ESSENTIAL OILS

MARKET REPORT

WINTER 2021

JOY TO THE WORLD!

Ultra International B.V.

Essential Oils, Ingredients, F & F

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USA
page 58 - 59
Grapefruit Oil
Lemon Oil
Orange Oil

ITALY
page 40 - 41
Orange Oil
Clementine Oil
Lemon Oil
Mandarin Oil
Bergamot Oil

ARTICLES

INDIA

page 36 - 38

Peppermint Oil
Cornmint Essential Oil
Spearmint Oil
Indian Basil Oil
Lemongrass Oil

INDONESIA

page 30 - 31

Clove Oil
Patchouli Oil
Nutmeg Oil
Vetiver Oil
Citronella Oil

AUSTRALIA

page 6 - 8

Tea Tree Oil
Buddawood Oil
Sandalwood Oil
Eucalyptus Radiata Oil
Lemon Myrtle Oil

NEW ZEALAND

page 32 - 33

Manuka Oil

Mother Nature is at work, painting the world in the beautiful play of muted greys, icy blues, and dazzling whites, unmistakable signs of a consummate artist. All around, the riot of tropical flora has given way to verdant, coniferous greens. Vibrant reds and greens of Christmas warm hearts while the glitter of Christmas décor shimmers and shines in the twilight. The stockings are ready, and so are our shopping lists and party menus. The air is humming with warmth, good vibes, and hope as we gear up to count our blessings.

Welcome to Winter Market Report 2021.

If there is a catchphrase that I have heard, and steadfastly believe in, it is that change is the only constant. And these past two years have been a reminder of this eternal truth. This year, at Ultra too, we decided to look change in the eye, embrace it and let it lead us off our beaten track. With this report, we take you not into the fields for product updates as we usually do, but into the world of breakthrough developments of essential oils with informative articles.

Turn the pages to dive into the glitzy world of fine bartending. Couture and perfume cocktails have arrived and are notching up the style quotient, while essential oils are the new darlings of chefs in new-age culinary creations. Taking you away from the glamour into the fascinating world of nutraceuticals, you will see that in a patented encapsulation technology, essential oils are now available in powdered form.

Parachuting from the laboratory straight into a sunny lemon grove in Spain, we get a first-hand perspective from José Antonio Garcia, Director of AILIMPO, the Spanish lemon and grapefruit Association.

Addressing change on a sombre note, how can we not talk about the immense change in weather patterns that we have seen in the last few years? Trees are flowering sooner and these environmental conditions ultimately have significant impact on compositions, agrarian yield, and the commodities trade.

Another significant change that the industry is grappling with is the post-COVID 19 freight and logistics landscape. Every shipper, shipping line, freight forwarder, and transporter is fraught with worry. Will the ports or airport where they load and unload their cargo be in lockdown at the time? Are there bottlenecks on the route? Will they get enough stevedores and warehousing facilities in their ports of call? The tide has turned on the world transport and logistics landscape. Bottlenecks in almost all major ports have resulted in congestion, high load volumes and long queues. There is a shortage of containers, disruption in loadings and deliveries, longer transit times and zero schedule reliability. Consequently, costs of containers and freight have skyrocketed with ripple effects on all trades. Compounding the challenge is the global stimulus initiatives implemented by governments. Intended to be the shot in the arm to spur demand, the industry is unable to meet the sudden surge that these have generated.

In an update of his keynote presentation on *Naturals in Indonesia* at the 2019 IFEAT Bali Conference, Ravi Sanganeria discusses the impact and challenges of COVID-19, climate change, transport bottlenecks and sustainability issues on developments in this major supply source of essential oils.

Despite the challenges, it is after all, the time to look back in wonder. There is also a detailed account of the latest IFEAT conference We bring you the updated highlights of some of the recent key developments, and reiterate the criticality of how we in the oils and naturals industry must adopt changes to incorporate sustainable practices for a better future for all.

I sign off with warm wishes for a Merry Christmas and a brilliant 2022.

Priyamvada Sanganeria
Director, Ultra International BV

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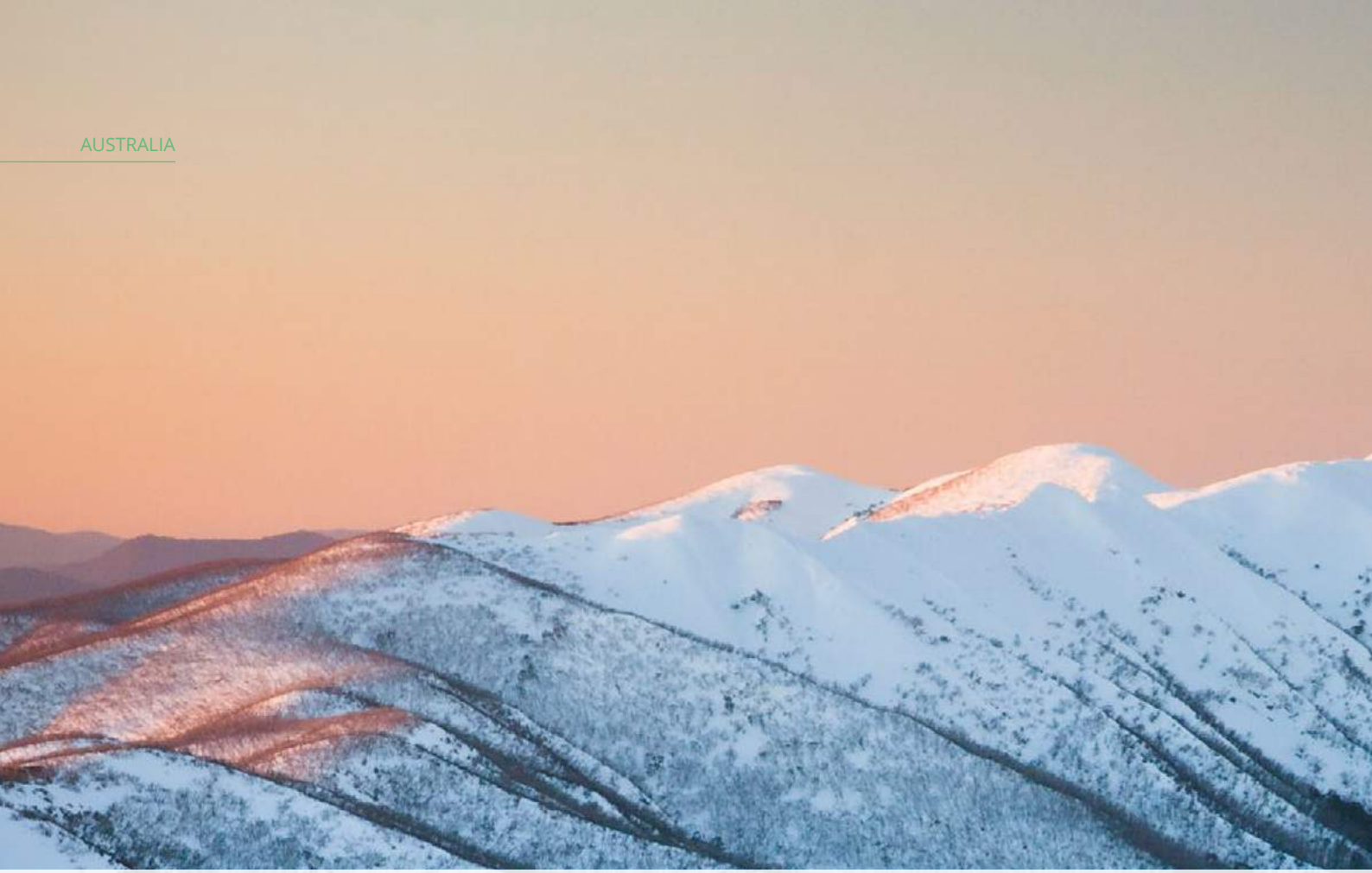
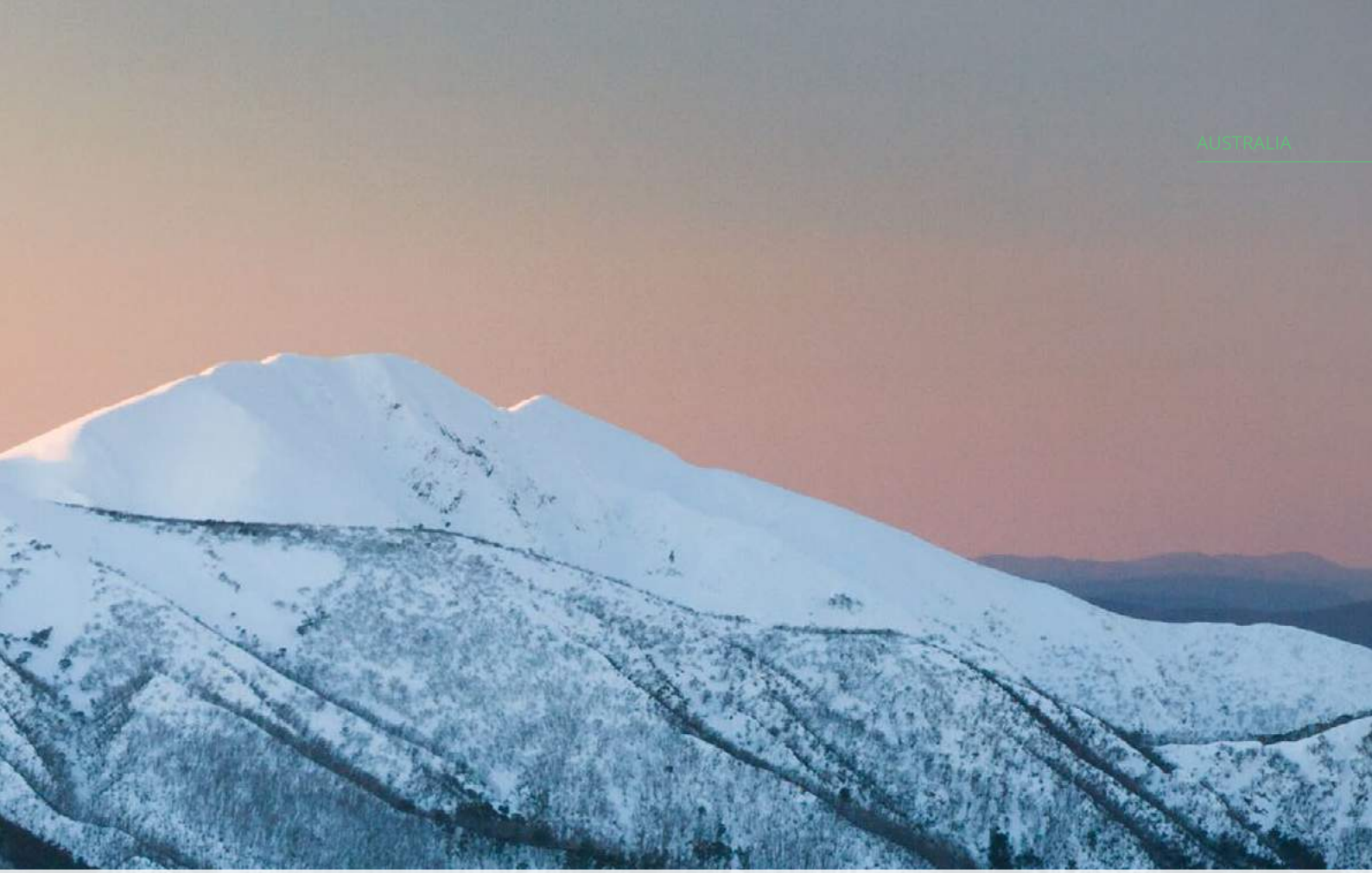


