Socio-Economic Report on Tea Tree Oil 2026

by **Jisha Das** & **Peter Greenhalgh**[1]

Contents

Why this report matters now

Tea tree oil (TTO) is one of the world's most recognisable natural ingredients. Distilled from *Melaleuca alternifolia*, it has moved from traditional use to become a widely incorporated component in cosmetics, personal care, hygiene and wellness products. Over more than a century of commercial development, a global value chain has emerged linking farmers, processors, manufacturers and brands across multiple continents.

Behind this international trade lies a network of rural communities whose livelihoods are closely tied to the crop. In Australia, plantation systems supply much of the world's authenticated TTO. In parts of Africa, cooperative and out-grower models connect smallholder farmers to international markets. In China and other regions, decentralised cultivation and local processing provide seasonal income and rural employment. Although these production systems differ, they share a common reliance on stable demand and predictable market access.

At the same time, regulatory approaches to naturally complex substances are evolving. Within the European Union, discussions concerning the classification and safe use of certain natural ingredients have brought increased attention to TTO. These developments illustrate a broader challenge: how regulatory frameworks designed primarily for single chemical substances should address botanical materials composed of many naturally occurring constituents.

IFEAT commissioned this Socio-Economic Report to provide a structured overview of the TTO sector at this moment of transition. The report brings together information from producing countries, industry participants, scientific literature and regulatory sources to present a comprehensive picture of the supply chain and its wider implications.

In particular, the report aims to provide an evidence-based perspective on:

- the scientific and regulatory context surrounding TTO
- the structure of the global production and supply chain
- the socio-economic role of the crop in producing regions
- environmental and sustainability practices emerging within the sector
- the potential implications of regulatory developments for producers and downstream users

The purpose is not to advocate a particular regulatory outcome. Rather, it is to provide context and clarity so that policymakers, industry stakeholders and consumers can better understand the broader landscape in which decisions about natural ingredients are made.

The report should therefore be read both as a technical reference and as a snapshot of a global agricultural value chain at a pivotal point in its development. Decisions affecting TTO do not occur in isolation: they intersect with questions of science, trade, rural livelihoods and environmental stewardship across several regions of the world.

[1] A detailed list of individuals and organisations acknowledged for their contributions to this report is provided in the Bibliography.

1. Executive Summary

Retail sales of products containing TTO in the European Union are estimated to range between €200 million and €300 million annually, with higher estimates approaching €500 million depending on product categories and market assumptions.

Approximately 20,000 individual products containing TTO are estimated to be present on the EU market across cosmetics, personal care and household applications.

Other major markets for TTO, including the United States and parts of Asia, are also significant. However, due to time constraints and data limitations, this report focuses primarily on the European market where detailed information was available.

Industry evidence indicates that adapting product portfolios to regulatory changes can require substantial technical and regulatory work; one company reported approximately €470,000 in combined reformulation and research and development costs across 27 products.

Global production of TTO is concentrated in a small number of producing countries. Australia remains the largest origin with peak production estimated at approximately 1,100 tonnes in the early 2020s. Other producing regions include China, South Africa, Kenya and Zimbabwe.

The sector supports significant rural employment and economic activity across producing regions, including approximately 460 direct jobs and around 1,100 indirect roles in Australia, several thousand livelihoods linked to production networks in South Africa, between 10,000 and 30,000 people connected to cultivation and processing in China, and organised smallholder supply chains involving more than 1,200 farmers in Kenya.

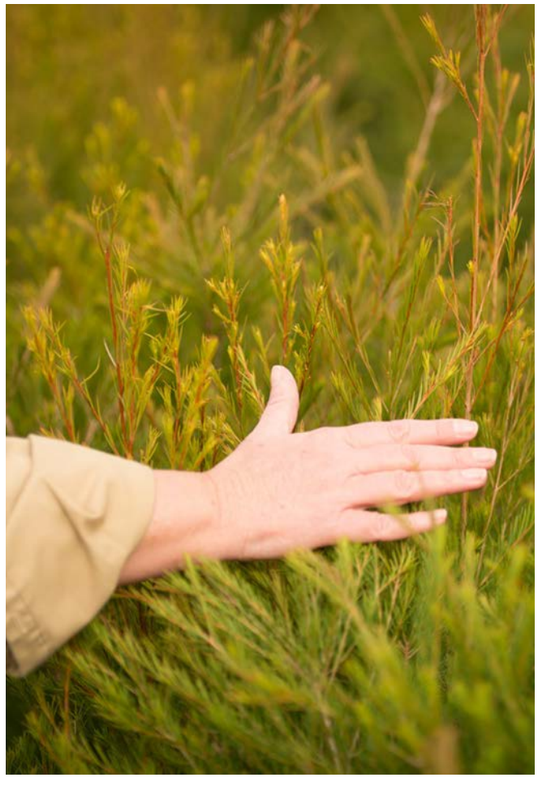
This report examines the global tea tree oil (TTO) value chain at a time of increasing regulatory scrutiny, particularly within the European Union. Distilled from *Melaleuca alternifolia*, TTO is a naturally complex substance with more than a century of commercial use and a long history of traditional application. It is widely used in cosmetics, personal care formulations, household hygiene products and aromatherapy.

Production of TTO supports rural livelihoods across several producing regions, contributing to employment, export revenues and community development in areas where alternative income opportunities are limited. Australia remains the technical and regulatory reference point for authentic TTO, supported by the Australian Tea Tree Industry Association (ATTIA), decades of agronomic research and industry standards aligned with ISO 4730. However, climate variability, market volatility and regulatory uncertainty have constrained production growth and delayed reinvestment in some regions.

Within the European Union, regulatory processes affecting TTO are advancing through parallel frameworks, including hazard classification under the CLP Regulation and ingredient safety evaluation under the Cosmetics Regulation. In 2025, the Scientific Committee on Consumer Safety concluded that TTO conforming to the relevant ISO specification can be considered safe for defined cosmetic uses when concentration limits and stability requirements are respected. At the same time, hazard classification processes based on high-dose animal studies have introduced additional complexity and uncertainty for international supply chains.

Evidence gathered during preparation of this report indicates that regulatory developments are already influencing supply chains. Companies report increased compliance requirements and reformulation work, while producers note impacts on planting decisions, investment planning and long-term supply agreements. These effects propagate upstream through the value chain and may influence income stability and sustainability initiatives in producing regions.

As regulatory discussions continue, the future trajectory of the sector will depend on how regulatory frameworks evolve and how effectively producers, manufacturers and regulators address questions relating to exposure, compositional complexity and market access.



2. Introduction

The International Federation of Essential Oils and Aroma Trades (IFEAT) prepares Socio-Economic Reports (SERs) to provide evidence-based insights into essential oil supply chains. These reports examine production landscapes, market dynamics, socio-economic contributions, environmental considerations and regulatory developments, supporting stakeholders across the fragrance, flavour and aromatherapy sectors in making informed sourcing and investment decisions.

This SER on TTO follows that approach. It brings together data and perspectives from major producing regions, including Australia, Africa and China, at a time of heightened regulatory scrutiny, particularly within the EU and Great Britain. TTO has become central to broader discussions concerning how NCSs are assessed under chemical and cosmetic legislation. Understanding these developments is now as important as understanding agronomic practice or global supply.

2.1 Historical background

Wild *Melaleuca alternifolia* grows in Bundjalung, Yaegl, Gumbaynggirr, Dunghutti, Birpai, and Worimi Countries. These areas form part of the plant's native habitat and are also the lands of the groups and clans of Australia's First Nations people. Aboriginal communities used crushed leaves and vapours for respiratory conditions and prepared poultices and infusions for wounds, skin ailments and infections. Oral histories also describe so-called healing lakes formed where fallen leaves accumulated and created naturally antiseptic waters.

European references to tea tree date from the late eighteenth century, when Captain James Cook recorded the brewing of a tea-like infusion from the leaves. Commercial development, however, did not begin until the early twentieth century. In 1925 the Australian chemist Arthur Penfold published laboratory findings demonstrating that oil distilled from *Melaleuca alternifolia* possessed strong antiseptic properties compared with standard disinfectants of the time. These results stimulated early commercial interest and laid the foundation for the modern TTO industry.

During the initial period of commercialisation, production relied largely on wild stands located around Grafton, Casino and Lismore in northern New South Wales. Trees were harvested manually and foliage transported to small mobile bush stills for steam distillation. Annual output was variable and modest, typically between 2 and 20 tonnes. Inconsistent demand left the sector vulnerable to downturns and contributed to the clearing of some native stands for alternative agricultural uses.

From the 1970s onwards, the Australian sector transitioned progressively towards plantation-based cultivation. This development responded to the need for reliable supply, improved quality consistency and greater agronomic control, marking the emergence of the production systems that underpin modern TTO markets. By the 1980s and 1990s Australia had become the dominant global producer and the principal technical reference for ISO-conforming material.

2.2 Botanical characteristics

TTO is obtained from *Melaleuca alternifolia*, an evergreen shrub or small tree belonging to the Myrtaceae family. Although several *Melaleuca* species yield aromatic oils, *Melaleuca alternifolia* is uniquely valued for its terpinen-4-ol-rich profile, which underpins the ISO 4730 specification defining internationally traded TTO. The species also forms the basis of the majority of toxicological, dermatological and pharmacological studies, ensuring continuity in safety evaluation.

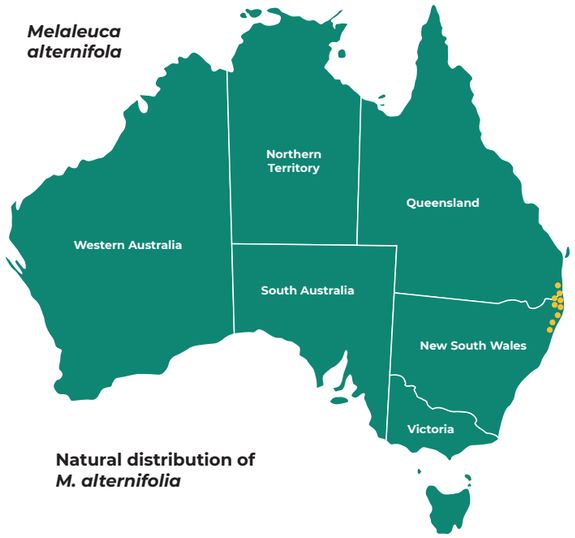
The natural distribution of *Melaleuca alternifolia* is geographically limited. This has historically influenced production patterns and continues to shape concepts of authenticity and traceability within international trade. The plant typically thrives in warm, humid environments along drainage lines, low-lying flats and seasonally waterlogged soils. Its tolerance of conditions that challenge many other crops gives it a distinctive place in regional land-use systems.

While *Melaleuca alternifolia* overwhelmingly dominates global supply, it has been observed that certain

chemotypes of related species such as *Melaleuca linariifolia* and Melaleuca dissitiflora may also meet the terpinen-4-ol type ISO specification. In practice, however, *Melaleuca alternifoli*a accounts for the vast majority of traded material and for almost all safety and regulatory data.

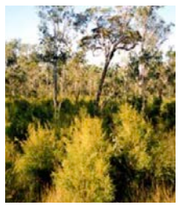
The expression “tea tree oil” is sometimes used loosely to describe a broader group of oils from the *Melaleuca genus*. In regulatory and commercial usage, TTO refers specifically to oil from *Melaleuca alternifolia*.

A related but distinct product is lemon-scented tea tree oil, usually produced from *Melaleuca citrata* or citral-rich chemotypes of *Melaleuca ericifolia*. This oil is dominated by citral and is used mainly in fragrance blends, household cleaners and insect-repellent formulations. It is not interchangeable with *Melaleuca alternifolia* TTO in therapeutic or antimicrobial contexts and is not covered by ISO 4730. Its niche position reflects the aromatic diversity within the genus.



Natural distribution of *M. alternifolia*

Mature *M. alternifolia* in the bush



A natural stand of *M. alternifolia*

Young foliage

Figure 2.1 - Natural distribution *M. alternifolia* extending from south-east Queensland to approximately Port Macquarie in New South Wales.

Source: Davis 2003.

3. Uses, Quality and Composition

3.1 Introduction

Tea tree oil (TTO) is a widely used natural ingredient spanning several major sectors, including cosmetics and personal care, medicinal and over-the-counter health products, aromatherapy, plant protection and household applications. Its broad-spectrum antimicrobial properties, together with anti-inflammatory, antipruritic (anti-itch) and deodorising effects, make it a versatile component across a wide range of formulations.

Over several decades, the global understanding of TTO’s safety, efficacy and quality characteristics has been shaped by sustained research investment led by the Australian tea tree industry in collaboration with academic, regulatory and government institutions. In particular, the Australian government has provided substantial co-funding for research programmes, contributing approximately 50% of funding in certain initiatives, and government bodies have played a central role in commissioning studies in consultation with growers and industry representatives. This coordinated public–private effort has underpinned the scientific literature supporting the international use of pure TTO and informed key safety assessments and quality benchmarks, including ISO 4730, inclusion in major pharmacopoeias, and more recently the EU SCCS safety dossier. Without this cumulative and structured research investment, the evidence base supporting the widespread global use of TTO would not exist in its current form.

