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NATURALLY BEAUTIFUL

COSMETIC AND BEAUTY PRODUCTS FROM FORESTS

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It has not been easy to find a set of products in Asia and the Pacific to feature in this collection of case studies of forest resources used in the cosmetics and fragrance industries. As is evident in the Annex, even this partial list of forest resources used in make-up, personal care and perfumery products is already quite extensive. We would like to thank all those who agreed to contribute case studies to this volume, and especially their organizations for the support provided.

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Snehlata Nath, Maria Cristina Guerrero, Tanya Conlu, Earl Diaz

NTFP-EP

Acronyms and abbreviations

AEC/FNCCI	Agro Enterprise Center/Federation of Nepalese Chambers of Commerce and Industry
ANSAB	Asia Network for Sustainable Agriculture and Bioresources
APDS	Asosiasi Periau Danau Sentarum (Association of Periau in Lake Sentarum) (Indonesia)
APFW	Asia-Pacific Forestry Week
APPCL	Aadhimalai Pazhangudiniyar Producer Company Limited
ASEAN	Association of Southeast Asian Nations
BDS	Business Development Services
BPDAS	Balai Pengelolaan Daerah Aliran Sungai (Central Management of Regional River Flow) (Indonesia)
BRT	Bilingiri Rangan Hills
CBI	Centre for the Promotion of Imports from Developing Countries
CFUG	Community Forestry User Group
CIFOR	Center for International Forestry Research
DoF	Department of Forests (Nepal)
DPPH	2,2-diphenyl-1-picrylhydrazyl
DPR	Department of Plant Resources (Nepal)
ELC	Economic Land Concession
EU	European Union
EWG	Environmental Working Group
FA	Forestry Administration (Cambodia)
FAO	Food and Agriculture Organization of the United Nations
FPIC	Free and Prior Informed Consent
FRA	Forest Rights Act (India)
FSC	Forest Stewardship Council
GI	Geographical Indication
GMO	Genetically Modified Organism
HBTL	Himalayan Bio Trade
HET-CAM	Hen's Egg Testing of Chorioallantoic Membrane
ICIMOD	International Centre for Integrated Mountain Development
ICS	Internal Control System
IPR	Indigenous Peoples' Rights
IPRA	Indigenous Peoples Rights Act (Philippines)

ITC	International Trade Centre
IUCN	International Union for Conservation and Nature
JMHI	Jaringan Madu Hutan Indonesia (Indonesia Forest Honey Network)
JSC	Joint Stock Company
LAMPS	Large-scale Adivasi Multipurpose Society
MAFF	Ministry of Agriculture, Forestry and Fisheries (Cambodia)
MAPs	Medicinal and Aromatic Plants
MARD	Ministry of Agriculture and Rural Development (Viet Nam)
MoE	Ministry of Environment (Cambodia)
MTIC	Martha Tilaar Innovation Center
NGO	Non-governmental Organization
NPK	Nitrogen, Phosphorus and Potassium
NTFP	Non-timber Forest Product
NTFP-EP	Non-Timber Forest Products – Exchange Programme
NWFP	Non-wood Forest Product
ROPT	Repeated Opened Patch Test
ROS	Reactive Oxygen Species
SCPT	Single Closed Patch Test
SNV	SNV Netherlands Development Organisation
SPC	Pacific Community
SWOT	Strengths, Weaknesses, Opportunities and Threats
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
UV	Ultraviolet
UV-A	Ultraviolet A (long wave)
VND	Vietnamese dong
VT	Vanuatu vatu
WCS	Wildlife Conservation Society

Preface

Flowers as garlands and seeds as beads

It is said that 'there is a plant for every use in every continent' – this is true of cosmetic use also. Non-wood forest product (NWFP) use for beauty products extends into antiquity, which is reflected in the poetry and literature of numerous countries. NWFP-based cosmetics and beauty products have been used both as traditional preparations and for trade in various Asian and Pacific countries. This report covers their traditional uses and those that have been commercialized by local enterprises or major brands.

The global beauty market had reached US$465 billion in 2014 according to Euromonitor International's study in 2015. The use of plant extracts in the cosmetics range is increasing, mainly due to increased interest in the use of natural products as opposed to synthetic alternatives. Plant-based products are increasingly popular choices in modern markets. Many facial creams, soaps, shower gels and oils (including those used for massage, hair growth and so forth) are increasingly relying on natural products from forests. A classic example is aloe vera, which is widely used in the preparation of different products. Neem (*Azadirachta indica*) and sandalwood oil (derived from *Santalum* spp.) are widely used in soaps and shower gels. Other products are used in relatively unprocessed form, such as dust from thanaka wood (*Murraya* spp.), which is used as a sun block/skin care/beauty product in Myanmar. More controversially, palm oil is used in the preparation of many soaps and similar products.

During the last decade or so the extent of natural ingredients used by the cosmetics industry has increased, but there is no comprehensive publication on beauty products based on forest products, although scattered information does exist. By bringing attention to the role of forests in supplying beauty products and the connections with livelihood security and utilization of NWFPs, awareness of the importance of forests and their connection with cosmetics will be raised.

Within this context, FAO and the Non-Timber Forest Products – Exchange Programme (NTFP-EP) Asia have conducted this regional assessment of NWFPs related to the cosmetics and fragrance sector. The study compiled a set of case studies that examined specific NWFPs and the various traditional contexts in which they are collected, processed and marketed. The main objective of this volume is to present the case studies and the emerging synthesis, while encouraging cross-sectoral discussions in Asia on forests and beauty products. The study also provides recommendations on further enhancing equitable arrangements between forest communities and industry players. The initiative also organized a mini-seminar on forest product contributions to the cosmetics industry as part of the Asia-Pacific Forestry Week 2016 in Clark, Pampanga, the Philippines.

This volume covers plant species from across nine countries in Asia and the Pacific. The case studies attempt to cover all scenarios that exist in the region, such as those NWFPs that are

only locally used; those that have conservation value; those which are popular commercially; and those which are cultivated. Due to our special interest, we lay emphasis on community-based initiatives and enterprises.

The cases also provide diverse coverage of the parts of plants that are being utilized for cosmetic preparations. This volume covers fruits, barks, whole plants, gums and resins, leaves, roots, rhizomes and hardwood of different species. The only animal product included in this volume is forest honey, one of the oldest harvested NWFPs in history.

The contributors to this volume have made special efforts to cover their specific work domains and often examined niche products with potential for development. In some cases, little information is available on the product and more research will throw light on its potential in the cosmetics industry. From other cases, we learn about the importance of NWFPs in the forest economy and of mainstreaming products in farms as part of different agroforestry systems.

There are constraints to the further development of NWFPs, specifically in the global natural personal care market. Unorganized trade systems, lack of land security, protected area status, unsustainable harvesting, lack of working capital, increasing use of chemical inputs and changing perspectives with modern outlooks are some of the few factors facing the development of NWFPs in the beauty sector in the Asia and Pacific region.

More research, local-level economic incentives, proper organization and policy support, community forestry arrangements and further conservation are needed if NWFPs in the beauty industry can realize their potential, meet the growing demand for green or natural products, and contribute more significantly to local economies. This study may be just the tip of the iceberg with reference to NWFPs used in the beauty industry and an initial analysis on the trends and challenges faced by forest-based communities and industry players alike.

While working on this volume, the editors debated on the concept of 'beauty' itself. Poetically, beauty is a feeling from within or that lies in the eye of the beholder, but these notions do not hold true in today's world for some. Large investments in skin whitening treatments in the cosmetics industry raised a number of eyebrows across the team for example. The clients of these cosmetics are mainly women. Is there a stereotype being perpetuated here? From the world of NWFPs, it seems important to reflect a while on society and its norms – but also to raise our spirits with the following lines:

…… beauty is life when life unveils her holy face.
But you are life and you are the veil.
Beauty is eternity gazing at itself in a mirror.
But you are eternity and you are the mirror.

– On Beauty; Khalil Gibran

Figure 1. Dried soapberries

Introduction

Non-wood forest products (NWFPs) are defined as "goods of biological origin other than wood, derived from forests, other wooded land and trees outside forests" (Dembner & Perlis, 1999).

> The term non-timber forest products or NTFPs refer to biological materials other than timber which are extracted from forests for human use (de Beer & McDermott, 1996). This differs from NWFPs in that they include small branches, roots, fuelwood and construction materials for subsistence use. Other similar terms include minor forest produce, ordinary forest products, secondary forest products, wild products, and others (Belcher 2003).

In a forest ecosystem, often timber products only comprise 10 percent of all products whereas 90 percent are NWFPs, which are estimated to account for as much as 25 percent of the income of close to 1 billion people (Molnar et al. 2004). FAO clearly makes the case that 50 million people in India depend on forests, mainly NWFPs, for subsistence (FAO 2013). In Lao PDR, wild foods are consumed by 80 percent of the population daily and similarly in Cambodia, 50–70 percent of all meat and vegetables consumed come from the forest (Nomad RSI et al. 2012).

There is a growing recognition of the role of NWFPs in rural livelihoods, especially those of indigenous peoples (IPs). They are considered as cultural, subsistence and economic resources, which IPs use across the world. Besides directly impacting forest communities, NWFPs are important as raw materials for the food, cosmetics and medicine industries. Despite this role in peoples' well-being, local economy and industry, NWFPs rarely find a reference in planning and policy documents. Land use, forestry and rural livelihoods schemes are made by governments; however this resource and the role it can play is ignored. Information on NWFPs is also difficult to get, as it remains mostly undocumented and is often not presented in simple and useable ways.

Discussions on rural development in forested areas and those related to IPs, often feature NWFPs. They are also considered a better way to sustainably manage forests *vis-à-vis timber* extraction. Advocacy from rights-based groups have forced governments across Asia to grant tenurial rights to IPs on both farm and forest land. The latter ensures rights towards collection, management and marketing of NWFPs. Different tenurial laws, e.g. The Indigenous Peoples Rights Act (IPRA) in the Philippines; the Forest Rights Act in India, the Constitutional Court Decision MK 35/2012 in Indonesia and The Cambodian Land Law, 2001 are fairly recent and in most cases have not been fully implemented. Most Asian countries are faced with conflict in forested areas, due to land concessions for mining, plantations or

other private uses. In some areas, strife over land, resources and governance has led to militarization and extremism. Land rights for IPs are an important aspect being addressed by several organizations across Asia.

In India alone it is estimated that more than 100 million people are dependent on NWFP gathering as a source of livelihood (Kabra 2009). Forests in India cover only up to 20 percent of the land cover and pressure from large-scale development projects, mining, urbanization and unregulated harvests of forest products for the medicinal plant industry negatively impact the quality of the remaining forest areas. Displacement of IPs and conversion of biodiversity resources are juxtaposed, leading to an irreversible erosion process for both.

Whereas NWFPs are most common for subsistence across different indigenous cultures, their commercialization has added to the cash economy of these people. Traded for centuries, some of these NWFPs have seen a shift from traditional to commercial use and have industrial use in various products. Some of the main sectors are alternative medicine like Ayurveda and homeopathy, essential oils, cosmetics, paint and varnish, food, crafts and so forth.

Overharvesting and destructive harvesting may lead to populations of some species to dwindle in their natural environments, which is the case for several NWFPs. Many efforts are being taken across the world to keep sustainable flows of NWFPs for both rural incomes and industry. In Cambodia, efforts are being made to control fire used in the extraction of *Dipterocarpus alatus* resin for example to stimulate the flow of resin. Other methods without the use of fire are also being tested. Some species have completely disappeared from natural forests and are now being cultivated. Efforts to raise nurseries, propagate and replant species are taking place as part of large restoration projects. In some areas interventions have been made to revive customary practices related to first fruit ceremonies and seasonal harvests. Some conservation groups, have also developed harvest protocols which are shared with harvesters to ensure sustainable populations of NWFPs.

Usually, across Asia, NWFP trade is conducted through informal and traditional markets. Efforts are being undertaken to mainstream NWFPs in all the processes of raw material production, postharvest processing and sale of products. These efforts are often made by development role players, either government or non-government agencies, to achieve community ownership and management. The long NWFP value chain, with many traders, wholesalers, retailers and intermediaries until it reaches the processing units, results in low returns to gathering communities. Efforts which aim to bring the processing and value addition closer to rural areas are ongoing to shorten this value chain. This enables more control over the quality of products and provides for locally generated employment and income. Amongst our case studies, both forest honey in Indonesia and medicinal spas in Viet Nam have community-owned models.

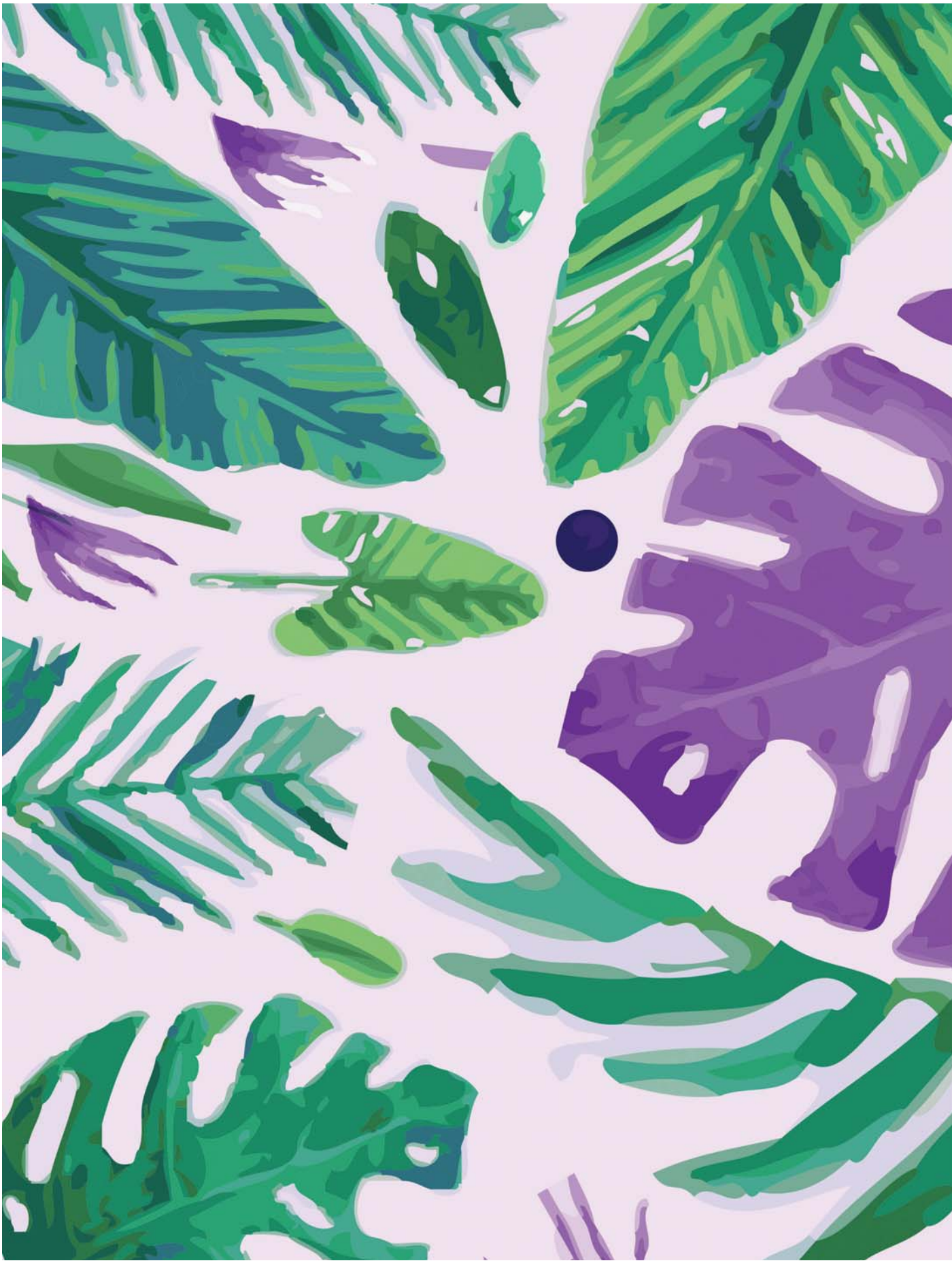
Specifically, in the cosmetics industry many changes are taking place in the

search for sustainable supply chains. Large industries look for products that can have a steady supply and community benefits. Globally, Brazil has been under criticism due to high exploitation of the Amazon forest, despite having companies who claim fair trade and sustainable use. The cosmetics industry looks for the innovative and turns to natural products for options and inspiration. Many traditional beauty recipes are now being revived and produced as marketable products by private companies. In a fair that took place in Paris recently, several innovations were introduced, including boreal forest products, marine products, honey and algae (Mohler 2016).

Almost any part of a plant is used by the industry, for example:

1. Fatty oil seeds – by far the most common ingredient for making creams and moisturizers, balms, etc. – cocoa, baobab.
2. Leaf extracts – neem, henna.
3. Essential oils – acai, patchouli.
4. Barks and woody parts of the plant – sandalwood, red sanders, thanaka.
5. Resins and exudates – hazel sterculia, *Dipterocarpus* spp., *Canarium* spp.
6. Minerals – kaolin clay, iron oxides, mica.
7. Gel – aloe vera.

With growth in natural cosmetics industries, pitched at almost 10 percent *per annum*, it will be essential to see how the resource politics play out. Will the NWFPs be sustainably harvested, will they be cultivated for large-scale use and will they benefit forest-based communities? Trends in privatization may not benefit communities in the long run, making it essential for government policy to promote community-based development models.



Cosmetic and beauty products from forests in Asia and the Pacific

OVERVIEW

The use of cosmetic and beauty products derived from forests has a history dating back more than 6 000 years. Traditional beauty products were almost invariably derived from plant, animal or surface mineral sources, including many forest products. However, today, the vast majority of ingredients in commercially available cosmetics are synthetic compounds mainly derived from petroleum and natural gas. Nonetheless, plant-based products are becoming increasingly popular choices in modern markets. Many facial creams, soaps, shower gels and oils are increasingly relying on natural products from forests. There is significant potential for products derived from forests to capture an increased share of the global beauty and cosmetic market, the value of which was estimated at USD 460 billion in 2014 and is expected to grow rapidly to USD 675 billion by 2020.

Increasing use of natural and organic cosmetics has become a major trend in recent years, driven by increased environmental awareness and health consciousness. Particular trends in the twenty-first century include interest in wellness, sustainability, ethical beauty and total holistic beauty. These trends appear to offer significant opportunity for beauty products derived from forests to penetrate mainstream international cosmetics markets and develop specific niches through marketing of the 'naturalness' of non-wood forest cosmetic products. A recent (2017) study by FAO and NTFP-EP examines the situation and prospects for 12 non-wood forest products (NWFPs) used in beauty and cosmetic products.

An overarching conclusion drawn from the analysis is that NWFPs used in beauty and cosmetic products are, like most products and services, subject to economic laws of supply and demand. NWFP beauty products sourced from Asia-Pacific forests may often be victims of their own success if, in the absence of 'barriers to entry', scarcity of initial supplies results in: (a) attraction of additional producers (NWFP collectors) to the industry; (b) severe depletion of forest supplies; (c) efforts to domesticate and cultivate the wild forest species; and/or (d) development of alternative synthetic products.

Unless there are significant barriers to entry that create obstacles to new competitors from easily entering the industry, as either collectors or cultivators, it is usually difficult for the initial collectors of an NWFP (often poor rural indigenous communities) to

capture much of the additional revenue deriving from high valued products. Often, they are crowded out of the industry by cultivated or synthesized products, or otherwise raw material supplies are rapidly depleted or exhausted by overexploitation (see Box 1). Where natural resources are not protected by property rights, then resource depletion may occur in a 'tragedy of the commons'. Adjusting tenure or resource governance arrangements may be necessary to maintain sustainable supplies or encourage investment in cultivation. On the other hand, if potential competitors face barriers to entry – either natural technical barriers (e.g. very limited habitats) or artificial regulatory barriers – then NWFP producers may earn 'above normal' returns due to scarcity of the NWFP or because it occupies a unique product niche.

While some NWFPs, such as sandalwood and spikenard, have already established strong product niches in international markets, others such as langsat and forest

Box 1
Resource depletion and domestication of sandalwood

The exploitation of sandalwood throughout the first half of the nineteenth century provides an early example of how demand for a highly valued NWFP can result in rapid resource depletion. With little regulation of sandalwood cutting and lucrative prices in the main market, sandalwood stocks were successively decimated in Fiji, French Polynesia, Hawaii and Vanuatu. By 1865, the Pacific islands' trade in sandalwood had all but disappeared. Currently, the small amount of sandalwood produced in Pacific island countries is still mainly sourced wild from forests, largely in Vanuatu. In the past 20 years, an important development for sandalwood markets has been the establishment of a significant sandalwood plantation estate (more than 15 000 hectares) in Western Australia, which is currently coming into production. Over the next decade, this will significantly change the global dynamics of sandalwood production, with potential for the Australian resource to produce more than 75 percent of currently traded volumes of sandalwood heartwood and oil.

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honey, are utilizing research to identify potentially unique properties that may provide avenues for significantly penetrating international markets and earning price premiums. Intellectual property, such as knowledge of traditional recipes, as in the case of the Red Dzao spa ingredients (Box 2), may also be used to establish a specific market niche and provide above normal returns to local communities.

A particular challenge for NWFP collectors and growers is in capturing a significant share of the value of the final beauty product. Most rural communities in Asia and the Pacific tend to have little market power and serve as 'price takers'. Efforts to overcome power imbalances in markets include establishing various types of seller collectives (Box 2) and developing local processing facilities to capture value-added revenues.

Several other institutional arrangements that may be useful in increasing the profitability of NWFP collection or cultivation include development of quality assurance procedures for some products, certification systems and

Box 2
New institutional arrangements: Red Dzao spa

The Red Dzao people in Viet Nam collect a variety of plants for use as ingredients in a traditional spa, which is being commercialized as a tourist attraction. To better coordinate various activities and to strengthen their market position local people have established the Sapanapro Joint Stock Company (JSC). The strong commercial focus of this entity is designed to overcome perceived weaknesses in various cooperative models including lack of professionalism, high administrative costs, challenges in mobilizing financial resources and lack of incentive for action. The JSC has achieved some tangible financial gains including a 14-fold increase in the per tonne selling price of raw materials.

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instituting fair trade arrangements. At the community level, overcoming logistical issues such as accessing working capital, obtaining market intelligence, developing appropriate marketing strategies, implementing quality control measures and providing appropriate storage facilities and improved packaging may all assist in increasing returns.

The way forward

Several overarching lessons help to chart the way forward for NWFPs used in cosmetic markets, including:

- Work to establish broad markets characterized by strong competition with multiple buyers and preferably with direct links to local or national processing facilities.
- Address imbalances in market power that enable dominant buyers to exploit producers and depress product prices.
- Ensure security of product supplies by addressing resource depletion issues and potentially seeking opportunities to domesticate and cultivate the product.
- Create sustainable market positions by identifying barriers to entry (or lack of them) and acting to maintain competitive advantages.
- Investment in research and development to identify unique attributes of the product will assist in creating a clear and robust product niche.

More research, institutional organization, appropriate local-level economic incentives and policy support, community forestry arrangements, and conservation investigation may be needed if NWFPs in the beauty industry are to realize their potential, maximize contributions to local economies and meet growing demands for green/natural products.

Forests and beauty: overview and synthesis

Introduction

An enormous number of beauty and cosmetic products are available for both women and men. The value of the global cosmetics market was estimated at USD 460 billion in 2014 and is expected to grow rapidly to reach USD 675 billion by 2020 (Business Wire 2015). A long list of cosmetic products are currently offered for sale including make-up for face, eyes and lips; fragrances and deodorants; skin care products for cleansing, nourishing, protecting, coloring and treating imperfections and inflammations; hair treatments for cleansing, coloring, styling and removing; nail polishes and treatments; and teeth cleansing and whitening products.

The use of cosmetic and beauty products derived from forests has a history dating back, at least, several thousand years. Traditional beauty products were almost invariably derived from plant, animal or surface mineral sources, including many forest products. However, today, the vast majority of ingredients in commercially available cosmetics, by some accounts more than 90 percent (Smeh, 1995), are synthetic compounds derived from petroleum and natural gas. Nonetheless, a change may be in the wind. An important consumer trend towards increased consumer preferences for "natural" commodities that are perceived to be healthier alternatives to more processed products – a trend that is particularly evident in the food and beverage sector – also appears to be reflected in beauty and cosmetic products. This is likely to result in new or expanded opportunities for formulations derived from natural sources including non-wood forest products (NWFPs). Data on some deemed important products may be found in FAOSTAT, and countries have their own statistics on NWFPs which they consider important to them.

Health, wellness and beauty are necessarily intertwined. The wellness industry statistics value it at USD 3.7 trillion for 2018 (Global Wellness Summit, 2018 with the industry growing faster than our global economy). Health and wellness trends are expected to greatly influence the beauty and cosmetics industry (McDougall, 2015). Trends for higher energy levels will mean beauty brands will have to work with food, drink and leisure brands to create healthy living products that complement each other. Energy boosting products in hair and skin care are already on the way while "kitchen beauty" trends are focusing on artisanal foods and processes to control beauty through food consumption. Our focus however, is distinctly on beauty and cosmetic products from NWFPs.

Naturally beautiful: cosmetic and beauty products from forests comprises twelve case studies that examine the situation and prospects for beauty and cosmetic products derived from trees and forests.

Table 1. Characteristics of selected non-wood forest products' production for use in beauty and cosmetics products

NWFP	Subsistence use	Locally traded	Broadly commercialized	Collected from the wild	Domesticated/ cultivated	Contribution to local collectors'/ growers' incomes	Resource depletion an issue	Robust institutional arrangements established
Wild turmeric	Moderate	Minor	Moderate	Minor	Moderate	Minor	Minor	Moderate
Indian soapberry	Extensive	Moderate	Moderate	Extensive	Moderate	Minor	Minor	Moderate
Thanaka	Extensive	Extensive	Moderate	Minor	Extensive	Extensive	Minor	Extensive
Forest honey	Minor	Minor	Minor	Moderate	Minor	Minor	Moderate	Moderate
Sea buckthorn	Minor	Moderate	Moderate	Minor	Extensive	Extensive	Minor	Extensive
Manila elemi	Minor	Moderate	Moderate	Minor	Moderate	Moderate	Moderate	Minor
Langsat	Minor	Minor	Moderate	Minor	Extensive	Extensive	Minor	Extensive
Gurjum balsam	Minor	Moderate	Minor	Moderate	Minor	Moderate	Moderate	Minor
Hazel sterculia	Minor	Extensive	Moderate	Minor	Moderate	Extensive	Moderate	Minor
Red Dzao medicinal spa	Moderate	Moderate	Moderate	Extensive	Minor	Moderate	Extensive	Moderate
Spikenard	Minor	Moderate	Moderate	Extensive	Minor	Moderate	Moderate	Moderate
Sandalwood	Minor	Moderate	Extensive	Moderate	Minor	Moderate	Extensive	Extensive

Legend: Minor Moderate Extensive

Table 1 summarizes some of the key characteristics, commonalities and differences among the twelve case study products. It is important to note that the classifications in Table 1 and subsequent discussion and analysis relate specifically to the various products' usage in beauty and cosmetic products, even though products such as sea buckthorn, forest honey, langsat and hazel sterculia are also used – sometimes extensively – as foods or beverages.

Economic theory and non-wood forest products

In general, the use of NWFPs in cosmetic and beauty products might be expected to reflect, in a microcosm, many of the issues that occur in broader markets for other NWFPs and other renewable (and sometimes non-renewable) natural resources. Analysis of the 12 case studies appears to generally bear this expectation out. One important difference is that many of these 'other' products, especially other NWFPs, are staple household commodities, often collected or grown for subsistence purposes, whereas NWFPs used in beauty and cosmetic products are more generally classified as luxury items. For example, products such as sandalwood, Manila elemi and spikenard, which are highly valued in international cosmetics markets, are collected or cultivated almost exclusively for sale for cash incomes. An evident product characteristic is minimal subsistence use of the product. Conversely, for products such as thanaka, which is extensively used

in Myanmar but has penetrated few markets elsewhere, development patterns are similar to many other NWFPs that have been broadly commercialized and cultivated for local markets.

An overarching conclusion drawn from the analysis is that NWFPs used in beauty and cosmetic products are far from immune to economic laws of supply and demand. In particular, the basic premise that when demand for a product exceeds supply, the product price will rise to encourage greater production efforts appears clearly applicable. Among the case study products, several demand-driven reactions may be in evidence including:

- The attraction of additional producers (NWFP collectors) to the industry;
- Increasing the economic viability of collection (enabling exploitation of resources from further afield);
- Encouraging efforts to domesticate production (agricultural cultivation of wild forest species); and
- Encouraging the development of alternative synthetic products.

Unless there are significant barriers to entry that create obstacles to new competitors from easily entering the industry, as either collectors or cultivators, it is usually difficult for the initial collectors of an NWFP (often poor rural indigenous communities) to capture much of the additional revenue deriving from high-valued products. Often, they are crowded out of the industry by cultivated or synthesized products, or otherwise raw material supplies are rapidly depleted or exhausted by overexploitation.

On the other hand, if potential competitors face barriers to entry – either natural technical barriers or artificial regulatory barriers – then NWFP producers may earn 'above-normal' returns due to scarcity of the NWFP or because it occupies a unique product niche. The following discussion explores these concepts in more detail.

Collection from the wild and barriers to entry

Among the 12 case study products, several – including gurjum balsam, the Red Dzao spa ingredients, spikenard and sandalwood in Pacific island countries – are harvested almost exclusively from the wild. Soapberry also largely regenerates naturally but, at least in some areas, the trees receive some tending and are to a certain degree cultivated. Similarly, forest honey in Indonesia is sourced from the forest, but collectors build artificial branches to encourage wild bees to establish nests in favourable locations, so to a small degree honey production is 'managed'. However, attempts to properly domesticate the wild bees (*Apis dorsata*) have failed, thereby creating a substantial technical barrier to entry in the Indonesian forest honey market.

A variety of technical barriers to entry have protected several other case study products from domestication and commercial cultivation. For example, the parasitic nature of sandalwood appears to have provided a technical barrier to domestication/cultivation for many years, although in recent times a substantial sandalwood plantation resource has been established in Western Australia and significant quantities of sandalwood have also been established in home gardens in

Vanuatu. Similarly, *Nardostachys jatamansi*, the plant from which spikenard oil is derived, occurs at elevations above 3 000 metres in the Himalayas, which appears to have constituted a technical barrier to cultivation. In Viet Nam, the Red Dzao people have traditionally collected the ingredients of their medicinal spa from the wild, including from forests. To date, the very limited and localized habitat of some ingredient species and knowledge of the traditional recipe for the spa (an intellectual property) have provided significant barriers to entry, although the case study notes the incidence of commercial spas in the vicinity purporting to use the Red Dzao formula, but in fact using fake recipes.

For several products, most notably gurjum balsam, the price paid for the product collected from the wild is likely to be insufficient to tempt outsiders to enter the market. Gurjum balsam is a resin tapped from wild *Dipterocarpus* trees in Cambodia and several other Southeast Asian countries. The relatively low price paid to resin tappers (USD 0.25–0.50 per litre) likely renders uneconomic the establishment of *Dipterocarpus* plantations for resin production, while also discouraging other potential collectors from tapping trees. In fact, one of the most significant challenges for Cambodian resin tappers is competition from illegal loggers who covertly fell resin trees for timber.

Resource depletion

Depletion of natural NWFP resources as a result of excessive harvesting or loss of habitat due to deforestation and forest degradation is a significant theme in several of the case studies, including those for forest honey, Manila elemi, gurjum balsam, hazel sterculia, the Red Dzao spa, spikenard and sandalwood.

The exploitation of sandalwood throughout the first half of the nineteenth century provides an early example of how demand for a highly valued NWFP can result in rapid resource depletion. With little regulation of sandalwood cutting and lucrative prices in the main market (Guangzhou, China, formerly Canton), sandalwood stocks were successively decimated in Fiji, French Polynesia, Hawaii and Vanuatu. By 1865, the Pacific islands' trade in sandalwood had all but disappeared. Currently, the small amount of sandalwood produced in the Pacific is still mainly sourced wild from forests, largely in Vanuatu. Pacific production of sandalwood has been less than 100 tonnes *per annum* in recent years and continues to decline. Similar trends are observed in other major sandalwood-producing countries, where sandalwood is largely sourced from the wild, such as India, Indonesia, Malaysia and other Southeast Asian countries.

In Viet Nam, production of hazel sterculia from the wild has largely been supplanted by cultivation in household plantations in two provinces. The wild resource is reported to be severely depleted. For example, the case study notes that in Nui Chua National Park, hazel sterculia was abundant up until 1993. However, uncontrolled harvesting and inappropriate resin-tapping techniques led to a vast reduction in hazel sterculia trees in the Park. More broadly, the case study suggests that the few natural remnant wild populations of hazel sterculia are being tapped destructively

and the trees are at risk of extinction in the wild.

Also in Viet Nam, depletion of some of the constituent ingredients of the Red Dzao spa is increasingly an issue as urban and tourist demand for the spa has increased. Development of a commercial community enterprise, the Sapanapro Joint Stock Company, has helped to address some sustainability issues by coordinating collection of the herbal ingredients.

Unregulated collection of spikenard has similarly resulted in resource depletion, with overharvesting, harvesting of immature plants and loss of spikenard habitat identified as significant problems. In December 2013, the European Union reportedly placed restrictions on imports of spikenard due to unsustainable harvesting. The case reflects the frequent 'tragedy of the commons', whereby shared resources are damaged or depleted by individual users acting according to their own self-interest, but contrary to the common good of all users. Approximately 80 percent of the spikenard is now harvested in areas formally managed by Community Forestry User Groups (CFUGs). The CFUG rights of tenure exclude outsiders from collecting spikenard and enable resources to be managed sustainably. For example, some CFUGs have implemented block rotational management systems for spikenard.

An informal, traditional system of property rights governs the collection of gurjum balsam in Cambodia. The person who first collects resin from a tree retains ownership of the tree (although not the land the tree grows on). This protects the trees from excessive, detrimental collection of resin. Dipterocarp trees are also protected from logging under Cambodian law. However, extensive illegal logging and land clearance for agriculture and development have substantially reduced the population of resin trees causing a significant decline in production. Similar loss of forest habitat has affected the production of forest honey in Indonesia.

