

# IFEAT

# WORLD

## INTERNATIONAL FEDERATION OF ESSENTIAL OILS & AROMA TRADES

JULY 2022

IFEAT 2022 ANNUAL  
GENERAL MEETING

F&F INGREDIENTS:  
A CHANGING MARKET

IFEAT 2022 VANCOUVER  
CONFERENCE NEWS

SOCIO-ECONOMIC REPORT  
ON CEDARWOOD OILS

THE EU GREEN DEAL  
AND CHEMICALS STRATEGY  
FOR SUSTAINABILITY

MY FAVOURITE:  
CHINESE CEDARWOOD  
OIL AND FIRWOOD OIL



**VANCOUVER**  
9-13 OCTOBER 2022

IFEAT



# THE FUTURE WE SHAPE

We firmly believe that the citrus fruit production cycles are an example of circular economy. Through **sustainable choices**, in Agrumaria Reggina we avoid wastage of by-products through a controlled supply chain excellently designed. We produce **animal feeds rich in citrus fibers** that are excellent for animal nourishment. The benefits of this action allow us to recover the nutritional value of citrus fruits, feed local farms and to avoid the waste of any ingredient.

This is **#TheFutureWeShape**

Agrumaria Reggina is an internationally-oriented Italian company specialized in citrus essential oils and fruit-based solutions for the Flavour & Fragrance world.

Discover our citrus world at [agrumariareggina.it](http://agrumariareggina.it) |  

**#TFWS**

# FROM THE VANCOUVER CONFERENCE CHAIR



Since the April 2022 IFEATWORLD publication, registration for the Vancouver Conference was launched. I am pleased to report that registration has been very active

and more than 850 delegates have registered to meet in person and have secured meeting rooms and exhibition stands to showcase their companies, services and materials.

Vancouver will be a tremendous and successful conference that we have "longed for" after living through the pandemic years of sheltering and hibernation. Our industry thrives on sensory experiences and the Vancouver Conference will certainly be our forum for re-igniting our obsession to smell and experience the materials we are passionate about. Please visit the Conference website at:

<https://conference.ifeat.org/vancouver-conference-programme> to view and familiarise yourself with the jam-packed agenda and session offerings.

The Local Organising Committee along with members of the Vancouver

Conference Committee have been very busy working to finalise many of the details to ensure delegates' experience is exceptional. Work continues to identify and secure gift bags, sponsorship items and a host of other aspects that will truly make the Conference one to remember. And the Whova platform has been opened to all registrants where you can begin to schedule both in-person and online meetings.

Let me take this opportunity to thank the IFEAT Executive Committee, Local Organising Committee along with the entire IFEAT staff for all the hard work and dedication allowing us to arrive arrive at this point. We all look forward to seeing you in beautiful Vancouver!

**Alan Brown**  
Chair of the IFEAT 2022  
Vancouver Conference Committee

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*If you would like to contribute editorial, or write a "My Favourite" article, please contact the editor, Tina Hotchin, by email at: [tina.hotchin@ifeat.org](mailto:tina.hotchin@ifeat.org)*



## MEMBERS' NEWS

# OUR LONGEST SERVING MEMBERS

In a previous issue of IFEATWORLD we asked IFEAT Members to let us know how long they have been a Member.

Have you been an IFEAT Member as long as De Monchy Aromatics? If so, please send your certificate photograph to the editor at: [tina.hotchin@ifeat.org](mailto:tina.hotchin@ifeat.org)



## IFEAT 2022 ANNUAL GENERAL MEETING (AGM)

For the first time in three years, the IFEAT AGM will once again take place in person. It will be held at the IFEAT 2022 Vancouver Conference on Tuesday 11th October at 9am in the Stanley Park Ballroom, The Westin Bayshore Hotel, Vancouver, Canada.

The AGM will start at 9am sharp and, as IFEAT Member company

attendance is very valuable, we ask Members to arrive at the Stanley Park Ballroom from 8.30am onwards in order to sign in.

**All IFEAT Members are encouraged to attend!**

We look forward to seeing you at the AGM in Vancouver.

## MEET THE IFEAT 2022 VANCOUVER CONFERENCE SPEAKERS

We have an excellent line-up of speakers for Vancouver who will deliver some educational and informative presentations. Some will also be memorable, thought-provoking, interactive and fun!

Vancouver Conference Chair, Alan Brown, will open the programme with a welcome to all delegates and he will give a short overview of the speaker sessions.

Some of the presentations will be delivered online only so please check the conference agenda on the Whova platform if you are registered for the Conference or if you have yet to register, you can see the agenda on the Conference website at: <https://conference.ifeat.org/vancouver-conference-programme> This is where you will find more detailed biographical information about each of the speakers.

### MONDAY

#### MINTER DIAL Professional Speaker "Energy in Connection"



Minter Dial will be the first speaker to take to the stage after Alan's welcome.

Minter will certainly get the Conference sessions off to a lively start with a keynote presentation entitled "Energy in Connection".

Between the pandemic, a land war, economic issues and the Great Resignation, to name just some of the events from the past few years, there is much to be anxious about. For many, this has been a tough period.

In this extended session, Minter will energise, provoke and bond with the audience. He'll address why and how to tap into each individual's and their team's greater discretionary energy; find ways to make business stronger,

and leave each audience member with concrete, actionable ideas to take back to their businesses.

Expect to experience a dynamic session, gain some good insights, and have interactive fun!

Having worked for L'Oreal for over 16 years, Minter Dial is now a professional speaker, storyteller, author, and consultant, specialising in leadership, branding and transformation. He prides himself in elegantly elevating the debate, has given over 500 talks and seminars to audiences in five continents and was voted in the top three out of 150 speakers at the Adobe Summit EMEA three years in a row. Minter is author of three award-winning books and his latest entitled "Heartificial Empathy, Putting Heart into Business and Artificial Intelligence" has won the Book Excellence Award 2019 in the category of technology and was finalist for the Business Book Awards 2019. His book on leadership, "You Lead, How Being Yourself Makes You A Better Leader" (Kogan Page) launched in January 2021 is a finalist for the Business Book Awards 2022.

#### ALAIN FRIX Allchemix BV "F&F Feedstocks & Renewability"



Alain will share his view on the low renewability of F&F ingredients in general, quantifying each of the major raw materials such as petrochemicals, forest products, essential oils, biotechnology and others.

He will outline the difficulties along with the efforts that must be made to preserve F&F access to raw materials, which also includes the cultural need to better understand larger, fast changing, industries.

Finally, he will explain why there is no perfect sustainability solution, with petrochemical and natural ingredients

each having a different, but never complete, sustainability profile. Alain Frix dedicated 30 years to the business of renewable materials, from forest products such as turpentine and its perfumery derivatives, to aromatic plants and essential oils.

After chairing IFEAT from 2013 to 2016, he now chairs IFEAT's Scientific Committee and is involved in various projects related to aromatic plants, biodiversity and climate change. Alain founded his consultancy company Allchemix BV in 2020, and this keeps him busier than ever. He has a scientific background (Master's degree in biology, Université Libre de Bruxelles, 1988) and a commercial background (special diploma in management, Ecole de Commerce Solvay, 1991).

#### MICHAEL FORD BDP International "Current Transportation and Trade Challenges Impacting Shippers"



Port congestion, high freight costs, new regulations and COVID-19 have all played a role in disrupting the global supply

chain during 2021, and this continues in 2022. In this session, Michael will focus on several important transportation and trade regulations that will impact all businesses in the aroma trades industry for the remainder of 2022 and on into 2023.

Michael Ford is a career professional in international transportation, specialising in import/export documentation and regulatory compliance. Michael's leadership in communication and system logic on governmental rules and regulations is central to BDP's ability to understand and resolve complex regulatory issues quickly, decisively and with minimal impact upon customers. He has been associated with BDP for more than 40 years and among his other affiliations, he is the Co-chair for trade on the Export Committee in the development

of the Customs ACE System and has served with customs as a member of COAC (Commercial Operations Advisory Council); Chair of the Mid-Atlantic District Export Council, and is a member of the Responsible Care Committee, American Chemistry Council. Michael also teaches an MBA in International Logistics course at Saint Joseph's University in Philadelphia.

### DR ISABELL HILDERMANN

*naturamus GmbH*  
**"Improving Working Conditions of Seasonal Migrant Workers in the Supply Chain of Organic Essential Rose Oil"**



Dr Isabell Hildermann will present the project to improve working conditions of seasonal

migrant workers (SMWs) in the agricultural supply chain of organic essential rose oil of WALA group (Dr. Hauschka) in Turkey in collaboration with Aydin Gülyagi and a child-welfare NGO.

*Dr. Isabell Hildermann is an agronomist and has worked in several positions within the organic food sector and was Quality Manager in an organic cereal processing company for nine years. At naturamus, she is responsible for the management of the raw material partners and for communications. She is managing different projects on ecological and social topics in the supply chain.*

### ROMEL GUZMAN

**"Sustainability Assurance of Tonka Beans in the Amazonian Region of Venezuela"**



Tonka trees in Venezuela are mainly located in the Bolivar State, where the Amazonian jungle has been home

for centuries to Piaroa and Pemón ethnics who, following traditional practices, obtain tonka beans which are much appreciated for their aroma because of their coumarin content.

However, in 2018 "Project Avilan" members witnessed that many of their day-to-day practices were threatening the subsistence of the ecosystem, including their rich culture, by introducing plants and animals for food; practising illegal activities (gold mining, carburarit trafficking); and due to an exodus of younger generations.

Romel will discuss the project in more detail including the sustainable tonka bean production objective.

*Romel's CV includes Doctor of Science, Food Science and Technology 2011, UCV-CIRAD (France); Magister Scientiarum in Sciences 2008, Universidad Central de Venezuela (UCV); Agricultural engineer 2005, UCV; Director of the Institute of Food Science and Technology (ICTA-UCV); Leadership Team member of "Project Avilan"; Innovation and Technical Team Head.*

## TUESDAY

### KIM BLEIMANN

*Berjé Inc*  
**"Medal Lecture - Catalysts of Change"**



For this year's medal lecture we are pleased to announce that Kim Bleimann will hold a frank conversation

about the forces, both internal and external, which have been driving our industry and the impact they will likely have in the near and medium term on our lives.

*Berjé Inc Chairman Kim Bleimann has worked in the flavour and fragrance industries since 1973, the year he joined Berjé Inc. He assumed ownership and became the President in 1981. Berjé has grown under his tutelage from a company of nine employees to a firm which employs over 160 people of 20 nationalities with offices in Los Angeles, Atlanta, Geneva Switzerland, Spain, Belgium and Plovdiv, Bulgaria, where Berjé is the first ever American company to have produced rose and lavender oils in Bulgaria. Kim is a member of the Flavor Extracts Manufacturers Association (FEMA) and the European Federation of Essential Oils (EFEO). From 2011 he served as Chairman of the International Fragrance Association North America*

*for three years and has been a Director of IFEAT for 15 years. He chaired the Finance Committee and served on the Executive, Study Tour and Scientific Committees and is currently co-opted into the IFEAT Executive serving as a liaison to other world-wide organisations.*

*Kim is known for the quality of the numerous speeches which he has given and continues to make. He has been the featured keynote speaker at industry conventions held in London, Tel Aviv, New York, Cape Town and Dubai.*

### SHANAVAS BAVU

**"Process Optimisation; Value Enhancement & Total Value Recovery in Essential Oils & Botanical Extracts Production"**



Shanavas Bavu will discuss how process improvements, co-product lines and total value recovery enhance

profitability and customer value in essential oils and botanical extraction. He will focus on opportunities with real examples that can be extended to several other product lines.

The presentation will allow essential oil manufacturers to review their current operations and techniques, optimise processes, yield and quality, and enhance or augment their facilities to accommodate new product lines or co-product streams.

*Shanavas Bavu is one of the founding directors of Innopolis Bio Innovations Pvt Ltd, located in Kochi, India. He is an engineer by training with a masters degree in International Business and previously worked as Head of the New Products Division at Synthite Industries Ltd and as Territory Manager for South Asia and the Middle East for Flavourtech Pty Ltd. Shanavas also worked on setting up several extraction plants for essential oils and oleoresins, as well as tea and coffee extracts: including SCFE plants and precision distillation equipment globally. He is a trained sensory panelist and was a speaker at the IFEAT Conference in Singapore where he presented a paper on the Indian oleoresin industry. He has also presented at several other industrial and academic conferences.*

# WE CARE

## FARM SUSTAINABILITY ASSESSMENT



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### ZHAOKAI WU

#### "The Path for Innovation of Oriental Aesthetics: Current Status and Trends in the Chinese Fragrance Market"



China is the cradle of east Asian culture and 5,000 years of civilisation has created a unique oriental aesthetics

system and formed fragrance connotations with the soul and the mind. In a background of globalisation, with China being the second largest economy, there is huge demand in the domestic market that pushes and accelerates the development of the fragrance market. Fragrance products from creativity in oriental aesthetics are leading an emerging consumer market in China. This presentation will give an interpretation of the current status and trends in the Chinese fragrance market driven by creativity and these oriental aesthetics.

Zhaokai Wu is the director of the purchasing department at Guangdong Wincom Flavors & Fragrances Co., Ltd. China. He has a Master's degree in Business from Sydney University. His work covers supply chain, studying the market, and brand operation. He is very familiar with the flavour and fragrance industry and has a particular understanding of the ingredients market.

### RAVINDU RUNAGE

#### "Technological Developments in the Cinnamon Oil Industry & Modern Usage of Essential Oils"



Essential oils are mainly used for perfumery, cosmetics, pharmaceuticals, and food production. In modern

conditions, developing and standardising drugs based on plant materials, especially using essential oils, is becoming even more vital.

Essential oils have an extensive spectrum of biological activity, have low toxicity in recommended doses, and are available for mass use. In the industrial production of essential oils, the most often used technology is steam distillation, including in the

cinnamon leaf oil and cinnamon bark oil industries. In Sri Lanka, obsolete techniques for distillation are used for both oils and there are major drawbacks to continuing this as an industry. Ravindu Runage will discuss the technological developments in more detail.

Ravindu Runage began his career in the Runage Group in 2005 after completing higher education in Rahula College, Matara, Sri Lanka. He then studied business management at the University of Ruhuna finishing his course at Durham University in the United Kingdom. After gaining a BA Hons in Business he went on to gain a Masters Degree in Management. He joined Rathna Producers Cinnamon Exports Pvt Ltd as a Director in 2006 overseeing sales and marketing, HRM, production, quality, and the R&D departments.

### PRASUN SATYAL

#### "Collaboration with the Community Forest User Group: a Tried-and-True Method of Promoting Transparency, Accountability and Sustainable Forest Management"



In today's flavour and fragrance industry, customers are concerned not just about how their product smells or tastes,

but also the firm's environmental impact and sustainability initiatives.

Essential oils, also known as non-timber forest products, are a segment of Nepal's natural product sector. Essential oils are especially important in the flavour and fragrance industry because they can be used in beauty and personal care products, providing a natural odour for perfumes as well as bath and shower products. This presentation will talk about the Community Forest User Group (CFUG) and how it has helped Nepal's essential oil sector to grow over the last decade.

Prasun Satyal of Annapurna Aroma Company Private Limited is an entrepreneur by profession and an environmentalist at heart. He is a firm believer that his country's natural resources are one of its most valuable assets, and that they must be developed and used wisely. With that same belief, he started Annapurna

Aroma, a social enterprise, in 2011, with the sole purpose of utilising the country's valuable natural resources and conducting business on high ethical principles, dynamism and innovation. He is also a member of the Nepal Herbs and Herbal Products Association (NEHHPA) and a member of IFEAT.

## WEDNESDAY

### "The EU Green Deal and its impact on Flavours & Fragrances: The Domino Effect"

Wednesday sessions will be a mix of in-person and online speakers as well as a panel discussion and live Q&A, moderated by Sven Ballschmiede, Executive Director of the International Organization of the Flavor Industry (IOFI).

### ALEXANDER MOHR



After a general introduction to the Green Deal and its eight strategic pillars, the potential impact of the CSS and F2F initiatives on the flavour segment will be reviewed.