3.2 Uses and applications

Cosmetics and personal care

TTO is widely incorporated into skincare products designed for oily or blemish-prone skin. Facial cleansers, toners, targeted treatments, serums, shampoos and scalp preparations frequently include TTO, where it is positioned as a botanical purifying agent. It also appears in soaps, body washes and intimate-care formulations that highlight deodorising and refreshing attributes. TTO has demonstrated antimicrobial activity against a range of microorganisms associated with common conditions and has consequently been evaluated in hand-hygiene products (Carson, Hammer and Riley, 2006). In oral-care applications, studies report activity against recognised pathogens and, in certain investigations, favourable comparisons with conventional antiseptics. As a result, TTO is present in toothpastes, mouthwashes, dental flosses, gum gels and breath fresheners (Thosar et al., 2013; Karbach et al., 2015).

Although the documented antimicrobial properties of TTO underpin its widespread incorporation into cosmetic and personal-care formulations, its safe use depends on appropriate concentration and formulation control. While effective at relatively low concentrations, ingestion at high doses may lead to toxic effects. Careful dilution, stability management and adherence to applicable guidance are therefore essential. Some authorities provide recommendations on acceptable use levels. For example, the German Federal Institute for Risk Assessment recommends a maximum concentration of 1% in cosmetic leave-on products[2].

Clinical Research and Product Applications

Clinical investigations have evaluated TTO extensively within dermatology. Trials indicate that a 5% TTO gel can reduce acne severity with efficacy comparable to benzoyl peroxide while producing fewer adverse reactions (Bassett, Pannowitz and Barnetson, 1990; Carson, Hammer and Riley, 2006). Anti-inflammatory action, sustained release and enhanced penetration are considered contributory factors.

Evidence also supports application in dandruff management through activity against dermatophytes and *Malassezia* species. Studies further document antimicrobial performance relevant to oral health, foot care, minor wound management and certain viral conditions, reinforcing its inclusion across a wide spectrum of topical products.

Interest has increased in “self-preserving” cosmetic systems that rely on essential oils with intrinsic antimicrobial activity. TTO has been evaluated successfully within such approaches (Varvaresou et al., 2009), although outcomes depend strongly on concentration, formulation design and interactions with other ingredients.

Adverse reactions remain uncommon but may occur in sensitised individuals. Oxidation is recognised as a key factor increasing irritancy, particularly through elevated para-cymene levels. Effective stability control and appropriate storage are therefore central to safe application (ATTIA, 2020).

Household and industrial applications

Within the household sector, TTO is used in cleaning sprays, surface sanitisers, disinfectant preparations and air-treatment products. Its aromatic profile and antimicrobial characteristics support marketing as a botanical alternative to conventional chemistries. Some veterinary and pet-care formulations also employ TTO, though concentrations must reflect species-specific tolerances.

Industry interviews suggest that while direct consumer purchase of neat oil has expanded in certain markets, the majority of global volume continues to move into formulated goods such as shampoos, cleansers, deodorising sprays and medicated skincare. Several distributors report a moderation in aromatherapy growth following earlier expansion, with personal-care manufacture remaining the dominant commercial channel.

Agriculture and crop protection

Beyond consumer markets, TTO is increasingly incorporated into biological crop-protection strategies. In some jurisdictions it is registered as a bio-fungicide or bactericide, acting through disruption of pathogen cell membranes. Such products may assist growers seeking to reduce reliance on synthetic actives and to align with evolving expectations for lower residue profiles and more sustainable agricultural inputs.

3.3 Chemical composition and key constituents

TTO is a naturally complex mixture containing more than one hundred identified components, primarily monoterpenes and related alcohols. Terpinen-4-ol is the principal marker compound and is widely associated with antimicrobial performance. Other characteristic constituents include γ-terpinene, α-terpinene, terpinolene and 1,8-cineole.

Early analytical research identified multiple chemotypes distinguished partly by cineole content. Commercial focus progressively favoured low-cineole material due to improved dermal tolerability and alignment with safety expectations. Subsequent work highlighted para-cymene as a more direct indicator of oxidation and potential irritancy, and monitoring of this parameter has become central to quality management.

Natural variation arises from cultivar selection, environmental conditions, harvest timing and distillation practice. International trade therefore depends upon defined compositional ranges, with ISO 4730 providing the shared reference framework used in commercial verification, authenticity assessment and regulatory review. These limits also support the detection of adulteration and the maintenance of batch-to-batch consistency.

3.4 Quality standards and specifications

Quality governance in the TTO sector combines international, national and pharmacopoeial systems. The historical development of standards extends from early codex inclusion through successive refinements culminating in ISO 4730:2025, which defines the profile required for material marketed as genuine *Melaleuca alternifolia* oil.

Regulatory authorities frequently assess safety on the assumption that marketed oil conforms to ISO parameters. The SCCS evaluation, for example, confined its assessment to material within the ISO 4730:2017 specification.

In parallel, producers operate under industry codes addressing agronomy, harvesting, distillation, storage and traceability. Pharmacopoeial frameworks, including the European Pharmacopoeia, may impose additional purity or stability expectations, and in certain cases constituent thresholds differ from ISO ranges.

Correct identification is equally critical for labelling. Under the International Nomenclature of Cosmetic Ingredients, TTO is defined specifically as *Melaleuca alternifolia* leaf oil. Extended or substituted materials cannot legitimately use this designation, creating legal and reputational exposure that generally outweighs any perceived economic advantage of adulteration.

[2] This recommended maximum concentration may be subject to change pending regulatory adoption of the SCCS Final Opinion on TTO.

3.5 Adulteration, residues and chiral analysis

Growing demand has heightened attention to adulteration and pesticide residues. The value of TTO may incentivise dilution or substitution with synthetic fractions, isolated terpinen-4-ol or oils from other species. Such interventions can alter efficacy, toxicological relevance and regulatory interpretation.

ISO analysis addresses a defined group of constituents within a complex matrix. Investigations have shown that manipulated material may satisfy headline parameters while diverging in minor components or enantiomeric balance. Products of this nature do not correspond to the datasets on which published safety and efficacy evaluations are based.

Chiral analysis has therefore emerged as an important complementary technique. Characteristic enantiomeric distributions in authentic *M. alternifolia* oil are difficult to reproduce artificially, and deviations may provide strong evidence of substitution or blending. The approach can enhance confidence in authenticity, traceability and the applicability of toxicological conclusions. However, chiral gas chromatography is not currently a universal industry standard and may require specialised instrumentation and technical expertise. Wider adoption could therefore present practical and financial challenges, particularly for small producers, importers and distributors, underscoring the need for proportional and risk-based application.

Residue expectations are also rising, particularly in European markets where downstream brands promote natural positioning. Producers increasingly emphasise integrated pest management and low-input cultivation. Cooperative systems in parts of Africa frequently discourage synthetic pesticides, while some Chinese operations promote residue-controlled production within broader sustainability strategies.

Handling and storage are critical in this context. Oxidative degradation can elevate irritancy and reduce conformity with recognised specifications. Industry guidance therefore prioritises cool, dark and airtight conditions, rapid movement through supply chains and detailed batch documentation. Published evidence links sensitisation risk directly to oxidation, reinforcing the need for robust stability management.

ISO 4730:2025[3]

ISO 4730:2025 defines the internationally recognised compositional and physical specification for Oil of *Melaleuca alternifolia* (terpinen-4-ol type). The standard establishes:

- Defined compositional ranges for key constituents
- Physical parameters such as density, refractive index and optical rotation
- Enantiomeric (chiral) distribution requirements to support authenticity verification.

The ISO standard provides the primary global reference for determining whether material marketed as tea tree oil conforms to recognised authenticity and quality criteria.

4. Cultivation and Agronomy

4.1 Growing conditions and regional overview

Production of TTO is closely linked to the ecological characteristics of *Melaleuca alternifolia*, a species adapted to warm, humid environments and capable of tolerating seasonally waterlogged soils. The plant is notably resilient, withstanding flooding and periodic

Figure 3.1 – Where TTO appears in everyday consumer products

Illustrative overview of product categories incorporating TTO across personal care, hygiene, oral care, household and agricultural applications.

Note: Illustration generated using AI for visualisation purposes.

[3] Full ISO 4730:2025 is available for purchase from the International Organization for Standardization (ISO).

Figure 4.1 – Precision soil preparation prior to planting, Australia

Laser-assisted levelling and rolling designed to optimise water distribution, minimise runoff and improve irrigation efficiency.

Source: Down Under Enterprises.

fire, and it performs well across a range of soil types, including volcanic and elevated terrains. These attributes have influenced both the geographic distribution of production and the cultivation systems that have emerged in different regions. Production spans estates, cooperatives, and vertically integrated operations.

Australian commercial plantations are located predominantly within or adjacent to the species' natural range in northern New South Wales, with some plantations also situated on the mid-coast of New South Wales. Operations encompass multi-generational family farms, medium-sized enterprises and larger vertically integrated estates. The concentration of activity within a defined area has facilitated coordinated research, shared infrastructure and technical support networks, contributing to stable yields and consistent quality.

Plantation cultivation replaced earlier dependence on wild collection in response to variability in supply and composition. By the end of the twentieth century, managed plantations accounted for the vast majority of Australian output, enabling closer control of planting density, harvest scheduling and biomass handling. This model subsequently informed production development in other countries.

China is also a significant producer, with cultivation concentrated mainly in Fujian and Guangxi provinces. Smallholders typically grow tea tree as a seasonal crop and deliver harvested biomass to centralised distillation facilities. Estimates indicate planting across approximately 12,000 mu, equivalent to about 800 hectares. The crop often occupies winter production windows, providing supplementary household income. Decentralised cultivation linked to factory processing is a defining feature of the Chinese system.

In South Africa production is centred primarily in KwaZulu-Natal, where between 500 and 1,000 hectares are reported, and in the Eastern Cape, with an estimated 200 to 300 hectares. Structures range from large commercial estates to cooperatives, out-grower arrangements and independent family farms.

Kenyan production occurs in the highlands surrounding Mount Kenya and in coastal areas near the Tanzanian border. In Zimbabwe, one established producer operates in Marondera North, east of Harare. Other countries, including Eswatini and Vietnam, have at times contributed small volumes, though their participation in global supply has been limited.

4.2 Crop cycle, harvesting and plantation management

Plantations are generally established from seedlings or vegetative cuttings selected for productivity and favourable terpinen-4-ol profiles. Following establishment, growth is rapid, with initial harvests typically occurring between one and three years after planting. Although trees can exceed five metres in height, they are maintained as low shrubs to facilitate efficient cutting and rapid regrowth.

Figure 4.2 Commercial tea tree cultivation in China, illustrating row-based planting systems and early-stage crop development.

Source: Summit Xiaman.

Commercial plantations operate under coppice management, whereby plants are cut close to ground level and allowed to regenerate repeatedly over extended periods. In Australia coppicing is the standard and universal production system forming the structural basis of long-term plantation productivity. This approach enables multiple harvest cycles from a single planting and supports a relatively stable oil profile. Under Australian conditions harvesting is typically conducted once annually. Harvest frequency is aligned with biomass recovery cycles and quality optimisation. Organic production systems may in some cases stagger harvest timing to align with demand, but the standard commercial model is based on a single annual harvest.

Earlier published yield data from the early 2000s suggested average outputs in the range of 150 kilograms of oil per hectare under rain-fed systems. However, advances delivered through the Australian Tea Tree Breeding Program have significantly improved genetic performance. Contemporary commercial plantings commonly achieve yields in excess of 300 kilograms of oil per hectare under well-managed conditions. Exceptional outcomes may exceed this level, though performance remains influenced by rainfall, soil type, plantation age and management practices.

Mechanised harvesting predominates in Australia and is expanding in South Africa. Manual cutting remains more common in Kenya and China, particularly where terrain, farm scale or capital constraints limit mechanisation.

Figure 4.3 – Plantation-based cultivation system
High-density planting, mechanised harvesting and regrowth under coppice management.

Source: Down Under Enterprises.

Figure 4.4 – Manual establishment of tea tree crops
Planting methods supporting rural employment across production regions.

Source: Ayanda African Oils.

Figure 4.5 – Plant nursery operations
Nursery propagation ensures consistent plant material and supports the large-scale establishment of commercial plantations.

Source: Ezinqoleni Essential Oils.

Figure 4.6 – Harvesting of tea tree biomass
Harvesting activities involve coordinated field labour to collect biomass for subsequent oil extraction.

Source: Ezinqoleni Essential Oils.

Figure 4.7 – Mechanical field operations in tea tree plantations
Mechanised equipment supports large-scale plantation management and improves operational efficiency.

Source: Down Under Enterprises.

Large Australian enterprises frequently integrate field operations with transport and distillation, loading biomass into sealed trailers that connect directly to steam units and create continuous paddock-to-still workflows.

