



Manaaki Whenua
Landcare Research

Kānuka industry market scoping and feasibility report

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Kānuka industry market scoping and feasibility report

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Summary

Project and Client

- In 2021, Hikurangi Bioactives Limited Partnership, a majority community-owned Māori entrepreneurial enterprise based in the Waiapū Valley (Tairāwhiti), secured funding from the MPI SFF Futures Fund to explore the potential to build a new industry based on kānuka oil. This 12-month initiative formalised the establishment of Hā Kānuka, a collective of six Māori entities across Aotearoa New Zealand working together to assert Māori interests on the development of a kānuka industry. The market scoping and feasibility report presented here is one of the key outputs from the project, and it is primarily intended to create a shared vision for the entity members.

Objectives

- To understand the commercial potential of kānuka products (limited to oil, honey, and dried leaf), with a focus on oil, concentrating on high-value markets that are likely to be receptive.
- To identify models and lessons from other natural product industries that can inform the establishment of the kānuka industry in Aotearoa.
- This project is intended to benefit Māori entities who have kaitiaki responsibilities for kānuka as a taonga species, and Māori communities who could leverage the opportunities of a successful kānuka industry to achieve their economic, cultural, and environmental outcomes and aspirations.

Methods

To deliver a preliminary market situation evaluation we:

- assessed ITC Trademap data provided from NZTE identifying key international markets that import mānuka honey, and then established the relative size of essential oil imports in these same markets. The rationale was that this would give a high-level indication of the total addressable market for kānuka oil.
- utilised existing publicly available documents and reports, and information gathered from conversations with stakeholders and experts.
- undertook SWOT analysis for the kānuka industry, along with clear drivers and trends analysis, and competitive landscaping. We sought feedback from all kānuka industry players we had identified during the study to ensure the accuracy of our data and key assumptions.

Conclusions

- There are several key challenges for the kānuka industry, including: low awareness of the product, and its benefits and differentiation from mānuka. Lack of industry development has inhibited investment in plantations and infrastructure. Highly variable chemical composition between individual plants. In common with other enterprises based in remote areas with workforce limitations (e.g. lack of housing,

along with capability and capacity issues), investment in a labour force will be required.

- It will be necessary to educate the market about the unique selling proposition of kānuka products. It is critical to invest in Research, Development & Extension RD&E to ensure the consistency of kānuka product standards and to deliver a certification system that both gives consumers confidence and safeguards the industry against fraud. To develop the kānuka product market and create a premium brand, it is critical that kānuka producers work collectively to develop standards, certification, and marketing information and messaging. Building a marketing story based on indigenous provenance stories (whakapapa) led by Māori is a sensible strategy to future-proof the industry, and avoids workarounds that occur when hero compounds are sourced from alternative sources. The continued fragmentation of the kānuka 'industry' through individualistic behaviour is likely to erode any efforts to create a strong cohesive branding story. We therefore advocate for a mahitahi (collaborative) approach.
- There are several key opportunities for the kānuka industry, including earlier investment in scientific studies that give sufficient confidence both in target sectors (e.g. health and wellness) and in the development of useful and meaningful quality standards.
- Our opportunity analysis has identified a compelling case to invest in the collective development of the kānuka industry. There has been demonstrable growth in mānuka oil and related products on the back of the outbreak of Covid, and there is increasing global demand for new indigenous plant extracts. Global markets already understand the value proposition of mānuka honey, mānuka oil, and other indigenous plant products, and the pathway to market is clear and accessible for kānuka products. Key addressable international markets for kānuka oil were identified as North America, Australia, Singapore, and Hong Kong based on ITC Trademap data.

Recommendations

- There is sufficient interest from current and potential Māori producers to invest further effort in building the industry. There needs to be continued effort to convince kānuka producers that the national body exists to provide RD&E for the good of everyone, including activities that no individual entity would invest in alone, and that collaborating does not preclude a house of brands approach.

1 Introduction

1.1 Project aim

1.1.1 Objectives

- To understand the commercial potential of kānuka products (limited to oil, honey, and dried leaf), with a focus on oil, concentrating on high-value markets that are likely to be receptive.
- To identify models and lessons from other natural product industries that can inform the establishment of the kānuka industry in Aotearoa.
- This project is intended to benefit Māori entities who have kaitiaki responsibilities for kānuka as a taonga species, and Māori communities who could leverage the opportunities of a successful kānuka industry to achieve their economic, cultural, and environmental outcomes and aspirations.

2 Background

2.1 What is kānuka?

2.1.1 Brief taxonomy

Kānuka is a tree from the Myrtaceae family that contains economically significant trees including mānuka (*Leptospermum scoparium*), the Australian tea tree (*Melaleuca alternifolia*), those with emerging commercial potential (e.g. kunzea *Kunzea ambigua*), and many other plants with commercial application for forestry, essential oils, horticultural use, and food production. The taxonomic nomenclature of kānuka has caused much confusion over the years as it has shifted according to botanical opinion. Originally classified as *Leptospermum ericoides*, kānuka was transferred to the genus kunzea in 1983, becoming *Kunzea ericoides* (A. Rich) J. Thompson (Thompson 1983). At the same time, Australian and New Zealand species were merged into the one shared species, and it was not until 2014 that the variability within the species was addressed (de Lange 2014). The Kunzea genus in Aotearoa is currently described as comprising ten endemic species, although the validity of this classification is again under review due to having a weak level of genetic support and lack of breeding barriers (Heenan et al. 2022).

2.1.2 Geographic distribution and ecology

With the notable exception of Taranaki, where it is scarce (de Lange 2014), kānuka is common throughout lowland and mountain scrub and along forest margins of the North and South Islands, from the Three Kings Islands to about the Kawarau Gorge and Dunedin in Otago. It is not found naturally south of there. The species have a wide range of tolerances and have been found growing around active geothermal systems. They can be found from sea level to 1800 m. They grow well on all soil types except water-logged soils, and are tolerant of wind, drought, and frost. While de Lange (2014) earlier concluded that

K. robusta is the most common kunzea species in Aotearoa, Heenan et al. (2022), have more recently proposed that *K. serotina* is equally widespread. In Aotearoa, kānuka are well-known plants, being prominent in successional shrublands and secondary forests, and especially prominent in highly erodible, marginal landscapes. Kānuka are important keystone species, acting as pioneer species to colonize disrupted or damaged ecosystems, providing erosion mitigation, an important habitat for other organisms (for example, endemic geckos and fungi), and enabling carbon sequestration.

2.1.3 Contribution to people and taonga status

Beyond their contribution to wellness of te taiao (the environment), kānuka are increasingly recognized for their contribution to human health (e.g. as a rongoā rākau/plant-based remedy), and for their potential to generate economic returns through utilisation in a range of products (e.g. essential oils, honey, herbs and beverages, firewood, timber, and smoking woodchips). From a Te Ao Māori perspective (Māori worldview), kānuka are an important taonga (treasure) species, and we recognize the interconnectedness between kānuka and all the other elements of an ecosystem, as explained to us in our whakapapa (a system that recognizes kin connections). For Māori, centuries of knowledge (mātauranga) about ways of observing and living with these species are handed down through the generations, and having these plants present in our landscapes enable us to reconnect with that knowledge.

It is likely that *K. robusta* is the species most frequently meant when people use the name 'kānuka' but the meaning and origin of 'kānuka' is uncertain (de Lange 2013 in de Lange 2014). The name seems to have first appeared in the East Cape area about 1871 (Orsman 1997 in de Lange 2014). Yet most herbarium specimens collected between 1860 and 1930 refer to all 10 of the currently recognised *Kunzea* species as 'mānuka', and this is the name by which it is still mostly referred to by Māori elders from the northern North Island (de Lange 2014). In the East Cape area, *Kunzea* species were also known as 'maru' (Kirk 1889). In the South Island, based on early herbarium records (the 1830s, 1840s) the French also recorded the name 'titira' and 'atitire' for both *K. robusta* and *K. ericoides*. These names may simply be a transliteration of 'ti tree' (tea tree) because fresh and dried leaves of both *Leptospermum* and *Kunzea* were brewed as a tonic by many Māori who had adopted the 'tea drinking' practice. In the far north of the North Island, aside from 'mānuka', *K. robusta* is still also occasionally referred to by Ngāti Kuri, Te Rarawa, and Ngā Puhi iwi as 'rawirinui', to distinguish it from the smaller and slender 'rawiri' (*K. linearis*) and 'rawiritoa' (*K. amathicola*) (de Lange 2014).

For Māori, the story of kānuka in our landscapes has many parallels to our experiences of colonization and connection to our own cultural values. Before colonization, all decisions about natural resource management and ways of living with te taiao were made within the context of Te Ao Māori. For example, by 1840, 80–90% of the Waiapū catchment was still under natural forest (Harmsworth et al. 2002), with high biodiversity of plant and animal species, and an intimate connection of Māori to our land and the natural world. The implementation of Te Tiriti o Waitangi (The Treaty of Waitangi) in 1840 established Eurocentric systems and ways of thinking and knowing as the dominant paradigm for Aotearoa. In the 19th century, government incentives (e.g. tax breaks for land development and discounted loans) were mechanisms to convert large and often

unsuitable areas of land to pastoral farming (Rhodes 2001). The land wars of the 1860s alienated Māori from our lands (Moewaka Barnes & McCreanor 2019), and where land did remain in Māori ownership or was later returned to us, this was generally the marginal land that was undesirable to the colonists. In the 1970s removal of kānuka 'scrub' on unimproved or reverted hill country land was heavily encouraged through government provision of Land Encouragement Loans (Ministry of Agriculture and Fisheries 1981). Capitalist incentives changed the way that Māori interacted with our whenua (land). For example, in the Waiapū Valley, deforestation led to increased erosion and sedimentation of the waterways (Marden 2012), and ultimately the loss of biodiversity and knowledge about taonga species (Harcourt et al. 2021). Kānuka, deemed a weed by pastoral farmers (Māori and Pākehā) in the 1970s and 1980s, was removed from the landscape.

As described by Bella Paenga (Hikurangi Bioactives Limited Partnership 2020), a huge driver for reconnecting with kānuka as a taonga in our landscapes is the aspirations of the landowners themselves. They want to achieve something new and different on their blocks, to replace sheep and pine. As Māori, reconnection with our whenua and tika (culturally appropriate) ways of behaving, requires us to assess alternative land use opportunities and the way we behave in reciprocity with te taiao from a Te Ao Māori perspective. There is thus a shift towards healing the whenua, choosing land use opportunities that increase biodiversity, adopting methods that privilege mātauranga, and seeking to utilise western science and other Pākehā constructs where we perceive that they add value within our own spaces. One of the key aspirations identified by Māori is to find ways to enable our people to return to our land, to be able to live on and from it. The kānuka industry could enable all this to happen if we can overcome the challenges.

2.1.4 Reconnection with taonga plant species on the landscape

Recent changes to Aotearoa's environmental policy and legislation have signalled a change in the way the government frames methods of working with and thinking about the environment. For example, the National Policy Statement for Freshwater Management (2020) (NPS-FM 2020), acknowledges Māori Indigenous principles and values, and gives prominence to Te Mana o te Wai (TMOTW) (the authority of water itself), which emerges from a Te Ao Māori perspective. Ultimately, TMOTW signals the beginning of a fundamental change in society's relationship with knowledge by expanding what counts as credible knowledge and ways of knowing. Indeed, environmental concepts from Te Ao Māori are now central in A-NZ environmental policy and legislation (Ruru et al. 2017; DOC 2020; MfE 2020, 2021 Bargh & Tapsell 2021).

In recognition of the need to reduce production of net greenhouse gas emissions (excluding biogenic methane) the government set a target to achieve zero emissions by 2050 under the Climate Change Response-Zero Carbon Amendment Act 2019. To achieve this target, the government has created several incentives, a key example being Te Uru Rākau – One Billion Trees (Ministry for Primary Industries 2021), an afforestation scheme that aims to double the current planting rate to reach one billion trees by 2028, with a focus on the right tree, in the right place, for the right purpose. Of the total funds available for tree planting by landowners, two-thirds of the \$240 million funding is earmarked for indigenous species.