Alexander Mohr, PhD, is the Executive Director of the European Flavour Industry Association (EFFA), based in Brussels. Before joining the EFFA secretariat in 2016, he was the Secretary General of the Association of European Producers of Steel Packaging (APEAL) and headed the public affairs practice for the European container glass industry (FEVE). Alexander has previously worked for a political think tank on global political party consulting issues in Southeast Asia and Africa. He has been a lecturer on international relations at the 'Institut d'études Politiques de Paris' (SciencePo) and Senior Advisor to the Permanent Thai Delegation to UNESCO in Paris. He has published several articles and interviews in the context of EU regulatory and policy developments and, more recently, on the EU Flavour Regulation progression.

### MARTINA BIANCHINI



Martina Bianchini will talk about the impact of the CSS on fragrance creation and use. Martina has been the President of the International Fragrance Association IFRA since June 2016. She sees a huge

opportunity in bringing together science and society for sustainability in all areas of life, drawing from her multinational and multicultural experiences across the agricultural, chemical, biotech, food, health and luxury goods sectors. Martina is passionate about scent and believes that fragrance is essential to life and our wellbeing. She was educated at the Louisiana State University, the University of Trier, the University of London and the Harvard School of Public Health. She holds an MSc in Environmental Toxicology and a BSc in Earth Sciences. Martina's career has included international leadership roles at Monsanto and Dow, and active engagement in intergovernmental organisations such as the UN and OECD, and the International Chamber of Commerce.

### CHARLES LAROCHE



Charles Laroche will contribute his extensive experience in advocacy of European affairs to the topic of the implementation of the Green Deal in general and particularly what the concept of essentiality may eventually mean for the essential oils (EO) and associated natural complex substance (NCS) industries.

At Unilever, where he worked for 35 years, Charles served 10 years in finance before joining their marketing team, fulfilling roles such as European Brand Development Director. In 1999, he took responsibility for Public Affairs and Corporate Relations becoming Vice President European External Affairs HPC before leaving Unilever in 2008. Charles has been active in trade associations as a member of the board and President of A.I.S.E, a member of the board at Cosmetics Europe, and as a member of the board of Cefic. He represents the interests of EFEO with the European Institutions and is the Public Affairs advisor of CIHEF, the interprofessional committee of French essential oils. In 2005, he co-founded EPAA (the European Partnership for Alternative Approaches to animal testing). In 2009, he launched "Bee", a think and do-tank focusing on resource efficiency and sustainable development in partnership with GLOBE-EU. He also takes an interest in European internal market issues with the Kangaroo

Group, where he sits on the Executive Committee as Treasurer. Charles served as a professor in Marketing Strategic Decisions. He is also Master of Conferences at the University of Liège responsible for International Public Affairs in an Executive MBA programme.

### JEAN-PHILIPPE MONTFORT & ANDREW FASEY

#### "The Essential Use Concept (EUC) in the CSS: Legal and practical implications"



Both from the legal firm Mayer Brown, Jean-Philippe Montfort and Andrew Fasey will discuss the legal framework, practical implications and considerations of the concept of essentiality. They will also discuss the following:

- State of play (EUC and the REACH Revision)
- What is the EU Commission likely to propose for the 'essential use' criteria? Application of the Montreal Protocol criteria?
- Implications of the EUC for the proposed revision of the REACH Regulation (e.g. Grouping Approach to Risk Management (GRA))?
- Legal and practical considerations and concerns
- How might the EUC impact flavour and fragrances?

Jean-Philippe Montfort is a partner at Mayer Brown based in Brussels, and the leader of Mayer Brown's REACH and EU product regulatory team. He provides strategic advice, as well as advocacy and litigation support to companies and trade associations in the defence of their substances under various REACH and CLP processes. He is widely recognised as a very innovative, yet pragmatic legal advisor and litigator and has a very successful track record before the European Courts and the Board of Appeal of ECHA, with landmark

wins, such as the "CTC" case, the "Fipronil" case and more recently the "Aluminum salts" cases. Jean-Philippe also chairs Mayer Brown's global chemical industry group, a group of 50 attorneys providing corporate, litigation, trade, IP, regulatory, and other support to chemical companies in the four continents where the company operates.

Andrew Fasey is a senior scientific and regulatory advisor in the Government and Global Trade practice of the Brussels office. He has been heavily involved in EU and international developments on regulatory chemical issues at a senior level for over 30 years. He was previously at the European Chemicals Agency (ECHA), where he was one of three members of the ECHA Board of Appeal (BoA). In the ten years from its creation in 2011, Andrew was involved in all the rulings of the BoA. He has also worked as an official at the European Commission, as one of the authors of the EU Commission proposal for the REACH Regulation, and at the UK Health and Safety Executive. He is one of the most recognised and knowledgeable experts on EU REACH and on chemical legislation in the UK and Europe, and he brings his unique experience and expertise to the REACH/Product Regulatory team at a time when clients are facing significant new challenges with the development of the Chemical Strategy for Sustainability under the European Green Deal.

## THURSDAY

### EDUARDO MATTOSO

#### "Can the F&F Industry Help Fight Deforestation in the Amazon?"



Brazil is one of the ten countries with the biggest carbon emissions in the world and almost half of it comes from deforestation, mostly in the Amazonian region.

One strategy to fight deforestation is the wild harvest of native species. Another is the reforestation of open land with native forest species. Two of the most important ingredients sourced from wild harvest in the Amazon are well known by the F&F industry: tonka beans and copaiba balsam. These two items

are collected from the wild, without damage to the tree, taking place only in pristine forests. As part of the "caboclo" culture, both of them are used as natural remedies and can represent a significant proportion of the annual income in traditional communities.

The presentation will discuss how the industry can help fight deforestation in the Amazon region.

*Eduardo Mattoso is the founder and General Director at Kaapi, a Brazilian company dedicated to sourcing endemic essential oils, fragrance compounding and distribution of imported aromatic ingredients. He graduated in physics and gained a Master's degree in Organic Chemistry, studying aromatic plants from the Brazilian Amazon forest. He discovered the F&F world in 2001, after an internship at a rosewood distillery in the heart of the forest. This experience opened his eyes to the countless opportunities to improve quality and services provided by the provincial industry of aromatic ingredients from the forest.*

**CHUC NGUYEN VAN**  
"A Deeper Look into Vietnamese Cinnamon: from Seeds to Global Market"



Cinnamon is one of the world's most beloved spices with its various applications in its original form or its

components in pharma, flavouring, and perfumery. Vietnam is one of the world's top cinnamon producing countries and produces mainly *Cinnamomum cassia* and Saigon cinnamon in many provinces from the north to the south. Cinnamon cultivation in Vietnam has been developing for years and has created many different industries utilising the large areas of raw material available.

Cinnamon has been cultivated for a long time and formed large material areas in the north of Vietnam. The farmers in the northern areas, which has the largest plantation of *Cinnamomum cassia* in Vietnam, first cultivated the plants in the 1940s. After more than 80 years, *Cinnamomum cassia* plantations

have been expanded to neighbouring regions and have developed good farming practices. The presentation will look at where it is farmed, the components and quality of the oil and the different policies and farming techniques used between the north and the south of Vietnam.

*Dr. Chuc Nguyen Van is a talented chemist with more than 12 years of research experience. He has successfully carried out a large number of research projects and despite receiving many job offers from overseas corporations, Dr. Chuc decided to work in his homeland, Vietnam, because of his passion for local agricultural products. Techvina is the place where he chose to satisfy his passion for science as well as to carry out his mission. Dr Chuc has a degree in Engineering - Organic Synthesis and Petrochemical Technology and a Master of Science - Organic Synthesis and Petrochemical Technology, both from the Hanoi University of Science and Technology in Vietnam. He also gained a Ph.D in Science and Engineering - Catalysis - Chemical Engineering from Claude Bernard University, Lyon, France.*

**AJAY KUMAR JAIN**  
"Synthetic Menthol Used in the Global Flavour and Fragrance Industries and the Effect on Natural Menthol Production"



Production of natural menthol has been decreasing day by day with some of the larger companies

doubling their production of synthetic menthol. Synthetic menthol has come to the market in large volumes along with natural menthol.

Mentha oil production in India has declined with lower plantings of the aromatic herb having the effect of falling prices in the past three years.

Topics covered in this presentation include global production, threats to India's position as a producer and exporter, the markets for the crop, and the challenges faced, among other topics.

*Ajay Kumar Jain is the Chairman and Managing Director of Virat Exports (P)*

*Ltd, New Delhi, India and President of Crystals Drop Inc., Toronto, Canada. He studied for a B.Sc in 1982 from DBS college (Dehradun) Garhwal University, Uttarakhand and has an M.Sc in Organic Chemistry from Meerut University, Uttar Pradesh, India. Ajay is actively associated with several national and international industry organisations and associations and was president of the Essential Oil Association of India (EOAI) for two terms (2015-2017 and 2017-2019). He is also a member of the Executive Committee of the Asian Aroma Ingredients Council. Ajay has travelled extensively to different essential oil regions promoting activity sites/ programmes of the FFDC Kannauj, CSIR-CIMAP, IIM Jammu and CAP Dehradun in India. Being born in the mint growing region, he started his business journey with a small menthol processing unit in 1987 in Delhi and kept moving ahead by processing different varieties of mint oils and their derivatives and other natural essential oils for almost three decades.*

**SERGIO SEPIURKA**  
"The Production of Patagonian Essential Oils in Argentina: Compared Varieties of Douglas Fir from North and South Pacific Areas"



During the IFEAT 2001 Buenos Aires Conference, Sergio presented a paper entitled "The production of herbaceous oils in Argentina".

At the end of that presentation he briefly discussed a new initiative born in Patagonia in the 1990s for the production of essential oils extracted from native and cultivated plants from the southern region of the country.

Since then, most of the seven new ingredients commented upon at that time are currently used worldwide in aromatherapy, cosmetics, and perfumery. In addition, all of them are recognised as a part of Patagonia biodiversity, including two varieties of trees native to North America that are now identified as Patagonian pines.

Sergio will compare both varieties of Douglas fir (from the north and south Pacific areas), showing the different harvesting conditions, the processes, the compositions, and uses of these essential oils.

*Sergio Sepiurka was born in Buenos Aires in 1958. He is an industrial engineer and has lived in Esquel, (Patagonia, Argentina) for more than three decades. He founded Hierbas Patagónicas SRL in 1997. The company has produced and marketed essential oils worldwide since 2000. He has spoken at a number of conferences and events and is author of several books about Patagonia.*

**JONPAUL HOWARTH**  
"Supply Chains in Troubled Times"



Essential oil supply patterns are typically seasonal or so we would like to think, but what happens when after

all that forecasting and financial planning something outside our control impacts those plans? We have always had acts of "Mother Nature" which have disrupted supplies, but now more than ever 'unseasonal' and 'extreme' weather patterns are becoming more the usual than the unusual. Post-COVID recovery has disrupted demand patterns in an unprecedented way and geopolitical manoeuvring between the 'West' and the 'Rest' has all but stopped the movement of some goods and the access to financial and global markets for many farmers.

Written to support a buyer's understanding of the products they purchase, this presentation touches on the impact of some of these recent global events that have disrupted supplies and raised prices. Jonpaul will analyse what's next for those farmers and producers caught up in the aftermath and the future of the essential oils at the heart of these events.

*For 24 years Jonpaul has been working with growers, producers, and resellers of essential oils through various roles based in the UK, Australia, and Ukraine. Having experienced various commercial roles at a senior level, Jonpaul moved to Australia in 2009 and to Ukraine in 2013, where relations and understandings with farmers developed along with a passion for trying to shorten supply chains and bring end users closer to the origins of the essential oils they buy.*

*Initially through marketing native Australian essential oils, to establishing a leading industry market report, this was followed by the creation of his own business to serve the marketing needs of emerging essential oil producers. Drawing on the insights gained from his experience, Jonpaul continues to support the supply chain through his business Jandico Limited and advocate transparency in the supply chain.*

**ROUNDTABLE:**  
"Certifications: A Major Step Forward or Extra Burden & Cost?"  
Moderated by Dominique Roques and Peter Greenhalgh



IFEAT will continue its regular roundtable series which began in Athens in 2017. The roundtable will take place on Wednesday afternoon at the Conference.



Producers in our industry are experiencing the rising tide of certification expectations from the market for their factories and supply chains.

Where do we stand in terms of relevance, workload and cost versus benefit? Are we moving towards a few labels taking recognised leadership?

The roundtable is for in-person Vancouver Conference delegates but will be on a "first come first served basis" with sign-up during the morning and is limited to 50 participants. The roundtable will be free of charge.





**SOUTH AFRICA  
STUDY TOUR**

Registration for IFEAT's South Africa Study Tour opened at noon on 6th July, with a large number of bookings made within the first 30 minutes. There are still a few places remaining, so IFEAT Members are encouraged to book quickly.

IFEAT's first event in Africa was the very successful Cape Town Conference in 2006. This is IFEAT's first African Study Tour, and, like previous tours, will provide some unique educational and cultural experiences in the world of natural essential oils.

South Africa is an increasingly important global supplier of essential

oils, and the region is a significant producer of lesser-known indigenous essential oils and botanicals, increasingly used in new cosmetic and cosmeceutical formulations.

The tour begins in beautiful Cape Town, giving delegates a chance to experience the Cape's floral region: a UNESCO World Heritage Site. Encompassing the largest floral kingdom in the world, this region includes the distinctive fynbos flora, such as buchu, Cape chamomile, Blue Mountain sage, and Cape snowbush. Alongside fynbos oils, delegates will see production of organic rosemary, lavender, and *Artemisia afra*, before travelling to Kirstenbosch National

Botanical Garden, one of the world's leading botanical gardens, and the Cape Winelands. Then it's on to Durban and the east coast to see the production and processing of tea tree, lemongrass, niaouli, lemon tea tree, rose geranium, and eucalyptus. The final day will be spent on safari, incorporating game drives and bush walks providing first-hand experience of fragrant and medicinal plants. A study tour not to be missed!

For more information and to book your place, please visit <https://studytours.ifeat.org>

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## THE EU GREEN DEAL AND CHEMICALS STRATEGY FOR SUSTAINABILITY (CSS):

# MAKING EUROPE'S GREEN AMBITIONS WORK FOR THE FRAGRANCE VALUE CHAIN

BY MARTINA BIANCHINI,  
PRESIDENT OF IFRA

Sustainability – in every sense of the word – is the overriding concern of all businesses today. Each sector, association and company is looking to show how it contributes to a cleaner environment, a better society, and a stronger economy.

The fragrance sector and the fragrance value chain are no different: companies in the fragrance industry and throughout the value chain have been acting in this area for many years, and in 2020 the fragrance and flavour industry associations, the International Fragrance Association (IFRA) and the International Organization of the Flavor Industry (IOFI), developed a new, holistic Sustainability Charter to strengthen the drive to sustainability across the industries.

Yet such voluntary initiatives have not lessened the desire of policymakers to create more formal regulatory and non-regulatory frameworks for sustainability. The European Union's Green Deal, presented by the new European Commission in 2019, aims to transform the EU into the first carbon-neutral continent by 2050, and set in train several sector-specific measures including, in October 2020, the 'Chemicals Strategy for Sustainability (CSS) – Towards a Toxic-Free Environment'.

The Strategy – known as the CSS – is an ambitious blueprint that seeks to introduce the biggest changes to the EU's approach to the management of chemicals since REACH, the comprehensive framework for the Registration, Evaluation and

Authorization of Chemicals, nearly 20 years ago. The CSS rules will impact all industries using chemicals. The CSS is also setting new boundaries for fragrance creation and its effects will be felt by all actors in the fragrance value chain, from raw material and essential oil suppliers to fragrance manufacturers, and to downstream users in the consumer goods industry.

The CSS covers non-regulatory measures, seeking to strengthen the EU's strategic autonomy, boost innovation through new concepts such as 'Safe and Sustainable by Design', and make the green and digital transition. The CSS also covers regulatory measures, such as a targeted re-opening of the REACH legislation and the revision of the Classification, Labelling and Packaging (CLP) rules. It also seeks to introduce new concepts such as 'essentiality' into EU regulation.