Approaches to weed management, fertilisation and irrigation differ between regions. Australian growers benefit from long-standing agronomic research programmes, while African producers often combine local expertise with cooperative extension initiatives that emphasise soil stewardship and reduced chemical inputs. Chinese producers commonly cite the plant's inherent robustness and pest tolerance as enabling relatively low-input systems.

4.3 Pests, diseases and environmental pressures

Despite its resilience, the crop is susceptible to fungal pathogens such as rusts and root rots, along with insect pressures including beetles, caterpillars and psyllids. Early-stage plantations are particularly vulnerable to weed competition that can suppress establishment. Weather variability presents an additional challenge across producing regions. Periods of drought, flooding and irregular rainfall patterns influence biomass accumulation, harvest timing and ultimately oil output.

Figure 4.8 – Biomass transfer following harvest
Collected tea tree biomass is transported from fields to processing facilities for distillation.

Source: Down Under Enterprises.

As climate variability intensifies, adaptive management and varietal improvement are becoming increasingly important components of risk mitigation.

Sustainable practices, including mulching, recycling of distillation residues and integrated pest management, contribute to soil health and long-term productivity.

4.4 Breeding and genetic improvement in Australia

Australia has undertaken more than thirty years of structured breeding activity through the Tea Tree Breeding Program, coordinated by research organisations in partnership with industry bodies including ATTIA and supported partly by statutory levies administered through AgriFutures Australia. The programme has delivered successive generations of non-GMO clones selected for terpinen-4-ol content, vigour and adaptation to waterlogged environments typical of tea tree landscapes.

These improved lines have substantially increased yield reliability and average oil output while enhancing plantation resilience following flood or drought events. Current work aims to widen the genetic base and strengthen tolerance to pests and diseases, including rusts and psyllids, alongside traits associated with climate resilience. Research is also examining canopy form, root systems and other attributes influencing harvest efficiency.

Adoption of improved planting material has reshaped productivity within Australia and remains central to the industry's capacity to supply consistent volumes from a comparatively concentrated production footprint.

Figure 4.9 – Biomass transportation logistics
Efficient transport systems ensure rapid movement of harvested material to maintain oil quality.

Source: Down Under Enterprises.

Figure 4.10 – Farm-level irrigation infrastructure supporting controlled water distribution across tea tree plantations.
Distributed storage tanks and regulated outlets enable targeted irrigation while avoiding field-wide flooding.

Source: Down Under Enterprises.

Figure 4.11 – Installation of underground piping for drip irrigation systems in tea tree plantations.
Subsurface distribution supports efficient water use and reduces surface runoff.

Source: Down Under Enterprises.

Figure 4.12 – Mechanical planting of tea tree seedlings into newly prepared paddocks.
Soil preparation and calibrated planting systems ensure uniform establishment across commercial plantations.

Source: Down Under Enterprises.

Figure 4.13 – Post-planting irrigation of newly established tea tree seedlings.
Targeted watering supports early root development during initial crop establishment.

Source: Down Under Enterprises.

5. Processing and Markets

5.1 Distillation

TTO is produced almost exclusively by steam distillation, a method that has remained broadly consistent in principle for decades while evolving significantly in terms of harvesting logistics, boiler efficiency, energy systems and quality control.

In Australia, harvesting and primary processing are integrated. Purpose-built harvesting machines cut the tea tree crop and simultaneously chip the biomass as part of the harvesting process. The chipped foliage is funnelled either into a catchment bin at the rear of the harvester or into a transport bin running alongside the machine. Once full, these bins are transported to large stainless-steel distillation bins located on the farm, which are then moved to the distillery.

Figure 5.1 - Freshly harvested tea tree biomass delivered to the distillery.
Efficient logistics between field and processing site are critical to maintaining oil quality.

Source: Inter-Agri Oils.

At the distillation site, the loaded bin is guided into position along rail-like tracks and sealed with a secure stainless-steel lid. Steam is introduced through a line connected at the base of the bin. As steam passes upward through the packed biomass at approximately 100°C, it ruptures the oil glands within the leaves, releasing volatile aromatic compounds. The oil-laden steam rises and passes into a condenser, where cooling occurs. The condensed vapour then flows into a separator, where the essential oil and hydrosol (aromatic water) separate naturally due to differences in density.

The oil is tapped off and transferred to settling vats, where it cools and clarifies. Once settled, it is filled into ATTIA-approved containers, including IBCs, stainless-steel drums, aluminium drums or fluorinated HDPE containers. Where feasible, containers are blanketed with nitrogen or argon to minimise oxidation during storage and transport.

Australia was the first major commercial producer of TTO. Early production relied on small bush stills, but

Figure 5.2 Loading tea tree material into the distillation vessel.
Batch handling systems allow consistent throughput at industrial scale.

Source: Inter-Agri Oils.

these were progressively replaced by enclosed stainless-steel systems. This transition improved yield, energy efficiency, contamination control and operator safety, and strengthened Australia's reputation for producing consistent, ISO 4730-compliant oil.

Proper post-distillation handling remains critical. TTO oxidises readily when exposed to heat, light or air; poor storage can increase irritancy and compromise compliance with cosmetic and regulatory definitions. Producers therefore emphasise cool, dark storage conditions, controlled headspace management and efficient movement through the supply chain to maintain freshness.

Although the core steam distillation principle is similar worldwide, operational structures differ. In Australia, distillation is typically carried out on-farm or in nearby specialised facilities, integrating agronomy and processing within a documented quality framework. In parts of Africa cooperative structures are common, with growers supplying foliage to central distillation units that generate economies of scale. In China decentralised planting combined with centralised factory distillation predominates, with processors managing the technical and logistical chain.

5.2 Producing Countries and production volumes

Global supply of TTO is geographically diverse, though output is concentrated in a limited number of origins. Australia remains the largest producer by volume. China has historically been the second-largest origin by peak output, although recent contractions have narrowed the gap with South Africa, which has developed a substantial and increasingly sophisticated export-oriented industry. Kenya represents a smaller but well-established African origin supplying recognised volumes into international markets.

AgriFutures levy data indicate that Australian production has fluctuated significantly in recent years, reflecting climatic disruption, inventory adjustments and market uncertainty. Output in the early 2020s peaked at

Table 5.1 Comparative Overview of Major Producing Countries

Country	Indicative Recent Production	Structural Features	Governance / Quality Framework	Current Trends
Australia	Peak ~1,100 MT (early 2020s); recent levels significantly lower	Plantation-based and integrated farm distillation systems	Government-backed RD&E levy (AgriFutures); Tea Tree Breeding Program; ATTIA Code of Practice; CHIRAL authenticity testing; ISO 4730 reference	Flood recovery, post-COVID inventory correction; gradual rebalancing of supply
China	Peak ~400 MT; recent ~200 MT	Decentralised cultivation with centralised factory distillation	Variable species usage; compositional and authenticity variability reported; sizeable domestic market	Contraction from peak levels; quality and regulatory perception influence export positioning
South Africa	Peak ~250–300 MT; recent ~200 MT (indicative)	Mix of estates, cooperatives and independent growers; centralised distillation common	Increasing certification participation (organic, fair trade models); export-oriented supply chains	Production pressure from water constraints, pricing dynamics and regulatory uncertainty; diversification into other crops reported
Kenya	~40–50 MT	Estate and organised smallholder models; ethical-trade structures	Export compliance frameworks; species may differ from *M. alternifolia*	Infrastructure variability; stable but moderate production scale
Zimbabwe	~20 MT	Single established producer	Organic production focus	Consolidated origin; limited expansion
Other origins	~10 MT combined	Small and emerging operations	Variable	Limited contribution to global supply

approximately 1,100 tonnes according to AgriFutures levy data but has since reduced markedly, with more recent years showing substantially lower declared first-sale volumes. While indicative rather than definitive, these perspectives are shared across producers, distributors and buyers.

Reported production capacity also reflects recent environmental events, post-pandemic inventory adjustments and regulatory uncertainty, all of which have influenced planting decisions and investment confidence.

Figure 5.3 – Steam distillation of TTO
Biomass-fuelled boiler systems generating steam for extraction.

Source: Ayanda African Oils.

Figure 5.4 Steam distillation in progress.
Vapour carries volatile components from the plant material before condensation and separation.

Source: Down Under Enterprises.

Indicative annual production by origin

Australia: AgriFutures levy declarations show production above one thousand tonnes at the start of the decade, followed by a pronounced contraction after the flood events affecting the Northern Rivers region. More recent figures sit well below earlier highs.

China: peak estimates near 400 tonnes, with recent figures nearer 200 tonnes. Alongside authentic production, variability in species, composition and quality

has influenced perceptions in international trade. China also maintains a substantial domestic market.

South Africa: production is distributed across estates, cooperatives and independent grower networks. Information supplied by major operators indicates that individual companies may report annual volumes in excess of 150 tonnes, suggesting substantial installed capacity even though national output fluctuates in response to market conditions, water availability and pricing dynamics.

Kenya: approximately 40 to 50 tonnes. Production has expanded through development initiatives, though infrastructure and distillation capacity vary.

Zimbabwe: roughly 20 tonnes from a single established producer.

Other origins: small combined volumes, estimated at around 10 tonnes.

These figures provide an indicative view of global supply and highlight the sensitivity of planting and investment decisions to market signals.

5.3 Grades, derivatives and by-products

International trade focuses primarily on ISO 4730-conforming material, often differentiated by origin, testing protocols or certification schemes. Pharmaceutical and higher-end cosmetic markets may apply additional specifications or require expanded analytical documentation.

Some processors fractionate or refine oil to adjust concentrations of constituents such as terpinen-4-ol or 1,8-cineole, or to create derivatives tailored to particular regulatory or formulation needs.

Distillation residues are commonly recycled as mulch or used as boiler fuel, supporting circular production approaches and reducing waste. Hydrosols and condensates are attracting increasing commercial interest, particularly in response to demand for upcycled ingredients and reduced-water formulation concepts. Tea tree hydrosol offers mild aromatic character, lathering support and skin-conditioning properties at a lower price point than essential oil. While volumes remain smaller than bulk oil trade, the hydrosol segment is expanding in certain markets.

5.4 Market dynamics and pricing trends

TTO markets are influenced by interactions between agronomic variability, regulatory change and evolving consumer preferences. Climatic events including droughts and floods can quickly affect output and pricing. At the same time, interest in plant-based antimicrobials and “clean” formulations has sustained demand, even as regulatory scrutiny in some jurisdictions has prompted reformulation or reduced usage in specific applications.

Recent export analytics indicate that North America has represented a larger volume destination than Europe in several recent years, although relative shares fluctuate depending on purchasing cycles and inventory adjustments. African suppliers have built established export relationships, particularly in Europe and North America, while Chinese producers serve both domestic and international customers.

Historical experience demonstrates the sensitivity of prices to changes in supply. Periods of elevated returns have encouraged rapid expansion, followed by downturns when production exceeded demand. Such cycles influenced later industry efforts to strengthen coordination, quality assurance and market discipline. In the current environment, price volatility is compounded by regulatory uncertainty, making long-term planning more complex for growers and processors.

Historical price cycles illustrate the sector’s sensitivity to supply-demand imbalances. In the 1990s, Australian farm-gate prices reached approximately A$60 per kg, triggering rapid plantation expansion and significant corporate investment. Subsequent oversupply led to a sharp contraction, with prices falling to approximately A$12–15 per kg in 2000–2001, below cost of production for many growers. This period resulted in widespread plantation closures.

From 2002 through roughly 2010, reduced supply combined with renewed global demand supported recovery and a prolonged period of relative price stability. Demand increased significantly during the COVID period, particularly for hygiene-related applications. However, post-pandemic inventory overhang resulted in reduced purchasing during 2022–2023. Demand began recovering in 2024 as stock levels normalised, though prices remained subdued due to accumulated supply. Early indications in 2025 suggest gradual price strengthening as supply and demand rebalance. In early 2026 Australian TTO prices were quoted at A$35-55 per kg farm-gate. Prices to end consumers may also reflect costs of transportation, customs, storage and tariffs, etc. Future pricing dynamics remain closely linked to regulatory developments in key export markets, particularly the European Union.

Prices vary substantially depending on origin and compliance documentation. In international trade, TTO is assessed primarily against ISO 4730 specifications. Buyers may request expanded analytical documentation, but these parameters are generally encompassed within the ISO framework. Retail product prices are many times higher than wholesale prices to take account of other costs including packaging and marketing.

Indicative downstream market exposure in the European Union

No single official dataset quantifies the value of consumer goods containing TTO across cosmetics, aromatherapy and wellness categories. However, industry surveys and submissions provide approximate ranges.

An anonymised industry exercise conducted in 2024, involving twelve companies active in the EU, estimated combined annual turnover linked to TTO-containing products at approximately €60 million within the European Union and approximately €80 million globally for the participating companies.

Wider sector assessments suggest that retail sales in the EU may plausibly range between €200 million and €300 million, with higher estimates approaching €500 million depending on assumptions regarding concentration levels, product categories and retail margins. These calculations are derived from usage volumes and market modelling rather than harmonised statistical reporting.