golden grove
NATURALS



The impact of COVID-19 has been significant on the essential oils industry. Certain varieties witnessed a positive outlook due to their medicinal and remedial usage. Oils used extensively by the fragrance industry saw a global decline. The industry is now recovering with demand picking up. According to market research, the EO sector is expected to grow almost 10% from USD 9.62 billion in 2021 to USD 18.25 billion by 2028.

This seasonal update is not a comprehensive take on the entire industry. We have focused on regions exhibiting significant change.

TEA TREE OIL

Melaleuca alternifolia *Australia*

Floods were responsible for reduced oil production in 2020. Last year production fell to 700 MT, though 2021 has seen production numbers reach 1,000 MT. There is a healthy demand for the oil in the market. The challenge for Australian farmers is varieties coming from other sources. This has increased competition. However, the oil price continues to be stable.

AUD 49.00 /kilo

BUDDAWOOD OIL

Eremophila mitchellii *Australia*

There is consistent oil supply. Two MT of oil was produced in 2021. There is low demand for the oil. The shutting of duty-free has had a direct impact. The fragrance industry is a major consumer of buddawood oil. Luxury items are low priority at the moment.

USD 435.00 /kilo

SANDALWOOD OIL

Santalum spicatum *Australia*

The market is stable, though closure of duty-free has impacted sandalwood demand. A large consumer of the oil is the fine fragrance industry.

USD 1350.00 /kilo

EUCALYPTUS RADIATA OIL

Eucalyptus radiata *Australia*

This year the production of *eucalyptus radiata* oil in Australia was over 6 MT. The oil market has mostly been stable with no major fluctuations. Demand for the oil has been strong this year.

AUD 82.00 /kilo

LEMON MYRTLE OIL

Backhousia citriodora *Australia*

Production in 2021 touched the 3 MT figure. A steady production and processing cycle is undertaken in Australia. Companies dealing with aromatherapy products have shown interest in the oil due to its appealing fragrance. Its usage has grown significantly.

USD 320.00 /kilo

May this year's learning nurture our minds
and help enrich our planet.
Wishing you and your loved ones
peace and good health this festive season.

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Entf
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THE IFEAT ONLINE CONFERENCE
9-10TH NOVEMBER 2021

Despite the ongoing pandemic IFEAT (International Federation of Essential Oils and Aroma Trades) continues to make its presence felt in the world of essential oils. From 9th-10th November it held its second successful Online Conference (OC) of 2021 under the banner of "Bringing the Industry Closer Together". Given the areas that the F&F industry covers, the variety of topics discussed during the two days was both wide-ranging and in-depth. Moreover, at the beginning of the OC, three major IFEAT events were announced for 2022:

1. The Vancouver Conference 9th-13th October 2022, based at the Westin Bayshore with its breathtaking surroundings. This will be a hybrid conference with the theme "The Pacific Reunion" in part reflecting delegates' ability to meet up again on the shores of the Pacific Ocean after a three-year hiatus.

2. A Focused Study Tour (FST) 20th-23rd February 2022 to Murcia in southern Spain to visit lemon production and processing operations. The FST is a new concept for IFEAT involving a shorter duration, lower cost, focused on one location and one major topic – lemon oil - and thus appealing to a wider range of F&F participants.

3. A Study Tour to South Africa from 4th-12th November 2022, which is an ideal time to see the harvesting and processing operations of a range of familiar and unique essential oil crops in the Cape and eastern provinces of this beautiful country, which is an expanding producer of essential oils.

In all there were 320 registered delegates at the OC, some 14 exhibitors and 13 sponsors. While the conference's eight live sessions took place over two days, registered delegates were able to watch these sessions for several weeks after the conference. Moreover, delegates were able to use the Whova event hub to begin networking and hold video meetings from 20th July, when registration opened, until the end of December 2021. In addition, during this period delegates can visit exhibitors' booths, as well as view companies' videos and previous conference presentations on demand. Several speed networking sessions during the conference also proved popular.

The OC began with a welcome address by Hussein Fakhry, the IFEAT Chair, who outlined IFEAT's response to the unprecedented challenges it has faced in 2020 and 2021 – and the various initiatives being made in all fields of its activities including building new partnerships among the scientific, regulatory, and academic communities. He considered it a period of wake-up calls and the need for our industry to find solutions to a wide range of challenges, not least of which was climate change and sustainability. Nevertheless, he remained optimistic about the year ahead, particularly the Vancouver Conference, on which Alan Brown, the Vancouver Committee chair, made a short presentation.

Following the Welcome presentation, there followed four sessions on each of the two days. Some sessions were presentations, others panel discussions on topics and issues directly relevant to those involved in the production, processing, trading and utilisation of essential oils and other F&F ingredients. Throughout the live sessions delegates were able to post their questions and all the sessions produced excellent informative analysis of the topics under discussion.

This first presentation by Martin Hitziger introduced ***The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)*** and described species and products of particular relevance for the essential oil industry that might be or can be regulated under CITES, such as frankincense and guaiac wood. It detailed the ongoing administrative, regulatory and policy processes to further develop CITES regulations in the future, further details of which can be seen on the CITES website.

Citrus and Mints: Concerns of Small and Large Farming for the Future of Essential Oils was the first panel discussion. It compared and contrasted citrus and mint oils which are by far the two largest groups of essential oils used by a large variety of industries, including F&F, pharmaceuticals, and aromatherapy. A most informative discussion was chaired by Dominique Roques with two major citrus oil producers, Manuel Suarez Altuna (Argentina) and Sigifredo Gudiño Jr (Mexico)] and two mint producers Vaibhav Agrawal (India) and Greg Biza (USA) exchanging views on aspects of their production, processing and sustainability policies. Citrus is grown and processed mainly by large and medium scale operations while mint oils predominantly by small scale operations. However, there were examples of the opposite, namely US peppermint and spearmint production and European citrus. The relative pros and cons of different systems were discussed from technical, economic, and environmental perspectives and the general view was both large and small operations would continue.

Agricultural Residues in Naturals: Scientific and Regulatory Landscape was the second panel discussion involving experts involved in various stages of the value chain, and chaired by Jonathan Bonello, IFEAT's Chief Scientific Officer. This is an increasingly important and complex topic that has become a major issue for some essential oils.

The panellists shared their insights, perspectives, and vision on the short, medium, and longer-term aspects on a range of complex issues, such as:

- The need for a more realistic global approach to pesticides and their residues including managing regional legislative differences and data collection.

- The growing number of bans, especially in the EU and USA and sometimes at short notice of important pesticides, often commonly used as PPPs (Plant Protection Products). The European debate on PPPs is becoming more contentious and the European Commission is reviewing its Sustainable Use of Pesticides Directive, as part of its flagship Green Deal initiative launched in December 2020. Similar regulatory initiatives are already ongoing in other regions of the world, some of which will be influenced by the EU's approach.

- The constantly evolving regulatory framework on maximum residue levels (MRLs) and often very low contaminant concentrations, and their concentration through further processing.

- The technical challenges in developing accurate and reproducible analytical protocols for identifying and quantifying PPPs in agricultural produce and downstream products.

- The challenges faced, particularly by small producers and traders, and their ability to continue in business faced with the expanding regulatory environment and without the use of PPPs.

The final session of the day was a lecture by a serial entrepreneur and chemist John Warner on ***Materials Metabolism: Green Chemistry for a Circular Economy.*** He argued that in trying to develop more sustainable products to fit within the circular economy we need to learn from the patterns within nature. There exists a circular pendulum that swings between the natural world of stable ecosystems and the human built world of products. Centrally located between these two systems exists the domain of the "materials metabolism", the molecular mechanistic foundation for the assembly and disassembly of molecules and materials. The concept of "materials metabolism" was discussed and, citing many of his own inventions, he illustrated how the principles of green chemistry provide a logical framework for the design of products.

The second day began with sessions covering two overlapping topics namely traceability and sustainability. ***Traceability: Market Expectations and Business Reality: Where do we Stand?*** saw six panellists representing producers, traders and end users along the supply chain being moderated by two leading figures in the F&F sector, Geemon Korah and Dominique Roques.

Over the past several years there has been a dramatic increase in industry requirements for traceability of growers, collectors, and processors at the origin of essential oil and extract production. In part this relates to the growing demand from consumers for information and transparency around the origin of their fragrance and flavour ingredients and the livelihoods of the farming communities involved in their production and initial processing. This has led to stakeholders along the supply chain requesting in-depth information from producers and traders, with the aim of looking for reassurances around human rights, social and environmental issues. Traceability is at the heart of these new expectations and has brought producers face to face with a range of new challenges along with a degree of complexity which can be high. For many, traceability is not an option anymore but a requirement, but rapid technological change and innovative funding techniques and certification schemes have facilitated its implementation and expansion. The panellists discussed the impact of traceability on their operations, what efforts were being made to ensure traceability, whether traceability was mandatory, who should bear the costs of this added complexity, and if there is a shared vision between producers and users about what should be done. One overwhelming sentiment among the discussants was the need to better support growers, many of whom are at or near to the poverty line. Without support in a variety of forms, they will be unable to meet the traceability and sustainability requests made upon them.