A combination of reforestation incentives, reconnection of Māori with our whenua, and exploration of alternative land use opportunities that deliver on aspirations and empower values (for example, enabling the enactment of kaitiakitanga (a type of sustainable natural resource management) has led to the re-emergence of kānuka on the landscape.

2.1.5 Rediscovery of the bioactive potential of indigenous plant species

The advent of microbial resistance and concerns about the use of synthetic chemicals in recent decades has led to a resurgence in utilisation of traditional remedies. The use of indigenous plants by the settlers of Aotearoa for health and wellness applications (Porter & Wilkins 1998), along with mātauranga Māori about rongoā rākau (herbal medicine), provides a starting point for potential product development. For kānuka, there is abundant evidence that bark, leaves, sap, and seeds were all utilised for their medicinal properties (Porter & Wilkins 1998). Reports include infusions for ‘immoral people’, urinary and intestinal complaints, as a febrifuge, sucking the gum for coughs, vapor inhalations for colds, poultices for back pain and skin conditions, inflamed breasts, burns and scalds, and mouthwashes and gargles and gum disease (Brooker et al. 1987 in Perry et al. 1997; Carr 1998). There has been an increase in the publication of scientific studies about the bioactivity of Aotearoa’s indigenous plant extracts (including honey and oil) over the last decade (e.g. see Chen et al. 2016; van Vuuren et al. 2014). Most recently, Shortt et al. (2022) published the findings of a single-blind randomized vehicle-controlled trial that demonstrated that a 3% kanuka oil cream led to a significant reduction in moderate-to-severe eczema. The rise in the number of scientific studies being undertaken in conjunction with Māori partners is particularly exciting, and the Shortt et al. (2022) study arose from a partnership with Hikurangi Bioactives Limited Partnership, who have been actively investing in scientific studies to elucidate the bioactivity of kanuka oil over the last 5 years. The Kānuka Handbook (Hikurangi Bioactives Limited Partnership 2020) was put together by Hikurangi Bioactives to provide potential kānuka industry players with a comprehensive source of information about the environmental and economic potential for the industry.

Hikurangi Bioactives and others (e.g. Wakatū Incorporation) have been strategically investing in research and development to put in place the foundations of a successful industry. Wakatū Incorporation’s in-house RD&E capability in their newly created Auora centre has a key focus on developing new ingredients and products while preserving and enhancing the taonga species of their traditional rohe, Te Tau Ihu (the top of the South Island). For example, Wakatū Incorporation (representing the interests of some 4,000 owners descending from the customary Māori landowners, the whānau and hapū of the Whakatū, Motueka, and Mōhua rohe) has recently partnered with Chia Sisters (an Aotearoa beverage company) to explore the potential health benefits of incorporating kawakawa as part of a bioactive beverage targeted at metabolic and immune health for markets in Japan and Southeast Asia. While many of these RD&E projects have a broad focus on indigenous plants, the point is a growing number of Māori groups are investing in RD&E for products from taonga species.

The mānuka honey gold rush was triggered by the observation some 35 years ago, and subsequent media hype, that mānuka honey had similar antimicrobial potency to

registered antibiotics (Van Eaten 2004). This placed mānuka products in the spotlight, and mānuka is still perceived by many people thinking about generating income streams, to be more economically valuable than other indigenous plants. The reputation of mānuka honey and associated stories about profits to be made in exports is a clear reason. It has been reported that approximately 9.2 million mānuka trees are planted each year across Aotearoa to produce honey (NZ Herald 2020). Mānuka oil production has never achieved the same economic returns (and thus production focus) as honey.

Kānuka has been perceived to be a poor cousin of mānuka since the beginning of the mānuka honey boom (Warhurst 2019; Tyson 2020). In parallel with investment in honey research over the last few decades, validation of the bioactivity of essential oils has also been undertaken, albeit to a far lower extent, possibly because the economic returns were not available. To increase the value and thus perceived hero status of mānuka honey, a deliberate strategy was taken by the mānuka honey marketers to position kānuka as the underdog.

3 Methodology

To deliver a preliminary market situation evaluation we:

- assessed ITC Trademap data provided from NZTE identifying key international markets that import mānuka honey and then established the relative size of essential oil imports in these same markets. The rationale was that this would give a high-level indication of the total addressable market for kānuka oil.
- utilised existing publicly available documents and reports, and information gathered from conversations with stakeholders and experts.
- undertook SWOT analysis for the kānuka industry, along with clear drivers and trends analysis, and competitive landscaping. We sought feedback from all the kānuka industry players identified during the study to ensure the accuracy of our data and key assumptions.

4 Findings

4.1 Understanding current dynamics in relevant markets

The global essential oil industry has exhibited strong growth, which is forecast to continue, with limited Covid impact. Coriolis (2021) reported that globally, \$7.6b of essential oils are sold to personal care and cosmetics (46%), food and beverages (43%), and pharmaceuticals (8%). It has been variously reported that the Covid pandemic has increased demand for natural antimicrobials and wellness products (GlobalData 2020). Allied Market Research (2020) predict that the global essential oil industry will realise an annual compound growth rate of 9.1% because of the Covid stimulus, forecasting the industry to be worth \$11.19 billion USD in 2022.

4.1.1 Inclusion criteria

The top four addressable markets for kānuka honey and oil were identified by tracking total essential oil imports per capita (USD 2019) for those countries with mānuka honey imports (all formats) exceeding US\$2 million per year (for summary data see Appendix 1). These were identified as North America, Australia, Singapore, and Hong Kong (see Table 1). On the back of the success of the mānuka honey industry, there has been a recent focus by some mānuka oil producers to lift the profile of mānuka oil. The findings of Foresights: Mānuka Essential Oil (GlobalData 2020) report that these same markets (North America, Australia, Singapore, and Hong Kong) understand the value proposition of mānuka honey, and by extension, other mānuka-derived products. In this same report (GlobalData 2020), China, Japan, and the United Kingdom were also reported to have a high awareness of mānuka honey.

Table 1 Analysis of market demand-top four (source: ITC Trademap 2021)

Market	Total essential oil imports per capita (USD 2019)	Global ranking mānuka honey imports (A-NZ) USD 2020	Global ranking essential oil imports (total) USD 2019
Singapore	\$30.30	8	11
Australia	\$3.70	6	18
Hong Kong	\$3.59	10	28
North America	\$3.32	2	1

To get an understanding of how kānuka oil (and other products) might resonate with the top four addressable markets (Table 1), and the potential respective opportunities and challenges therein, we undertook market analysis for Australian Tea Tree oil (mature industry) and Australian Kunzea oil (emerging industry), as well as mānuka honey and oil in these same territories. It is critical to first understand which markets hold the best opportunity for kānuka products.

Essential oils from Australia compete with those from Aotearoa for market share. Of the total essential oil production of Australia, 10% is sold domestically, 60% exported to North America, and most of the rest exported to the European Union (Coriolis 2021).

4.1.2 High level market analysis

Australian tea tree oil

Current situation

The Australian Tea Tree oil industry is Australia's largest essential oil export. It is a mature industry, producing around 900 tonnes of oil per year, and worth about \$35.32 million (Taylor 2018). To achieve its current growth status, the industry has had 30 years of government investment in RD&E, including research partnerships with universities, and has been led by an industry body for 25 years.

The Australian Tea Tree Industry Association Ltd (ATTIA) was formed in 1986 to build and drive the Australian Tea Tree oil industry. For 20 years it tried to convince producers to adopt a levy, and finally, in 2017, a Tea Tree oil levy was introduced, meaning that oil produced and sold in Australia by a producer or exported attracts a levy. AgriFutures Australia (the rebranded Rural Industries Research and Development Corporation (RIRDC)) and Plant Health Australia are responsible for spending the levy on emergency plant pest responses and RD&E. The levy is charged at a set rate per kilogram of oil. The take-home message for the kākūka industry is that it took 20 years to convince tea tree oil producers to pay a levy to invest in the industry for the benefit of everyone.

Local demand is relatively small, and 90% of the Tea Tree oil produced in Australia is exported, 54% to North America, 30% to Europe, and 14% to Asia. Despite being an established industry and having strong consumer recognition (Global Data 2020), 80% of all exports are oil in bulk form, with a small fraction utilised in value-add formats (e.g. cosmetics, pharmaceuticals, aromatherapeutic, and veterinary products) (Taylor 2018). Thus, there is considerable potential to add value. Strategic investment in proving scientific efficacy was made early because the industry recognised that consumers perceived the oil to be a low-value home remedy (Thursday Plantation 2015). Investment in scientific studies helped raise the credibility of Tea Tree oil, and by the mid-1990s, its clinical use had been described in monographs published by the World Health Organisation, British Pharmacopoeia, The Pharmaceutical Society of Great Britain (Martindale), and ESCOP (2009). ATTIA, along with AgriFutures Australia, has played a significant role in the growth of the market, publishing a comprehensive dossier on the safety and effectiveness of Tea Tree oil (ATTIA), and AgriFutures Australia has funded the bulk of research on in vitro, and, more recently, clinical studies, to prove its efficacy, primarily as an antibacterial (Carson et al. 2006; Thomsen et al. 2011; Lee et al. 2013; Haines et al. 2021; Yasin et al. 2021; Borotova et al. 2022), but also antifungal (Hammer et al. 2002), anti-viral (Carson et al. 2005), and anti-inflammatory (Finlay-Jones et al. 2001) product.

Collaboration between The University of Western Australia and the Tea Tree oil industry has led to the creation of a dedicated research unit, the Tea Tree Oil Research Group, established and funded by AgriFutures Australia since 1993. For example, Professor Thomas Riley, Chief Researcher in the Tea Tree Oil Research Group, has published more than 50 papers related to the antimicrobial properties of Tea Tree oil during his almost 30-year research term to date. ATTIA ensure that the industry has a strong and growing presence through administering an industry website, and regular communications via newsletters, and they make industry statistics and trade data available to the public.

The Australasian Tea Tree oil industry faced several challenges in growing its market share and entered into a research partnership with AgriFutures Australia 25 years ago, in a programme that 'aims to improve the productivity and sustainability of the Australian tea tree oil industry through research, development and extension (RD&E) projects that reduce barriers in the market and improve production systems with the development and adoption of new varieties and improved agronomic practices'.

The AgriFutures Strategic RD&E programme plan (2018–2022) had 3 objectives:

- Improving supply of Australian tea tree oil through investigation of higher yielding varieties, agronomic advances, reduction in input costs and better adoption of RD&E outputs.
- Increasing demand through the development of innovative uses for Australian tea tree oil, particularly agricultural and cosmetic applications, and ensuring market access.
- Focus on extension, industry sustainability and building human capital.

In addition to reducing production costs, part of the challenge of improving profitability is increasing consumer demand and the price they are willing to pay. The Australian Tea Tree oil industry recognises that it cannot compete with other countries on production costs. China, for example, is the second largest producer of Tea Tree oil and has more economical production technologies. Even though *M. alternifolia* is native to Australia, it has been introduced to many other countries (e.g. China, South Africa, Kenya, Indonesia, and Thailand), and grows just as well in those other countries. Although there are variations in the chemotypes of *M. alternifolia* plants, within and between geographic territories (Borotova et al. 2022), existing publications suggest that Tea Tree oil has good antimicrobial efficacy despite its origins, and that other factors such as extraction, harvesting, and storage methods are likely to also contribute to bioactivity.

