It is not possible to provide accurate consolidated data for sandalwood imports into China (as this level of information is not currently being gathered by Chinese Customs). The reported annual import figure (in 2011) of 3,100 MT of sandalwood logs and products into PRC is considered an underestimate due to undocumented trade in rare and expensive woods. A quoted price for imported <i>S. album</i> wood from India into PRC in 2013 was 6,300-8000 RMB/kg or a staggering USD 900-1,150 per kg of heartwood.</p> <p><b>2040 production</b> Plantings – Approx. 70 ha being harvested @ 6 MT/ha (@ 30 years age) or 420 MT (with 2% oil).</p> <p><b>2040 demand</b> With China's growing middle and upper class it will need at least 100 MT of oil per annum for local medicines, perfumes and body care products. For example, annual perfume sales of around USD 1.2 billion are expected to increase four-fold as the perfume market in PRC grows and matures. Sandalwood has been an important ingredient in traditional Chinese medicine but is hardly stocked nowadays due to lack of supply – this situation will change as sandalwood supplies increase and become more reliable at a lower cost (an example</p>



	<p>of the elastic international market for sandalwood). China will also remain the premium destination for larger carving logs and furniture-grade sandalwood – this will continue to be the most highly priced market segment for sandalwood logs: it is difficult to estimate future demand for this segment of the market, but a conservative estimate would be 1000 MT of heartwood per year. One estimate is that sandalwood, if timber supply were available, would be used for 1/3 of the top end furniture market (which is provided by hong mu literally ‘red wood’ which includes sandalwood)– this equates to USD one billion (of which the wood comprises most of its final value).</p> <p>At a minimum, China will require an additional 5,000 MT per annum of plantation album heartwood to meet new and unmet demand for oil, carving logs and solid wood furniture. The local <i>S. album</i> plantation wood in southern China will be mainly be used domestically for local handicrafts and incense products. China will continue to require and import vast amounts of low grade sandalwood products (<i>S. album</i> spent charge, <i>spicatum</i> powder and pre-grind, incense sticks) for incense market.</p>
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**Australia**

<p>Major producer of lower quality sandalwoods for arid and northern regions - <i>S. spicatum</i> (mainly in WA) and <i>S. lanceolatum</i> (mainly from Qld). The WA <i>spicatum</i> industry has for a long time been well-controlled by the Forests Products Commission with approx. 2,150 MT harvested each year. Approximately 1,500 MT of powdered sandalwood is exported by the dominant processor, Wescorp Sandalwood Pty Ltd to agarbatti industry in Asia and Middle East, with 500 MT exported as pre-grind, and a small quantity as unprocessed (mainly for carving and furniture). Major challenges facing the sustainable production of wild <i>S. spicatum</i> include a surge in illegal harvesting in WA and reported dumping of low grade <i>S. spicatum</i> powders into the market.</p>	<p>Limited local use and small domestic market mainly for value-added sandalwood products, such as perfumes, soaps and body care products.</p> <p>Almost the entire (&gt;98%) Australian sandalwood production in 2040 will be destined for export. The product, export market and price will vary depending on species and other factors.</p> <p>The majority of <i>Quintis album</i> wood will be locally distilled in Western Australia (presumably using new distillery apparatus in northern Australia, located near to their plantations). This oil, which meets the ISO East Indian Sandalwood standard will go into fine fragrances and medicinal uses (such as through their joint venture with Santalis Pharmaceuticals for anti-cancer treatments and skin care products – skin cancer, acne treatments etc and body care products (such as through Lush).</p>
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In 2008, 12,000 ha of *S. spicatum* had been planted in WA and by 2014 this had increased to 20,000 ha: the main planting now is replacement direct seeding (for wild harvested *S. spicatum*). The commercial rotation period for *S. spicatum* in arid zones is likely to be 30-35 years (cf. 15-17 years for irrigated *S. album*) with a yield of 3-4 MT of heartwood per ha. Failed MIS schemes are being poorly managed such that, for example, it is reported that 760 ha of *S. spicatum* plantation on one farm has died at age 10 years, due to initial high stockings and lack of thinning (Coakley 2013). Wescorp is working with *S. spicatum* growers to commercialise a seed oil to provide intermediate returns to growers. There is limited production of *S. lanceolatum* wood, although there may be a substantial but poorly documented illegal harvest. The guesstimated current annual production of *S. lanceolatum* from the wild is 150-250 MT of heartwood.

Australia is now the major international producer and supplier of *S. album* wood and oil, through plantations in northern Australia (mainly in Kimberley around Kununurra, NT and north Queensland). Quintis is by far the largest manager of *S. album* plantations globally and currently manages a total area of 12,564 hectares with approx. 5.5 million *S. album* trees across northern Australia.

The more recent Quintis plantations (established after about 2007), using drip irrigation and more appropriate host regimes, are of much higher quality than their early *S. album* plantations. Given Quintis investor and lease arrangements for earliest plantings it is likely that they will need to harvest relatively low quality *S. album* plantations. Quintis logs being supplied into Asian carving markets have a large proportion of 'secondary' or transitional heartwood (which is not preferred) and as a consequence in future they may lose access to these lucrative markets.