Domestication and cultivation

When product prices are high and there are no significant barriers to entry, attempts to domesticate and cultivate wild forest species are likely. Where these attempts are successful, it is likely that production efficiency of planted crops will 'crowd out' supplies collected from the wild. A number of the product case studies exemplify situations in which cultivated crops have largely displaced (or are in the process of displacing) collection from the wild, including wild turmeric, thanaka, sandalwood and hazel sterculia. For example, wild turmeric has become widely cultivated in the Asian tropics. The case study notes an example from the Nilambur Valley in Kerala, India, where the indigenous people previously collected wild turmeric from the forest. However, in recent times the traders who purchased that product have disappeared and wild turmeric is no longer collected from the forest, suggesting that demand for the wild product has been crowded out by supplies of cultivated product.

In the case of thanaka, a widely used traditional cosmetic in Myanmar, the vast majority is now grown in plantations, sometimes in an intercropping agroforestry system. Thanaka cultivation is a well-established industry in Myanmar,

with well-developed market and distribution systems and collection from the wild, where it occurs at all, is largely for subsistence use.

In Viet Nam, collection of hazel sterculia from the wild has largely been supplanted by cultivation in household plantations in two provinces. Wild resources of hazel sterculia are severely depleted and more than 2 000 hectares of plantations have been established. The government views plantation-grown hazel sterculia as a promising crop for alleviating poverty and local government support is being provided in the form of extension and tree improvement. Cultivation of hazel sterculia is showing significant promise, with some growers earning up to USD 9 000 *per annum*.

In the past 20 years, an important development for sandalwood markets has been the establishment of a significant sandalwood plantation estate (more than 15 000 hectares) in Western Australia, which is currently coming into production. Over the next decade, this will significantly change the global dynamics of sandalwood production, with potential for the Australian resource to produce more than 75 percent of currently traded volumes of sandalwood heartwood and oil. Pacific island (and other) suppliers of sandalwood sourced from natural forests will likely find less demand and lower prices for their products.

Other case study products grown in plantations include langsat and sea buckthorn. However, plantations of these species have been primarily established as fruit orchards (langsat) and for land stabilization (sea buckthorn). The cosmetic and beauty applications of langsat and sea buckthorn fruit are effectively secondary products and cultivation of these species is largely driven by the primary product/purpose.

Developing product niches

A caveat to the idea that cultivated products may crowd out products collected from the forest is that the 'wild' product may be able to establish a particular niche that yields above-normal returns. Cultivated products may also seek specialist niches that emphasize the advantages of their natural base, compared with, for example, synthetic products. Hence, several of the case studies document attempts to carve out specific niches through marketing the 'naturalness' of the product.

Honey (and beeswax) is already used extensively in cosmetic products as well as having an enormous market as a food product. Wild forest honey in Indonesia is developing a market position as a niche food product and has potential to develop a similar type of niche in cosmetics markets. Jaringan Madu Hutan Indonesia (the Indonesian Forest Honey Network) and related social enterprises have developed a forest honey shampoo and are exploring other cosmetic products such as liquid soap. The use of wild honey in cosmetic products is still in an essentially exploratory phase – but, is a somewhat different proposition to many other forest beauty products in that it already has a well-established market as a food product and significant quantities of honey from domesticated bees are already used in cosmetic products. A key challenge for wild forest honey will be to

differentiate its use in cosmetics from 'domesticated' honey. In particular, forest honey needs to identify a unique beauty function (product niche), not replicable by farmed honey, and particularly, command a price premium that reflects its higher collection costs compared to farmed honey.

Potential also exists to market the 'social' and related environmental benefits of NWFPs. Where producers are able to show evidence of intensified efforts to protect forests as the source of their raw materials, this can be a strong marketing tool. For example, 'rain forest chocolate' and 'rain forest coffee' are creating significant market niches based on leveraging of environmental protection aspects. Similarly, organizations such as Trade Aid have, for many years, promoted goods from poor communities in less-developed countries as a means of creating and enhancing livelihoods.

Scientific research of beauty and cosmetic uses for products such as langsat, hazel sterculia and sea buckthorn are helping to establish clear niches for these products. For example, the Martha Tilaar Innovation Center (MTIC) found strong depigmentation (whitening) and moisturizing properties in langsat and has developed product lines accordingly. Challenges to strengthen MTIC's competitive advantage include improving traceability and consistency of the product and to apply proper organic certification standards to strengthen consumer acceptance and establish price premiums. Similarly, the Vinh Tan Company and several others in Viet Nam are marketing commercial preparations of hazel sterculia beauty products. This market is only in a development phase although rapid expansion of product sales since 2013 discussed in the Vinh Tan Company example shows plenty of promise. The sea buckthorn case study focuses on commercialization, noting that more than 200 companies are involved in producing a wide range of sea buckthorn-based beauty products including anti-ageing facial creams, shampoos, cleansers, moisturizers and so forth. Generally cosmetic preparations derived from sea buckthorn sell in moderately well-developed markets with significant scope for expansion.

Products such as thanaka and sandalwood have established dominant positions in specific markets. In the case of sandalwood oil, for example, it is a major constituent in many fragrances, reputedly providing 'notes' in 47 percent of perfumes made in the last 200 years. Conversely, thanaka is a dominant traditional cosmetic used largely, if not exclusively, in Myanmar and by Myanma people abroad. It is estimated that 90 percent of women in Myanmar use thanaka on a daily basis. Consequently, thanaka cultivation is a strongly established industry in Myanmar, with well-developed market and distribution systems.

Capturing a greater share of the value chain

A significant challenge for producers of raw NWFPs, whether by collection or cultivation, is to capture a tangible share of the value chain. In many instances, these producers are paid only a tiny proportion of the value of the final product, especially when the final product is, for example, an expensive international fragrance.

The case studies identify several distinct approaches in attempting to capture greater shares of the value chain by NWFP producers. An approach frequently used by primary product producers around the world is to band together into seller collectives or cooperatives in an attempt to strengthen market power and increase prices (an approach formally known as 'cartelization'). A number of the case studies, including Indian soapberry (large-sized Adivasi multipurpose cooperative societies), thanaka (producer associations), forest honey (Indonesian Forest Honey Network), gurjum balsam (association of collectors), Red Dzao medicinal spa (Sapanapro Joint Stock Company) and spikenard (CFUGs) note the formation of some form of producer collective as a means of organizing collection and marketing, increasing market power and obtaining higher prices. The establishment of a Joint Stock Company (JSC), in the case of the Red Dzao medicinal spa, is particularly interesting, in that it clearly identifies perceived weaknesses in cooperative models including lack of professionalism, high administrative costs, challenges in mobilizing financial resources and lack of incentive for action. The Red Dzao spa case study identifies some very tangible financial gains achieved by the JSC noting, for example, a 14-fold increase in the per tonne selling price of raw materials.

A second approach used in attempting to capture a greater share of value chains is the establishment of local processing and manufacturing facilities. For several products, including thanaka, sea buckthorn and sandalwood, robust markets and marketing and distribution channels are already established and strong competition should ensure fair prices are achieved. Other products such as wild turmeric, langsat and hazel sterculia are sold domestically to narrower sets of commercial companies, manufacturing downstream products.

Several of the case studies note suggestions or efforts to add value through local processing. For example, a producer company, Aadhimalai Pazhangudiniyar PCL, has been established to process Indian soapberries into a hair care product. Similarly, the social enterprises Dian Niaga and Borneo Chic are manufacturing forest honey shampoo and lotion in Indonesia, while NatureWild is planning to build a gurjum balsam refining facility in Cambodia as a means of capturing value-added revenue. Spikenard oil is normally distilled in Nepal prior to export, although usually at centralized distilleries in Kathmandu and other urban centres. Conversely, the Manila elemi case study notes an absence of downstream processing of Manila elemi in the Philippines and recommends research in this direction to enhance local value capture.

Several other institutional arrangements that may be useful in increasing the profitability of NWFP collection or cultivation include development of quality assurance procedures for some products, certification systems and instituting fair-trade arrangements.

Conclusions

For many forestry practitioners, particularly those working closely with communities, there may be a significant

temptation to regard NWFPs as being somehow 'special cases' in terms of application of economic theory. The good news, at least in relation to NWFPs used for beauty and cosmetic purposes, is that many of these products may indeed be 'special'. The bad news is that this specialness usually has to be proven, and once it has, it may then be difficult to prevent outsiders from co-opting the product and crowding out the original producers (collectors). In this regard, it is important, at an early stage, to identify whether any natural barriers to entry will preclude potential competitors from entering the market, or whether it is possible to protect the current producers through regulatory means. Where no significant barriers to entry exist, current collectors can mainly protect their market share through increasing their productive efficiency, possibly by seeking to domesticate and cultivate the NWFP themselves.

Economics also has a tendency to impinge on other aspects of NWFP production, including where excessive exploitation and depletion of common resources occurs and where market power imbalances heavily constrain the share of revenues that accrue to the usually poor rural collectors and cultivators of NWFPs. In the case of resource depletion, government intervention or better allocation of property rights may offer solutions. Alternatively, Ostrom (1990) developed a set of key principles for governing common resources and these may also be effective in improving management. In relation to market imbalances constraining revenues, various case studies discuss efforts at collectivization to increase market power and local processing to capture greater shares of the value chain.

An overarching competitive advantage of NWFPs used in beauty and cosmetic formulations is the perception of naturalness compared to many other products. However, additional scientific research and development may be crucial in establishing unique product characteristics to create a product niche. A key challenge then is to capitalize on this niche advantage in order to earn price premiums. Effective marketing will likely be critical in leveraging competitive advantage into above-normal returns.

In general, the case studies demonstrate that prospects are very good for continued and increased use of NWFPs in beauty and cosmetic products. A variety of important challenges exist across the case study products, but collectively the case studies demonstrate that solutions to most of these challenges can be found. However, as for any product, markets and developments are dynamic and change is ongoing. NWFP producers of beauty and cosmetic products need to be continuously adapting and improving to ensure they maintain their advantages.

Figure 2. Women selling thanaka along the streets

Strengths, Weaknesses, Opportunities and Threats (SWOT) to NWFPs used in beauty and cosmetic products

Introduction

A common methodology for assessing the likelihood of product success and minimizing risks is SWOT analysis. This is a simple strategic planning tool that looks at the strengths, weaknesses, opportunities and threats relevant to a product, organization or project. In short, a SWOT analysis examines:

- Strengths – the characteristics of a product or venture that give it an advantage over others;
- Weaknesses – the characteristics that place a product or venture at a disadvantage relative to others;
- Opportunities – elements that a product or venture can exploit to its advantage; and
- Threats – elements in the environment that could cause difficulties for the product or venture.

A full SWOT analysis for an individual product may be quite a complex exercise involving situational analysis covering macro-economic analysis, market chain analysis involving characteristics and elements both internal and external to a producer organization, and downstream development of strategies and roadmaps.

However, a much more simplified version of the technique can be used across a number of products – as in the case of the use of NWFPs in beauty and cosmetic products – to identify commonalities among the environments, opportunities and challenges faced by various products.

Table 2 provides a summary of key strengths, weaknesses, opportunities and threats relevant to the 12 case study products. The subsequent discussion identifies commonalities among the products arising from the analysis that may be broadly relevant to other NWFPs used in beauty and cosmetic products or, in some instances, more generally relevant to all NWFPs.

When looking at products, industries and markets as a whole, obviously the choice of perspective in identifying relative strengths, weaknesses, opportunities and threats is important. For example, while local growers and collectors of NWFPs will likely view low raw product prices as a weakness and a threat, for traders and manufacturers, low raw material prices will likely constitute a strength and an opportunity. Similarly, natural resource depletion is a threat to NWFP collectors, but an opportunity for

Table 2. SWOT analysis – characteristics of selected NWFPs used in cosmetics markets

Product	Strengths	Weaknesses	Opportunities	Threats
Wild turmeric	• Development of commercial manufacturing • Cultivated resources give supply security	• Weak or non-existent NWFP distribution systems	• Expansion into mainstream cosmetics markets	• Collection from wild crowded out by cultivated sources
Indian soapberry	• Natural and hypoallergenic cleansing product	• Limited development of commercial products	• Alternative to synthetic cleansing products	• Competition from other products
Thanaka	• Very extensively used in Myanmar	• Minimal use in markets outside Myanmar	• Development of international products utilizing unique properties	• Penetration of international cosmetics into the Myanmar market
Forest honey	• Unique niche product	• Limited supply • Collection costs • Little development of commercial products	• Potentially unique chemical properties	• Competition from farmed honey • Threats to wild bee habitat
Sea buckthorn	• Large planted resource established • Important chemical properties well-established • Established market in China	• Little attention to ease of harvesting, berry improvement, etc.	• Expansion into mainstream cosmetics markets	• Oversupply could depress prices to farmers
Manila elemi	• Established market as component in high-grade perfumes	• Collectors have little market power/low prices	• Establishment of a range of locally produced perfumes	• Development of synthetic or other alternatives
Langsat	• Widely cultivated • Established product market	• Fruit spoils very quickly • A single processing company dominates the market	• Further expansion into mainstream cosmetics markets	• Narrow processor/ retailer base
Gurjum balsam	• Potential in international markets	• Weak institutional arrangements • Ineffective and excessive regulation • Lack of attention to sustainability • Low prices paid to collectors	• Production of cosmetics domestically • Further expansion into international cosmetics markets	• Deforestation and forest degradation

Table 2. *(continued)*

Product	Strengths	Weaknesses	Opportunities	Threats
Hazel sterculia	• Established local market • Established plantation resource • Government support	• Basic processing • Undeveloped market for highly processed cosmetic products	• Further expansion into mainstream cosmetics markets	• Competition from other cosmetics • Potential for rapid plantation expansion to create oversupply
Red Dzao medicinal spa	• Niche traditional product	• Fragmented industry with most revenues accruing to downstream traders and hotels	• Increased tourism offers major scope for expansion • Potential to domesticate at least some of the plant species used	• Collection of plants from the wild risks depletion and limits expansion • Competition from other spas including fake Dzao spas
Spikenard	• Established international product market	• Relatively weak institutional arrangements	• Greater revenue capture by collectors	• Unsustainable harvesting • Encroachment into natural habitat
Sandalwood	• Important constituent in mainstream cosmetics	• Resource severely depleted	• Establishment of planted resource	• Competition from extensive plantations in other countries

potential cultivators. In general, the analysis in Table 2 – and the discussion in most of the case studies – reflects, as a priority, the perspectives of rural communities in specific countries that collect or cultivate raw NWFPs. However, there are generally self-evident strengths, weaknesses, opportunities and threats included in Table 2 that adopt alternative perspectives.

Strengths

There are significant commonalities in the most clearly identifiable strengths of the case study products. An evident strength exists for products that already have an established niche in mainstream, international cosmetics and beauty product markets; as in the case of sandalwood and spikenard, and to a somewhat lesser extent, Manila elemi and gurjum balsam. Other products – including thanaka (Myanmar), sea buckthorn (China), hazel sterculia (Viet Nam) and langsat (Southeast Asia) – are well-established in domestic or regional markets. Large and well-established markets ensure good prospects of sales of raw materials and the likelihood of strong competition among buyers to maintain price levels.

A number of products have established strong security of supplies through domestication and cultivation. In particular, a large area of sea buckthorn – planted mainly to protect against desertification in western China – has also yielded significant supplies of fruit, flowers, leaves and rhizomes that may be used in cosmetic and other preparations. Similarly, a large planted resource of langsat – established mainly as an

orchard crop – also provides enormous supply security for langsat use in cosmetics. Cultivation of wild turmeric (in India), hazel sterculia (Viet Nam), thanaka (Myanmar) and sandalwood (Australia) also confers greater supply security to downstream manufacturers using these products.

An analogue to supply security is that development of commercial manufacturing capacity increases market security for growers and collectors of primary products. Significant and recent development of commercial manufacturing of sea buckthorn beauty products, and to a lesser extent, cosmetic products made from wild turmeric, langsat and hazel sterculia have strengthened value chains and increased security for producers. In the case of hazel sterculia, specific government support through extension, seedling supply and so forth, constitutes a significant strength.

In part, scientific research to identify valuable (and potentially unique) chemical properties of raw products, particularly in the cases of sea buckthorn and langsat, has provided an important foundation for manufacturing development and is a key strength for these products. Such research will be useful, and potentially crucial, in establishing unique product niches for some less-developed products including forest honey and Indian soapberry. Meanwhile, the Red Dzao medicinal spa is capitalizing on its status as an authentic, unique traditional remedy as a key strength in building its market, with particular appeal to tourists.

Weaknesses

A range of key weaknesses relates to various aspects of market and value chain development in relation to beauty products derived from NWFPs. At the raw material source, naturally produced products such as forest honey, gurjum balsam, spikenard and sandalwood are increasingly affected by forest or resource depletion and degradation and face challenges in ensuring continuous supply security.

For a number of other case study products, including wild turmeric, Manila elemi, gurjum balsam and spikenard, the raw material collectors have very limited market power and tend to be price takers who receive a very small proportion of the value of the finished cosmetic and beauty products. Such producers may well be victims of unfair trading practices and need to seek ways in which market power imbalances can be redressed. In some instances, collectors and growers have banded together into various forms of cooperatives to collectively increase their market power, although with varying and often small degrees of success. In the case of the Red Dzao medicinal spa, a community JSC was formed to better coordinate various activities and has been relatively successful in increasing revenues earned by stockholding participants in the Red Dzao community. Nonetheless, many activities appear to be remain fragmented and much of the value produced still accrues to downstream spa operators. In the case of wild turmeric, it appears many collectors may in fact been crowded out of the market by cultivated

supplies, which offer greater supply security and potentially lower cost products. In at least some localities, the distribution system for forest-grown wild turmeric has collapsed with the traders that previously bought the product having disappeared. Collection costs are also an issue for forest honey, which is generally more time-consuming and expensive to collect than farmed honey.

Lack of development of commercial-scale manufacturing, especially close to collection/cultivation localities, limits opportunities for value capture for various products including Indian soapberry, forest honey, gurjum balsam and Manila elemi. Other products such as hazel sterculia and spikenard have relatively nascent processing industries. Further development of local processing will likely offer greater potential for value capture by growers/collectors of these products (particularly in the case of hazel sterculia). Langsat processing is more developed, but with a narrow (single organization) manufacturing base that potentially leaves the langsat cosmetic industry vulnerable to corporate failure.

The various case studies also identify a range of more diverse weaknesses including ineffective and/or excessive regulation of harvesting, transportation and export of gurjum balsam and ineffective protection of the trees from which it is harvested. These appear to be issues for the Cambodian Government to resolve. Technical issues relating to growing, harvesting and transporting various case study NWFPs may also pose significant challenges. For example, the very short shelf-life of langsat requires that attention be given to a chemical treatment to help preserve the fruit or rapid transportation to processing facilities. In the case of sea buckthorn, scant specific attention has been given to berry production, including planting and tending, to improve ease of harvesting and tree breeding, to improve berry quality, productivity and so forth. Similar comment is probably applicable to most other case study products.

Opportunities

Unsurprisingly, the most significant opportunities for most of forest-based cosmetic and beauty products relate to expansion of sales into broader markets, often the mainstream and international cosmetics markets. A number of the products, including wild turmeric, Indian soapberry, langsat and hazel sterculia are at incipient phases of commercialization, with commercially-manufactured beauty products being produced, but with broad market penetration yet to be achieved. For example:

- Production of commercial formulations using wild turmeric including specialized face washes, antiblemish treatments, face packs and acne treatments, which are mainly sold in India;
- Indian soapberries are increasingly used in commercially produced herbal shampoos, soaps, body washes and other cleansers, mainly in India, although moderate quantities of soapberries are also noted as being exported to various European countries and Japan;
- MTIC has developed the Sari Ayu Putih Langsat collection of beauty

products based on the skin lightening and moisturizing properties of langsat; and

- Commercial preparations of beauty products such as skin creams based on hazel sterculia are currently produced by a small handful of companies in Viet Nam.

For these products, the initial opportunity is to broaden their market base, including strengthening and broadening marketing and distribution systems, and eventually, seeking to expand into new international markets.

The sea buckthorn case study focuses on commercialization opportunities for a product already enjoying substantial success in China. More than 200 companies are already involved in producing a wide range of products including anti-ageing facial creams, shampoos, cleansers and moisturizers. The major opportunity for sea buckthorn products, initially, is the rapidly expanding Chinese beauty and cosmetics market, with cosmetics users in China forecast to double from 200 million to 400 million people in the period 2015–2020.

For products such as Indian soapberry, thanaka and forest honey the greatest opportunities possibly lie in research to identify unique properties that can be marketed in broader international and niche markets. In the case of thanaka, opportunities to sell the traditional paste formulations used in Myanmar in international markets seem relatively limited, but the protective and soothing qualities of the product appear to offer prospects for developing new, alternative formulations that could be successfully sold in wider markets. Similarly, the successful marketing of forest honey beauty products will likely be dependent on identifying unique chemical properties that will enable products to occupy a specific market niche. For both products, lessons from the langsat case study may be relevant.

For other products – including Manila elemi, gurjum balsam and spikenard – the case studies suggest that further development of local processing and local markets may offer the best prospects of increasing value capture for collectors of the raw material. In particular, the development of community-based technologies that enable greater local processing might enable greater value capture near the product source.

In general, there should be considerable and increasing scope for direct marketing of products using the Internet, thereby removing layers of intermediaries and enabling greater producer capture of product revenues. Direct marketing of traditional products, such as thanaka, to diaspora should also continue to provide significant sales opportunities. New promotional angles directly tying products to traditional cultural aspects may offer additional opportunities in diaspora markets. Similarly, promotion of social and environmental benefits including forest protection, supporting development in poor communities and fair-trade aspects offer promotional aspects that might be more vigorously taken advantage of. In some instances, the use of Geographical Indication (GI) to link particular products to specific locations and particular communities or

groups may offer useful promotional opportunities and assist in developing price premiums. GI might also assist in establishing voluntary quality standards for cosmetic products by enabling certification of qualities attached to the products themselves and establishing traceability instruments and trustworthy control systems.

A variety of other opportunities exists for several products. There is potential opportunity to increase supply security through cultivation for products such as sandalwood in the Pacific islands and Asia and also for some of the components of the Red Dzao medicinal spa. Increasing tourism should also offer opportunities for the Red Dzao medicinal spa and potentially other products that might appeal to tourists including forest honey, langsat, and perhaps, thanaka.

Threats

An evident threat to all forest-based beauty and cosmetic products is competition from more mainstream products. The case of thanaka as a traditional cosmetic in Myanmar is particularly of interest in the medium and longer term as markets become more open to mainstream international cosmetics. There would seem to be potential for significant substitution of thanaka by other products, especially among younger generations. Similarly, products which enjoy widespread 'traditional' or subsistence use in domestic markets – including hazel sterculia, Indian soapberry and wild turmeric – may similarly be particularly vulnerable to competition from mainstream products, including synthetic alternatives. The development of synthetic substitutes, which replicate the chemical properties of natural products, is a potential threat to many products including Manila elemi, gurjum balsam, spikenard and perhaps even strongly established products such as sandalwood. For products such as forest honey – and to a lesser extent langsat and hazel sterculia – a slightly different threat exists in that these may fail to sufficiently differentiate themselves from other, more mainstream (for example farmed honey-based) cosmetics and consequently their niche-marketing strategies might fail.

Significant threats to some products also exist much higher up in the supply chain. In the case of wild turmeric, for example, the significant threat that collection from the wild may be crowded out by cultivated sources already appears to be being realized. This, of course, highlights the point about 'perspective' with such crowding out being an opportunity for cultivators and a threat for collectors. A similar process is also occurring in relation to sandalwood, where dwindling harvests from the wild in Pacific island countries (and elsewhere) will be substituted by supplies from a burgeoning Australian plantation resource.

Degradation of natural forests and excessive exploitation and depletion of key species that detrimentally affect supplies of forest-based products are significant threats to a number of products including forest honey, gurjum balsam, spikenard and some products used in the Red Dzao medicinal spa. Conversely, where new plantation

resources are being created rapidly, there is potential for oversupply to depress prices, as in the case of sea buckthorn, hazel sterculia and sandalwood.

A range of other threats at various stages of the value chain exists including some products having quite narrow processor and retailer bases (for example, langsat and hazel sterculia) leaving them vulnerable in the event of failure of key players. There is also the potential for unscrupulous competitors to create cheaper, but fake, formulations of some case study products (for example, the case study notes that bogus formulations of the Red Dzao medicinal spa have proliferated in Viet Nam) bringing the legitimate product into disrepute.

Lessons learned

The preceding analysis identifies some significant commonalities among the case study products and also suggests that where strengths and opportunities exist for some products, deficiencies in these areas for other products constitute weaknesses and threats. In summary, these might be distilled into five overarching lessons that are generally applicable to NWFPs used in cosmetics markets and perhaps, more broadly, most NWFPs. They are:

i *Work to establish broad markets* characterized by strong competition with multiple buyers and preferably with direct links to local or national processing facilities. Strong competition among buyers is the most effective means of ensuring a fair price for produce. Cases that exemplify this lesson include thanaka, sea buckthorn and sandalwood.

ii *Address imbalances in market power* that enable dominant buyers to exploit producers and depress product prices. This can be done by: (a) forming collectives that enhance the market strength of sellers through cartelization; (b) by seeking to apply fair-trade remedies and through government regulation; and (c) by seeking alternative avenues for sales. Indian soapberry, forest honey and, particularly, the Red Dzao medicinal spa are among the cases that illustrate this lesson.

iii *Ensure security of product supplies*. In part, this requires addressing resource depletion issues including generic deforestation and forest degradation, but also issues relevant to depletion of the specific NWFP resource including excessive exploitation, regulatory issues enabling tragedy of the commons and potentially seeking opportunities to domesticate and cultivate the product. Case studies that help to illustrate this lesson include those relating to hazel sterculia, gurjum balsam and spikenard.

iv *Create sustainable market positions*. Understanding of the market, including identifying barriers to entry (or lack of them) will help producers to maintain their position in markets. In particular, where no barriers to entry exist, above normal returns are being earned, and a product can be domesticated; if the

current collectors of the product do not seek opportunities to cultivate the product, other people likely will. The wild turmeric and sandalwood cases are among those that exemplify this lesson.

v *Invest in research and development*. While the naturalness of NWFPs provides an area of competitive advantage over synthetic products, research to identify unique attributes of the product will assist in creating a clear and robust product niche. Efforts to ensure and certify product quality, including ensuring quality in packaging and presentation, are likely to yield significant benefits. The cases of langsat, forest honey and Manila elemi are among those that address this lesson.

Figure 3. Sandalwood seedlings

Traditional uses for cosmetics and synthesis

Across civilizations, traditionally natural ingredients and forest products have been used as food, medicine and cosmetics. The history of cosmetics goes back to more than 6 000 years. Body painting by natural mineral pigments used by African and American aborigines is one of the early examples of use for beauty. Ancient Greek use of castor oil and Roman use of bees wax creams, olive oil and rose water for skin treatment has been written about in ancient texts. In Egypt, representation of their ancient queen Nefertiti, who lived 1330 was with elaborate eye make-up.

Amongst indigenous communities, the use of natural plants is common for medicine. Documented ethno-botany has more information about use of plants as food or medicine. A lot of leaf, seeds and barks are used across communities for skin care, including problems of acne, scabies and warts. Several Smilax species and Thuja occidentalis were recorded to be used amongst American Indians for skin care. Amongst many indigenous communities across India – skin care and treatment of pimples, boils and acne have been formulated by the use of bark of Terminalia arjuna, lemon, sandalwood paste, and others. Mulethi *(Glycyrihiza glabra)* is used commonly for tooth care and skin fairness. Indigenous communities in Tamil Nadu use *Memecylon umbellatum* leaf paste to cure skin pimples and dryness, whereas across southern Indian states, turmeric is used for skin treatments and beauty (Karuppusamy, 2007). Though these uses were known by indigenous communities well before – they were documented only in later years by researchers and ethno-botanists.

Chinese cosmetics elaborated the use of gelatin, bees wax, egg white and gum arabic. The painting of nails and skin care was the main signs of beauty. The Japanese geishas also had coloured lips with flower petals and darkened eyebrows. In India, ayurveda is an ancient science of health and medicine, including beauty. Old epics like Shakuntalam and Meghadootam of Kalidasa have many references to natural ingredients as enhancers of beauty. Old Buddhist time paintings in the Ajanta and Ellora caves show both men and women adorned with cosmetics and jewellery. In the Arabic world, the use of kohl, solid perfumes, henna for colour, frankincense for smoking hair, were known and included in their ancient medicine related texts. “Health is beauty” was a concept common in early societies.

During the early 20th century in Europe there was a perception of “fair” being beautiful. This is because the working class in the fields often got darker, while the aristocracy maintained their lighter skins. This started the use of arsenic for making the skin fairer and was quite dangerous. Since then skin lightening has

remained an important aspect of beauty care and till now comprises of a large segment of all cosmetics. Many natural ingredients like saffron, honey, lemon, and Aloe vera are used for this purpose.

Theatre, ballet and dance performances in Paris around 1910 popularised "make-up" which highlighted the features and accentuated lips, eyebrows and skin colours. However, it was in Los Angeles that the first make up shop was opened by Max Factor and over the years the other main role players came about – Elizabeth Arden, Coco Chanel. L'Oreal – all of whom still remain leaders in the cosmetic industry. The base of these cosmetics was alcohol and petroleum jelly, a bye-product from the manufacture of petrol in the oil refineries. While fashions changed during the war times, it was only after 1960s to 1970s that some feminists started rejecting cosmetics, preferring the natural look. Concerns over their chemical ingredients and their effects on the skin became matters of concern and the world again turned back to natural ingredients found in the forests, gardens and those produced by some animal species.

Cultivation of herbs for essential oils (like lavender, geranium) became an enterprise in the West, while the East mostly continued to depend on NTFPs. As an example in India, the ayurvedic and other traditional herbal medicine & cosmetics have acquired importance. The largest company, Dabur, started in 1884 and remains the largest role player in herbal food, cosmetics and medicine sector. Similarly, AVEDA and Body Shop, which use large amounts of NTFPs and natural ingredients in their cosmetic range, are also under criticism for exploiting forests and indigenous knowledge of the communities that trade them. Many traditional and local recipes are also sold as products by private companies and manufacturers.

All across South Asian countries, use of common food items for homemade cosmetic recipes is prevalent. Some of these are honey, lemon, green gram powder, Aloe vera gel, neem leaf powder, rose water, papaya pulp, sesame oil, castor oil, and turmeric. These items are used in different preparations and recipes for eye, skin and hair care. In a study done in Attock district of North Pakistan, 40 plants were identified which were used for cosmetic and home remedies for common illnesses (Ahmad & Zafar, 2008). Similarly, a study in Kashmir, India identified 39 plants used as cosmetics by local women (Shaheen, 2014).

In this chapter we have case studies from mainly India and Myanmar. The cases reflect traditional and local use. They have also been part of alternative strains of medicine.

Sapindus emarginatus, a plant for cosmetics, was described in classical Indian poetry. Soapnut is known in ayurveda as the third in the family of extremely beneficial fruits. Soapnut has been traditionally used in hair and skin care preparations. It is claimed to prevent hair loss and is used as a shampoo cleanser. For skin care also it cleanses the pores and keeps the skin moist. Besides its cosmetic use, soapnut seed pericarp is soaked in water and the extract used to wash fine garments of silk and wool. It is also used for washing gold and other jewellery.

The other case study is of *thanaka* from Myanmar, which has been used for at least 2 000 years for skincare, as sunscreen, and as a decorative cosmetic with a pleasant fragrance. A paste is made with the bark and wood of this species, which is *Limonia acidissima*, also called theethee or wood apple. The paste is used on the face in interesting designs. It prevents sunburn, cools the skin and has a pleasant smell, like sandalwood. Sometimes, people use *thanaka* head to toe during summer.

The third case study is of *Curcuma aromatica*. There are several local uses of this species, commonly called wild turmeric. During pregnancy a paste of wild turmeric is applied to the abdomen to avoid stretch marks. Honey and turmeric is applied as a face pack to rejuvenate skin tone. Wild turmeric powder mixed with warm coconut oil is applied to remove unwanted facial hair. Wild turmeric and sandalwood powder can cure acne if applied regularly. Buttermilk and wild turmeric applied around eyes can remove dark circles. Wild turmeric with milk acts as a cleanser to naturally deep clean skin from dirt or oils. For hundreds of years, this species is used by communities in India as a daily household recipe.

Besides the three NTFPs included in this section, other case studies also have traditional recipes and use. Honey can be used in skin care (anti-wrinkle and skin moisturizer) hair care (shampoo and hair tonic), body care (soap, shower gel, and body lotion) and also in make-up (face powder and lipstick). Honey, due to its antioxidant properties, acts as a rejuvenator, and is also an important ingredient in beauty culture as a moisturizer and a conditioner. Honey has Vitamin B2 (riboflavin) and helps address chapped lips. Use of honey in both medicine and cosmetics has ancient historical references.

Case 1:

Wild Turmeric

Figure 4. Turmeric processing

Humans have been highly dependent on plants and plant products since ancient times. Food, medicine, fibre, fodder for livestock and construction materials were mostly plant-based and extracted from the wild. There are more than 50 000 plants documented globally that are of use for medicinal purposes alone (Schippmann et al. 2002). While much emphasis is given to documenting plants of medicinal and nutritional value, the plant products used in the cosmetics industry are less well-known. In 2011, sales of the top 100 cosmetic companies reached USD 195 billion, with an annual increase of 10.6 percent (Weil 2012). One-third of the ingredients used in cosmetic products are plant extracts (Schmidt 2012). In India alone, the cosmetics market was predicted to expand at a rate of 17 percent in 2015 to 2016. Additionally, Indian consumers are also increasingly shifting to natural and herbal cosmetic products (RNCOS Business Consultancy Services 2013).

For many people, plant-based shampoos, skin tonics, perfumes and dyes are an integral part of growing up in India. These herbal cosmetics are part of one's life cycle, whether it is in the special products that are used for baby baths, or the face packs to fight acne or lighten dark skin in one's youth, or the special skin and hair care treatments during weddings. Plant products have become important cultural products that are carried when communities migrate, making them an important part of one's identity. Many times the herbal cosmetic product plays a dual role of enhancing beauty while having a medicinal value, like the hair tonics that also work to cool the body or the skin toners that also disinfect the skin.