The second session was on ***The Future of Sustainable Natural Products and Biotechnology: Expectations and Reality***, with five very knowledgeable panellists. Sustainability in essential oils and their end uses is a complex and dynamic balance between economic, environmental, and social aspects and includes competing objectives. It is a broad concept that is present in many current discussions and plays a key role in investment decisions. The session began with Alain Frix, the moderator, providing some fascinating data on the sources and renewability of ingredients for the F&F industry. Synthetics sources, predominantly from petrochemicals, are the dominant supply source supplying close to 500,000 MT. Aroma chemicals from turpentine supply around 110,000 MT. These are synthetic but are renewable because they are obtained from pine trees, but turpentine is a by-product and production does not directly respond to demand from the F&F industry. In contrast, essential oil production, which is renewable, is directly responsive to F&F sector demand and the annual volume of production is of a similar order of magnitude to that of pine oleochemicals. Biotech products account for a very small proportion of F&F ingredients. These biotechnologies have enormous future potential but in the next decade are likely to only affect products valued over $50/kg.

The panel discussion evaluated the sustainability expectations for essential oils and biotech products. Many interrelated parameters define a sustainable product (renewability, biodegradability, carbon footprint, toxicity, water management, rural economy, fair trade, farmers' livelihoods, extraction technology, plant protection, soil degradation, biodiversity preservation, transportation, green chemistry, etc.). The panel highlighted some of the key parameters of sustainability that will be increasingly demanded by the F&F industry. Producers of essential oils and/or aromatic molecules need guidance in prioritising their sustainability investments. In addition, sustainable products will need to be available in significant quantities. The panellists discussed the current and future availability of essential oils and biotech products and to what extent they can coexist. It was recognised that commitment was needed by the trade and end users to support sustainable initiatives.

> *IFEAT is expanding its educational programme and the OC saw the launch of its first online learning course with a Cardamom Profile Session.*

IFEAT is expanding its educational programme and the OC saw the launch of its first online learning course with a ***Cardamom Profile Session.*** The session, which provided an excellent introduction to cardamom oil, was made up of three components. First, presentations including short videos by Elisa Aragon from Guatemala and Mithun Chakravarthy Rajamannar from India on the cardamom sectors in these two major origins. Second, the perfumer Jill Costa and the flavourist John Wright discussing samples of cardamon oil from these origins. Finally, a live panel discussion, of the presentations including questions from delegates, moderated by John Nechupadom. IFEAT will be incorporating much of the information into a Socio-Economic Report on Cardamom Oil to be published in IFEATWORLD in 2022.

The final session of the OC was ***EU Chemicals Strategy for Sustainability – a Paradigm Shift in EU Chemicals Management*** given by Sylvie Lemoine of CEFIC. This provided an overview of the main changes introduced under the EU Chemicals Strategy for Sustainability in terms of both EU chemicals legislation (such as the revision of the REACH and CLP Regulations) and managing the transition to safe and sustainable chemicals. She highlighted the areas that have been identified by the chemical industry as most challenging and explored potential solutions.

IFEAT's second online conference provided an excellent platform on which delegates were able to network and update themselves on the increasing challenges being faced by the F&F industry. Such online events will continue but it was recognised that it is impossible to totally replicate several of the activities of a physical conference e.g., smelling and tasting products, face-to-face meetings, cultural exchanges and entertainments, impromptu meetings and discussions, social interactions, and an accompanying person's programme – and we are looking forward very much to being able to do all these once again at the forthcoming Vancouver Conference in October 2022.


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WELCOME TO A
SCENT-TILLATING CHRISTMAS

Once again, as the Earth traces its path around the sun, the nights grow longer and days shorter. As holiday plans take shape, so do visions of snuggling up with a soul-satisfying cup of cinnamon-laced hot chocolate. Or maybe a glass of sweet and spicy, slow-simmered mulled wine?

The raisins and currants co-exist in easy camaraderie in the cake mix while the holly and the mistletoe jostle for space in home décor. The cellars are full and a wonderful aroma of baking wafts in the air. The vibes are unmistakable. Just like that in the busy bustle, one unassuming, humble ingredient has tiptoed into holiday menus, making traditional holiday recipes pack a fragrant punch. A few drops in the diffuser to intensify the holiday feelings with the right aroma is familiar, but on your salad or in your cocktail? Now, that's something else!

Essential oils are no stranger to flavouring and perfumery. But in the hands of some master chefs and mixologists, these have become the brush with which they add finesse to the canvas of their culinary creations. Making their way out of the bedroom and medicine cabinets, essential oils have now found a firm place on kitchen shelves and bar tops.

FLAVOUR ENHANCERS

Potent and fragrant, essential oils have traditionally been used in aromatherapy, perfumery, and as alternate medicine. Recently, culinary artistes and mixologists who are passionate about using the finest quality of ingredients, are experimenting with essential oils.

As flavour enhancers and mood modifiers, fragrant essences are now being translated into cocktails and epicurean delights. This has opened new avenues for recipe development in the global food and beverage industry.

Essential oils are, in actuality, plant essences. The unique, concentrated essence is unmatched by any other form of the same ingredient. For example, the flavour and aroma of lime essential oil used in a dish will be different from those from fresh lime zest. Mixed with a carrier in limited quantities or used with water in a spray, the strength of the oil can be tweaked to suit your taste. Naturally, it allows the play of dominant or subtle flavours and lends itself well to a wide spectrum of creative experimentation. Consider getting the best of the zest of orange without the lingering bitterness of pulp.

Research has shown that aroma has a memory trigger and emotional connect. In a breakthrough experiment that created ripples in the world of bartending, the iconic aromas of Chanel No.5 were isolated and the art of the perfumer fused with the poetry of the mixologist to create the popular No.5 Champagne Cocktail. Givenchy's signature fragrances found expression in a collection of the most exquisitely crafted, delicious cocktails mirroring those scents. All the cocktails were meticulously replicated to resemble the same distinct colour and aroma as that of the *eau de parfum*. Couture cocktails had arrived. Crafting the distinctive taste and smell of signature scents, perfumers, distillers, mixologists, and chefs are collaborating to create smooth, perfume cocktails that offer a one-of-kind sublime sensory experience. Thanks to the innovative use of aromatic essential oils, it is now possible to sip your perfume.

This leads us to the question that's on everyone's minds, are essential oils safe to ingest? There are certain procedures to extract essential oils. Most of these that are intended for aromatherapy and bath and body are not suitable or safe for consumption. However, essences that are produced in a particular way are safe, similar to vanilla essence or almond extract that are common in dessert recipes. These are always labelled as 'Food Grade' so make sure you go through the label with a fine toothcomb before adding those cinnamon drops to your hot chocolate or eggnog.

In a breakthrough experiment that created ripples in the world of bartending, the iconic aromas of Chanel No.5 were isolated and the art of the perfumer fused with the poetry of the mixologist to create the popular No.5 Champagne Cocktail.

THINGS TO REMEMBER

- Convert the measurement into drops. An indication of the number of drops can be estimated by the volume of the corresponding ingredient in the recipe. Remember essential oils are extremely potent substances. A general rule of thumb is 1 drop for 1 teaspoon. We recommend adding 1-2 drops gradually; you can add more later if you want. Otherwise, it will end up ruining your food and your holiday mood.

- Dilute the essence with another carrier or, alternatively, use convenient hydrosol sprays. This allows the oil to disperse it throughout the dish in reasonable concentrations that are easily assimilated by the body. Or use a toothpick to dip into the oil and then into the food.

- Delay the addition of the essences till the final stage. If cooking with essential oils, the heat breaks down the chemical composition. Alternatively, if you are shaking up a perfume-inspired cocktail, make sure you atomise the glass or add the oil at the last.

From heart-warming cocktails to fizzy tipples, you can jazz up your holiday menu with a touch of essential oils. What is more, they smell equally divine and hit just the right sensory chords too. We did some brainstorming to help you along.

Lemon essential oil suitable for consumption imparts a zesty, tangy note in salads, ice-creams, marinades. Beverage recipes galore, add a drop of the oil to gin for martinis, shake it in with cognac and vanilla for a smooth warm-up cocktail. Add a drop of sage oil to dark, aged rum, and a slice of pineapple to move away slightly from the traditional hot buttered rum. Peppermint oil sprayed on the glass marries fantastically with the good old hot chocolate, while cinnamon oil does an incredible job of spicing up a mulled wine or eggnog. And a hot toddy gets the party going with a drop of cardamom.

Try it also with fudge, cheesecake, and chocolate. A touch of basil adds body to meat, meatloaf, and mince pies. Add some thyme to your broths and see them pep up or spray some saffron on roasted vegetables. A hint of orange oil in your cranberry sauce notches up the tartness.

Essential oils complement food and beverages yet retain their own vibrant character. Whether it's misting through the air in your room, an edible mist on your glass or a spritz on your wrist, essential oils are surely an essential part of holiday festivities.

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POWDERING WELLNESS
ESSENTIAL OILS IN POWDER FORM OPEN UP NEW PRODUCT OPPORTUNITIES

Constant innovation is the new normal when it comes to the essential oils industry. Companies are spending a lot of time and resources in research to present sustainable, purer, and unique products to the consumer. On this journey, the latest traveller to join the essential oils bandwagon is not liquid, but powder.

After years of research, trials, and tests, several companies are producing essential oils in powder form. These oils are being lapped up by nutraceuticals, health and wellness, and food industries. Companies producing cosmetics, food, and health ingredients have all reacted positively to the essential oils powder range. One of the major advantages of powder form is shelf life. Products in powdered form are easy to handle and last longer. Working with liquid essential oils is cumbersome, since it requires the usage of protective clothing. Powered essential oils carry all the benefits sans the complexities.

THE CONVERSION PROCESS

When it comes to actual production of powder essential oils, there are several challenges that researchers have overcome. For starters, technologies being developed to change the state of essential oils need to provide protection from oxidative decomposition and evaporation. This is where encapsulation technology comes into play. It protects the overall profile of the essential oil. A natural encapsulation tech, called Natur-Cell has been developed by a French company to perfect the conversion process. It is used to convert oil to powder form via entirely natural means. Inulin is used as a matrix in this case to protect the original profile of essential oils, and consequently turn it into powder. Inulin is a soluble prebiotic fibre. It acts in the capacity of an active carrier and possesses digestive benefits. At times, the entire process ends up increasing the potential health benefits associated with essential oils. This in turn augments their applications. When we talk about actual quantities, largely it has been witnessed a tonne of oil produces approximately 150 kilograms of powder.