These measures would be driven by a series of concepts drawn up by the Commission: chemicals should be 'Safe and Sustainable by Design'; harmful chemicals that have 'non-essential societal use' should be phased out, especially in consumer products. Complex assessment procedures should be rationalised through a 'one substance, one assessment' approach, substances should be grouped for simplification and then restricted through a 'generic approach to risk management', and there should be innovation in testing methodologies to phase out the use of animal testing.

Fine words and fine sentiments: but what do these mean in practice? What happens when ambition and good intentions meet business reality and practical stumbling blocks? And what will be the impact on the fragrance value chain?

First, a look at one of the most controversial concepts: the 'essential use' concept. The Commission seeks to protect consumers from the most harmful substances by allowing them to be used only when the use of this substance is critical for health, safety, or the functioning of society, and if there are no alternatives.

The term 'essential use' is a novel concept currently not well defined within EU law and the legal base must be first defined before the concept can be implemented in EU law. The definition procedures and the criteria for essentiality will be lengthy and complex and the burden of proof of essentiality will ultimately rest on the applicant. Additionally, 'essentiality' is a value-based concept and what is essential to one group of society may not be perceived to be essential to another group of society. IFRA considers fragrance as a safe and essential part of life, and a key differentiating element of consumer products, promoting positive emotions and well-being.

More specifically for our industry, by possibly not being considered as essential, certain fragrance ingredients in consumer products may no longer be allowed. Take for example the idea of a ban on bergamot oil because of carcinogenic,

## THE EU GREEN DEAL AND THE CHEMICALS STRATEGY FOR SUSTAINABILITY (CSS) ARE SETTING NEW BOUNDARIES FOR FRAGRANCE CREATION



mutagenic, or reproductive toxicity attributes: 'essentiality' could apply on the substance for a specific product use, so while there is uncertainty on how this concept may apply to different product categories, it is possible to see how bergamot oil could no longer be used in fine fragrance, personal care products or home care products.

We have presented our case to policymakers, civil society groups and think tanks, and in meetings with industry partners to build alliances and understanding of the potential impact of a draconian approach to essentiality. We are also working with perfumers to further leverage the essentiality case for fragrance. This 'essential use' debate will be one of the key policy discussions this year, with the Commission expected to publish several external studies and many stakeholders arguing for a proportionate approach, derogations, and greater consideration of societal impact. While the EU has stated that the essentiality concept in the future should apply across all policy areas,

the main concerns are a lack of an informed EU debate and the failure of the EU to test some of its critical assumptions such as that bans will trigger innovation in the EU and that the EU will be the frontrunner and lead the way for other trading partners to follow.

Other key regulatory actions of the CSS are the REACH and CLP Revisions. Working with our downstream partner associations in the cosmetics and cleaning products industries, and working with the European Chemicals Industry Association, IFRA is looking to address a series of concerns in the REACH and CLP Revisions, such as the introduction of a mixture assessment factor for the chemical safety assessment of substances, and the scope of endocrine disrupting chemicals as 'substances of concern'. IFRA is equally concerned about a generic risk approach (GRA) that may group substances based on hazard categories and structural similarity. A move from a broad risk-based approach to a strict hazard-based approach would be a significant shift

away from science-based policy making and present new issues for industry, including the fragrance industry.

As with all legislation, we want the REACH revision to be targeted and based on scientific advice from many different experts. As the German Federal Institute for Risk Assessment (BfR) said in 2021, "[with] the exception of a few public consultations on very general roadmaps, the Commission has sought scientific input almost exclusively from its own services and agencies." IFRA is ready to contribute the scientific expertise of the industry and demonstrate how fragrance is an essential part of life and of our well-being, health, and hygiene.

On classification and labelling, IFRA is concerned about proposed new hazard classes and criteria to address endocrine disruptors, environmental toxicity, persistency, mobility and bioaccumulation, and an extension of the scope of the CLP regulation to require hazard labelling for cosmetic

## THE NEW EU CHEMICAL STRATEGY FOR SUSTAINABILITY CSS COVERS REGULATORY AND NON REGULATORY MEASURES



2020

2021

2022

2023

2024

products. IFRA advocates that the introduction of new hazard classes should first take place under the UN Globally Harmonized System of Classification and Labelling of Chemicals to ensure a level playing field.

A further issue relates to the compliance, enforcement, and enforceability of the proposed new CSS framework legislation. IFRA and its industry partners advocate that no restrictions or bans should be adopted if enforceability cannot be demonstrated by the EU, ensuring that responsible actors are not negatively impacted by such new rules. A Commission-sponsored high-level roundtable, including industry CEOs, has been looking at this point and has jointly with the Commission developed recommendations.

Since the launch of the CSS proposals, IFRA has been actively engaged in the political process, working directly with politicians, regulators, industry partner associations, think tanks and other stakeholders. We have expressed our concerns about

certain elements of the CSS to the Commission, responded to all relevant EU consultations and started political outreach in Brussels and, with the support of IFRA's network of National Associations, in EU member states. In France, for example, growers of lavender and other raw materials in the south of France have mounted a strong advocacy campaign with a focus on specific local issues resulting from the proposals, complementing IFRA's high-level messaging.

Data underpins our approach. IFRA has commissioned a socio-economic impact assessment of the CSS on the fragrance industry. The study is based on the common EU Better Regulation Methodology, a methodology also followed in similar CSS impact assessment studies by partner associations. Thirty companies, large and small, have contributed data to the report, looking at the impact on the range of fragrance ingredients in use today and determining how the tougher new CSS rules – including greater scrutiny of low-tonnage ingredients, grouping of materials for assessment, and essential use criteria

– would affect their use in consumer products.

This in-depth report will be published before the summer and will be one of the key pieces of evidence for the fragrance industry as we seek to shape the CSS and ensure it is both an ambitious and workable policy.

In conclusion, the EU stated its intention to depart from existing processes and introduced a paradigm shift in European legislation through the CSS. The EU also signalled its desire to accelerate and simplify the legislative process through novel concepts like essentiality, or through the Generic Risk Approach, the One Substance, One Assessment Approach, as well as through non-regulatory actions to support innovation towards sustainable chemicals and develop safe and sustainable by design criteria for such approaches.

2022 is therefore a pivotal year. By strengthening voices from throughout the fragrance value chain and beyond, we can build a coalition to ensure a reasonable, proportionate, and science-

based approach to the CSS, and a Green Deal that meets its ambitions while supporting industries, economic growth, and employment. IFRA is finalising a political roadmap that crystallises our approach, acknowledging the overarching goals of the EU Green Deal and our intention to help the EU to make the green and digital transition through the right transition pathways. At the same time, we also point out that fragrance is safe, essential, and deserving of special consideration in EU legislation.

We look forward to collaborating with our value chain partners, both upstream and downstream, and including IFEAT, to deliver on our high-level advocacy plan and help to enable our industry to thrive into the future through a workable CSS policy framework.

Martina is one of the speakers in the session entitled, "EU Green Deal and its impact on Flavours & Fragrances: The Domino Effect" which will take place at the IFEAT 2022 Vancouver Conference on Wednesday 12th October.



## ISEO 52<sup>nd</sup> International Symposium on Essential Oils 2022 Wrocław, 4-7 September



On behalf of the organizers of the 52<sup>nd</sup> International Symposium on Essential Oils, I would like to invite the members of the IFEAT community to participate in the event that will be held in Concordia Design Wrocław, Poland from 4 to 7 September 2022. This prestigious symposium has been organized annually in Europe since 1969 (with an exception in the pandemic year of 2020) to stimulate cooperation among scientists from academia and industry for the advancement of research and development in the science of essential oils and their constituents.

Topics of ISEO 2022:

### Essential oils:

- Agricultural innovations (aromatic plants cultivation, breeding techniques)
- Isolation (distillation and extraction technologies)
- Analysis

### Essential oils and their components:

- Biological activity, toxicological effects;
- Application in the fragrance industry, perfumery, cosmetics, pharmacy, aromatherapy, food production, and agriculture (plant protection)

### Essential oils' components:

- Separation and structure determination
- Structural modifications
- Biosynthesis and biotransformations

In addition to the scientific event, industry participants will have the opportunity to take part in the ISEO B2B international meetings (organized by the Enterprise Europe Network) and discuss potential business opportunities with representatives of food, pharmaceutical, cosmetics and household chemicals companies from different countries.

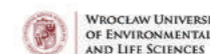
If you are interested in attending, please register via the symposium website: [www.iseo2022.pl](http://www.iseo2022.pl) or contact us directly at [daniel.strub@iseo2022.pl](mailto:daniel.strub@iseo2022.pl)

Yours sincerely,

Daniel Strub, Ph.D., Eng.

Chair of the Organizing Committee of the 52<sup>nd</sup> International Symposium on Essential Oils

Organizers



# F&F INGREDIENTS: A CHANGING MARKET

BY ALAIN FRIX, FOUNDER, ALLCHEMIX BV

The F&F industry is probably one of the most complex industries, as it involves art, science and culture, combining the intricacies of nature and human ingenuity.

## AN ELEGANT AND IMPORTANT INDUSTRY

Each of the products which compose our palette, be they natural or man-made, will drive people to purchase consumer goods which contain them: a fine perfume, a child's lollipop, a cosmetic, a detergent for clothing, an incense stick to inspire, a refreshing beverage on a hot summer's afternoon. Indeed, flavours and fragrances evoke a large spectrum of emotions, invisible partners in reassurance, seduction, appetites, relaxation and meditation, a conjunction between well-acting and well-being.

The F&F Industry is not only about stimulating emotions, but also a significant provider of work and income to over ten million farmers worldwide as well as other people involved in transforming natural feedstock into a highly diversified offering of perfumes and flavour materials. Equally important are those technicians who spend their lives creating new synthetic molecules which have apparently been "forgotten by nature," carrying out research guided by scientists in chemistry, biology, physics and finally IT. All these materials will fill the magician's hat of those perfumers and flavourists who can assemble these olfactive colours into a quantum of happiness.

Whether synthetics or naturals, F&F aroma ingredients are mostly relatively tiny hydrocarbon molecules. Solvents, fillers, carrier agents, preservatives or other products which do not contribute to odour or taste are excluded from this definition of aroma ingredients. Furthermore, from an ingredient standpoint, there is no universal rule - as long as regulation permits - that a fragrance ingredient could become a flavour ingredient and vice versa.

## QUANTIFICATION OF THE F&F INDUSTRY

Many articles provide F&F industry turnover without a good indication of volumes. Moreover, turnover estimations are always subject to the price volatility of ingredients and therefore a weak indicator in volatile markets. Nature produces a biomass of hydrocarbons; it does not produce bio-dollars nor bio-euros. To assess F&F renewability and sustainability factors, it is necessary to estimate volumes as a key indicator, helping us to think proactively where and how to source material in the future - those pools of hydrocarbons that we will continue to tap for both synthetic and natural odouriferous substances.

## COMPLEXITY OF F&F INGREDIENTS

There are over 1,500 main types of fragrance ingredients and over 3,000 main types of flavour ingredients. Generally, each product type is available in different commercial grades or purities. Very often further specifications are required, involving detailed analysis of all components according to dozens of parameters. Manufacturers need to guarantee perfect product performance and safety in their application, and the absence of traces that could create off-notes (human sense of smell can detect traces with a very low odour threshold). It is unusual to see the same aroma ingredient being prominent in both F&F industries, often a major ingredient used in fragrances - dihydromyrcenol for example - will have a much smaller, even negligible presence in flavours. And vice versa, a sizeable flavour ingredient, such as vanillin, will likely be present only to a smaller extent in fragrances. Besides, both markets comply with different regulations (REACH for fragrances, but not for flavours, food versus skin allergens, etc.). From a structural standpoint, the fragrance market is quite globalised, while the flavours

market is much more fragmented and relies more on local producers of ingredients. Cultural values start with food and tradition, the taste of your first spoonful will constitute the first steps of a long cultural journey. Quite likely, as a result, flavours reflect ethnicity even more than fragrances do. The combination of all of the above explains why the F&F world is extremely complex and this complexity is further increased with issues related to raw material availability.

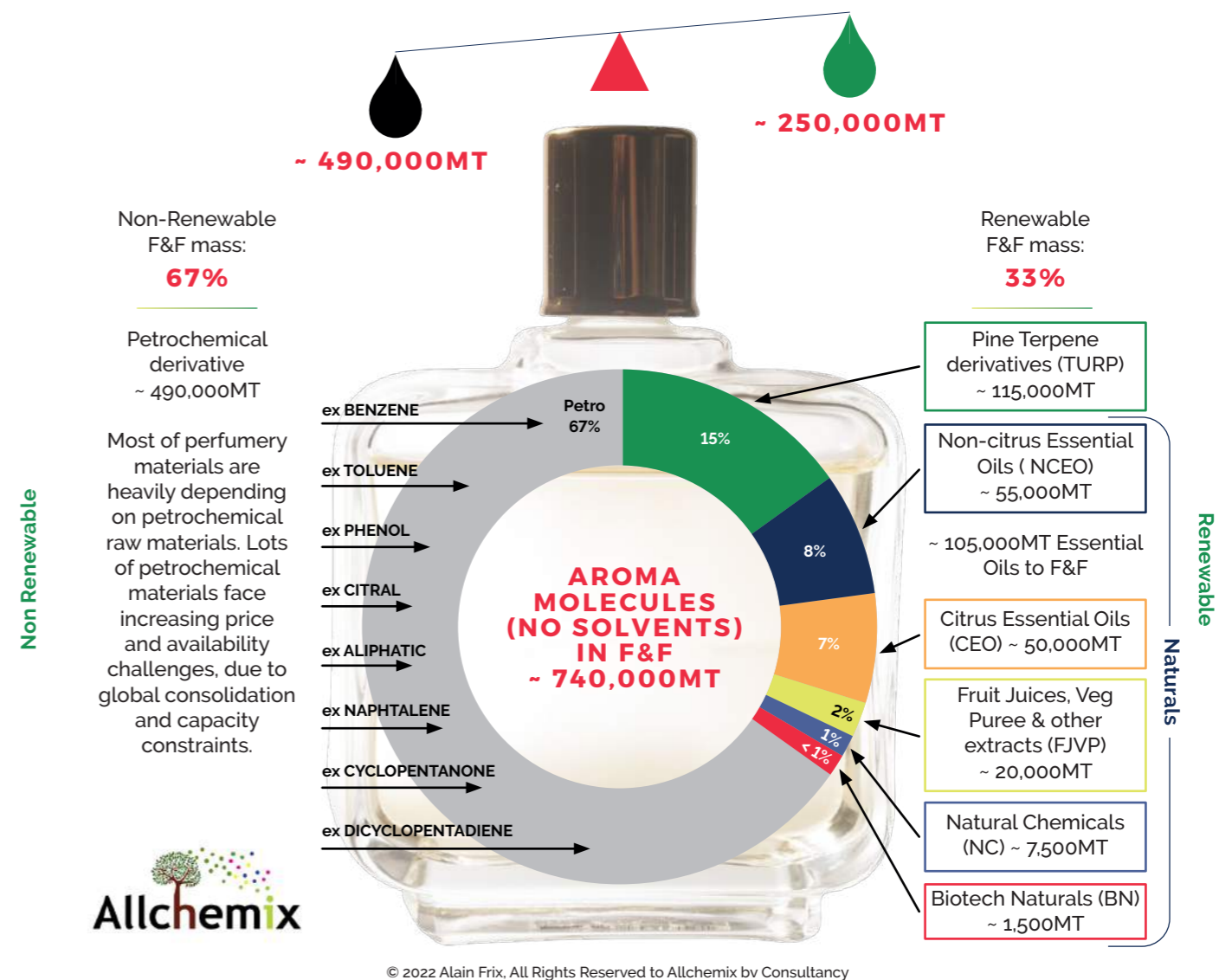
## CERTIFICATES, REGULATIONS AND CASUALTIES

In recent years, further requirements such as renewability, traceability, sustainability programmes, organic or vegan nature and compliance with the rules of a myriad of other certifying bodies have added a sizeable burden and complexity. These additional constraints have proven to be very demanding to many small producers, as they lack the personnel or expertise to complete the paperwork being requested. Ultimately many small players discontinue or sell their business to larger entities, which are facing continued consolidation themselves. The pond of F&F companies is being drained at an alarmingly fast rate as a result of excessive and often unnecessary regulations.