Opportunities

In the AgriFutures Tea Tree Oil programme, building the reputation of Australian-sourced oil through traceability and quality assurance is their key strategy to remain competitive in the market. Therefore, communications from the industry refer to 'cheap adulterated product' coming out of these other countries. ATTIA membership gives members access to various rights and permissions for use of the ATTIA logo on their labelling, marketing content, and communications, conveying industry standards of quality and consistency that are globally recognised. Members can be producers or non-producers (e.g. associate member, non-producer member, code of practice (COP) accredited ATTIA producer member).

For example, Thursday Plantation has certification that it uses only 100% pure Australian Tea Tree oil. Other members have elected to become certified to use the COP logo. The chemical composition of *M. alternifolia* oil is defined by international standard ISO 4730:2017, which specifies levels of 15 of the more than 113 components found on Australian Tea Tree oil (e.g. alpha-pinene), as well as several physical parameters (e.g. appearance, odour). Any batch of oil sold by an ATTIA member must be accompanied by an independently tested certificate of analysis demonstrating conformance to these Standards. ATTIA also recommends that the country of origin is clearly declared when purchasing tea tree oil from any supplier. These ISO standards require the oil to have more than 30% terpinen-4-ol and less than 15% cineole. ATTIA state that terpinen-4-ol plays an important role in tea tree oil's antimicrobial activity, and those products containing high concentrations of terpinen-4-ol are thus more desirable (ATTIA 2007). Presumably, where adulteration does occur outside Australia, increasing terpinen-4-ol concentrations of oil will be one of the strategies to lift the value of the product. Further, it is known that extraction processes have a significant impact on terpinene-4-ol recovery (Huynh et al. 2012).

Challenges

The Australian Tea Tree oil industry was built on scientific efficacy rather than on celebrating its geographical origins. By focusing on the chemical activity of *M. alternifolia* on microbes, rather than the provenance of the oil, the Australian Tea Tree oil industry has enabled other countries to capitalise on their efforts to build the market. Clearly, ATTIA recognises that producers in other countries will compete for the same market share. Producers outside Australia are responding by producing their own traceability and quality assurance (e.g. providing safety data sheet, certificate of analysis, and specification sheet), and are meeting the requirements of international standard ISO 4730 (Huynh et al. 2012). Emerging research publications about tea tree oil produced outside Australia, for example from China (e.g. Wang et al. 2021) and Vietnam (Huynh et al. 2012), are establishing credibility for bioactivity of these oils. These producers are also celebrating the differences from oil produced in Australia, for example the lower odour profile of Chinese oil lends it to be 'highly versatile' (Beije).

On the American market, Australian Tea Tree Oil commands a higher price of \$40USD/kg (2022) than oil sourced from the southern China plantations \$28 USD/kg (2022). This price gap may well reduce as Chinese Tea Tree oil builds its own body of scientific validation. The Chinese plantations are yielding higher volumes of oil than Australia currently produces; in 2019, 2.61 million metric tons were produced in China (Wang et al. 2021) compared with just 1000 metric tons from Australia (Larkman 2020).

Thursday Plantation is the largest producer of Tea Tree oil in Australia and provides a good case study for development of the essential oil market. They began commercial production of the oil in 1976, on the back of the oil having a strong legacy of use as a household remedy to treat skin infections in the 1930s and having been a staple part of the Australian soldier's field kit during World War II. Tea Tree oil was exported from Australia during the 1930s to European countries (including the UK, Germany, France, Italy, Denmark, Sweden) for use as a topical germicide.

Thursday Oil recognised the need to invest in plantations back in the late 1980s, to achieve the scale required to enable the industry to grow, and invested heavily in research and development to enhance the plants, harvesting and extraction process, as well as bioactivity of the oil product (Thursday Plantation 2015). They recognised that plantations would enable them to have some control over the inherent variability associated with individual chemotypes of wild plants. Thursday Plantation has a by-line, *Australia's Original*, and makes the statement:

Thursday Plantation's strong heritage underpins all that we are. It supports the trust and authenticity of our brand and our products.

All of our products are developed based on the knowledge that has been passed down through generations combined with the latest scientific research.

The Indigenous voice is notably absent in the Australian Tea Tree oil industry. Where indigenous use is mentioned, this knowledge forms part of marketing collateral that refers to the oil being a tried-and-trusted remedy (referred to as 'folklore' by Twomey in the 1995 Tea Tree Oil National Conference 1995 [ATTIA, 2015]) There is scant reference to the

Bundjalung people of eastern Australia as having used inhalation of the oil from crushed leaves to treat respiratory ailments, topical application of leaves on wounds as poultices, and brewed infusions of leaves as a tea for internal ailments (Carson et al. 2006; AgriFutures Tea Tree Oil 2017). Having built a marketing story based solely on the key chemical constituents of a plant now being grown outside of Australia, in countries with better production efficiencies, it is difficult for the Australian Tea Tree Oil industry to retrofit a unique selling proposition into their branding.

A significant known challenge for Australian Tea Tree oil is the high incidence of adverse reactions. Numerous reports associate high doses of Tea Tree oil with significant skin irritation and mucus membrane damage (Hammer et al. 2006). As specific components including 1,8-cineole are known to be responsible, these can be purified out (Lee et al. 2013). ATTIA has worked hard to overcome the association of Tea Tree oil with skin irritation, skin sensitisation, genotoxicity, phototoxicity, and cytotoxicity through heavy investment in safety and toxicity trials (e.g. The PSC 1989; Elliott 1993; Seawright 1993; Jacobs & Hornfeldt 1994; Del Beccaro 1995; Creig et al. 1999; Aspres & Freeman 2003; Morris et al. 2003; Veien et al. 2004). The AgriFutures levy has been utilised to support RD&E for processes and guidelines that minimise adverse effects and ensure the viability of the industry.

Kunzea oil

Current situation

An example of an emerging Australian industry of relevance to kānuka oil market development is Kunzea oil (Tick bush oil) from the *Kunzea ambigua* plant, indigenous to Australia. Kunzea is the genus shared by *K. ambigua* and different species known collectively as kānuka in Aotearoa (for example *K. ericoides*). Domestic production of *K. ambigua* oil (hereafter kunzea oil) is reported to be 4–5 tonnes per year, putting it on par with the reported annual production of mānuka oil from Aotearoa before the Covid. Like mānuka oil, kunzea oil is identified as an emerging agricultural industry (AUS\$1.6–2 million). The domestic market accounts for AUS\$0–0.5 million (2019) of sales, and most of the exports are as neat oil to North America.

There are currently no dedicated kunzea oil industry body, website, or collective industry profile (e.g. there are no industry newsletters or regular conferences), and no trade data available over and above estimates published by Coriolis (2021). However, Essential Oils of Tasmania (EOT) provides an extraction and formulation hub for essential oils from native Tasmanian trees (e.g. kunzea, boronia *Boronia megastigma*, coastal tea tree *Leptospermum laevigatum*, southern rosalina *Melaleuca ericifolia*, and other plants more broadly (e.g. Lavender *Lavandula angustifolia*, parsley *Petrocelinum crispum*, fennel *Foeniculum vulgare*, peppermint *Mentha piperita*). EOT recently partnered with the Tasmanian Institute of Agriculture (TIA), to boost research for the Tasmanian essential oil and plant extracts industry (UTAS 2021). Most kunzea oil is produced in Tasmania, the geographic region where it naturally occurs at high concentrations. For example, one of EOT's key industry partners is Bush Pharmacy, which harvests wild kunzea on Flinders Island, and is at the beginning of establishing the first kunzea plantation. The current production relies mainly on wild harvest.

Opportunities

The kunzea project is currently underway and has sought to identify wild samples throughout Tasmania to identify superior cultivars for developing commercial plantations. EOT is planning to set up a trial site at Margate for the kunzea cultivars soon, to enable them to select the individuals with the highest oil yield and desirable characteristics (including fragrance and bioactivity).

There are no standards or industry certification developed yet for kunzea oil. EOT recognise that developing internationally recognised standards for kunzea oil is critical to growing the market, and the partnership between TIA and EOT is beginning to build the data required to realise this. As has been the case with tea tree oil, the marketing of kunzea oil has been built on its bioactive properties. There are a growing number of research publications that support claims of kunzea oil as an insecticide (Khambay et al. 2002; Thomas et al. 2009; Park et al. 2017). Other than its use as an insecticide, most of the reported uses of kunzea oil are as a topical treatment for skin and muscle inflammation. We could not locate any scientific publications supporting the anti-inflammatory activity of kunzea oil; however, it has been reported that oil from *K. ambigua* has an alpha-pinene content ranging from 0.6% to 62.5% (Thomas et al. 2010). This is significant for two reasons. First, alpha-pinene is well established to have anti-inflammatory activity when applied as a topical agent to the skin as a known part of a plant extract (Li et al. 2016; Salas-Oropeza et al. 2021), or as a pure compound utilised in an inflammatory assay (Bae et al. 2012; Kim et al. 2015). Second, the alpha-pinene content of *K. ambigua* plant leaves is known to be highly variable, and therefore the content of the oil itself is highly variable (Thomas et al. 2010).

Challenges

To develop an international standard for kunzea oil and achieve quality assurance, careful attention will need to be paid to the levels of components specified (e.g. alpha-pinene is commonly found in many plants) and to the development of consistent oil yields. Thus, there are many challenges to be overcome for the kunzea oil industry and it is early days for growing the market. EOT currently sell 5-ml bottles of kunzea oil (Bush Pharmacy) for AUS\$19; Golden Grove Naturals sells 500 g of kunzea oil for AUS\$435. In comparison, 25 ml of Australian tea tree oil (Thursday Plantation) retails for AUS\$11.



Figure 1. *Kunzea ambigua* flowers (Source: Tann).

Mānuka oil

Current situation

Mānuka oil is in a similar industry growth phase to kunzea oil. The current production of mānuka (*Leptospermum scoparium*) oil from Aotearoa is reported to be 10 tonnes per year (Griffin 2021), up from 4–5 tonnes per year before the outbreak of Covid (NZBusiness 2020), a similar volume to kunzea oil. Assuming mānuka oil averages NZ\$650 per kg, this would suggest the industry is currently worth around NZ\$6.5 million. Note that the production of Australian tea tree oil is about one hundred times greater than production of mānuka and kunzea oils. All essential oils and cosmetics combined generated USD\$176 million in export earnings for Aotearoa in 2017.

As previously captured in a review of the mānuka oil industry growth status (Harcourt 2020), the medium-scale commercial production of mānuka oil has been underway for around 20 years in Aotearoa, in parallel with the development of the mānuka honey industry. The two biggest producers (responsible for 90% of annual production) are Tairāwhiti Pharmaceuticals on the East Cape, and New Zealand Mānuka Group in the eastern Bay of Plenty. Mānuka oil is currently positioned in the health/natural products for wellness market sector based on its triketone content – the chemicals that are responsible for its antimicrobial properties. In the last few years, plantations focused solely on mānuka oil production have begun to emerge, suggesting the mānuka oil market is gaining momentum. One company, Manuka Bioscience, has invested heavily in recent efforts to lift the profitability of the mānuka oil industry. The Auckland-based company sells mānuka oil-based topical wellness products (there are currently 24 products on their website) under the Manuka Rx brand (launched in 2017). In 2021, Manuka Bioscience refreshed its branding and commissioned a promotional marketing piece in *The New Zealand Listener* (Griffin 2021). Manuka Bioscience has a subsidiary, Mānuka Biologicals, that manages six

mānuka plantations in partnership with Iwi landowners, some of whom are shareholders in Manuka Bioscience. Manuka Bioscience state that their customer base is 23,000 customers across Australasia and that they want to expand into other markets (Griffin 2021). It is worth emphasising that even though the four addressable markets on which we focus in this report understand the mānuka value proposition, and have a high consumption of essential oils per capita, mānuka oil is yet to achieve significant traction in those markets.