JOINING HANDS WITH NUTRACEUTICALS

The countless benefits of essential oils in powder form have piqued the interest of numerous industries, but the most notable one is nutraceuticals. When you amalgamate nutrition and pharmaceuticals, the resulting compound is nutraceuticals. These are products used for the dual purpose of providing nutrition, and as medicines. Their nutritional, safety, and therapeutic benefits make them extremely popular in the market. They possess psychological benefits and provide protection from chronic diseases. In fact, several studies have shown positive impact of nutraceuticals in treating conditions such as diabetes, atherosclerosis, cardiovascular diseases, cancer, and neurological disorders. These conditions give rise to alterations in the redox state. This refers to changes in the body's oxidation levels. Nutraceuticals with their antioxidant ability counteract the changes, making them effective in preventing life threatening conditions. Nutraceuticals are sold worldwide in medicinal form, isolated from foods. Unlike pharmaceuticals, patent protection is not an issue with nutraceuticals. Some of the popular products include ginseng, echinacea, green tea, omega-3, and folic acid.

Essential oils in powder form have come as a huge boost to the nutraceutical industry. This development has potentially opened the market for a range of new products. Companies are working to introduce natural product ranges to address issues like digestion, immunity, and relaxation. Some of the products being tried by companies in this space include a combination of essential oils and plant extracts. These are easy to use and are proven to have a deeper impact on curing illness and aiding in the process of mental calmness.

The beauty industry has got their hands full as well. One of the blends is believed to work wonders on cellulite and circulation. Skin hydration and wrinkle reduction can be achieved with a combination of a lipowheat and a rare citrus essential oil from Sicily.

Globally, there has been a strong push towards essential oils for their health and wellness benefits. In fact, according to research published a while ago, the market for essential oils is expected to jump to $27.5 billion by 2022. This is an approximate 55% rise in 5 years. France is one of the countries that strongly believes in the health benefits of essential oils, and has recommended their oral consumption.

A HEALTHY DROP FOR FUNCTIONAL FOODS AND BEVERAGES

Another industry largely expected to benefit from powder essential oils is functional foods and beverages. These products have caught the fantasy of the health conscious in recent times. Nutritionally superior, functional foods and beverages possess biologically active compounds. One of the biggest concerns with functional foods is their packaging and storage. Microbial spoilage, and risk of food-borne infections is a real concern. This is where essential oils come into the picture. Various studies have indicated the advantages of producing functional foods with essential oils. Essential oils possess superior antibacterial, antioxidant, antifungal, and anti-carcinogenic properties. With the consumer's push towards natural products, essential oils are the perfect additive to preserve functional foods. Their shelf life can be greatly augmented courtesy the use of essential oils for antimicrobial packaging. With the innovation of essential oils in powder form, their solubility increases exponentially, thus eliminating the task of specifically formulating essential oils into nanoparticles to increase stability and solubility. The future of functional foods and beverages is secure with powdered essential oils for company.

THE REGULATORY PUSH

Powdered essential oils have received a tremendous response in the market. Regulatory changes have had a huge role to play in this market perception. It was only in December 2018 that essential oils were considered safe for oral consumption. Studies were undertaken at massive levels, across the globe to prove the safety of essential oils. The green signal by the European Food Safety Authority (EFSA) has come as a major support to the essential oils industry. In fact, there are several countries where scientific proof and regulatory clearances are mandatory. Thus, the support of a regulatory body has made essential oils acceptable on a global scale. Europe is in fact leading the queue when it comes to perception change. Essential oils are now much more than regulars in aromatherapy.

Research and innovation have infused new life into the essential oils industry. For a long time essential oils have been considered partners in aromatherapy treatments to aid in the process of stress relief and relaxation. Now nutraceuticals and functional foods and the beverage industry are some of the biggest enthusiasts of powdered essential oils. A new dawn is here with oral consumption of essential oils for a healthier lifestyle.

https://www.nutritioninsight.com/news/essential-oils-in-powder-form-robertets-technology-targets-immunity-and-digestion.html

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https://www.foodmag.com.au/essential-oils-make-easy-work-for-food-manufacturers/

https://www.researchgate.net/publication/324692649_Perspective_Uses_of_Essential_Oils_in_Functional_Foods_and_Antimicrobial_Packaging_Material


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CLOVE OIL

Eugenia caryophyllata *Indonesia*

Weather has not been conducive for clove this year. Rains are still persistent. Lack of a dry spell is responsible for low raw material availability. This has led to a rise in the oil price.

Eugenol USP 99.5% USD 25.00 /kilo

Clove Leaf 85% USD 24.00 /kilo

PATCHOULI OIL

Pogostemon cablin *Indonesia*

Currently, supply is exceeding demand. This is due to increased oil production. Prices have been stable.

Patchoul IF USD 56.00 /kilo

Patchouli Dark USD 44.00 - 60.00 /kilo

NUTMEG OIL

Myristica fragrans *Indonesia*

The stock for minimum 10% myristcin material is extremely limited. The new normal is 8-9% myristicin. At present, the oil supply in the market is less than the demand.

USD 72 /kilo

VETIVER OIL

Vetiveria zizanioides Indonesia

There is a steady demand for the oil, though the crop has become unsustainable for farmers due to the low market price. This almost halted production and price has doubled in the past three months. The Indonesian vetiver variety has a smoky note. Even though it is not preferable, it could potentially replace the Haiti variety in certain formulas. This is because of the geopolitical issues in Haiti, which have become a hindrance to vetiver production. Until the recent instability, Haiti was the leading global producer of vetiver.

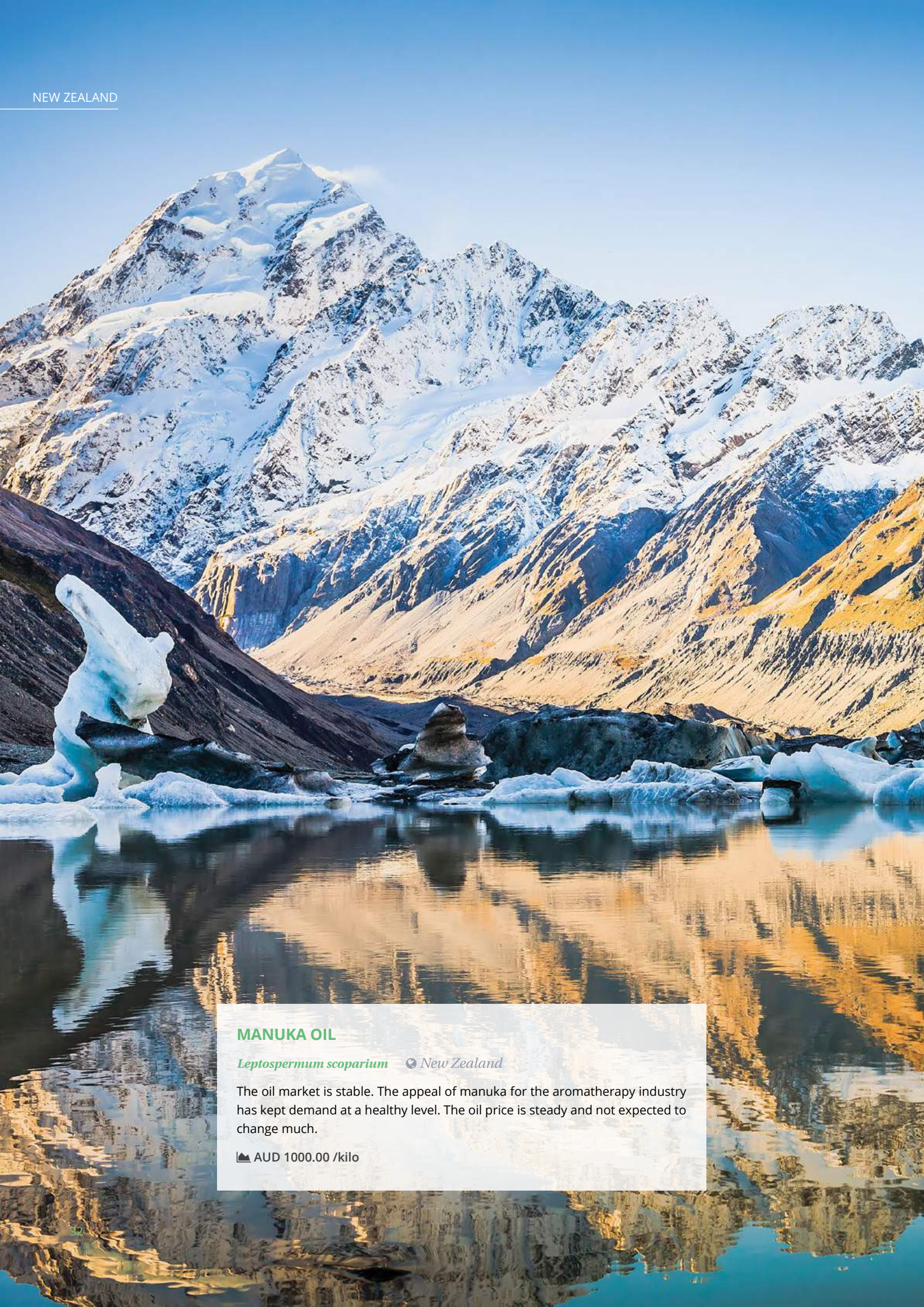
USD 345.00 /kilo

CITRONELLA OIL

Cymbopogon winterianus Indonesia

There is steady demand for the oil, though supply is limited, and logistic costs have escalated. Farmers lost interest in citronella due to diminishing returns. This led to reduced oil production. Currently the oil price is rising because of the demand-supply dynamics. This trend is expected to continue for the coming months.

USD 17.95.00 /kilo



MANUKA OIL

Leptospermum scoparium *New Zealand*

The oil market is stable. The appeal of manuka for the aromatherapy industry has kept demand at a healthy level. The oil price is steady and not expected to change much.

AUD 1000.00 /kilo

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THE INDIAN **COLLECTION**

PEPPERMINT OIL

Mentha piperita *India*

American peppermint is priced lower than the Indian variety. There are also numerous synthetics in the market. With so many alternatives, the price of Indian peppermint is not expected to rise exponentially, though it is still advisable to stock quantities. This is primarily because of farmers' reluctance towards the crop. They are inclined towards maize, which will reduce the acreage of *Mentha piperita* in 2022. Currently, the market price is on the rise.