Wild turmeric, *Curcuma aromatica* Salisb., is one such important herbal product. The root of wild turmeric has a distinct fragrance and a cream colour that makes it different from the more commonly used and known turmeric. Wild turmeric is widely used in India as a herbal cosmetic. The rhizome is an esteemed drug for skin care. It possesses good germicidal activity, hence, it is ideal for protection against skin infections. Traditionally used for bathing new born babies, wild turmeric is an ingredient of many cosmetics, skin care products and tonics for women, particularly for use after childbirth.

Early history

The ancient texts of Ayurveda, the ancient Indian system of medicine dating back to 5 000 years ago, contain records of turmeric use. The Greek physician, Dioscorides, who was in the Roman army, also mentions the use of turmeric and early European traders are credited with introducing the product to the west around the fourteenth century (Aggarwal 2007). Turmeric, originating from India, reached the coast of China in 700 C.E. (Common Era). One hundred years later, it reached East Africa, and then West Africa after another 500 years (Aggarwal 2007). Arab traders were likely to have taken turmeric and pepper to the European continent in the thirteenth century. The sea route was a secret known only to the Arab voyagers, which was later discovered by Vasco da Gama (Aggarwal 2007). The exact location of the origin of turmeric in India is still not clear, but it is most likely to have come from the southern and western regions of the country (Nair 2013).

Marco Polo mentioned turmeric in 1280 C.E. in his travel memoirs about China and during his several legendary voyages to India via the 'Silk Route.' He was highly impressed by turmeric, describing it as a vegetable possessing properties akin to saffron (Parry 1969). This is probably why it was also known as 'Indian saffron.' Turmeric derives its name from the Latin 'terra merita', meaning meritorious earth, which refers to the colour of ground turmeric, resembling a mineral pigment.

Initially, turmeric was cultivated as a dye because of its brilliant yellow colour. Over time, ancient populations learned about its varied uses and they began introducing it into cosmetics. The plant's roots are used in one of the most popular Indian Ayurvedic preparations, a concoction prepared from ten different types of roots called *dashamularishta*, which relieves fatigue, and has been in use for thousands of years (Nair 2013). Turmeric flowers are also used as an antidote against worms in the human stomach and can also cure jaundice and venereal diseases. They have also been known to have specific properties helpful in combating mental disorders. More recently, turmeric leaf extracts have been used to treat human breast tumours (Nair 2013).

Botany of wild turmeric

Curcuma aromatica, also called wild turmeric or *kasthuri manjal*, belongs to the family Zingiberaceae. In 1753 the genus *Curcuma* was established by Linnaeus in his *Species plantarum* (Linnaeus 1753). *Curcuma* was described early (1678–1693) by Van Rheede (1678) in *Hortus indicus malabaricus*. He recorded two species of Curcuma under the local names *kua* and *manjella kua*. Of the total 40 species of *Curcuma* found in India, 16 to 17 are found in South India (Ravindran et al. 2007). The genus *Curcuma* derives its origin from the Arabic word *kurkum*, meaning yellow and it comprises over 80 species of rhizomatous herbs, which are widespread from sea level to altitudes as high as 2 000 metres in the Western Ghats and Himalayas (Ravindran et al. 2007). Having originated in the Indo-Malayan region, the genus is widely distributed in the tropics of Asia to Africa and Australia. *Curcuma* species exhibit inter- and intraspecific variations of biologically active principles, as well as morphological variations with respect to the aboveground vegetative and floral characteristics and belowground rhizome features, besides for curcumin, oleoresin and essential oil (Ravindran et al. 2007).

The plant is short and herbaceous, leaves are 1- to 2-feet long, elliptic or lanceolate oblong, leaf tips are caudate or acuminate, flowers pink with a yellow lip and three lobed (Fischer 1928). This species is found in the South Asian region, predominantly in the eastern Himalayas and in the warm forests of the Western Ghats of India (Nair 2013).

Curcuma species in South India have been thoroughly investigated by many researchers. However, confusion in the classification of *Curcuma* still persists, considering the interspecific and intraspecific variations. This has to be resolved through more detailed investigations on *Curcuma* species from different parts of the world and

simulation data from morphology, cytology and molecular markers (Nair 2013).

Turmeric in trade

About 80 percent of the world's turmeric, including cultivated varieties like *C. longa*, comes from India, which is the largest producer, consumer and exporter. Cultivated turmeric production in India is about 856 464 tonnes from a total area of 183 917 hectares (Prabhakaran Nair, 2013). India's position in global turmeric trade is high with a total of 48 percent in volume and 44 percent in value. India is the global leader in turmeric export and its value-added products. Trade figures for *C. aromatica* are available at the Web site https://www.zauba.com. According to this Web site, India exported a total quantity of 56 337 tonnes in the period 2014–2015, worth USD 143 388. The average price of *C. aromatica* per unit is USD 2.55 and the average value per shipment is USD 2 516.

Overseas producers are Thailand, China, Taiwan Province of China, South America and several countries in the Pacific. Major importers are Japan, the USA, the UK, Sri Lanka, North African countries and Ethiopia in East Africa, and Near Eastern countries (Nair 2013). Japan is the largest buyer of *C. aromatic* accounting for exports worth USD 84 956 followed by Sri Lanka and Bangladesh, which imported *C. aromatica* worth USD 29 615 and USD 11 674 respectively. The average price of *C. aromatica* per unit is USD 2.55 and the average value per shipment is USD 2 516.

Existing uses of wild turmeric

The volatile turmeric oil is extracted from dried rhizomes, containing about 5 to 6 percent oil and from leaves, which contain about 1.5 percent. The oil is extracted by steam distillation (Chempakam and Parthasarathy 2008). The characteristic turmeric aroma is imparted by ar-turmerone, the major aroma component in the oil (Chempakam and Parthasarathy 2008). *C. aromatica* is comparatively much higher in volatile oil (4–8 percent) and lower in curcuminoids (1.5 percent) (Kojima et al. 1998) than other types of turmeric.

The rhizome of *C. aromatica* is known for its germicidal properties and is highly recommended for skin care. It is a component in many skin care products and tonics for women, and is especially recommended for use after child birth. It is also traditionally used for bathing newborns and infants. A simple home remedy for acne treatment is rose water and a paste of *C. aromatic* dried root. The rhizome is also prescribed as an antidote for scorpion and other poisonous insect stings.

Information on subsistence uses of wild turmeric has been gathered based on individual and personal interviews with local residents. The product was sourced from the local raw herbs' markets by most of the people who were interviewed. Some were also growing it in their kitchen gardens and in pots in their homes. Below are some of the prescriptions that people shared with interviewers:

- Honey and turmeric is applied as a face pack to rejuvenate skin tone;
- During pregnancy, a paste of wild turmeric is applied to the abdomen to prevent stretch marks;
- Wild turmeric powder mixed with warm coconut oil is applied to remove unwanted facial hair;
- Wild turmeric and sandalwood powder can cure acne if applied regularly;
- Buttermilk and wild turmeric applied around eyes can remove dark circles around them; and
- Wild turmeric with milk acts as a cleanser to naturally deep-clean skin from dirt or oils.

Commercial uses of wild turmeric are high in the Indian market. Turmeric is already known in India as a tonic, a carminative, as an antidote to snake bites and as an astringent. It is used for bruises, corns and sprains, and is well-known for enhancing the complexion. Wild turmeric is used in cosmetic formulations and traditional medicinal applications as an anti-inflammatory agent, to promote blood circulation, to enhance complexion, to remove blood stasis and for the treatment of cancer.

There are distinguishing features between *C. aromatica* and *C. longa*. *C. longa* tubers are bright orange with a yellow tinge while *C. aromatica* is whiter with a mild yellow tinge. *C. aromatica* tubers have a bitter taste and smell like camphor, while the *C. longa* tubers have a distinct herb-like aroma and a spicy taste. The percentage of curcumin is lower in *C. aromatica* but the essential oil component is higher than that of *C. longa*.

Opportunities, challenges and lessons

In the remote corners of the evergreen forests of Nilambur Valley in the state of Kerala, India, the collection of forest products constitutes up to 40 percent of the household income of indigenous people. Interviewers inquired about the collection of wild turmeric and were informed that there is no longer any organized or regular market for the product from the wild. The last time they recalled collecting the root was about seven years ago and the traders who asked for the product have disappeared. The people used to collect it, chop and dry the root and sell it for approximately 50 cents per kilogram. As there are no longer any buyers, the community says there is now an abundance of turmeric plants growing in the forest, but no one collects it.

Very little is known about the ecology of this plant in the wild. There are also no accurate figures of areas under cultivation for this species. One study done in Kerala in the 1990s refers to the plant and mentions that even after 95 percent removal for harvest by medicinal plant traders, 100 percent regeneration was observed (Muraleedharan et al. 1999). Further investigation on the status of turmeric plants in the wild is very important if the species is to be conserved. Before exploring the market potential of this product, this initial information is needed.

The trade and collection of *C. aromatica* have much in common with most medicinal and aromatic plants collected from the wild, especially with regard to

quality and traceability. The lack of information on plant sources, the disorganized nature of trade and the lack of incentives to add value to the product at source, undermine its potential as a source of livelihood for marginalized communities. There is still a need to organize the local collection of the product so as to meet ecological and livelihood needs, while at the same time assuring buyers of the quality of the product.

The challenges mentioned above must first be addressed in order to develop *C. aromatica* as a product for the global market. It has many unique properties and there is clearly demand for it. Its many uses make it a promising product that can be maximized and further developed for use in the beauty industry.

Case 2:

Indian Soapberry

Figure 5. Fruits of an Indian soapberry tree

Since the dawn of human civilization, medicinal plants have been used by humankind for their therapeutic value. The uses of *Sapindus emarginatus* Vahl. for cosmetics were described in classical Indian poetry and in literature written hundreds of years ago. *Sapindus emarginatus,* or soapberry or soapnut, is still popular in India today, and is being used in skin, hair and body treatments.

Ancient Indian texts make references to soapberries. The book *Saint heritage of India* relates that Hatha yoga founder Machindranath was converted under a soapberry tree some time during the ninth to tenth century. The *Historical dictionary of ancient India* and a paper titled 'Some Notes on the History of Soap Nuts, Soap and Washermen of India between 300 and CE 1900 explain that soapberries were found even earlier.

For hundreds of years, people in India and Nepal have been doing their laundry and cleaning with soapberry. Soapberries are also referred to as washing nuts or *ritha/ reetha* in Hindi. They contain saponins which have the ability to clean and wash. When in contact with water, they create a mild lather, which is similar to soap.

The last few decades have witnessed radical changes in the formulation of cosmetic and personal care products by beauty companies, which are paying more and more attention to natural, organic and safety needs increasingly being demanded by consumers. The cosmetics industry has been able to respond to changing consumers' preferences for chemical-free cosmetics formulas and to switch to natural and organic cosmetic compounds, which are replacing harmful synthetic substances throughout the entire supply chain. The beauty industry is progressively going green and is moving towards an ecofriendly and ethical dimension. Soapberry has significant potential to take advantage of these trends.

Natural history of soapberry

The genus *Sapindus* was mentioned for the first time in *Species plantarum* by Linnaeus in 1753. *Sapindus* is a genus of about five to 12 species belonging to the Sapinaceae family, which consists of about 150 genera and 2 000 species. It is native to warm temperate to tropical regions in both the Old World and the New World. The genus *Sapindus* includes both deciduous and evergreen species. The scientific name is derived from the Latin words *sapo,* meaning 'soap', and *indicus,* meaning 'of India'. Soapberry powder is known in Ayurvedic medicine as the third in a family of extremely beneficial fruits, along with *shikakai (Acacia concinna)* and *trifla*. Ayurveda is an Indian system of traditional medicine which is based on the idea of balance in the bodily system. *Trifla/triphala* is an Ayurvedic herbal formula consisting of equal parts of *amla* (*Emblica officinalis*), *bibhitaki* (*Terminalia bellirica*) and *haritaki* (*Terminalia chebula*).

Distribution of soapberry in India

Soapberries grow in a range of environments in India, from the far southern state of Kerala to the northern regions of Rajasthan and the eastern plains of the Himalayas. A remarkable number of varieties grow in the country. Approximately ten species are of commercial significance.

Different species of soapberries grow in different areas. *Sapindus emarginatus* and *Sapindus mukorossi* grow throughout the states of Karnataka, Andhra Pradesh, Orissa, Himachal Pradesh and other states in the north and east of India. *Sapindus laurifolia* grows in the north and east of the

country, particularly Assam, West Bengal and the Himalayas (Santhosh, Ambrika, and Arun, 2014). On the other hand, *Sapindus trifoliatus,* known as 'South Indian soapnut', grows in the southern states of Tamil Nadu, Kerala and Maharashtra (Mahmood et al., 2013). *Sapindus emarginatus, known as 'notched leaf soapnut',* is distributed in South Asia. It is dominant in the deciduous belt from the plains to 1 000 metres above sea level.

Morphology

S. emarginatus is a medium-sized densely foliaceous, deciduous tree. It grows to 8–10 metres in height, with a straight and cylindrical trunk. The leaves are compound, alternately arranged, with 14–30 leaflets, the terminal leaflet often absent. The flowers form in large panicles and each flower is small and creamy white in colour. Flowering is observed during November to December. Fruits are ovoid drupe, three-lobed, smooth, green in colour and slightly hairy when young. As the fruit ripens it turns yellow and becomes blackish, wrinkled with a leathery texture. The fruit contains one to three seeds which are black in colour, smooth and globose.

The sapling of *S. emarginatus* can be raised by soaking the seeds in lukewarm water for 24 hours and then sowing them in a nursery bed or polythene bags. Cutting and grafting can also be done for its propagation. The propagation methods are used in producing saplings in large numbers, which can be grown on farms.

Common names

- *English:* Notched leaf soapberry tree;
- *Hindi:* Reetha kannada, Kukate kayi, Kudale kaye, Kookatakayi, Malayalam, Soapumka, Punnan kotta, Uravanchi, Pasakotta, Pachakotta, Chuvapukkamaram, Chavakayimaram, Soppinkaimaram, Uringi, Uruangi, Uruvanjikaya;
- *Marathi (Maharashtra):* Aritha, Rimgi, Rimthi;
- *Oriya (Odisha):* Ritha;
- *Sanskrit:* Phenila, Aristam, Aristhphalam, Arishta;
- *Tamil:* Poovandikottai, Manipungan, Ponnankottai; and
- *Telugu:* Kungititkaya, Kukudu kayalu, Kunkudu chettu.

Benefits of soapberry

Soapberry has been used in traditional and folklore medicine to cure various ailments for centuries in India. It is also used in hair and skin care preparations. Several uses with specific instructions and effects are provided below:

- Hair care: It is an excellent hair cleanser. The liquid can be applied to the scalp and left for a few minutes followed by rinsing with clean water. It is antibacterial and antifungal in nature and keeps the scalp free from dandruff; it also prevents hair loss. It also works against infections of lice and other parasites and keeps hair shiny and silky;
- Skin care: It is an excellent cleanser and has a very cool effect on the skin. Soapberry makes the skin soft and tender and prevents it from drying. It is also used in curing eczema and psoriasis and in removing pimples, blackheads and freckles. The moisture value is estimated at 16.4–24.41 grams/100 grams;
- Laundry: Washing clothes with soapberry has a gentle effect on the skin. It is allergen-free and helps to maintain the original colour of clothes. About six to eight shells can be placed in a small pouch or tied up in a piece

of cloth and put into the washing basin or washing machine load with temperature of up to 90°C;
- Cleaning and detoxifying food: Fruits and vegetables can be soaked for approximately 10 minutes in soapberry liquid and rinsed off. This removes harmful chemicals and residues;
- Cleaning jewelry: Soapberry is commonly used in Indian households for cleaning and polishing jewelry. This is done by soaking jewelry in soapberry liquid and then rubbing with a cloth to give it a better shine;
- Natural pesticide: Soapberry is an effective and natural alternative to repel insects in the house. Left-over soapberry liquid or pericarp from washing or laundry can be used for this purpose. The extract is a source of a botanical biocide with potent anti-mosquito properties. Kernel extract can be used to kill all the developmental stages of three important vector mosquito species, *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus*;
- Contraceptive: Spermicidal and antimicrobial activity was detected in the saponin fraction isolated from the fruit pericarp of soapberry. The Central Drug Research Institute in Lucknow, India has developed a contraceptive cream with the fruit of *Sapindus*. It is marketed under the trade name 'Consap';
- Food for other animals: *Sapindus* species are used as food plants by the larvae of some Lepidoptera (moths and butterflies) species including *Endoclita malabaricus.* Deer, squirrels and rodents have been observed foraging on the fruit. It is also a very valuable honey source. All the *Apis* species collect its nectar and white pollen in large quantities, producing a light-coloured honey with a pleasant aroma. Pollination studies in two villages in the Nilgiri Biosphere Reserve showed that visitation by *Apis* species increases the fruit set and yield of soapberry;
- Blood purifier: Seeds of *S. emarginatus* contain anti-inflammatory oil which is traditionally used to purify the blood; and
- Fishing: The unripe fruit is used to intoxicate fish for netting.

Collection, processing and marketing

Harvest from the forest

Soapberry trees produce flower buds from May to November each year. Flowers open between November and December. Fruiting occurs from December onwards and maturity is reached by February to March. Fruits are plucked from the trees. For easy removal from the trees and in order to reduce collection time, some harvesters cut fruiting branches and later collect the fruits from the branches. This method of cutting primary branches has a harmful effect on fruit productivity and has long-term effects on the health of the tree. The harvested fruits are collected by indigenous communities and sold to traders or to cooperative societies or large-scale Adivasi (indigenous) multipurpose societies (LAMPS). Most collection is done in the wild.

Storage

Soapberries absorb moisture very easily. The fruits become dark and sticky in a very short period of time if left exposed to air. They should be packed air-tight.

Price trends

Figure 6 shows average annual prices paid to the collectors of fruits, nuts and seeds, and also indicates significant fluctuations in

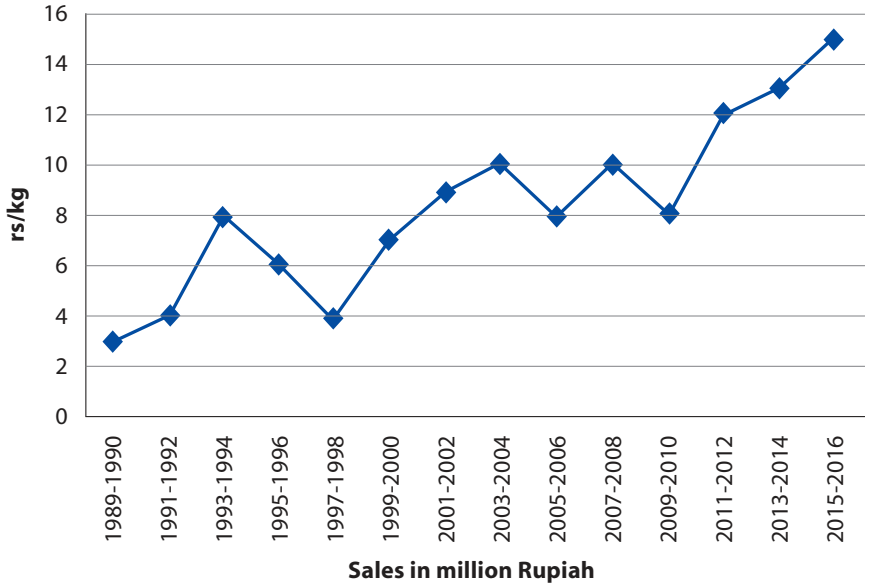


Figure 6. Annual price paid to soapberry collectors in the Nilgiris Biosphere Reserve, Tamil Nadu

Source: Report: Marketing of Non-timber Forest Produce, Agragamee Anjan Guha (1998). Feasibility of setting up of micro enterprises based on Five Short-listed NTFP's.

prices, on a year-to-year basis. The variations in prices depend on the accessibility of the region to a market and the season in which the produce is sold. Unripe or immature fruits fetch a low price. In a few locations (such as Sigur and Pillur in the Nilgiris Biosphere Reserve) collection has stopped as the LAMPS did not have sufficient funds for procurement.

Contribution of soapberry to the incomes of indigenous communities

Even though the fruits are collected from several species of *Sapindus*, trade and market chains are collectively clubbed together as soapberry or *Sapindus* agents. Consequently, the information provided in this section refers not just to *S. emarginatus* but other *Sapindus* species as well. Setty (2015) reported that the harvest of soapberry from forests contributed only 1–2 percent of the total income for the Sholiga community (an ethnic group inhabiting the Biligiri and Rangan Hills and associated ranges in the southern Karnataka region). Collectors received an average rate of INR4.89/kilogram (USD 0.07) and soapberries were onsold for INR7.81/kilogram (USD 0.12) by LAMPS. However, even this small amount represents an important contribution to the community's income. In 2004 for example, there was a ban on harvesting of all NWFPs in the Biligiri and Rangan Hills as these were given the status of a protected area. The ban had a negative consequence on the livelihoods of the harvesters. However, the community has started harvesting NWFPs again under the Forest Rights Act. A case study of the *ritha* value chain in Nepal reported that in 2014–2015, about 233 tonnes of *ritha* from Gokuleshwor and its neighbours were traded, with farmers earning nearly NPR3.5 million (USD 58 000) at NPR15 (USD 0.25) per kilogram.

Manufacturing process

Processing of soapberry involves cleaning, drying, powdering, filtering and packing. Harvested soapberry is dried thoroughly and finely ground in a pulverizer. A variety

of formulations can be made using ingredients like *amla (Emblica ofiicinalis),* orange peel *(Citrus* sp.*), methi (Trigonella foenumgraecum),* neem *(Azadirachta indica)* leaves, henna *(Lawsonia inermis)* and sandalwood powder.

Market prospects

In the soapberry context, the pericarp of the fruit is used for its saponification property and it has a good demand from manufacturers of shampoos and hair care preparations. It was reported during a Dabur Investor presentation in June 2005 that the Indian shampoo market is estimated at USD 15 million. According to a Tanstia FNF report on herbal *shikakai* (*Acacia concinna*), the herbal shampoo market in India is reckoned at USD 6 million. CavinKare Private Ltd. in Chennai is a market leader in Tamil Nadu for herbal hair and skin products and consumes about 36 tonnes of *shikakai* and 6 tonnes of soapberry *per annum.* The consumption is expected to rise to 60 tonnes *per annum* (ITCOT no date). The company sources both *shikakai* and soapberry from outside Tamil Nadu. Kuniyal et al. (2013) reported that annual consumption by the Indian domestic herbal market is around 182 tonnes.

According to the Web site Zauba (2013), India exported soapberry species valued at USD 15 million in 2014. Hamburg in Germany and Santos in Brazil were the largest buyers of *Sapindus*, followed by Antwerp (Belgium) and Tokyo (Japan). According to ICIMOD (2015), India also imports about 450 tonnes of *Sapindus* annually from villages of Nepal.

Value addition at the community level

In 2013, the Keystone Foundation formed the producer company, Aadhimalai Pazhangudiniyar Producer Company Limited (APPCL). Soapberry is purchased at an average rate of INR14/kilogram (USD 0.211) from the collectors. The price is higher compared to the price given by traders. The fruits are dried and then powdered. The product is manufactured and marketed by the indigenous community. Prescriptions for product development have been collated for experimental purposes.

Mali et al. (2010) formulated and completely evaluated a herbal shampoo with *Asparagus racemosus*, *Acacia concinna* and *Sapindus* as the main ingredients along with other herbal ingredients. However, the work stopped after the research concluded and the marketing strategy was not examined.

Challenges and recommendations

In the past 20 years, plant-based cosmetics and pharmaceutical industries have been major NWFP stakeholders, with an upsurge in the transaction of medicinal and pharmaceutical plants. Most NWFPs are traded or exported in raw and crude form, in bulk, for which producers receive a very low price. Constraints include a lack of processing facilities, seasonality of supply, quality control, storage, packaging and inadequate marketing strategies, in combination with market price fluctuations.

Attempts at value addition of the raw materials at the collectors' level would help to achieve higher prices. In-depth research and development of soapberry products need to be initiated. Pharmacological studies on *S. emarginatus* have been done by many researchers. What remains to be done is to assess its population status to determine sustainability in harvesting of the fruit.

Case 3:

Thanaka

Figure 7. A boy using thanaka as a sunscreen for his face

Thanaka, a yellow paste made from the bark of the thanaka tree, is the most popular cosmetic in Myanmar and is part of the daily routine of women, men and children. For hundreds of years, thanaka has been used for skin care, as a sunscreen, and as a decorative cosmetic.

Thanaka trees, *Limonia acidissima* L. grow in the dry zone of Myanmar's central plains, covering Magwe, Mandalay and Sagaing Divisions. The trees are typically harvested after five to seven years, although the highest quality thanaka is grown for as long as 35 years. Sections of the stems are sold in markets across the country, either individually or in bundles. At home, women grind the bark against a stone slab, called a *kyauk pyin*, and mix it with water to create a fragrant paste. Women, children and some men apply thanaka to their faces and skin. Thanaka is a symbol of Myanmar and the government has prioritized it as the country's first nomination to UNESCO's intangible cultural heritage designation (Khine, 2014).

Uses

Thanaka is believed to improve skin quality and has strong anti-inflammatory and anti-oxidant properties. It also has mild antibacterial properties. Some women believe that it lightens the skin, which may be the result of its slight tyrosine inhibition activity. Thanaka contains marmesin, a chemical which protects the skin by absorbing UV-A light (Se-Hwan, Sang-Cheol & Seong-Ki, 2004). As a result, it is also an effective sunscreen. Women cover themselves in thanaka paste to protect their skin from the harsh sunlight while working in the fields. Thanaka also has a pleasant fragrance and gives the skin a mild cooling sensation when applied.

The roots, leaves and berries of the thanaka tree are used in traditional medicine. In addition, the wood of the tree's root has a beautiful pattern and is carved into everyday items including combs, smoking pipes, beads, utensils, boxes, bullock cart axles, walking sticks and sculptures.

Thanaka has been used as a cosmetic for centuries; some say that it has been used for over 2 000 years (Yeni, 2011). The earliest written record of thanaka use is in a fourteenth century poem written by a consort of King Razadarit (Rajadhirat), who ruled and unified the Mon Kingdom in southern Myanmar from 1384 to 1422. A *kyauk pyin* that is believed to have been used by Princess Razadatukaly, the eldest daughter of King Bayintnaung, provides evidence that thanaka was used during the king's reign in the mid- to late-1500s. The stone was found amongst the ruins of Shwemadaw Pagoda in Bago after the pagoda was destroyed by a powerful earthquake in 1930.

Silviculture

Thanaka is found across South and Southeast Asia. It is a dry deciduous tree species and it grows in plains areas on thin, rocky soils. In Myanmar, thanaka is found in dry deciduous forest and scrub forest in the country's central dry zone. Although it flourishes in the wild, the tree is now mostly cultivated and harvested from plantations. Thanaka

trees grown in Shwebo District and the *Shinmataung* thanaka in Pakokku District are famous for having the highest quality. A variety grown in southern Shan State in the town of Mauk Mei is also well known and is called *shan khauk*.

Most thanaka trees are grown in plantations, sometimes as part of an agroforestry system intercropped with annual crops, including soybeans and pulses. In Ah Yar Dar Township, cultivators report that these crops are grown only during the first few years of thanaka cultivation because soil fertility declines as the trees grow. Spacing between trees varies, with some villages planting trees at approximately 9 × 9 feet and others around 3 × 6 feet apart.

Trees with particularly good characteristics, including thick bark, are used as seed sources. In Ah Yar Dar, one man is particularly well-known for selling high-quality seeds and he corners much of the market. Cultivators buy the thanaka fruits, extract the seeds and plant them in nursery bags. Germination rates are high and seedlings are planted in the field after one year. Some cultivators buy seedlings, but most buy seeds and have their own nurseries.

Thanaka grows slowly and traditionally it was not cut before reaching 35 years. With the use of chemical fertilizers (nitrogen, phosphorus and potassium [NPK]), the trees grow faster and can be harvested in five to seven years. The trees reach a harvestable size of 1.5 centimetres in diameter in five years, but are commonly harvested when they reach 3 centimetres in diameter, usually after seven years. In Ah Yar Dar, which is famous for producing high-quality thanaka, the price for a seven-year old tree is not significantly higher than for a five-year old tree, so some cultivators report that there is no incentive to wait more than five years to harvest. Still, most harvesters prefer to wait seven or more years so they can harvest a larger volume of thanaka from each tree. While the price does not change substantially, the additional two years gives the bark at the higher reaches of the tree time to reach a marketable thickness. A thanaka tree's marketable height is about one-third of its total height, as the bark near the crown is too thin for use. A seven-year old tree may be around 28-feet tall but only the first nine feet can be cut into segments and sold. Growers in Ah Yar Dar report that older trees may become too wide to easily hold and grind and are therefore less appealing to consumers.

Trees that are cultivated with traditional methods, without chemical fertilizer, grow more slowly and are considered to be of higher quality. Older trees are more fragrant and the cuttings last longer, providing more than twice as many applications as cuttings from younger, faster growing trees. In addition to the fragrance and colour, thanaka used for cosmetic properties should also be straight and have a thick bark.

Traditional cultivation methods include regular weeding and monthly application of natural fertilizer from sheep, goats and other livestock. Now most cultivators use NPK or urea fertilizer, because they do not have enough livestock to produce the manure needed for natural fertilizer and chemical fertilizer is less expensive than

purchasing manure. Increasingly, the traditional method of cultivating thanaka is being replaced by machine tilling and chemical fertilizers and pesticides. Traditionally, the cultivator and hired labourers would plough the field with an ox to prepare the soil; while this is still common, some cultivators have begun to replace animal power with mechanized tillers. Cultivators also now apply chemical pesticides imported from China.

The tree regenerates from coppicing and can be harvested after another four to seven years. When thanaka is harvested, the tree is cut, including around 6 inches of root so that no root remains above ground. Coppice regrowth will continue until the root dies off. Thanaka trees are never harvested during the monsoon, when the root is particularly vulnerable to rot.

Thanaka trees are planted and owned by individuals or families and they are typically cultivated by men. They are not usually planted in community forest areas in the dry zone but rather on individually-owned land. The head of the thanaka producers' association in Ah Yar Dar identifies land availability as the main constraint for planting thanaka. As interest in thanaka cultivation increases, however, more people are interested in planting it in smaller quantities around home compounds and fields.

Access to sufficient quality and quantity of thanaka seeds is not considered a problem and all inputs are readily available in areas where thanaka is commonly grown. Communities draw upon traditional knowledge to cultivate and care for the trees. Thanaka cultivation requires relatively little labour, mostly to prepare the land and plant seedlings, and occasional weeding and fertilizer application. Investment costs are higher for cultivators who choose to erect fencing around plantations. Some may also hire a skilled harvester to cut their trees. In Ah Yar Dar, most of the labourers are men, who are paid a daily wage of 5 000 kyat (USD 4.24). Women are paid 3 500 kyat (USD 2.97) per day, but more commonly work as vendors, rather than labourers.

Market trends

Thanaka is grown and sold by individuals, although some townships have a planting and producer association. The association gathers information to guide decision-making and facilitates links between trusted brokers and individual producers. The brokers negotiate the price with each producer. In 2011, farm-gate prices were only 3 000 to 6 000 kyat (USD 2.55–5.09) per tree. In Ah Yar Dar, prices have now risen to 10 000 to 20 000 kyat (USD 8.49–16.98), depending on the age and quality of the tree. Brokers then transport the trees to market for sale to wholesalers or individual sellers, or sell them to companies to be processed into cosmetics.

Thanaka is traditionally sold as a cutting from the tree, which is ground and mixed with water to form a paste. The pieces are sold at market stalls individually or in bundles, and the paste is made at home by grinding it on a stone and adding water. Cuttings are around 18 inches long. Thanaka cuttings

are sorted into three quality categories for sale to consumers, with the base class selling in Sagaing in 2014 for around 2 000–10 000 kyat (USD 1.70–8.49) and the second-best class for 8 000–10 000 kyat (USD 6.79–8.49). The best thanaka can fetch up to 15 000 (USD 12.73) or more per cutting.

Increasingly, thanaka is being sold in processed forms, such as powders and pastes. These processed thanaka products were first sold in the 1950s. Companies add perfumes, citrus, preservatives and other additives to the pastes. However, consumers often prefer buying stems of thanaka, despite the convenience of the processed pastes, because they can be sure that the stems are not adulterated with clay or contaminated with harmful ingredients. Most processed products are not sold with a safety verification label and there have been reports of heavy metal contamination in some products sold abroad.

Processed thanaka products are also exported and purchased by Myanmar communities abroad and international sales may be an opportunity for market growth. In order for processed thanaka to expand into international markets, it will be critical to establish processes for safety inspection and certification. Natural cosmetics brands may also see an opportunity to incorporate thanaka powder's beneficial properties in products that appeal to international buyers, such as lotions and cosmetics.

One report estimated that in 2011, annual domestic consumption of thanaka in Myanmar would be worth 201.6 to 403.2 billion kyat (USD 252–504 million) (Foppes et al. 2011). The same report mentioned that 90 percent of all women in Myanmar use the product daily. Retail vendors in the thousands sell unprocessed thanaka in markets across the country. Many of the vendors are women. There are also many interstate traders. Previous assessments have not found any monopolies in the thanaka market. For processed products, there are currently more than 20 companies selling it packaged in various forms. Swe Pyi Nann Co., Ltd. is the largest thanaka company in Myanmar. The company owns 127 acres of thanaka plantations and employs about 200 people. It exports thanaka cosmetics to Thailand, Malaysia, Singapore and the Philippines.

While the use of thanaka may be decreasing in urban centres due to increasing competition from international cosmetics companies, it remains part of the everyday routine for many people in Myanmar. However, there are different and changing views on thanaka. An 35 year old assistant manager of Myawaddy Bank said, "I have used thanaka since I was in primary school. Nowadays, there are more cosmetics available and I sometimes use make-up, but on top of make-up I always place thanaka again as make-up is hot on my face and thanaka has a cooling effect. Unlike in the past, instead of using a piece of thanaka, I now use a ready-made paste." A finance assistant of a local NGO said, "I used to put thanaka on my face, but I heard that the ready-made one includes clay so I now use make-up and I don't use thanaka anymore." A graduate student said, "I sometimes use thanaka in the traditional way when I have time to grind it into a mixture, but I don't use it

as frequently as in the past as I don't have much time to prepare it." A male officer working for a British organization said, "Since I was young, I would always use the root part of thanaka on my face. When I went on a study trip to Thailand, my parents prepared thanaka together with the flat stone to grind it. I always placed it on my face for an hour before sleeping at night. But at work now, I don't do it because it seems peculiar to see a man with thanaka in cities."