## SOURCES FOR F&F INGREDIENTS AND ESTIMATION OF USAGE LEVEL

For this study, the aroma ingredients are classified into five main categories or segments. They are interconnected in complex streams of materials and these will evolve as the F&F market is exposed to new stimuli from consumer demand, regulations, technology and biomass availability. The calculations which follow are estimations of a substance's aromatic components following correction referring to all

FIG 1. SOURCES OF F&F AROMA INGREDIENTS



masses being expressed as 100% pure products (Figure 1).

### Turpentine derivatives (TURP):

Turpentine is a renewable product extracted from pine trees, as a by-product from the tree tapping resins, as well as a by-product from cellulose (pulp) production. Most of the turpentine derivatives used in F&F are chemically transformed and therefore considered synthetic by regulatory bodies. About 115,000 MT of turpentine derivatives end up as ingredients in the F&F world, which equates to about 15% of the total F&F aroma feedstock. Other industries also consume turpentine derivatives such as agrochemicals, polyterpene resins, solvents, pharmaceuticals and camphor. More industries will look toward turpentine derivatives as a

source of renewable feedstock in the future.

### Essential oils and extracts (NCEO+CEO):

All are natural and renewable products. In some rare cases, extracts might be chemically transformed into other ingredients to become renewable synthetics. There is a global biodiversity of essential oils, with an excess of 200 commercial essential oils, providing vital resources to both developed and less developed countries. About 105,000 MT of essential oils are used in the F&F trades each year. As their production provides work to millions of farmers, they are by far the biggest socio-economic contributors of our industry. Although essential oils are primarily geared towards the

F&F industries, there are increasing applications in the aromatherapy, pharmaceutical, organic phytosanitary products and other ancillary industries.

Other extracts such as fruit juices and vegetable purees (FJVP): these are almost exclusively used in flavours and are much less concentrated than their corresponding essential oils. The use of fruit juices and vegetable purees and other extracts is quite sizeable in flavours, roughly equivalent to about 20,000 MT of pure aromatic component.

### Natural chemicals (NC) and biotechnology naturals (BN):

These chemicals are produced complying with either US or EU natural chemical protocols. An

estimation of volumes is 9,000 MT, which includes biotechnologically produced products, though the latter do not currently exceed 1,500 MT annually. Most biotech processes are designed to produce natural substances, although biotechnology can also be used as a processing step toward synthetic products.

#### Petrochemicals (PETRO):

All their derivatives are synthetic and not renewable. Some F&F ingredients might be produced through chemically binding a petrochemical derivative with a renewable chemical coming from one of the above-mentioned four sources. In such cases the final ingredient will be a "partly renewable" synthetic. Petro-derived aroma chemicals are prevalent in F&F ingredients: up to 490,000 MT per annum. The predominant use of petrochemical materials is in industries other than ours: vitamins, printing, construction polymers, agrochemicals, plastics, etc. It is interesting to consider if these petrochemical companies will be able to run their plants based upon renewable streams such as bio-naphtha or other new pathways. There might be a number of logistical constraints in these scenarios. In any case, the F&F industry will be under high pressure to phase-out the utilisation of fossil hydrocarbons. It is foreseeable that petrochemicals – currently often the cheapest source of F&F ingredients – will become more expensive, as they will very likely be subject to the environmental CO<sub>2</sub> tax which is absent until now. Renewable ingredients should logically benefit from a lower CO<sub>2</sub> tax regime.

#### Summary of aroma ingredients (without solvents):

Some 739,000 MT, out of which 582,000 MT are used in fragrances and 157,000 MT in flavours. These aroma ingredients are mixed with various delivery systems such as solvents, fillers, preservatives, vegetable oils, etc. The combined weight of commercial flavours can easily be many times greater than the weight of its core aroma components. In fragrances, this multiple is generally smaller than in the flavour industry. It is interesting to note that over 230,000 MT of solvents – mostly synthetic and only very few renewable – are used in F&F. If the above estimations are valid, the global F&F industry needs less than 750,000 MT of smell and taste hydrocarbons. This

is probably less than 0.1% of the global chemical industry's hydrocarbon output. Interestingly, various rigorous studies indicate that pine forests naturally release great amounts of VOC including terpenes. Some estimates exceed several hundred millions of tonnes per annum of forest "fragrances." How does that translate with the new VOC regulations for fragrances? This is a topic that merits more attention.

### NEED FOR MORE RENEWABLES

The key drivers of renewability are mainly turpentine derivatives and essential oils (and their extracts): they allow 30% of F&F's aromatic substances to be renewable. This is not enough as the demand for more renewable consumer goods is mounting.

**Turpentine derivatives**, with a weight of 115,000 MT, are a very important feedstock for perfumery. Turpentine itself is one of the smallest by-products of the softwood timber industry by tonnage, starting from over one billion MT of softwood biomass to produce wood, paper, resins, etc. This black box on softwood biomass streams and their quantification is illustrated in *Figure 2*.

The future availability of turpentine will essentially depend on various factors including the demand for gum rosin, but more particularly the demand for long cellulose fibre, the fittest sustainable technology to produce them, and the availability of conifers in accessible areas. A good portion of conifers grow in boreal forests, mostly inaccessible wetlands. Conifers in accessible areas exhibit early symptoms of climate change, some already suffer from invasive insect plagues. While complex, the

coniferous biomass chain and streams offer many new avenues for renewable molecules in the next 30 years. Companies will need to find a new, smarter way to use them.

**Essential oils** are equally fundamental in today's renewability quest. This important F&F feedstock of 105,000 MT can be split into two categories: citrus oils and non-citrus oils.

**Citrus essential oils** represent about half of the total essential oil contribution to F&F. They are primarily extracted from the peel of oranges, lemons, and other citrus fruits, mostly as by-products of the citrus juice industry.

**Non-citrus essential oils** represent more than 150 products from lavender, cinnamon, patchouli, vetiver, and sandalwood being the most well-known, to the esoteric ones such as lovage root or cascarilla bark. These oils are the sole real source of renewable products intentionally made for the F&F market. In other words, production responds closely to demand. As they are naturals, the supply chain might not always be linear, but it is a fact that these essential oils play a major role in satisfying our demand for more renewable naturals. This is an important differentiation in contrast to the turpentine derivatives which are considered renewable synthetics.

### ESSENTIAL OILS AS A CONTRIBUTOR TO HUMAN HEALTH AND SOCIO-ECONOMIC INCOME

Essential oils and their corresponding aromatic plants have coexisted with humans for a very long time and were carefully selected through so many generations of our ancestors for

their healing, health-supporting and well-being properties. This very long relationship through highly diverse traditions can be considered as one of the most diligent assessment processes for reliability and safe product application that mankind has probably seen. Many essential oils outperform synthetic and biotech versions in fine fragrance applications. Although challenging to work with at times due to their richness, they certainly are of profound elegance. Synthetic molecules bring more flexibility, allow for more creativity and finesse, while often providing a better resistance to acidic or basic solutions (bleaches, laundry powders, etc.), which is important to prevent discolorations and odour degradation. This complementarity creates a welcome balance between feedstocks.

Furthermore, the social impact of these oils is of great importance as they provide work and income to rural communities, often operating in very remote areas of the world. IFEAT experts have estimated that over 10 million farmers are saved from poverty thanks to the aromatic crops which they produce, often in their small plots of land and at times with very ancient techniques. IFEAT provides high quality information on the socio-economic aspects of many essential oils at <https://ifeat.org/socio-economic-reports/>. These reports are also regularly published in IFEATWORLD. It is a moral pledge, by some, to better support these farmers, not only in views of generating corporate reports and obtaining various certifications. Without work, these families' situation might become precarious followed by migration to cities or seeing them risking their life on a boat. Everything is somehow interconnected.

### SUSTAINABILITY OF F&F PRODUCT: MUCH MORE THAN CARBON FOOTPRINT CLAIMS

Sustainability is a concept that is prevalent in many recent discussions and plays a key role in future investment decisions. However, people may not always fully understand what sustainability is really about; they often forget the social aspect. Sustainability can be defined as a complex and dynamic balance between economic (increased yields, energy savings, etc.), environmental (renewable feedstocks

such as biomass and energy, waste reduction, biodegradability, biodiversity, preservation of natural resources such as water, soils, etc.) and social matters (fair trade, profit sharing, access to genetic resources, rural economy, women empowerment, etc.). Some companies still express their sustainability efforts myopically through carbon footprint estimates. But carbon footprint itself is absolutely not a guarantee of a sustainable contribution to biodiversity, biodegradability, fair trade, rural employment, and so many other indicators that warrant a balanced business model. Social criteria are integral to the sustainability picture of each ingredient, and it is of increasing emotional value to many consumers in their purchase decision. As previously reported, millions of farmers, labourers, and pickers are highly dependent on our sector. Their lives form the third pillar of sustainability, the human footprint.

In fact, there are very few, if any, entirely perfectly sustainable solutions, and here again each feedstock has its advantages and its inconveniences. Often, a very good carbon footprint comes at the cost of a reduced social impact. It is a myth to believe that one can excel on all scores. In the end, a successful sustainable company is one that adopts the challenge to continuously improve on its own internal framework, year by year, regardless of whether it transforms petrochemicals or agricultural products into an F&F ingredient. The progress is more important than the score one keeps.

Moreover, the sustainability scores of both petrochemical-based and natural-derived industries are complementary. In other words, their weaknesses are different. Therefore, both main streams are absolutely needed to ensure an overall sustainable and reliable supply of molecules to our F&F industry, at least for the next three decades. And, as a result, companies should continue to invest on process improvements, both in each domain; petrochemicals and biomass.

Also, some definitions are being reviewed according to industry pressures. Recently, the European Union released a statement suggesting that natural gas could be perceived as a "transitory" sustainable

solution in the decarbonisation efforts to move away from the so-called "more polluting" feedstocks such as coal. If so, how much would this policy impact in our tiny F&F market? The chemical industry's frightening dependence on natural gas already poses a real danger for the price stability of many raw materials, let alone the entire economy. Given the preponderance of petrochemical feedstock as well as gas in our F&F industry, one can foresee a higher frequency of future price instability in F&F and further consolidations as a result.

### URGENT ACTIONS REQUIRED FROM CPGs

There is a real cost for sustainable practices. Farmers, especially small-scale farmers, are by far the weakest point in the full value chain of essential oils. While consumer goods companies rightfully impose more sustainability requirements on F&F houses and the entire supply chain, it is the farmer who mostly gets hit by the domino effect. As explained previously, over 10 million farmers and pickers, in the case of the essential oil industry, live at or just above the poverty level. They cannot be made the sherpas of sustainability. They need to be supported financially and socially and be educated in sustainable practices. Unfortunately, the prices that are being offered for their natural products often do not allow them to properly invest in better practices. Consumer goods companies and brands need to educate end-users that there is a premium to pay to really improve the livelihood of the farmer, and the environment. Some consumers will agree to pay a premium if they understand why they have to pay more and how this premium impacts our planet. Therefore, traceability needs to go in both directions—consumers need the ability to follow a product from the farmers' hands, but they also need verifiable evidence that the price premium effectively goes to the farmers and better farming practices. Only then will sustainability be truthful and impact the entire product lines, much more than today's initiatives, which are often limited and selected by major companies.

### ESSENTIAL OILS AND THEIR SAFETY ASSESSMENT:

An urgent call for action: regulatory

FIG 2. FROM SOFTWOOD BIOMASS TO FRAGRANCES



bodies from the EU and other regions seem to struggle to understand natural complexity. The current mindset towards safety assessment protocols - evaluating natural complexes according to their individual components - is of great concern. This approach implies that the NCS (Natural Complex Substance - like essential oils) will react as if each individual component were to behave as if in isolation. This has been shown on several occasions not to entirely be the case. For example, several studies performed by the Research Institute for Fragrance Materials (RIFM) in collaboration with IFEAT indicate that the genotoxicity profile of whole oils containing chemicals of concern often demonstrates a much better profile than may be expected based on individual component analysis and pass the various genotoxicity endpoint tests. As an example, NCSs such as rose oil, which contains methyl eugenol, yielded favourable results, contrary to similar test results conducted on methyl eugenol alone, which was deemed to be unsafe. The approach to breaking down essential oils into individual components and establishing their safety profile based on algorithms using existing chemical databases could likely save costs and facilitate bureaucratic documentation, but it does not necessarily always reflect reality. There is only one way to

accurately assess essential oils safely and that is by testing the essential oil per se. Will our F&F world embrace this initiative? Under the leadership of IFEAT, RIFM conducted genotoxic tests on almost 100 essential oils over the past five years, and, while some eight oils remain under review, the vast majority of tests carried out so far have not revealed any genotoxic concerns. Therefore, it seems that in various cases, the interactions between the constituents in NCSs attenuate certain properties and characteristics of the individual components in a favourable manner. Furthermore, it is worth noting that natural aroma chemicals do not necessarily have the same chirality as synthetics. Living organisms produce chiral molecules predominantly with a specific optical rotation, while chiral substances synthesised in the laboratory tend to be mostly racemic mixtures. It is well known that chirality can play a critical role in the physiological impact of chemicals on humans.

Let us not forget that any combination of ingredients, as safe as they could individually be, will undoubtedly lead to chemical reactions once they are mixed together, with the formation of some new compounds and degradation of others. The chemical universe of a detergent, a shampoo, a perfume or a flavour, cannot be the same as the

sum of their individual constituents. To be pertinent and far more relevant, safety assessment should be done on the finished consumer goods product.

**CONSIDERATIONS ON BIOTECHNOLOGY**

Surprisingly, biotechnology is still relatively small in F&F. One of the reasons is probably the relatively limited market potential for most aroma molecules, and another factor could also be low yields and technically demanding purification. The challenges are to separate the yeast, or bacterial components, from the highly precious volatile components, which are small in quantity but of huge importance to define a rich olfactory note. For sure, biotechnology will progress and solve some of these obstacles, but it seems doubtful that biotechnology will play a significant role in F&F before 2030, at least for molecules selling for less than \$50.00 per kilo. This pricing category, however, defines the vast bulk of F&F ingredients today.

**BIODIVERSITY: A LONG WAY TO GO**

At a time when all industries worldwide are mobilising efforts to preserve and foster biodiversity, our F&F industry could probably do more and take the lead in protecting more essential oils against pointless regulations, as well as further

supporting oil safety assessments. Why not fund an international programme to specifically support essential oils against climate change? We will need this to adapt our crops to new climatic conditions. We might also need to improve our extraction techniques in anticipation of lower yields for the same climatic reasons. There are several examples of how to foster biodiversity. Maybe a good one is about Indian sandalwood, which was almost extinct due to grievous over-harvesting. In the late 1990s, the Forestry Department of Western Australia began to grow east Indian sandalwood trees as part of a global conservation programme. *Santalum album*, the east Indian sandalwood tree, showed promising potential. Today, more than 10,000 hectares of arid savannah landscape in Kununurra (Western Australia) have been transformed into an immense plantation of sandalwood trees, creating a new ecosystem, and providing income to the local population. These plantations created a new source of sandalwood oil of sustained availability, while the same was on the brink of extinction decades ago. Such projects should be acclaimed, as they are true vectors of biodiversity preservation.