The other major *album* producer in Australia is Santanol Pty Ltd. Santanol had about 700 ha of plantation at 8 to 12 years old and growing

Larger pieces of *album* wood (especially longer, straighter, thicker and with a high proportion of heartwood) will be auctioned, especially for Chinese art and furniture markets.

Notes regarding use of *S. album* oil in perfumes:

1. Alexandre Choueiri (2008), head of Lancome UK, speaking at the Sandalwood Conference 2008, Kununurra, WA, noted that of 7,000 classified fragrances since the year 1750, 3212 contain sandalwood notes. Drawing on data from *Fragrances of the World* by Michael Edwards, Choueiri made the point that of (only) 106 current fragrances now listing sandalwood, only 36 detail Indian sandalwood, and of those, only 16 detail Mysore sandalwood. Of the 36 fragrances marketed by leading fragrance houses, two are supplied by Robertet, nine by IFF, four by Drom, two by Takasago and three by Firmenich. Of these 16 current fragrances allegedly employing Mysore sandalwood, four are supplied by IFF, two by Givaudan/Quest, one by Firmenich, and one by Symrise.
2. It is evident that only a very small number of major perfume houses can afford to use genuine sandalwood oils in their creations, or long existing brands (Dior, Chanel, Guerlain). The vast majority of the other companies use much cheaper artificial sandalwood odorants. Besides these glamorous perfume manufacturers, a small number of natural cosmetic/personal care products use - to some extent - the natural product. For example Lush (UK), and Weleda (Switzerland). In other words, the worldwide fragrance market cannot absorb all of the expensive sandalwood oil that will become available through replanting.
3. French organic chemists contend that synthetic santalols do not exist, and will never exist as fragrance ingredients, but that perfumers have at hand quite a number of cheap artificial products with interesting sandalwood odours. They further contend that synthetics cannot provide the performance of the genuine oil which will always be in the highest demand for fine fragrances. The current situation is that



without host trees. In 2013 Santanol purchased 1,746 ha of sandalwood plantation from Elders Forestry in partnership with KKR & Co L.P. (Kohiberg Kravis Roberts) – as a result of this sale the original MIS investors would have only gotten back about half of their original investment. These purchases included about 1,600 ha in the Ord and 120 ha at Lakeland Downs (in North Queensland). Santanol reputedly have a treatment method to induce early sandalwood heartwood and oil production, and intend harvesting the trees at 8 years old and mainly supplying oil. Note: my earlier roadside view of the un-hosted plantings of Santanol is that they appeared to be unhealthy, with low woody biomass and require expensive irrigation and fertilizer inputs. Apparently the trees are now being sprayed aerially every month (which must make it the most expensive tree plantation in the world).

many perfumes are now using these cheaper synthetic sandalwood substitutes but some (an unknown quantity) would likely revert to and/or incorporate sandalwood oil if the price dropped and supply became more consistent (and ethically sourced). Also even for existing up-market brands of perfume, often a proportion of the natural sandalwood oil is currently being substituted with synthetic 'sandalwood' fragrance compounds.

4. E,E-Farnesol (present in high levels in *S. spicatum* and at intermediate levels in some populations of *S. austrocaledonicum* and *S. yasi*), is now included in the list of defined chemical compounds which are considered as "suspected skin allergens" by the EUs Scientific Committee on Consumer Safety . Therefore, any cosmetic product, including alcoholic perfumes, which contain E,E-Farnesol will need to mention it on their packaging, if their concentrations exceed a certain limit (10 ppm and 100 ppm on leave-on and rinse-off products, respectively).

#### 2040 production

Quintis plantations have sandalwood planting density of 500 per ha, which is expected to come down to 420 surviving stems at the final harvest at 14-16 years. The average yield is 22.5 kg heartwood per tree at 25% MC with a yield of 3% oil, i.e. 9.45 MT heartwood per ha. In 2040 it is estimated that 700 ha of *S. album* plantation will be harvested or 6,615 MT. Assuming 95% of the harvest is distilled into oil @ 3% oil (with possibly 5% of heartwood destined for China art/furniture market, but this market is at risk from sub-standard offerings) this would generate c. 200 MT of *S. album* oil for export (or approximately half of the entire likely world market demand for high quality sandalwood oil in 2040, assuming re-incorporation back into perfumes and a substantial new market in medicines, natural body care products and chewing tobacco). It is expected that in 2040, *S. spicatum* and *S. lanceolatum* will continue to be harvested from the wild (similar to current harvest rates), and supplemented to some extent by small amounts of planted *S. spicatum* with approximate harvest of 2,000 MT going into the same markets as today,