The future of thanaka

Producers consider thanaka as a good future investment and are interested in planting more trees. In a survey of four villages in Magwe Division, thanaka was ranked overall as the crop people were most interested in planting. Prices have remained stable or have increased in past years and producers expect the demand to stay strong. There is a perception that the current demand for thanaka outstrips the supply, indicating that the product may have strong potential to increase incomes for farmers in the dry zone. Landownership may constrain the thanaka market from benefiting poorer households. A community forestry arrangement that grants individual plots to poor and landless households could allow these marginalized groups to benefit from thanaka production.

The Ministry of Science and Technology in Myanmar is currently developing a law that would allow the government to confer Geographical Indication (GI) status on specialty agricultural products. This is a type of intellectual property right linked to specific production areas or cultivation techniques and can raise the profile of specialty products while protecting their brand from imitators in other countries. Thanaka is one of the products being considered for this status, along with teas, lotus root cloth and teak wood. This designation could spur international interest in thanaka products.

There is growing interest in cultivating thanaka and the policy initiatives to support its production indicate that it is being prioritized as a product for the international market. There are clear opportunities to expand and capitalize on thanaka as a product, given its uses, its potential market value and contribution to local incomes.

Figure 8. Stone plate used to grind wet thanaka powder

NWFP benefits for the beauty sector

As discussed in Chapter 2, NWFPs have been used traditionally for beauty purposes. Soapberry has been used in India for hair and skin care preparations. Another NWFP, langsat (Lansium domesticum), is also used as fragrance and for skin lightening with other ingredients by indigenous communities in Kalimantan and West Sulawesi, Indonesia. But NWFPs have also been growing in significance to the larger mainstream beauty industry. Investigating the many benefits that NWFPs generate for the beauty sector, the reason is obvious. This chapter discusses a range of beauty benefits provided by the various case study products highlighted in this publication, with a specific focus on forest honey, seabuckthorn and Manila elemi. Particular beauty benefits of NWFPs include cleansing properties, treating blemishes and controlling oil, moisturizing, cooling, skin lightening and brightening, as a sunscreen, as a perfume or aromatic, and anti-inflammatory and anti-ageing properties, some of which are summarized below.

Cleansing properties

For many women, removing make up at night becomes a vital part of maintaining a youthful appearance because base or foundation that is left on all night will dry out the skin and clog the pores. A gentle cleanser with botanical ingredients can provide a safer, kinder way to remove make up. Regular soap can contain harsh surfactant ingredients that can strip your skin of its natural moisture. Non-soap cleansing products are milder than regular soap, and can help keep skin healthy and moisturized. NWFPs thus can provide natural ingredients for non-soap cleansers.

Treating blemishes and controlling oil

Oils produced by the body help keep skin healthy, but excess oil can lead to blemishes and acne flare-ups. Dermatologists agree that the most effective way to manage oily skin is to cleanse your face both morning and night. Many dermatologists also warn against astringent toners as they tend to irritate the skin and can lead to more oil production. Natural cleansers and toners are gentler solutions. Those with antioxidants may also reduce blemishes, such as honey. The Vietnamese medicinal spa example in this chapter provides the benefit of opening pores, removing dead skin and reducing impurities.

Moisturizing

Hydrating the skin is an important benefit sought after by those worrying about their complexion. NWFPs like honey often tops the list for keeping skin

moist up there with coconut oil, buttermilk and other natural products. Sea buckthorn fruit extraction also keeps the skin moist and hydrated.

Cooling

Creams and skin care products help revitalize the body's circulatory system. That enables valuable agents to reach the subcutaneous tissue, i.e. the place where wrinkles are created.

Many people wake up with puffy eyes because fluid can pool in the area below the eyes while sleeping, especially after having a salty dinner. Cooled moisturizers, eye care, treatment serums, make up and toners give a cooling effect will take away puffiness and boost circulation to the skin ensuring a healthy glow. Cold constricts blood vessels, thereby reducing swelling and redness of the skin. Thanaka has a pleasant fragrance and gives the skin a mild cooling sensation when applied as does soapberry.

Skin lightening and brightening

As the cream lightens the skin, it also removes various skin marks caused by uneven melanin distribution. Some of these blemishes include sunspots, age spots and freckles. Most skin brighteners also have anti-ageing effects. Brightening agents are designed to impart a natural, vivid radiance to the skin, not to whiten. Skin whitening treatments are typically a lot harsher than brightening or lightening the skin.

The Martha Tilaar company, one of the largest cosmetics companies promoting wellness in Indonesia has conducted clinical tests on the brightening effects of the langsat fruit.

Sunscreen

Sunscreen reduces your risk for skin cancer, premature ageing and sunburns. You can optimize your protection by choosing the right sunscreen, wearing it regularly and using it as directed. Thanaka is an effective sunscreen as it contains marmesin, a chemical which protects the skin by absorbing UV-A light. Women cover themselves in thanaka paste to protect their skin from the harsh sunlight while working in the fields.

Perfume and aromatics

Essential oils also help treat problems such as thinning hair or an itchy scalp and they add shine to the hair and a fresh scent to the shampoo. Other essential oils include: thyme, birch, sandalwood and parsley for fragile hair, and yarrow, lemon, Roman chamomile and rose oils, which encourage hair growth and minimize hair loss. Botanicals and herbs are widely used in deodorants because they appeal to consumers who prefer more natural products. Botanical ingredients render authentic scents of the earth. This gives opportunities for NWFPs in the industry.

Spikenard oil found in Nepal similarly has high value in perfumery and is used as an aromatic adjunct in the preparation of medicinal oils and cosmetic products. In the beauty industry, spikenard oil has been used in products like deodorants, perfumes, anti-ageing creams, soaps, air

fresheners, incense, hand and body lotions, body wash and colour cosmetics by many leading cosmetics industries at the international level.

Anti-inflammatory properties

When acne breakouts, redness, or flakiness flare up, your skin is delivering a clear message: that irritants like UV exposure, allergens, and chemicals from skincare products are throwing things off. Acute inflammation is a good sign that your immune response has been triggered and is functioning. This response may turn chronic and produce harmful hormones, enzymes, and free radicals that damage skin tissue.

Many botanical ingredients have been well-researched for their anti-inflammatory benefits. Honey is used in cosmetics to reduce inflammation and to improve tissue health, making it ideal for sensitive skin types. Bioactive compounds found in Manila elemi have also displayed anti-inflammatory activity.

Anti-ageing properties

Honey has bioactive compounds which have anti-ageing properties, particularly with the presence of anti-oxidants. Through research conducted by NTFP-EP and Jaringan Madu Hutan Indonesia (JMHI) (Sari & Bertoni, 2014), it was revealed that seven kinds of Indonesian forest honeys have anti-ageing properties in addition to anticancer activity due to the presence of certain anti-oxidants. Anti-oxidants can work to address free radicals that enter the body from the external environment including from cigarette smoke, through alcohol consumption, electromagnetic radiation from exposure to sunlight, consumption of processed foods, air pollution and so forth.

Case 4:

Forest Honey

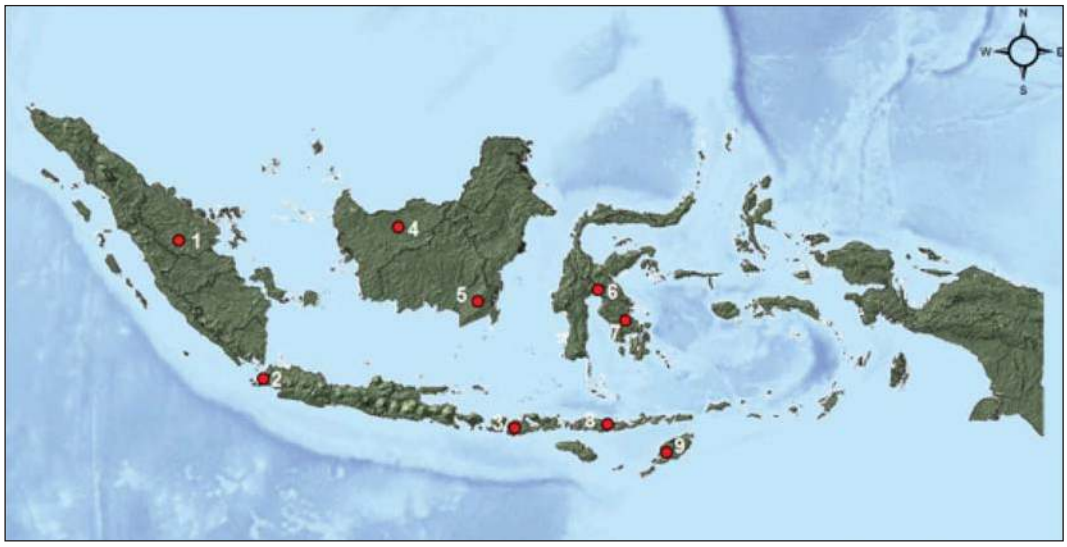
Figure 9. Huge beehives from the forest of Indonesia

Forest honey is an NWFP with great potential for the Indonesian archipelago. Forest honey is found in almost every island in Indonesia. The development of the forest honey sector is also one of the top priorities in the National Forestry Plan of Indonesia for 2010-2019.

Wild bees play an important role in multifunctional forest systems, specifically in pollination. *Apis dorsata,* the giant, native honey bees of South and Southeast Asia, need strong tree branches and nectar-producing trees and plants to maintain healthy populations. Given this symbiotic relationship, maintaining forest hives contributes to forest conservation and regeneration. Forest bees can also improve the welfare of local peoples through the production and trade of honey and its by-products. Bees produce honey, which has become a source of community income.

In line with the National Forestry Plan, the Indonesian Forest Honey Network, JMHI, has made a commitment to encourage partners, mainly forest-dwelling people, to protect forests.

JMHI was established in 2004 and is composed of community-based and regional associations of forest honey collectors, NGOs and social enterprises. It has developed into a thriving network to exchange information and upgrade the skills of its members through learning from experiences and knowledge of local and international resource persons and organizations. Key themes range from sustainable and hygienic harvesting and processing, to laboratory testing and quality control. JMHI also promotes joint market development and links forest honey producers with value chain players (Utama 2014).



Legend

JMHI Members

1. Tesso Nilo, Riau
2. Banten, West Java
3. Sumbawa, West Nusa Tenggara
4. Kapuas Hulu, West Kalimantan
5. South Kalimantan
6. Luwu, South Sulawesi
7. Uesi, Southeast Sulawesi
8. Larantuka, East Nusa Tenggara
9. Gunung Mutis, East Nusa Tenggara

Figure 10. Map of JMHI members

Source: JMHI (2014).

Dian Niaga, a Jakarta-based social enterprise, has been the marketing partner of the network since its early stages. The company has worked hard with partners to improve quality and to raise awareness and appreciation for forest honey through branding, packaging and its national distribution. Over the years, regional associations have also developed their marketing capacities and have become active in the local and regional commercialization of their honey.

In recent years, Dian Niaga, together with Borneo Chic, also a social enterprise, have developed forest honey shampoo and forest honey and virgin coconut oil-based lotion. These products are now being distributed in Jakarta. Through partners in Southeast Asia, they are also exploring other honey-based cosmetic products, such as liquid soap and other beauty and personal care products.

Biology and management of *Apis dorsata*

Apis dorsata is one of the most important bees in Indonesia and the whole of Asia. The forest is its natural habitat. *A. dorsata* is an important part of forest ecosystems. In forests, many species of plants would not survive without bees. This is because the production of seeds, nuts, berries and fruits is highly dependent on insect pollination. Bees are natural pollinators, along with bats and birds. Bees pollinate flowering plants and thereby contribute to maintaining the forest ecosystem. Without bees, there would be no flowering plants, and without flowering plants and trees there would be no bees. The bees, in turn, depend on the forest ecosystem for their nourishment and shelter. Certain tree species provide them with protection from predators, as well as the nectar which they turn into honey. A clean water source is also important for the bees.

A. dorsata naturally makes hives on branches of trees or on cliffs. When disturbed, they can become very aggressive and dangerous, making cultivation or beekeeping challenging. However, in Indonesia, and in other Asian countries like Viet Nam and some parts of Cambodia, a bee management method, called the Rafter Method, is effective, sometimes being practised over submerged areas or lakes. *Sunggau, tikung* and *tingku* are traditional techniques of 'managing' *A. dorsata* that have been practised for more than a century in Indonesia. These techniques are part of Indonesian heritage; therefore, preserving these techniques is of cultural importance (Hadisoesilo 2001).

A. dorsata differs from other bees in its genus in terms of nest design. Each colony consists of a single vertical comb made of workers' wax suspended from above, and the comb is typically covered by a dense mass of bees in several layers. The nests are mostly conical in shape and vary in size, reaching up to 1 metre in width. Each cell within the comb is hexagonal in shape. *A. dorsata* bees store their honey on the top right-hand corner of the comb and rear, the worker and drone broods in the same area. *A. dorsata* can form dense aggregations in one nesting site, sometimes with up to 200 colonies on a single tree. Each colony can have up to 100 000 bees and is

Figure 11. A nest of *A. dorsata,* consisting of a single exposed hanging comb: The bottom of the comb has a number of unoccupied hexagonal cells

Source: NTFP-EP Indonesia.

separated by only a few centimetres from the other colonies in an aggregation. In some areas though, colonies can also be distant from each other. Some colonies also exhibit patterns of nest recognition, in which they return to the same nesting sites post migration (Rumah Madu Johgja 2014).

A. dorsata lives only in subtropical and tropical Asia, in countries such as Indonesia, the Philippines, Malaysia, India, Nepal and Pakistan, and is not found beyond Asia. In Indonesia, it is still widely found in Sumatra, Kalimantan, Sumbawa, Sulawesi, Papua and Nusa Tenggara. This bee is rarely found in Java. Some of its local names in Indonesia are *manye, muanyi* (Dayak), *gong* (Java), *odéng* (Sunda), *labah gadang, labah gantuang, labah kabau, labah jawi* (Minangkabau) and *harinuan* (Batak) (Rumah Madu Johgja 2014).

Economic value at the household level, threats and sustainability issues

A. dorsata wild honey harvesting has significant economic potential. Honey from *A. dorsata* is now commercialized and readily found in the market. For some forest-based communities in Indonesia, wild honey has become an additional income source to help cover their daily needs (Osbeck et al. 2007).

Forest honey is traditionally sold in small bottles, locally known as *madu curah* or 'bulk honey'. Other products from forest beehives are wax and bee pollen. Local partners are also developing various end products, such as candles, shampoo and soap from forest bee products.

Based on the experience of JMHI, honey bees can provide additional income for forest-dwelling people through the sale of honey and its by-products (Utama 2014). In Sumbawa, for one of the JMHI members, the contribution of forest honey to family income is about USD 200 per month. Total production of all JMHI members is currently close to 70 tonnes per year. The potential production of forest honey from JMHI members alone is estimated to reach up to 200 tonnes per year (Rakib 2014).

With JMHI's intervention, prices for forest honey have increased. The price of honey rose for many of JMHI's local partners between 2008 to 2013 (Rakib, 2014). For some members it grew only 14% over the last few years but for others it grew 221%. These price increases are attributed to sustainable harvesting as well as attractive and safe packaging.

JMHI collaborates with Dian Niaga, which acts as a buyer and marketing arm for forest honey. In 2013, Dian Niaga marketed 15.09 tonnes of forest honey (Utama 2015, personal communication). Most of it was sold to Amway, a leading multilevel marketing firm of food and health care products. Dian Niaga also markets honey to health food store chains in Jakarta. Recently, another multilevel marketing firm, Oriflame, has also begun to market honey from partners, specifically from the islands of Flores, Banten and Riau.

In Danau Sentarum, West Kalimantan, an area known for large volumes of honey flow, honey harvesting occurs mainly at the end of the wet season or during the early dry season (Osbeck et al. 2007). In this area, the production of forest honey is threatened, mostly by forest fires and drought. Strong rains and floods in the past have also destroyed some hives. Illegal logging and monoculture plantation expansion are also among the threats to forest honey production.

The increasing economic value of the product can also become its potential threat. As demand for forest honey increases, there is the possibility of overharvesting, which can have an impact on the bees and their role in the forest ecology. This is why JMHI, even before working on commercialization, started with the promotion of sustainable harvesting protocols.

Under sustainable methods, harvesting is performed during the day. Only smoke is used to disperse the bees, allowing them to return to the nest once the smoke has settled. The harvest only includes the head part of the nest, which contains the honey. The head part also contains larvae, but they are left in the nest. The larvae can still be fed the remaining honey and develop into adult bees. In three weeks, the bees rebuild the head part of the hive, and it is ready for another harvest. This sustainable harvesting technique produces forest honey of higher quality while reducing bee mortality, thus preserving the bee population (Sihombing 2014).

Table 3. Price of forest honey at the farmer level (USD/kilogram)

Years/Organization	2008	2009	2010	2011	2012	2013
APDS (KalBar)	2.00	3.75	3.75	5.00	5.00	7.50
JMHS (Sumbawa)	2.50	3.30	3.75	4.50	5.00	6.25
APMTN (Riau)	1.00–1.50	1.50–1.80	1.80–2.00	2.10–2.50	2.50–2.90	3.00–3.30
KTMHUK (Banten)/Jar	2.00	–	2.50	2.50	3.00–4.00	6.25
LPMA (KalSel)/Jar	2.50	2.90	4.00	4.00	4.00	4.00–5.00
Kalotok (SulSel)	3.30	3.75	4.00	5.00	6.25	6.25
JMHU (SulTra)	–	–	2.90	2.90	3.30	3.30

Source: JMHI members, 3 February 2014.

Dissemination of sustainable harvest protocols for forest honey is important to ensure the continuity of bee populations. Sustainable harvesting of wild honey and management of *A. dorsata* habitats are critical to protecting the forest and the environment. Sustainable honey harvesting is also a solution to encourage care for bees and the forest ecosystem.

There are two subspecies of *A. dorsata* in Indonesia namely, *A. dorsata dorsata,* which is found all over Indonesia except Sulawesi, and *A. dorsata binghami,* which is found only in Sulawesi and its surrounding islands. Attempts to cultivate *A. dorsata* have failed, although in some parts of Indonesia, honey collectors have been practising traditional bee management techniques to attract *A. dorsata* colonies to artificial nesting branches made of wooden planks, where they become more accessible to the honey farmer (Hadisoesilo 2001).

In Danau Sentarum National Park, Kapuas Hulu, West Kalimantan, the traditional forest honey collection groups called *periau* travel together to gather forest honey. The *periau*, particularly in the villages of Leboyan, Semangit and Semalah, have used rafters or artificial branches called *tikung* as a honey-farming tool for a long time. The rafters are made of dead *tembesu* trees. The tree trunk is cut into pieces that are 1.5 metres long, 25 centimetres wide and 4.5 centimetres thick. The rafters look like a kite, wide in front and narrow at the back, imitating a natural branch suitable for a honeycomb. The rafters are then placed in trees to serve as homes for the forest honey bees. When the trees bloom, honey bees come to feed on the nectar and nest in the provided branches (Sihombing 2014).

In 1996, various *periau* in Danau Sentarum started practising a sustainable forest honey-harvesting technique as part of the harvesting standard set by Asosiasi Periau Danau Sentarum (APDS), an association of *periau* groups in Sentarum Lake founded in 2006. APDS further complemented the technique with a set of rules and procedures, including the obligation to watch and protect the *periau* area from logging, forest fires and poison used for fishing. The members of the association also adopted hygienic processing by committing to the use of rubber gloves, covered containers, fine and clean screen filters and clean and sharp knives. These protocols guarantee

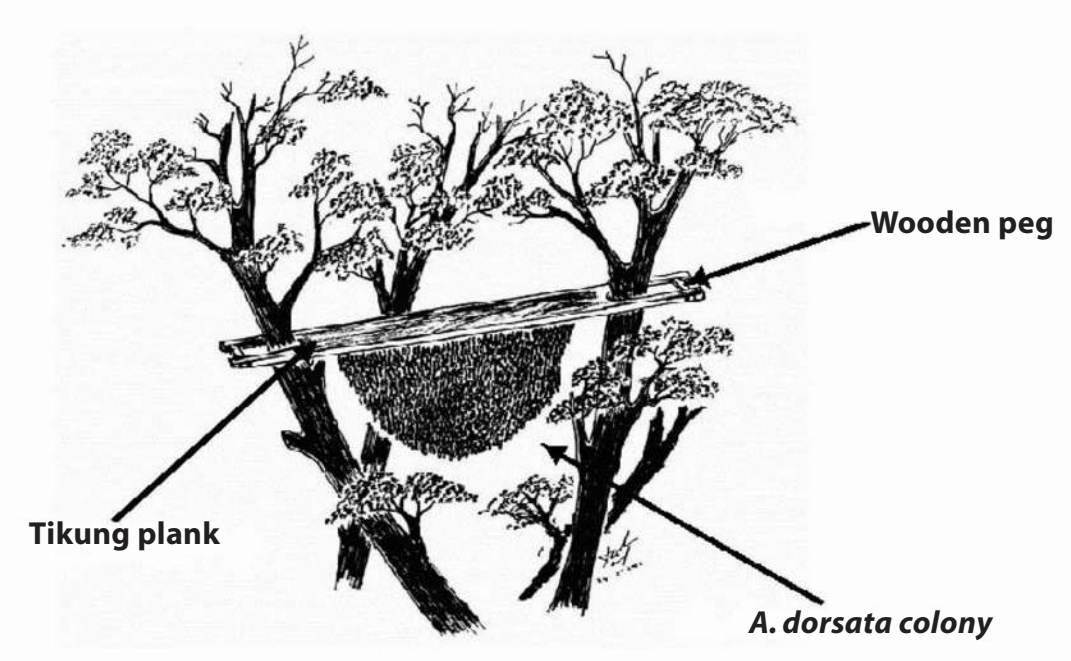


Figure 12. A rafter or *tikung*

Source: Hadisoesilo (2001).

that the forest environment is protected and that the honey is clean and free from contaminants and can be claimed as organic forest honey. Together, the sustainable harvesting technique and internal hygiene standards are called the Internal Control System (ICS) (Sihombing 2014). It plays an important role in promoting organic honey production, while contributing to the livelihoods of honey farmers or *pemuar* in the conservation area.

Key obstacles and challenges

The development of the forest honey sector faces a number of challenges regarding markets and production.

While the situation is slowly changing, markets are not yet paying a premium for the health benefits provided by honey. Forest honey for energy and for health purposes is traditionally accepted by consumers in most parts of Asia, but has long been forgotten in other parts of the world, which requires new studies and research to prove health benefits. Also, little research has been done on the benefits of honey for use in cosmetics and beauty, and its anti-ageing effects have only been recently studied (Sari et al. 2013).

Monoculture plantations are also decimating the natural honey bee habitats across Indonesia. Forest fires, whether deliberate or caused by high temperatures, destroy natural hives, and kill or drive away bees. In Riau on Sumatra island, the use of pesticide spray also poses danger to bees (Pangaribuan 2015, personal communication). Change in the environment, such as the impacts of climate change, is also a challenge. A change in climatic conditions is bound to have an impact on honey bee species, which are closely associated with their environment (Le Conte and Najavas 2008). For example, a change in flowering

season, forest fires, drought or floods affect the shelter and food source of bees.

Finally, lack of working capital has plagued the local partners of JMHI, which prevents them from purchasing honey during the honey flow season (Bradbear, 2009). In such instances, honey collectors may then opt to sell to traders who may be offering lower prices just so they can get proceeds quickly.

Health benefits of forest honey from *Apis dorsata*

Forest honey is natural, in the sense that it is free from human-produced fertilizers, antibiotics and pollution. It is recognized as a valuable natural substance with many diverse uses. It is a nutritious food, an effective medicine, a safe home remedy, and an ingredient in cosmetics (Ediriweera and Premarathna 2012).

Honey is a valuable product of nature, with health benefits and cosmetic uses being rediscovered all over the world. It also has cultural and religious significance. Honey can be used alone or in combination with other ingredients to treat various ailments such as eye disease, sore throat and stomach problems, among others. It also has the rare and invaluable quality of enhancing the properties and actions of medicinal substances with which it is combined. Due to its anti-oxidant properties, honey acts as a rejuvenator. It is also an important ingredient in beauty products as a moisturizer and conditioner (Ediriweera and Premarathna 2012).

A key research study on the health benefits of forest honey showed that it contains proteins, vitamins B1, B2 and D, and minerals such as sodium, potassium, iron, magnesium, manganese and zinc (Sulaiman et al. 2010). Sodium and potassium are macronutrients needed in large quantities daily to maintain water balance and healthy muscle function, while iron and manganese are also needed by the body but in smaller amounts. Magnesium helps to process protein and maintain muscle health. Vitamin B2 (riboflavin) aids growth and reproduction. Deficiency of riboflavin results in chapped lips, tongue irritation, itchy eyes and cataracts. Zinc assists in regulating the immune system.

Forest honey also has antibacterial qualities. Tested forest honey from Indonesia showed antibacterial activity against *Salmonella* sp., *E. coli, P. aeruginosa* and *S. aureus* (Sari et al. 2013). The factor that influences antibacterial activity in honey is inhibine. Inhibine contains hydrogen peroxide (H2O2) as a result of enzyme activity. This natural H2O2 is known as an effective antibiotic and is a primary component of some penicillin antibiotics.

Benefits of forest honey for the beauty sector

Due to its anti-ageing, moisturizing, and anti-oxidant properties, honey can be used in skin care (i.e. as antiwrinkle cream and skin moisturizer), hair care (shampoo and hair tonic), body care (soap, shower gel and body lotion), and also in make-up (face powder and lipstick) (Barwa 2015, personal communication).

Honey is suitable for all skin types, whether dry, oily, normal or combination-type skin. Honey helps to rejuvenate the skin and acts as a vehicle for other active substances, which allows for better absorption of plant extracts. Honey also eases problematic skin conditions, such as acne, red blotches and so forth, and also has preservative and antiseptic properties, which are important for products of natural origin (Barwa 2015, personal communication).

According to traditional knowledge, forest honey is known to contain high bioactive compounds, which vary depending on the multiflora bee activity, or how many and which kinds of flowers the bees pollinate. The bioactive compounds may reflect anticancer and anti-ageing qualities. Through research conducted by NTFP-EP and JMHI (Sari & Bertoni, 2014), it was determined that seven kinds of Indonesian forest honeys have anticancer activity (Sari et al. 2013). Anti-ageing activity was reflected by the presence of certain anti-oxidants, which absorb free radicals. Most free radicals enter the body from the external environment such as cigarette smoke, alcohol consumption, electromagnetic radiation through exposure to sunlight, consumption of processed foods, air pollution and others. Even stress can produce high levels of free radicals in the body.

This initial information is important in further promoting the multiple benefits of forest honey for good health and beauty, and is expected to encourage further research and spark market interest.

Honey and current trends in cosmetics industries

Honey and honey extracts are used in cosmetics and personal care products as humectants, which are substances used to reduce moisture loss and serve as fragrance and skin-conditioning agents (Cosmetics Info 2015). Honey is also used in cosmetics to reduce inflammation and improve tissue health, making it ideal for sensitive skin types. Honey has been used in baby and bath products, eye and facial makeup, fragrances, colouring and non-colouring hair products, personal cleanliness products, and suntan and sunscreen products. There is also the growing cosmeceutical sector that offers additional opportunities for honey in the beauty industry.

It is difficult to provide an exact volume or value for the honey that is used in the cosmetics industry and only estimates can be made from available data. According to the CBI (Center for Promotion of Imports in Developing Countries) market report on honey (2009), it is estimated that 85 percent of global honey exports are for food consumption. Most of the remaining 15 percent goes to the food industry, where it is used for baking, confectionery and cereals. Other markets include the tobacco industry and pharmaceuticals, but this only makes up a very small part of the demand. According to the International Trade Centre (ITC), the world imported 625 577 tonnes of honey in 2014 with a value of USD 2.32 billion (ITC 2015). Assuming that a small amount of 0.5–2 percent goes to

cosmetics, it can be estimated that USD 11–45 million worth of honey, about 3 000 to 12 000 tonnes, could be going to the cosmetics industry.

In other industries, especially in food, there is a rise in honey-flavoured food products. In fact, honey was named 'Flavor of the Year' in 2015 by Firmenich, one of the biggest flavour and fragrance companies in the world. This is mainly because of the perception of health, according to David Turner, a food and drink analyst at Mintel. In the USA, six out of ten people think that honey is good for them (Magazine Monitor 2014). This perception may be transmitted to other products, including cosmetics, an industry in which consumers are shifting to healthier options.

The growing demand for natural ingredients in the cosmetics industry may drive interest in honey in the industry. There is also a trend of food-based ingredients for cosmetics. There is a perception that if it is good to eat, then it must be good for the skin too. Examples of such products include coconut shampoo, grapefruit body scrub, mushroom anti-ageing cream, pomegranate-pigmented lipstick and cucumber eye-makeup remover.

An interesting collaboration that demonstrates the potential of this market segment is a partnership between Nestlé and L'Oreal that created the product line, Inneov, sold with the byline 'Beauty from the inside.' The products are based on the natural ingredient cocoa, which is now used in a variety of skin treatments for its anti-oxidants that are said to help delay signs of ageing, activate fat-burn and have psychological stimulating effects (Kearney 2014).

The beauty care market

The global beauty market, which includes the hair care, colour cosmetics, skin care and fragrance sectors, is estimated to have reached USD 465 billion in 2014, according to Euromonitor International research in 2015, while the global natural personal care market is worth USD 33 billion, with a 10 percent increase from 2014 (Kline and Company 2015). Brazil is reported to be the fastest-growing country in the global natural personal care market, while Asia is the fastest-growing region. Rising consumer incomes and changes in lifestyle are driving this growing market. The report highlights an increase in demand coming from both Europe and the Asia-Pacific region. Potential is seen in premium and luxury cosmetics due to the expansion of the middle class in many developing countries.

Skin care is said to be the largest segment in beauty care and offers great potential for growth, while the second-largest segment is hair care. There is a demand for multi-feature products such as a moisturizing cream that also has UV protection. As honey has applications that are currently used mainly in skin and hair care, there may be increased opportunities for honey-based products (Yeomans 2012).

Germany is the most important market for natural cosmetics in Europe, with more than 15 percent of total spending

on nature-inspired, natural and organic cosmetics. In 2014, natural cosmetics spending reached EUR 1 billion, a 10 percent increase, with an 8 percent market share of the whole cosmetics industry (Cosmetic Business 2015). This is already double that of other European markets. The Environmental Working Group (EWG) identified about 182 products that have honey extracts (EWG 2015).

Highest growth for natural cosmetics is seen in the Asia-Pacific region (35 percent market share) and Brazil – but this is for natural cosmetics in the wider sense, and includes near-natural brands, not pure natural.

According to a market analyst, the growth of the market for natural cosmetics will depend on wide distribution, product range and accessibility. While there are consumers who are able to differentiate true natural cosmetics, there are not enough outlets, and consumers expect to find natural cosmetics in the same places where other cosmetics are found. Cosmetics companies are changing their product assortments to accommodate the demand for natural products, and transparency and credibility are given much importance.

As Eva Grigar from Kline & Company reported, at the global level, other trends that can influence demand for natural cosmetics are vegan and sustainability movements. There is also a noticeable move to more organic ingredients. The USA shows a very strong trend of GMO-free products.

An interesting segment in the cosmetics market is the cosmeceutical segment – cosmetics that also deliver medicinal functions. The global cosmeceutical market potentially offers huge opportunities, although it is still at the nascent stage in the economies of Asian countries such as Japan, China and India. The target is a large untapped population, with the desire to look young and fair (Aesthetics Journal 2015). One of the known cosmeceutical products is anti-ageing skin products. According to the Global Anti-aging Products Market 2015–2019 research report (Technavio, 2015), there is an increasing demand for natural and organic ingredients in this product sector. Anti-ageing is not only for skin but also for hair. Anti-ageing hair care products, such as shampoos, conditioners, serums and volumizers, are used to address the age-related changes in the texture and appearance of hair, such as brittleness, roughness, dullness and hair loss (PR Newswire 2015). Other categories that offer potential growth for natural cosmetics and toiletries are found in baby care, bath, shower and hair care products.

Challenges for forest honey in the beauty care market

A potential challenge in the growth of honey and other natural products in cosmetics is the regulation of the EU and the USA that requires manufacturers to declare ingredients that are known to cause allergies.

Another hindrance to the potential use of forest honey in cosmetics is the supply

of honey. The unstable supply of forest honey may prevent cosmetics companies from using it as a primary ingredient. However, the popularity of honey as a health product may still drive the demand for honey-based cosmetics.

The comparatively high cost of wild forest honey may also be a hindrance for wild honey to be used as a cosmetic ingredient. If there are no chemical properties that will differentiate *A. dorsata* forest honey from farmed honey for use in cosmetics, or cosmeceuticals, then it will be difficult for forest honey to compete in the market, especially with domesticated honeys coming from all over the world at a wholesale price averaging USD 3/ kilogram or less (Andaya 2014).

Honey will also have to compete with a wide variety of natural and exotic resources being tapped by the cosmetics industry. Many of these resources are cultivated, minimizing the threat of unstable or discontinued supply. To compete, forest honey will have to find a unique beauty function and will require appropriate marketing support.

Discussion and conclusions

Forest honey is an NWFP with great potential for the Indonesian archipelago. JMHI has committed to encouraging forest-dwelling people to protect forests through the development and trade of NWFPs, specifically forest honey. Forest honey is considered a natural product, in that it is free from fertilizers, pesticides and pollution. It is an invaluable natural substance with many diverse usages. It is an effective medicine, a safe home remedy, a cosmetic and a nutrient usable by people.

Honey and honey extract are used in cosmetics and personal care products as humectants, or substances used to reduce the loss of moisture, as flavouring agents and as skin-conditioning agents. Its anti-oxidant properties may also make it an interesting ingredient in cosmetics, specifically cosmeceuticals. The high cost of wild forest honey may hinder it from becoming a widely-used ingredient. Although it is difficult to provide an exact volume or value for honey used in the cosmetics industry, trends may still drive demand for it. Further study on the properties of wild honey for cosmetic purposes and marketing support will be critical to developing wild honey as a competitive product in the global market.