Opportunities

Manuka Bioscience's current scale, being 200 ha in the East Cape region, can produce up to nine tonnes of mānuka oil, suggesting that supply currently exceeds demand. They have concentrated on marketing mānuka oil as a natural antimicrobial against gram-positive bacteria (bacteria with simple cell walls and lacking an outer membrane) that cause impetigo, blood poisoning, surgical wound infections, and flesh-eating diseases. Beta-triketones in mānuka oil are responsible for strong activity against gram-positive bacteria (Mathew et al. 2020), and it has been reported that mānuka oil is up to 30 times more effective against antibiotic-resistant gram-positive bacteria than Australian tea tree oil (MānukaOil.com). Demand for antimicrobials in the post-Covid global market appears to have increased demand for natural antimicrobials (GlobalData 2020). Parrs, producers of a range of East Cape-sourced mānuka-based skincare essential oils, report a huge increase in demand from markets in Asia and the Middle East since the outbreak of Covid, with sales having tripled in 2020 (*NZ Herald* 2020):

Traditionally we export around 20 percent of what we produce (mainly to Australia and South-East Asia) but this year we have started getting a lot of interest from other places such as the Middle East... Before this year we might have had a query from there about once a month; now we are getting dozens every week. (Andrew Rainham, Parrs)

Manuka Bioscience takes on the Australian tea tree oil industry head-on with its marketing:

At ManukaRx we focus on skin health, not cosmetics. We develop only the highest quality of natural cosmeceutical and bio-active skincare to deliver real results, harnessing the powers of mānuka oil.

80 active compounds

1,000x more powerful than mānuka honey

30x more powerful than Australian tea tree essential oil

Over 1,000 scientific papers & studies

Highest concentration of β -triketones in the world.

Challenges

There is strong geographic variation in the beta-triketone content of mānuka plants (Douglas et al. 2004), and the East Cape-sourced mānuka oil is highly prized due to its very high beta-triketone content. Some mānuka plants from outside the East Cape region of Aotearoa may have low or negligible levels of beta-triketones, including *L. scoparium*

growing in Australia. Beta-triketones are also not present in Australian tea tree oil. As is the case for kunzea and Australian tea tree oils, natural variation in chemical components between individual plants is problematic for *L. scoparium* (Perry et al. 1997; Christoph et al. 1999; Douglas et al. 2004). Mānuka chemotypes enable plants to be assigned to three general groups, based on the ratio of chemical components (monoterpenes: sesquiterpenes: beta-triketones) (see Manuka Oil Beta Triketones). Where marketing of mānuka oil is concerned, the high beta-triketone oils from the East Cape command the highest prices, and marketing collateral is based on scientific research.

There is still no industry body, and mānuka oils derived from outside the East Cape region can either piggyback on the hype created by the scientific research published for the East Cape oils or create their own point of difference. It should also be noted here that the use of the names mānuka, maanuka, and manuka, all referring to *L. scoparium* growing only in Aotearoa, is the subject of a legal challenge by the Mānuka Charitable Trust to secure indigenous intellectual property rights to its use in global markets. A new entry into the mānuka oil industry is Mānuka Oil Technology Limited (Tribal Mānuka Cooperative Ltd), with their oil branded as Tribal Mānuka Oil. They create a point of difference from the high beta-triketone East Cape oils:

The mānuka oil from Northland is far richer in terpene and terpenol compounds than the triketone heavy oil from the East Cape region. The very low triketone count found in the oils from Northland opens the door to a wider potential range of topical and ingestible therapeutic health and wellness applications. (*Tribal Mānuka Cooperative Ltd*)

The Northland- and Coromandel-derived Tribal oil will retail for NZ\$72.30 (20 ml) (Tribal Health Corp. 2021) compared with East Cape derived Manuka Rx oil (NZ\$84.95) for the same volume. Mānuka Oil Technology Limited is targeting the North American market and is in the process of opening a pop-up store in Florida to create an in-market presence. The mānuka oil industry remains highly fragmented and competitive, with no united vision. Māori landowners are over-represented at the lowest end of the value chain (e.g. brush cutting and supply).

Mānuka oil is listed under the New Zealand Inventory of chemicals (CAS 219828- 87-2), ECHA (CAS 223749-44-8), and EINECS (425-630-7); however, there are no international standards or industry certification in place. Thus, as with kunzea oil, significant research is required to understand how to develop standards that are robust and useful given the high chemotype variability.

While there has been significant investment in in vitro validation of mānuka oil bioactivity (Mathew et al. 2020), validation in clinical studies remains underexplored. Until such time as an industry body forms to invest in RD&E on behalf of the industry, individual companies will continue to fund their own research.

The high cost of production means that it is an expensive ingredient in cosmetics and other value-added products, which restricts market growth (e.g. a kilogram of Australian tea tree oil retails for NZ\$75 compared with NZ\$650 for mānuka oil).

However, despite the apparent opportunities to grow the mānuka oil industry, it is at a similar stage to where the Australian tea tree oil was 25 years ago, with a strong need to address production dynamics and extraction efficiencies, along with quality standards and more investment in clinical trials. With no industry body and generating less than NZ\$10 million per year, mānuka oil is still very much an emerging industry.

Though it remains to be validated by market research, the strong aroma of mānuka oil may limit its use in some products, but its potential as a natural alternative to conventional antimicrobials is likely to resonate with consumers. The ability to link this product to the premium-brand image of mānuka honey should help to create trust in an educated market.

Mānuka honey

Current situation – mānuka honey

Understanding the opportunities and challenges faced by the mānuka honey industry during its growth can also give key insights that will be useful to developing the kānuka industry in terms of both honey and oil.

Mānuka honey is a major agricultural industry and a high-value product that attracts a significant retail premium, and honey exports from Aotearoa exceed NZ\$350 million per year, with mānuka accounting for 70–75% of that value. Honeys from Aotearoa receive a price multiple at least seven times higher than other exporting countries. It is the quality, trustworthiness, brand power of Clean Green New Zealand, and the unique attributes of mānuka honey itself, that have created this premium global market position. There has been a shift from companies supplying bulk honey to selling packaged product under their own honey brands to capture more of the supply chain value. The government have identified that the honey industry of Aotearoa can add \$65m in export earnings over the next 10 years (MPI 2020). Currently, just 10% of total registered beekeepers in Aotearoa are export registered.

As with mānuka oil, Māori are over-represented at the lower end of the value chain, primarily as passive recipients (e.g. hive-site rentals). The mānuka honey industry was developed by a few major commercial companies on the back of early scientific research by the Waikato Honey Research Lab in 1984 that showed mānuka honey had significant non-peroxide antimicrobial activity (Van Eaten 2004). Mānuka honey continues to command a significant premium because of that early strategic investment in scientific studies. FDA-approved honey-based devices for wound treatment are generally based on the superior antimicrobial activity of mānuka honey (see Scepankova et al. 2021). Active mānuka honey is sold under multiple quality standards like UMF, MGO, MGS and OMA, a characteristic that quantifies the antimicrobial activity of honey over and above its peroxide activity. This is confusing to customers.

Top 6 mānuka honey companies in Aotearoa based on revenue

Company	Comments
Comvita	Aotearoa's largest honey firm, listed on the public stock exchange in 2018 (\$0.1b, 2020), and have cornerstone shareholders Li Wang 16% and China Resources 9% (Coriolis 2020). Vertically integrated supply chain, with 150+ branded retail stores throughout Asia. Revenue was NZ\$171 million (2019) (AR19). It is the leading mānuka honey brand in China and Hong Kong.
Manuka Health	In 2004 they nurtured a start-up to NZ\$100 million. Manuka Health are vertically integrated and export to over 45 countries, with market leadership in Europe, Japan, China, Australia, New Zealand, and North America. Manuka Health are owned by Hong Leong Company (Malaysia) and Berhad via Guoco Group Limited (Hong Kong). Their revenue was estimated to be NZ\$90–120 million (2018) (Coriolis).
Arataki	Produce some mānuka honey and launched in the Australian market in 2014. Arataki had an estimated revenue of NZ\$20–30 million (2018) (Coriolis).
Oha Honey Group	Owned by Ngāi Tahu Capital via Hoaka Limited. They were founded in 2003, and export mānuka honey to Australia, Malaysia, Singapore, Hong Kong, China, Japan, North America, Canada, UK, Germany, Denmark, and Dubai. Their estimated revenues were NZ\$20–30 million (2018) (Company). Oha Honey Group have several brands that they sell product under, including Watson & Son.
100% Pure Honey	Export mānuka honey to North America, UK, Europe, Middle East, Asia, and Australia. They utilise a customised app to ensure honey traceability and have a global licence with NZ Rugby for the sale of All Blacks branded honey products. Their estimated revenue was NZ\$15–20 million (2019).
Steens	Producer and marketer of high active raw mānuka honey. The business is vertically integrated and has full traceability of all products. Their estimated revenue was NZ\$15–20 million (2019) (Company). Marketing the raw and unpasteurized whole comb extraction technology; track and trace; released artisan UMF27+ raw manuka honey collection (1,000 packages) selling at NZ\$1,800; won packaging award at Dieline Awards, Chicago '19; all driven by the need to differentiate.

Singapore is a sophisticated consumer market receptive to mānuka honey, and the market recognises honey brands that have been produced, packed, tested, and certified in Aotearoa by a UMFHA member company, and promotes that their consumers buy these. Similarly, Hong Kong recognises and promotes UMF® mānuka honey brands (e.g. Comvita). This reinforces the power of having standards and certifications that are internationally recognised and trusted in overseas markets.

Opportunities

Demand for mānuka honey continues to outstrip supply.

Challenges

Due to the high value of mānuka honey, fraud is a huge issue and adulteration continues to pose a risk to product integrity. The economic damage of honey fraud to beekeepers who produce authentic honey has been estimated to be in the order of \$1 billion, as they are now competing with sellers of low-priced fraudulent honey (Phipps 2016).

A trademark claim for use of the word mānuka, if granted, will be a strong move to stop Australia competing for the same consumers. It has been proposed that an additional NZ\$2.2 billion of value could be created by 2033 if the word and associated IP of 'Mānuka' honey is protected (Rawcliffe 2019). Recently, the United Kingdom Intellectual Property Office made a ruling that allows honey from other countries to be sold in the UK as manuka honey. The Mānuka Charitable Trust are appealing this on the grounds that it is an indigenous rights issue, and that the UK is out of step with indigenous intellectual property frameworks and consumers' demand for authenticity and quality (Gifford 2022). The New Zealand and European Union (EU) Free Trade Agreement includes the definition of mānuka and a separate tariff recognising the inherent distinctiveness of mānuka as a taonga species exclusively from Aotearoa (Mānuka Charitable Trust 2022).

There is a high level of fragmentation and infighting within the honey industry, and if this could be overcome by enabling a single voice to emerge, and a clear vision to be identified and articulated, this could help to deliver the potential of the industry. For example, the existence of multiple quality standards (including UMF, MGO, MGS, and OMA) is confusing to the consumer and reflects a lack of a shared vision and agreed strategy for the industry.

There is no national database or national communication strategy. In 2019, commercial beekeepers voted down the ApiNZ Commodity levy, and this could have been invested in RD&E on behalf of the industry. The industry is vulnerable to biosecurity threats like American Foul Brood and Varroa mite, and significant investment is required to safeguard the industry. Although Māori are heavily involved in the honey industry, this tends to be at the lower end of the value chain. The Mānuka Charitable Trust provides a hopeful example of Māori taking control of our taonga species, but the challenges in retrofitting an industry that is fair and just with respect to indigenous people profiting from commercialisation of their taonga are complex and many. Designing a kākā industry from the beginning enables the strategy to place Māori at the core of everything as consistent with Wai262.

Summary of key insights from market analysis

The importance of having a strategic approach to brand, product differentiation and marketing strategy.

Operating as individual companies creates challenges of having a small size and limited resources. Growing business relationships overseas is essential to growing those markets, and investment is required in market research, customer knowledge and strategy development.