	<p>principally incense in Asia and Middle East and carving wood in East Asia.</p> <p><b>2040 demand</b> Local demand for sandalwood products will remain limited in Australia, mainly for imported value added products incorporating oil, such as perfumes, body care products and medicines.</p>
<p><b>Vanuatu</b></p>	
<p>Production initiated in Erromango in 1830. Together with New Caledonia, Vanuatu is the major producer and supplier of <i>S. austrocaledonicum</i>. The only other two countries which have plantings of <i>austrocaledonicum</i> are Cook Islands and Fiji, both very limited in area (&lt; 10 ha).</p> <p>The quantity of sandalwood harvested from Vanuatu has been the most consistent of any Pacific Island country over the past decade. The more even production has been the result of close Government oversight through its sandalwood regulation which restricts harvesting to 80 MT per year and for a short harvesting season of three months from June to August each year, and sandalwood trading season from June to October. Nevertheless, the quantity of heartwood has nearly halved in recent years from 116 MT between 2003 and 2007 to 64 MT from 2008 and 2011: this fall reflects, in large measure, that more easily and accessible mature sandalwood trees have already been harvested. The available export data is limited, viz. 110 MT of wood products in 2009 and 13.59 MT of oil from 2009-11, and indicates that sandalwood harvested in any given year may be stored, processed and traded in subsequent years. The recorded export markets for Vanuatu sandalwood are Fiji (for oil distillation), Hong Kong, PR China, Taiwan, Australia, Republic of South Africa, England, India, France, New Caledonia, Singapore, United Arab Emirates and USA.</p> <p>The most recent inventory of wild sandalwood resources in Vanuatu was undertaken in 2007</p>	<p>Limited local uses and insignificant domestic market mainly for value-added sandalwood products, such as perfumes, soaps and body care products.</p> <p><b>2040 production</b> The main production source will be <i>S. austrocaledonicum</i> mainly from planted trees. There will also be an annual sustainable resource from native stands of c. 50 MT. The plantation area established in 2014 is about 1400 ha (equivalent as most has been established at lower density plantings in agroforestry settings). The estimated average heartwood yield is 46 kg for a 25 year-old tree, 33 kg for a 20 year-old tree and 20 kg for 15 year-old tree. For a density of 300 trees/ha the yield of 100 ha of 15-year trees would be 600 MT of heartwood. If SPSL were, in collaboration with local landowners/partners, to plant an additional 500,000 trees in Vanuatu (say over the next four years) then the additional production in year 2040 from a 2020 planting of 100,000 trees (with survival of 95%) would be 95,000 x 20 kg/tree or 1,900 MT, and considerably increasing the total production for Vanuatu to 2,450 MT. This is approximately 1/3<sup>rd</sup> of what would be being produced in the Australian <i>S. album</i> plantation sector in the same year, but at a much lower cost structure. The cost of sandalwood production (or at least to new investors) in Quintis and other sandalwood operations in northern Australia is high cf. sandalwood production costs in Vanuatu. Investments in any new Quintis sandalwood plantations are likely to incur the following (or similar) costs:</p>



(Gillieson et al. 2008). These field surveys were conducted in regions of known sandalwood populations and estimated a low aggregated density (0.4 trees/ha) of commercially sized trees. Based on the field data, the authors estimated that the current resource on the four islands (Aneityum, Erromango, Malekula and Moso) surveyed to be approximately 210 MT, with another 80 MT estimated on other islands of Vanuatu. The latter figure may be somewhat underestimated and the authors recommended additional surveys be conducted on Tanna and northern Santo.

The rate of sandalwood planting in Vanuatu has been increased markedly over the past two decades, due to the extension efforts of the Department of Forests, VANWODS (micro-credit scheme for women), Vanuatu Chamber of Commerce and private sector, aided by economic analysis, research and development conducted with assistance from AusAID including by Dr Luca Tacconi in early 1990s, SPRIG/CSIRO from 1996-2006, and in recent years by major ACIAR-James Cook University research projects. Between 1993 and 1998, the annual planting rate in Vanuatu was estimated to be around 500 sandalwood trees per annum, but this increased to more than 14,000 per annum between 2000 and 2006. In 2012 Page et al. estimated the total number of sandalwood trees established by smallholders to be between 300,000-600,000 trees plus 150 ha of sandalwood plantations established by corporate entities (SPSL and TRA, the latter now liquidated). SPSL has about 90,000 trees planted at its Summit Estate. SPSL are anticipating their first significant harvests from around 2022, when early plantings reach 15-16 years and expected heartwood production of 50-100 MT. A recent estimate puts the number of trees planted by smallholders at 1.2 million (Vanuatu Daily Post, March 25, 2014) with more than 450 ha equivalent of sandalwood planted (VDoF, August, 2014), but perhaps only half (or less) of these planted sandalwood will develop into reasonably sized, heartwood bearing trees (due to poor management).

- Establishment fee for 1 ha = USD 55,300 per ha (discounted fee rate for 12 or more lots)
- Annual fee and rents for 1 ha = USD 4,600 per ha (x 15 years).

Other Australian/Quintis sandalwood production costs would also be high cf. Vanuatu, viz. harvesting and processing fees of USD 11,000 per ha, plus selling and marketing fees (5% of gross sales) and incentive fees (30% (plus GST) of the amount (if any) by which the actual net proceeds of sale exceed the target net proceeds of sale.