Price on Request

CORNMINT OIL

Mentha Arvensis *India*

Logistical issues continue to adversely affect production. High freight prices are responsible for expensive quotations. There is a healthy demand for DMO (dementholised oil), and fractions like cis-3-hexanol. This is keeping crude DMO prices high. In fact, DMO varieties with high menthol content are priced in the same bracket as menthol. On the other hand, the demand for menthol crystals is average. This has kept the price of finished menthol products at a low level. *Mentha* oil prices are firm in the market, primarily due to low supply of crude from farmers and stockholders.

The current market price is not favourable for farmers. Around 1,500 MT of raw material is coming from Madhya Pradesh. This will help keep the market stable for the time being, but the upcoming crop in 2022 is expected to be lower than 2021. This will strain the supply of crude oil, and prices will rise in the coming quarter. Demand has been recovering post COVID, thus it is advisable to keep stocks.

Synthetic menthol is being imported into India in large quantities. Prices are under check due to the constant supply of synthetics. This despite menthol powder being exported to China on a regular basis.

Price on Request

SPEARMINT OIL

Mentha spicata *India*

All eyes are on the upcoming harvest in 2022. The current availability is at unhealthy levels. The product prevalent in the market is the adulterated version. At present, the oil price is at an all-time high.

Price on Request

INDIAN BASIL OIL

Ocimum basilicum *India*

Estragole requirements can be covered presently. The new crop has arrived in the market. In terms of price, fluctuations are being witnessed at the moment.

USD 115.00 /kilo

LEMONGRASS OIL

Cymbopogon citratus *India*

It is advisable to keep required stock. There is healthy demand for the oil in the market. Fresh production should commence soon. But the oil price is high, and no reduction is expected in the near future.

USD 240.00 /kilo


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During the 2020/21 season the total production of Italy's major citrus fruits – orange, lemon, clementine, mandarin, and bergamot – grew by an estimated 38% compared with the previous year. A substantial reduction in output is anticipated in the coming 2021/22 season despite the area under cultivation of 226,000 hectares remaining stable. This decline in output is mainly because of unfavourable climatic conditions rather than pests and diseases. These include the lower rainfall in April to August 2021, as well as reduced irrigation and limited water availability, especially for associations without automatic irrigation systems. These will impact productivity, growth and resistance to parasitic diseases, as well as fruit drop.

Citrus processing levels are also predicted to decline in 2021/2022 to an estimated 800,000 MT compared with 1.166 million MT. However, processing yields for both essential oils and juices are predicted to be good.

According to SINAB (*Sistema d'informazione Nazionale sull'Agricoltura Biologica*) some 27% of Italy's citrus growing area is organic, making Italy the world's largest producer of organic citrus fruit. Organic farming is increasing for several reasons, including the concentration of citrus fruit production in southern Italian regions, which have a low incidence of phytosanitary problems thanks to a relatively stable climate. Much of the land is under individual family management who are reluctant to invest in phytosanitary products to raise yields. In 2020 Sicily accounted for 61% of the cultivated organic area while Calabria accounted for 30%.

ORANGE OIL

Citrus sinensis Italy

Orange accounts for almost 60% of Italian citrus fruit production and is grown on 82,000 ha. of which 65% is dedicated to navel and other blond oranges and 34% to blood oranges. The harvest in the coming year is expected to decline by a potential 40%. This will impact the volume of oranges processed which has been estimated at 40% of output but can be even higher.

EURO 16.00 /kilo

CLEMENTINE OIL

Citrus reticulata Italy

Clementine is a natural hybrid of mandarin and sweet orange, and in terms of volume the second largest citrus fruit grown in Italy. Output in 2021/22 is forecast to grow by 3% to almost 700,000 MT produced from 26,000 ha. Approximately 20% of clementine are processed, a lower processed level than any other major Italian citrus fruit.

EURO 82.00 /kilo

LEMON OIL

Citrus limon (L.) Burm. F. Italy

Lemon production in 2020/21 was estimated at 475,000 MT from 25,000 ha. The harvest is expected to decline by 30% in 2021/22. This will directly impact the volumes available for processing, which could come down by a quarter. Approximately 35% of lemon output is processed.

EURO 24.00 /kilo

MANDARIN OIL

Citrus reticulata Italy

Mandarin is grown on 8,500 ha, approximately 6% of cultivable citrus land. Production in 2020/21 was 150,000 MT. In the 2021/22 season a 30% decline in the harvest is expected with output at 105,000 MT resulting in a similar decline in processing volumes. Approximately 25% of the mandarin crop is processed.

EURO 79.00 /kilo

BERGAMOT OIL

Citrus bergamia Italy

Bergamot had a bumper crop in 2020/21 of 34,650 MT, though in the coming year it is expected to return to volumes produced in the previous two seasons produced from 1,650 ha. Local farmers continue to show interest in bergamot. It occupies just over 1% of cultivated citrus land. Almost all the bergamot crop is processed.

EURO 235.00 /kilo

NATURALS FROM INDONESIA - AN UPDATE

Ravi Sanganeria

At the last IFEAT Conference in Bali in October 2019 I made a keynote presentation providing an overview of Indonesian essential oils and the many challenges and opportunities faced by the sector[1]. Since then, the past two years have probably been the most difficult faced by the sector in living memory and this article provides an update of some recent key developments.

The topics covered in this paper are

- *Trends in the production of major Indonesian essential oils*.

This is followed by a discussion of the major challenges faced by the sector since the Bali Conference, namely:

- *The impact of the COVID-19 pandemic*
- *Climate change*
- *Transport and other logistical issues*
- *Sustainability, traceability and the DAI*
- *Some concluding comments*

TRENDS IN THE PRODUCTION OF MAJOR INDONESIAN ESSENTIAL OILS

Indonesia continues to be a dominant and diverse supplier of natural ingredients to the world's F&F industry exporting at least 40 essential oils. It is the major global supplier of patchouli, cloves, nutmeg, and vetiver. This section reviews some key features and trends of these major oils as well as citronella, vetiver, and vanilla. Of course, Indonesia provides many other essential oils to our industry. These include cananga, cajeput, cinnamon, cubeb, fennel, ginger, gurjun balsam, kaffir lime, lemongrass, massoia, black pepper, sandalwood, and agarwood – but these are not discussed although the table provides estimates of Indonesian output of these items.

Photo: Group photo to honour all the Indonesian Delegates at IFEAT Bali

[1]*Ravi Sanganeria: Naturals in Indonesia – vital raw materials facing many challenges. Paper presented at the IFEAT International Conference in Nusa Dua, Bali, 29 - 3 October 2019 Naturals in Asia*


INDONESIA
Demographic Features
Population 269 million
747 languages
Life expectancy 69 years
40% population in agriculture
300 different ethnic groups
Second largest bio diversity
NUSA DUA BALI
29 SEPTEMBER – 3 OCTOBER 2019
INDONESIA
Demographic Features

INDONESIA: ESTIMATED ESSENTIAL OIL PRODUCTION 2014 -2020 (METRIC TONNES)

	2014	2015	2016	2017	2018	2019	2020
Turpentine	-	-	13,000-14,000	12,500-13,500	14,000-14,500	14,500-15,000	14,500-15,000
Clove (leaf/stem/bud)	3,500-4,000	4,200-4,700	3,200-3,500	2,500-3,000	4,000-4,500	3,300-3,800	4,000-4,300
Patchouli	800-1,000	1,400-1,600	1,500-1,700	1,200-1,400	1,000-1,200	900-1,100	1,300-1,400
Citronella	500-600	600-700	600-700	700-800	1,000-1,200	1,500-1,700	1,800-2,000
Cajuput	350-400	350-450	350-450	350-450	500-600	500-600	500-600
Nutmeg	350-400	300-350	300-350	300-350	300-350	300-350	200-250
Gurjun Balsam	8-10	8-10	40-50	40-50	30-40	30-40	30-40
Vetiver	20-25	10-15	8-10	5-8	30-35	20-25	15-20
Massoia	12-15	15-20	20-25	15-20	20-25	15-20	12-15
Cananga & Ylang-ylang	12-15	8-10	6-8	3-5	4-6	4-6	3-4
Ginger	5-7	7-10	6-8	6-8	4-5	4-5	3-4
Lajagoa	-	-	2-5	2-4	3-5	3-5	3-4
Agarwood	2-3	2-3	2-3	2-3	2-3	1.5-2.5	0.2-0.3
Kaffir Lime Leaf	2-3	2-3	2-3	2-3	2-3	2-3	2-3
Cinnamomum culilawan	-	-		1	2-3	2-3	2-3
Lemongrass	-	-	1-2	0.5	2-3	3-4	3-4
Black Pepper	-	-	2	0.5	2-3	2-3	2-4
Cubeb	1-2	<1	0.5	1	1	1	1
Cinnamomum burmannii	<1	<1	0.5	1	1	1	1
Sandalwood (Santalum album)	<1	<0.7	0.5	0.5	0.5	0.3	1
Fennel	-	-		0.5	0.5	0.5	0.5
Piper Betle Leaf	-	-		0.5	0.5	0.5	0.5
Palmarosa					0.2	0.2	0.5

*Notes: *Agarwood consists of 46 species: 12 Aquilaria sp., 13 Gyrinops sp. and others not controlled under CITES*

Source: DAI - Interviews with essential oil producers and exporters

Indonesian essential oil production activities are spread throughout a very large country and involve many parties in the value chain ranging from predominantly smallholder farmers producing raw materials, to an estimated 3,300 small and medium-sized distilling operations, collectors, and traders, to technically advanced processing industries and exporters. Essential oils provide work and income for many of Indonesia's rural communities, often in remote areas, and are of great importance to the economic, social, and environmental wellbeing of an estimated 200,000 people in these communities. In addition, the sector is continuing to produce more value-added products, such as CO_2 extracts, while the large F&F companies (e.g., IFF, Givaudan, Firmenich, Symrise, alongside sizeable Indonesian companies) are investing tens of millions of US dollars in manufacturing capacity in Indonesia.