Case 5:

Seabuckthorn

Figure 13. Seabuckthorn fruit

Sea buckthorn (*Hippophae rhamnoides* V.), also known as hippophae or achid gill, is a deciduous plant found in alpine arid regions or the cold desert. It is a shrub that has great value for economic development. Its fruit is rich in folic acid, vitamin C, vitamin E, polyphenol compounds and sea buckthorn flavonoids, all of which promote metabolism, enhance body functions and combat oxidants. This makes it an excellent product for health maintenance and skin care.

Sea buckthorn was first known as a remedy for horses. Its leaves and young branches were added to fodder to induce rapid weight gain and a shiny coat; in fact, 'hippophae' means 'shining horse'.

Geographical distribution

Sea buckthorn is distributed in temperate regions in both Europe and Asia and is divided into six species and 12 subspecies, of which five species and 12 subspecies are found in China. Wild sea buckthorn is widely distributed in China, mainly concentrated in Shanxi, Shaanxi, Inner Mongolia, Hebei, Gansu, Ningxia, Liaoning, Qinghai, Sichuan, Yunnan, Guizhou, Xinjiang, Autonomous Region of Tibet and another 19 provinces and autonomous regions. It has the ability to grow in various soil conditions, from those in the high altitude alpine regions of the Qinghai-Tibetan Plateau and the Loess Plateau to dry desert. It can survive in barren, saline, wet and dry areas. It can withstand extreme temperatures from -43°C to 40°C and is considered to be drought-resistant. However, irrigation is needed in regions receiving less than 400 millimetres of rainfall annually.

Sea buckthorn develops an extensive root system rapidly and is therefore an ideal plant for soil erosion control. Due to its strong tolerance to salty, dry and barren soil, it is one of the main afforestation tree species used in China, playing an important role in the rehabilitation of the ecological environment of western China. Over the past 20 years, China has established an average of 80 000 hectares of sea buckthorn annually and, as a result, its coverage had reached 2 million hectares in 2014, accounting for 95 percent of the total area in the world.

The economic value of sea buckthorn

As one of the most valuable economic plant species in the world, sea buckthorn contains natural vitamins and plenty of other nutritive materials; its rhizome, leaf, flower and fruit are full of natural goodness. Its fruit tastes sweet and sour, the average 100-gram fruit containing 453.9 milligrams of vitamin C. One hundred grams of sea buckthorn seeds contain 200 milligrams of vitamin E and 100 milligrams of vitamin A. Sea buckthorn fruit contains 20 amino acids that are essential for the body, such as oleic acid and linoleic acid. Moreover, it contains more than 200 types of substances such as the essential elements zinc, iron, calcium and copper, which are beneficial for the human body. According to Wang and He (2005), a gram of sea buckthorn fruit has 2 746 enzyme units of superoxide dismutase

(SOD), which is four times as much as that of ginseng and three times of the pea. These substances have been shown to enhance intelligence, improve resistance and immunity, prevent disease, induce anti-ageing effects and prolong life span.

Sea buckthorn as a beauty product

Sea buckthorn is used in the cosmetics industry as an important raw material; it is extracted with advanced technology to make highly purified and active sea buckthorn oil. The extraction obtained by high-temperature technology is richer in nutritious and skin care ingredients compared to plant essences extracted with more common technologies. For example, there are 2 800–3 200 milligrams of vitamin C per millilitre of extract (Li, Zhang & Shi, 2010), far more than the vitamin C content from other plants. In addition, a millilitre of sea buckthorn oil contains 5 623 enzyme units of SOD – an anti-oxidant that repairs damaged cells and promotes tissue regeneration and epithelial tissue healing (Liu, Quan, Xu-hua, 2012).

Apart from moisturizing skin, sea buckthorn fruit extract can be rapidly absorbed by a skin area suffering from acne, inhibiting infection, repairing damaged skin and restoring the normal healthy skin metabolic system. Sea buckthorn oil also has a very strong natural moisturizing effect, promotes anti-ageing and makes skin tender, smooth and supple. The oil's UV-spectrum shows a moderate absorption in the UV-B range which makes it attractive for sun-protection cosmetics (Quinni and Gerard 1993).

Market demand

In 2011, China's per capita consumption of cosmetics amounted to USD 12.00, equivalent to only one-tenth of the USA at USD 114, and one-twentieth of Japan at USD 244. Fifty percent of the Chinese population is rural and consumes significantly fewer cosmetic products compared to the urban population. With economic development, rural people are expected to consume more cosmetics with their increased income (Yi, Yuan, & Fan, 2007). With the advancement of social living standards, anti-ageing treatment, beauty salons and health care products are becoming increasingly popular. In the face of stress, young people also tend to have a high incidence of acne. It is reported that the incidence of acne in adolescents is 87 percent. According to Japan's Shiseido Chinese research institution, the number of cosmetic users in China was expected to reach 400 million by 2020. The natural cosmetics market is expected to grow at a rate of 20 to 25 percent annually. Sea buckthorn cosmetics have the effects of softening skin, refining pores, repairing damage and controlling oil, and can be used as an effective treatment for acne. As a natural product extracted directly from the plant, sea buckthorn cosmetics are in high demand and have great market potential.

Product development and capacity

Research and development of sea buckthorn products for beauty has matured in the last 20 years. The

technology and equipment used in processing it through picking, collecting, screening, cleaning, separating, extracting and using mixed preparations have been established. There are approximately 200 cosmetics manufacturers using sea buckthorn leaves, stems, fruits and seeds and production value is estimated at around 2 billion yuan (USD 394 million). There are many successful brands such as 'Beijing Gao Yuan Sheng Fruit' and 'Sea Buckthorn Beautiful Skin Cream' produced by Beijing Union Medical College, Spaceman of Heilongjiang, Beijing Risecon, Guangdong Camenae, Guangzhou Guang Yan Tang Sebes and Legendary, manufactured under the supervision of Qinghai Plateau Research Center. The Chinese market also sells sea buckthorn skin care products from the Russian Federation and Republic of Korea. These cosmetics brands have already attracted many consumers and are becoming even more popular.

Benefits to farmers

Under the harsh environmental conditions in western China, sea buckthorn's economic value especially stands out due to its tough and adaptive features. Farmers can earn income by collecting its fruits, mainly from cultivated trees. Sea buckthorn normally starts to yield fruits in the fourth year and produces on average 375 to 750 kilograms per hectare. A farmer can obtain around 1 000 yuan (USD 147) for 800 kilograms.

In Shaanxi's Wuqi County, for example, according to statistics in 2007, the sea buckthorn forest area had reached more than 120 hectares, of which 67 hectares were of bearing age. If each hectare yielded 800 kilograms, that would mean the income brought by the sea buckthorn fruits for the county would be 67 000 yuan or USD 9 849 *per annum.*

Challenges in beauty product development

Sea buckthorn product development was initially established in China in the 1980s and has achieved advances in propagation, scientific research and processing. But overall, industrialization of sea buckthorn in China still remains at a low level, as the utilization rate of the fruit is less than 10 percent. This accounts for only 30–40 percent of global production. Product development for the cosmetics industry, in particular, lacks research. There is insufficient branding, a low market share and there are no high-end products.

Among several challenges:

- There are too few specialized cultivation bases for sea buckthorn. Due to its adaptive features and high survival rate, it is generally used in afforestation and reforestation activities in northern China for its ecological benefits or preventing water loss and soil erosion. Fields that are especially developed for sea buckthorn beauty products are very limited;
- Although sea buckthorn is dioecious (having the male and female reproductive organs) and reproduces easily, high-volume

cultivation and harvesting are still challenging. The yield of fruits varies every year. After the initial plantation, bearing age is reached at four to five years, full productive age at ten to 15 years and recession in 20 years. Its life span is relatively short compared to other fruit trees and so is its economically useful period. Sea buckthorn plants have to be replaced every 20 to 30 years. Moreover, the Chinese sea buckthorn's fruit is small and has barbed branches, which can cause difficulties in managing and harvesting; and

- The industry still has scope for enormous expansion in terms of marketing. Knowledge of sea buckthorn products among consumers is minimal and the industry has not yet entered a production cycle in which resource cultivation adjusts and sustains the market demand. In northwestern China, where most sea buckthorn resources are allocated, most enterprises do not have the ability to produce high-quality products, but produce mainly low-end and similar products that are lacking in market competitiveness. Some enterprises are still experiencing quality issues, insufficient marketing strategies and poor management. The potential of sea buckthorn is still waiting to be exploited by large-scale companies with the ability to scale up production, conduct scientific research and develop consumer markets for sea buckthorn products.

Recommendations

Sea buckthorn, being a very durable plant, not only thrives under harsh conditions, but also has great potential as a beauty product source. With careful development, it can benefit both farmers and consumers. Currently in China, consumer knowledge of sea buckthorn's attributes is very limited and significant efforts to raise awareness and enhance knowledge through promotional campaigns will be a necessary step in market development. Particularly among local governments in the northwestern region, sea buckthorn could be promoted as a pillar industry to achieve growth in local economies and farmers' income. Measures to build knowledge and consensus and motivate farmers – who are ultimately responsible for production and directly benefit from it – would be useful steps in developing a more stable and productive base. Policies could be established to encourage and support plantation and industry development of sea buckthorn. Stakeholders should be motivated to provide necessary information and technology to push sea buckthorn development into a more high-end market via orchard-type cultivation as well as a large-scale and specialized production.

Enterprises should be fostered to yield more high-quality sea buckthorn beauty products. The government could undertake a variety of initiatives to support the industry including provision of preferential policies and support for processing companies, and to encourage upscaling of plantations, serializing of product lines, standardizing quality

control, intensifying production and modernizing management to boost the market.

Technology research will greatly improve the quality of sea buckthorn cosmetics. Enterprises, universities and scientific research institutions should be encouraged to collaborate and undertake research and development on a wide variety of topics including: germplasm resources, plant breeding, cultivation techniques, quality standards, storage conditions, deep-processing, packaging and transportation, cultivation of larger and stingless fruits, building stronger resistance, developing good quality plants without the need for pesticides and chemical fertilizers, and shortening the process of getting products from the land to the market.

Lastly, there should be support to increase financial investment. Emphasis on the development of the industry can be placed during budgeting, and public finance could allocate special funds every year. Banks could grant loans to planting and processing enterprises, and social capital can be mobilized to support the development of the sea buckthorn industry.

Case 6:

Manila Elemi

Figure 14. Tall Manila Elemi tree

The term 'elemi' refers to a type of resin, specifically called oleoresin, containing a considerable amount of volatile fragrant oils. While elemi can be found in different countries and from various botanical origins, it is often associated with a product from the Philippines called Manila elemi, which according to Coppen (1995) is the most internationally traded form of elemi. During the Spanish colonization period in the Philippines from the 1500s to 1800s, it was locally known as *brea blanca* (white pitch), but at present it is called *pulot ng pili* in areas where it is produced.

Manila elemi is characterized by its soft texture, clear to yellowish colour and distinct fragrant turpenic smell. A freshly collected resin is clear and transparent. With time, it diminishes its transparency and its consistency hardens as the resin decreases the oil component due to volatilization.

Biological source

In the Philippines, Manila elemi is obtained from trunks of the Canarium tree which is locally referred to as the *pili* tree. Although Manila elemi can be obtained from other Canarium species, *C. luzonicum* is the most commonly tapped species. *C. ovatum* can also be a source, but it is less frequently tapped because it produces nuts which are processed as confectionery products.

C. luzonicum is an evergreen tree growing up to 30 metres in height. It is endemic to the Philippines and can be

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Figure 15. A mature Canarium tree and a *Canarium luzonicum* tree secreting Manila elemi exudate and the machete and wooden mallet used for the traditional method of tapping

found in primary forests at low to medium elevations in Luzon as well as other islands in the country. Its conservation status is 'Vulnerable' on the IUCN Red List (WCMC, 1998), although it has thrived in cultivation in backyard plantations and along roadsides. The government has also promoted its cultivation by including it in its reforestation programme (NGP 2016).

Collection of Manila elemi resin

According to an interview conducted for this study, Manila elemi resin is extracted through the traditional method of tapping the *pili* trees, using modifications introduced at seminar-training events that aim to reduce the harm done to *pili* trees caused by extracting the resin. The improved method taught by the Department of Environment and Natural Resources-Forest Products Research and Development Institute also ensures better quality and quantity of resin (Ella and Domingo no date). Mature *pili* trees are tapped using machetes and wooden mallets at a height of around 60 centimetres from the ground. The resin is allowed to flow freely through the tapping point that is usually around 15 centimetres in length and 2 centimetres in width. The resin forms a deposit on the bark of the tree. Tapping is repeated at the same tapping point for three to four times a week to obtain higher yield of resins. The deposited resin is collected after one month.

Due to the availability and accessibility of Canarium trees in the Southern Tagalog, Bicol and Western Visayas regions, resin tapping by men, women and even children is a common activity and provides a livelihood for people. An average of 28 kilograms is collected via crude and improved methods every 15 days from an average of 15 trees. This amounts to PhP 1 770 (USD 32.78) in family income per month (Ella 2003).

Figure 16. Manila elemi is packaged in coconut shells for retail in the market or in plastic bags for export

A site visit to Manapao in Sorsogon in October 2015 established that, to date, there is no organized plantation of *pili* trees for industrial production of Manila elemi. The Manila elemi resins marketed locally and exported outside the municipality are produced by individuals who extract them from *pili* trees planted within the surrounding area of their households only. The number of trees being tapped by one individual may range from ten to 20. In Manapao, around ten to 20 persons are involved in tapping resins, known locally as *pagtatalaga*. In most instances, *pagtatalaga* is done by women because men spend more time in their daily work and women have more time in between household chores to do the tapping.

After one month of repeated tapping and deposition, around 10 kilograms of resin is scraped off and collected from the trunk of the *pili* tree. The collected resin is sold either to the market or to a collector for export to Gumaca, Quezon. The resin sold in the market is packed in half-coconut shells or rolled in leaves, while that sold for export is packed in plastic bags and stored in sacks. Tapping is usually done all year round, but the yield is highest during the rainy season. An average of 10 kilograms per tree per month can be obtained during this season.

Traditional uses and local trade

Freshly-tapped resin is traditionally used for topical application to relieve pain and heal wounds. The crude and raw Manila elemi resin sold in the local market for PhP 12–30 (USD 0.25–0.63) per kilogram is used for kitchen woodfire lighting and for caulking of boats. Other producers sell their yields to collectors for approximately PhP 50–55 (USD 1.05–1.15) per kilogram. The collector then exports the product to a known and pre-arranged buyer in Gumaca, Quezon. Based on an interview with a collector, the supply of raw Manila elemi is also provided by producers from other areas in the municipality and from other towns in Sorsogon. Local markets from nearby towns and provinces of the Bicol region also sell crude and raw Manila elemi resin.

Export industry

Records show that at the start of the twentieth century, Manila elemi was exported in considerable quantities from the Philippines to Europe and China (West and Brown 1929). In 1916, 104 311 kilograms of Manila elemi were exported at a value of PhP 48 852 (USD 1 017.75). Coppen (1995) noted that 600 000 kilograms of the resin were exported in 1990. High income was reported in 1996 at USD 947 000 and in 2011 at USD 977 000 (Ella, 2000).

The exported resin is classified into two types according to its quality. Resins which are more yellowish and opaquer are exported for use as raw material for the local manufacture of monobloc furniture, as an additive to the production of rubber pump belts and in preparation of asphalt. Resins of clearer and more transparent quality are exported to foreign countries for the manufacture of perfumes. The exported Manila elemi resin is used for a number of perfume products on the international market. Famous international brands,

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Figure 17. The bolo and wooden mallet used for tapping the trunk of Canarium tree and the traditional method of tapping

mostly based in Europe, have formulated perfume and other beauty products that contain oil of Manila elemi as a major or secondary component.

Challenges and opportunities related to the market potential of Manila elemi in the Philippines

While Manila elemi has gained recognition in the international trade market as a component of expensive perfume brands, it is evident from a simple market analysis, that the local producers in Sorsogon are not able to get maximum, or even optimum, benefit of the Manila elemi as a product because it is sold as a raw material at a low price. The huge discrepancy between the selling price of the raw material at a cost of as low as PhP 50 (USD 1.05) per kilogram and the cost of a finished product that is a hundred-fold higher indicates the need to look for ways to add value to this locally-available product. It is envisioned that value adding to the resin would increase the profit of the local producers, thereby improving their livelihoods.

A number of merchants also sell the product online to domestic and international clients. Depending on the amount of the resin and its grade, the current price may vary from USD 30 to USD 1 000 per 40 kilograms.

Components of Manila elemi and their market potential as a beauty product

Analysis of the components of Manila elemi resin is likely to play an important role in value addition to the raw material. Determining the components

will allow an advantage to the producers of the resin to process the raw material into other products of higher value.

Manila elemi, being an oleoresin, is composed of two major products: the oil and the resin. A study by McNair in 1932 cited that the oil comprises 20 to 30 percent of the Manila elemi but a more recent study by Villanueva et al. in 1993 revealed that it yields a lower 18.54 percent of oil from the resin. Being volatile, the essential oil can be separated from the resin, or the non-volatile components, through steam distillation. Plant-based essential oils such as Manila elemi are non-water-soluble liquids and have distinct fragrance.

Essential oil from Manila elemi

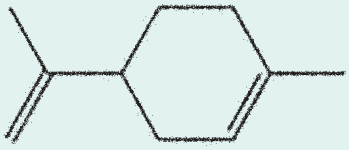
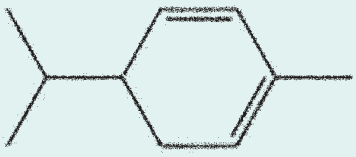
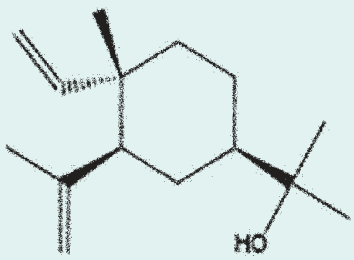
Manila elemi oil is traditionally used for varnishes and as a binding medium for paintings. At present, Manila elemi oil is sold online at USD 34 per 100 millilitres (Only Natural Essential Oil, 2015).

Freshly extracted Manila elemi oil has a citrus-like fragrant smell and a pale-yellow colour. Due to its fragrant smell and pale colour, Manila elemi oil has been used as a base for perfumes, colognes and body sprays of famous, and expensive, international brands. In addition to its fragrant smell, Manila elemi oil has gained recognition as a natural ingredient for skin care due to its capacity to promote collagen-building and increase cell turnover. Locally, the oil has been formulated into a facial wash and face toner. It has also been used as an active ingredient in soaps and creams due to its antimicrobial activity against several micro-organisms. A local brand has also formulated a feminine hygiene wash using Manila elemi oil.

Further investigation of each of its components will provide more information on the potential of Manila elemi oil as a beauty product. Villanueva's study (1993) indicated the presence of limonene as the major component (56.02 percent). Moreover, α-phellandrene, elemol and sabinene were also found to be present in the oil. A closer look at these components will show that they are actually biologically active phytochemicals which are known to have effects on human health. Particularly, it is a cosmeceutical, a term used for pharmaceuticals which are used for nourishing and improving the appearance of the skin, and are also documented as effective agents for treating various dermatological conditions (Biesalski et al. 2009).

According to McCullough and Kelly (2006), skin ageing is the result of a complex biological process that is affected by both genetic and environmental factors. Environmental factors such as exposure to UV rays, cigarette smoke and other pollutants initiates oxidative stress of the skin and contributes to the natural ageing that leads to the production of free radicals and reactive oxygen species (ROS). These free radicals and ROS are responsible for a cascade of reactions resulting in cell damage. In effect, the presence of ROS, and its accumulation that leads to inflammation, plays a pivotal role in the ageing process (Podda and Grundmann-Kollmann 2008; Pillai et al. 2005). To neutralize free radicals and to combat the harmful effects of ROS and

Table 4. Major components of Manila elemi oil (Villanueva et al. 1993), their bioactive properties and other characteristics

	Amount in Oil	Investigated bioactive properties	Reference
Limonene 1-methyl-4-(1-methylethenyl)-cyclohexene 	56.02%	a. clinical trials as an alternative cure for cancer	Gould M.N. (1997); Vigushin DM et al. (1998)
		b. anti-microbial	van Vuuren and Viljoen (2007); Yousefzadi et al. (2013); Singh et al. (2015)
		c. anti-oxidant	Albano et al. (2012); Wu et al. (2013)
		d. anti-inflammatory	Kummer et al. (2013); Sumiwi et al. (2015); d'Alessio et al. (2013)
α-Phellandrene 2-methyl-5-propan-2-ylcyclohexa-1,3-diene 	17.56%	a. anti-inflammatory (of phellandrene-containing essential oils)	Carrera-Martínez et al. (2015); Pinheiro et al. (2015)
		b. anti-oxidant	Kazemi (2015); Obadiah et al. (2012)
Elemol 2-[(1R, 3S, 4S)-4-ethenyl-4-methyl-3-prop-1-en-2-ylcyclohexyl] propan-2-ol 	6.28%	a. prevention of microorganism infection and skin troubles	Yang et al. (2015)

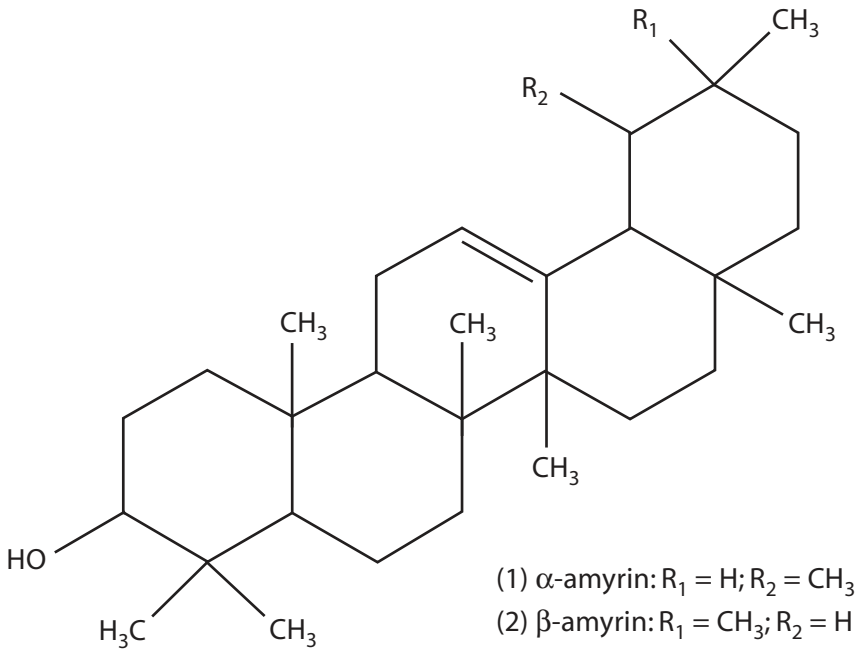


Figure 18. Chemical structure of α- and β-amyrins

inflammation, the human body needs to increase its levels of anti-oxidants that exhibit protective effects against oxidative stress. Various studies have already established the potential of anti-oxidants to neutralize free radicals (Reyes et al. 2014; Halliwell 2012), to arrest further oxidative stress (Halliwell 2012) and to prevent and reduce inflammation (Reyes et al. 2014; Zhang et al. 2011).

As oxidative stress is a primary reason for skin ageing and other dermatological conditions, cosmeceuticals, with proven anti-oxidant, anti-inflammatory activity, could be useful not only for improving the appearance of the skin but also for prevention and delaying of skin ageing (Singh and Agarwal 2009). Manila elemi oil could be a potential source of these cosmeceutical ingredients.

In addition to anti-oxidant and anti-inflammatory activities, the ability of phytochemicals to act as antimicrobial agents has been extensively studied recently to investigate the possible natural alternatives for synthetic antibiotics. The emerging resistance of micro-organisms to various synthetic antimicrobial drugs poses a serious health concern and has become the driving force to consider the antimicrobial potential of plant-based and plant-sourced bioactive compounds. A number of studies have already been published about the antimicrobial activities of bioactive phytochemicals against many different types of micro-organisms (Soković 2010; Tamilarasi and Ananthi 2012; Tulasi et al. 2015).

Bioactive compounds such as limonene and elemol are being studied in relation to their potential in preventing cancer, heart disease, and other ailments. While Manila elemi oil and its components have not yet been analysed for their bioactive components and other special characteristics; there is a vast range of literature about potential compounds found in the plant. The availability of such add value to Manila elemi. If processed separately, they can be added into beauty products as cosmeceuticals, which will add commercial value.

Unlike its oil, limited studies have been conducted on the components of the resin (non-volatile portion) of Manila elemi. In addition, few beauty products have been formulated that use the non-volatile portion of Manila elemi. An international cosmetic brand carrying a line of beauty products has investigated and studied a procedure for extracting a compound, elemi PFA, from the resin that is capable of stimulating tensin expression which is responsible for the preservation of the shape and vitality of cells, for a maximum level of skin density and suppleness. Elemi PFA is a key ingredient in the company's sculpting, firming concentrate and firming mask products. The patent for Elemi PFA has been classified under A61k8/97 – Cosmetics or similar toilet preparations characterised by the composition containing materials, or derivatives thereof of undetermined constitution from algae, fungi, lichens, or plants; from derivatives thereof.

Only a few scientific investigations have been able to identify the components of Manila elemi resin. In the study of Hernández-Vázquez et al. (2010), the highest amount of α- and β-amyrins was found in Manila elemi resin compared to other plant-derived resin samples used in the analysis. De la Cruz-Cañizares et al. (2005) also found the presence of α- and β-amyrins in Manila elemi resin. However, the study also showed the susceptibility of amyrins towards natural and induced oxidative degradation.

In published studies, α- and β-amyrins from other plant sources and plant extracts containing α- and β-amyrins have been found to possess anti-oxidant and free-radical scavenging activities (Fabiyi et al. 2012; Sunil et al., 2014; Singh et al., 2015), anti-inflammatory activity (Santiago et al. 2014; Melo et al. 2011; Krishnan et al. 2014) and antimicrobial activity (Chung et al. 2011; Musini et al. 2015). Commercially, amyrin, specifically the α-isomer, is marketed as the main terpene component of shea butter.

Recommendations

The Philippines, being the primary producer of Manila elemi, should be at the forefront of profitable opportunities arising from its products. However, because the country exports raw, crude and unprocessed material, the local producers are not able to maximize its full potential as a product.

It is highly recommended to establish a comprehensive research study on the components of Manila elemi to determine alternative uses for the product. In determining the components of a product, more products of higher value may be developed with better success. There is still a wider area of research to pursue, especially in the components of the non-volatile portion of Manila elemi. At present, very little is known about these components and therefore, its use in beauty product formulation is still limited.

In addition to research, there are also considerable opportunities for development of techniques and technology to process, minimally or fully, Manila elemi. Even a small amount of processing, like purification of the crude material and extraction of oil, allows better income for the local producers. Establishing a community-based technology would provide greater opportunity for local producers of Manila elemi to process their own produce and more fully reap its benefits.

Figure 19. Seabuckthorn fruit

Trends in the beauty and cosmetics industry

General

The value of the global beauty market is estimated to have reached USD 465 billion in 2014, according to Euromonitor International research in 2015. The global natural personal care market is worth USD 33 billion, with a 10 percent increase from 2014 (Kline and Company 2015), Brazil is reported to be the fastest growing country market and Asia is the fastest growing region. Rising consumer incomes and changes in lifestyle are driving this growing market. Potential is seen in premium and luxury cosmetics due to the expansion of the middle class of many developing countries.

Natural and organic

Natural and organic cosmetics have become a major trend in recent years. This has been driven by various factors such as the growing awareness that we are responsible for the world in which we live and on the increasing concern for one's own health (Barwa 2016). There is also a growing recognition that physical appearance must be balanced with caring for inner beauty and health. Finally, consumers are growing more concerned about wellness/fitness with a growing awareness about holistic health. This has revolutionized the cosmetics market.

Figure 20. Natural beauty trends

Source: Martha Tilaar Group.

In reviewing natural beauty trends in the twentieth and twenty-first centuries, it can be seen that while the 1950s and 1960s had the world focused on modern western looks, this changed in the 1970s with a back-to-nature look, possibly also fuelled by the peace movement. The first decade in the twenty-first century saw interest in organic cosmetic markets that stimulated the trend toward total holistic beauty. By 2010 wellness cosmetics founded on green science was the driving force while in 2015 ethical beauty, sustainability and traceability were driving forces (Barwa 2016). This is illustrated in Figure 20.

A report by Eva Grigar (from Kline and Company) notes that, at the global level, other trends that can influence demand for natural cosmetics are vegan and sustainability movements. There is also a noticeable move towards more organic ingredients. The USA shows a very strong trend for GMO-free products.

The forecast for natural-based cosmetics is good but market analysts do not expect the sector to overtake mainstream products in sales. They project, however, that manufacturers will increase the amount of natural ingredients in their products to meet consumer demand.

Beauty product trends

White skin

Skin care is the largest segment in the beauty care market and continues to offer major potential for growth. This is illustrated in Figure 21. There is demand for multifeature products such as moisturizing creams that also have UV protection properties.

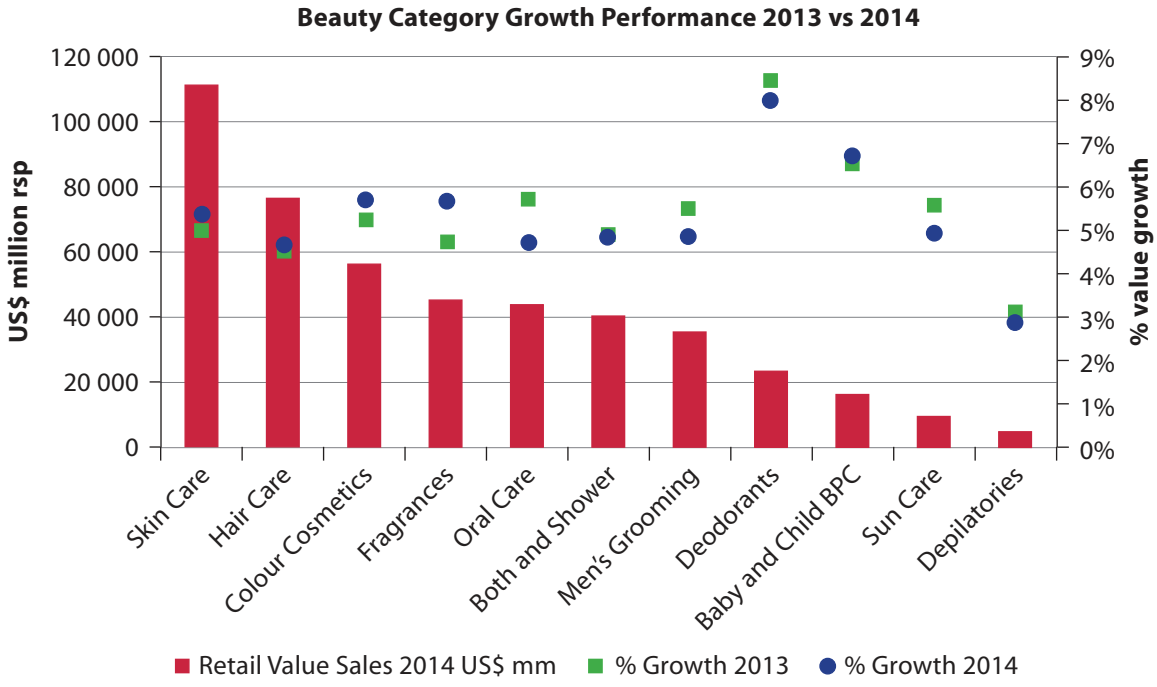


Figure 21. Beauty category growth performance, 2013 vs 2014

Source: Euromonitor International.

Having white skin is considered highly desirable for most Asian women because beauty is synonymous with white skin (Barwa 2016). Global Industry Analysts reported that the global market for skin lightening products was estimated to be worth USD 10 billion in 2015. Asian markets dominated lightening products with a value of USD 2 billion in 2012.

Beauty and medicine

An interesting rising segment in the cosmetics market is cosmeceuticals – cosmetics that also deliver medicinal functions.

According to *Global cosmeceuticals market outlook 2016*, the global cosmeceutical market offers huge potential, although it is still at the nascent stage in Asian countries such as Japan, China and India. The target is a large untapped population, with the desire to look young and fair.

With the advancement of social living standards and concomitant anti-ageing awareness, beauty salon establishment and health care concerns, it is anticipated that such trends will be very influential towards beauty product purchases. Growing stress levels of a young working population have also led to higher incidences of acne in countries like China (He Riu et al. 2015). Natural cosmeceuticals are thus being sought after. Natural cosmetics such as sea buckthorn-based products that soften skin, refine pores, repair wounds and control oil can be used as an effective treatment for acne and capitalize on the demand for facial treatments.

Defying age

As in the general cosmetics market, skin care and hair care are major segments in the global cosmeceutical market. One of the better-known cosmeceutical products is anti-ageing skin products. According to the Global Anti-aging Products Market 2015–2019 research report, there is an increasing demand for natural and organic ingredients in this product sector. Anti-ageing treatments also target hair products such as shampoos, conditioners, serums and volumizers to address age-related changes in the texture and appearance of hair; over time, hair can become brittle, rough, dull and prone to thinning.

Anti-ageing and anticancer studies have been conducted for forest honey in Indonesia (Sari and Bertoni 2014); they support the argument that forest honey is high in bioactive compounds and antioxidant activity, acting to neutralize free radicals and prevent ageing.

Synthetic vs. plant-sourced bioactive compounds

Another emerging trend in beauty products is cosmeceutical companies' interest in using plant-sourced bioactive compounds in lieu of synthetic varieties. The emerging resistance of micro-organisms to various synthetic antimicrobial drugs poses a serious health concern and has become the driving force for considering the antimicrobial potential of plant-based and plant-sourced bioactive compounds. This provides opportunities for forest products such as Manila elemi which has bioactive

compounds known to have antimicrobial (van Vuuren and Viljoen 2007; Yousefzadi et al. 2013; Singh et al. 2015), anti-oxidant (Kazemi 2015; Obadiah et al. 2012) and anti-inflammatory properties (Kummer et al. 2013; Sumiwi et al. 2015; d'Alessio et al. 2013; Carrera-Martínez et al. 2014; Pinheiro et al. 2015).

Consumer needs

A Data Monitor Consumer survey in 2013 revealed the following consumer needs: a time-saving element (easy to apply or use), value for money (minimizing the amount of money spent on beauty), instant gratification (results achieved quickly) and enjoyable experience (pleasant feeling on the skin) (Data Monitor Consumer 2015). These factors influence the opinion of a person on health and beauty products. If a natural cosmetic product can achieve the aforementioned elements, it is likely to have good uptake.