In the absence of having an in-market presence, a distribution model is the default option for exporting product. An in-market distributor with local sales contacts and market knowledge will serve the intermediate purpose. The disadvantage of relying on an in-market distributor is loss of control over the brand and pricing strategy. The marketing strategy itself will be heavily influenced by the in-market distributor.

It is critical to understand how to build credibility and resonance for products in export markets. This involves conducting market research and validation studies and finding the right people in the market and at home. There is a fundamental need to identify which

markets present the best opportunities, so that knowledge and connections enable the building of a marketing strategy.

Having a strong industry body is essential to help overcome challenges that no individual company can afford to tackle alone, including the protection of purity, authenticity, and the overall state of the industry. An industry body can help lift the overall profile of the industry by fostering more collaboration and identifying agreed priorities, having more influence over Government and regulators, and a greater ability to enforce rules and stop fraudulent activity. The government and regulators prefer to communicate with a single industry body rather than multiple entities (Boleat 2001). Investment in science and certification standards creates consumer trust and value lift associated with a premium product and protects the industry by delivering on claims.

From a future-proofing unique marketing point of view, one of the key lessons from the Australian Tea Tree and Kunzea industries is that a lack of indigenous presence made them vulnerable to competitors in other countries based on compounds and genetics alone. Taking a provenance marketing approach, and specifically acknowledging Māori in branding and marketing, needs to make sure Māori have leadership over the industry to ensure the brand meets reality.

Developing a national database to facilitate communication between industry members and share information is critical to achieving cohesion.

Summary of key insights from focus industries

Industry	Current growth status NZ\$	Comments
Australian tea tree oil	Mature \$35 million	ATTIA (Industry body) has overcome many of the RD&E challenges faced by the industry and has implemented internal standards and certification. Export-dominant focus, but mostly bulk oil. Long history of investment in RD&E from government. Failure to secure a unique point of difference for Australian <i>M. alternifolia</i> , by concentrating on chemotype alone, has enabled other countries to compete based on production efficiencies and the ability to tell the same stories about the science. Investment in RD&E by other countries to comply to international standards set by ATTIA and validate bioactivity of oils produced outside Australia in peer-reviewed publications is a threat to further growth of the Australian industry.
Kunzea oil	Emerging \$1.6–2 million	No industry body, national data base, or shared vision by Australian kunzea oil producers. Small scale with small recent investment in RD&E via a partnership between Essential Oils of Tasmania and the Tasmanian Institute of Agriculture, to boost research for the Tasmanian essential oil and plant extracts industry. Lots of challenges for quality assurance with high individuality in chemotypes between plants. Small and emerging exports to North America, domestic market-focused at present. No robust trade data available.

Industry	Current growth status NZ\$	Comments
Mānuka oil	Emerging \$6.5 million	As with kunzea oil, this is a highly fragmented industry with no industry body, internal standards, or certification. There has been significant investment in in vitro validation of mānuka oil bioactivity but there remain challenges with the variability of oil chemotypes, and lack of clinical studies. Individual companies are developing their own marketing stories and ways of ranking the chemical components of the oil, presenting a confusing message to consumers. High cost of production means that it is an expensive ingredient in cosmetics and other value-add products, and the market is dominated by bulk oil. Current market is dominated by Australasia and there is a desire to grow exports into other territories. No robust trade data available.
Mānuka honey	Mature \$350 million	High value due to heavy investment in scientific validation of bioactivity over 35 years. Dominated by a few large, vertically integrated players, with in-house presence in global markets, and an export focus. Issues with fragmented certification standards, lack of a levy-funded universal industry body has hampered investment in RD&E on behalf of the industry. Lack of protection for Indigenous taonga status of mānuka has eroded control of the market, with Australia competing for market share.

Based on key insights from the four industries analysed in this report, several aspects need to be explored to understand whether a kānuka industry is feasible.

4.2 Current state of the kānuka industry

There has been little change in the growth state of the kānuka industry since the findings of the review were published in 2020 (Harcourt 2020). Despite kānuka being a known rongoā and compelling evidence for it having scientific efficacy, the kānuka industry remains underdeveloped. The size of the potential commercial opportunity is large; however, the kānuka market is very much in its infancy, being primarily focused on the domestic New Zealand market, and it lacks a cohesive brand profile. A successful kānuka industry would be transformational for Māori, with economic and employment gains to rural communities, self-employment opportunities, enhancing biodiversity on Māori land, and increasing land use options that support social and cultural wellbeing by restoring and supporting the health of the whenua.

4.2.1 Kānuka market players

Kānuka Oil

All companies selling kānuka oil commercially were identified. Companies were approached to ensure any information included in this report was correct. Only those who were happy to have information disclosed in this report have been identified, but statistical analysis has included all companies for which information was available. The criteria for 'commercial sales' was offering products for sale online. Kānuka products were defined as any product featuring kānuka as the hero ingredient.

- There were 18 companies identified selling kānuka essential oil online (Appendix 2), and the average retail price for a 10 ml unit was NZ\$26 (March 2022), noting the average price for a 10-ml unit of mānuka oil was NZ\$36.70.
- Between November 2021 and March 2022, we observed a 44% growth in the number of companies selling kānuka essential oil online.
- 75% of these companies specified that their oil was harvested from *K. ericoides*. It was noted one company had erroneously stated *L. Ericoides*.
- 56% of these companies did not disclose the geographical origins of the brush from which their oil was produced.
- Just two of these companies marketed themselves as Māori enterprises (12.5%); the other 14 companies refer to traditional use of kānuka plants (broadly) by Māori.
- One of these companies was based in Australia (Golden Grove Naturals), and also sold Kunzea, Tea tree (*Melaleuca alternifolia*), and Mānuka oils as part of a broad essential oils range. They noted that kānuka (*K. ericoides*) is endemic to Aotearoa, and that this was the source of their oil. Compare this with mānuka oil, where the geographic origin was always stated on the premium products (e.g. PUR360 Manuka Oil states on the main label 'East Cape Organic' NZ\$138 30 ml compared with Moksha NZ\$9.36 30 ml and no geographic origin given (other than Aotearoa-sourced).
- Only two of the companies specialised in kānuka oil products alone; the other 88% of companies also sold mānuka oil products.
- All the companies rely on direct online sales as their primary sales strategy. The Coromandel-based company, Kanuka Oil NZ, has a key market in Germany. They have customised labeling of their products for the German market, and this is available on Amazon. Kanuka Oil NZ also has retailer distribution in Switzerland.
- Tribal Mānuka Cooperative Ltd support an export-led kānuka whenua development strategy. They have announced plans to open a pilot showcase store in Florida in late 2022. They have direct retail in the United States via third-party apps, and also utilising wholesale distribution.
- Nature In Bottle is a wholesale distributor, with offices in USA, India, and France, who have a direct buying relationship with independent harvesters, farmers, distillers, and suppliers from over 65 countries.
- Golden Grove Naturals is an Australian producer of native essential oils and a key supplier of essential oils from other countries to the domestic Australasian and South East Pacific markets.
- Manuka Biotic (a blend of mānuka and kānuka oil) is sold through 53 retail distributors across Aotearoa, including the health and wellness chain store, Health2000. They have BioGro certification (organic production) and state that their oils are certified, but there is no qualification of this certification on their website.
- 44% of companies identified cite key compounds of interest known to be found in kānuka oil (including alpha-pinene), and two provided examples of chemotype analysis performed for an exemplar batch of their oil (e.g., Golden Grove Naturals 2019 batch, and Aromasense).

Kānuka Honey

Companies selling Kānuka honey commercially were identified as those who offered their products for sale online:

- There were 13 companies identified selling kānuka honey online (March 2022, see Appendix 3)
- As of March 2022, there are still no key buyers for kānuka honey. Kānuka honey is often sold as bush honey (personal communication). The average price for a 500-g unit of kānuka honey was NZ\$18.98, compared with NZ\$26 for a 500-g unit of low bioactivity rated mānuka honey (UMF5). Of the top six mānuka honey companies (generating 15 million+ NZD per year), only 100% Pure New Zealand Honey had kānuka honey for sale.
- 61% of the companies selling kānuka honey identified its geographical source. The provenance story was only strong for a couple of the honey brands (Kai Ora White Label and Tahī). The intergenerational story was a strong narrative for three of the brands (Kai Ora, Tahī, and Tranz Alpine).



KANUKAÖL & BALSAM
aus neuseeland



Figure 2. Examples of different branding strategies by Coromandel company Kanuka Oil NZ, for the two different markets, Germany (above) and Aotearoa (below).

Value-add products based on kānuka derivatives

Value-add products from kānuka do exist, although there aren't many of them (see Table 2). Other than coromandel-based Kanuka Oil NZ's balm, insect repellent and an anti-fungal treatment, there were relatively few products identified which featured kānuka oil as the hero ingredient. Honey-based skincare products continue to be a strong category. We could only identify a single commercial supplier of kānuka leaf (March 2022). Other kānuka products available commercially (March 2022) included firewood and a seedling gifting service. Although there are references to a food tech start-up (Nuka Ltd) that sells kānuka liquid smoke (O'Connell 2021), the products are yet to enter the market.

Table 2. Key examples of kānuka derivatives across broad product categories

Product categories	Oil	Honey	Leaf
Natural medicine (OTC)	Product not yet available on the market- TRG Natural Pharmaceuticals have completed a clinical trial that confirms that 3% kānuka oil cream is effective for treating moderate-to-severe eczema (ACTRN 12618001754235, see Shortt et al. 2022). Species unknown, region Tairāwhiti.	TRG Natural Pharmaceuticals-3 products – Honevo Rosacea NZ\$34.90, Honevo Acne NZ\$34.90, Honevo Cold Sore NZ\$24.90 – all underpinned by a patented topical kānuka honey formulation. Clinical studies underpin the products. Licenced the Honevo range to Taro Pharmaceuticals USA Inc. covering North America, Canada, and Israel. 216 retail distributors across Aotearoa Direct online sales. Species and region unknown.	
Cosmetic formulations	Balm , e.g. Kanuka Oil NZ Balm (kānuka oil, beeswax, cocoa butter, and coconut oil) NZ\$59 (65 g). Species and Region (Coromandel) specified. Sold on Amazon (Germany) and via direct sales. List of main compounds: alpha-pinene, eucalyptol, viridifloral) WashBar Paw balm (kānuka-based repair ointment for dogs) with beeswax and copaiba oil, 50 ml. No species information or source region. Distributed by Kong's NZ Ltd. (pet and vet channel) and SVS Veterinary Supplies for specialist vets (Aotearoa), and Kong's (Aust.) Pty Ltd (Australia). Also sold on Amazon (USA), Singapore (Silversky PTE Ltd.), Hong Kong (Pentagon Premium Pet Products), Japan, Taiwan,	Moisturiser , e.g. Snowberry (P&G) Rejuvenating night cream 50ml \$90 NZD, Snowberry (P&G) Nourishing rich cream 50ml \$90 NZD. Undertake RD&E with University of Auckland. Farmers department stores, leading pharmacies and select independent retail distributors across Aotearoa. Direct online sales. Cleanser , e.g. Au Natural Skinfood On The Spot-Gel Cleanser 50ml. The range started in 2018 as a new skincare subscription service, which delivers products direct to your door in refillable containers for NZ\$79.95/month. Direct online sales.	