## New Caledonia, French Polynesia & France

NC - production initiated around 1840 on Isle de Pins. Major supplier of *S. austrocaledonicum*. From 1841-1855 about 400 MT of heartwood was exported per year, and the resource was rapidly depleted. From 2002-09, traditional landowners harvested between 35 and 53 MT of heartwood per annum. This wood was provided to two steam distilleries - one on Maré (Loyalty Islands) and the other on the Isle of Pines - for conversion into essential oil. The Maré distillery produced approximately 500-600 kg of essential oil per year and the Isle of Pines distillery produced 900-1,000 kg of essential oil per year (Thomson and Doran 2010). In 2008/9 a new sandalwood oil production unit started operations on Maré island using solvent extraction. This operation is associated with Robertet SA, a French company based in Grasse and extraction rates have reportedly increased to around 6 to 7% of oil yield (Philippe Bourguine, pers. comm.). This compares with the average of 3.1% from steam distillation between the years 2002 and 2008. The increased efficiency of Maré oil extraction operation has contributed to a considerable increase in oil production and export, rising to 3.51 and 5.73 MT in 2010 and 2011, respectively. Between 2007 and 2011, the market for the essential oil of *S. austrocaledonicum* from New Caledonia has been almost exclusively Europe (> 99%), principally France (86%), followed by Germany (6.0%), Spain (2.8%), UK (1.9%), Georgia (1.3%) and the Netherlands (1%). Depending on market and quality, in 2011, this oil sold for 340-703 € per kg and was used principally in top end perfumes, aromatherapy, and beauty care products. The solvent extracted oil may be less attractive for the perfumery industry as indicated by the lower prices being paid for *S. austrocaledonicum* oil from New Caledonia in 2010 and 2011 (declared FOB into France).

The most recent sandalwood inventories on Maré, Loyalty Islands (2003) and on the Isle of Pines (2008) have demonstrated the presence

### 2040 production

The current planting programs for *S. austrocaledonicum* in NC are rather modest (despite having an ambition of planting 100 ha per year in Southern Province). Limited plantings have been undertaken near Poya. The main sandalwood replanting has been in the Loyalty Islands: since 2010, seedlings have been planted at an annual rate of approximately 15,000 trees on Maré and Lifou. About 30 trees are planted for each sandalwood tree harvested, which is 10 times more than the present regulated requirement. This is reputedly an efficiently organized sandalwood reforestation program supported by a private company: seedlings are planted in the wild in their original habitats and without any planted medium or long term hosts. The estimated production in NC in 2040 is predicted to be less than 50 tonnes per year due to short-term pressures to overharvest natural stands and the slow growth of sandalwood planted into native forests and then left to fend for themselves: in such unmanaged environments both sandalwood survival and growth will be low with a project average rotation period of 40-50 years.

The only replanting on French Polynesia in recent years has been for conservation purposes. In future small plantings of *S. insulare* may be undertaken for local artisanal purposes, but there will be no export of sandalwood products from FP for at least the next 30-40 years given slow growth rates and lack of replanting.

### 2040 demand

France has been a major market for sandalwood oil for incorporation into value-added sandalwood products, such as perfumes, soaps and body care products. During the late 1980s and early 1990s when India and Indonesia were the main producers of *S. album* oil, France imported approx. 10 MT of oil per annum (mainly for perfumery). The amount of *S. austrocaledonicum* oil being imported into France from Loyalty Islands (New Caledonia) has been steadily increasing to 5.2 MT in 2011. This is likely to be almost exclusively for Robertet, and



of reasonable quantities of sandalwood that could be harvested on the basis of an annual quota of heartwood (Bourgine 2010). The majority of mature sandalwood was on Isle of Pines with 530 tonnes of heartwood. An apparent increased harvesting rate for Loyalty Islands in 2010-11 may result in shortfall of sandalwood supply in the next few years, as more recent plantings have not yet attained maturity.

The planting programme for *S.austrocaledonicum* has historically been about one to two ha per year in Southern Province (Bourgine 2010). This programme has been conducted mainly on the Isle of Pines and on bare land. On Grand Terre, 15 ha of new sandalwood plantations have been established near La Foa, and 11 ha near Poya by a private investor (Philippe Bourgine, pers. comm.). On the Isle of Pines, the Provincial Forestry Department is working with Wapan distillery to encourage them to finance production of the sandalwood seedlings which are given to the stakeholders. The aim is to make sandalwood replanting part of an integrated operation managed, and financed by the processing and sales of sandalwood. Recipients of sandalwood seedlings are recorded to assist with future inventories, and associated monitoring and evaluation. Sandalwood seedlings are provided to landowners at the rate of five seedlings per harvested tree (up from three seedlings since 2008) to those landowners who harvest their trees. In addition to the seedlings being provided to landowners, the Southern Province has created a forest company which includes a sandalwood planting programme of 100 ha per year over five years commencing in 2012 (Philippe Bourgine, pers. comm.). For the Loyalty Islands, the plan is to replant 30,000 sandalwood seedlings per year; this will be done by smallholders in association with the distillery on the island of Maré.