CITRONELLA *(Cymbopogon winterianus Jowitt)*

Citronella is a perennial grass grown by smallholders that is relatively easy to cultivate. It can be hand-harvested every three months and distilled throughout the year, using basic equipment and techniques. No additional fertiliser and weeding are required and it acts as a natural pesticide. Recently Indonesian production has grown very quickly with the opening of new planting areas and annual output is estimated at 1,800-2,000 MT. Production has been moving eastwards particularly in Java and into Sulawesi. As production expands there is also a lot of out-of-specification material available in the market. Because of substantial local consumption, only 300-350 MT is exported. Indonesia has recently overtaken China as the world's largest citronella oil producer. Indonesian citronella is better priced than citronella from China, Vietnam, and Sri Lanka but price volatility is considerable. Consumption has been growing, reflecting its wide range of uses. These include use in cosmetics, perfumery, aromatherapy, insect repellents, various medicinal purposes, and potential use in biofuel. Although citronella oil is produced organically it is not currently certified.

CLOVES *(Eugenia caryophyllata, syn. Syzygium aromaticum)*

Indonesia is the world's biggest producer and consumer of cloves, producing an estimated 80,000 MT each year from some 440,000 hectares located mainly in Sulawesi (accounting for 60% of clove production), Java and Sumatra. Most clove buds are used domestically in the "kretek" cigarette industry. Clove oil is produced from the clove buds, leaves and stems and clove oils are the second largest essential oil produced in Indonesia, after turpentine oil. Annual oil production has shown wide fluctuations with 2020 annual output estimated at 4,000 – 4,300 MT although production dipped to between 3,300 and 3,800 MT in 2019. Climatic factors are an important factor behind the annual fluctuation and every fourth year Indonesia tends to have a large harvest lasting 3 – 4 months. Unseasonal weather patterns including excess rain have affected the availability and increased supply uncertainties. Despite variations in annual output and prices, current estimates suggest that the overall production trend is stable. Clove oil production is done by hundreds of small traditional distilleries, spread over large areas of Java, Sumatra, and Sulawesi. All the major clove oil distillers are concentrated in Java, close to the kretek cigarette factories. Within Indonesia, sizeable investments are being made to produce value added clove products. Such investments provide clove producers with greater security. There is a strong demand for clove derivatives, in part because of new applications (e.g., in animal feed and pheromones).

NUTMEG *(Myristica fragrans Houtt.)*

Indonesia dominates world production of nutmeg and nutmeg oil, accounting for approximately 80% of global output. Annual Indonesian nutmeg oil production in recent years has averaged between 300 – 350 MT, although 2020 production fell to an estimated 200 – 250 MT. Unlike some crops, such as patchouli and vanilla, which are very labour intensive, once nutmeg has been planted it is relatively easy to maintain and harvest. Moreover, farming and distillation methods for nutmeg oil are more organised and concentrated than other Indonesian essential oils.

PATCHOULI *(Pogostemon cablin)*

Patchouli oil is one of the most sought-after ingredients for fine fragrances and Indonesia dominates global production, with annual exports of 1,200 – 1,500 MT accounting for approximately 90% of international trade. Considerable efforts are being made to improve sustainability and stabilise production and prices but for a variety of reasons including the impact of climatic factors (drought in 2019, heavy rains, El Niño), pests and disease, shifting cultivation, the fluctuations and volatility of the process has continued. In late 2021 the unseasonal weather patterns and heavy rain severely impacted the availability, quality, and prices of patchouli. Sulawesi produces over 1,000 MT and now accounts for some two-thirds of Indonesia's patchouli oil output. Despite efforts to stabilise the supply sources there is evidence of a continuing shift of the crop from southeast Sulawesi to central and north Sulawesi creating a more cumbersome supply chain and greater price volatility.

TURPENTINE *(Pinus merkusii)*

Turpentine is a renewable product extracted from pine trees (Sumatran pine), produced as a by-product from tapping trees for resin or from cellulose pulp production. Production has been growing and is between 14,000 – 15,000 MT and is a very labour-intensive industry. Unlike most Indonesian essential oils, turpentine is produced predominantly on government-owned estates in Java and Sumatra. Most of the turpentine derivatives used in F&F are chemically transformed and therefore considered synthetic by regulatory bodies. Turpentine derivatives, particularly terpenes are a vital source of F&F ingredients, particularly for use in fragrances and the industry is looking towards these derivatives as a vital source of renewable feedstocks in the future.

VANILLA *(V. planifolia and V. tahitensis)*

Indonesia is the world's third largest producer of natural vanilla, after Madagascar and Papua New Guinea. Annual output is difficult to estimate in part because of sizeable imports from neighbouring PNG. Recent Indonesian output has been estimated at 100 to 150 MT compared with approximately 300 MT in PNG. The high prices of recent years have led to an expansion of Indonesian planting which in turn should lead to a rise in production. The vanilla sector faces several challenges, which include natural disasters in some growing areas (e.g., landslides, tropical cyclone), higher freight cost and less frequency of shipment activities due to the Covid-19 pandemic, and high prices leading to early harvesting practices.

VETIVER *(Vetiveria zizanioides).*

Demand for vetiver has been growing, encouraged by greater use in aromatherapy. Value added products are being produced (e.g., vetiver CO_2 extract, with a superior olfactory profile, and vetiveryl acetate) helping to raise demand. Increasing interest combined with rising prices encouraged efforts to expand production. Severe precipitation has led to yield variations. Industry is looking for sustainable quality supplies, but whether Indonesia can provide a long-term solution remains to be seen. Indonesian producers have faced criticism for delivering inferior quality but recent developments to enhance quality and improve distillation equipment and processes are leading to improved export quality. Indonesian vetiver oil maintains its unique characteristics and is perceived as a quality product compared to the Haitian material.

THE IMPACT OF THE COVID-19 PANDEMIC

Indonesia has suffered one of the worst COVID-19 pandemic outbreaks in Asia and the world. COVID-19 was confirmed in Indonesia in March 2020 and a month later the virus had spread to all 34 provinces. By early December 2021 some 4.3 million cases had been confirmed and official deaths totalled 144,000, ranking second in Asia and eighth in the world. However, actual figures are likely to be much higher. Unlike many countries, Indonesia did not implement a national lockdown but rather imposed "large-scale social restrictions" (PSBB) later modified to community activity restrictions. Nevertheless, COVID-19 is having an enormous social and human impact in terms of the deaths, illness and numerous disruptions and tragedies it has caused.

The COVID pandemic is having a considerable impact on Indonesia's economy, and the essential oils sector has not escaped. COVID created four major challenges – logistics, labour, finance, and price volatility. The logistics issue is discussed in a separate section on transport and freight. Labour movement and availability was restricted, thus reducing production capacity and the time required to fulfil supply requirements. Financial issues arose, sometimes operations had to be closed creating difficulties in rotating capital, sometimes raw materials couldn't be obtained or wages paid. Economic growth either stagnated or declined and there was severe disruption to the supply chain. The F&F secto was less disrupted than many since it was often designated an essential industry. Price fluctuations vary from product to product but were invariably substantial due to demand-supply imbalances.

COVID-19 led to one of the most severe global recessions in living memory and although Indonesia experienced a milder recession than many, it was not spared. Following real GDP growth in 2019 of 5% the economy declined by 2.1% in 2020 and almost 3 million people fell into poverty. In 2021 Southeast Asia's largest economy returned to growth, but growth in the third quarter (July – September) slowed more than expected to an estimated 3.5% (compared with 7% expansion in April – June quarter) as further restrictions to control the deadly Delta COVID-19 variant put a further brake on activity. It was predicted that growth would be getting back on track in late 2021 but this again could be limited by concerns over the new Omicron variant and concerns over trends in the global economy. Uncertainty remains very high with sizeable downside risks.

Unfortunately, in late 2021 the anticipated return to a much greater degree of normality has not materialised as the disruptions due to the COVID-19 pandemic have not subsided. Significant volatility throughout the world continues to plague the ability to operate normally. Supply chain and logistic disruptions continue, demand for many F&F products remains high, while raw material availability is either reduced or uncertain and costs are rising creating many difficulties; labour costs are rising, and severe shipping and freight constraints remain, leading to increased delivery times.

CLIMATE CHANGE

While global climate change is impacting the economies of all countries, the impact on Indonesia is greater than most. There is ample evidence showing that the Indonesian climate is changing. Over the past two decades rainfall patterns have changed with increasing frequency of droughts and floods triggered by the Australasia monsoon and by the El Niño Southern Oscillation (ENSO). Not only are average temperatures rising but also rainfall patterns are changing with the rainy season ending earlier and the length of the rainy season becoming shorter. All economic sectors are affected by the erratic weather patterns but the agricultural sector and output are particularly impacted. This is having negative consequences for rural incomes, food prices, and food security, and a disproportionate impact on the poor.

A major threat from climate change is the rise in sea levels. Indonesia has an estimated 95,180 km of coastline and coastal areas contain vast areas of agricultural land and account for at least a quarter of national gross domestic product (GDP). Some areas such as Sulawesi are particularly vulnerable. Towards the end of the dry season in September 2021, Sulawesi experienced unseasonal weather patterns with almost non-stop rainfall leading to numerous issues in the region regarding severe flooding, land erosion, crop damage, destruction of infrastructure including roads, bridges, and distillation equipment. The patchouli and clove crops were particularly impacted since the shorter dry season reduced the ability to build up raw material supplies.

Climate change will continue to have a significant impact on agricultural production including essential oil crops. The UN's Intergovernmental Panel on Climate Change (IPCC) latest report expects year-on-year monsoon rainfall to increase as weather patterns become less predictable. The impact will be both direct (e.g., lower agricultural productivity due to increased air temperature and changes in rainfall patterns, and infrastructure damage) and indirect (e.g., changes in irrigation water availability because of changes in crop evaporative demands and runoff, as well as shifts in the types of pests and diseases affecting crops).

Enhanced awareness by government agencies and companies along the value chain, including farmers, is helping the rural economy adapt to the adverse impacts of climate change. However, much will depend on national policies relating to Indonesia's forestry and energy (especially coal and oil) sectors, which are not only the two leading sources of livelihoods in Indonesia, but also the country's top two carbon emitters. The Indonesian Government and many of its institutions are very aware of the impact of climate change on the economy and took a leading role at the recent COP 26 Glasgow climate change discussions. This role will continue in 2022, when Indonesia holds the G20 presidency, and in 2023 when it chairs ASEAN. Substantial commitments were made in Glasgow to substantially reduce Indonesia's carbon emissions but the implementation of commitments remains a major issue.

LOGISTICS AND TRANSPORT

COVID-19 has created turmoil throughout much of the global transportation systems and Asia has been particularly affected. Asian ports have been closed, lockdowns and the need for testing have restricted labour availability and freight movements; export and import procedures have become more complicated; freighters have been unable to enter ports. Once lockdowns eased, transportation systems have been unable to meet the resurgent demand, leading to the inevitable upward pressure on freight costs and further delays.