Product categories	Oil	Honey	Leaf
	Sweden, Thailand, Malaysia, Chile, The Netherlands, Belgium, and Luxembourg). Moisturiser e.g. New Zealand Native Oils Kānuka and Hemp Seed Oil Hand Cream NZ\$35 100 g. Species unspecified, region Kapiti Coast.		
Dental	e.g. Ecostore toothpaste range NZ\$4.99 300 g -Complete Care (Kānuka oil and magnolia bark), Whitening (Kānuka oil, magnolia bark, baking soda), Propolis (Kānuka oil and magnolia bark, bee propolis). Ecostore Complete Care Mouthwash NZ\$7.99 450 ml (Kānuka oil and magnolia bark, clove oil). Ecostore range present in several retail stores including Countdown supermarkets (e.g., Countdown Cambridge had the complete care toothpaste on the shelf, 31 March 2022). Region-undisclosed. Declare <i>K. ericoides</i> as the source plant Main constituents: alpha-Pinene, Viridifloral, Eucalyptol, p-Cymene, Calamenene, Linalool.		
Beverage/ Food			e.g. The Apothecary , retailing 100g NZ\$35. Species unknown, region Canterbury. List constituents of leaf. States has GRAS rating (Generally Recognised as Safe).
Insect repellent	Kanuka Oil NZ \$22 NZD roll-on (86 g) Species and Region (Coromandel) specified. Sold on Amazon (Germany) and via direct sales List of main compounds: alpha-pinene, eucalyptol, viridifloral.		
Hand sanitiser	e.g. Kanuka Oil NZ . Species and Region (Coromandel) specified. Sold on Amazon (Germany) and via direct sales List of main compounds: alpha-pinene, eucalyptol, viridifloral.		
Aroma spray	e.g. Kanuka Oil NZ . Species and Region (Coromandel) specified. Sold on Amazon (Germany) and via direct sales List of main compounds: alpha-pinene, eucalyptol, viridifloral.		

4.2.2 Key insights from existing kānuka oil, honey, and value-add products

Lack of consistent messaging

Confusion between mānuka and kānuka is a significant issue to be overcome. There is a total lack of consumer awareness of kānuka. While piggybacking on mānuka to promote kānuka is being utilised to get kānuka products into market, there will be limited opportunities to grow kānuka as a unique product. For example, no clear unique selling proposition for kānuka oil as distinct from mānuka oil is being articulated, other than having a 'lighter fragrance' than mānuka oil. A massive differentiation exercise is required.

There are no standards about how kānuka producers, retailers, or wholesalers market their products. Two companies were identified that erroneously referred to kānuka by the wrong taxonomic name (separately as *Leptospermum ericoides* and *Leptospermum scoparium*). There is a lack of consistency in the supporting information supplied about the kānuka products, both in terms of species identification and geographical origin, but also the chemical composition of the derivatives (e.g. oil) themselves. Just two of the companies producing value-add kānuka oil products provided a list of the main compounds that had been confirmed to be present in the oil from laboratory analysis. For example, alpha-pinene, eucalyptol and viridifloral (Kanuka Oil NZ).

A key example about the importance of having consistent messaging to build market trust is demonstrated by the mānuka industry. To differentiate their product from others on the market, Tribal Mānuka Cooperative Ltd states that 'the very low triketone count found in the oils from Northland opens the door to a wider potential range of topical and ingestible therapeutic health and wellness applications'. This may be the case, but at this time mānuka oil continues to be graded and sold according to its triketone content, based upon scientific validation of triketone antimicrobial efficacy (Mathew et al. 2020). Lack of coordinated messaging to consumers is likely to cause confusion, and there remains a need to generate evidence for alternative marketing claims that create awareness amongst consumers in a way that is consistently applied across the industry.

Marketing tied to science

In addition to treating infection and injury (reviewed by McLoone et al. 2020), honey is a key ingredient in various cosmetic formulations (reviewed by Kurek-Gorecka et al. 2020). Mānuka honey products dominate the category in Aotearoa and are generally linked to the plethora of scientific publications about the superior antimicrobial activity of mānuka due to its methylglyoxal content (van Eaton 2014). In addition to piggybacking on scientific publications about the antimicrobial efficacy of mānuka honey, there are several examples of marketing that ride on the few scientific publications about the bioactivity of kānuka honey. For example, Au Natural Skinfood cites research that shows kānuka honey has the highest arabinogalactan content of all kinds of honey in Aotearoa (see Gannabathula et al. 2012) to support their claims that their product is very hydrating:

Research around the active ingredients in Kanuka Honey indicate that it contains more of the beneficial compounds called arabinogalactans (AGPs)

than any other New Zealand Honey. AGPs aid in the repair of inflammatory skin conditions such as acne, eczema, rosacea and cold sores, making Kanuka Honey a very valuable ingredient in topical skincare application. Applying Kanuka Honey directly onto external wounds will draw healing fluids and key nutrients to the affected area, promoting rapid, gentle healing and regrowth of underlying tissues.

Kanuka Honey is relatively new as an ingredient for skincare products, unlike synthetically bleach-based treatments, which tend to dry out the skin, Kanuka Honey is naturally moisturising and leaves the skin in better condition. With this knowledge our team has decided to use this key ingredient in concentrated levels in our new [On The Spot range](#).

Au Natural Skinfood have an aggressive PR campaign, with 96 targeted product placements and articles in the popular press during the past four years since their launch (including, Forbes, Buzzfeed, Mindfood, Good Magazine, and Viva).

Tauranga-based TRG Natural Pharmaceuticals (previously HoneyLab) have undertaken a targeted media campaign to build the scientific credibility of kākūka honey since 2011 (see Holt 2011). Rather than rely on piggybacking on scientific publications about kākūka honey alone to enter the market, TRG's business model was to apply a pharmaceutical approach to natural products by undertaking extensive R&D for a proprietary formulation based on kākūka honey (Honevo) (Fig. 3). By patenting the Honevo formulation and undertaking clinical trials, TRG developed a strong intellectual property position. They were able to choose partners with strong distribution networks and marketing expertise in overseas territories to license the products.



Figure 3. Honevo Rosacea pharmaceutical kākūka honey mask (HoneyLab) is clinically proven.

Marketing based on sound understanding of consumer demands and trends

Another opportunity for driving growth of kānuka products beyond investing in science alone is provided by the companies who have a deliberate strategy to gain consumer trust through utilising existing pathways to market. For example, Washbar (producers of the kānuka paw balm) utilise existing specialist vet distributors (e.g. SVS Veterinary Supplies) to create a reputation as a trusted brand. Ecostore (producers of a kānuka-based dental range) have vast experience selling plant and mineral-based household and personal care products in Asian markets. Many Asian consumers (especially in China) experience and even buy products through recommendations of daigou, so utilising daigou networks is a useful strategy employed by Ecostore (Fiedler & Obushenkova 2021).

4.3 Brief comments about cost of production

Given that the kānuka market is not yet proven and little economic data are available, any financial modelling is reliant on the limited data that exists for the mānuka industry. Insights into potential business models are based on conversations with mānuka industry participants and publicly available data (key sources included: Daigneault et al. 2015; Pizzirani, 2016; MacIntyre 2017; Boffa Miskell Limited 2017; Awatere et al. 2018; Olsen & Lee 2021; Tupu.nz)

Carbon credits can provide additional income beyond kānuka products alone. Carbon credits are based on look up tables that monetise units of carbon sequestered. Different plants species sequester carbon at different rates and thus attract different prices. The carbon prices change over time, for example, in 2020 mānuka trees attracted a price of \$25/NZU and in 2022 the price has increased to \$75/NZU. It should be noted that the ETS scheme is built on several assumptions, including stem density/hectare. It assumes utilisation of the trees will not significantly impair their ability to sequester carbon, because the branchlets (brush) are not part of the carbon accounting. The tree canopy must exceed five metres for the block to qualify for ETS registration.

If planting kānuka (or indeed mānuka), it is important to decide on the purpose of the block because this decision will determine the planting density (stems/hectare) chosen, and where on the terrain the trees will be located. Unlike mānuka, where cultivars have been bred for superior honey production traits, we are not aware of any selectively bred kānuka seedlings, and choices for kānuka are limited to simply using eco-sourced seedlings or planting seedlings sourced from other rohe.

There are several components to consider when forecasting the costs of production: costs associated with establishing and maintaining the trees (development costs); costs associated with harvesting the brush (oil and tea production) and/or honey collection and harvest; costs associated with extraction of the oil from the brush and honey from the hives; and costs associated with sale of the products themselves (e.g. packaging and distribution including warehousing, marketing, and inventory). This analysis is beyond the scope of this report, but the economics of kānuka oil production will be summarised in a targeted guide for Māori land blocks and made available by Hikurangi Bioactives Limited Partnership on their website in late 2022.

4.4 SWOT analysis

4.4.1 Strengths

Indigenous extracts from Aotearoa are renowned for health and wellness products and sustainable production ethos. There has been demonstrable growth in mānuka oil and related products on the back of Covid, and there is increasing global demand for new indigenous plant extracts. Global markets already understand the value proposition of mānuka honey, mānuka oil and other indigenous plant products, and the pathway to market is clear and accessible for kānuka products.

There are several products that can be derived from kānuka trees (e.g. dried leaf-teas and tinctures, honey and essential oil-including value add formats). There is a growing scientific literature to support claims about the bioactivity of kānuka products (Bloor 1992; Porter & Wilkins 1998; Lis-Balchin et al. 2001; Maddocks-Jennings et al. 2005; Maddocks-Jennings, 2008; Van Vuuren et al. 2014; Chen et al. 2016; Park et al. 2017).

4.4.2 Weaknesses

Difficulties exist in educating the current mānuka product market about the unique properties of kānuka products. The perception that kānuka is a lesser version of mānuka means some customers may not be willing to pay a premium price.

Kānuka honey (NZ\$4.50–9 kg wholesale, before costs) is worth much less than mānuka honey (NZ\$18–95 kg subject to UMF rating, before costs). Kānuka honey generates the same return to landowners/apiarists as bush blend honey, and there are currently no key buyers for kānuka honey. This is probably because of the significant investment of time and effort put into creating and protecting the mānuka honey industry, and especially the emphasis on differentiating mānuka from kānuka honey. This has created the image of kānuka as a poor cousin, and it is possible that the stigma associated with kānuka honey being a lesser product than mānuka may have impacted on the market potential of other products from this tree.

While massive hype has been created for mānuka honey in the global market, and there is a perception that mānuka honey has special health-giving properties making it a premium brand, kānuka honey has not benefited from any similar brand development. The A-NZ Government's creation of a formal definition and strict export certification for mānuka honey reflects the value of mānuka honey as an export commodity, and the need to protect the unique profile of this honey against fraudulent behaviour that could erode brand reputation. Industry bodies have been formed to protect the mānuka honey industry and ensure that prices remain high through collective efforts and strategy, such as UMFHA, the rebranded Active Mānuka Honey Association that was formed in 1998 with the launch of the first activity rating for antibacterial efficacy of mānuka honey captured as UMF. In contrast, there is no formal collective for kānuka honey producers. Mānuka producers have a financial incentive to ensure that their honey is of a mono-floral type (e.g. bees have only foraged on mānuka and there is no nectar sourced from other plant species in the honey) but there is no financial incentive to differentiate kānuka honey from bush honey, given that the price paid per kilogram is the same.

As is the case with the other Myrteaceae plants considered in this report, individual kānuka plants vary in their oil composition (Perry et al. 1997). If selective breeding and cultivation are not successful in producing consistent chemical compositions (and potentially bioactivity) this will impact commercial use. The highly variable bioactive composition of kanuka products (e.g. oil chemical composition varies due to the genotype of the individual trees, but also environmental factors and tree age) means care needs to be taken in any marketing based on specific chemotype.

Using kānuka leaves for tea and herbal preparations remains a cottage industry. There are only a limited number of companies buying kānuka foliage, and conversations with some of these companies have revealed that there are limited opportunities for new suppliers at this time. This has been estimated at 500 kg per year. However, this is expected to grow. The average price for finished teas based on indigenous plants from Aotearoa is NZ\$16 (30 g). The current price paid for dried kānuka and mānuka leaf ranges from NZ\$20 to NZ\$60/kg.

Given that many of our Māori communities who are interested in kānuka farming are in remote areas with serious workforce limitations (e.g., lack of housing, along with capability and capacity issues), investment in labour force will be required. A key weakness in driving the kānuka industry forward is the lack of funding. Production efficiencies lay outside of this state of the market report, but production inefficiencies, and specifically lack of current scale and cohesion are significant issues to be addressed.