French Polynesia – short period of intensive production of *S. insulare* (high quality heartwood oil) in 1814-18 mainly from Marquesas to Guangzhou – the quantities are

possibly onward supply to other perfume houses (due to difficulty in obtaining *S. album* oil for current fragrances). One of the best market opportunities for *S. austrocaledonicum* being grown in Vanuatu would be either to supply heartwood to New Caledonia (for processing into oil) or selling processed oil via European-based agent to perfume houses in France (given they have experience with this oil and are currently using it as substitute for *S. album* in their perfume formulations). It is predicted that the demand for Santalum oil will continue to grow in France to approximately 20 MT by 2040 (with the demand rather elastic depending on the availability/price of sandalwood oil).

Rather minor local traditional uses in NC and FP which will continue, but with increasing sales of value-added sandalwood products to expat local and visiting tourists.



unable to be verified (as confounded with supply from Hawai'i and Fiji) but likely to be of the order of several hundred MT per year. No recent production and only very limited replanting occurring in FP.

### Fiji, Tonga, Samoa, Niue & Cook Islands

Production initiated in about 1816 in Fiji. Fiji has been a major supplier of *S. yasi* wood into world market averaging about 50 MT per year over the past decade, while Tonga has averaged about 40 MT per year over the past decade. There have been no comprehensive assessments of the natural resources of *S. yasi* in Fiji, Niue and Tonga: there is a dearth of mature trees (see Huish et al. 2012), and the most viable remnant populations are to be found on Kadavu (Fiji) and 'Eua (Tonga), although in all cases the populations are dominated by younger specimens and smaller size classes. At least three oil distillation operations have been initiated in Fiji over the past 10-15 years, but none has operated for more than a year due to lack of supply.

Both the Fijian and Tongan Departments of Forestry have been promoting sandalwood planting over many years, but the area established has been limited.

Sandalwood is being planted on an increasing scale in Fiji, including through the Department of Forestry's three year Sandalwood Development Project from 2011-13. The DoF has a target of 40,000 sandalwood seedlings planted per annum. Most plantings have been in the dry and intermediate rainfall zones, but trials have also been established at 21 sites in wet zones (> 2,500 mm per annum) by the DoF (Binesh Dayal, pers. comm.). Existing larger plantings in Fiji include:

- i. Kadavu (including protection and management of natural regeneration) involving three villages and several thousand plants,
- ii. Rotuma involving 100 smallholder growers, 27 nurseries, with more than 4500 plants in nurseries and field planted (Nataniela and Thomson 2010),

#### 2040 production

The estimated planted area (equivalent) of sandalwood in 2018 in these five countries is 1000 ha (with more than 80% in Fiji): the main species planted is *S. yasi*, with some *S. album* and hybrids (in Fiji and Tonga), and a small area of *S. austrocaledonicum* and hybrids with *S. album* (in Cook Islands).

The estimated harvest of planted sandalwood in 2040 is 12,000 trees with a total yield of 300 MT heartwood per ha (with 3.5% of oil). The estimated yield from natural stands in 2040 is 65 MT heartwood (with 5% oil). The total production from Fiji and Southern/central Polynesia is 365 MT of heartwood. Almost all of this wood would be exported, mainly in unprocessed form, to East Asia and the Middle East. As larger planted areas are harvested it is likely that there will be more local value adding, through conversion of heartwood into essential oil.

#### 2040 demand

Limited local uses and insignificant domestic market mainly for value-added sandalwood products, such as perfumes, soaps and body care products for expatriate communities and carry-on export/tourist markets.



iii. Naitasiri Province (Viti Levu) by Pacific Reforestation (Fiji) Ltd involving more than 3,000 plants, on an increasing scale since 2005, and including *S. yasi*, *S. album* and hybrids and with excellent performance and growth rates,  
iv. Ra Province (Viti Levu) –recent plantings by Mr Radha Krishna.

Of concern for Fijian industry has been the recent importation of about 50 kg of *S. austrocaledonicum* seed from Vanuatu by one grower – this particular seed source is likely to have a different and less desirable inferior oil profile to *S. yasi*, readily hybridizes with the local *S. yasi* and has the potential to lower the oil quality of future sandalwood production in Fiji. Importation of further seed of *S. austrocaledonicum* has now been banned by the Fiji Government.

Whilst there is considerable enthusiasm amongst Forestry Agencies and landowners for commercially growing sandalwood throughout Polynesia, this has yet to translate into substantial plantations. It is possible, but considered unlikely, that Tonga will become a major source of planted *yasi* in future. Tonga and Samoa combined have an area equivalent to < 30 ha of planted sandalwood in 2019. Sandalwood species also grow well in Cook Islands and Niue but most of the current plantings are only on a small-scale and more of a trial nature. Plantings of *S. album* in Tonga were largely destroyed by Category 4/5 Tropical Cyclone Gita in 2018.