Geographic trends in production and consumption

Europe

European markets for natural cosmetics products are growing with country leader being Germany (Cosmetic Business 2015). In general, growth of the market for natural cosmetics is expected to be based on wide distribution and continued demand. Consumers expect to buy natural cosmetics where they buy other cosmetics and skin care products. In Germany, major retailers offer their own certified natural cosmetics brands. The main market leader/distributor is the drug store. Cosmetics companies are changing their product assortments to accommodate the demand for natural products, and transparency and credibility are given much importance.

Asia

In the last few decades, there has been a radical change in the formulation of cosmetic and personal care products by beauty companies, even in Asia, as consumers are paying more and more attention to natural, organic and safety claims. The cosmetics industry has been able to respond to changing consumer preferences for chemical-free cosmetic formulas and to switch to natural and organic cosmetic compounds, which are replacing harmful synthetic substances throughout the entire supply chain. The beauty industry is progressively going green and is moving toward an ecofriendly and ethical dimension. The herbal shampoo market alone in India has been estimated at USD 6 million and is growing.

In Myanmar, there are changing perspectives about thanaka (*Limonia acidissim*a L. syn. *Hesperethusa crenulata Roem* syn. *Naringi crenulata*) especially among urbanites who may be ashamed to have the yellow color across their face at work, but it is still assumed that 90 percent of women use thanaka daily. (Foppes et al. 2011). Exports of thanaka cosmetics are growing to Thailand, Malaysia, Singapore, and the Philippines.

The cases featured in this chapter are *Lansium domesticum* Corrêa from Indonesia, *D. alatus* from Cambodia and *Sterculia foetida* from Viet Nam. *Lansium domesticum* Corrêa or 'langsat' as known

locally, has been developed by the Martha Tilaar Group from a product only traditionally used by the indigenous people of Kalimantan and Sulawesi, to a successful, national brand Sari Ayu Putih Langsat. *D. alatus,* on the other hand, whose oleoresin and essential oil are used in the perfumery industry, is not as commercially known and commonly used. *D. alatus* faces many challenges considering lack of interest in processing the product, an onerous permit process and the conversion of forest areas for economic land concessions. For *Sterculia foetida,* sustainability is also an issue but this is more related to uncontrolled harvesting and inappropriate tapping techniques. The gum and leaves of the plant are very promising for skin care, pigmentation and acne treatment, yet value addition by small producers is still at a very basic level with products largely unable to compete with internationally known brands.

Case 7:

Langsat

Figure 22. Langsat fruit

Langsat (*Lansium domesticum* Corrêa syn. *Lansium parasiticum)* of the Meliaceae family, is a tropical forest fruit originating from Southeast Asia. Local names in various countries are *langsat, duku, dokong, longkong* (Brunei Darussalam); *langsat* (Cambodia); *langsat, duku, kokosan* (Indonesia); *langsat, duku, duku-langsat, dokong* (Malaysia); *lanzones, duku, longkong* (the Philippines); *longkong, langsat, duku* (Thailand); *bon-bon* (Viet Nam); *langsat* (Myanmar); *lan sa* (China); *lan sa guo* (Taiwan, Province of China); *langsat, langsep* (Denmark); and *kokosan, langsep* (Netherlands) (ASEAN Stan 8 2008; Heyne 1987; Verheij & Coronel 1992; MMPND 2007).

Langsat is widely cultivated in most Southeast Asian countries and it also thrives in southern India, Sri Lanka and Central American countries. In Indonesia, langsat is cultivated in forests or in gardens; it is widely distributed in Sumatra, Kalimantan, Java, Sulawesi and Papua (Heyne 1987; Verheij & Coronel 1992).

Langsat is a slender tree, 10 to 20 metres in height, with a straight trunk, slender upright branches and an irregular or rounded crown. Leaves are large and divided into five to seven alternately placed leaflets and one terminal leaflet. The leaflets are dark green and shiny on the obverse side, light green and dull on the reverse side; they are 150 to 200 millimetres long and 60 to 100 millimetres wide. The leaves are faintly hairy on the underside.

Collection

Langsat normally has one or two crops each year, from April to September.

Fruits are normally harvested when all the fruits on each bunch have turned full yellow in colour. Under ambient temperatures, the ripe fruit does not remain marketable for more than four days, mainly because of browning of the pericarp. However, when fruits are treated with a benomyl dip and stored at 15°C in an atmosphere of 5 percent oxygen and in the absence of carbon dioxide, they can remain in good condition for more than two weeks (Pantastico & Abilay 1969).

In several ASEAN countries, the market demand is greater for fully tree-ripened fruits than for those just maturing. Whole bunches are cut off with a sharp knife or secateurs. Fresh fruit is sold both on the bunch and as single fruits.

Cultivation

Cultivation of langsat is done mainly in two ways: either through cloning or by planting seeds. Both are commonly done at the farmers' level, where cultivation from cloning material results in faster fruiting but with a shorter life span than plants grown from seed.

Seeds are grown in a polybag. Before seeding, the seeds are dried first under the sun for five to seven days. While waiting for dried seeds, polybags are filled with a planting medium such as soil mixed with compost or manure and sand. Seeds are planted in the polybags at about 2–4 centimetres below the surface. Watering is done twice a day regularly. The planting area is then prepared by making holes of 50 × 50 × 50 centimetre dimension and allowing the sun to rid the holes from pests and disease. After the seedlings in the polybags grow as

high as 10–20 centimetres, with a few leaves, the seedlings are ready to be moved to the planting holes in the field. Daily watering is important and organic fertilizer is applied every three months. With intensive care, the plant will start fruiting after around five years.

For seedlings derived from cloning, if the grafting process has taken root, then the branches can be cut and directly planted in a larger planting hole (80 × 80 × 80 centimetres) compared to seedlings derived from seed. Land preparation and crop maintenance is similar for both methods. With intensive care, graft seeds will be able to produce fruit in the season faster than the seed cultivation method.

Langsat is cultivated in individual gardens and no large plantations or estates have been established. Planting sources currently used in the beauty industry are farmers in East Kalimantan in Kutai Barat District, in the subdistrict Mook Manaar Bulatn, in the villages of Sakaq Tada, Sakaq Lotoq, Gadur and Muara Jawaq. Additional stock is also sourced in the Sumatran regions of Jambi and Palembang if necessary. The size of the area currently being cultivated has not yet been estimated.

Threats to sustainability

Although mostly ignored in the past, tropical fruits have received high priority among horticultural crops for agricultural development during the last few decades. During this period, there was significant growth in tropical fruit production in Asia, with India, Indonesia, Thailand and China contributing almost half of the total global fruit production. This has contributed to improving the livelihoods of rural farming communities.

Rapid agricultural development and industrialization, changing land-use patterns, large-scale deforestation, the expansion of monocrop plantations in forest areas, such as in Sumatra, Kalimantan, Sulawesi and Papua New Guinea, have reduced the availability of freshwater and degraded soils. These factors have also adversely affected local communities, which are dependent on ecosystem services and products provided by forests, and are serious threats to biodiversity and the production of tropical forest fruits.

Ethnobiological and ethnopharmacological properties

The Dayak Ngaju indigenous community of Kapuas District in Central Kalimantan has used the seeds of langsat as an anthelmintic to fight infections and parasitic worms (Najamuddin 2001). Langsat has also been effective when used to produce mosquito repellent against *Aedes aegypti* (Verheij & Coronel 1997; Arbiastutie and Muflihati 2008). The Dayak Seberuang indigenous community, on the other hand, has used langsat to treat malaria. Langsat has also been used for its fragrance and for skin lightening purposes, along with six other ingredients as produced by local communities in Kalimantan and in West Sulawesi (Arung 2015).

Besides being a delicious fruit, langsat also has therapeutic benefits and contributes significantly towards improved human nutrition and health. It

contains the antimicrobial compound Lansioside D, that, isolated from the fruit peel, is remarkably effective against the Gram-positive *Bacillus subtilis,* and has also been moderately effective against the Gram-negative bacteria *Escherichia coli* (Marfori et al. 2015).

The Martha Tilaar Innovation Center, located in Jakarta, Indonesia, has reviewed the langsat fruit for its cosmeceutical value, particularly for its anti-oxidant, moisturizing, whitening and lightening effects. Martha Tilaar is one of the largest cosmetics companies in Indonesia and has developed its brand based on indigenous wisdom and natural ingredients. Martha Tilaar has stores in Indonesia, Malaysia and Singapore.

Chemical composition

The edible portion of langsat is 68 percent of the fruit weight, where every 100 grams consist of 84 percent water, a small amount of protein and fat, 14.2 percent carbohydrates (mainly reducing sugars, predominantly glucose), 0.8 percent fibre, 0.6 percent ash, 0.019 percent calcium, 0.275 percent potassium, some vitamin B1 and B2 and just a little vitamin C. The energy value of langsat fruit is 238 kilojoules/100 grams.

The fresh peel contains 0.2 percent of a light-yellow volatile oil, a brown resin and reducing acids. A dark, semiliquid oleoresin can be obtained from the dried peel, which is composed of 0.17 percent volatile oil and 22 percent resin (Heyne 1987; Verheij & Coronel 1992).

The following components can be isolated from langsat seeds: five tetranorterpenoids, domesticulide A-E, 11 known triterpenoids and six classes of limonoids (andirobin derivates, methyl angolensates, mexicanolides, an azadiradione, onoceranoids and dukunolides) (Tilaar et al. 2008).

Development of Sari Ayu Putih Langsat products

Background

The Sari Ayu brand was created by Dr Martha Tilaar in 1970. The brand has as its special mission to beautify Indonesian women and women of the East. Sari Ayu refers to the holistic beauty philosophy of Rupasampat Wahyabiantara, which balances inner and outer beauty. This brand uses products from the wealth and diversity of Indonesian resources, analyses beauty trends and applies green science and technology as a basis for product development.

Having white skin is desirable for many Asian women, because, in most Asian cultures, beauty is synonymous with white skin. Based on the report of Global Industry Analysts (GIA), the global market for skin lightening products was estimated to be worth USD 10 billion in 2015 (Whiterskin 2009). The same report showed that Asian markets dominated the lightening products sector with a value of USD 2 billion in 2012.

The Martha Tilaar Innovation Center (MTIC)

Green science is at the core of the code of conduct of the MTIC. The centre promotes green resources, green product development activities and green production to achieve green products.

Figure 23. The green science of the MTIC, showing how natural elements and methods permeate all MTIC products and processes

Source: Presentation by Nuning Barwa on "Sariayu Putih Langsat Green Science"at the FAO-Asia Pacific Forestry Week Forest and Beauty Session, February 26, 2016, New Clark City, Pampanga, Philippines.

Research and development of Sari Ayu Putih Langsat products

As illustrated in Figure 24, langsat has experienced a rigorous research and development process that integrates indigenous knowledge with cutting-edge laboratory testing and prototyping before a final formula is produced and registered.

The research has shown that the dried hydroethanol extract of *L. domesticum* fruit can be used as an ingredient for cosmetics. It functions as a skin care product for skin depigmentation and moisturizing. The recommended dose of the liquid extract is 2–5 percent (Tilaar et al. 2007).

In vitro studies on biological activities

From *in vitro* studies, it was shown that the extract of *L. domesticum* has anti-oxidant activity against the free radical DPPH and antityrosinase activity (Vanni 1990; Shimada 1992; Tilaar et al. 2007; Tilaar et al. 2007).

Dosage and safety

Dermatological safety evaluation was performed using the Repeated Opened Patch Test (ROPT) and Single Closed Patch Test (SCPT). ROPT showed that *L. domesticum* extract did not cause any irritation or allergic skin reaction. The SCPT showed that with concentrations of 1 percent and 3 percent, the extract

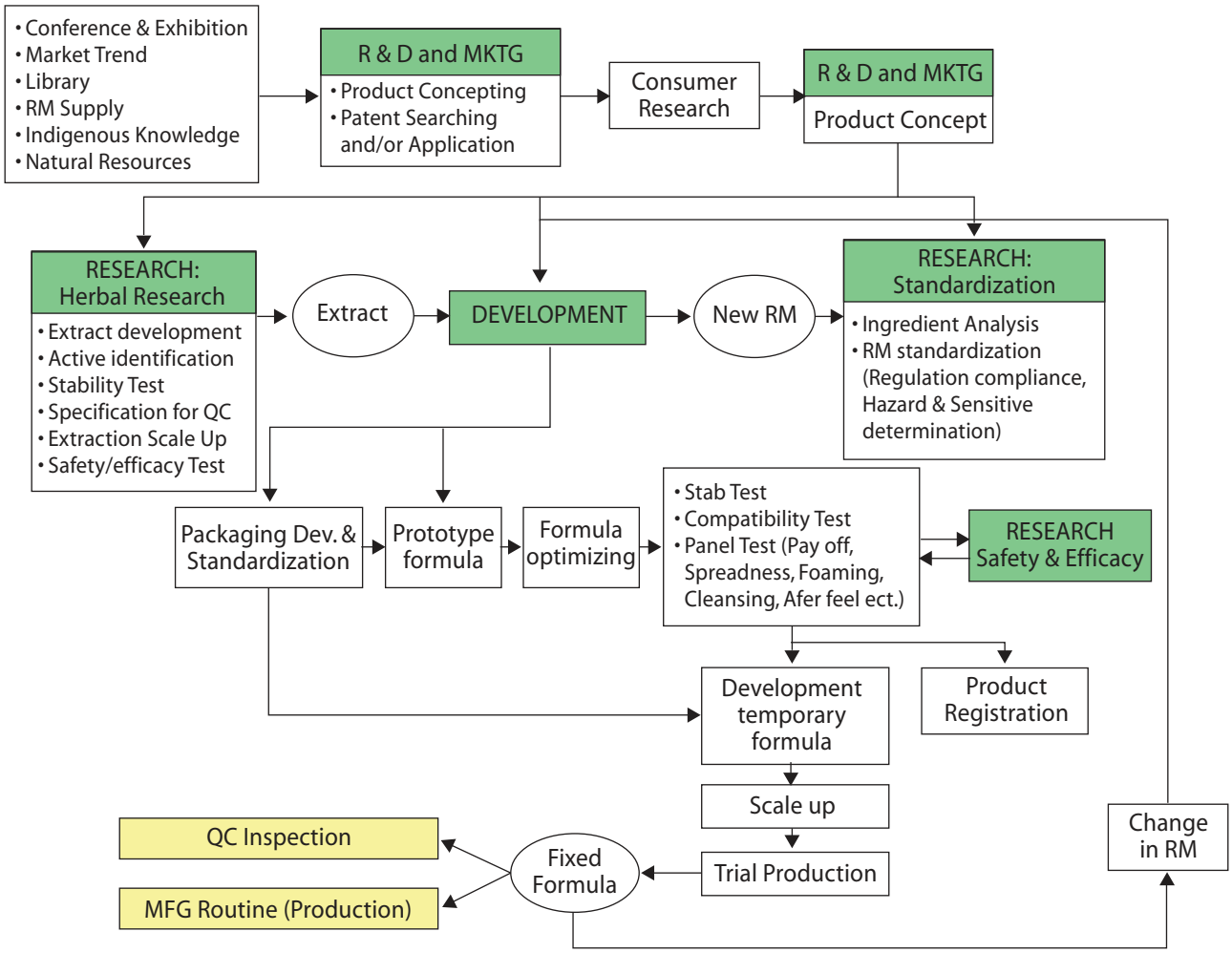


Figure 24. The research and development scheme of Sari Ayu Putih Langsat

Source: Presentation by Nuning Barwa on "Sariayu Putih Langsat Green Science"at the FAO-Asia Pacific Forestry Week Forest and Beauty Session, February 26, 2016, New Clark City, Pampanga, Philippines.

did not cause any irritation or allergic skin reaction in all volunteers, while a concentration of 5 percent caused irritation in 1.9 percent of all subjects. According to the Hen's Egg Testing of Chorioallantoic Membrane (HET-CAM) method, 50 milligrams of *L. domesticum* extract in a lotion base was applied onto the chorioallantoic membrane and left in contact for 20 seconds. The membrane was then evaluated for five minutes for any appearance of hyperemia, haemorrhage and opacity (Curry 1991; Serup and Jemec 1995; SCCNFP 2000; Tilaar 2007b; Luepke 1985; Tilaar et al. 2008).

Clinical study on skin moisturizing and lightening effects

Clinical studies on langsat's skin moisturizing and lightening effects were performed according to Good Clinical Practice on a panel of 30 female volunteers aged 32–52 years for four weeks. Skin moisture content was measured using the Corneometer CM 820. The skin lightening effect was measured using a Mexameter MX 16 and data were statistically evaluated. The results showed that *L. domesticum* extract could significantly increase skin moisture content and decrease the skin melanin

Figure 25. Sales' growth of the Sari Ayu Putih Langsat series

Source: Presentation by Nuning Barwa on "Sariayu Putih Langsat Green Science"at the FAO-Asia Pacific Forestry Week Forest and Beauty Session, February 26, 2016, New Clark City, Pampanga, Philippines.

index (Serup and Jemec 1995; Anonymous 1998a; Anonymous 1998b; Tilaar 2007a; Tilaar et al. 2008).

Based on these studies, the Sari Ayu Putih Langsat product collection was developed.

Sari Ayu Putih Langsat products have also gone through safety evaluation tests.

Economic and commercial value

Analysis shows very rapid growth in sales of Sari Ayu Putih Langsat products with sales contributions reaching over 60 million Rupiah or USD 5 137 000 in 2015 as shown in Figure 25. The Martha Tilaar company has intellectual property rights (IPR) for the use of langsat in the Sari Ayu Putih Langsat series that consists of 13 face and body care products. Thus, most of the cosmetics produced in Indonesia using langsat come from Martha Tilaar although there are reports of the use of the ingredient in other brands.

Martha Tilaar has also received awards in pioneering technology for its efforts to develop products based on natural materials and the use of indigenous knowledge in the beauty industry.

Obstacles and challenges

The langsat tree has a growth period of about seven to ten years before it can produce fruit. The quality of the harvest and of the products depends on the selection of good seedlings, good organic cultivation treatment, good postharvest treatment and proper documentation systems.

The langsat fruit is stable for a very short period, only a maximum of one to two weeks. The extract has a maximum shelf-life of only one year. Planning and preparation for production is critical in

the process to ensure a sustainable supply of high-quality products in the market.

Given the limited resources of langsat fruit, careful planning is needed to ensure that the right amounts of extract are produced during the harvest period. This means that the sales forecast should be well predicted and the stability and shelf-life of langsat extract should also be taken into consideration.

Recommendations and conclusions

Experiences in the development of the Sari Ayu Putih Langsat product range show several lessons for the development of similar NWFPs as well as for expanding sales of langsat products. These include:

- The supply of raw materials should be managed in the early stage of the research and product development period to ensure the sustainability of the product.
- In order to guarantee the traceability of raw materials, there is a need to develop win-win partnerships and to work in close collaboration with farmers and local community members. Good partnerships with farmers can strengthen the sustainability supply and traceability of products.
- The proper application of organic certification standards is critical for langsat products to be competitive in the global market and to meet consumer demand.

Case 8:

Gurjum Balsam

Figure 26. Dipterocarp trees

The most common species of wild hardwood evergreen dipterocarp that is tapped for resin in Cambodia is *Dipterocarpus alatus.* This tree is ranked in the IUCN Red List as 'Endangered' and is threatened by loss of habitat in all of its original range. In Indo-China and Thailand the species occurs along river banks and in the Philippines it is found in mixed dipterocarp forest.

In the market, oleoresins that are tapped from dipterocarp trees are commonly called gurjum balsam. The uses of the resins are highly diverse. Primarily, in Cambodia, Viet Nam, Lao PDR and Thailand, it is used for waterproofing boats, while in Cambodia it is also used to waterproof baskets and umbrellas. It can be used as a preservative for wood or bamboo by injecting it into parts containing mould (Baird and Dearden 2003), as a clouding agent and in printing inks, lacquer, polishes, paints and varnishes, although manufacturers generally prefer cheaper artificial substitutes. It can also be used as fuel to start fires for cooking and in the manufacture of cosmetics, as in Singapore. Some resin from Viet Nam or China is also exported to the Near East and Europe and processed into essential oil for the manufacture of cosmetics. Both the oleoresin and its essential oil are used in the perfume industry. The balsam is used as a natural fixative while the essential oil is mainly used for its fragrance (Andaya-Milani 2011). The resin from *Dipterocarpus kerii,* which comes mainly from Malaysia, is the type usually used in the production of essential oils (Ankarfjard and Kegl 1998; Jantan et al. 1990; Gianno 1986 as cited in Prom 2009).

According to Dr Hieng Punley, Director of the Traditional Medicine Department at the Ministry of Health of Cambodia, the leaves of *Dipterocarpus obtusifolius* are used in a decoction to strengthen teeth. They may also be used as a contraceptive and can cure gonorrhoea and skin diseases. The shell of this tree's fruit can cure diarrhoea and has other healing properties. The inner part of *Dipterocarpus intricatus,* in a decoction, has energetic properties and can cure diarrhoea.

Sociocultural context surrounding resin

Traditional organization of villages

The traditional organization of villages where resin is usually collected is headed by a village chief, who takes charge of conflicts, resolves disputes and links the commune with the district authorities. He also deals with weddings, family records and rice field distribution. He makes decisions in accordance with the local, provincial and national development plans.

The deputy village 'chiefs' are a group of four to six elders, including women, who are responsible for arranging and organizing traditional celebrations such as ceremonies and offerings to the spirits. They have the power to punish villagers who do not follow the traditional rules. They make decisions about allowing foreigners to enter their village as well as personnel of government projects and NGOs. At the next level are group leaders, who are responsible for informing villagers of announcements and solving small neighbourhood problems.

Collectors

The management of a resin tree is private. Each tree has an owner, the same person who collected from the tree for the first time. This owner may not own the land on which her/his tree grows, but has the rights to the use of the tree and can give, sell or trade these.

Resin collectors in Cambodia are villagers from indigenous communities for the most part, and cannot be defined by one socio-economic category, as they come from the richest to the poorest parts of the villages. The average annual income of a collector varies from USD 229 to USD 375 (Prom 2009). They are generally not in contact with each other, which allows merchants to have very strong bargaining power.

Some resin tappers benefit from informal microcredit from traders or wholesalers to buy their collection materials (bamboo, plastic containers, etc.) and thus are heavily dependent on them. This makes them obliged to sell all of their harvests to these creditors, which further reduces their bargaining power. Sometimes traders live in the villages of the collectors and can have family or friendly ties.

An association of collectors consists of collectors from one or a few villages who bundle their harvests for better negotiating power. These are community-based structures managed by local NGOs in cooperation with international NGOs, who build and manage the group of collectors, conduct collection planning, provide technical expertise on the resin trade, set up production processes and suggest methods for value addition. These support groups usually create a system for filtering the resin and separating resin from different tree species and different tree ages; they also give training on sustainable collection techniques.

In Cambodia, there are five associations located in the provinces of Mondulkiri, Preah Vihear and Kampong Thom. None of them is recognized officially, but the one in Preah Vihear seems to be the 'pilot project' for the others. The association's supporting agency, the United Nations Development Programme (UNDP), is currently working with them to obtain official status.

Collection process

Indigenous communities are usually animists and use techniques that respect the forest and the trees. Collection of resin is done by cutting a slanting hole in the lower part of the trunk, usually of trees that are more than 60 centimetres in diameter. The hole is burned briefly to stimulate the flow of resin. The collector then leaves the tree for up to six days to allow the liquid to drain down the trunk vessels. The resin is then collected in a bamboo container and the remaining resin is used for burning the hole again for two to three minutes to stimulate more exudation. The hole is again left for six days before the next collection. This process is repeated until the resin is exhausted. After two or three cycles, the upper hole is cleared in order to take out the charcoal that forms which prevents the flow of resin. The excessive formation of charcoal has to be constantly checked as it decreases the production of resin.

Collectors often remove leaves, twigs and other flammable debris around the tree to prevent forest fires. They attest to very little or no forest fires caused by the collection of resin. During the rainy season, collectors have a technique to prevent water from mixing with the resin.

Trees that produce little resin are usually left to rest. No long-term study has been conducted on the length of *D. alatus* productivity.

Legislation

Harvesting of dipterocarp timber is illegal according to the Forestry Law in Cambodia, but collection of the liquid resin is allowed by customary laws. The regulation for collection is determined by three criteria: type of collector, purpose of collection and forest type where it is collected.

By type of collector and purpose: Communities have the right to collect resin without an official permit for non-commercial purposes and if the amount collected does not exceed the amount they need for local use (Cambodia Forestry Law, Articles 24 and 40). Further, it is stipulated in the law that only trees with a diameter of over 45 centimetres and height exceeding 1.3 metres can be tapped.

By forest type: Collection is allowed in protected forests under the jurisdiction of the Ministry of Environment of Cambodia. For forests classified as part of community forestry, collection areas should not be a threat to the sustainability of the forest (Cambodia Forestry Law, Articles 40 and 44). Collection in unclassified forests can be done only if it causes minor impact on the forest, as determined by the Forestry Administration (FA).

In unclassified forests, the issue of who has the right to use a resin tree arises the first time it is tapped after the award of a concession. Establishing community forestry group in the collection area will avoid this issue.

The resin trade in Cambodia

A few decades ago, gurjum balsam was produced in Indonesia, Malaysia and Thailand. However, the villagers who did the collection found better sources of income or went to work in urban areas so the production in these countries has considerably decreased, if not disappeared, because of lack of human resources.

Actors

Apart from the communities who collect the resin, several actors are involved in the resin trade, such as wholesalers, exporters, carriers and retailers. Wholesalers and exporters are companies based on the borders of Cambodia. They store, process and export the resin. Their average annual business turnover per company is between USD 13 000 and USD 21 400.

There are 22 wholesalers of dipterocarp resin using five major trade routes. These wholesalers often have the benefit of obtaining credit from Vietnamese buyers, whether through privileged professional relationships or financial dependence. Most frequently, the wholesalers or exporters are the ones responsible for transportation to the neighbouring country.

Some independent carriers are responsible for transporting the resin from the wholesalers, to be brought to the border to Cambodian exporters or retailers. They always use independent taxis, paid per trip.

Processing, transport and storage

There are filtering facilities established by the associations of Preah Vihear resin

collectors and in Phnom Penh in the warehouses of wholesalers. Residues of filtering performed by wholesalers are rejected as devoid of market value and discarded thereby contributing to local pollution. The ratio of high quality to resin residue is approximately 50:50 or 60:40.

NatureWild, the marketing arm of NTFP-EP in Cambodia, is currently planning to construct an oil production facility in Phnom Penh that will extract essential oil from resin (Seyla Tith, personal communication).

Resin is usually exported as a raw material and is rarely processed or transformed before export. Each wholesaler exports an average of 3 000 to 4 000 tonnes per year. However, it is important to note that reported exchanges are estimated at approximately only 30 percent of their actual amount due to permits, taxes and restrictions imposed by the government. Taking into account unrecorded trade, the total quantity exported annually is about 10 000 to 13 000 tonnes per wholesaler.

The average wholesale storage capacity is 2 tonnes. Each cargo of resin usually ranges from 1 tonne to 20 tonnes, though they may be as large as 40 tonnes at one time. Filtering factories at the border or in Viet Nam pack the resin in plastic canisters of 18 litres.

Permits

Permits and licences are required for the sale and transport of resin. Interprovincial transportation requires a permit issued by the FA in Phnom Penh plus approval from the FA cantonment. If the resin comes from a community forest, a transport quota permit must be applied for to the cantonment chief (Cambodia Forestry Law, Article 26.C.4). Taxes cost 315 riels per kilogram (USD 1.00 = 4 000 riels) or 225 riels per litre (Cambodia Forestry Law, Article 25.A.4 and 40.B.5). A separate storage and distribution licence is required and should be approved by the FA and then submitted to the Ministry of Agriculture, Forestry and Fisheries (MAFF) (Cambodia Forestry Law, Article 26.C.2); an export licence must be approved by the Ministry of Commerce and the Council of Ministers, authorized by the MAFF under the approval of the Royal Government of Cambodia. An export-import licence is issued by the FA director and is subject to a service fee of 1 percent of the total value of the goods exported as a royalty fee (Cambodia Forestry Law, Article 26.B.5). In practice, there are no export permits but only unofficial agreements with the FA which issues exporters a bill for every 50 tonnes of resin.

Exporters pay a tax of 300 riels per kilogram to the National Bank of Cambodia and 15 riels to the National Treasury for the management of forests. According to the MAFF, the total amount of trade tax and export of the resin is 18 900 riels in increments of 60 kilograms. With the added 5 percent tax for management of forests, this amounts to 315 riels per kilogram or 225 riels per litre.

Dipterocarp resin, according to Cambodia law, can be used and exported as raw material (Cambodia Prakas 132, 2005). Semitransformations, such as filtration, are also allowed for export, but there is no mention of transformation into essential oil. No production quota is mentioned.

Tom Evans of the Wildlife Conservation Society explained that in practice, the villagers can sell their resin, but only those traders who do not collect the resin are allowed to transport it. However, according to the law, transport of resin within a canton is not allowed.

Although there are several associations of existing collectors, none of them have managed to obtain agreements with the FA or the government for necessary permits and licences to trade resin.

There are five administrative steps necessary for the trade of non-wood forest products (NWFPs) in Cambodia and all of them need time to process. First there is the submission of application, then the FA considers and approves it, after which follows the granting of the export-import quota, and then the granting of an export-import licence, and last, the granting of an export-import transportation permit. The quota is good for a year, but extensions may be requested (Bun 2010).

In reality, permits and licences required for resin trade are not available. There is lack of documentation and official procedures are poorly respected (Bun 2012).

Officially, all the players in the value chain should be subject to different licences and taxes relating to the collection, transport and trade of resin. However, in practice, only wholesalers and exporters procure permits for transportation, storage and distribution.

Supply and market demand

The resin is exported by land, so it is mainly exported to neighbouring countries (Thailand, Lao PDR and Viet Nam). However, precise figures are lacking because a large portion of exports is not declared officially. The biggest consumer of resin from Cambodia is Ho Chi Minh City, with six processing companies that filter and treat the resin. Part of this is re-exported to China, or to some European and Near Eastern countries. This type of export is being carried out illegally, so there is no product traceability. No accurate data can be found on the final destination or the quantities of resin traded.

National production has declined in Cambodia since 2003 because of the general fall in demand as well as lack of supply due to deforestation. Several studies cite that the overall demand for resin has been declining since 2003 due to lack of awareness and market visibility (Prom & McKenney, 2003). As of 2009, 11 000 to 18 000 tonnes are produced each year. In Stung Treng Province, for example, the annual production of resin ranges from 1 500 to 2 000 tonnes (Prom 2009).

According to Evans et al. (2003), tappers enter the forest and collect 30 to 150 litres per trip. A dipterocarp resin tree produces on average between 30 and 35 litres per year, depending on the size of the tree. It produces more resin during the rainy season, but villagers collect less resin at this time as they have more activities to pursue, mainly rice farming. Additionally the resin is of lower quality in the rainy season as the water seeps into the tree and into the resin itself. There is more collection during the dry season but the trees yield less, so resin production seems to be constant throughout the year (Prom 2009).

The price of the resin varies depending on the prices of Vietnamese and Chinese markets, and also on the quality of the

resin. The quality differs according to tree species, the season in which it was harvested and whether it was filtered or not. The weight of 1 litre of resin may vary depending on its water content or residue, but 1 litre has an average weight of 1.4 kilograms.

The average selling price of resin is 1 429 riels per litre, or 1 020 riels per kilogram (about USD 0.25) (Prom 2009). The association of resin collectors in Preah Vihear sells resin at USD 15 per 28 litres, or the equivalent of 2 142 riels per litre, almost double the price. Communities get the lowest revenues from the trade of resin, but their share could be increased significantly and resin could even be their main source of livelihood if the price could be revalued at the source and if the number of intermediaries could be reduced.

The relative shortfall in revenue earned by initial collectors is real and has been pointed out by many studies. According to Camille Bann, in 1997, the market value of all of the NWFPs that could be grown on 1 hectare of forest was USD 3 922 while the value of cut trees on 1 hectare was only USD 1 697. Concomitantly, the value of NWFPs collected by villagers on 1 hectare was USD 36 while the same products sold on foreign markets could reach up to USD 4 000. This difference is due to the very low level of prices negotiated by the communities and their lack of knowledge about the market and about simple technical processing of the products (Bann 1997).

Packaging and storage

The resin collected is carried in plastic or sometimes bamboo containers of 30 litres usually provided by traders. The collectors generally do not store the resin but sell directly to traders after collection. Resin associations store and package the resin, with NGOs usually providing 28-litre metal containers.

Opportunities

There is much market potential for dipterocarp resin. One area to explore in the resin industry is its use for waterproofing, as the boat manufacturers that consume resin in Cambodia and Viet Nam use considerable quantities.

For the cosmetics sector, NTFP-EP and NatureWild are currently exploring the establishment of essential oil manufacturing in Phnom Penh. Experiments done by POH KAO on the distillation of oleoresin of *D. alatus* have shown that it can be done by local technicians. Mr Denis Delepinois, an expert on distillation for the cosmetics industry in France, conducted a training event for the Association Angkor Center for Research and Development of Herbal Medicine. Resin was sampled from the forests of Veun Sai Siem Pang Conservation Area to test the compatibility of the essential oil produced with similar products used in the European market for cosmetics and perfumes. Chromatography analysis of dipterocarp resin essential oil samples were issued by two different laboratories in France. Essential oils were distributed to a French cosmetics group bringing together prestigious brands, and one shampoo manufacturer expressed interest in the scent.

Key obstacles and challenges

In the past, *D. alatus* was the most commonly tapped species for liquid resin and the main source of cash income for

villagers. However, rapid socio-economic changes in Cambodia are challenging the future of healthy forests. Major threats are habitat loss due to illegal logging and the granting of economic land concessions. Some villagers resort to illegal logging as it has become more lucrative than resin tapping. Most communities have abandoned sustainable NWFP harvesting practices and turned to a more destructive approach, so production has declined over the past decade. Further, there is lack of motivation from the FA to promote local production and its burdensome administrative procedures for securing permits, which are rarely met, also discourage sustainable and legal trade. There is an urgent need to protect the exceptional natural resources found in Cambodian forests, not only because they are unique, such as *D. alatus,* which is found only in Indochina and the Philippines, but also because this presents a great opportunity to develop a fair market that promotes forest production by and for local people through commercialization of processed oleoresin products, particularly essential oil.