**MIGRATION OF OILS :**

Essential oils are like people, they migrate. Some oil-bearing plants,

like the almighty *Mentha arvensis*, have crossed several continents in the last century, chasing "better" growing conditions and economics. Today, various essential oils are leaving their endemic boundaries. There is no doubt climate change is having its effects, as even slight alterations to an ecosystem can have a large impact. A good example is, how global warming induced a fourth annual reproduction cycle for the pine bark beetle, killing millions of conifers throughout North America and facilitating widespread forest fires. There are various projects to grow essential oil crops in new areas, especially in West Central Africa, as these are likely to suffer much less from extreme drought patterns. Also, these new areas have little exposure to hurricanes or tropical storms. The author is also part of one of these projects, offering new alternatives to facing climate change, while supporting rural populations who have little to no income in a life of subsistence. Climate change will force producers to be active in multiple areas in order to reduce the risk to their supply.

**YOU CAN'T CONTROL EVERYTHING**

A good mapping of global renewable carbon streams should accompany R&D efforts from the very start. As biomass will be sought by

many industries, availability will depend on several evolving and competing factors. Being cognisant of renewable streams' availabilities and qualities will be necessary to focus our R&D according to ever-changing indicators. Acquisitions and consolidation by stakeholders may be a partial answer to overcome these challenges, as it is virtually impossible to fully control the entire supply chain.

**VENUE OF OTHER MARKETS AND PRINCIPLE OF GREEN GRAVITATION**

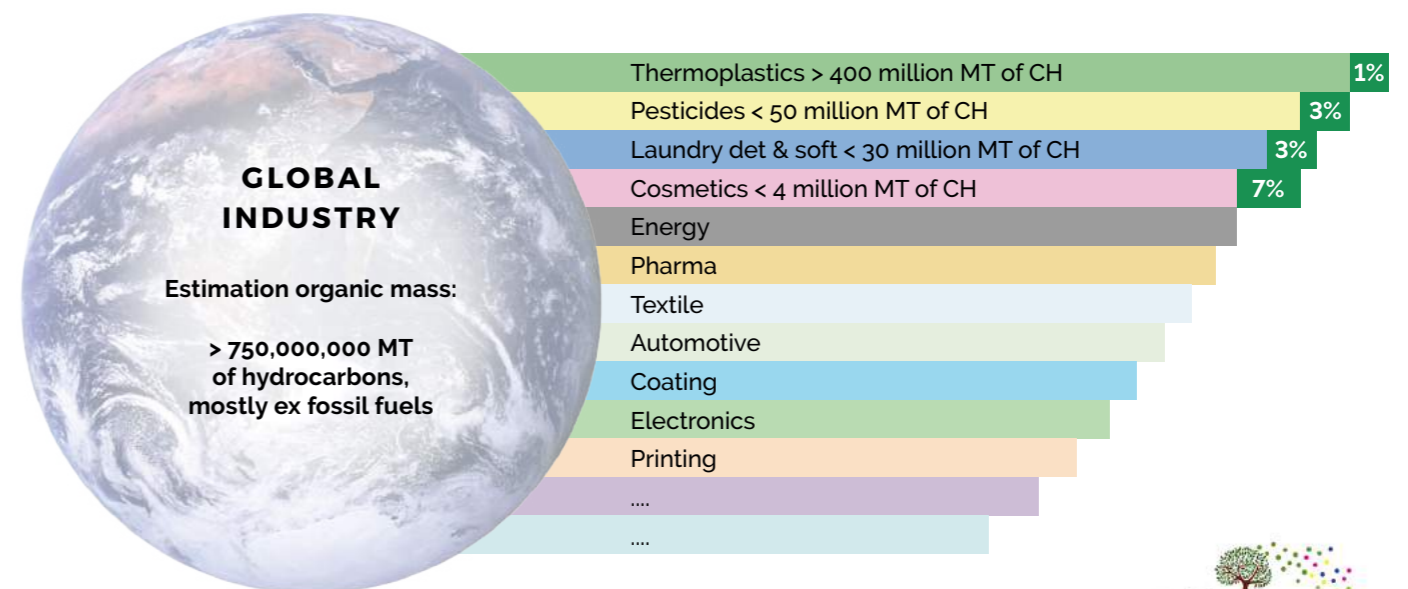
F&F ingredients are often sourced from co-products and by-products traditionally sourced from other industries, a system that has been relatively stable for the past 50 years. However, each industry is now looking for more renewable solutions, driven by consumer demand for greener and cleaner products. This means that those industries might feel more obliged to keep and recycle their own organic waste, in particular, their waste of renewable substances. A rough estimate of some other industries' hydrocarbon consumption (in MT per annum) is a good exercise to predict new demand flows on renewable hydrocarbons (Figure 3)



WHERE WILL THE BIOMASS MOVE ?

FIG 3. OTHER WORLD NON-FOOD INDUSTRIES AND THEIR CARBON NEEDS

Global Non-Food Industry probably requires over 750 million tonnes of carbon



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## VENUE OF OTHER MARKETS AND PRINCIPLE OF GREEN GRAVITATION

F&F ingredients are often sourced from co-products and by-products traditionally sourced from other industries, a system that has been relatively stable for the past 50 years. However, each industry is now looking for more renewable solutions, driven by consumer demand for greener and cleaner products. This means that those industries might feel more obliged to keep and recycle their own organic waste, in particular, their waste of renewable substances. A rough estimate of some other industries' hydrocarbon consumption (in MT per annum) is a good exercise to predict new demand flows on renewable hydrocarbons (Figure 3 on page 23):

- Thermoplastic industry: requiring 400 million MT of hydrocarbons, currently almost exclusively from fossil feedstock (and recycling less than 100 million MT each year). What will be the impact if thermoplastic industries were to add some renewable carbons to their feedstock? The thermoplastic industry would need three million tonnes of hydrocarbons to achieve 1% of increased renewability.
- Pesticides: possibly need 50 million MT of hydrocarbons; there is a big push for renewable feedstock such as turpentine derivatives as building blocks for new green agrochemicals.
- Laundry/detergents: possibly need 30 million MT of hydrocarbons.
- Cosmetics: could require up to 4 million MT of hydrocarbons.

This is not to forget other industries which will also compete with renewable feedstock, including energy, pharma, textile, automotive, coating, printing, and electronics beyond the growing sector of traditional biomass uses, such as lumber for construction and homebuilding.

These estimations are meant to illustrate that size does matter. As a result, there will be a "green gravitation," with the strongest market keeping and/or attracting the

available green hydrocarbons. One might probably see new applications for renewable and natural materials. In conclusion, the many F&F ingredients constitute a complex universe, undergoing a big evolution due to its interdependence on other industries, regulations and, finally, climate change. The quest for more renewable materials across industries will accelerate the evolution of F&F value chains. In order to preserve supply continuity and respond to the demand for more green products, companies will need to think out of the box, or - pun intended - think out of the bottle!

## ACKNOWLEDGEMENTS

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## ABOUT THE AUTHOR

Alain Frix dedicated 30 years to the business of renewable materials, from forest products such as turpentine and its perfumery derivatives to aromatic plants and essential oils.



After chairing the International Federation of Essential Oils and Aroma Trades (IFEAT) for several years, he currently chairs IFEAT's Scientific Committee and is involved in various projects related to aromatic plants, biodiversity and climate change. He is also a member of other prestigious associations such as SFP (Société Française des Parfumeurs) France; PCA (Pine Chemicals Association) USA (forestry derivatives from conifer biomass); SEPAWA (Europe's widest association for Soap, Perfumery, Detergent and Cleaners), Germany; DGP (German Society of Perfumers) Germany; VALBIOM (Biomass valorization), Belgium.

Alain Frix founded his consultancy company, Allchemix BV, in 2020. He has a master's degrees in biology and in management.

*Alain is one of the speakers at the IFEAT 2022 Vancouver Conference and will speak on the subject of F&F Feedstocks & Renewability. His presentation will take place on Monday 10th October during the morning session at the Westin Bayshore Hotel.*

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IFEAT

# SOCIO-ECONOMIC REPORT ON CEDARWOOD OILS

BY PETER GREENHALGH

## PART 1: CHINA AND THE USA<sup>1</sup>

### INTRODUCTION

The term "cedarwood oil" can be confusing, in that the most important essential oils in this group are produced by distilling different junipers and cypresses (*Juniperus* and *Cupressus* spp.) rather than from true cedar trees (genus *Cedrus*). The *Oxford Encyclopaedia of Trees of the World* lists 34 tree species that have the common name "cedar" covering not only some of the above-mentioned species but also *Thuja* and *Pinus* spp. Cedarwood oil is commercially produced in many parts of the world and widely used. According to Milchard (2019) cedarwood oil is second in product volume only to the *Pinus* species of oils produced from the wood of essential oil-bearing plants.

The true cedar trees of the *Cedrus* spp are stately evergreen trees commonly divided into four species:

- *Cedrus atlantica* or Atlas or Atlantic cedar from North Africa
- *C. brevifolia*, the Cyprus cedar
- *C. deodara*, the Himalayan or Indian cedar
- *C. libani*, the cedar of Lebanon

Commercial "cedarwood oils" are obtained from three main genera of *Cupressaceae*:

- *Juniperus* spp. for Texas and Virginia cedarwood oils
- *Cedrus* for Moroccan and Indian oils
- *Cupressus* for Chinese oils.

Part 1 of this socio-economic report provides an overview of cedarwood oil along with details of cedarwood oils from China and the USA. Also, in this edition of IFEATWORLD is *My Favourite: Chinese Cedarwood Oil (Cupressus funebris) and Firwood Oil (Cunninghamia lanceolata)* by Cathy Chen. This provides additional information and data on Chinese cedarwood and firwood oils. The latter oil is not discussed in detail in this report. The next edition of IFEATWORLD contains Part 2 which discusses cedarwood oils in India and Morocco and other smaller producers.

Many other cedarwoods are known, and have been distilled on a minor scale for their oil including:

- Nootka cypress (*Chamaecyparis nootkatensis* 'Glauca') sometimes called the yellow or Alaska cypress, which is a tall evergreen tree found on the west coast of Canada and the USA.
- *Chamaecyparis obtusa* (Siebold & Zucc.) Endl. - Japanese cedarwood from which "hinoki" oil is extracted from the leaves, branches and timber of the tree.
- Mulanje cedarwood *Widdrington whytei Rendle* syn. *W. nodiflora* (L.) Powrie.
- Port Oxford or Oregon cedarwood *Chamaecyparis lawsoniana*
- Weeping blue juniper *Juniperus recurva* Buch.-Ham.
- Hibawood oil *Thujaopsis dolabrata* (L.f.) Siebold & Zucc. which was formerly used as a perfumery ingredient.

In addition, there is a small production of other cedar oils such as cedarleaf oil distilled from *Thuja occidentalis* from eastern white cedar (Trahan 2008). The main areas of cedarleaf oil production have traditionally been in New York, Vermont, Quebec, and Ontario, and some distillation has taken place in Michigan and British Columbia (western red cedar *Thuja plicata*).

### USES, QUALITY AND COMPOSITION

Cedarwood oils each have characteristic woody odours which may change while drying out. The crude oils are often yellowish or even darker in colour if they are dry distilled in China. Some, such as Texas cedarwood oil, are quite viscous and deposit crystals on standing. They are used, sometimes after rectification, in a wide range of fragrance applications such as soap perfumes, household sprays, floor polishes and insecticides. Small quantities are used in microscope work as a cleaning oil and in the pharmaceutical industry.

Cedarwood oils have various uses in aromatherapy and as herbal remedies. Cedarwood has been known for thousands of years and is mentioned in the bible as a source of both wisdom and protection. It is claimed to have various medicinal properties including anti-inflammatory, stimulating blood circulation, protecting the scalp and skin from bacteria and environmental pollutants, lengthening sleeping time, reducing the onset of ageing, pain relief and acne treatment. Cedarwood oils are used to enhance relaxation and improve focus. For this reason the oil is being studied

for its beneficial effects on children with ADHD, with cedarwood oil found to decrease hyperactivity and evoke a calm, almost sedative quality reducing the stress and anxiety that comes along with the disorder. Also, the oil has been registered with the US EPA as a pesticide that stops moths from eating clothing.

The timber from the wide range of junipers (*Juniperus*), cypresses (*Cupressus spp.*) and true cedar trees (*Cedrus*) have a range of other non-oil uses such as timber, furniture, fencing, pencil making, ornamental trees, and railway sleepers. This is briefly discussed in the individual country sections.

All the cedarwood oils of commerce contain a group of chemically related compounds, the relative proportions of which depend on the plant species from which the oil is obtained. These compounds include cedrol and cedrene, and while they contribute something to the odour of the whole oil, they are also valuable to the chemical industry for conversion to other derivatives with fragrance applications. The oils are therefore used both directly and as sources of chemical isolates, including alpha cedrene epoxide, methyl cedryl ether and cedryl acetate.

Virginia cedarwood oil is considered by many perfumers to have a smoother and finer (but less powerful) odour than Texas oil. In addition, it is used in insecticides, polishes and cleaning products, soaps, liniments, and cedarwood still residues have been used in the manufacture of linoleum. A sizeable proportion of the oil is used as a starting material for cedrol and cedryl acetate.

Chinese oil has a lower cedrol content than American oils and is used more in its own right as a fragrance oil than as a source of chemical isolates. The oil and wood are used to prepare incense in China.

The uses of Moroccan cedarwood oil (*Cedrus atlantica*), Indian cedarwood oil (*Cedrus deodara*) also known as Himalayan cedarwood oil, Japanese hinoki oil (*Chamaecyparis obtusa*), and Canadian cedarleaf oil (*Thuja occidentalis L.*), are discussed in Part 2.

An important constituent of cedarwood oils is cedrol, which is used in flavours and fragrances as well as being used to make a range of chemical

derivatives such as cedrol methyl ether, cedryl acetate and other esters. The sesquiterpene hydrocarbon fractions are commercially chemically derivatised to make fragrance ingredients like acetyl cedrene and cedr-8-ene epoxide. These are all important high-volume ingredients for the global fragrance industry. After processing, the derivatives produced and their formulated products have a more diverse range of markets. Commercial cedarwood oils are vacuum rectified from the steam distilled crude oil, to give oils of a very pale-yellow colour. During rectifying crude oil, the fractions are water – top fraction (alpha pinene etc.) – cedrene – liquid cedrol – residue. Then cedrene and liquid cedrol are blended into commercial cedarwood oil based on customers' specifications. Liquid cedrol turns into solid cedrol at below 60°C and can be made into commercial cedrol by being centrifuged and dried and its melting point is about 80°C. Cedrene is also being used separately to make MCK (methyl cedryl ketone and cedrol into methyl cedryl ether, while there is a mixture of cedrene and cedrol in cedryl acetate.

Further processing of the crude oil takes place through rectification which produces fractions with different olfactory properties and isolates with individual constituents for derivative manufacture. This is undertaken either by producers in China or the USA, where there is large scale production and sizeable domestic consumption, or by end-users in importing countries in Europe and Japan.

### QUALITY AND COMPOSITION

Both the overall olfactory properties and the chemical composition of cedarwood oils are important quality characteristics. The olfactory properties will be assessed by some purchasers since they are vital for its use in fragrances, while its chemical composition is vital for use as a raw material in derivative manufacture.

**Texas cedarwood oil** shares many of the same constituents as Virginia cedarwood oil detailed below: cedrol, alpha cedrene, beta cedrene, thujopsene, cuparene, various chamigrenes, widdrol, and pinenes, but Texas oil usually tends to show higher levels of cedrol, with the highest content being in the crude oil from the continuous distillation process at 40% or more. Despite having similar components to Virginia, the Texas

cedarwood tends to smell more woody and less oily, with much of the differentiation in smell occurring in the minor compounds of the oil. Because of the presence of these minor compounds and separate odour profiles, Texas cedarwood oil tends to have uses in the fragrance market that are distinct from Virginia oil. Additionally, there is a growing use for Texas cedarwood oil in natural insect repellents and pesticides, and the pesticidal properties of the oil are also considered to come from the combination of minor compounds in the natural oil, and not from one individual constituent.

The crude Texas cedarwood oil is a dark orange to brown, turbid, semi-viscous liquid from which crystals can separate on standing, particularly during winter. It has a pleasant odour, sweet woody but a little smoky and only used for further processing. The almost colourless non-smoky rectified fractions are used to make consistent "standardised oils" to meet customer specifications, dependant on applications. These are mostly in fragrance materials for use in soaps, candles, room sprays and floor polishes.