Industry representatives further indicate that roughly 20,000 individual products containing TTO are available in the EU. Reformulation costs have been estimated at approximately €30,000 per product, covering laboratory work, manufacturing adjustments and compliance testing, but excluding marketing expenditure. Aggregate impacts across the portfolio could therefore be substantial.

Several firms participating in surveys have noted that even where reformulation is technically feasible, alternative ingredients may not deliver equivalent performance or consumer acceptance. The potential economic implications of regulatory change are therefore significant even in scenarios where use is not formally prohibited.

6. Producing Countries – detailed overview

6.1 Australia

TTO has been present in Australia for centuries, while organised commercial production expanded during the twentieth century and grew strongly into the early twenty-first century. Output reached a high point in the early 2020s at approximately 1,100 tonnes according to AgriFutures levy data. Subsequent contraction has been associated with lower prices, stock overhang, flood damage in key producing districts and uncertainty in major export markets.

Interpreting production estimates: recent Australian production estimates are often derived from the AgriFutures tea tree industry levy programme. Industry stakeholders note that levy data reflect production recognised at the point of first sale, meaning that oil held as inventory is not captured until it is sold. While inventory holding is understood to be uncommon due to the upfront costs of harvesting, transporting biomass and distillation, this reporting feature means that levy-based series may, in some circumstances, understate physical output in years when inventory is carried.

Commercial plantations remain concentrated within or close to the species’ natural range, particularly in the Northern Rivers and Mid North Coast regions of New South Wales. Previous production in south-east Queensland has ceased. The sector includes multi-generational family farms, medium-sized enterprises and larger integrated businesses. Many producers distil on farms or work with specialised nearby facilities, forming closely linked regional value chains from propagation through to packaged oil.

Traceability and quality assurance are supported through an industry code of practice, levy-funded research and recognised third-party standards. Advances in cultivars, mechanised harvesting and controlled distillation have supported consistent production of ISO-conforming TTO.

Climatic volatility has intensified. Severe flooding, including two major flood events in 2022 and 2023 in the main growing region, damaged plantations and surrounding infrastructure and reduced output for some operators prompting investment in drainage, machinery adaptation and revised field logistics. Periods of drought and heat can likewise influence biomass accumulation and oil characteristics, reinforcing the importance of resilient planting material and adaptive management.

The broader socio-economic and environmental contributions of the sector are examined in Sections 8 and 9. Industry information indicates approximately 460 direct jobs and around 1,100 indirect roles across nurseries, contracting, engineering, transport and associated services.

Research is supported through a statutory levy paid by all Australian tea tree growers (regardless of association membership), with government co-contribution into an R&D funding pool administered through AgriFutures Australia. This has underpinned long-term investment in agronomy, breeding, disease management, sustainability performance and regulatory science.

6.2 China

Commercial development began in the early 1990s. Initial planting programmes encountered challenges related to unsuitable seed material, producing oils with low terpinen-4-ol and high cineole levels. Subsequent collaboration with Australian sources and domestic advances in tissue culture and vegetative propagation improved results.

Research institutes in Guangxi, Jiangxi and Guangdong have since developed varieties capable of delivering terpinen-4-ol levels broadly between 32 and 40%, with cineole generally maintained at levels acceptable to buyers. Material exceeding these expectations can encounter market resistance.

Planting expanded across several southern provinces, but the estimated area has reduced in recent years to roughly 8,000–9,000 mu (approximately 500–600 hectares). Even at this level, supply is widely regarded as exceeding demand.

Production is organised through combinations of companies, cooperatives and village-based farming systems. Smallholders frequently cultivate during winter months and deliver biomass to central facilities. Under favourable conditions, plantings may remain productive for more than ten years and provide supplementary income.

Estimates suggest national output may have declined from around 400 tonnes in the early 2020s to nearer 200 tonnes by the mid-2020s. In response to market pressure and reduced government support some farmers have shifted land into alternative crops.

Quality and authenticity are variable. Production may involve species other than *Melaleuca alternifolia*, and international buyers have raised concerns regarding compositional adjustment practices. China also differs from many other origins in maintaining a sizeable domestic market.

Differences between domestic frameworks and export regulatory expectations can require additional adaptation for access to international trade.

6.3 Kenya

Alongside South Africa, Kenya is among Africa's more established TTO producers, supplying recognised volumes into international export markets. Production systems range from estate-based operations to organised smallholder groups, many of which operate under ethical-trade or community-based frameworks. These arrangements support documentation, traceability and residue management, while enabling farmers to meet export requirements and maintain access to international markets.

Tea tree cultivation in Kenya is a relatively young industry that has developed in regions where alternative cash crops are limited. In such areas, particularly in Laikipia, the Mount Kenya highlands and selected coastal districts, the crop is regarded locally as a comparatively climate-resilient option. For many smallholders, tea tree has provided diversification away from traditional subsistence crops such as maize and vegetables, contributing to income stability in the face of climatic variability.

Kenyan TTO has become integrated into global personal care and skincare supply chains, particularly through partnerships with buyers seeking traceable and socially responsible sourcing. One of the principal operators is Fairoils, which operates a vertically integrated "seed-to-supply" model centred on farmer participation and defined environmental and social standards. The company's operations are concentrated in the highlands around Mount Kenya and in coastal growing areas near Lunga Lunga. The broader socio-economic implications of this model, including the potential impact of recent EU regulatory developments, are examined in Section 8.3 of this report.

National production is commonly cited as having peaked at approximately 50 MT per year, with volumes subject to fluctuation in response to climatic conditions and market demand.

6.4 South Africa

South Africa has become an important origin during the past two decades. Production is concentrated in KwaZulu-Natal and the Eastern Cape and involves estates, cooperatives, out-grower systems and independent farms.

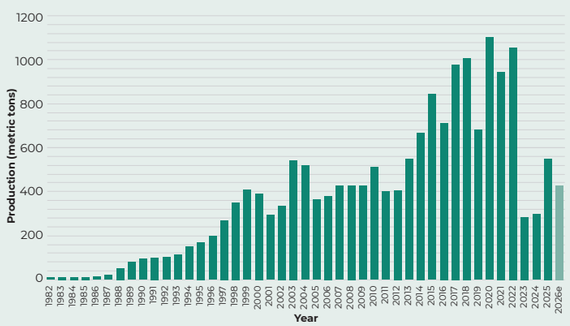
In terms of relative production scale, stakeholders generally identify a tiered structure within South Africa, with Ayanda African Oils recognised as the largest producer, followed by Oribi Oils, Inter-Agri and Eze Oils, alongside a number of smaller and emerging operators. The diversity of business models ranges from estate production to cooperative and smallholder networks, creating a heterogeneous supply base with varying approaches to certification, investment and market strategy.

Ayanda African Oils illustrates coordinated value-chain organisation, linking nurseries, field management, distillation and export across its 31 commercial farmer membership and supporting substantial rural employment.

Oribi Oils operates through a mixed supply model comprising approximately 15 commercial farms, 65 cooperative structures and more than 30 independent smallholders, representing over 460 individual farmers. Across planting, harvesting, logistics and distillation, the wider value chain is estimated to engage around 1,800 workers, many of whom are employed on a seasonal basis. Reliable consolidated national statistics are difficult to obtain, as production is distributed across estate operations, cooperatives and independent marketing groups. However, information provided directly by leading operators indicates that combined annual production volume is in excess of 200 tonnes. Ayanda

Figure 6.1 – Australian production trend (indicative)

The production series illustrates a pronounced contraction following the peak years of the early 2020s. Industry sources attribute the decline primarily to severe flooding events in key Australian growing regions during 2022 and 2023, which disrupted harvesting, damaged plantations and constrained distillation capacity. Levy data, recorded at the point of first sale, may also under-represent volumes temporarily held in inventory, although stakeholders indicate that large-scale stock retention is uncommon given the capital tied up in production. Together, these factors have contributed to reduced availability and heightened uncertainty for downstream users.



Source: AgriFutures Australia levy data; compilation supported by Down Under Enterprises and ATTIA.

African Oils, widely regarded as the largest producer in the country, has reported output in the range of approximately 130–180 tonnes per year, including a substantial certified organic share. However, producers report that market instability and uncertainty regarding future regulatory conditions in export destinations are already influencing planting decisions. Some growers indicate that tea tree is being replaced by crops perceived as offering greater security, including sugar cane and macadamia. This transition reflects the narrow economic margins under which many operations function and the sensitivity of rural employment to demand fluctuations.

In addition, operators report that organically managed production represents an important and growing component of national supply. For some larger producers, certified organic volumes alone account for several tens of tonnes annually.

In addition to estate production certain processors provide distillation services to neighbouring growers who lack their own facilities. In such arrangements plant material is distilled centrally and payment to farmers may be deferred until the oil is sold, in some cases extending beyond twelve months. Producers describe this model as essential for enabling participation of emerging farmers and maintaining income continuity in remote communities.

Harvest commonly occurs once per year, with strongest yields during the middle years of the plantation cycle. Biomass is normally distilled within hours of cutting. Organic and conventional material is processed separately, and oil is filtered and stored in facilities designed to minimise contamination.

While a significant proportion of South African TTO is exported as whole oil, investment in downstream capability is increasing. At least one grower within the cooperative system has installed fractional distillation equipment able to manufacture isolates at purities ranging from approximately 50% to 99%, demonstrating technological advancement within the origin.

Industry expansion in the late 2010s was influenced by targeted social-impact initiatives, including the distribution of planting material and technical support to smallholder growers. During the period 2018–2020 these programmes contributed to rapid increases in available biomass and oil volumes. Demand growth during the COVID period, particularly for hygiene products, reinforced this expansion. In subsequent years supply-chain disruptions and commercial realignments resulted in some growers establishing new marketing channels, including the formation of additional independent groups within the sector.

Several investments in processing and upgrading have been financed directly by growers or grower groups, reflecting long-term commitment to the sector despite fluctuating international demand.

Overall, the South African sector combines estate-scale agriculture with highly organised cooperative participation, supported by established export channels and growing technical sophistication. The industry therefore represents both a significant rural employer and a mature contributor to international TTO supply.

> ***"The uncertainty around EU regulation has made it extremely difficult for growers to plan. Tea tree oil prices have in some cases fallen below the cost of production, and many farmers are moving to alternative crops simply to survive."***
>
> – **Mathias Wessels, Inter-Agri Oils**

6.5 Zimbabwe

Zimbabwe's TTO sector has consolidated considerably. Where several producers previously operated, activity is now centred on a single farm of roughly 500 hectares. Annual output is estimated between 15 and 20 tonnes and is marketed as organic. Producers cited price pressure, global competition and regulatory developments as key constraints.

6.6 Other producers

Small volumes have historically been produced in other locations across Africa and Asia, including Eswatini, Ethiopia, Malawi and Vietnam. Present contributions are limited. Future growth will depend on agronomic suitability, investment conditions and the capacity to meet increasingly demanding quality and sustainability expectations.

7. Regulation and Certification Framework

The legislative and regulatory environment concerning tea tree oil is evolving rapidly. The analysis in this section reflects information publicly available and stakeholder communications as at 11 March 2026.

The regulatory landscape surrounding TTO has become one of the defining issues for the industry in recent years. As a NCS used widely in cosmetics, personal care, household formulations and certain medicinal preparations, TTO is subject to safety and classification assessments in the EU, Great Britain and other jurisdictions. These processes carry implications not only for manufacturers and brand owners, but also for growers, processors and exporters, particularly in producing countries where livelihoods depend on predictable demand and stable access to markets.

Within the EU, regulation affecting TTO is advancing along two legally distinct pathways: hazard classification under Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging (CLP), and ingredient safety evaluation under Regulation (EC) No 1223/2009 on cosmetic products. Although these frameworks operate independently, experience within the sector indicates that hazard decisions can influence commercial behaviour well before formal implementation deadlines.

7.1 EU harmonised classification under CLP

TTO has been included in the 24th Adaptation to Technical Progress (ATP24) draft Delegated Act to the CLP Regulation. The draft measure was notified to the World Trade Organization (WTO) on 27 November 2025, opening a consultation period under the Technical Barriers to Trade Agreement and enabling governments and stakeholders to submit comments.

The proposal was subsequently discussed at the CARACAL meeting of Member State competent authorities on 28 January 2026. According to information communicated by the European Commission in February 2026, the Delegated Act will proceed with the inclusion of TTO as a Category 1B reproductive toxicant. The Commission indicated that no postponement was granted because no new scientific evidence had been submitted that would justify reopening the assessment. Following adoption, a two-month scrutiny period by the European Parliament and the Council will take place. Publication in the Official Journal is expected end-May 2026, with entry into force 20 days later. Application of the measures linked with the classification is foreseen for mid-December 2027 in line with the standard transition period. The Commission has clarified that the scope will apply to the essential oil itself, derivatives not being covered by the classification. Legal services are working on a legally robust definition.