Recommendations

- Resin tappers should be trained on the best production techniques. It would also be very beneficial for communities if they were taught semiprocessing techniques, such as filtering, which would provide added value to the product. The separation of different classes of resin should be explained to them;
- The development of quality resin production through traceability of the origin, packaging and labelling, as well as product standardization, will significantly increase its sale value;
- Resin must be collected in new containers, ideally plastic containers, to develop quality and product standardization. This will reduce the number of impurities contained in the resin, and therefore the ratio of resin per kilogram will increase;
- If filtering is performed by the villagers, packaging could also be done by local cooperatives. If processing is undertaken by the commercial industry, packaging will be done in Phnom Penh. Metal barrels seem to be the optimal packaging for export and they are the same as the containers used by the associations of collectors of Preah Vihear. These containers should preferably be re-used to avoid waste;
- The legalities of harvesting and selling oleoresin by communities should be transparent, so that they can obtain the full benefits from their harvest. Establishing community forestry in collection areas will ensure that harvesters will be able to transport and sell their products without several layers of intermediaries; and
- There is an urgent need to protect the exceptional natural resources found in Cambodian forests, not only for unique species such as *D. alatus*, but also because this presents a great opportunity to develop a fair market that promotes forest production by and for local people through commercialization of processed oleoresin products, particularly essential oil.

Case 9:

Hazel Sterculia

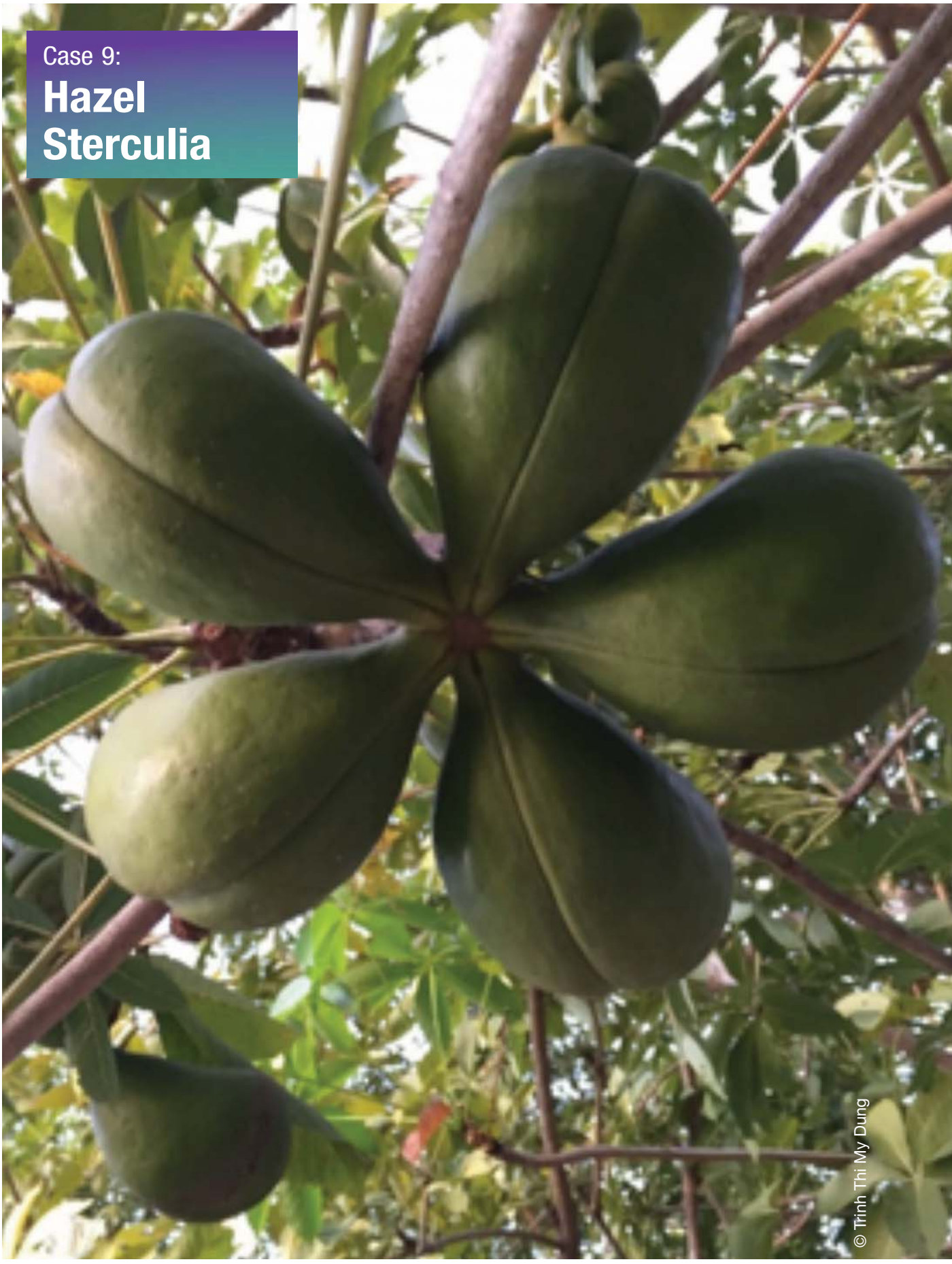


Figure 27. Hazel sterculia

Sterculia foetida L. is an evergreen tree of the Malvaceae family. Called greater sterculia or hazel sterculia, it grows up to 30 metres in height and 80 centimetres in diameter. The tree is characterized by green palmate leaves, unisexual flowers and fruits of one to five follicles. Each follicle contains ten to 15 seeds (Pham-hoang 2000). The fruits are green when young and become red when ripe.

Hazel sterculia occurs in various soils, including very poor and barren lands, in humid to dry climates. It survives well in harsh areas of strong tropical sunlight, low rainfall (600 to 700 millimetres annually), a long dry season (six to nine months) and high temperature (40–45°C), and therefore it is regarded as a drought-tolerant species (Dang 2009; Dang and Bui 2004). It flowers in February to April and fruits in May to September.

The tree is widely distributed, spreading from East Africa to the north of Australia. It is recorded in Australia, Bangladesh, Djibouti, Eritrea, Ethiopia, India, Indonesia, Kenya, Malaysia, Myanmar, Oman, Pakistan, the Philippines, Somalia, Sri Lanka, Tanzania, Thailand, Uganda, Viet Nam, Yemen and Zanzibar. It grows naturally in the provinces of central and southern Viet Nam, such as Kom Tum, Gia Lai, Dak Lak, Lam Dong, Khanh Hoa, Ninh Thuan, Binh Thuan, An Giang and Kien Giang.

Uses

All parts of the hazel sterculia tree can be used and for a wide variety of purposes. The gum and leaves are used locally in skin care. The gum can be soaked in water to make a jelly that is then applied as a facial mask for two hours. Likewise, leaf crush is used for the same purpose. In cities, spa services apply the gum alone or mixed with other materials for facial masking. A drink of the gum jelly with honey is believed to be helpful in retaining women's beauty. Recently, the gum has been used to produce a facial cleanser and creams for skin care, pigment bleaching and acne treatment. In spas, the fresh gum is preferred to the dry one in facial masking. Parts of the tree are also used as medicinal

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Figure 28. Products produced from *Sterculia foetida* L.

ingredients, food, fuel and wood. The species is a popular shade tree that is planted along roads and in city parks.

Economic and commercial values

At present, only the gum is commercialized and other products from hazel sterculia are used infrequently and locally. Recent data collected from 20 households in Ninh Thuan and Binh Thuan provinces indicate that the tree is intensively planted at an average density of 353.75 plants per hectare. Each household has a 0.2- to 5-hectare plantation. Each hectare needs two to five workers and can produce 0.8 to 1.5 tonnes of gum. The gum yield increases when the trees grow larger and becomes stable starting in the fourth year after plantation. A plantation worker earns VND30–80 million (USD 1 343–3 583) a year.

In the northern communes of Binh Thuan Province, the government sees hazel sterculia as a way to eliminate poverty. In an ongoing pilot project of 9.5 hectares, a hazel sterculia plantation was developed for 17 households in Tuy Phong District. Five have escaped from the local poor-household list and the others have increased their incomes.

In Nui Chua National Park, wild hazel sterculia used to be abundant in the forest before 1993. From 1989 to 1993, the local Raglai and Cham people harvested the gum and it was their main income source. However, uncontrolled harvesting and inappropriate tapping techniques led to decline of the tree in the wild. At present, the gum is tapped mostly from plantations and it is the main income source for about 400 households.

Threats and sustainability issues

Although no data have shown the natural volume of hazel sterculia in the past, its wild stock has declined dramatically in Viet Nam. The few remaining natural populations are being tapped destructively and facing risk of extinction.

The gum has good potential as a source of livelihood for people in the dry Ninh Thuan and Binh Thuan provinces, where the tree seems to have the most abundant populations in the country. The tree has been planted and propagated in local gardens and farms over the last 20 years. However, this kind of planting faces risks of unsustainability as it is not based on any planning, accession selection, standardized planting or tapping technique or assessment of market demand. Tappers sell the gum at relatively low prices even when it is still fresh and not cleaned.

Actual products made from hazel sterculia are not as abundant as could be provided. Most of the gum is sold raw and used for drinks. Processing is still at primitive levels. The most value-added products from the gum are face and skin creams that are produced by a few companies, but these are new products that need more time to develop their own market shares in the very competitive cosmetics market that is dominated by large internationally known producers. Recently, increased support by local governments for farming extension, accession selection, seedling

supply and so forth appears to be a good approach to tackling these challenges.

Ethnobiological and social context

Collection

Most hazel sterculia gum used to be tapped from the forests using knives to puncture the trunk bark and fire to stimulate gum exudation. However, nowadays plantations provide nearly all the gum harvested and traded. Farmers harvest the gum using two methods to puncture the trunk bark:

- Method 1 involves making rectangular or round holes of 3 × 3 centimetres using a knife.
- Method 2 involves making round holes of 2 × 2 centimetres using a hand corer. A small board made

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Figure 29. The first tapping method: using a knife to cause injuries to the tree bark

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Figure 30. The second tapping method: coring the tree bark

from plastic or other clean materials is fixed just below the hole in order to prevent the exudates from attaching to the trunk and containing 'dirty' wood or bark chips. By using other materials to make the board, tappers can produce the exudates in various forms or shapes that meet customers' various demands and sell at different prices.

In either of the methods, the number and density of holes depend on the size of the tapped trunk. The harvest can take place within a three-month duration and a new tapping rotation starts with newly-made holes. If carefully made, the abandoned holes will heal quickly and can be remade in the future. The first harvest is often possible ten to 15 days after the hole is made followed by consequent harvests over three to four intervals. After harvesting, the gum can be sold fresh or mostly dried for one to two days before selling. When fresh, the gum can be mechanically chopped or moulded and then dried into different shapes. Each farm often gathers its harvest and sells five to six times a year. The average dried yield is 250 to 300 kilograms per hectare. The harvests are concentrated in the dry season to avoid the impacts of rain.

Processing

The gum harvested by the first tapping method normally contains contaminants such as wood chips and other particles, and is cleaned by hand. Gum is sorted into three quality classes. The first-class gum must be translucent white, dry and clean of visible contaminants. Similar gum with brownish-lilac colour is considered to be second class. The third-class gum is brown and/or contains some minute contaminants. Meanwhile, the gum harvested by the second tapping method is free of contaminants and is directly sold to the market as first class without further processing.

The gum is then processed and dried further by traders and arranged in different shapes, such as short and long bars, coarse and fine particles and so forth, using simple equipment. After this step, the gum is ready to be sold as preprocessed packages directly to end users or as raw material to processing factories. At the processing factory of Lien Hao Company, for example, the gum is ground and packed before being transported to delivery shops. At Vinh Tan Company, the gum is processed to produce cosmetics that are delivered to customers through their agents.

Marketing

In Binh Thuan Province, the tappers sell the gum in both fresh and dry forms. Forty percent of the gum is sold to tourists, mainly as a drink. The best known selling site is the Hang Pagoda in Binh Thanh commune, Tuy Phong District although the gum is also a common commodity at local markets. The rest is sold to intermediaries of the Kinh and Cham ethnic groups and is then transported to Ninh Thuan Province and Ho Chi Minh City or to several processing companies in Binh Thuan Province. Lien Hao Company and Vinh Tan Cosmetics Ltd. are the two main processors of hazel sterculia gum in Viet Nam. However, Vinh Tan

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Figure 31. Cleaning gum before sale (Left) – Gum after cleaning (Right)

dominates the national gum-based cosmetic market with its emerging creams for skin care which are patented and traded as new high-class cosmetics. The company is constructing a new cosmetics factory in Binh Thuan Province.

In Ninh Thuan, the gum is also gathered in fresh and dry forms by local intermediaries. They transport the local gum together with that from Binh Thuan to Ho Chi Minh, Da Nang, Ha Noi and Phan Rang Cities. It is estimated that there are about 60 traders in both provinces. The price of the gum varies depending on gum quality. It also fluctuates, peaking in February to April in the dry season and is at its lowest in May to July in the rainy season; it becomes stable in August to January. In general, the price has decreased in the last few years as the area of plantations has increased. At present, tappers sell fresh and dry gum to intermediaries at VND50 000–90 000 (USD 2.24–4.03) and VND120 000–150 000 (USD 5.37–6.72) per kilogram, respectively – much lower than before 2010 when it was VND200 000–330 000 (USD 8.96–14.78) per kilogram. In Binh Thuan Province, the dry gum is sold to tourists at VND150 000–180 000 (USD 6.72–8.06) per kilogram. In major cities, only the dry gum is available at shops and sells for VND220 000–300 000 (USD 9.85–14.78) per kilogram, depending on quality. Most customers prefer gum in natural forms of large bars that sell at higher prices. In Viet Nam, hazel sterculia gum is sold in all provinces, most of which is consumed as drinks and medicinal ingredients; and only 5–10 percent is used in the cosmetics industry. The gum is exported to several international markets such as China, Germany, Canada and the USA but the export volume is not known.

Before 2010, hazel sterculia gum was also imported from Indonesia and Cambodia and sold at lower prices. Presently this does not appear important as the imported gum is not favoured in the market and its low price is no longer a competing strength in comparison with the locally-produced product.

Livelihoods and incomes

Interviews with the Department of Agriculture and Rural Development of Ninh Thuan Province and eight local farmers indicated that the tree is planted in an average density of 340 stands per hectare. Noticeably, fertilizers are not used in plantation and minimum management is adopted. Four years after plantation, farmers start harvesting gum at annual yields of 0.3–0.7 kilograms per tree or nearly 300 kilograms of gum per hectare. The yields increase to about 400 kilograms in the second year of harvest and stabilize at 600 kilograms afterwards.

In Binh Thuan Province, farmers employ more intensive cultivation and earn more profit. Their planting density is up to 2 214 trees per hectare, which is seven times greater than that in Ninh Thuan Province. Their plantations, in spite of much higher densities, surprisingly grow better and can even provide gum at annual yields of 0.3–0.7 kilograms per tree equal to 900 kilograms per hectare right after the first year of plantation. Consequently, they start earning three years earlier and at three times as much profit as their counterparts in Ninh Thuan Province.

It is quite early to draw any conclusion on sustainability but the planted trees looked healthier in Ninh Thuan Province.

Generally, each hectare of a hazel sterculia plantation requires two to five workers working for about 96 days a year. The interviewed farmers expressed approximately equal ratios of men and women involved in caring for the seedlings and retail. However, men account for two-thirds to three-fourths of the labour and are responsible for heavy activities such as planting, fertilizing, watering and collecting while women take the main role in preprocessing the gum after harvest. A hired male can earn VND180 000–200 000 (USD 8.06–8.96) per day while their female counterparts only earn VND120 000–150 000 (USD 5.37–6.72) per day.

Opportunities for enhancing income and rural livelihoods

Farmers' incomes may be improved if several issues are addressed. Depending on the location, only 50–75 percent of planted trees can yield gum. The reasons are unknown, but partial genetic regulation is likely. Sound selection of high-yield accessions will increase farmers' profits. Although hazel sterculia is well adapted to dry conditions, watering is required to maintain high gum yields from plantations. More effective irrigation systems would improve the farmers' situation in both provinces.

Farmers tap all year round despite the lower prices in September to December, and in general, they do not have power over the prices of their gum. A better tapping and selling scheme, such as reducing tapping during lean months or storing surplus gum to sell during months with better prices, would improve their profit. Forming a coalition and using cooperative mechanisms will further improve gum quality, and establishing brand names will promote close links among farmers, traders and processing companies.

Innovations in farming hazel sterculia in Binh Thuan can be easily replicated in other areas. Simple innovations include using a board to collect the gum and moulding the gum shape for higher quality. These could significantly increase selling prices, particularly if products can be sold to the cosmetics industry, which only uses first-class gum. The use of fertilizers would likely also increase yields.

Hazel sterculia is one of the few profitable crops that survives well in the semi-arid areas of these two provinces, which have among the highest poverty rates in Viet Nam. Farming the species requires little investment and does not appear to be complicated, so it can easily be practised by local farmers. An extension programme would provide opportunities for local people who have land but do not know which crops to plant to improve their livelihoods.

Obstacles and challenges

The development of hazel sterculia gum and its derivative products, including cosmetics, reflects issues regarding sustainable harvesting and development of many valuable forest products in Viet Nam. Promising products are being developed from a natural resource that has been much reduced in the wild; consequently the necessary inputs can only be supplied from plantations.

Hazel sterculia appears to be exhausted in the wild due to loss of habitats and overexploitation, but the species has not been included in any reforestation

Box 3
Hazel sterculia as a traditional medicine

Ms Vo Thi Lieu, director of Vinh Tan Company, starts her famous story from her childhood in Binh Thuan Province, where she was familiar with the Trom tree (hazel sterculia). “Many times my family had nothing to eat but the gum from Trom, which helped me to have healthy hair and a ruddy complexion,” she relates.

She was diagnosed with hepatitis B at its final stage and cured in a traditional medicine center, but the illness left her with so many scars. As a traditional medicine doctor, she applied the hazel sterculia gum in her recipes to eliminate the scars. Her skin became much improved after several weeks. This prompted her to study the use of the gum in skin care. She talked about her failures for 15 years in doing research. But her discovery of the best recipes led to the establishment of Vinh Tan Company in 2013. Two years later, the company has more than 500 agencies nationwide and her products are even exported to other countries, bringing an annual profit of VND50 billion (USD 223 950).

This success promoted plantations of hazel sterculia and improved the livelihood in poor communities in Binh Thuan. From 12 households operating in 12.5 ha, it has grown to 370 households in 400 ha by 2015. Trom has become an industrial tree and a symbol of Tuy Phong District. Currently, the company is constructing a cosmetic factory in Vinh Hao District. “I believe this factory will not only provide jobs, but also help buy raw materials from local people,” said Ms Lieu.

programmes in Viet Nam. Its inclusion could bring significant added value to restored forests in the future. Instead it has been intensively planted for gum production in ten districts of the aforementioned two provinces. According to provincial records, a total area of 2 016 hectares has been planted in the last 20 years.

In Nui Chua National Park of Ninh Thuan Province, 30 000 seedlings have been provided free to villagers to plant since 2011, but no exact data on their survival are available. It is reported that 80 percent of the current plantation in the park's buffer zone is a result of this project, and 20 percent is motivated by local villagers. In Bin Thuan, farmers buy seeds and seedlings for planting, with prices varying from VND100 000–400 000 (USD 4.48–17.92) per kilogram without warranty if the seeds will germinate or not.

Box 4
The benefits of hazel sterculia

Mr Phan Khan Phong was a gum tapper and became a gum farmer in 2015.

Mr Phong used to cultivate grapevines. He said: "It was the most productive crop at that time, but then I realized it took a lot of time and care. It was really hard to grow and was not easy to have a good yield due to severe weather conditions. I usually had to stay at the garden all day to take care of the crops and had no time to spend with my family, to engage with social activities or do something else".

He found out about the benefits of the hazel sterculia tree from his neighbor Mr Trinh Toan's family. "Since then, everything has changed. This type of tree doesn't need too much care. I don't need to water or manure them continuously so I have all the time I need to do other things, like studying more about how to grow the tree effectively." Being an eager person, he tried grafting in hope for higher productivity. He discovered a more successful method to collect gum by using portable corer, which costs less time and effort. His harvested gum became cleaner, more beautiful and sold at much higher prices than other people in the village (VND120 000–180 000 or USD 5.37–8.06 vs. VND80 000 or USD 3.58 per kg). His experience has been shared voluntarily to other villagers.

With support from the local government, he and other villagers established a cooperative group to "help each other and protect the benefits of the farmers," as he said. They have conducted many workshops for experience sharing and other discussions. Last September, he won 4th prize in a provincial innovative contest. He is writing some proposals to ask for more support from the government for the group. He said, "I have asked them to give some corers for the group and they agreed. I hope the group will grow bigger and all members can earn more benefits from growing Trom".

According to him, Vinh Tan Company promised to buy his group's fresh gum at a stable price of VND200 000 (USD 8.96) per kg. "Everybody is looking forward to it", he said. His annual income reaches VND200 million (USD 8 958), about three times as much as when he cultivated grapes five years ago. He shares further: "I have opportunities to meet a lot of interesting people and learn new things. It seems that my social position is higher and it is all thanks to the hazel sterculia".

In the last five years, the Ministry of Agriculture and Rural Development has recognized the importance of hazel sterculia and has funded several research and development projects. Initial findings show that the tree fares better when planted during the rainy season, in well-drained soils with light texture, with at least 40-centimetre depth and rock coverage of less than 40 percent. Trees planted in poor and very dry soils provide less gum. Spacing of trees should be 4 × 4, 3 × 3 or 2.5 × 3 metres. Watering is needed for new plantations. In poor soils, phosphorus, biofertilizers or compost should be supplied to holes prior to plantation. After plantation, phosphorus or NPK fertilizers should be supplied twice a year. When the canopy is closed, the ground must be kept clear. However, to know if this planting procedure is suitable for other locations requires trials for different soils and environments for sound recommendations. Different farming techniques raise different issues; for example, the intensive farming in Binh Thuan may incur risks in the future such as shorter longevity due to early and intensive tapping. Until a sound and comprehensive evaluation of yields and economic efficiency is done, it is difficult to make a blanket recommendation for farmers, although among those surveyed, most expressed an urgent need for a comprehensive technical guide to the cultivation of the species.

Another risk for farmers is instability of gum prices. The actual demand remains unknown while plantations are sprouting up in many locations, which could lead to oversupply and lower prices in the future. The development of hazel sterculia gum markets should be analysed in order to help farmers tap sustainably and obtain a stable income from it. This will also establish foundations for local governments to make better plans for gum development.

Figure 32. A misty morning in the community

Contributions to rural/forest livelihoods in Asia and the Pacific

There is a strong link between poor rural communities and NWFP collection, while higher-income people generally attach lower importance to NWFP collection (Wunder et al. 2003). Recent research, covering 8 000 rural households in 24 developing countries, estimates that environmental income accounts for 28 percent of total household income, out of which 77 percent comes from the forest (Angelsen et al. 2014). This includes fuel, fodder, timber, medicinal plants and commercially collected NWFPs. However, it is difficult to extract data on income accruing specifically from the collection of NWFPs for the cosmetics industry.

A variety of plants are cultivated for the cosmetics industry – especially essential oils and essences such as vanilla, lavender and geranium. Aside from the case study products presented, other commonly used and cultivated species include aloe vera, *Azadirachta indica* and red sanders in India. Amongst the case studies presented in this publication, *thanaka*, *hazel sterculia,* sandalwood, langsat and sea buckthorn are cultivated in home gardens or plantations. This ensures the community regular and assured harvest, though there are market fluctuations. Amongst our case study products that are collected from the wild, like Spikenard, wild turmeric and soapberry the returns to the gatherer are low and dependant on the trader. Table 5 provides more specific information on NWFP collection and income generated in various Asia-Pacific countries for the case study products presented in this report.

Some key emerging aspects about rural incomes from NWFP collection for the cosmetics industry are:

- Collection is dependent on demand, which is generated through the chain of local markets and traders. Often this is not regular or consistent over seasons. In turn, this local demand is derived from demands from larger wholesale dealers in big cities and ultimately, the retail market. This chain of dealers and intermediaries determines the prices to be paid to the gatherers/growers – which are often very low;
- Incomes from NWFPs are both seasonal and uncertain, making it necessary for communities to look at other diversified options for survival throughout the year;
- In some cases, incomes can be planned as the products are produced under cultivation by farmers and can be harvested after a determined period of time. However, the trees and plants take time to grow and can only add to rural incomes after long gestation periods;

Table 5. Income from NWFP collection by rural communities in Asia-Pacific countries

Country	Name of product(s)	Income and duration	Risks and uncertainties
Nepal	Spikenard oil/jatamansi *Nardostachys grandiflora*	Depends on how much collected by the family. Per kg rate is USD 7.00 in Nepal and USD 15.00 in India. It forms 20–25% of the annual income of the gatherer	Prioritized by the government of Nepal for export
India	Wild turmeric *Curcuma aromatica*	Depends on how much is collected by a family per year. Sells for 50 cents per kg	Seasonal. Collection on a large scale, depending on traders/demand
	Soapberry/soapnut *Sapindus emarginatus*	Depends on how much is collected per family per year. Sells for 7–12 cents per kg	Bulk collection in areas by families, seasonally, depending on traders/ demand
Pacific islands	Sandalwood *Santalum* spp.	Cultivated. 15–20 years for tree to mature. Wood is USD 13.47 per kg	Slow growing; promoted by governments, export potential
Viet Nam	Medicinal spa or bathing medicine – combination of plants/NWFPs	USD 1 400 per family per year	6 families in a commune make this preparation
	Hazel sterculia *Sterculia foetida*	Mostly cultivated. USD 1 400–3 500 per year per family	Unsustainable tapping of resin from the wild; now only from plantations
Myanmar	Thanaka *Murraya* spp.	The tree is cultivated; mature after 7 years, when the whole tree is cut, the farmer can earn USD 8–17 per tree	Has potential in the market; does not benefit poor households without land
Indonesia	Forest honey from *Apis dorsata*	25–30% of family income every year	Seasonal fluctuations in yield and natural disasters, e.g. forest fire
Cambodia	Gurjum balsam *Dipterocarpus alatus*	In 2009, USD 229–375 per family *per annum*	Now people have formed an association for the resin; there are 5 associations in Cambodia
The Philippines	Manila elemi *Canarium luzonicum*	USD 32.78 per family per month	Yields 28 kg of resin from 15 trees, every 15 days

- Fluctuating prices in global markets, taxes and trade regulations usually result in income changes for the grower/gatherer. If the product is exported, e.g. spikenard from Nepal, these fluctuations have significant impacts on the collectors.
- In some cases, overharvesting can result in a species becoming endangered in forest areas. This is usually due to high demand, high returns and unregulated tenure. For example, in the case of hazel sterculia in Viet Nam, wild populations are bordering on extinction and cultivated plantations now produce almost all of the gum for the cosmetics industry. The promising economic returns coupled with unsustainable harvesting patterns of these NWFPs may result in the decimation of the natural resource base.

Case 10:

Medicinal Spa

Figure 33. ***Sambucus javanica*** **Blume shrub**

'Dia dao xin' is what the Red Dzao people in Ta Phin commune call their medicinal spa or bathing formulation. Ta Phin commune is one of the 16 communes of Sapa District, Lao Cai Province in the north of Viet Nam. The commune covers an area of 26.8 square kilometres, on an elevation of 1 300 metres above sea level, and has a population of about 2 000 people belonging to Red Dzao and Mong ethnicities.

The practice of bathing using herbal plants is a special feature of the Dzao people and is closely associated with their indigenous culture. The medicinal spa comprises species from a number of botanical families, encompassing five to ten varieties, as the most important components. These include *Cissampelopsis volubilis* (Blume) Miq., *Clematis buchananiana* D.C., *Elsholtzia pendulifolia* W.W. Smith., *Ficus semicordata* Buch.-Ham. ex J.E. Sm., *Luculia pinceana* Hook f., *Mussaenda pubescens* Aiton f. and *Sambucus javanica* Blume.

Biology

Cissampelopsis volubilis (Blume) Miq., locally called *puong dia bua* (Dzao) and *vi hoang* (Viet), is a liana of the daisy family, growing up to 3 metres or more in size. Its petals are white and pale yellow. It is found in South Asia, China and Indo-China.

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Figure 34. *Clematis buchananiana* D.C., locally called *puong dia nhau* (Dzao) and *day ong lao* (Viet), is a fast-growing woody vine of the buttercup family, generally growing on small trees and bushes. It is found in East Asia, preferring moist soil. Its petals are white, long and threadlike

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Figure 35. *Elsholtzia penduliflora* W.W. Smith, or the greater yellow herb, locally called *da sai, bo ho* (Dzao) and *kinh gioi ru* (Viet), is an aromatic shrub, 1–2 metres in height. Its mature seeds are roasted and the extracted oil is used for cooking

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Figure 36. *Ficus semicordata* Buch.-Ham. ex J.E. Sm., locally called *si cau pien* (Dzao) and *sung nua la tim* (Viet), is a small to medium tree of the fig family which grows from 3–10 metres in height. Its bark is smooth and grey and its reddish-purple fruits are edible, growing on leafless branchlets

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Figure 37. *Luculia pinceana* Hook f., locally called *keng pi deng* (Dzao) and *hung de mu* (Viet), can grow into shrubs up to 2 metres in height or trees up to ten metres in height; it has white and pink fragrant flowers with five petals. It is widespread and common

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Figure 38. *Mussaenda pubescens* W.T. Aiton, locally called *tra kinh m'hay* (Dzao) and *buom bac* (Viet), is a climbing shrub, with branches often extensively twining. Native to southern China, it has yellow flowers and well-developed petaloid sepals. One to five of these are sometimes expanded and white

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Figure 39. *Sambucus javanica* Blume, locally called *tung de* (Dzao) and *com chay* (Viet), is a perennial shrub growing 1–4 metres in height. Called Chinese elder, it is from the elderberry family and is found in subtropical and tropical Asia. Flowers are white with yellow anthers and fruits are red and small, 3–4 millimetres in diameter. Its fruits, flowers, leaves and roots are edible but the latter two have to be cooked

Uses

In addition to the basic plant components, other species may be added to the spa depending on use, which makes the medicinal spa of the Red Dzao in Ta Phin different from other Dzao spas. It can be used for treatment for high blood pressure and bone ailments, joint pain, influenza, edema, itch, constipation and boils. It is also used for postnatal recovery and to help convalescent patients. According to the Red Dzao, the medicinal spa helps with

physical and mental fatigue by enhancing overall circulation. It also opens pores and removes dead skin and impurities, leaving the skin smooth and soft.

Scientific studies have confirmed the effects of the medicinal spa on people's health. Initial studies by scientists from Ha Noi University of Pharmacy show that the remedy is not toxic even if it is taken orally. It also has biological effects on pulse rates and the heart, and is an analgesic.

Economic and commercial values

The medicinal spa of the Red Dzao has already been commercialized by other communities, hotels and hospitals in Sapa town. The clients are both local and international tourists. In Ta Phin, the price for each bath is VND30 000–50 000 (USD 1.5–2.5) whereas in Sapa it ranges from VND50 000–70 000 (USD 2.5–3.5). Approximately 15 tonnes of herbal plants are estimated to be consumed per year.

Hotels are buying the different plants from Ta Van and Ta Phin where they are converted into dried powdered form, packed in 200-gram bags and sold for VND20 000 (USD 1.00). There are about ten spas in Sapa District. Normally the therapy in these spas employs up five or six plants, and the price of each package is VND10 000–30 000 for approximately 1 kilogram. Shops buy the packages at VND3 000 (USD 0.15) per kilogram. It is estimated that trading in these spas involves 12 to 15 tonnes of herbal plants per year.

The Red Dzao communities offer both home bathing services as well as fresh ingredients for sale. Results from interviews show that each household earns about VND3 million (USD 150) from the medicinal spa. Currently the market is extensive, reaching as far as Ha Noi, Ho Chi Minh City and Ha Tay, among other locations. The spa is used in both hotels and traditional medicinal hospitals. In Ha Noi three key traders buy 40–70 tonnes of herbal plants for the spa from the Red Dzao in Sapa.

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Figure 40. Medicinal spa products from the Red Dzao in Ta Phin commune

In general, the commercialization of the Red Dzao medicinal spa has been conducted by individuals and organizations in different ways.

Ethnobiology and social context

Collection

The plants used in the spa come from a variety of local vegetation types, including plants growing in agricultural systems (gardens, fields and fallow areas) and in natural ecosystems such as banks of streams, primary and secondary forests. Most are found on the banks of streams where biodiversity has been preserved. Some species are also grown in household gardens. These are usually the rare and valuable species which are indispensable in the remedy, and the parts used are twigs and leaves. Usually women harvest the plants.

Processing

The plant materials are put in large pans or pots with a capacity of up to 50 litres and boiled for 30 minutes. The water is then poured into wooden or plastic barrels, and when the temperature has come down to 37–40°C soaking for bathers starts. People usually soak for 15–20 minutes until they start perspiring and their heart rates increase.

If used on site (i.e. in Ta Phin), the plants can be used in fresh form whether for household use or for tourists. Rare plants can also be used in dried form if the spa is to be used throughout the year. Some households sell them to hotels and if bought from Sapa, the purchasers chop the plants into small pieces and dry them. Dried packages sold to visitors usually have limited ingredients, from six to ten plants.

Market

The market for the medicinal spa is both local and domestic. The local market is for tourists in homestays at Ta Phin and uses fresh plants for the spa. The plants may also be dried and converted into powder form and packed into 200-gram bags for sale to tourists. The domestic market caters to hotels and traditional medicinal hospitals in bigger cities such as Ha Noi, Ho Chi Minh and Hai Phong urban centres. For the domestic market, fresh materials are chopped into small pieces and dried under the sun or hung from the kitchen ceiling during wet and foggy seasons.

Threats and sustainability issues

Due to increasing demand, the unsustainable harvesting of plants for the medicinal spa may lead to exhaustion of supplies of some plants. There is no replanting or restoration because cultivation of the plants used in the spa is not customary to the Dzao people. Many outsiders also exploit and commercialize the medicinal spa for their own benefits, while the community, which owns the indigenous knowledge, receives fewer benefits from this commercialization.