### USA including Hawai'i

Hawai'i is the sole supplier of *Santalum ellipticum* and *S. paniculatum* to the world market. In Hawai'i, it is probable that limited sandalwood exploitation for export to China was initiated in the last decade of the 18<sup>th</sup> Century. The main documented period of sandalwood exploitation was from 1811 to the early 1830's. 16,850 tons were supplied to Guangzhou between 1815 and 1833, with almost all of this wood coming from Hawai'i, i.e.

### 2040 production

The production from wild stands in Hawai'i is expected to be limited in future, possibly averaging up to 50-100 MT heartwood per year if currently protected/little known stands were sustainably harvested. There is little commercial interest in replanting. Hawai'i's renowned 'sandalwood man' Mr Mark Hanson informed in May this year that he had sown 100,000 sandalwood seeds, and sold 3,500 plants (at less than the cost of production).



more than 900 MT per year. Sandalwood exploitation has been sporadic in recent times including 300 MT in 1987/88 and approximately 250 MT per year from 2010-14 to China, Dubai and Sri Lanka. A reasonable guesstimate puts the figure for *S. paniculatum* as much higher, at 600 MT in 2011-12 (Coakley 2013). The recent export phase of sandalwood from Hawaii appears to have almost ceased.

Mark indicated that he has been unable to attract private sector (or Government) investment into sandalwood replanting in Hawaii. Planted sandalwood generally grows slowly in Hawaii such that the project rotation for reasonable heartwood yields would likely average at least 35-40 years: the long rotation would explain the lack of appetite for private investment in sandalwood in Hawaii.

**2040 demand**

USA has been a major market for value-added sandalwood products, such as perfumes, soaps and body care products.

US-based Santalis Pharmaceuticals, Inc. is a wholly-owned subsidiary of Quintis. Santalis was formed to develop a range of prescription and over the counter products based on the botanical drug substance produced by Quintis' *S. album* trees. Santalis has the world-wide exclusive rights to Quintis' East Indian Sandalwood oil for healthcare uses. It is not possible to predict the amount of oil that Santalis will require in future for incorporation into pharmaceuticals – it could range from zero to hundreds of MT.

Limited traditional local uses in Hawai'i.

**Papua New Guinea**

Production initiated in early 20<sup>th</sup> Century and has widely fluctuated. PNG is the only supplier of *S. macgregorii*. From 1997 to 2008 an average of 36 MT of heartwood was exported per year, but there have been no documented exports in recent years.

There has been limited reported replanting of *S. macgregorii* in PNG. In East New Britain, Amruqa has been establishing small scale trial plantings since 2010 with high survival and moderately fast but variable growth rates.

No recorded local uses. Lower value heartwood mainly exported in unprocessed form to East Asia, with limited quantities to TRA/Vanuatu (for processing into oil)

**2040 production**

Likely to be negligible (< 10 MT of heartwood per year) due to past overharvesting of wild stands, coupled with lack of replanting and frequent wildfire in native habitats in Central and Gulf provinces.

**2040 demand**

Insignificant

**Europe (including Germany, Italy, Netherlands, Russia, Scandinavia, Spain, Netherlands & UK)**



<p>No native sandalwood</p>	<p><b>2040 demand</b> Europe and the UK is a major market for value-added sandalwood products, such as perfumes, soaps and body care products. During the late 1980s and early 1990s when India and Indonesia were the main producers of <i>S. album</i> oil, Europe imported 12.5 MT of oil per annum. As for France the demand for Santalum oil is expected to grow in other parts of Europe and the UK to around 20 MT by 2040 (with demand being rather elastic and depending on the availability of consistent supply at a reasonable/stable price from ethical and sustainable sources).</p>
<p><b>East Asia (including Japan, Korea)</b></p>	
<p>No native sandalwood</p>	<p><b>2040 demand</b> Sandalwood is extremely important to East Asian cultures and religions, with the first Buddha being carved out of sandalwood. Sandalwood even features in the creation myth for Korea. It is mainly imported in the form of powdered sandalwood, incense sticks and small logs for carving. Import data is limited, but it is expected that the current demand will be maintained and increased for certain uses such as perfumes and traditional medicines. Meaningful trade data not available.</p>
<p><b>SE &amp; S Asia (including Thailand, Vietnam, Singapore and Sri Lanka)</b></p>	
<p>Minor populations of <i>S. album</i> in Sri Lanka, but not known to have been exported to any extent. Plantation have been initiated in recent times in Sri Lanka: in 2012 over 200 ha of <i>S. album</i> had been planted by Sadaharitha Plantations Ltd and Touchwood Investments Ltd, with the former company expanding its sandalwood plantations at 75-100 ha per year (Subasinghe et al. 2013) with Touchwood planning to also develop sandalwood plantations in Vietnam (nurseries established) and Thailand (40 ha in 2014 with plans for 400 ha in 2015). As for India, the estimated yield for Sri Lanka and Thailand is 8 MT per ha on a 25 year rotation. Note: the countries in SE and S Asia are more climatically suited to sandalwood</p>	<p><b>2040 production</b> Limited production in 2040, but likely to increase 800 MT per year by 2040 based on plantations now being established in Sri Lanka and Thailand</p> <p><b>2040 demand</b> It is difficult to predict the demand for sandalwood in these Asian countries but it is likely that increased domestic demand for sandalwood (in perfumes, medicines, furniture, incense) will absorb a reasonable proportion of the increased domestic production.</p>