CLP legislation provides a mechanism for review should new scientific information become available. Additional evidence may therefore be submitted by Member States in the future with a view to reclassification.
At the same time stakeholders frequently observe that once a harmonised hazard entry is confirmed, downstream market actors may adjust formulations rapidly rather than wait for longer-term scientific clarification.

International engagement

The ATP24 proposal has attracted notable international attention. Through the WTO Technical Barriers to Trade process, several governments, including Australia, China, Israel, South Africa and the USA have raised concerns regarding scientific interpretation, proportionality and potential trade consequences. These submissions emphasise that the discussion extends beyond a single commodity and touches broader questions relating to the treatment of NCSs within chemical regulation.

In parallel, the Australian Government has formally communicated to the European Commission its view that the proposed classification raises issues concerning the underlying evidence base and possible impacts on primary producers. This correspondence reflects the wider diplomatic and economic dimension of the situation.

Producer submissions to WTO processes have also highlighted the potential livelihood implications of classification decisions. Representatives from producing regions argue that measures affecting market access in Europe translate directly into employment, income stability and rural development outcomes far beyond the EU.

Producer perspective – South Africa

> ***"For Oribi Oils, the proposed CMR 1B classification of Tea Tree Oil represents a disproportionate regulatory measure that threatens the economic viability of a deeply embedded rural supply chain. Our supply chain includes 65 smallholder co-operatives whose members rely on Tea Tree Oil as their primary, and in many cases sole, source of income. Any reduction in EU market access would therefore have a correspondingly disproportionate impact on smallholder incomes, rural employment, and community development initiatives, particularly in communities already operating below the poverty line and dependent on stable, value-added essential oil exports from South Africa."***
>
> **– Stuart Bateman, Founder, Oribi Oils**

7.2 EU cosmetic safety assessment (SCCS, 2025)

Running alongside CLP deliberations, the European Commission's Scientific Committee on Consumer Safety (SCCS) adopted its final opinion on TTO on the 30th of October 2025. After evaluation of toxicological and clinical material, the Committee concluded that TTO conforming to the relevant ISO specification can be considered safe for defined adult cosmetic applications when concentration limits and stability requirements are respected.

The final SCCS opinion considers the use of tea tree oil (TTO) as an anti-seborrheic and anti-microbial agent safe in four defended product types - up to the maximum concentration of 2.0% in shampoo, 1.0% in shower gel, 1.0% in face wash and 0.1% in face cream. Central to these conclusions is the prevention of oxidation through appropriate formulation, packaging and shelf-life management. Aerosol and spray uses were not included because of insufficient inhalation data.

The limits are intended to provide protection across the toxicological endpoints under consideration, including sensitisation and the reproductive toxicity concerns examined within the CLP context. The SCCS opinion therefore establishes defined conditions under which TTO may continue to be used in cosmetic products. However, continued market access may also depend on additional regulatory considerations, including issues related to food safety and the requirement to demonstrate that suitable alternatives are not available for certain uses. Even where food safety concerns may be limited, demonstrating the absence of suitable alternatives remains challenging, particularly in light of the negative assessment issued by the French national agency ANSES. These aspects were discussed at the European Commission Working Group on Cosmetic Products meeting held on 13 March 2026.

7.3 Divergence between the EU and Great Britain

Great Britain now operates its own system under GB CLP. In 2025, the UK Health and Safety Executive concluded that the available evidence did not justify classification of TTO as a Category 1B reproductive toxicant and that, before adopting a final opinion, more time should be given to industry to deliver additional scientific evidence. The assessment applied a weight-of-evidence approach incorporating exposure considerations, while allowing for future review should new information arise.

This divergence between neighbouring markets introduces practical challenges. Companies trading in both jurisdictions might need separate labels, safety documentation and compliance strategies. Producers report that uncertainty in EU decision-making has already influenced purchasing patterns and investment confidence.

Interviews with downstream brands indicate that regulatory complexity is shaping formulation strategy even where TTO would remain technically permitted.

> ***"Tea tree oil has never been a core ingredient in our formulations, largely due to sensory preferences. However, with incoming regulatory changes, we would expect to use less rather than more TTO going forward. This is not because of a lack of functionality, but because regulatory complexity increasingly influences formulation choices, and alternative botanicals with antimicrobial properties may be considered instead."***
>
> **– A global, UK-based personal care brand with a strong focus on natural ingredients and ethical sourcing**

7.4 Scientific debate: hazard, risk and human relevance of data

Industry organisations, including ATTIA, stress the distinction between hazard identification and risk under conditions of use. They note that consumer exposure to TTO is predominantly dermal, typically at low concentrations, and that decades of widespread utilisation have not produced epidemiological confirmation of reproductive toxicity in humans.

Points frequently raised include species-specific metabolic differences, the relevance of oral gavage studies for topical exposure and interpretation of endpoints for NCSs. These matters remain central to regulatory dialogue.

A large proportion of the evidence base relied upon internationally has been generated using authenticated ISO-conforming material. Maintaining and extending such datasets requires substantial investment and coordination among industry, researchers and downstream users.

Structured research response

In light of the concerns expressed during EU deliberations, stakeholders have developed a coordinated Scientific and Regulatory Roadmap. Presented in expert forums in early 2026, the programme proposes targeted studies designed to clarify exposure relevance, reproductive endpoints and broader weight-of-evidence considerations. The initiative has been shaped with input from toxicologists and regulatory specialists and has received support from several multinational brands.

The Commission has indicated that implementation of this roadmap could, in future, provide the basis for a Member State to submit a new dossier for reconsideration. Such a step would not suspend the current regulatory timetable.

Participants emphasise that this approach is intended to work within established EU scientific principles. However, they also acknowledge that evidence generation is time-intensive, whereas market responses to hazard signals may occur much more rapidly.

The regulatory environment has further encouraged exploration of alternative compositions or blends intended to replicate certain functional attributes of TTO. Interviewees note that such materials may not possess the same history of evaluation or depth of documentation.

Stakeholders also caution that research performed on adulterated or poorly characterised material risks weakening regulatory interpretation, given that the established literature is based on verified *Melaleuca alternifolia* oil.

7.5 International standards and certification

ISO 4730 remains the principal reference point for international trade. Authorities and buyers rely on it to define authenticity and compositional expectations, and it formed the basis of material considered within the SCCS opinion.

Producers may additionally participate in organic, ethical and sustainability certification systems. These frameworks can strengthen supply-chain transparency but may introduce administrative burdens, particularly for smaller operators.

Within Australia, ATTIA administers a Code of Practice covering cultivation, harvesting, distillation, storage and traceability, supported by regular audits. Chiral analysis programmes complement this framework by assisting in verification of natural origin.

7.6 Trade, export regulation and documentation

Exporters, importers and distributors of TTO must comply with overlapping regulatory regimes governing chemicals, cosmetics and international trade. Documentation typically includes safety data sheets, certificates of analysis, traceability records and declarations of conformity. While producers are critical to ensuring upstream quality and consistency, importers and distributors play an equally essential role in verifying compliance, maintaining documentation integrity and facilitating lawful market placement across jurisdictions.
Across major markets, regulators increasingly expect demonstrable control over product stability, compositional authenticity and responsible sourcing. Preparedness in these areas has become fundamental to maintaining market access, with distributors in particular forming a key compliance interface between producers and downstream manufacturers.

7.7 Downstream impacts: reformulation and compliance costs

Industry participants frequently observe that hazard classifications can influence retailer and brand behaviour long before legal deadlines apply. Once a substance receives a high-concern designation, companies may adopt precautionary reformulation strategies to simplify compliance, manage liability and protect brand reputation.

Several authorities have also signalled that downstream substitution is already occurring in anticipation of regulatory change.

Feedback from multinational firms indicates that adapting to regulatory developments requires substantial allocation of scientific and administrative resources. These efforts can divert attention from innovation and longer-term investment.

Several interviewees suggested that the trajectory affecting TTO is increasingly viewed as indicative of broader pressures on essential oils and other natural ingredients.

CASE STUDY

Downstream perspectives on tea tree oil in the EU

A European, privately-owned natural personal care and aromatherapy company operating primarily across Germany, Austria and Switzerland provided downstream insights into the use of TTO within its product portfolio. The company specialises in pure essential oils, aromatherapy blends and natural cosmetics, with a strong emphasis on organic sourcing, in-house quality control and direct engagement with consumers through specialist retail, pharmacy and organic distribution channels. Its portfolio comprises several hundred individual products, serving both end consumers and professional users.

TTO plays an important role within the company's range, both as a standalone cosmetic ingredient and as a component of natural cosmetic formulations. It is regarded as a core essential oil within aromatherapy practices and remains an important product for a loyal customer base. Indicative annual purchases of TTO are in the order of one tonne per year.

Ongoing EU regulatory developments have already required the company to adapt formulations and sales strategies, including changes to recipes and the way pure TTO products are offered to consumers in order to comply with concentration limits. These adjustments carry financial and operational implications, requiring additional product development, reformulation efforts and enhanced consumer communication to maintain access to TTO-based applications.

Regulatory uncertainty also affects upstream supplier relationships. During periods of reduced demand, purchase volumes may need to be adjusted, which can be challenging for producers reliant on stable orders. The company indicated that managing this uncertainty requires active dialogue with suppliers, careful volume planning and, where possible, exploration of alternative oils to mitigate impacts. Long-term relationships with trusted producers were described as central to maintaining product authenticity, avoiding adulteration risks and supporting supply-chain stability.

The company also participates in industry advocacy through European and national essential oil associations, recognising the importance of ensuring that regulatory discussions take account not only of scientific hazard assessment, but also of downstream market realities and the socio-economic consequences for producers and processors beyond Europe.

"Tea tree oil remains an important ingredient for us, both from an aromatherapy perspective and for our customers. Regulatory developments in the EU have already required adjustments to recipes and sales models, creating financial and operational challenges. At the same time, uncertainty affects suppliers, as changes in purchase volumes can be critical for them. Managing these impacts responsibly requires close dialogue and long-term relationships across the supply chain."

8. Socio-Economic Impact of TTO

8.1 Employment, livelihoods and community benefits

The socio-economic significance of TTO extends far beyond its role as a traded natural ingredient. Across producing regions, the value chain sustains rural employment, stimulates enterprise development, contributes to export earnings and supports community resilience. Production structures vary, ranging from plantation models to smallholder and cooperative systems. Despite these differences, TTO commonly provides income diversification in areas where alternative opportunities are limited.

TTO production generates activity across nurseries, land preparation, planting, harvesting, transport, distillation, quality assurance, packaging, trading and logistics. These stages support direct employment and create wider multiplier effects for engineering services, machinery suppliers, agronomic expertise and transport providers.

In established origins such as Australia the sector has enabled families to transition from declining agricultural activities into specialised export production. In developing regions, particularly in Africa and parts of Asia, TTO has become an important cash crop supporting income stability and local economic diversification.

Opportunities for women and young people are increasingly visible within TTO supply chains, though participation differs by region. Women are strongly represented in several African production areas, while in Australia they hold leadership and technical positions. In parts of China, the crop supports continued economic activity in communities affected by outward migration of younger workers.

In Africa, cooperative arrangements are central to connecting growers with markets. Shared nurseries, agronomic advice, distillation facilities and certification management reduce barriers to participation while improving consistency and traceability. These models strengthen negotiating capacity and enable compliance with social and environmental expectations.

The following section provides more details of the socio-economic benefits in the TTO producing countries. This is followed by several case studies. For example, the interaction between ethical sourcing, livelihoods and market access is illustrated by a Kenyan example.

Figure 8.1. Solar-powered water storage infrastructure installed through Fair for Life premium allocations derived from TTO sales.

Source: Ayanda African Oils.

8.2 Country profiles: socio-economic context

Australia

Production remains concentrated within the natural habitat of *Melaleuca alternifolia*, primarily in the Northern Rivers region of New South Wales. It also forms a continuous belt extending southwards to Port Macquarie (New South Wales), with a small operation in Western Australia. Tea tree operations in Far North Queensland have since ceased following the excess inventory and subsequent contraction in demand experienced in the period after COVID-19.

The industry includes multi-generational farms, medium-scale plantations, larger estates and specialist processors operating within established governance and quality frameworks, including ATTIA's Code of Practice, the CHIRAL authenticity system and structured (non-GMO) breeding programmes.

The sector supports approximately 460 direct jobs and an estimated 1,100 indirect roles across harvesting, distillation, laboratory services, engineering, transport and compliance. Employment is typically concentrated in rural districts with limited alternative opportunities. The long productive life of plantations has historically contributed to stable economic activity in regional towns.

Figure 8.2. Farmer training session delivered by a seed company, supporting household-level food production and self-sufficiency among TTO producers and their communities.

Source: Ayanda African Oils.

Figure 8.3. Small-scale planter boxes supporting household nutrition and livelihood resilience following farmer training.

Source: Ayanda African Oils.