The worldwide supply chain crisis impacted Indonesia dramatically by pushing up air and sea freight costs several fold and by doubling or even tripling lead times for shipping. Thus, it can take almost six months to ship goods from Asia to the USA or the EU compared with two months pre-COVID. Transportation of some essential oils has not been helped by their classification as “hazardous goods” and a reluctance by some shippers to handle them. Certainly, logistics and transport were one of the most important and severely affected sectors in the COVID-19 pandemic. The movement of ships and aircraft and their cargo was severely restricted and fewer ships and aircraft arrived and departed from Indonesia. Large numbers of containers ended up being in the wrong location and often being unable to be landed and emptied. This increased freight costs, transportation times and reduced shipment volumes. Thus, major obstacles were created along the supply chain and there has been continued uncertainty over procuring space and containers for shipping products and their eventual arrival at export destinations. The proportion of freight costs in the final value of the product has surged.

SUSTAINABILITY, TRACEABILITY AND THE DAI

Globally there is a growing demand for essential oils as consumers increasingly try to move away from synthetic ingredients often obtained from petrochemical sources to “natural” products. A related movement during the past few years has been the pressure, predominantly from consumers and consumer goods companies, for product traceability and the adoption of sustainable agricultural and environmental practices. This has put greater pressure on growers, especially small-scale farmers, who are probably the weakest link in the value chain. Many are operating at or near the poverty line and find it difficult to absorb the additional costs imposed by trying to meet the traceability and sustainability requirements of those along the value chain, particularly the F&F houses. To enable growers to invest in the new practices required several things need to happen:

- Growers need to be supported educationally, technically, and financially
- Consumers and consumer goods companies need to be educated that a price premium must be paid to meet these higher standards
- Local associations can play an important role in this.

In my Bali 2019 presentation I outlined some of the growing range of sustainability initiatives being undertaken in the Indonesian naturals sector, particularly in patchouli and cloves, by local Indonesian companies, major F&F houses, and local organisations. Where possible these initiatives have continued and expanded during the past two years, but they only scratch the tip of the iceberg.

More integrated policy options are needed, including changes in the institutional infrastructure and enhanced stakeholder awareness to adapt not only to the sustainability and traceability demands of consumers but also to the related adverse climate change impacts. A key area is the continued development of sustainable policies based on the three pillars of economic, social, and environmental sustainability. While such policies are now being adopted and implemented in the essential oil supply chain much more needs to be done.

Over the past decade the DAI (Dewan Atsiri Indonesia - Indonesia Essential Oils Council), under the recent chairmanship of Robbie J Gunawan of Indessso, has become an increasingly important force in developing the Indonesian essential oils sector. Its various programmes are encouraging the sustainable growth of the sector by helping empower and train stakeholders, especially smallholders, by supporting and disseminating applied research, by supporting certification schemes and value-added projects.

SOME CONCLUDING COMMENTS

The past two years have seen dramatic global changes that have impacted the way we conduct our business and this will continue for the foreseeable future. In order to survive all the stakeholders in the value chain have had to demonstrate greater adaptability and resilience. The COVID-19 pandemic has increased levels of uncertainty in all aspects of our sector whether it relates to shifting crop patterns, climate change, logistics, labour availability, rising costs, sustainability and changing demand patterns. As one of the major suppliers of natural ingredients to the F&F sector, Indonesia has been at the centre of some of these changes. However, some things have not changed:

- Indonesia continues to be a fascinating country that offers immense opportunities. It is the 10th largest economy in the world and the largest in Southeast Asia, the world's fourth most populous nation and, until the recent pandemic, had made enormous gains in poverty reduction.
- It can become of even greater importance to the F&F industry in several respects:

As a continued major supplier of raw material ingredients
As an increasingly important supplier of value-added products
As a major market for F&F products
And as a leader in agricultural practices and sustainable production of essential oils.


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GRAPEFRUIT OIL

Citrus paradisi USA

The USDA upped its estimate on 2021/22 US grapefruit production to 11.1 million boxes compared with 10.4 million the previous year. It is now predicting Florida will produce 4.1 million boxes up from 3.3 million boxes in October and November. Red grapefruit will account for 3.3 million boxes and white grapefruit at 800,000 boxes. In both cases, fruit size is predicted as above average and droppage below average. The forecast for California grapefruit production, 3.9 million boxes, is unchanged from last season. Texas grapefruit production is expected to increase from 2.4 million boxes last season to 3.1 million boxes this season.

USD 59.50 /kilo (Grapefruit Oil White)

USD 32 /kilo (Grapefruit Oil Pink)

USA: ESTIMATED GRAPEFRUIT PRODUCTION 2018/19 TO 2021/22 ('000 BOXES)

Crop and State	*Production 2018-2019*	*Production 2019-2020*	*Production 2020-2021*	*Forecast Dec Production 2021-2022*
Florida-All	4,510	4,850	4,100	4,100
Red	3,740	4,060	3,480	3,300
White	770	790	620	800
California	4,200	4,700	3,900	3,900
Texas	6,100	4,400	2,400	3,100
Total USA	14,810	13,950	10,400	11,100

LEMON OIL

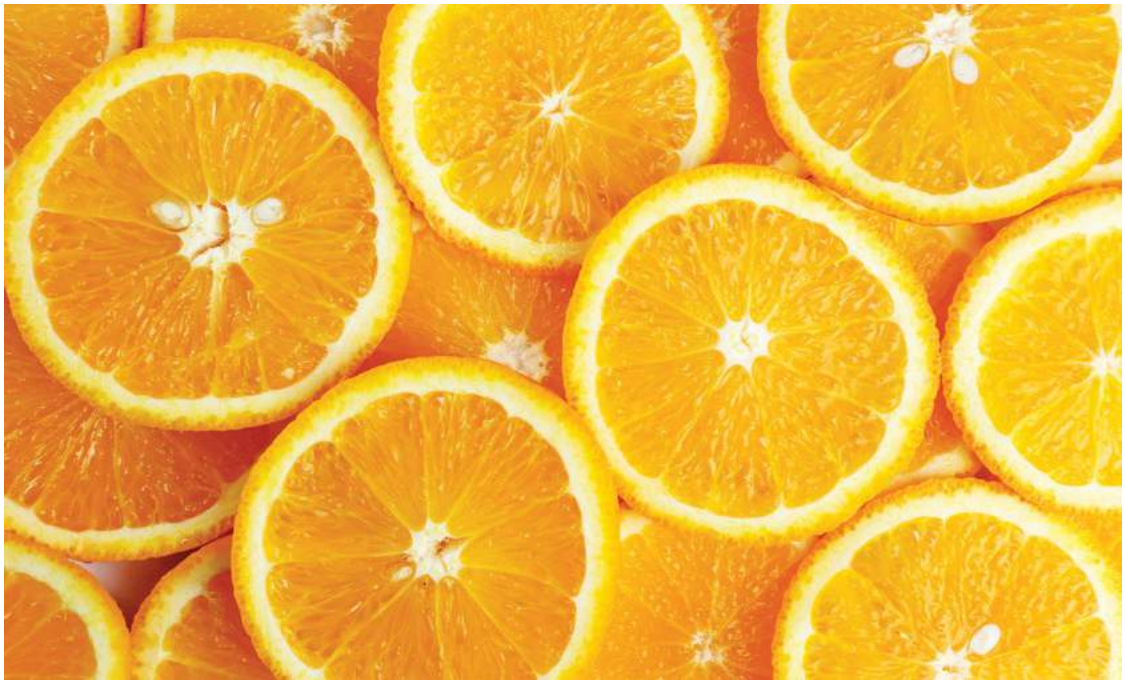
Citrus limon (L.) Burm. F. USA

California dominates US lemon production, with the USDA forecasting Californian production in 2021/2022 of 21 million boxes out of US production of 22.3 million boxes, Arizona accounting for the remainder. Estimated total production is slightly up on 2020/21 levels but substantially below earlier years.

USD 35.00 /kilo

USA: ESTIMATED LEMON PRODUCTION 2018/19 TO 2021/22 ('000 BOXES)

Crop and State	*Production 2018-2019*	*Production 2019-2020*	*Production 2020-2021*	*Dec Forecast Production 2021-2022*
California	23,700	25,300	21,300	21,000
Arizona	1,350	1,800	800	1,300
USA Total	25,050	27,100	22,100	22,300



ORANGE OIL

Citrus sinensis USA

In mid-December the USDA presented its latest citrus crop forecast with total USA orange production in the 2021/22 season expected to reach 90.05 million boxes, split almost equally between Florida (46 million boxes) and California (43.5 million). The projection for Florida Valencia oranges at 28 million boxes has not changed, while forecasters now say Florida will produce 18 million boxes of non-Valencia oranges, down from a projection of 19 million boxes in October and November. Though the reduction is slight, it comes amid a years-long slide in those projections, with the forecast already the lowest in at least 25 years. However, this year is unlikely to be worst in terms of final production since during the 2017/18 season Florida produced fewer than 19 million boxes of oranges and 3.9 million boxes of grapefruit due to the impact of Hurricane Irma.

Fruit drop has severely impacted orange yield in Florida. According to the USDA citrus crop forecast, the estimate of fruit drop for early/mid-season and Valencia oranges was 43% and 34% respectively. There are four basic parameters that are assessed in compiling the forecasts: the number of bearing trees, number of fruits per tree, fruit size and fruit loss from droppage. The first two of these parameters have the greatest influence on the forecast.

USD 16.00 /kilo

USA: ESTIMATED ORANGE PRODUCTION 2018/19 TO 2020/21 (MILLION OF 40.8 KG BOXES)

Countries	*Production 2018-2019*	*Production 2019-2020*	*Production 2020-2021*	*Forecast Dec 2021-2022*
Florida	71.85	67.40	52.80	46.00
California	52.20	54.10	52.10	43.50
Texas	2.50	1.34	1.05	0.55
Total USA	126.55	122.84	103.95	90.05

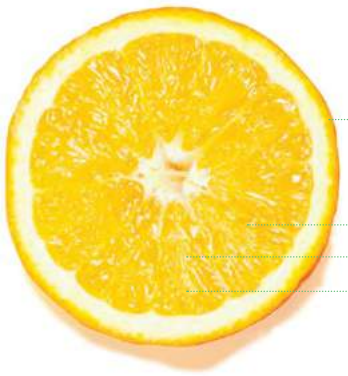
SPANISH LEMON:
A SUSTAINABLE AND GROWING INDUSTRY

José-Antonio Garcia

Spain is Europe's largest producer of both lemons and lemon oil, each year usually processing between 20-25% of output.[1] Over the past 50 years Spanish lemon production has shown an upward trend, despite wide annual fluctuations. Over the period annual production has doubled and the total Spanish lemon output in 2020/21 was a record 1,340,000 MT, making it the world's largest producer of lemons, of which 415,000 MT (30%) was processed. Currently there are an estimated 14 million trees growing on approximately 48,000 hectares (ha), of which in 2019 7,117 (ha) were producing organic lemons. Organic lemon production has grown quickly over the past decade and Spain is a key reference regarding organic fresh lemon, juice, and oil.