cultivation cf. China due to low elevation locations being frost-free.	
<b>Middle East (Oman, Saudi Arabia, United Arab Emirates)</b>	
No native sandalwood	<p><b>2040 demand</b> During the late 1980s and early 1990s when India and Indonesia were the main producers of <i>S. album</i> oil, the Middle East (including UAE and Oman) imported 4 MT of oil per annum, and it is expected that demand will more than treble to &gt; 12 MT oil per annum by 2040. There will also be a continuing strong demand in Saudi Arabia and Gulf States for sticks of heartwood to be burnt at the conclusion of dinners and social evenings.</p>
<b>Africa</b>	
In East Africa (Kenya, Tanzania and Somalia) there is close sandalwood relative and substitute <i>Osyris</i> spp. which have been exploited over the past two decades for a lower grade of sandalwood.	<p><b>2040 production</b> It is expected that all legal and most illegal sources of wild-harvested <i>Osyris</i> will have been overharvested such that there will be almost nil supply of this sandalwood relative and substitute. <i>Osyris</i> species are slow growing shrubs not well suited to commercial production of sandalwood, and the yield from planted sources will be very limited in the medium-long term. There is reportedly interest in developing <i>Santalum album</i> plantations in Africa (Padmanabha 2014, pers. comm.).</p> <p><b>2040 demand</b> Minimal demand from Africa, but expected to increase due to improving African economies and through sandalwood being a desired consumer products (body care and perfumes) by upper/ middle classes.</p>
<b>Latin America</b>	
No native sandalwood. Sandalwood has been recently, in 2010, introduced into Costa Rica and is reportedly growing well in the fertile soils with 40 ha currently planted (Padmanabha 2014, pers. comm.).	<p><b>2040 production</b> It is conceivable that Costa Rica will be producing up to 600 MT per year (based on 100 ha per year x 20 year rotation x 6MT) by 2040.</p> <p><b>2040 demand</b></p>



Modest demand in Latin America, but expected to increase due to improving Latin American economies and through sandalwood being a desired consumer products (body care and perfumes) by upper/ middle classes.

#### **4. Marketing Strategy for Pacific Island sandalwood to maximise niche market value**

A well-developed marketing strategy will be required to optimize the commercial potential of Pacific Islands endemic sandalwoods. The recommended and planned market strategy is to build up its secured sandalwood resource, develop state-of-the-art distillation and processing facilities and then market this branded oil through the services of an established sandalwood trader. Such a strategy, which emphasizes the excellent qualities of *S. austrocaledonicum* oil, while fitting within ISO standard for *S. album*, will maximise returns from the plantation and value-adding operations.

Two complementary and recommended marketing options for further development and investigation are:

- **Option 1:** Develop Pacific Islands niche brand – the focus would be on distilling pure oil from the native species, and then through a reputable sandalwood trading agent, working with a major flavour and fragrance house to develop a perfume based on *S. austrocaledonicum* or *S. yasi* oil
- **Option 2:** Sell wood by type to highest bidder / best market at the time – i.e. larger, straighter pieces into art market – auction on internet; desapped heartwood to other essential oil producers such as NSS in New Caledonia with sapwood/spent charge for incense/agarbatti market.

#### **Key market players and opportunities**

##### **Fragrances and body care products**

Of the 36 fragrances marketed by leading fragrance houses, two are supplied by Robertet, nine by IFF, four by Drom, two by Takasago and three by Firmenich. Of the 16 current fragrances reportedly employing Mysore sandalwood, four are supplied by IFF, two by Givaudin (Quest), one by Firmenich, and one by Symrise. It is evident that only a handful of major perfume houses can afford to use genuine sandalwood oils in their creations, or long



existing brands (Dior, Chanel and Guerlain). The vast majority of the other perfume companies use much cheaper artificial sandalwood odorants. Besides these upmarket perfume manufacturers, a small number of natural cosmetic and personal care products use - to some extent - natural sandalwood products: these include Lush (UK), and Weleda (Switzerland). It would appear that the worldwide fragrance market cannot absorb all of the high-priced sandalwood oil that will be produced by Quintis and others in the near future.