The sector has made a substantial economic contribution in terms of employment, economic stability and multiplier effect. In terms of job creation, the sector supports approximately 460 direct jobs (harvesting, management, distilling, lab work) and at least 1,100 indirect jobs (contractors, mechanics, agronomy, transport). In the Northern Rivers region, employment historically ranged between 150–200 direct jobs with an additional 200 indirect roles, though recent price and production drops may have halved these numbers. In the past, TTO has provided stable, long-term income due to the 50-year productive cycle of plantations. It serves as a major economic pillar and one of the few long-term export industries consistently injecting cash flow into rural regions. In addition, the industry supports a wide ecosystem of local businesses, including engineering workshops, machinery repairers, and rural retailers, who rely on TTO producers as stable clients.

The sector has impacted communities and raised their resilience. The industry demonstrated strong community spirit, particularly during catastrophic floods in the Northern Rivers, where growers and contractors shared equipment and resources to rebuild infrastructure.
It has engaged with indigenous communities by its support for local sports teams. Specific companies have implemented a Reconciliation Action Plan (RAP) to foster relationships and opportunities with First Nations people. Intergenerational continuity has been facilitated with many farms being passed down from parents to children, allowing younger generations to remain in regional towns rather than relocating to cities.
Women and younger people play an integral role in the sector with women having founded TTO businesses and are actively involved in farm management, quality assurance, export operations and other aspects of the workforce. Similarly, younger family members are actively entering the business and being employed in diverse roles ranging from agronomy, irrigation, distillation technology, management and bringing digital tools and sustainable practices. Training staff in industry-specific skills is also a vital component of each company's operations.
Producers also report strong traditions of cooperation during climatic shocks, particularly flooding events. Engagement with Indigenous communities, participation of women in management and technical roles, and the involvement of younger generations contribute to continuity and skills retention.

China

Production is geographically dispersed and employment measurement is therefore indicative. Estimates suggest that between 10,000 and 30,000 people may be connected to cultivation, processing and trade. The crop is frequently grown on marginal land and is recognised locally for its capacity to generate income over extended periods.

Figure 8.4. TTO workers at a production site in South Africa, illustrating employment and skills development opportunities for women across producing regions.

Source: Ezinqoleni Essential Oils.

For many households, TTO provides either a principal or supplementary revenue stream, contributing to poverty alleviation and rural stability. Environmental co-benefits cited include erosion control and vegetation restoration. For some farmers TTO is the main income source and certainly the sector supports employment and poverty alleviation in rural southern China as well as popularising scientific planting and processing techniques among farmers. Prior to the recent downturn, Chinese TTO farmers were estimated to earn US 430 per mu, which assuming 8,000 mu under cultivation would provide farmers with an income of US $3.44 million.

A single planting of tea tree can yield income and employment benefits over a decade, and it was hailed in China as "plant gold" because of its ability to provide a long term stable rural income alongside contributing to ecological restoration.

South Africa

In KwaZulu-Natal and the Eastern Cape Provinces of South Africa, TTO has, until recently, been a significant driver of rural economic diversification. The crop has provided a stable cash income for smallholder and subsistence farmers transitioning from maize cultivation or cattle farming. Out-grower and cooperative arrangements operating under fair-trade-like contractual frameworks are reported to generate supplemental income in the range of R10,000–R50,000 per hectare annually, supporting poverty reduction and enabling household investment in education, housing and food security. In some vertically integrated "farm-to-finish" models, growers are reported to receive up to 90% of export value, contributing to longer-term income stability in the context of volatile commodity markets.

Employment impacts are substantial across the value chain, including farming, distillation and related services. One major producer reported supporting directly between 800 and 1,000 individuals, including more than 550 out-growers as well as company staff, extension officers and distillery workers. Indirect employment is estimated at between 3,000 and 5,000 individuals, including family members engaged in harvesting and transport activities and service providers such as seedling nurseries and logistics operators. Company-level information provided by another KwaZulu-Natal operator indicates direct employment of approximately 155 permanent staff, with a further 80 seasonal workers engaged for part of the year. Employers emphasise that many of these positions are filled from surrounding rural communities where alternative formal employment opportunities are limited.

Women comprise approximately 70% of out-growers within certain networks, while youth aged 18–35 account for roughly 30% of the workforce. In addition, youth engagement through apprenticeship and training initiatives contributes to addressing rural unemployment and supporting skills development within producing regions.

Producers further note that organic cultivation systems often rely on manual weed control rather than herbicides. These practices are labour intensive, particularly during high rainfall periods when weed growth accelerates, but generate additional employment while aligning with environmental stewardship objectives. Companies describe this dual benefit as both an environmental choice and a livelihood contributor.

Beyond income and employment, producers report a wide range of community-level initiatives linked to tea tree revenues, including food programmes, school funding, water infrastructure provision, healthcare support, sustainable agriculture initiatives and agricultural services such as training, mentoring, land preparation, transport and logistics, as well as provision of firewood for heating and cooking. These activities illustrate the integration of commercial production with broader social responsibility and rural development objectives.

Kenya

Kenya has developed into a recognised African supplier, with systems ranging from estates to organised smallholder networks, often linked to ethical-trade arrangements. These structures facilitate market access, pesticide-free cultivation and export compliance.

The crop has proven adaptable in regions where other commercial options are constrained, including Laikipia, the Mount Kenya highlands and coastal districts. Long-term relationships with international buyers have integrated Kenyan TTO into global skincare supply chains.

Figure 8.5 – Tea tree cultivation within smallholder landscapes in KwaZulu-Natal.
Production occurs in close proximity to homesteads, illustrating the integration of TTO into household-level livelihood systems.

Source: Oribi Oils.

Figure 8.6 - Access road to the Inathi Child and Youth Care Centre, a community institution supported within the broader tea tree producing region.

Source: Inter Agri Oils Ltd.

CASE STUDY

Community Fair Trade sourcing of tea tree oil in Kenya: The Body Shop and Kutoka Ardhini

TTO has been a cornerstone ingredient for The Body Shop since 1995, with a long-standing commitment to their Community Fair Trade programme, sourcing natural ingredients in ways that generate positive social and environmental outcomes. Since 2020 The Body Shop has sourced TTO through its Community Fair Trade partnership with Kutoka Ardhini, a collective of small- and large-scale farmers based in Kenya.

Kutoka Ardhini has been a member of The Body Shop's bespoke Community Fair Trade programme since 2020. The partnership provides farmers with fair and predictable income, supporting livelihoods and enabling investment in local communities, while allowing The Body Shop to source high-quality TTO for its products.

Kutoka Ardhini's approach places farmers at the centre of the supply chain, and aims to develop sustainable, organic farming systems that conserve National Park ecosystems. Tea tree is cultivated using small-scale farming methods, with leaves hand-harvested to ensure quality. Farmers select optimal growing areas, promote biodiversity by intercropping tea tree with other crops such as chamomile and vetiver, and support environmental stewardship through forest maintenance and reforestation on parts of their land.

In 2025, approximately 3,300 kg of TTO were supplied through this partnership, with around 1,294 farmers directly involved across roughly 186 ha of farmland. This sourcing model contributes to stable livelihoods, skills development, and local value creation within rural Kenyan communities.

"Tea tree oil has been a core ingredient for our brand for decades, and since 2020 we have sourced it through our Community Fair Trade partnership with Kutoka Ardhini in Kenya. This partnership provides farmers with fair and predictable income while supporting environmental stewardship and high-quality production. As regulatory frameworks for tea tree oil continue to evolve, it is important to consider the implications for the livelihoods of the farming communities that rely on stable demand."

Breanna Lujan, The Body Shop

CASE STUDY

Cooperative production in South Africa

Ayanda African Oils provides an example of how a cooperative model can deliver strong socio-economic and environmental outcomes. The cooperative comprises 31 commercial farmers and oversees production from nurseries to packaged oil. It reports sustainable employment for approximately 500 people and reinvests TTO revenues into school feeding programmes, classroom construction, water infrastructure and mobile healthcare services.

Recent reductions in international demand linked to regulatory uncertainty have led the cooperative to scale back production and reconsider expansion plans, highlighting the sensitivity of rural employment to downstream market confidence.

CASE STUDY

Community reinvestment through Fair for Life premiums

One KwaZulu-Natal producer participating in the Fair for Life programme reports that premium funds are currently directed toward provision of drinking water infrastructure for a local child and youth care centre serving vulnerable families. Additional allocations have supported food voucher schemes for employees and plans for future health facilities to assist mobile clinics visiting the area.

Figure 8.7 Children at the Inathi Child and Youth Care Centre.
Community organisations such as these form part of the wider social landscape connected to tea tree production areas.

Source: Inter Agri Oils Ltd.

CASE STUDY

Building inclusive supply chains in KwaZulu-Natal

Oribi Oils runs a community project which provides seedlings, mentorship, training, and certification to support the rural communities of KwaNyuswa in KwaZulu-Natal province of South Africa. The project gives the farmers the same access to international markets as large-scale farmers. For perspective, Oribi Oils has donated over 1.7 million tea tree seedlings and purchases $360,000 to $470,000 of TTO annually from the same growers, which, according to the farmers, is their only source of income. The project is Fair Trade certified through the Fair-For-Life standard, and spends a further $85,000 to $150,000 per year on social development projects in the area. Oribi Oils is also the first tea tree producer to be certified under the Regenerative Organic Alliance's Regenerative Organic Certification™, further underpinning the organisation's commitment to sustainability. Oribi Oils estimates that the TTO income supports over 2,000 lives in our project alone.

Through this project Oribi Oils has helped draw together people from historically separate and unequal farming contexts around a shared agricultural purpose. By linking Zulu smallholder growers on tribal land with established commercial farmers in a common tea tree value chain, the project has created practical spaces for cooperation, learning, and mutual respect. Working toward the same quality, organic, and fair-trade goals has shifted relationships from parallel existence to active collaboration, breaking down long-standing social and geographic divides. In doing so, the project demonstrates how inclusive agriculture can foster economic opportunity while building trust and social cohesion between neighbouring communities that were once separated by history, land tenure, and access to resources.

"Tea Tree Oil underpins household income and food security for over two thousand people across our smallholder network. Many of the co-operatives we work with have few viable alternatives, and income from Tea Tree Oil enables families to meet essential needs such as education, healthcare, and nutrition. Regulatory decisions that restrict market access therefore translate directly into community-level hardship rather than abstract commercial risk."

Lauren Bateman, Director, Oribi Oils

CASE STUDY

An international consumer brand – downstream impacts of regulatory change

An international consumer brand with global operations provided anonymised downstream insights into the impacts of recent and proposed EU regulatory developments affecting TTO. The company uses TTO across a range of consumer products and has more than a decade of experience working with TTO supply chains. To maintain EU market access, the company undertook extensive reformulation, relabelling and regulatory reassessment of existing products. These activities required substantial internal scientific and regulatory resources, reducing capacity for innovation and new product development. The cumulative compliance burden has influenced investment prioritisation and slowed expansion plans.

The company also highlighted challenges arising from regulatory divergence between the EU and other markets, where risk-based frameworks continue to apply. This divergence was described as increasing operational complexity and creating ongoing cycles of reformulation and compliance costs.

Figure 8.8 - Representatives of Uthingo Estates and partners in a tea tree plantation.
Collaboration between producers, workers and communities underpins regional employment and skills development.

Source: Inter Agri Oils Ltd.

Figure 8.9 - Manual harvesting and transport of tea tree biomass to distillation in China, illustrating labour-intensive stages of the value chain.

Source: Summit Xiaman.

8.4. Impact of regulation on livelihoods, investment and trade

Across producing regions, uncertainty regarding regulatory outcomes has influenced planting intentions, capital expenditure and long-term commitments. Smaller operators are particularly exposed to fluctuations in demand. Predictability and clarity in regulatory processes are therefore widely regarded as important to maintaining employment, community programmes and investment confidence throughout the global TTO value chain.

There are substantial socio-economic and trade implications of the proposed EU re-classification. Submissions made through the WTO TBT process in response to notification G/TBT/N/EU/1172 underline that TTO production is overwhelmingly located outside the EU. As the EU is not a commercial producer, the practical effects of reclassification would fall primarily on exporting countries and rural communities.

Contributors highlighted potential downstream consequences across cosmetics, personal care, plant protection and biocide frameworks, including reformulation, withdrawal of products and reduced consumer choice irrespective of established safe-use determinations. Economic assessments referenced in submissions point to cumulative compliance costs across thousands of products and potential revenue impacts for producers and manufacturers. Several participants suggested that alternative risk-management approaches might achieve health objectives while limiting trade disruption.

Taken together, these perspectives indicate that regulatory measures may influence employment, supply-chain resilience and development outcomes in producing regions.

9. Environmental Sustainability

Environmental stewardship is a central characteristic of the TTO sector. It is shaped by the ecology of *Melaleuca alternifolia*, the landscapes in which it is cultivated, and increasing expectations regarding traceability, low-impact production and climate responsibility. Across established and emerging producing countries, sustainability practices have developed rapidly in recent years through improvements in land management, circular biomass utilisation, water stewardship and attention to emissions.