The main constituents in **Virginia cedarwood oil** include cedrol, alpha cedrene, beta cedrene, thujopsene, and minor amounts of widdrol, chamigrenes, and other pinenes. The relative amounts of these compounds can vary with distillation cook time, temperatures, and raw material conditions. It is common to do some further processing of the crude oil, with limited need for fractionation and blending, to standardise colour and specifications. Generally, a redistillation will remove around 2%-3% of wood rosins, which can account for colour variations between batches.

The rectified Virginia cedarwood oil is an almost colourless oil, sweetly balsamic, non-smoky smelling and is considered by many perfumers as the finest of the cedarwood oils. This is reflected in its main application in fragrances intended for use in furniture polish (rather than floor polish), cosmetics, shampoos, aftershaves, incense, and aromatherapy. It has a premium price in the marketplace, and as a result is used as produced rather than made into derivatives.

International (ISO) standards exist for Texas and Virginia cedarwood oils. For Texas oil an alcohol content

(expressed as cedrol) in the range 35-48% is specified, with a minimum cedrol content of 20%. For Virginia oil, a maximum cedrol content of 14% is stipulated. Various physico-chemical data are also defined. Both these standards need revision. This is particularly the case with the Texas specification which no longer reflects the typical oil produced by the three existing factories.

**Chinese cedarwood oil** has a lower cedrol content than the American oils and is used as a fragrance oil as well as a source of isolates and chemical derivatives, which include cedrol, cedralone, MCK, cedryl acetate, and cedryl methyl ether. The oil's woody odour has a sharp, fresh, camphoraceous - sometimes smoky - character, and is not as sweet as oil from other origins. Appropriately, the fragrance uses of this oil are mostly in functional and industrial products except in China where it is preferred for most cedarwood oil product applications.

**Cedarwood Atlas oil** is a viscous pale-yellow oil with a sweet, woody odour with floral characteristics, and as such is different from the other main origins but resembling the Himalayan oil in having a high level of himachalanes rather than cedrenes.

**Himalayan cedarwood oil's** main constituents are:

- p-methyl acetophenyl acetate
- 4-methyl  $\Delta^3$ -tetrahydroacetophenone
- $\alpha$ -himachalene
- Iso-himachalene
- $\beta$ -himachalene
- Cis- and trans-atlantone
- Himachalol
- Allo-himachalol
- Longborneol and deodarone



SAWDUST

### Estimates of cedarwood production in 1985 by Brian Lawrence:

Texas	<i>Juniperus ashei</i> Buchh.	1,400 MT
Virginia	<i>Juniperus virginiana</i> L.	240 MT
China	<i>Cupressus Funebri</i> EndL	450 MT
India	<i>Cedrus deodara</i>	20 MT
Morocco	<i>Cedrus atlantica</i>	7 MT
Kenya	<i>Juniperus procera</i> Endl.	no production

### Current estimates of annual cedarwood oil production are:

China	1,800 – 2,000 MT
Texas	700 – 800 MT
Virginia	250 – 300 MT
India	600 – 700 MT
Morocco	100 MT

## PRODUCTION AND MARKETS

### Production

Production data on cedarwood oil are limited and annual variations in output do not help. Export data are also an inadequate guide because it is often aggregated with other oils and because of high domestic consumption levels in some producing countries. It is not possible, therefore, to be precise about the scale of global production or trade. Brian Lawrence in 1985 reviewed world production of cedarwood oil and his estimates of annual production data are shown in the above table.

### Markets

Major markets for cedarwood oils are the USA, China, Western Europe, India, and Japan. The USA utilises much of its domestically produced Texas and Virginia cedarwood oils as well as importing sizeable quantities of Chinese oil.

Chinese oil is more powerful than US cedarwood oils. The USA and Europe import large quantities of the Chinese

oil - as it is lower priced than Texas and Virginia cedarwood oils and has been widely used as an adulterant of these oils.

### CHINA<sup>2</sup>

Chinese cedarwood oil is obtained from the large evergreen tree or shrub *Chamaecyparis funebris* (Endl.) Franco [EFO] synonym *Cupressus funebris* Endl. [ISO 4720] – known as the Chinese weeping cypress. It has a wide distribution in Guizhou, Gansu, Sichuan, Kweichow, Zhejiang, Jiangxi, Fujian, Shangdong, and Shanxi provinces. One Chinese source indicates that *Juniperus chinensis*, *J. formosana* and *J. vulgaris* are also sources of Chinese cedarwood oil but cypress dominates. Timber from the tall, hard trunk of the cypress tree has a variety of uses such as furniture, construction, shipbuilding, and bridge building. Sawdust from cypress wood processing factories is distilled into cedarwood oil but the dominant source is abandoned tree roots. Each year large quantities of trees are felled and the roots left in the ground.



DISTILLATION EQUIPMENT for crude oil from sawdust



RECEIVERS AFTER DISTILLATION



SEPARATING CEDRENE AND CEDROL FROM THE CRUDE OIL

After a number of years, the roots are extracted from the ground, cut into pieces, and ground into sawdust, which is then steam-distilled or dry-distilled into cedarwood oil. This contrasts with Texas and Virginia cedarwood oils from the USA where no oils are obtained from root extraction.

The abandoned tree stumps and roots are collected by farmers and each year there are an estimated 1.3 million abandoned cedar and firwood stumps. There is no particular harvesting season, farmers go and extract the abandoned tree stumps and roots when they are free except during the rainy season. There is a preference for wild tree stumps and roots because the oil yield is higher than replanted trees, even if the latter are many decades old.

The older the tree stumps the higher the oil yield. The wild abandoned tree stumps are now usually deep in the mountains and to dig and transport them is not only hard physical work but also increasingly expensive as living costs increase in China. The willingness to undertake this work is mainly dependent on the price of cedarwood oil and its derivatives, and low prices prior to the COVID pandemic led to farmers and processors becoming less interested in this business and switching to other economic activities.

The stumps are either sold to oil processors or are stored outside farmers' houses waiting for a better price. Oil manufacturers chop the stumps and roots into pieces using machines and then steam or dry distill

the pieces to obtain crude oil. If the oil is made by dry distillation it has a burnt odour, which was a typical odour of Chinese cedarwood oil. The dry-distillation process has been gradually disappearing because of the oil's burnt odour and it was not good for the environment leading to government prohibition. During the last five years or so, no dry distillation has taken place in China. Steam-distillation makes a good odour and customers can use this oil directly in fragrances. As discussed earlier, the crude oil can then be further processed using distillation, rectification, and chemical synthesis technologies into a range of aroma chemical derivatives. After distillation and processing, further products can be produced from the remaining waste products.

It was in the 1950s and 1960s that production of cedarwood oil began in Hangzhou, Zhejiang province, predominantly for export. In the 1970s production expanded to Guizhou province and then in the 1980s to Sichuan province, where substantial quantities of abandoned tree roots were available. Sichuan, with almost two million hectares of cypress forest areas, including large quantities of tree roots, now dominates cedarwood oil production for both domestic and export consumption. In the 1990s Sichuan cedarwood oil processing reached a peak, with annual production exceeding 2,000 MT of crude oil. Increasingly cypress roots from cultivated trees are now being processed which usually have a lower yield of approximately 3%. The oil is used both directly as a fragrance ingredient and as a raw material for aroma chemicals, production of which began in the 1980s. Since then, China has been increasingly exporting the value-added aroma chemical products rather than the oil. As Chen (2022) points out, firwood oil, which is processed in the same way as cedarwood oil, has become a more important raw material for aroma chemicals than cedarwood oil, with an estimated usage ratio of 1:4. Over the past two decades the price of cedarwood oil has increased substantially leading to increased production of lower cost firwood oil, which contains similar components.

Annual cedarwood oil output in China was given as 1,000 – 1,500 MT in the mid 1990s (Zhaobang 1995). In 2006, the output of cedarwood oil was about 1,800 MT and firwood oil was 3,000 MT. Their exported quantity totalled around 1,600 MT. Recently, annual production of crude cedarwood oil was estimated at 1,800 – 2,000 MT compared with 6,000 – 7,500 MT of crude firwood oil.

Initially the processing technology was relatively simple resulting in low yields. Continuing improvement in technology has been made, with wooden barrels and bamboo pipes being replaced by steel equipment leading to improved quality and yields. This in turn has facilitated a growth in demand.

#### Socio-Economic and Environmental Benefits

The use of abandoned cedar tree stumps and roots increases the value and utilisation of forestry waste, thus supporting local farmers' incomes as well as assisting in meeting the requirements of social development

in China. An estimated 4,000 to 5,000 farmers and oil processing workers are directly involved in the oil production and processing business in Sichuan, Fujian, Jiangxi, Hunan, and Anhui. Additional employment is created in a range of supporting ancillary industries.

Alongside the economic and social benefits arising from cedarwood and firwood oil production, they also have substantial environmental benefits. Increasingly initiatives are being undertaken in the sector facilitating greater sustainability and assisting in combating climate change. Two of the main environmental issues associated with cedarwood oil are soil erosion if no trees are planted following the removal of tree stumps and roots as well as the environmental pollution created if the cedarwood and firwood oils are obtained by dry distillation. To overcome these problems the government developed a standard management system including the prohibition of dry distillation. Processing operations must strictly implement the management system to avoid any pollution. The government also requires farmers to replant a tree after digging out the stump and roots to ensure sustainability and protect the forests from deforestation and soil erosion. This meets the Government's requirements on environmental protection and maintaining a green landscape. The whole process of producing and processing cedarwood oil is encouraged by local government and is seen as an environmentally friendly circular process with minimal pollution. The process starts with the removal of aged tree roots left in the ground, which are then crushed into sawdust. The sawdust is heated with steam in a still and the oil and water filtered out, cooled, and separated. The water is recycled into another round of production, while the remaining sawdust and waste materials can be further processed into granular fuel, mechanism carbon, activated carbon as well as other products including pencil materials and bonding laminate. As such the resources of cypress and fir trees in China are sustainable because replanting must take place.

#### USA<sup>3</sup> TEXAS CEDARWOOD OIL

##### Raw Material Source

The small tree *Juniperus ashei* J. Buchholz [ISO 4720] syn, *Juniperus mexicana* Schiede, is an abundant scrubby looking cypress type of tree, growing in the southwestern parts

of Texas up to six metres tall. Even though two species exist, they are virtually indistinguishable in the field, and for the sake of consistency, most of the references to origin in the essential oil industry refer to *Juniperus mexicana*. The tree is commonly known as Texas cedar or mountain cedar and the Edwards Plateau in Texas is home to this species. It covers approximately 80% of the terrain and regenerates by aerial seeding. The tree is unpopular with Texas ranchers since it impedes the growth of other plants, leaving the surrounding soil barren. Its high water use limits water supplies from the underground aquifer to nearby farms and urban settlements. Moreover, it is unable to decay due to its high oil content of between 2% – 3%. The locals consider it an invasive species even if it is not officially designated as such. To address the problem, responsible land stewards have regularly cleared the cedar to allow for better agricultural use, and during the clearing process, any part of the cedar tree that is not usable as fence posts, was burned. However, this wild, prolifically growing "waste" can be recycled by distilleries to make steam-distilled cedarwood oil, thus making this by-product an excellent sustainable source of raw material for the essential oil industry.

Cedarwood's ability to naturally resist insects and decomposition, has made it a staple of the fencing industry for centuries. However, much of the cedarwood grown in Texas is unusable in fencing because it is not of the necessary length and diameter. The leftover can be either burnt or delivered to a cedar mill for cash. Alongside the dual use of cedarwood, the rancher often has the added benefit of not having to pay to clear and clean up the land.

Because of the availability of cheap wood, this oil is produced in relatively large quantities compared with other cedarwood oils, with annual production of 700 – 800 MT, and is one of the most widely used oils in the fragrance industry. A favourite among perfumers, it is said that some small amounts of cedarwood or its derivatives (particularly cedryl acetate and MCK) are used in 80% of all household products, fragrances, and cosmetics.

##### Harvesting and Transport

Land clearing of Texas cedarwood is invariably performed by hand, using chain saws and small trucks to cover



1. TEXAS CEDARWOOD FELLING



1. TEXAS CEDARWOOD TRUNK

the dangerous terrain on which the trees grow. In some cases, tractors and larger semi-trucks are needed for the longer distance hauls inside a ranch, or to the distillation plant, but this represents a smaller proportion of supply. On average, wood that is delivered to the processing plants is harvested within a 60 – 80-mile radius. Because the Texas cedar tree tends to be more shrub-like and typically lacks a primary central trunk, mechanised harvesting equipment is not ideal for processing and loading the trees. Similar to the Virginia cedar, there is a well-developed market for fence posts that are produced from the limited number of straight limbs that can be harvested from the branches, and the value of these posts is high compared with the remainder of the wood and branches the tree contains, and once the fence posts are removed, ranchers have typically burnt the remainder of the tree. With the presence of a distillery, some value can be added to the rest

of the tree that can justify classifying and loading the additional wood and hauling it to the factory. Because the remaining pieces of the tree are more like large branches than logs, they are not ideal for hauling on a large semi-truck, and most loads are loaded on mid-size trucks carrying 12 tonnes or less and are hauled over shorter distances. This also means that there is a wider network of small hauliers that can supply locally with less investment in equipment and fuel.

#### Preparation and Distillation

Once the wood is at the facility, it is ground in two successive processes until it is suitable for distillation. The exact grind size has to do with the plant design, and the best raw material is wood that is large, old, and as dry as possible. Drier wood tends to grind and flow more easily through the equipment, and older wood tends to offer more yields.



1. CEDARWOOD VIRGINIANA cross section



1. CEDARWOOD waiting to be processed

Three distillation methods are used to produce Texas cedarwood oil:

- Continuous distillation that produces yields up to 3%.
- Traditional batch distillation with pressure up to 50 psi which gives average yields of around 1.5% – 2%.
- Batch distillation with atmospheric pressure that also gives yields of 1.5% – 2%.

The composition and yield of the oil produced can vary according to the tree's age, its moisture content, and where it is harvested. The composition of the oil from these different processes can vary in composition depending on the pressure and residence time of the wood during extraction. The colour of the oil produced ranges from pale yellow to red, with the redness increasing with longer cook times and temperatures. Because of the red colour, Texas

cedarwood oil is often redistilled before being compounded into fine or household fragrance, and this further processing is done both at the source in Texas, as well as downstream in the supply chain where many specialty fractions and derivatives are produced for the broader market.

Texarome is one of the three Texas cedarwood oil production sites and its operations include a diverse and versatile range of processing equipment able to provide a variety of specialist cedarwood oil products on a large scale, alongside offering toll processing operations. The processes include continuous distillation, conventional batch distillation, fractional vacuum distillation, catalytic reactions, and molecular distillation. In 2016 Texarome's proprietary continuous distillation technology was able to process 24 MT of cedarwood oil per day. In addition, the two batch distillation plants permitted greater production versatility with 10 – 20 MT per day capacity for Texas and Virginia cedarwood. In addition, there are two vacuum fractionation units used for processing up to 5 MT per day of high quality rectified cedarwood oil (Greenhalgh 2017).

### VIRGINIAN CEDARWOOD OIL

#### Raw Material Source

Virginia cedarwood oil is obtained from a small slow-growing tree *Juniperus virginiana* L. which can grow up to 18 metres tall. It grows all over the Eastern USA in areas including the east coast, through to the south, and into Texas, Oklahoma, and Arkansas. It is commonly referred to as red cedar, eastern red cedar, or aromatic red cedar. It is now principally found in the Carolinas, Alabama, and Virginia and is mainly used for timber in furniture manufacture but the branches, off-cuts, sawdust, and stumps are used for steam distillation of the oil. Most of the production comes from North Carolina. The volumes produced are now smaller and declining, compared

to the more cost competitive Texas oil. There is a well-established industry around using the aromatic red cedar in the furniture and housing industry to make closet linings, chests, and even structural lumber, and the wood can be recognised by its signature cedar smell that is alleged to keep away moths and other bugs. It has been commonly used in the production of #2 pencils, which is where the concept of the "pencil note" comes from in odour evaluations.