4.4.3 Opportunities

Indigenous plant extracts have social acceptance as food and medicinal products, and global demand for these is strong. Aotearoa is globally recognised as a source of pure and healthy ingredients and wellness products. Premium pricing in the niche market is a real marketing opportunity. Despite kānuka being a known rongoā, and compelling evidence for it having scientific efficacy, the kānuka industry remains underdeveloped. The size of the potential commercial opportunity is large: A successful kānuka industry would be transformational for Māori, with economic and employment gains to rural communities, self-employment opportunities, enhancing biodiversity on Māori land, and increasing land use options that support social and cultural wellbeing by restoring and supporting the health of the whenua.

To develop the kānuka product market and create a premium brand, it is critical that kānuka producers work collectively to develop standards, certification, and marketing information and messaging. Successful Māori entrepreneurs like Blanche Morrogh (Kai Ora Honey and Hāna Botanicals) whose products already have a global presence are working hard to raise awareness about the benefits of collaboration to raise the profile of the Māori business sector. Recently having returned from a trade mission to Australia, Morrogh stated:

... there are so many amazing Far North businesses offering unique products and services, but the cost of entering the market as a sole entity can often be a barrier. Through innovative collaboration, we can stop working in silos and do things like using the same single licensing, share the cost of a single export

office and scale and price competitively without leaving Northland. (Jensen 2022)

Given that there is scientific evidence that kānuka oil has antimicrobial properties and anti-inflammatory properties, and kānuka honey has immunostimulatory properties *in vitro*, the market potential should theoretically be like mānuka if the image problem can be overcome. The clinical proof that kānuka honey is an effective treatment for acne, cold sores and rosacea (e.g. Honevo has natural pharmaceutical status), and that kānuka oil is an effective treatment for moderate-to-severe eczema, indicates a promising pathway to a high value market. The market potential for kānuka oil is affected by the same challenges that face kānuka honey. Both are limited by the lack of brand development and not having a coordinated marketing strategy. There is evidence that kānuka oil may have therapeutic potential, yet its commercial potential is still not well understood, and this is because the industry is still in its infancy. The mānuka/kānuka oil industry is currently the subject of various Government-funded projects (e.g. the Provincial Growth Fund) and these will contribute to a better understanding of the market potential.

The potential for kānuka products to piggyback on existing global markets for mānuka products seems obvious if the unique selling proposition can be clearly stated to avoid any consumer confusion. Existing channels to market can also be utilised. This will certainly take a collective effort by all members of the supply chain, and the first step would be for the kānuka producers to form an industry body and undertake market research to understand how to position the brand so that it is distinct from mānuka. Although honey export volumes from Aotearoa constitute just 1.5% of the global honey market, our average export price is seven to nine times higher than most other exporting countries. This is proof that having a strong and unique value proposition that is clearly presented to and resonates with the target market works. As with mānuka honey, there are four potential product categories for kānuka honey: cosmetics; food and beverage; natural health products; and pharma. The focus of market development should be to raise the profile of kānuka honey and the products that use it, therefore increasing export demand and price.

4.4.4 Threats

Imports of Kunzea products from other countries, along with the potential for adulterated and fake products emerging when the products begin to command premium prices.

The major component of kānuka oil, alpha-pinene, could be obtained more cheaply from other sources (Porter & Wilkins 1998), and it is dangerous to tie a marketing story to a single compound that is readily found in other plant sources (e.g. eucalyptus, rosemary, citrus, sage, as well as a variety of coniferous trees like the European and North American pine trees). With no requirement for agreed standards, there is potential for producers to utilize adulterated (fake) oil in formulated products. This could erode the reputation of the industry.

The continued fragmentation of the kānuka 'industry' through individualistic behaviour is likely to erode any efforts to create a strong cohesive branding story. It is critical to secure

rights to produce and market products from the *Kunzea spp.* that are endemic to Aotearoa, to future-proof the genetic leakage of these species into foreign territories.

Is the product growth ready?	Not yet	Emerging	Yes	Key risks & challenges	Key opportunities
Consumer demand					
Growing local demand		X		Low awareness of product, its benefits and differentiation from mānuka	Create point of differentiation from mānuka (e.g., focus on anti-inflammatory profile).
Local point of difference			X		
Attractive high-value markets			X		
Biosecurity or other domestic barriers			X		
Efficient systems					
Mechanically harvested		X		Lack of industry development has inhibited investment in plantations and infrastructure	Ongoing research into maximising farming systems (yields, chemotypes, bioactivity etc)
High performance genetics available	X			Highly variable chemical composition between individual plants	
Proven, scalable production model	X				
Required skills for success		X			
Sustainable					
Drought tolerant			X	Thrives in marginal, erodible soils at high risk from the impacts of climate change (e.g., East Coast)	Value-add: leaf-tea, herbs, oil and honey
Low input production			X		
Wide range of uses			X		
Full product utilisation			X		
Indigenous knowledge			X		Growth and interest in Indigenous plants and rongoā (remedies)

Figure 4. Summary of kānuka industry growth status in 2022 (modified from Coriolis 2017).

5 Conclusion

Our opportunity analysis has identified that there is a compelling case to invest in collective development of the kānuka industry. There has been demonstrable growth in mānuka oil and related products on the back of Covid, and there is increasing global demand for new indigenous plant extracts. Global markets already understand the value proposition of mānuka honey, mānuka oil and other indigenous plant products, and the pathway to market is clear and accessible for kānuka products. It will be necessary to educate the market about the unique selling proposition of kānuka products. It is critical to invest in RD&E to ensure consistency of kānuka product standards and deliver a certification system that gives consumers confidence and safeguards the industry against fraud. To develop the kānuka product market and create a premium brand, it is critical that kānuka producers work collectively to develop standards, certification and marketing information and messaging. Building a marketing story based on indigenous provenance stories (whakapapa) led by Māori is a sensible strategy to future proof the industry, and it

avoids workarounds that occur when hero compounds are sourced from alternative sources. The continued fragmentation of the kānuka 'industry' through individualistic behaviour is likely to erode any efforts to create a strong cohesive branding story. Thus, we advocate for a mahitahi (collaborative) approach.

6 Limitations/caveats

While every effort was made to ensure we had representative input from diverse members of the kānuka 'industry' we had varying degrees of feedback from those we identified. All data are current to March 2022.

7 Recommendations

There is sufficient interest from current and potential Māori producers to invest further effort in building the industry. There needs to be continued effort to convince kānuka producers that the national body exists to provide RD&E for the good of everyone that no individual would invest in alone and does not preclude a house of brands approach.

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Appendix 1 – Summary data for total essential oil imports per capita (USD 2019), for countries with mānuka honey imports (all formats)

	Ordered from Manuka Honey	Combined total Manuka 2020 exports from NZ (USD\$)	Essential oils total 2019 global imports (USD\$)	Population	Combined total Manuka 2020 exports from NZ (USD\$ - per capita)	Essential oils total 2019 global imports (USD\$ per capita)	Markets that look interesting per capita
1	World	\$289M	\$5979M				
2	China	\$56M	\$264M	1400M	\$0.04	\$0.19	
3	United States of America	\$44M	\$1096M	330M	\$0.13	\$3.32	
4	United Kingdom	\$40M	\$273M	67M	\$0.60	\$4.08	Interesting
5	Japan	\$40M	\$207M	126M	\$0.32	\$1.64	
6	Germany	\$24M	\$380M	83M	\$0.29	\$4.57	Interesting
7	Australia	\$20M	\$95M	26M	\$0.79	\$3.70	Interesting
8	Saudi Arabia	\$10M	\$107M	33M	\$0.31	\$3.26	Interesting
9	Singapore	\$10M	\$173M	6M	\$1.78	\$30.30	Interesting
10	Kuwait	\$10M	\$10M	4M	\$2.18	\$2.30	
11	Hong Kong	\$7M	\$27M	8M	\$0.87	\$3.59	Interesting
12	Netherlands	\$6M	\$185M	17M	\$0.33	\$10.64	
13	Canada	\$4M	\$123M	38M	\$0.11	\$3.26	
14	United Arab Emirates	\$4M	\$48M	8M	\$0.41	\$5.67	Interesting
15	South Korea	\$2M	\$49M	52M	\$0.04	\$0.95	
	Ordered from Essential oils	Essential oils total 2019 global imports (USD\$)	Combined total Manuka 2020 exports from NZ (USD\$)	Population	Essential oils total 2019 global imports (USD\$ per capita)	Combined total Manuka 2020 exports from NZ (USD\$ - per capita)	Markets that look interesting per capita
1	World	\$5979M	\$289M				
2	United States of America	\$1096M	\$44M	330M	\$3.32	\$0.13	
3	India	\$693M	Too small	1350M	\$0.51		
4	France	\$444M	\$2M	65M	\$6.83	\$0.03	
5	Germany	\$380M	\$24M	83M	\$4.57	\$0.29	Interesting
6	United Kingdom	\$273M	\$40M	67M	\$4.08	\$0.60	Interesting
7	China	\$264M	\$56M	1400M	\$0.19	\$0.04	
8	Iran	\$226M	Too small	83M	\$2.71		
9	Japan	\$207M	\$40M	126M	\$1.64	\$0.32	
10	Ireland	\$190M	Too small	5M	\$38.30		
11	Netherlands	\$185M	\$6M	17M	\$10.64	\$0.33	Interesting
12	Singapore	\$173M	\$10M	6M	\$30.30	\$1.78	Interesting
13	Indonesia	\$167M	\$1M	274M	\$0.61	\$0.00	
14	Switzerland	\$155M	\$0M	9M	\$18.06	\$0.04	
15	Spain	\$136M	Too small	47M	\$2.87		

Appendix 2 – Characteristics of key companies selling kānuka oil commercially online (March 2022) in alphabetical order

Absolute Essential

Brand	Absolute Essential
www.absoluteessential.com	
Direct Sales Online	Yes
Wholesaler	No
Retailer/Distributor	Three in Auckland
Tech/Safety Sheets	No
Certificate of Analysis	No
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	No

Comments:

- Kānuka essential oil
- NZ\$39.95 10 ml
- Species incorrectly identified as *Leptospermum ericoides*
- Website provides information about uses (chest and throat, feet, immune system, digestive health)
- Safety information provided
- List of main compounds: alpha-pinene, viridifloral, Limonene, 1,8-Cineol

Aromasense

Brand	Aromasense www.aromasense.co.nz
Direct Sales Online	Yes
Wholesaler	No
Retailer/Distributor	No
Tech/Safety Sheets	No
Certificate of Analysis	Generic example
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	No

Comments:

- Kānuka Essential oil
- NZ\$125.40 50 ml
- Species (*Kunzea ericoides*) confirmed
- Website provides information about Māori uses of kānuka (combat pain and inflammation, heal wounds and skin irritations, alleviate fevers and promote sleep)
- Describes the smell and appearance of oil, and the distillation process
- List of bioactivity (anti-inflammatory, anti-bacterial, anti-fungal, anti-viral) and potential uses (relieve mild skin ailments including burns, insect bites, cuts and dermatitis, rheumatoid arthritis, fibromyalgia, sore muscles, back pain, intestinal complaints)
- Extensive list of ingredients (and percentages) supplied

Dolphin Clinic

Brand	Dolphin Clinic www.dolphinclinic.co.nz
Direct Sales Online	Yes
Wholesaler	No
Retailer/Distributor	No
Tech/Safety Sheets	No
Certificate of Analysis	No
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	No

Comments:

- Kānuka Essential oil
- NZ\$23.90 10 ml
- Species (*Kunzea ericoides*) confirmed
- Website provide description of uses (anti-inflammatory, muscular pains and sports injuries, skin tonic and relaxant)
- Wild harvested and steam distilled
- General safety information for essential oils supplied