Figure 9.1. Installation of nest boxes for native wildlife as part of biodiversity management on TTO farms.

Source: Down Under Enterprises.

9.1 Producing country overview

Australia

Because *Melaleuca alternifolia* is indigenous to Australian production areas, cultivation is generally compatible with local soils, hydrology and climatic conditions and often requires fewer external inputs than introduced crops. A defining feature is the routine return of distilled biomass to fields, enhancing soil organic carbon, moisture retention and erosion control while reducing fertiliser demand. Integrated pest management, restrained chemical application and precision monitoring further support environmental outcomes. Many producers maintain riparian buffers, wildlife corridors and mixed plantings to mitigate monoculture risk.

Environmental pressures nevertheless remain. Climate volatility has intensified, with flooding, drought and heat stress affecting plantations, while steam distillation continues to represent the principal source of energy-related emissions. In response, producers have invested in improved boiler efficiency, heat recovery, biomass fuels and, in some cases, renewable energy solutions. Australia is currently the only producing origin operating under a formal industry Sustainability Plan aligned with the Australian Agriculture Sustainability Framework.

Additional assurance mechanisms include ISO 14001, EcoVadis and B Corp certifications.

Figure 9.2. Native bird species observed within TTO production landscapes where vegetation buffers are maintained.

Source: Down Under Enterprises.

China

Chinese producers frequently highlight circular resource practices, including reuse of post-distillation biomass as mulch, fertiliser or fuel. The crop's natural tolerance to pests reduces chemical requirements, while deep root systems contribute to soil stabilisation and water conservation, particularly on slopes and lower-productivity land. These practices are often framed within national objectives concerning green chemistry, reduced waste and sustainable land utilisation.

South Africa and Kenya

In South Africa and Kenya, cultivation systems are often labour-intensive. In many cases, manual weeding and close crop monitoring may reduce reliance on herbicides and limit the need for pesticide applications. Biomass boilers are widely used. At certain sites, agricultural by-products such as macadamia shells serve as boiler fuel, allowing processors to substitute locally available waste streams for fossil energy inputs.

Water systems are often designed for reuse, and spent distillation material is typically returned to fields as mulch to conserve soil moisture and suppress weeds. In some areas, continued dependence on coal for steam generation illustrates the balance between environmental ambition and local energy realities.

Zimbabwe

In Zimbabwe, production is fully organic. Producers report improvements in soil condition, biodiversity recovery and wildlife return, together with investments in composting, dam construction and water-retention measures to manage rainfall variability.

9.2 Soil, land and water management

TTO is frequently cultivated on land less suited to alternative crops, including low-lying or marginal areas. Sustainable management therefore emphasises groundcover retention, erosion prevention and incorporation of organic matter through biomass recycling.

In Australia, raised beds, upgraded drainage and soil-carbon restoration have gained prominence following major flood events. In African and Chinese contexts, mulching and organic inputs are central to moisture conservation and structural stability under variable rainfall.

Water stewardship remains a priority across all origins. Increasing attention is being directed towards recycling systems, storage capacity and monitoring tools designed to reduce environmental exposure while strengthening resilience to both drought and inundation.

Figure 9.3. Restored riparian corridor five years after establishment in Australia, supporting soil stability and water protection.

Source: Down Under Enterprises.

9.3 Biodiversity and integrated land management

Where plantation development intersects with native vegetation, biodiversity considerations become particularly important. Certification systems and industry guidance encourage preservation of riparian zones, maintenance of habitat corridors and reduced chemical dependency.

In Australia, some producers actively enhance ecosystems through mixed plantings and vegetated creek lines that provide refuge for wildlife, including koalas. In South Africa and China, low-chemical or near-organic approaches contribute to soil vitality and broader ecological health, although these practices may involve higher operational complexity.

In parts of KwaZulu-Natal conversion from sugar cane to tea tree has been described by producers as environmentally beneficial. Unlike annual cane systems that may involve regular burning and higher agrochemical inputs, tea tree is a perennial crop, often managed organically, with more continuous ground cover and greater habitat diversity relative to adjacent conventional agriculture

Figure 9.4. Nest boxes positioned within TTO plantations to enhance habitat availability in working agricultural environments.

Source: Down Under Enterprises.

9.4 Energy use, carbon reduction and circularity

Steam distillation is the most energy-intensive component of TTO production. Across regions, circular approaches seek to offset this burden by using spent biomass as boiler fuel or returning it to the land. Australian research indicates that a relatively modest share of dried residue can sustain subsequent distillation cycles, reducing dependence on external fuels.

Additional strategies include higher-efficiency boilers, improved insulation, optimisation of distillation parameters and, in some operations, solar energy for ancillary requirements. Producers operating advanced management systems increasingly quantify energy, water, waste and emissions metrics, supporting structured carbon-reduction planning and alignment with buyer expectations.

9.5 Climate change risks and adaptation

Climate variability represents a growing constraint on global TTO supply. Floods, droughts, extreme temperatures and altered rainfall patterns influence yields, infrastructure requirements and investment decisions.

Adaptation measures include improved soil practices, enhanced drainage, irrigation management and development of more resilient planting material. Australian breeding programmes have produced cultivars with improved tolerance to waterlogging and faster recovery after flood events. In Africa and China emphasis is placed on mulching, water infrastructure and flexible harvest scheduling. Across all regions, resilience is increasingly connected to certification, long-term sourcing agreements and access to finance.

Figure 9.5. Biomass fuel used for steam generation in South African distillation.
Agricultural residues such as macadamia shells are utilised to reduce reliance on fossil fuels.

Source: Oribi Oils.

9.6 Certification and environmental assurance

Certification schemes provide formal recognition of responsible land management, biodiversity protection and limited chemical use. Organic, Fair for Life-type and wider ESG frameworks are particularly relevant to producers operating through cooperatives, enabling demonstration of compliance in international markets. In Australia, participation in systems such as EcoVadis and B Corp signals comprehensive environmental governance and positions TTO within broader sustainability expectations for natural ingredients. Such verification supports downstream communication at a time when traceability and environmental claims are subject to heightened scrutiny.

Some South African producers have also moved toward emerging regenerative frameworks. Thus one company reports certification under the Regenerative Organic Alliance's Regenerative Organic Certification™, reflecting commitments to soil health, biodiversity, and social fairness alongside organic production.

10. Concluding Comments

10.1 Market outlook

Tea tree oil retains a recognised position in global markets for natural, plant-based ingredients, particularly in skincare, haircare, household hygiene and aromatherapy. Its long association with antimicrobial and anti-inflammatory functionality, together with sustained consumer interest in botanical actives, supports continued relevance across diverse product categories. Europe, North America and parts of Asia remain important destinations, supplied principally by Australia, South Africa, Kenya and China.

Regulation is, however, an increasingly influential determinant of market direction. The 2025 SCCS Opinion has clarified the conditions under which TTO may be used in EU cosmetics, establishing defined concentration limits for rinse-off and leave-on applications. While these parameters provide a degree of regulatory clarity for ISO 4730–conforming material, they may also restrict certain high-strength or specialised formulations. At the same time, parallel regulatory developments under chemical classification frameworks have introduced additional uncertainty for market participants. Evidence gathered during preparation of this report suggests that companies are already evaluating reformulation strategies, product portfolio adjustments and sourcing decisions. As a result, the future demand profile for TTO in the EU may depend on how regulatory processes evolve and how industry adapts to the combined technical, regulatory and commercial implications.

In Great Britain, the decision not to proceed at this stage with a Category 1B reproductive toxicity classification has reduced immediate uncertainty, while leaving open the possibility of future reassessment should additional data become available. This approach illustrates the continuing importance of evidence generation and exposure relevance in regulatory evaluation.

Producers in China and South Africa frequently align TTO with broader trends towards environmentally responsible consumer goods and green chemistry. Provided regulatory systems remain proportionate and the sector continues to demonstrate credible environmental and social performance, many anticipate steady or gradually expanding demand over the medium term. Established familiarity, versatility and long-standing market presence provide a foundation for continuity across both mainstream and specialist applications.

10.2 Challenges and opportunities

The sector faces a series of interconnected pressures. Price volatility remains significant, particularly where farm-gate returns periodically approach or fall below production costs. In parts of Africa, earlier regulatory debates in the EU were reported to have contributed to fluctuating orders, deferred planting and more cautious capital investment. Smaller producers are particularly exposed, especially where certification, documentation and compliance requirements demand additional skills and administrative capacity.

Producers in South Africa report that prolonged uncertainty surrounding EU regulatory processes has made forward planning exceptionally difficult. Several operators indicate that anticipated restrictions have already contributed to reduced planting, withdrawal from the crop, and hesitation to invest in new infrastructure, even before formal measures are adopted.

Despite this, some operators continue to invest in certification, processing capacity and supply-chain development, reflecting long-term commitment to the crop.

Differences between regulatory approaches in the EU and Great Britain introduce operational complexity for companies serving both jurisdictions. Beyond regulation, producers continue to manage climatic variability, disease risks and the practical challenges of maintaining consistent ISO compliance across geographically dispersed supply bases.

For Australian growers, long-term investment in replanting, equipment and soil improvement is closely linked to clarity regarding future demand conditions. While many markets remain stable, uncertainty in key importing regions has influenced timing of expansion and capital renewal. Predictable and evidence-based regulatory pathways are therefore viewed as central to planning for environmental and socio-economic sustainability.

At the same time, substantial opportunities remain. Demand for traceable and ethically sourced ingredients aligns TTO with procurement strategies increasingly favoured by global brands. Certification and sustainability verification frameworks, including organic standards and Community Fair Trade models, as well as corporate-level assessments such as EcoVadis ratings and B Corporation (B Corp) accreditation, can facilitate access to differentiated markets while providing assurance regarding environmental, social and governance practices.

Agronomic and technical innovation continues to strengthen resilience. Improvements in planting material, soil management, distillation efficiency and circular biomass utilisation enhance both environmental performance and economic viability. Ongoing research investment, including programmes supported by AgriFutures Australia, is expected to deliver further gains in productivity, consistency and adaptability.

Opportunities also exist in product differentiation, such as terpinen-4-ol-focused fractions and value-added activities undertaken closer to origin. Communication grounded in transparent data and responsible claims can reinforce consumer confidence and contribute to a more stable regulatory environment.

Many stakeholders note that timely clarity within the EU remains pivotal. Where uncertainty persists, downstream

brands may reformulate away from TTO, making later reintroduction difficult even under improved conditions. Continued dialogue between industry, scientific experts and regulators is therefore widely regarded as essential.

Extended periods of weaker pricing have already prompted some producers to evaluate alternative crops. Reports from South Africa indicate shifts towards macadamia in pursuit of improved margins and reduced regulatory exposure. Similar adjustments have occurred in other essential oil sectors when profitability remains constrained.

Some producers emphasise that long-term sustainability requires resisting extreme price discounting during periods of oversupply. Several stakeholders described deliberate decisions not to release oil at levels they considered incompatible with environmental stewardship or fair returns to growers, arguing that short-term market capture can undermine both producer viability and social investment.

10.3 The path ahead

The future trajectory of the TTO sector will depend on its capacity to balance regulatory expectations, environmental performance, scientific evidence and socio-economic realities across diverse regions. Maintaining confidence in authenticity and quality through adherence to ISO 4730 and sound agricultural and manufacturing practices remains fundamental. Equally important is constructive engagement with regulators to ensure that safety evaluations reflect realistic exposure scenarios and the accumulated record of use.

Fair distribution of value along the supply chain is also critical. Cooperative arrangements in Africa and Asia demonstrate that TTO can support employment, food security, education and access to essential services. These experiences illustrate how governance, traceability and shared investment can align commercial activity with internationally recognised sustainability objectives. Brands and retailers play an important complementary role. Responsible communication, avoidance of exaggerated claims and commitment to long-term supplier relationships can enhance resilience and reduce vulnerability to abrupt market shifts arising from regulatory or reputational developments.

In a global environment shaped by climate pressures and demand for natural solutions TTO has the potential to remain a relevant and adaptable ingredient. Realising this potential will require coordinated effort across the value chain, continued investment in agronomy and environmental stewardship, rigorous scientific engagement and sourcing approaches that recognise the labour, knowledge and heritage of producing communities. Where these elements converge, TTO can continue to contribute both to consumer needs and to sustainable rural development.

11. Glossary

AgriFutures Australia
The Australian rural research and development corporation responsible for administering statutory levies and supporting agronomic, breeding and sustainability research for the tea tree and other rural industries.

ATP (24) – 24th Adaptation to Technical Progress
Refers to the 24th update to Annex VI of Regulation (EC) No 1272/2008 under the CLP framework, proposing harmonised classification amendments for certain substances.

ATTIA (Australian Tea Tree Industry Association)
The industry body representing tea tree growers and processors in Australia. ATTIA provides technical guidance, industry standards, regulatory submissions, research coordination and advocacy.

B Corporation (B Corp)
A third-party certification awarded to companies that meet verified standards of social and environmental performance, transparency and accountability.