In making these various products there is inevitably some waste by-product coming from these industries. In addition, the way in which the cedar tree propagates naturally, makes it a wild crop that grows back aggressively on land that has been cleared for other purposes, frustrating those landowners trying to maintain clean pastures and reduce underbrush. So, in the process of land clearing or harvesting there is always some wood that is of value in the lumber and furniture market as well as other cedarwood that is considered waste and is often burned during the land clearing operations. It is this unwanted wood that provides a good feedstock for essential oil production, since the distillation process requires that the wood be ground up anyway, and the quality and geometry of the log is less of a consideration. For the purposes of distillation, the tree only needs to be large enough to contain a significant amount of red heartwood which is where the oil is produced and stored within the tree.

#### Distillation

The heartwood and tree stumps contain most of the oil but the latter are not widely processed. Oil yields and quality can vary widely between 1% – 3% depending on such factors as the type and age of the tree, the form in which the wood is distilled (e.g., sawdust or chips, heartwood or sapwood). Older and slower growing

trees with a strong central axis provide higher yields.

The harvesting and primary processing of cedarwood oils, in part depends on how the cedarwood is used. When the trees are primarily utilised to produce timber, then the waste wood materials, shavings and sawdust from the sawmills are taken to the distillery for steam distillation and essential oil extracted as a secondary product. Nevertheless, these raw materials need to be handled relatively carefully to try to maximise yields and oil quality.

Technologies are in place for either continuous or batch distillation but the more common method currently used for Virginia cedarwood oil is the low-pressure batch process. Using this method, the wood is loaded into stills of various sizes using various methods of material handling. In this process the stills are filled with ground material and cooked for a period ranging between 8 – 48 hours, depending on steam pressure and raw material conditions. In a typical extraction, a yield of between 1.3% – 1.7% can be anticipated on a wet basis with the wood moisture content ranging between 20% – 35%. The crude oil produced usually comes out as a pale yellow liquid with a soft and almost oily note, and the Virginia oil is more often used directly in fine fragrance without much additional processing. After distillation, the spent wood is removed from the system and subsequently burned in a biomass boiler to provide a good source of renewable energy for the steam production.

#### Production and Markets

The markets for both Texas and Virginia cedarwood oils are mature and stable over long periods of time, but there are definitely trends that are contributing to change. For Virginia the estimated production capacity that is in place among the



CEDARWOOD VIRGINIANA STORAGE PILE, TEXAS



TEXAS CEDARWOOD VENDOR



TEXAS CEDARWOOD RAW MATERIAL STORAGE



CONTINUOUS DISTILLATION UNIT INTERIOR, Texas



VACUUM FRACTIONATION PLANT Texas



450 HP WOOD GRINDING SYSTEM Texas



CEDARWOOD MILLING



TEXAROME WASTE WOOD BURNING FURNACE for steam production



TEXAROME PLANT



CEDARWOOD DISTILLATION at Texarome



BATCH DISTILLATION PLANT WITH PRESSURE TANKS Texas

primary producers continues to grow and currently stands around 30 MT per month (360 per year) and is expected to level off at around 40 – 45 MT per month (480 – 540 per year) in the next few years. Even though the capacity is in place for this level of production, irregularities in the wood supply and competition from the Texas cedarwood oil within some facilities can change the actual output from month to month. In addition, changes in fuel pricing, labour trends, equipment costs, and other competing industries such as home construction and petroleum exploration, that are present in the wood harvesting areas, can offer outside uncertainties to costs and supplies of raw material.

Texas cedarwood oil has a larger installed capacity of around 70 MT

per month (840 MT per year), which is expected to grow to around 85 MT (1,020 MT) in the next five years. Actual production is also less than installed capacity because of the availability of raw material, which is influenced by high labour requirements, fuel prices, and local trends such as prolonged rain spells, and the hunting season. Labour shortages around the distillation facilities are also becoming a problem since the main operators are in very small towns with limited skilled resources and drastically increasing costs. Despite some of the ongoing challenges with raw material procurement, the production of Texas and Virginia oils continues throughout the year. Of the oil produced, it is used primarily in four major industries: fine fragrance, household fragrance, natural pesticides, and aromatherapy.

### SOCIO-ECONOMIC IMPACT

To begin the discussion on social impact it is important to try and quantify the number of people that are involved in an endeavour. In this case we are analysing the supply chain of two major essential oils in the trade, that have evolved deep roots in their local regions over the past 40 – 50 years. This type of longevity in an economy in itself represents a general acceptance of the business and, hopefully, this acceptance is positive and sustainable in the long term for all the hard-working people involved. In the case of cedarwood, some assumptions can be made: a person harvesting Texas cedarwood, which is often done by hand, can reasonably harvest, load, and deliver about 3 MT per day, whether working alone, or in a

larger crew. With Virginia, a person can probably deliver closer to 6 MT per day. So, working weekdays within a month, one can expect the help of at least 22 people in the Virginia supply and 83 people in the Texas cedarwood supply of materials. In the town where Texarome operates, the population is 425 people, so if each one of the people delivering wood each day, is supporting a family, one can imagine the local impact, in an area where not many other jobs are available. To add to the supplier network, each facility employs up to 30 more people, so between the suppliers and distillers at the source, more than 250 people would be directly involved in the crude production, and there are many more ancillary industries and services involved that benefit as well. In addition, many of the Texas workforce are originally from Mexico and Central or South America. These are areas where employment can be scarce and cedarwood oil production is helping lift people that are either at or close to the poverty line.

## ENVIRONMENTAL AND SUSTAINABILITY ISSUES

Alongside the direct economic and social benefits generated by the sector there are also important environmental and sustainability contributions. Clearing cedar is an environmentally friendly activity that is promoted and even subsidised by local governments. It is well known that the overgrowth of cedar can kill native grasses, stifle wildlife, prevent water from reaching the aquifer, and prevent proper land management as prescribed by local agricultural authorities. So, the ongoing transformation of an invasive plant into a valuable worldwide commodity is an activity and service that strongly serves the local communities.

In the USA the rate at which cedar is being consumed by the local cedar mills is overwhelmingly sustainable. Based on the total production of cedarwood oils with an average yield of around 1.7% by mass, the total quantity of wood required to maintain these levels would be around 8,600 MT per month, or 100,000 MT per year. To know if this is sustainable over long periods of time, one must assume the total coverage of both Texas and Virginia cedarwood as well as the rate that the trees grow back based on a buying radius from the facilities of around 100 miles. Within that area, Texas cedarwood can have up to 10 MT per acre and Virginia can have

up to 5 MT per acre coverage, which would represent 50,000,000 MT in the Texas cedar harvesting region, and 25,000,000 MT of inventory in the two major harvesting areas of the USA. A tree needs to have a maturity of about 15 years for it to be harvested for oil. This represents 100,000 MT per year used in production over 15 years, or 1,500,000 MT. When you compare 1,500,000 MT used and regrown over 15 years, to an estimated 100,000,000 MT that is readily accessible, it illustrates that not only is the raw material sustainable, but there is plenty of room to expand. After oil has been extracted from the wood, the waste product is re-cycled into biomass boilers to generate steam to be used in the distillation process. In addition, some of the waste is used as an additive in the local petroleum industry drilling process.

**Part 2 of this article will be published in the Vancouver Conference edition of IFEATWORLD in October 2022.**

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## FOOTNOTES

<sup>1</sup> IFEAT would like to acknowledge the contributions of Cathy Chen, Rick Boucard, Surender Mohan and Amine Bennani, who provided much of the information on China, USA, Indian and Moroccan cedarwood oils respectively.

<sup>2</sup> Much of the information on Chinese cedarwood and firwood oils is from Cathy Chen of Hangzhou Grascent Co.Ltd., China's largest cedarwood derivatives producer, see Chen (2022) and personal communication with Winnie Yeung.

<sup>3</sup> Much of the information on US cedarwood oils is from Rick Boucard of Texarome Inc. the USA's largest cedarwood oil producer.

# MY FAVOURITE CHINESE CEDARWOOD OIL AND FIRWOOD OIL

BY CATHY CHEN



Cedarwood's botanical name is *Cupressus funebris* and the common name, cypress, an evergreen tree. It belongs to the Cupressaceae family and is the raw material of *Cupressus funebris* oil or cedarwood oil, one of the top ten essential oils in the world. As one of the main plant essential oils, cedarwood oil is an important part of the flavour and fragrance industry. In China, cedarwood oil is mainly obtained from cypress roots, which are cut into pieces after being dug out, ground into sawdust, then steam-distilled or dry-distilled. Sawdust from cypress wood processing factories is also distilled into oil. It is rich in terpenes such as alpha cedrene, beta cedrene, thujopsene and cedrol. It can be used as an oil immersion agent for display mirrors, optical glass cleaners and lenses. It can also be made into

fragrance ingredients such as methyl cedryl ketone (MCK), alpha cedrene epoxide, methyl cedryl ether, and cedryl acetate etc. These fragrance ingredients are mainly woody and have an amber-musk note. They have a high boiling point and their odours persist and are used in products such as soap perfumes, air fresheners, household detergents, cosmetics, household sprays, insecticides etc. Cedarwood oil is popular in industry around the world.

In China in the early 1950s and 1960s people began to process cedarwood oil mostly for export. Cypress is distributed in the southwest, northwest and south of China with abundant resources in the provinces of Zhejiang, Jiangxi, Fujian, Guizhou, Sichuan etc. As its trunk is tall, hard and resistant

to cold and drought and grows well in alkaline soils, it is used for bridges, furniture, shipbuilding, sculptures, etc. Every year, a large number of cypress trees are cut down for the above-mentioned uses, leaving an abundance of roots in the mountains.

Mr. Wencong Lu, the Chairman of Hangzhou Grascent Co., Ltd. recalled that it was in the 1950s and 1960s that farmers in Jiande City, Hangzhou, Zhejiang Province first began to process cedarwood oil. At that time, the cedarwood oil quality standard for exporting was based on the BPC (British Pharmaceutical Codex). Up until the 1970s, people in Guizhou found many more abandoned roots resources available for processing cedarwood oil, so they went to Guizhou Province to dig roots and distill cedarwood oil,



CEDARWOOD LEAVES



FIRWOOD LEAVES



TREE ROOTS



TREE ROOTS



DIGGING OUT THE ROOTS



ROOTS DUG OUT FOR OIL PROCESSING



ROOTS IN THE FACTORY

but only a very small amount of it was used domestically in fragrance. About 1,000 metric tonnes (MT) per year of cedarwood oil was exported in the 1970s from China, but in the 1980s much richer cypress resources were developed in Sichuan Province. Since then, about 40 years have passed and Sichuan Province is still rich in resources and is the main area in China to process cedarwood oil for export and for domestic use as a fragrance ingredient as well as a raw material for aroma chemicals. Besides these places, people are also making cedarwood oil in the provinces of Shandong, Shanxi etc. in China.

In Sichuan, cypress is a very rich resource, ranking third among the tree species. There are 1.93 million hectares (ha) of cypress forest area,

accounting for 12.7% of the tree forest, and 98.63 million cubic metres (m<sup>3</sup>) of live wood stock, accounting for 5.8% of the province's forest stock. Bazhong, Guangyuan and Mianyang are the main areas of cypress distribution in Sichuan Province. In the three counties there are 736,000 ha. of cypress woodland, accounting for about one-third of the province's cypress woodland, 38,462 m<sup>3</sup> of stock, annual growth of 493,000 m<sup>3</sup>, annual harvesting (cutting down) of 83,000 m<sup>3</sup> for wood processing purposes. In addition to the above areas, surrounding places like Nanchong, Suining, Dazhou and other northeast Sichuan areas are also cypress growing regions. The annual harvesting of cypress has left a large number of roots in the mountains, a rich resource for cedarwood oil processing.

When cedarwood oil processing production began in Sichuan in the 1980s there was no advanced process technology and equipment. Wooden barrels were used for rectification and bamboo tubes as pipes, which resulted in very low resource utilisation. Then, the oil processing method was constantly improved and steel distillation vessels replaced wooden barrels and the temperature and pressure were much increased during processing. These resulted in a much-improved yield and better quality, which helped increase both supply and demand. In the 1990s Sichuan cedarwood oil processing reached a peak, with an annual output of more than 2,000 MT of crude oil. In particular, in the Guanyuan, Mianyang and Bazhong areas, smoke was seen from every house in the villages of



CUTTING EQUIPMENT FOR ROOTS



GRINDING EQUIPMENT FOR ROOTS

these three counties because of oil processing. The tree roots used at that time for oil processing came mostly from wild grown trees approximately several decades or even a hundred years old, whose trunks had been cut down in the 1950s or 1960s. These types of roots provide a high oil yield of about 4% by using the oil processing method at that time. But due to the disorderly development, coupled with the still backward processing technology, the oil quality had a heavy smoky note and a deep brown colour. The price was also pushed to a high level (please refer to the price trend chart). This resulted in reduced market demand in the early 2000s and the volume of demand has been kept stable ever since. Today the abandoned roots are still rich in Sichuan, but most of them used for oil processing are

from cultivated cypress trees, which were cultivated in the 1950s and 1960s and cut down about 20 years ago. The oil yield is about 3%.

Cedarwood oil has the main components of alpha cedrene, beta cedrene, thujopsene and cedrol. For crude oil, alpha + beta cedrene ranges between 20% to 40%, thujopsene 20% to 40%, and cedrol between 15% to 25%. Before the 1980s the majority of the cedarwood oil produced was exported. A very small amount of it was used domestically as a fragrance ingredient. In the early 1980s the Government in Jiande City, Hangzhou, Zhejiang Province wondered what the foreign customers used it for. Mr. Lu, now the Chairman of Hangzhou Grascent Co., Ltd., used to be on the technical staff at a local state-owned

enterprise, and was assigned by the Jiande City government the task of finding out what else cedarwood oil can be used for other than being directly used in fragrance. After a year of investigations Mr. Lu did not fail the government's expectations and found that cedarwood oil can also be used as the raw material to produce aroma chemicals, i.e., cedrene of cedarwood oil to be made into MCK, cedrol into methyl cedryl ether (cedramber) and the mixture of cedrene and cedrol into cedryl acetate etc. In 1983 the Jiande Government decided to invest RMB 0.5 million to ask Mr. Lu to set up a factory to make MCK, methyl cedryl ether, cedryl acetate etc. In 1986 this state-owned enterprise, called Xinanjiang Perfumery Factory, began to export MCK and methyl cedryl ether etc. Since then, cedarwood oil has



STEAM DISTILLATION

The sawdust is put into the steam distillation device by the conveyor belt, heated for steam distillation. The essential oil is brought out with the steam, and the oil is obtained by cooling and oil-water separation.



BIO-GRANULAR FUEL PRODUCTION EQUIPMENT

been used as a raw material for aroma chemical production in China.

Since the early 2000s, due to the highly increased price of cedarwood oil, more and more firwood oil is gradually being used to replace cedarwood oil as a raw material for aroma chemicals and a fragrance ingredient. Firwood oil is processed in the same way as cedarwood oil, from fir tree roots, having the same components of cedarwood oil, alpha + beta cedrene, cedrol and thujopsene though the percentage of each component is different compared with cedarwood oil. Firwood oil has a higher percentage of alpha and beta cedrene, a similar proportion of cedrol, but a much lower percentage content of thujopsene. In the past 10 to 15 years firwood oil's usage has increased very quickly,

which has also pushed up its price a lot, though it is still lower than cedarwood oil. Up until now, the usage ratio between cedarwood oil and firwood oil in China is about 1:4.

Firwood, botanical name *Cunninghamia lanceolata*, is an important cultivated tree species in China with a 2,000-year cultivation history. It is also an evergreen tree with a height up to 30 metres, fast growth, wide use, and high output. According to the statistics, in 1993 the area of China fir forest reached 911 million ha., accounting for one-third of the forest area in southern China, and the annual output of wood accounted for one-fifth of the country's commodity wood. It is widely located in about 17 provinces, like Jiangxi, Fujian, Anhui, and Hunan etc. especially in the southern collec-

tive forest area, where people have a long-term management history and cultivation experience of fir.