Southern Spain dominates lemon production with the Murcia region, bordering the Mediterranean sea, accounting for approximately half of production, while Valencia and Andalusia account for 35% and 15% respectively. Overall, the sector is profitable with old trees being replaced since there is a reduced threat of orchards being used for alternative purposes, such as housing.

[1] For a recent global overview of lemon production and Spain's important role see IFEAT Socio-Economic Report on Lemon IFEATWORLD September 2021, pp. 14-30.



PROCESSING LEMON IN SPAIN

WHAT CAN BE OBTAINED FROM SPANISH LEMON?

- Cold Pressed Lemon Oil (0.30 - 0.4%)
- Lemon Essence Oil (0.1%)

Concentration

- Direct Juice (30 - 40% NFC + Concentrates
- Pulp Cells (1.5 - 2%)
- Wet Peel (50 - 55%) >>> Dried Lemon for Pectin / Animal Feeding

Source: Bredenberg 2011

The higher-paying fresh fruit market remains the main focus and is in balance and sustainable despite the removal of EU subsidies for processed fruit. No untreatable diseases affect production although agricultural residues (ARs) from some treatments of pests and diseases have been of growing concern. The industry is strongly committed to reducing ARs and is implementing changes to reduce their presence. For example, sorting fruit for the fresh market or for processing is taking place in the orchards, so more fruit goes directly from the tree to the processing plants. A second selection is made at the packing house before applying post-harvest treatments. This change in dealing with the harvested fruit leads to a significant reduction of ARs. Growers and exporters were reported to be integrating but processors do not own the plantations, although there are some exceptions to this general pattern. The increasing size of plantations is facilitating improved efficiency, and exporters are reported to be integrating and this is shortening the distribution chain.

AILIMPO **(***Asociación Interprofesional De Limón Y Pomelo)* has been playing a key role for years in preparing the sector to adapt to the challenges of sustainability. The pivotal strategy of this vision for the future of the Spanish lemon sector is its sustainable operating model based on three key pillars: financial, environmental and social.

Sustainability, as a driver of innovation and the future, is therefore part of the new vision of the sector promoted by AILIMPO and requires the commitment and collaboration of all the players in the value chain integrated in the interbranch association: producers, cooperatives, exporters and processing plants. Some important goals have been reported in the following specific areas:

CO2 FOOTPRINT

Spain's lemon plantations have a large capacity to capture atmospheric CO_2. As a result, the net fixation of the crop amounts to 360,550 tonnes of CO_2 per year. Although the sector emits CO_2 in the course of its business at an amount of 49,300 tonnes of CO_2 (18,122 during transport, 19,705 in handling and packaging warehouses and 11,473 in processing plants), we conclude that its net carbon footprint is 311,250 tonnes of CO_2 per year. Therefore, the lemon sector in our country actively contributes to the fight against climate change by being a real carbon sink.

The high figures of CO_2 fixation indicated are due to the practices that producers are carrying out, which include the following:

- The area under organic cultivation has tripled in recent years in Spain. Between 2012 and 2019, the number of hectares increased from 1,708 to 7,117 hectares. Organic farming contributes to reducing emissions as the net fixation on organic farms is higher than on conventionally farmed farms.

- The shredding and incorporation of pruning residues reduces the evaporation of water from the soil and increases the organic matter in the soil, thereby increasing the CO_2 stored in the soil.
- Since 92% of the lemon area has localised irrigation systems with no soil tillage, no fossil fuels are consumed in land development. In addition, non-tillage leads to less mineralisation activity of organic matter, which favours the fixation of more carbon in the soil.
- The optimisation of irrigation and the use of techniques such as moisture probes, mulch nets to reduce evaporation or the Controlled Deficit Irrigation technique lead to reduced water consumption and therefore a reduced need for electricity for irrigation, thus reducing emissions.
- Significant investment has been made in modernising agricultural machinery in recent years. Today's farms are equipped with more modern and efficient machinery that can reduce fuel consumption and CO_2 emissions.

BIODIVERSITY CARE

AILIMPO co-operates to advance the conservation of the biodiversity in the environment of the lemon and grapefruit crops. An important example illustrating this is the project with ANSE (**Asociación de Naturalistas del Sureste)** (an environmental organisation) to support economically the creation of the cave reserve of La Yesera and the joint efforts to evaluate the conservation status of an endangered bat. Involvement from AILIMPO in the conservation of the long-fingered bat (*Myotis capaccinii*) is a good example, since it is the only bat officially catalogued as "endangered" in Spain. Indeed, bats are one of the most diverse and important groups within the mammal world, and they develop important ecosystem services such as pest control.

These initiatives are an important starting point to integrate biodiversity in lemon and grapefruit production, as demanded by society and consumers. In addition, the EU Green Deal - European Green Pact - establishes the preservation of biodiversity as one of its key axes, following the line of the SDG (Sustainable Development Goals) number 15 of the United Nations. In this context, the Spanish lemon and grapefruit sector is a pioneer in coordinating a working strategy for the future that integrates biodiversity into its activity.

> ***"Involvement from AILIMPO in the conservation of the long-fingered bat (Myotis capaccinii) is a good example, since it is the only bat officially catalogued as "endangered" in Spain.***

IMPROVING WATER USE

According to the UN's FAO (Food and Agricultural Organization) improvements in water management and agricultural practices are needed to reduce the risks of water scarcity and improve crop yields.

The lemon sector has made significant efforts in recent years to optimise and reduce water consumption. The increase in the area with localised irrigation in lemons has been 268% in the last 30 years. These advances in irrigation and fertilisation have managed to increase the productivity of the lemon crop by 274%. Today, 1 kg of lemons is produced using 63% less water than in 1988.

In short, the lemon sector has been adapting for years to the lack of availability of water resources, having alternative sources of water to those coming from rain (treated wastewater and desalinated water) as well as implementing technologies to reduce water consumption and to avoid evaporation. Some examples of these good and innovative agriculture practices to save and optimise the use of water are:

a) Controlled deficit irrigation

Controlled deficit Irrigation consists of applying doses of water below the crop's needs. This reduction should be as small as possible in the most critical phases of the crop (in citrus fruits these are the flowering and setting, growth and ripening phases).

This technique is useful as an emergency measure for the subsistence of the crop in cases of having fewer water resources as a result of a drought. However, its application during many campaigns causes significant losses in productivity, so it cannot be prolonged for many years.

b) Reduction in water consumption through information obtained with soil moisture monitoring tools.

By monitoring the water status of the soil with sensors, it is possible to monitor the status of soil moisture, finding out the actual water consumption by the lemon tree and the water that is lost below the area where its roots are. In this way, the irrigation time and the intervals between watering can be adjusted to meet the demands of the plants without losing water or nutrients in depth.

Irrigation management using the information obtained from these probes makes it possible to reduce the amount of water by between 20 and 30% in lemon orchards.

c) Installing plastic mulch on the soil.

The use of plastic mulch on the soil in growing lines entails a reduction in water losses due to evaporation. In addition, since the plastic used is black, the growth of weeds that compete with the lemon tree for water and nutrients is prevented. It is estimated that it is possible to save up to 25% of water volumes. Indirectly, the use of herbicides for weed control is reduced.

d) Covering irrigation ponds.

Most of the farms have one or more irrigation ponds where the water is stored so that it can be available at the time of irrigation. There are different systems for covering irrigation ponds to reduce the amount of evaporated water. Various studies estimate that between 20% and 30% of the water stored annually evaporates, so having covers means avoiding these losses.

To sum up, the lemon sector in Spain is well prepared for the coming challenges. Spain plays an important role in the lemon business worldwide, both in the fresh and the processed markets. The strategy is based on the idea to be a reference in terms of sustainability as it is a top priority for AILIMPO. Our focus is in producing lemons in an orderly, efficient, and environmentally and socially respectful way within a framework based on Global GAP (Good Agricultural Practice) and GRASP (Global Risk Assessment on Social Practice) certifications.

José-Antonio Garcia studied Business Administration at ICADE, a University based in Madrid run by Jesuits. He specialises in agri-food, specifically the fruit, vegetable, and citrus sectors. In 2019 he undertook the Advanced Management Programme (AMP) at ESADE, a leading European Business School, and holds a Certificate in Good Corporate Governance. For the past 22 years he has been a Director of AILIMPO, the Spanish lemon and grapefruit association, representing the supply chain (growers, co-operatives packing houses and juice processors), promoting internal co-operation and creating synergies and a market intelligence service for members. He is a board member of the European Fresh Produce Association based in Brussels and actively works as a lobbyist participating in different official forums at national and international level. In 2019 he helped found the World Citrus Organisation (WCO). He believes in teamwork, effort and consensus building as formulas for solving problems and conflicts and considers sustainability, based on social, economic, and environmental pillars as the basis for new sector projects. José-Antonio is married with four children and likes spending his spare time practising outdoor activities with his family.

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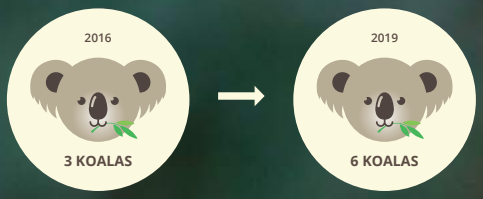
NATURALS

PROTECTING OUR NATURAL ENVIRONMENT, A HOME FOR THE KOALA



Our Initiatives:

1. Planting/establishing additional koala food and shelter trees.
2. Policy of NO domesticated dogs and cats on the farmlands. GGN does not allow guard dogs on farms in Australia.
3. Reducing weeds in and around the koala food for healthier trees that support koalas and other native animals.

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