Biodiversity buffer / riparian buffer
A protected strip of natural vegetation alongside waterways or ecologically sensitive areas, maintained within agricultural landscapes to protect soil stability, water quality and habitat.

Biodiversity corridor
A connected area of native or restored vegetation that supports wildlife movement and habitat continuity. In TTO-producing regions, this may include creek lines or mixed-crop plantings.

CARACAL (Competent Authorities for REACH and CLP)
An expert group chaired by the European Commission comprising Member State representatives and stakeholders, providing guidance on the implementation of REACH and the CLP Regulation.

Chiral authentication
An analytical method using enantiomeric ratios to confirm that TTO is naturally derived and unadulterated. In Australia, CHIRAL testing is mandated for commercial production.

Circular utilisation (agricultural)
A production approach in which agricultural residues, such as distilled biomass, are reused as mulch, compost or fuel to reduce waste and improve resource efficiency.

CLP Regulation
Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging
The European Union and Great Britain regulatory framework governing chemical hazard classification, labelling and packaging.

CMR 1B classification
A hazard category for substances presumed to be carcinogenic, mutagenic or toxic for reproduction based primarily on animal data.

Community Fair Trade / fair trade
Ethical sourcing systems designed to ensure fair pricing, community benefits and safe working conditions, while promoting long-term producer development.

Dermal exposure
Exposure via topical application to the skin. This is the primary exposure route for TTO in cosmetic and therapeutic products.

EFEO (European Federation of Essential Oils)
The principal representative body for the essential oils sector in Europe, engaged in regulatory and scientific advocacy.

Fair for Life
An independently audited certification system covering fair trade, social responsibility and traceability.

Fractional distillation
A secondary separation process enabling concentration or isolation of specific constituents to high purity levels.

Hazard vs risk (regulatory context)
Hazard describes the intrinsic properties of a substance; risk considers the likelihood of harm under realistic exposure conditions.

HSE (Health and Safety Executive, Great Britain)
The authority responsible for chemical classification under GB CLP.

ISO 4730
The international standard defining compositional limits and quality criteria for Oil of Melaleuca, terpinen-4-ol type.

Monocropping
An agricultural system in which a single crop is grown repeatedly on the same land.

Mu (Chinese unit of land)
A traditional Chinese unit of land area equal to 1/15 of a hectare (≈0.067 hectares) or approximately 1/6 of an acre, commonly used in agricultural land measurement.

Natural Complex Substance (NCS)
A naturally derived substance composed of multiple constituents occurring in variable but characteristic proportions. In regulatory terms, an NCS is assessed as a multi-constituent mixture rather than as a single chemically defined compound. Essential oils, including tea tree oil, are classified as Natural Complex Substances.

Oxidation (essential oils)
Chemical degradation occurs when oils are exposed to oxygen, heat or light, potentially increasing sensitisation potential.

RAC (Risk Assessment Committee)
Scientific committee within ECHA responsible for delivering opinions on harmonised hazard classification.

Regenerative agriculture
Farming practices aimed at restoring soil health, enhancing biodiversity and improving long-term ecosystem function.

Regenerative Organic Certification™
A certification standard combining organic agriculture with soil health, animal welfare and social fairness criteria.

Reconciliation Action Plan (RAP)
An Australian framework supporting respectful relationships with Aboriginal and Torres Strait Islander peoples.

Riparian restoration
Rehabilitation of vegetation along rivers and creeks to stabilise soil and enhance habitat.

SCCS (Scientific Committee on Consumer Safety)
EU scientific committee responsible for evaluating cosmetic ingredient safety.

SDGs (Sustainable Development Goals)
The United Nations framework of 17 global development objectives addressing social, environmental and economic sustainability.

Tea tree oil (TTO)
Essential oil distilled from *Melaleuca alternifolia* used in cosmetics, personal care, household products and aromatherapy.

Terpinen-4-ol
The principal constituent associated with antimicrobial activity and required at defined levels under ISO 4730.

WONF (With Other Natural Flavours)
Industry term describing formulations that replicate natural profiles using isolates or fractions and are not equivalent to ISO-compliant TTO.

World Trade Organization (WTO)
International organisation overseeing global trade rules and administering the Technical Barriers to Trade (TBT) notification process.

12. Bibliography and Acknowledgements

Data Collection and Industry Consultation

In addition to published literature, regulatory opinions and industry reports, structured questionnaires were distributed to selected producers, distributors, manufacturers and other value-chain participants. These detailed questionnaires were used to obtain primary data on production practices, market conditions, regulatory impacts and sustainability initiatives. Photographic documentation was provided with permission where indicated.

12.1 Bibliography

- AgriFutures Australia (various years). *Tea tree oil research and industry development reports.*
- Australian Tea Tree Industry Association (ATTIA) (2020). *Stability of pure Australian tea tree oil. 8 June.*
- Australian Tea Tree Industry Association (ATTIA) (2020–2025). Regulatory submissions, issue briefs, agronomic guidance and industry position papers.
- Australian Tea Tree Industry Association (ATTIA) (2025–2026). Questionnaire responses and industry consultation.
- Ayanda African Oils (2025). Video and photographic documentation. Producer communication and questionnaire responses, 2025–2026.
- Bassett, I., Pannowitz, D. and Barnetson, R. (1990). A comparative study of tea tree oil versus benzoyl peroxide in the treatment of acne. *Medical Journal of Australia,* 153, pp. 455–458.
- Carson, C.F., Hammer, K.A. and Riley, T.V. (2005). Compilation and review of tea tree oil literature. Australian Government RIRDC.
- Carson, C.F., Hammer, K.A. and Riley, T.V. (2006). *Melaleuca alternifolia* (tea tree) oil: a review of antimicrobial and medicinal properties. *Clinical Microbiology Reviews*, 19, pp. 50–62.
- Chemistry World; Cosmetics Law; Premium Beauty News (2024–2025). Media coverage of SCCS and CLP developments.
- Chopard, J. (2012). Improved identification methods for Australian tea tree oil. IFEAT Conference, Singapore.
- Cosmetic, Toiletry and Perfumery Association (CTPA) (2023–2025). Regulatory commentary.
- Davis, R.L. (2003). The Australian tea tree oil industry. IFEAT Conference Proceedings, Sydney.
- Down Under Enterprises (2025–2026). Photographs and descriptive material on TTO planting, harvesting and processing (2005 - 2006) and questionnaire responses.
- Emerald Acres, South Africa (2025–2026). Questionnaire responses.
- Enshaieh, S. et al. (2007). Efficacy of 5% tea tree oil gel. *Indian Journal of Dermatology, Venereology and Leprology*, 73, pp. 22–25.
- EO Products, USA (2025–2026). Questionnaire responses.
- European Chemicals Agency (ECHA), RAC (2024–2025). Hazard classification opinions.
- European Commission, SCCS (2025). Opinion on *Melaleuca alternifolia* (SCCS/1681/25).
- European Federation of Essential Oils (EFEO) (2023–2025). Technical communications.
- EZE – Ezinqoleni Essential Oils Pty (Ltd) (2025–2026). Questionnaire responses and photographic documentation.
- Golden Grove Naturals (2019). Australian study tour report.
- Greenhalgh, P. (2024). IFEAT South Africa study tour.
- GrowAG (various years). Agricultural investment summaries.
- Gupta, A.K., Nicol, K. and Batra, R. (2004). Antifungal agents in seborrheic dermatitis. *American Journal of Clinical Dermatology*, 5(6), pp. 417–422.
- Hammer, K.A., Carson, C.F. and Riley, T.V. (2002). In vitro activity against dermatophytes. *Journal of Antimicrobial Chemotherapy*, 50, pp. 195–199.
- Health and Safety Executive (HSE) (2025). GB CLP position.
- Inter-Agri Oils (2025–2026). Questionnaire responses.
- International Organization for Standardization (ISO) (2017 and 2025). ISO 4730.
- Karbach, J. et al. (2015). Antimicrobial effect of Australian essential oils. *Clinical Laboratory*, 61, pp. 61–68.
- Main Camp (2025–2026). Questionnaire responses and photographic documentation.
- Oribi Oils (2025–2026). Supply-chain submissions and questionnaire responses.
- Plant Therapy LLC, USA (2025–2026). Questionnaire responses.
- Satchell, A.C. et al. (2002). Treatment of tinea pedis. *Australasian Journal of Dermatology*, 43, pp. 175–178.
- SME Bluepages (various years). African production profiles.
- Summit Biotechnology (Xiamen) Ltd. (2025–2026). Questionnaire responses and photographic documentation (permission granted).
- Thosar, N. et al. (2013). Antimicrobial efficacy study. *European Journal of Dentistry*, 7, pp. S71–S77.
- Varvaresou, A. et al. (2009). Self-preserving cosmetics. *International Journal of Cosmetic Science*.
- Vossen & Co SA/NV, Belgium (2025–2026). Questionnaire responses and photographic documentation.
- Yun Nan Lorraine Aromatic Products Co., Ltd., China (2025–2026). Questionnaire responses and photographic documentation.

12.2 Acknowledgements – Individual Contributors and Reviewers

The authors acknowledge with appreciation the time, expertise and constructive input provided by the following individuals. Contributions included technical insight, sectoral perspectives, downstream user experience, regulatory commentary and review feedback during the preparation of this report. Responsibility for the final content rests solely with the authors.

Alan Brown
Cécile Bascoul
Hugo Bovill
Agnes Gendry-Hearn
Sibel Horsman
Charles Laroche
Francesca Perego
Jens-Achim Protzen
Mathieu Rolland
Dee-Ann Seccombe
Tim Valentiner
Elisabeth Vossen
Matt Wessels
Winnie Yeung

The authors also acknowledge the cooperation of companies and industry participants who provided questionnaire responses and photographic documentation in support of this report.

13. Annexure

This is as reported by a multinational brand in order to maintain regulatory compliance.

Table 13.1 – Indicative reformulation and development costs

Product category	Number of products	Estimated hours	Reformulation costs (USD)	R&D costs (USD)	Estimated total (USD)
Essential oils and blends	20	3,060	160,660	101,807	262,467
Personal care products	6	4,202	177,747	43,907	221,654
Supplement products	1	1,027	22,889	4,550	27,439
Total (reported)	–	–	361,296	150,264	511,560

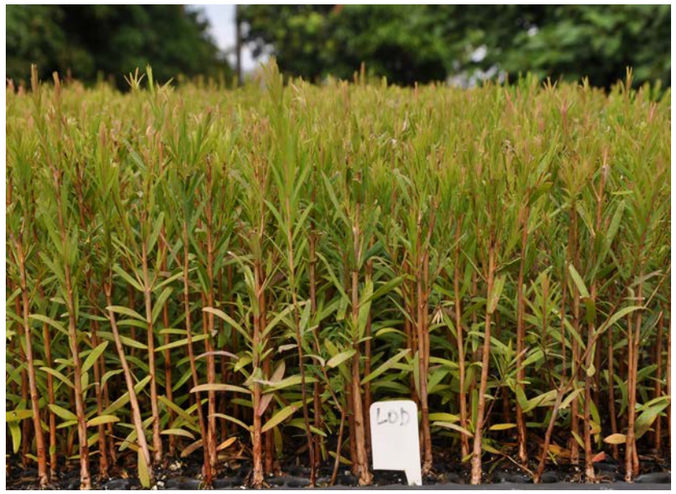
Table 13.2 – Regulatory decision-making landscape for TTO

Scientific Committee on Consumer Safety (SCCS)	The European Chemicals Agency (ECHA)	Committee for Risk Assessment (RAC)	Competent Authorities for Registration, Evaluation, Authorisation and restriction of chemicals [REACH] and Classification, Labelling and Packaging [CLP] (CARACAL)
This is the EU's advisory body responsible for providing independent and authoritative scientific advice and opinions on consumer safety aspects of non-food consumer products and services – including cosmetic products and their ingredients.	ECHA is responsible for implementing the EU's chemicals legislation, and helps companies comply with specific EU legislation on chemicals or biocides, including REACH regulations, and classification, labelling and packaging issues.	RAC prepares the opinions of ECHA, although the final decisions are taken by the European Commission. The RAC examines the proposals for harmonised classification and labelling and gives an opinion on whether substances may be carcinogenic, mutagenic, toxic for reproduction or a respiratory sensitiser, or other effects.	CARACAL works with the EU and ECHA in the implementation of the REACH and CLP Regulations.

REACH
REACH is a regulation of the EU that considers the risks to consumers that can be posed by chemicals. In principle REACH applies to all chemical substances, not only those used in industrial processes, so the regulation has an impact on most companies across the EU.

REACH places the burden of proof on companies. To comply with the regulation, companies must identify and manage the risks linked to the substances they manufacture and market in the EU. They must demonstrate to ECHA how the substance can be safely used.

Source: ATTIA.



Source: Down Under Enterprises.

6th Floor, King's House,
9-10 Haymarket, London
SW1Y 4BP, UK

secretariat@ifeat.org
www.ifeat.org

Registered in England and Wales with liability limited by guarantee under Company No. 01369368