Chinese fir has the characteristic of rapid growth, about 15 to 20 years to reach maturity or even seven to eight years in some places. Fir trunks, straight, insect resistant and corrosion resistant, are very practical, so fir is widely used in construction, furniture, utensils, shipbuilding, and other sectors. Similarly, the root, bark and fruit of fir have high value in medicinal and other areas. According to Chinese statistics 25% of all the trees used for construction are firwood, so fir cultivation is of great importance and significance for people's livelihoods in China.



### 1. BIO-GRANULAR FUEL AND CHARCOAL MADE FROM OIL-EXTRACTED SAWDUST

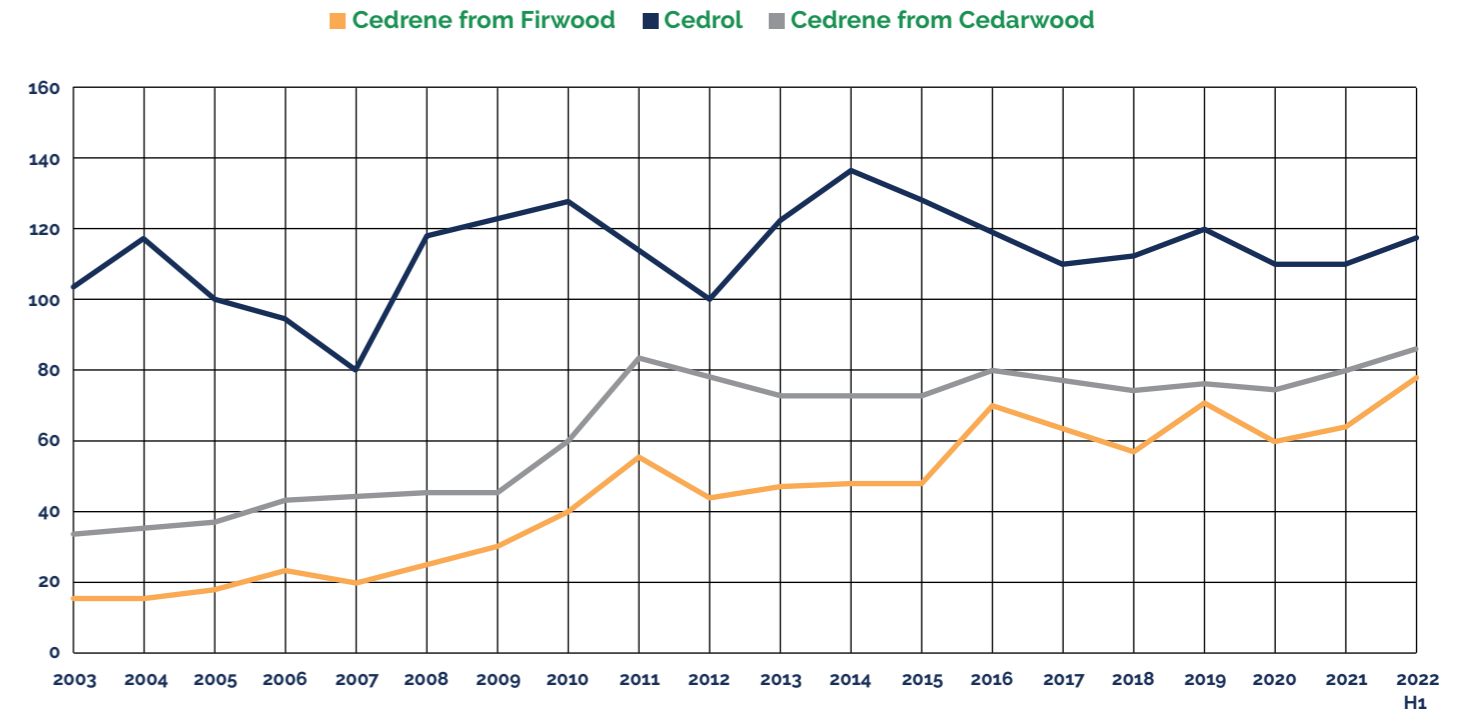
The fir roots used for oil processing today are mostly in Fujian, Jiangxi, Guangxi, Hunan, and Guizhou Provinces, where the old roots are still available and richer in the higher and deeper mountains. However, as time goes on, only the old roots in the higher mountains which are further away from the villages can be found. Previously, farmers would find and dig the tree roots in the mountains close

to their villages but now no old roots can be found in the mountains near the villages. Trees were cut down in the 1960s and 1970s when it was in a planned economy era when all the forests were state-owned forest farms and the trees were heavily felled for economic construction. After decades of exposure, the felled roots rotted on the outside, leaving behind the centre of the roots, whose oil-rich core yields

were around 4.2%. All of the roots are dug out mainly by hand, and this needs heavy labour, but in Qimen County of Anhui Province people now use an excavator to dig the tree roots for processing the oil, which has greatly reduced labour costs. However, the roots whose trunks were newly cut have a comparatively lower oil yield of about 2.3%.

### CEDARWOOD AND FIRWOOD OIL ANNUAL PRICES FROM 2003 (UNIT: YUAN PER KILO)

Raw Material	Cedrene from Firwood	Cedrol	Cedrene from Cedarwood
2003	12.9	105	31.4
2004	12.5	114	32.6
2005	16.2	98.4	35.1
2006	23.65	90.75	44.25
2007	20.75	80.5	45
2008	25.9	114	46
2009	29.25	122.5	46.3
2010	40.05	132.5	60.65
2011	54	116.5	84.25
2012	43.25	103	77
2013	46.75	121.5	71.75
2014	47.75	134.5	72.5
2015	48.15	127	72.5
2016	69.65	117.5	79.6
2017	63	110	76.75
2018	56.75	111.5	73.5
2019	68.75	118.5	74.25
2020	56.75	109	73.25
2021	63	109	78.5
2022 H1	76	115	86



Firwood oil maker, Mr. Shen, the owner of a firwood oil manufacturer in Qimen County in Anhui Province, says Qimen has the biggest forest area in Anhui Province. In Qimen about 60% of the forest is firwood. Mr. Shen's factory began making firwood oil with the sawdust from wood sawing factories in 2014, and in 2021 began to make firwood oil from the roots. Mr. Shen is still the only manufacturer to undertake this business in Qimen and one of only two in Anhui Province.

With oil processing technology continuously improving and steam distillation methods widely promoted and used, the quality of Chinese cedarwood and firwood oil has been greatly improved with a non-burnt odour in the past five to 10 years. Now, annually, about 1,800-2,000 MT of crude cedarwood oil and 6,000-7,500 MT of crude firwood oil are produced in our country based on market demand. Around 4,000 to 5,000 people are involved in this oil-processing business in Sichuan, Fujian, Jiangxi, Hunan, and Anhui, which not only helps local employment, but also supplements farmers' income.

With regard to environmental aspects, cypress and fir trees prevent soil erosion and ensure forest coverage etc. in China. Farmers are required to replant trees after digging out tree roots to ensure sustainability and protect the forests from deforestation and soil erosion. In some provinces, such as in Jiangxi province, "Replant

Fund" is required by local governments for trees' replanting. This meets the Government's requirements on environmental protection and maintaining mountains' green. And the whole process of the oil processing starts from the tree roots left over, dug out, crushed into sawdust, then sawdust put into the steam distillation device, heated with steam, then oil brought out with steam, oil-steam cooled down into oil-water and finally to oil-water separated. Oil is obtained and water is recycled into another round of production. The sawdust after its oil is extracted is further processed into granular fuel, mechanism charcoal and activated carbon. It is a closed cycle process, scientific and environmentally friendly with no pollution. So, the resources of cypress and fir trees in China are sustainable and will not dry up. "This business is highly appraised and encouraged by our local government" said Mr. Shen very excitedly during our visit.

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## IN THE NEWS

## FDA ADVANCES PLAN TO BAN SALES OF MENTHOL CIGARETTES

The Food and Drug Administration recently announced a plan to ban the sale of menthol-flavored cigarettes in the USA, according to a report from The New York Times. The proposed ban was announced following lobbying by tobacco and retail interests.

Read the full article here:  
<https://bit.ly/3xDUM3Z>

## LAVENDER ESSENTIAL OIL THREATENED BY CHANGES IN EUROPEAN REGULATIONS

By the end of 2022, lavender bottles could be classified as dangerous products. Some of their natural molecules are implicated. A motion for a European resolution has just been adopted.

Read the full article here:  
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**Contact:** Mr Tommaso Lser Menini  
**Email:** director@agarlimited.com  
**Web:** www.agarlimited.com

*Agar Limited is an award-winning Kenyan company dealing with natural resources in the ASAL (Arid and Semi-Arid Lands) areas of East Africa. Agar is the parent company of "Essenza by Agar", a line of pure essential oils from the African continent, aloe-based cosmetics, shea butter and carrier oils from Kenya.*

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*Guangzhou Aroma Time Imp. & Exp. Co., Ltd is a company supplying high quality botanical products for aromatherapy including essential oils, compound oils, vegetable oils, hybrosols and botanical cosmetic raw materials.*

 Wuhan Landmark Industrial Co. Ltd.  
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*Wuhan Landmark is a professional supplier of cinnamic series products in China.*

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**Web:** https://incatrailterpenes.com

*Inca Trail Terpenes aims to inspire consumers and businesses to divert to cleaner, all-natural alternatives in health, beauty, and beyond, with naturally-derived terpenes.*

 Crearomatic Especialidades Aromáticas, S.L.  
Pol. Ind. Cavila, C/industria, Parcela II-1; CP:30400 Caravaca De La Cruz (Murcia), Spain  
**Contact:** Mr Jesus Ruiz  
**Email:** jesus.ruiz@crearomatic.com  
**Web:** www.crearomatic.com


*We specialise in natural and nature identical essential oils. We have huge experience in the world of essential oils.*

 Ecospice Ingredients Private Ltd.  
Ecospice Farm, Thankamy PO, Idukki, Kerala 685609, India  
**Contact:** Mr Sunin Sunny  
**Email:** sunin@ecospice.com  
**Web:** www.ecospiceingredients.com

*Ecospice Ingredients are manufacturers of essential oils, oleoresins, natural colours, and oleoresin blends in liquid and powder form and we customise according to customer requirements.*

 Agri-Essence (Singapore) Co Pte. Ltd.  
33 Carpenter Street, 059912, Singapore  
**Contact:** Mr Mike Chong  
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*We aspire to be the leading pioneer in extraction and manufacturer of high quality essential oils made from the finest ingredients.*

 Sandeep Chemicals  
Manak Bhawan, Tirha Dataganj Road, Budaun - 243601, India  
**Contact:** Mr Sandeep Rastogi  
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**Web:** https://sandeepchemicals.com

*Sandeep Chemicals was established in 1995 for the fair trading of Indian essential oils and began exporting in 2004 and we started to attend IFEAT Conferences. "Grow with honesty" is our main motive.*

 Univar Solutions BV.  
Schouwburgplein 30-34, 3012 CL Rotterdam, The Netherlands  
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*EarthOil by Univar Solutions sources organic and conventional vegetable oils, and 100% pure essential oils direct from source. We support communities with FFL programmes.*

 Arochem Ratlam Pvt Ltd.  
454, Ram Bagh, Ratlam (MP) 457001, India  
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**Web:** https://arochem.com


*Arochem is a very well known entity in the fragrance industry in India. It was established five decades ago on 20th September 1969 and has been actively in operation since then.*

 Mysore Deep Perfume House  
49, SDA Annex, Lasudia Mori, Dewas Naka, Indore, Madhya Pradesh 452010, India  
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**Contact:** Ms Anisha Shahi  
**Email:** anisha@zedblack.com  
**Web:** www.mdph.com


*Mysore Deep Perfumery House (ivIDPH) is one of the top three manufacturers and exporters of incense sticks in India. Processing more than 30 million incense sticks per day in India's biggest incense sticks factory, making a range of 1,200+ products.*

 Port Blakely NZ Essential Oils LP  
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*We are a division of an established global leader in renewable forest products. We produce essential oils from our certified sustainable Douglas fir forests in New Zealand.*

 Crystals Drop Inc.  
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**Web:** https://crystalsdrop.com

*CrystalsDrop Inc.'s core mission is "To Serve You". This rewards the company's integrity and we will never compromise this commitment.*

 Fairoils SRL  
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*Fairoils leads the way in the responsible and ethical production of quality essential oils and vegetable oils. Our partnerships support local growers and strengthen communities in Africa.*

 TMV Natural Oils & Extracts Pvt Ltd.  
'TMV Gardnes' Mahakavi Bharatiyar Road, Cochin-682035, Kerala, India  
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**Web:** www.tmvaroma.com

*TMV Group has been dealing with the manufacture, trade and export of natural essential oils, isolates, oleoresins and extracts for the last 65 years.*

 Frutech International Corporation de Mexico SA de CV  
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**Web:** www.frutech.com


*For more than 30 years, Frutech has been a leader in Mexico providing citrus essential oils of extraordinary quality to the F&F industry, locally and worldwide.*

 Mangalam Organics Ltd.  
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**Contact:** Mr Akshay Dujodwala  
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**Web:** www.mangalamorganics.com


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*Swati Menthol has two manufacturing units which cater to the F&F world with natural menthol, essential oils and aroma chemicals. For more than three decades we have emerged as a sustained exporter in the industry.*

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*One of the leading family-owned manufacturers and international suppliers of natural essential oils and creative perfume oils, based in Hamburg, Dubai, and Jakarta.*

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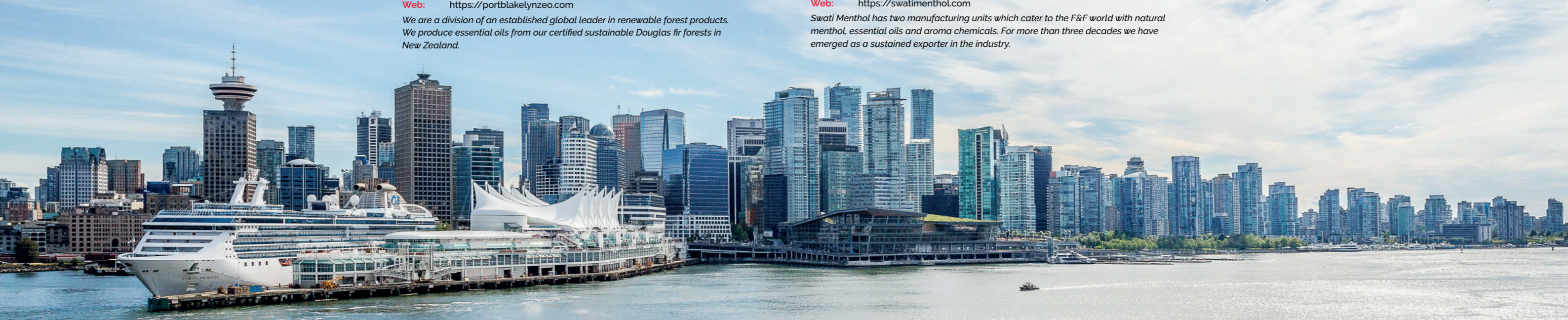
*Naturamole created in 2003, is a French company that focuses on the production of natural ingredients (NAT EU/US) such as esters, lactones, and aldehydes by biotechnological means.*

 Vimal Intertrade Pvt. Ltd.  
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*Vimal Intertrade Pvt Ltd (VIPL) has been a leading chemical distribution company since 1986, has an annual turnover of close to \$200 million, with a presence across India. We are representative of many multinationals. After our strong foothold in the chemical industry in India, we are utilising our experience in the paint and coatings, fragrance, textile, ink, adhesive and surfactant many other industries.*

 Indo Bio Organics (India)  
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*Indo Bio Organics works in partnership with over 200 farmers across India to help them set up farm distillation plants. Our skilled technicians closely monitor and control the quality of the products before export. This ensures users can have the confidence that they will receive the best raw materials suited to their requirements.*



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