The identified companies using sandalwood oils were Drom Fragrances International ([www.drom.com](http://www.drom.com)), Firmenich ([www.firmenich.com](http://www.firmenich.com)), Givaudan ([www.givaudan.com](http://www.givaudan.com)), International Flavors & Fragrances Inc. ([www.iff.com](http://www.iff.com)), Robertet SA ([www.robertet.com](http://www.robertet.com)), Symrise ([www.symrise.com](http://www.symrise.com)) and Takasago ([www.takasago.com](http://www.takasago.com)). Two natural cosmetic/personal care product companies which are using sandalwood oil and which might be interested in procuring oil from Pacific Islands are Lush (Lush Retail Ltd or Lush Fresh Handmade Cosmetics) ([www.lush.com.au](http://www.lush.com.au)) and Weleda ([www.weleda.com.au](http://www.weleda.com.au)).

### **Pan masala and chewing tobacco market in India**

There is a considerable demand in India for sandalwood oil for inclusion into pan masala and chewing tobacco. For many years during the 2000's this market has been unmet with at least one representative (Mrs Navneet Kaur) travelling to international sandalwood meetings in seemingly desperate quest for sandalwood or oil, with a strong concern that DS would not be able to continue these lucrative product lines (if they could no longer source sandalwood oil). In 2008, the Indian firm Dharampal Satyapal Group (DS Group; [www.dsgroup.com](http://www.dsgroup.com)) indicated to me that they required about USD 100 million per year of sandalwood oil (@ USD700-1000/kg) but they were having great difficulty sourcing from within India.

### **References**

Coakley T (2013). Sandalwood markets and threats. Pp 71-77 in Proceedings of the International Sandalwood Symposium 2012. Edited by M Nagewara-Rao, J. Soneji and D Harbaugh-Reynaud. International Sandalwood Foundation/Lulu Press, USA.

Gillieson D, Page T, Silverman J (2008) An inventory of wild sandalwood stocks in Vanuatu. ACIAR Publication No 2008-08, Australian Centre for International Agricultural Research, Canberra, Australia. 53 pp.

Padmanabha HSA (2013). Sandalwood plantations in agroforestry systems. Pp 186-198 in Proceedings of the International Sandalwood Symposium 2012. Edited by M Nagewara-Rao, J. Soneji and D Harbaugh-Reynaud. International Sandalwood Foundation/Lulu Press, USA.



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Page T, Tate H, Bunt C, Potrawiak A, Berry A (2012a) Opportunities for the smallholder sandalwood plantation industry in Vanuatu. ACIAR Technical Reports No. 79. Australian Centre for International Agricultural Research, Canberra, Australia . 67 pp.

Page T, Tate H, Tungon J, Tabi M, Kamasteia P (2012b). Vanuatu sandalwood: growers' guide for sandalwood production in Vanuatu. ACIAR Monograph No. 151. Australian Centre for International Agricultural Research: Canberra, Australia. 56 pp.

Subasinghe SMCUP, Nawarathne BS, Rohana HK, Hettiarachchi DS (2013). *Santalum album* L.: Current status and research conducted in Sri Lanka. Pp 93-103 in Proceedings of the International Sandalwood Symposium 2012. Edited by M Nagewara-Rao, J. Soneji and D Harbaugh-Reynaud. International Sandalwood Foundation/Lulu Press, USA.

Thomson LAJ (2013). Update on sandalwood resources and trade in the South Pacific. Pp 1-20 in Proceedings of the International Sandalwood Symposium 2012. Edited by M Nagewara-Rao, J. Soneji and D Harbaugh-Reynaud. International Sandalwood Foundation/Lulu Press, USA.

Tate H (2010). Vanuatu. In: Thomson L, Padolina C, Sami R, Prasad V, Doran J (eds) Proceedings of the regional workshop on sandalwood resource development, research and trade in the Pacific and Asian region, November 22-25, 2010, Port Vila, Vanuatu. pp 37-43.

Tacconi L, (1995). An economic analysis of sandalwood cultivation and trade in Vanuatu. In L Gerum, JED Fox and Y Ehrhart (eds.) Sandalwood seed, nursery and plantation technology. Proceedings of a regional workshop for Pacific Island Countries; August 1-11, 1994; Noumea, New Caledonia. RAS/92/361. Field Document No. 8. UNDP/FAO South Pacific Forestry Development Programme, Suva, Fiji. pp 235-257.

Thomson LAJ, Doran JC, Harbaugh, D and Merlin MD. (2011). Specialty Crops for Pacific Island Agroforestry. Farm and Forestry Production and Marketing Profile for Sandalwood (<http://www.agroforestry.net/scps/>).

Thomson LAJ, Doran JC (2010). Historical Perspectives, recent sandalwood trade and future prospects from the Pacific Islands. In: Thomson L, Padolina C, Sami R, Prasad V, Doran J (eds) Proceedings of the regional workshop on sandalwood resource development, research and trade in the Pacific and Asian region, November 22-25, 2010, Port Vila, Vanuatu, pp 117-120

Thomson LAJ (2013). Update on sandalwood resources and trade in the South Pacific . Pp 1-20 in Proceedings of the International Sandalwood Symposium 2012. Edited by M Nagewara-Rao, J. Soneji and D Harbaugh-Reynaud. International Sandalwood Foundation/Lulu Press, USA.