Fire and Ice

Brand	Fire and Ice www.fireandice.co.nz
Direct Sales Online	Yes (NZ only)
Wholesaler	No
Retailer/Distributor	No
Tech/Safety Sheets	No
Certificate of Analysis	No
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	No

Comments:

- Kānuka Essential oil
- NZ\$198 50 ml
- Species (*Kunzea ericoides*) confirmed
- Website provides description of kānuka common names, fragrance, and uses (decongestant for coughs, colds, croup and nasal congestion, hay fever, skin infections, boils, pimples, tinea, cold sores, insect bites and stings)
- List of bioactivity (anti-histamine, anti-viral, anti-fungal, antiseptic, anti-inflammatory)
- General safety information provided

Golden Grove Naturals

Brand	Golden Grove Naturals
www.goldengrovenaturals.com	
Direct Sales Online	Yes
Wholesaler	Producer of Australian oils only; key suppliers of others
Retailer/Distributor	No
Tech/Safety Sheets	Yes
Certificate of Analysis	Example from 2019 batch
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	No

Comments:

- Kanuka Essential oil
- AUS\$625 500 g
- Species (*Kunzea ericoides*) confirmed
- Website provides a description of kānuka oil common names, characteristics, and uses (treat respiratory issues, colds, back pain and skin conditions).
- Safety Data Sheet available
- Technical Document Sheet available

Kanuka Oil NZ

Brand	Kanuka Oil NZ www.kanukaoilnz.com
Direct Sales Online	Yes
Wholesaler	Yes
Retailer/Distributor	Amazon, Germany, Switzerland
Tech/Safety Sheets	Available on request
Certificate of Analysis	Available on request
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	Yes

Comments:

- Kānuka Essential oil
- NZ\$23.90 10 ml
- Species and Region (Coromandel) specified
- Website provides description of kānuka tree and environmental habits, as well as history of the plant's use
- List of bioactivity (anti-microbial and anti-inflammatory) with anti-bacterial, anti-viral, anti-fungal, anti-oxidant properties, and potential uses (applied to skin, compress, inhalation for respiratory diseases, massage oil)
- List of main compounds: alpha-pinene, eucalyptol, viridifloral
- Safety information provided
- Value added skin care products such as Kanuka Balm, Kanuka Balm stick and Kanuka Insect repellent, Hand sanitizer with Kanuka Oil, Aroma spray with Kanuka Oil

Manuka Biotic

Brand	Manuka Biotic
www.manukabiotic.co.nz	
Direct Sales Online	Yes
Wholesaler	No
Retailer/Distributor	53 throughout NZ
Tech/Safety Sheets	BioGro Cert (organic)
Certificate of Analysis	No
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	Yes

Comments:

- Kānuka essential oil
- NZ\$24.95 10 ml
- Species (*Kunzea ericoides*) confirmed
- Website provides list of bioactivity (antibacterial, antifungal, anti-inflammatory) and uses (cuts, scrapes, skin abrasions, acne spots, athlete's foot, cold sores, ringworm, warts, sore throat gargle, insect bites and stings, head lice, molluscum contagiosum, school sores, household disinfectant)
- Certified Organic (Certification by BioGro), wild harvested

Mānuka Sensations

Brand	Manuka Sensations
www.manukasensations.nz	
Direct Sales Online	Yes
Wholesaler	Yes
Retailer/Distributor	Yes
Tech/Safety Sheets	No
Certificate of Analysis	Supplied on request, after purchase
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	Yes

Comments:

- Kānuka Essential Oil
- NZ\$30.00 10 ml
- Species (*Kunzea ericoides*) and geographic location (East Cape) confirmed
- Website provides a description of the extraction process, and characteristics of the oil
- Main compound: alpha-pinene
- List of bioactivity (antifungal, anti-inflammatory, antimicrobial, antibiotic, antiseptic, antiviral) and potential uses (inhalation to dilate lungs, relaxation, aiding memory, insect repellent, acne and fungal treatment, pain relief, laundry additive to clean and refresh)
- Safety information provided

Nature in Bottle

Brand	Nature in Bottle
www.natureinbottle.com	
Direct Sales Online	Yes
Wholesaler behalf of independents	Nature in Bottle is a wholesaler on
Retailer/Distributor	No
Tech/Safety Sheets	Yes
Certificate of Analysis	Yes
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	Yes

Comments:

- Kanuka Essential oil
- NZ\$102.40 500 g
- Species (*Kunzea ericoides*) and region (East Cape) confirmed
- Website provides description of kānuka common names, fragrance, and Māori uses (skin issues, joint and muscular pain and inflammation)
- List of bioactivity (anti-inflammatory, anti-bacterial, anti-fungal) and uses (pain and inflammation, respiratory system and congestion as steam inhalation, rheumatoid arthritis and fibromyalgia, sleep)
- Technical Data Sheet
- Material Safety Data Sheet
- Certificate of Analysis (current batch)

New Zealand Native Oils

Brand	New Zealand Native Oils
www.nznativeoils.co.nz	
Direct Sales Online	Yes
Wholesaler	No
Retailer/Distributor	6 in North Island
Tech/Safety Sheets	No
Certificate of Analysis	No
Kānuka Species Confirmed	No
Geographic Origin of Brush Confirmed	No

Comments:

- Kanuka Essential oil
- NZ\$25 10 ml
- Website provides description of bioactivity (anti-fungal, anti-viral, anti-inflammatory) and uses (muscle relaxant, rheumatoid arthritis and fibromyalgia, burns and insect bites)

NZ Soap and Candle

Brand	NZ Soap and Candle
www.nzsoapandcandle.co.nz	
Direct Sales Online	Yes
Wholesaler	No
Retailer/Distributor	No
Tech/Safety Sheets	No
Certificate of Analysis	No
Kānuka Species Confirmed	Yes (also sell 'kanuka' oil made in India)
Geographic Origin of Brush Confirmed	No

Comments:

- Kānuka Essential oil
- NZ\$16.00 10 ml
- Species and region not specified
- Website provides description of kānuka versus mānuka, and Māori uses (skin, respiratory and digestive ailments), as well as appearance and fragrance
- List of bioactivity (antimicrobial) and uses (minor wounds, acne, and fungal conditions, inhalation for coughs and colds, ease stiff and sore muscles, sleep aid)
- Safety information provided
- Also sell 'Kanuka' essential oil made in India

Phytofarm

Brand	Phytofarm www.phytofarm.co.nz
Direct Sales Online	Yes
Wholesaler	No
Retailer/Distributor	No
Tech/Safety Sheets	No
Certificate of Analysis	No
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	No

Comments:

- Kanuka Essential oil
- NZ\$22 50 ml
- Species confirmed
- Website provides description of kānuka oil uses (antifungal, spasmolytic, anti-inflammatory, massage oil)
- Information provided about harvest season and composition of the kānuka oil (cold-pressed sunflower oil and castor oil for skin penetration)

Pure Nature

Brand	Pure Nature www.purenature.co.nz
Direct Sales Online	Yes
Wholesaler	Yes, through Pure Ingredients Ltd
Retailer/Distributor	No
Tech/Safety Sheets	Yes
Certificate of Analysis	Supplied on request, after purchase
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	Yes, Coromandel

Comments:

- Kānuka Essential oil, certified organic
- NZ\$89 50 ml
- Website provides description of kānuka oil uses (antimicrobial, inhalation for respiratory system, massage oil, calming and relaxing)
- List of main compounds: Alpha-pinene, viridifloral, gamma-terpinene, p-cymene, cis-calamenene, trans-nerolidol, linalool
- Safety information provided

Tribal Mānuka Cooperative

Brand	Tribal www.tribalmanuka.com
Direct Sales Online apps	Yes, United States only via 3rd party apps
Wholesaler	Yes, in the United States
Retailer/Distributor showcase opening in Florida, Q4 2022	Yes, USMCA fulfillment hub, pilot
Tech/Safety Sheets	Yes, for kānuka and mānuka oils
Certificate of Analysis	Yes, for kānuka and mānuka oils
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	Yes, Northland, Taranaki

Comments:

- Sells both kānuka and mānuka oils
- Steam distilled essential oils for therapeutic applications
- US\$49.90 20 ml
- Terpene-based isoprene building blocks deliver primary malicious pathogen inhibitors
- Website provides description of customary Māori uses/applications of kānuka and mānuka oils
- Tikanga compliant oils sourced from customary Māori tribal lands, supports supply kaupapa, uses long-term Taonga Supply Agreements to deliver equitable farm-gate pricing
- Blockchain validated provenance, ESG investment protocols, and carbon neutral production target plan
- Developing US prepper, TSA-linked, amortizable, tea tree landowner agribiz loan programme
- Value adds/market oils as therapeutic remedies for USMCA zone distribution, targeting USD38B HAI niche in USD250B + PA Complementary/Alternative Remedies sector

Zurma

Brand	Zurma www.zurma.co.nz
Direct Sales Online	Yes
Wholesaler	No
Retailer/Distributor	12 Christchurch, 2 South Island, 1 Whangarei
Tech/Safety Sheets	No
Certificate of Analysis	No
Kānuka Species Confirmed	Yes
Geographic Origin of Brush Confirmed	Yes

Comments:

- Kānuka Essential oil
- NZ\$24.60 10 ml
- Species (*Kunzea Ericoides*) and region (Coromandel) confirmed
- Website provides detailed physical description of kānuka oil, and Māori uses (pain and inflammation relief, skin diseases, calmness and sleep)
- List of bioactivity (antibacterial, antifungal, anti-inflammatory, antibiotic, antiseptic, anti-viral) and uses (pain relief, steam inhalations, relaxant, head lice, skin conditions, athletes foot, natural insecticide)
- Organic Certifier: Bio-Gro
- Safety information provided

Appendix 3 – Characteristics of companies selling kānuka honey commercially online (March 2022)

Company/brand	Comments
Wax Eyed Bees	500g \$22.99 New World
Kai Ora White Label	500 g \$17.00 Northland (Te Hiku O Te Ika). Direct sales and 12 retailers throughout Aotearoa. Hong Kong (178 Degrees online wholesaler), Australia (Bee 2 Body Ltd wholesaler; G&M Orient PTY Australia Distributor), Japan (Mariri New Zealand retailer online wholesaler), Romania (Dr Green-Shopping City retailer online).
Tranz Alpine Kanuka Honey	500g \$23.99 Coastal South Island (mid-Canterbury). Certification including (USDA Organic, New Zealand Com, Certified Organic). Exports to 28 countries and 5 continents including: Singapore, Japan, Middle East, Europe, North America.
PollenNation	500g \$15.90 Nelson ComplEat Wellness
Mahurangi Honey	500g \$15 NZD Mahurangi Peninsular. Claim their kānuka batches have a NPA of 4.2 (62 MGO).
Mountain Valley Honey	500g \$19.95 Marlborough Sounds, Mt Richmond Forest Park
Manuka Corner	500g \$18 NZD Central Plateau and Waikato. Direct online sales.
Puhoi Honey	250g \$16.99 NZD Amazon. They state "The bees that make it, gather pollen from the Kanuka tree (<i>Leptospermum Scoparium</i>)"
The Honeyman	250g \$25 NZD ships direct to: Hong Kong, Singapore, Australia, North America (also: China, South Korea, Taiwan, Vietnam, Canada, Fiji, France, Germany, Hungary, Ireland, and United Kingdom). Distributors.
Avoca New Zealand	250g \$17.30 Bay of Islands
100% Pure New Zealand Honey	250g \$10 NZD No geographic information
Hunt and Gather Bee Co	250g \$15 NZD Waikato
Tahi Kanuka Honey	250g £29.99 Selfridges&Co US\$29 (Kiwiimporter.com) While Kanuka honey is not as well researched as Manuka, It also has antibacterial properties superior to that of 'regular' honey and also has unique anti-inflammatory properties.