Opportunities for livelihoods

Collecting, processing and providing the medicinal spa in Ta Phin commune provides a good source of income, especially for women. Six households provide the spa service. A single household has an average annual income of VND15–20 million (USD 750–1 000) per year, equating to VND90–120 million (USD 4 000–5 000) for all six households. The total income of other households from providing raw materials

for the medicinal spa in Sapa town is VND45–60 million (USD 2 000–2 700). This amounts to USD 8 000–11 000 per year for all people involved in the medicinal spa industry in Ta Phin.

There is much potential for further development of the medicinal spa because of increasing demand, including on-site consumption for local and international tourists in major cities and in physical therapy and spa services. In particular, there is little competition from other areas because of the ecological characteristics of the raw materials. Many plants used in the spa cannot grow in lowland areas, which constitutes a significant 'barrier to entry'. The medicinal spa is one of the assets of the Dzao culture, which can be used to boost the district's tourism industry.

Obstacles, challenges and solutions

A lack of cooperation among community members involved in the industry often results in a loose community structure without a common agenda, which creates the chance for outsiders to exploit the industry. Only a small profit is gained from the collection, processing and selling of the herbal plants as raw material. Most of the profits go to the traders, especially as the packages and services in the establishments in Sapa use counterfeit materials. These packages comprise few of the plants necessary for the spa and are mostly just liana mixed with some herbal plants which have been transported from other places. This has badly affected the reputation of the Red Dzao medicinal spa.

Another difficulty is that the remedy constitutes several species which translates into difficulties in production and material sourcing. Some households are also solely interested in profits so unsustainable harvesting is another concern. Most of the plants used in the remedy are lianas of large diameters which need decades to reach the expected size, and the Red Dzao people only use the small branches and leaves.

No studies have addressed assessment of the economics of production as the materials are still collected from the wild; thus the true value of the herbal plants is unclear (Cuc and Rambo, 2001). Additionally, no value has been placed on the indigenous knowledge and community skills used in preparing the spa ingredients.

An acute constraint is lack of experience among community members in production and business organization. The commercialization of the medicinal spa is mainly done by outsiders on a large scale while the Dzao are confined to collecting the wild plants and selling them in raw form. Very few households have organized the home-bathing service even on a small scale. The community has no experience in collective marketing, business management, laws and marketing. The distribution of communities in mountainous areas also causes difficulties in collective production, organization of sites for bathing, processing, packing and product presentation. They also lack the capital and technology to accomplish these activities, including cultivation of the plants used in the spa.

An assessment of these challenges and possible solutions was made with participation by the local people. It was determined that site visits to other localities with similar conditions or services who can serve as models could

be arranged for Ta Phin community members. Scientists could also be invited to give on-site training courses on the proper technology for production.

The remedy could be diversified to become more specific for addressing different health problems, thus avoiding the need to use all plant species in each package or service. The lack of locations for the on-site spa could be addressed by preparing packed products for tourists to buy. Marketing issues could be assisted by expertise from the cultural sector.

The birth of a community enterprise

After long discussions among the communities and other stakeholders, a community joint stock company was established in 2006 to address the challenges of starting a community enterprise built around the medicinal spa. This was to ensure that participation of community members was not limited and to achieve wide capital mobilization without sourcing loans from banks. Sapanapro JSC envisioned a stable operation in the sustainable production of indigenous-based products to meet international standards. It aimed to have five to seven quality products for nationwide distribution, with a revenue of VND500 million per year in its first three years. It also aimed to employ over 20 members of the community at a professional level and to provide jobs and stable income for over 100 households.

The company started by developing a certified medicinal spa treatment for sale to end consumers, enabling the community to benefit from the true value of their traditional herbal remedies. It expanded its activities by offering an on-site herbal medication spa service for tourists at Ta Phin commune. At present, the company produces four herbal products for postnatal health restoration, women's health, relaxation therapy and foot massage, which were all developed from the traditional medicinal spa. The company was established by a group of 13 households of Red Dzao women with the support of scientists from the Ha Noi University of Pharmacy and Ha Noi Agriculture University. By the end of 2014, the number of participating households had increased to 99. In its first year, net profit was VND35 million (USD 1 750), which grew to VND639 million (USD 29 000) in 2014.

The company's manufacturing facility is located in Ta Phin, consisting of a house that stores fresh herbal materials for medicinal spa, a workshop for extracting herbs and condensing them into finished products and a service area providing bathrooms for tourists. It receives about 140 visitors daily.

Not all of the owners of Sapanapro are directly employed by the company. Sapanapro was based on a model that was new and strange to those familiar with how cooperatives work. This was later overcome by mobilizing participation from all Red Dzao shareholders. The Shareholder General Assembly is the most powerful unit of the company, comprising 40 members, 72.5 percent of whom are Red Dzao people in Ta Phin. The others are local officers who believe in the success of the model and that it will bring benefits to the community as well as scientists who have worked directly with the local people. This JSC model has helped to mobilize different resources to create capital for the company. Staff have gradually been professionalized, participation from other households has

increased and the capacity of members has been improved through training courses in Ha Noi.

There are the usual difficulties such as poor marketing infrastructure, low education and lack of sense of discipline, but the operation of Sapanapro is more complex. There are difficulties that can only be settled by professional promoters who have experience and understanding of mountain communities and ethnic minorities. When it first started, the people involved had multiple tasks and roles. Community members were encouraged to join either as staff or as providers of resources. This secured benefits for the shareholders in terms of both annual profits of the company and from supply of materials. Herbs are cultivated and harvested under the canopy of household forests all year round.

Lessons learned

The development of the Red Dzao medicinal spa model has resulted in significant hunger eradication, poverty reduction and sustainable development, not only for Ta Phin commune, but also by providing an example to other poor communities in Viet Nam and other developing countries.

The company model used for Sapanapro was chosen over the cooperative model because cooperatives tend to have a complicated management structure and are usually used as a means to get government support, which results in member inactivity. In addition, administrative costs for activities are usually higher than the value of the cooperative's services (Wandschneider and Yen 2007). Past failures are also still clear in people's minds, which have resulted in lack of interest in cooperative establishment. In contrast, a joint stock model secures professionalism as it is operated and managed in accordance with enterprise laws. It can also mobilize investment through proper commercial channels and members can be encouraged to buy shares and become owners. This results in enthusiastic participation from people as they feel

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Figure 41. The first shareholder general assembly of Sapanapro JSC and Ms Ly May Chan, one of the founders of the company

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Figure 42. Products of Sapanapro JSC

they are doing this for themselves and they have ownership of the company. Shares can be bought by giving materials, labour or money. Members are paid annual dividends based on their number of shares.

The products manufactured are based on market demand. Product development comes from ideas from the market demand study and from customers' tastes. The model links together market demand, quality and design of the products.

The model secures an important principle in community development which is "the market to give decisions, the community to do self-performance, the government to give overall management" (Hop and Quang 2000).

Value addition has really increased financial returns to the medicinal spa; before the company was established, the price of the raw materials was only equivalent to the daily cost of labour for material collection. With establishment of the company, 2 tonnes of dry material yields added value of over VND78 million (USD 3 900), inclusive of labour, dividends and community welfare. This translates to VND39 million (USD 1 950) for each tonne of materials for the owners of the medicinal spa. In comparison with raw material retail at VND3 million (USD 150) per tonne, the value has increased to VND42 million (USD 2 100). The equivalent income to this from selling raw materials as before would have resulted in having to harvest 14 times the amount of the natural resources.

Table 6. Comparison of values from the exploitation and production of Red Dzao medicinal spa in Sapa (with the medicinal plant quantity of 1 tonne)

Number of used herbal plants	Value (VND)		Public Welfare
	Raw Material	Added Value at the Community	
Outsiders to buy and organize the services in Sapa	3 000 000	0	0
Community company Model (Sapanapro JSC)	7 000 000	29 266 000	2 760 000

Being owners of a company for the first time, the community members are able to better control their assets, including through establishment of a product trademark that is under the company's ownership. The company has created an opportunity for the poor to have income and has also unified the community, although some still choose to offer baths independent of the company. It has caused people to avoid dependence on agriculture and the problems that this brings.

The establishment of a community development fund, which comes from the company's annual net profit, has contributed to fair and harmonious community development in that those who do not have the chance to benefit from the company or have no role can access this fund for scholarships, relief and other needed support. In the first 18 months of the business, VND5.5 million (USD 275) was turned over to this welfare fund.

The commercialization model of the Red Dzao medicinal spa is strongly characterized by aspects of sustainable development, which are socio-economic development, environmental protection and cultural preservation. It has been difficult to preserve the community's traditional knowledge due to market impact, and the young generations have not paid attention to traditional values, but rather on how to generate physical value in the shortest time. This company model has settled both material demand and preservation of traditional values for the community.

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Figure 43. Ta Phin commune members

Case 11:

Spikenard

Figure 44. Sorting spikenard

Spikenard (*Nardostachys grandiflora DC. syn Nardostachys z*), known in Nepal as jatamansi, is a perennial aromatic herb that is valued as a medicinal plant. It is found across the Himalayan region, particularly in Nepal, India, Bhutan, Myanmar and southwest China. In Nepal, it is generally found at an altitude of 3 000 to 5 000 metres, most abundantly occurring in the western part of the country (ANSAB/SNV 2003).

Spikenard usually grows on wet and shady meadows that cling to the steep rocky slopes of 25° to 45° in hilly areas, and is harvested for traditional and commercial purposes. Spikenard oil has high value in perfumery and is used as an aromatic adjunct in the preparation of medicinal oils and cosmetic products. In the beauty industry, spikenard oil is used in products such as deodorants, perfumes, anti-ageing creams, soaps, air fresheners, incense, hand and body lotions, body wash and colour cosmetics by many leading cosmetics industries at the international level. It is used in commercial preparations as a laxative, carminative, antispasmodic, tonic, stimulant, antiseptic and diuretic.

Spikenard is threatened by overgrazing, loss of habitat and forest degradation, generating 'Critically Endangered' status on the IUCN Red List. Further, the growing demand for its rhizome as medicine has caused unregulated collection from its wild habitat, where whole plants are uprooted and disturbed (Ved et al. 2015).

The growing demand and economic potential of spikenard

A recent national-level study reported that the plant grows in 27 districts of Nepal and it is found at economic scale in 14 of them (Subedi et al. 2014). It has been reported that Nepal has annual production capacity of about 394 tonnes of spikenard (USAID 2006). Consultation with traders involved in spikenard trade revealed that the plant is currently commercially collected from nine districts, predominantly in the mid-western development region of the country.

Spikenard collection and trade provide employment and income for local people, especially disadvantaged groups such as the abject poor and marginalized households. The current price of the spikenard rhizome is around USD 7 per kilogram in the domestic market and about USD 15 in the Indian market (ANSAB 2015). The current selling price of spikenard oil exceeds USD 500 per kilogram in the domestic market and around USD 650–700 in international markets. A high proportion of households living at high altitudes in Nepal rely on collection of spikenard and other NWFPs for cash income.

Because of its socio-economic impact and economic growth potential, spikenard has been prioritized by the government, private and development sectors in Nepal for national economic development. The Government of Nepal has prioritized it

as one of 30 species, and the Federation of Nepalese Chamber of Commerce and Industries has listed it as one 12 priority species to target in this context (DPR 2006; AEC/FNCCI 2006).

Nepal exports spikenard in both raw and oil form. It has remained a high-value commercial product, with great demand in international markets including India, Europe and the United States. It has almost no use in manufactured products in the domestic market. India remains the prime market and it currently accounts for over 80 percent of the total exports from Nepal. About 75 percent of the product is now processed into essential oil for trade; this was mostly done in raw form to India 20 years ago (USAID 2006). There are still reported cases of large quantities of unprocessed rhizomes being exported to India despite an export ban on spikenard in raw form. A comparative market study of spikenard over the past decade shows that the market price is increasing, although there have been fluctuations in annual supply. Nepal's official government records show that the total annual supply of spikenard was around 36.63 tonnes with annual trade value of NRs7 million (USD 64 659) in 2013 (Department of Forests' records); the quantity is around 15 percent of the total annual supply of about 260 tonnes reported by traders in interviews.

The high economic value and increased demand in the international market could result in a rise of unsustainable harvesting of the plant. Harvesters often have limited knowledge on sustainable techniques and overharvest or engage in other improper practices, such as harvesting while the plants are immature. Unregulated harvesting has a severe impact on the natural regeneration of the species. Furthermore, loss of spikenard habitat due to human settlement, agricultural encroachment and infrastructure development has reduced the population of the plant in its natural habitat. Migration resulting in changes in land use is a specific challenge. For instance, in most cases, forest land is burned for settlements and agricultural land. Some infrastructure developments also impact on forest products, including spikenard. There are cases of unregulated grazing of yak, sheep and other animals in high altitude areas where spikenard is found in dense quantities.

Traditional and commercial use of spikenard

Spikenard is usually collected by poor and marginalized groups of people in rural areas. It has been traditionally used together with juniper and rhododendron leaves as incense in monasteries. The plant is used in tonic preparation, as a diuretic and to treat headaches, high altitude sickness, fever, epilepsy, insomnia, indigestion, dysentery, measles, skin diseases and ulcers. It is used in Ayurvedic and Amchi (Tibetan) medicines as well as in modern herbal preparations.

At the local level, minimal amounts of spikenard are used traditionally, with most of it being traded for commercial purposes, particularly as an aromatic adjunct in the preparation of medicinal oils, perfumery and cosmetic products.

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Figure 45. Harvesting of spikenard in Humla district of Nepal

The harvesters dig up the spikenard rhizomes, clean them of dirt, dry them in the sun and package the rhizomes for sale to district/village traders or to local distillation plants. As spikenard is found in upper mountain regions, usually far from human settlements, harvesters often have to stay overnight for two to five days during collection trips. The difficulty of collection has limited the participation of women, so spikenard harvesters are predominantly men. People from various socio-economic backgrounds, usually farmers, herders and local teachers are involved in spikenard collection, although farming is the principal occupation of most of the harvesters during the rest of the year. Other sources of income are animal husbandry, wage labour, salaried jobs and collection of other NWFPs.

Harvesters sell spikenard to traders, as they are able to fetch high prices for the product. The local-level (village or district) traders are usually local moneylenders or school teachers, and are financially well-off by village standards. They often work for traders at the regional level or for exporters to collect the spikenard from the harvesters. Once the spikenard is exported from the districts where it is harvested or processed, the *vaishyas* (merchant caste groups) from the plains areas dominate the rest of the value chain functions. These are predominantly men working full-time in the formal sector. The number of hill people in urban-based functions is nominal.

The exporters work with the distillation units that process the spikenard into

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Figure 46. FSC-certified spikenard and other essential oils produced by community forestry user groups (CFUGs) of Humla and Dolokha districts in Nepal

essential oil, located mostly in Nepalgunj, Kapilvastu and Kathmandu districts. There are also a few other distillation units operating at the local level. However, their production efficiency is mostly limited to serving the trade volume, which annually yields less than 100 kilograms of oil on average. After receiving spikenard oil from the distillation unit, the Nepalgunj- and Kathmandu-based exporters send it to India and other countries. More than 80 percent of the spikenard oil is exported to India and only a small percentage is exported to other countries. No authorized record is available regarding export to China or the Autonomous Region of Tibet, although some studies have reported that spikenard roots are also sent to the latter.

Spikenard's contributions to local livelihoods and incomes

The collection and trade of spikenard and other NWFPs are important sources of income, particularly for people in rural areas where economic opportunities are severely constrained by difficult socio-economic conditions and poorly developed infrastructure, such as communication and transport facilities. It is estimated that over 15 000 people in Nepal are engaged in harvesting of spikenard, which contributes to about 20–25 percent of their annual income on average (USAID 2006; Department of Forests 2007). For many communities in the districts where spikenard is available at commercial scale, its collection is one of the few, and in some cases, the only

way, to earn cash income, often limiting seasonal migration of the people from their area. For example, AEC/FNCCI (2006) reported that about 80 percent of households in the Chaudabisa Valley of Jumla, a district in the western high mid-hills, were involved in collecting spikenard.

In addition to the harvesters, it is reported that another 25 community members are engaged almost full-time in local processing. The income from this accounts for 90 to 100 percent of their annual income. The United States Agency for International Development (USAID) has estimated that a person can collect 100 to 150 kilograms of spikenard in a season, which is currently worth USD 700–1 050 at the local market. The harvesters also collect other herbal products at the same time. It is possible for a person to collect about 3 to 5 kilograms a day. This is worth approximately USD 20–35 locally, and is higher than the local wage labour rate, which is less than USD 10 a day in the spikenard collection districts (USAID 2006).

CFUG organizations and local processing have improved income and profit margins for the harvesters, as they have more selling options. The trading of spikenard involves another 250 people who serve as local-level traders, airport traders, urban wholesalers and urban distillers.

Although it already accounts for much of people's income, there are still possibilities to maximize spikenard's income-generating potential for local people. Ensuring the involvement and participation of women in spikenard cultivation, processing and trade could further enhance economic conditions in local areas. Expanding local processing would also benefit more people, as only a few processing units have been established in rural areas and at the regional level. Observation shows that the industries carrying out oil distillation can bring more money to rural areas, as the processing of these products is labour-intensive. There are also other opportunities to employ rural people in the value addition of spikenard, as there are prospects to develop and diversify products. This could translate into domestic and international market demand and international product certification.

Obstacles, challenges and lessons learned

Over the last decade, Nepal has shown that it can supply quality NWFPs, including spikenard. These products have always been in demand, but for decades were traded at low prices, often illegally across the border to India. The spikenard sector is still not developed comprehensively, considering its resource potential and its impact on conservation, economic growth and local livelihoods. Multistakeholder collaboration to develop the sector has shown that the country can produce quality products, trade them legally with internationally recognized certification and include CFUGs and local interests in the deals.

Resource degradation

Most of the collection areas of spikenard and other NWFPs are natural forests, which are unregulated and are often open-access areas. Increased demand from traders results in increased extraction, which often leads to overharvesting and the harvesting of immature plants. It is reported that the European Union restricted the import of spikenard from Nepal in December 2013 for some months, citing unsustainable harvesting in the country.

The government and various organizations have been promoting and advocating for sustainable and regulated harvesting of the plant. As a result, over 80 percent of the total quantity of spikenard now comes from community-managed forest areas, which have accounted for less than 10 percent of the volume in the past two decades. The District Forest Offices and NGOs, such as the Asia Network for Sustainable Agriculture and Bioresources (ANSAB), have assisted CFUGs in instituting a block rotational system for the collection of spikenard. Some CFUGs have been effectively implementing their operational plans, which included this system. ANSAB also introduced Forest Stewardship Council (FSC) certification in Nepal, which sets the standard for forest and social conditions and sustainable harvesting of forest products. Some of the forest areas for spikenard and other products have been certified for practices that maintain optimum harvest levels and adhere to monitoring and record-keeping protocols.

Limited information on proper handling of the plant product

The consumption of spikenard and other medicinal and aromatic plants is mainly in the international market. Due to the unorganized value chain for these products, the harvesters have limited knowledge on end markets, market volume and quality standards, and have been practising traditional harvesting techniques. As there is a limited market for spikenard at the local level, it is often stored for weeks and months and transported over long distances before it is processed. Depending on when the spikenard is harvested, excess moisture and dirt can hasten the deterioration of the rhizomes and degrade the pure spikenard. ANSAB has developed and distributed local language information sheets on scientific harvesting, provided information on limited field trials and introduced proper harvesting techniques that can be adopted by the spikenard collectors. Improved harvesting has been noted in the community groups where the material is used in local training events and integrated with operational plans and local CFUG governance.

Limited value-addition activities and quality control mechanisms

Currently, most spikenard processing is traditional and there are limited activities focused on value addition to the products, diversification of production and international product certification. There are also possibilities to cater to the needs of domestic industries.

There is a need to improve quality control of the product. Proper testing and segregation of batches in distillation plants is needed to maintain oil quality. One constraint, is the cost associated with storage vessels, as spikenard is processed in small batches and multiple storage vessels are needed.

In terms of the value chain for spikenard, formerly almost all the spikenard traded to India was in raw form. Due to targeted interventions by the Nepalese government and some NGOs, a significant quantity is now being processed in the country. In addition, some studies are being conducted, such as those of USAID and ANSAB, which provide strategies to further develop the value chain.

Market challenges

Spikenard grows in mountainous terrain, which makes harvesting difficult. Additionally, the bulky nature of the plant makes its transportation inconvenient. In many cases, the poorest members of the community do the harvesting. Because they have limited access to information on quality and end-market demand, there are inconsistencies in the supply. As a result, the market does not operate in a systematic way. At the community level, there are no reported cases of using adulterants, but another herb, *bhutkes* or *Selinum vaginatum*, which has similar physical properties, has been sold in the Indian market as an adulterant.

Initial steps have been taken to address these challenges. For example, in order to reduce transportation difficulties, some distillation units have been established and are operating at the local level. ANSAB has established a marketing information system that collects information and disseminates a monthly price list of 33 NWFPs, including spikenard. This provides information on the market price of the product in six major trade centres in Nepal and India. Another notable initiative to systematize the value chain is the operation of the Himalayan Bio Trade Ltd. (HBTL) that was established by ANSAB as a long-term committed lead firm, with a clearly stated value-chain vision, goal and portfolio focused on essential oils and other NWFPs. HBTL has been sourcing FSC certified organic essential oil, including spikenard oil, from rural mountain communities to sell in the international market. It provides guaranteed buy-back and increased stakeholder income to its partner communities.

Nepal's spikenard experience has shown that linking primary forest products to the market can provide opportunities for local economic development while ensuring environmental sustainability. Development of the process likely needs support from the government and other organizations, as there are many factors involved. Some major lessons learned from experiences with spikenard in Nepal are:

Synergy between sustainable management of forest products and local economic development is possible

By developing synergy among local communities, commercially-viable forest products and enterprises, it is possible to generate enough economic incentives for local communities to sustainably manage the products. Spikenard and other NWFP-based enterprise activities provide economic benefits to a community of stakeholders who have both the incentive and capacity to engage in forest conservation and counter the threats to the forest. The experience in Nepal shows that as the harvesters and traders become more aware of their roles and develop a deeper sense of ownership, they improve resource management plans, institutionalize sustainable harvesting practices, pay for the resource conservation activities, initiate measures to mitigate threats, assist natural regeneration and promote regeneration of the forest products.

A key example is in the community-based essential oil enterprise, Humla Oil Pvt. Ltd., established in 1994 in the high Himalayas of northwestern Nepal, which promoted resource conservation at the local level. It provided economic incentives to the natural resource collectors, thus linking resource management with income-generating activities. During its operation, the company produced 300 kilograms of spikenard oil annually and provided handsome amounts to the collectors of forest products, including spikenard (Subedi et al. 2006). The economic benefits provided by this enterprise resulted in improved resource conservation practices. Before 1994, spikenard and other herbs in the alpine pastures, used to be burned to allow summer grasses to grow for livestock. But after realizing the importance of spikenard as an important cash-generating product, the communities started to institutionalize resource management systems within the framework of community forestry in Nepal. In five years, the communities in the region formed 19 CFUGs and brought 13 000 hectares of forest and pasture under the community management system (ANSAB 1999).

Forest product-based enterprises at the community level need value-chain facilitation for their development

Development of forest product-based enterprises at the community level will usually require external support to organize and develop communities' capacity for enterprise-oriented activities and to provide access to financial and non-financial business development services (BDS) and communities to participate in the value chain. Regular facilitation from organizations and government programmes is also necessary to provide critical services and support. There is a need to facilitate BDS market development and linkages in order to understand and meet the end-market requirements. There should be capacity development for all stakeholders at all levels, from the local level to national enterprises, the government and value-chain facilitators. Research and product development is needed to generate

information as well as analysis to improve the policy and regulatory environment.

While NWFPs have great economic potential, particularly for communities, there are many concerns that need to be addressed, particularly with ensuring sustainable management of resources, developing market links and facilitating local participation in the value chain.

The lessons learned from Nepal's experience with spikenard show clear ways forward in developing NWFP enterprises that improve local livelihoods, meet market demand and achieve forest conservation goals.

Case 12:

Sandalwood

Figure 47. Processing sandalwood

Sandalwood is a class of semiparasitic plants of the genus *Santalum* (family Santalaceae), particularly the fragrant wood of the true, or white, sandalwood, *S. album*. The genus *Santalum* was first proposed by Linnaeus in 1753 in his description of *S. album* under the family Santalaceae (Merlin and Van Ravenswaar 1990). Although the word sandalwood can be traced back to numerous origins, ultimately it is derived from the Sanskrit čandana-m, or 'the sandalwood tree', perhaps literally 'wood for burning incense' (Online Etymology Dictionary 2010).

The tree grows to a height of about 10 metres and is partially parasitic on the roots of other tree species. Both the tree and its roots contain a yellow aromatic oil, called sandalwood oil, the odour of which persists for years in articles such as ornamental boxes, furniture and fans made of the white sapwood.

The main commercial products from sandalwood are the heartwood and the essential oil distilled from the heartwood. Oil concentrations of sandalwood heartwoods vary within and between species, with the highest concentrations found in older trees. Within a particular species, the concentration and quality of oil is usually highest in the main woody roots near the base of the stem. The oil is obtained by steam distillation of the wood and it is used in perfumes, soaps, candles, incense and folk medicines. The trees are slow growing, usually taking about 20 to 30 years for the heartwood to reach an economically useful thickness. In the international market, the oil composition of any sandalwood is compared with that of the oils of *S. album*, the benchmark species. The standard is set in accordance with the concentration of santalols (an organic compound with a wide range of health benefits) among sandalwoods.

Sandalwood is an immensely important tree species in the Pacific that has provided income and trade for Pacific islanders for more than 200 years (Gjerum; Fox, and Erhart 1995). It is widely known for its historical, cultural, socio-economic and environmental importance. The high prices available in East Asia at the beginning of the nineteenth century sent adventurers into the Pacific in search of the wood and this started the 'Sandalwood Trade'.

Traditional uses of sandalwood in the Pacific

Traditionally, sandalwood is used in various ways throughout the Pacific, such as by mixing sandalwood dust with coconut oil for skin lotions, perfumes and medicines and the burning of sandalwood for rituals (Brennan and Merlin 1993). The best quality sandalwood is exported and used for wood carvings and handicrafts, and its oil is used for perfumes. Lower quality wood and residues are used to make incense. All parts of the tree that contain heartwood are utilized, including the roots. Because of its light colour and low oil content, the sapwood (the soft outer layers of recently formed wood that contains the vascular tissue) is less attractive for commercial use, although it can be mixed with heartwood for carvings and incense. Prices vary

depending upon whether billets are sold with sapwood or removed. Sapwood chips are utilized in some countries such as Fiji and Vanuatu for incense and as an insect fumigant. In Tonga, there is no market for sapwood and it is roughly removed in the forest, causing some loss of valuable heartwood through chainsaw cuts.

In Fiji, sandalwood is traditionally sprinkled on the heads of the groom and bride during wedding ceremonies. Chiefs are also anointed with sandalwood-scented oil during their traditional installation and sandalwood dust is sprinkled on their heads.

Natural distribution in Asia and the Pacific

Applegate et al. (1990) listed areas of global distribution for about 16 *Santalum* species from Australia, India, Indonesia, Hawaii, Pacific island countries and the Juan Fernández Islands off the coast of Chile.

According to Doran (2012), *S. album,* commonly known as Indian sandalwood, is found in the tropical dry deciduous forests of India, the Lesser Sunda Islands of Indonesia and Arnhem Land of Northern Australia. It is the only species of the genus found on the Asian mainland and may have been introduced to India from the Lesser Sundas centuries ago. Indian sandalwood has been stripped from most of India's forests and is now rare in the wild.

Five species, including *S. album,* are native to Australia. *S. acuminatum*, known as the sweet quandong or native peach, produces a shiny bright red fruit used increasingly in Australia for jams, jellies, chutneys and pies. Of the species of *Santalum* that grow naturally in Australia only *S. album*, *S. lanceolatum* and *S. spicatum* are known as sandalwood, as these species contain aromatic wood. They are found mainly in the arid and semi-arid region of Australia with *S. lanceolatum* being the most widespread. The most commercially-valuable species in Australia is *S. spicatum*. The sandalwood industry in Australia developed as early as 1844 and was based on harvesting the natural stands of *S. spicatum* (Applegate and McKinell 1993).

Four species, commonly called 'iliahi', are endemic to Hawaii. *S. fernandezianum*, endemic to the Juan Fernández Islands off the coast of Chile, was overexploited for its aromatic wood, and may now be extinct (Merlin, Thomson, & Elevitch 2006).

S. yasi is the only species of sandalwood native to Fiji. Its natural distribution in Fiji is very localized and it is found in Bua Province, the Udu, Nasealevu and Dreketi areas, Macuata Province of Vanua Levu, Kadavu, Rotuma, Ono-I-Lau, Lakeba, Oneata (Lau Province), the Nausori Highlands and the Colo West Range from Tubenasolo to Nasaucoko, Western Viti Levu. *S. yasi* is a small tree growing up to 10-metres in height with a maximum diameter of about 40 centimetres; it has a light crown and irregular branching habit. *S. yasi* is slow-growing and takes about 25 to 30 years to attain harvestable size when grown under optimal conditions. Older trees have a higher proportion of better quality

heartwood and are therefore much more valuable than younger trees (less than 20 years old) (Jiko 1993).

Indian sandalwood (*S. album*) produces highly valuable heartwood and is the most valuable species. It was introduced for trials in Fiji many decades ago and is well-adapted to Fijian conditions, growing faster than the native *S. yasi*. Natural hybrids between *S. album* and *S. yasi* have been found to grow very quickly in Fiji, but the rate of heartwood formation in these hybrids is not yet known.

Field surveys of sandalwood show sparse and scattered distribution and indicate that the natural distribution of *S. yasi* has fluctuated over time and has even declined in some areas. *S. album* has been introduced and there is evidence of the naturalization of *S. yasi* and *S. album* hybrids.

Historical background of sandalwood in the Pacific

Shineberg, in her book *They came for sandalwood*, provides a good historical background of the sandalwood trade in the Pacific in the nineteenth century. The first Pacific islands to feel the effect of the scramble for sandalwood were the Fiji islands, with sandalwood stocks having been decimated by 1816. On a smaller scale, sandalwood was discovered in the Marquesas' Islands, probably in 1814, and the islands had been stripped of the species within three years. Hawaii experienced a sandalwood boom from 1811 to 1828, when the Hawaiian chief traded sandalwood cut by locals for the best silks, liquor, tableware and clothing brought by European traders. The final episode of sandalwood trade in the Pacific occurred in Eromango and the other islands in the southern New Hebrides (now known as the Republic of Vanuatu) in the late 1820s. This was triggered by the discovery of sandalwood in the Isles of Pines, the Loyalty Islands and New Caledonia in the 1840s, as well as in Espiritu Santo, the largest and northernmost island of the New Hebrides in the 1850s. The sandalwood from Eromango had the reputation of being not only large and plentiful, but also of consistently superior quality. There were small finds of sandalwood in Western Australia in 1846, but this was of poor quality. A small quantity was exported intermittently throughout the period, but it was never a rival to the South Seas' wood. By 1865, the sandalwood trade was described as 'dead' (Shineberg 1967).

Opportunities and challenges

There has been a growing interest in sandalwood because of its potential for generating cash income, even when grown on a small scale. It can even be grown in outer islands that are far from markets, because it is a non-perishable product.

The export demand for sandalwood remains high and it continues to be a valuable commodity in a number of Pacific island countries, particularly Vanuatu. In 1998 the royalty paid to villagers totaled VT31.6 million (USD 250 000) and it is a major source of rural income in the areas where it is still found.

Sandalwood is commonly grown in agroforestry farming systems in rural areas, where farmers plant the trees together with their crops. It is suitable for inclusion in alley-cropping systems, home gardens or woodlots. All *Santalum* species are readily grown from seeds and because they are known to be semiparasitic, they must be grown together with other plant species to act as hosts. Sandalwood needs regular pruning of its lateral branches to encourage development of good bole form. The whole tree is harvested, including the major roots and large branches that contain heartwood. It normally takes about 15 to 20 years before a sandalwood tree develops a good amount of heartwood for harvesting. *S. yasi* is slow growing, taking about 25 to 30 years to attain harvestable size when grown under optimal conditions. Older trees have a higher proportion of better quality heartwood and are therefore much more valuable than trees which are less than 20 years old.

Sandalwood essential oils are extracted by steam distillation wherein superheated steam is passed through the powdered wood. The steam then carries the oil locked inside the cellular structure of the wood. After the steam cools, sandalwood hydrosol and sandalwood oil are produced.

Demand for sandalwood oil has resulted in drastic overharvesting. *Santalum* is one of the most heavily exploited groups of plants across its range. The species endemic to the Juan Fernández Islands (*S. fernandezianum*) became extinct in the last century because of human exploitation. One variety in the Hawaiian Islands (*S. freycinetianum* var. *lanaiense*) is currently listed as endangered by the U.S. Fish and Wildlife Service, and two other taxa are considered threatened by extinction, *S. insulare* var. *hendersonense* and *S. boninense*. *S. album* was listed as 'Vulnerable' in the IUCN Red List of Threatened Species in 1998. Understanding the genetic diversity and relationships of this genus is crucial to the development of appropriate management and conservation of the existing populations of sandalwood (Merlin and Van Ravenswaar 1990).

Vanuatu, a main supplier of sandalwood for the last several decades, has seen a continuing decrease in the natural stock of sandalwood. The species has been widely depleted especially on Efate and Aneityum and is threatened in much of its natural range. The major threat to sandalwood comes from unsustainable and uncontrolled harvesting. Other threats include damage to natural regeneration by feral cattle and clearing for agricultural development. The Forestry Department of Vanuatu, in collaboration with James Cook University, conducted an inventory on wild stock in Eromango, Efate and Malakula in 2008. The report indicated a very limited stock of mature sandalwood in the wild. Therefore, the sandalwood industry should not rely on the wild sandalwood stocks for its future supply (Tate 2010).

The sandalwood industry has played a significant role in raising the profile of sandalwood by highlighting opportunities

Table 7. Sandalwood harvests (Tonnage) and landowner benefit (Vatu) for 2009 to 2014 – Vanuatu

Year	Harvests (Ton)	Royalty (VT)
2009	73.0	73 470 000
2010	50.9	60 950 889
2011	37.4	41 833 506
2012	29.1	61 795 528
2013	40.5	96 072 410
2014	25.8	60 583 875

Source: Forestry Department, Vanuatu.

in the international market. The establishment of onshore processing facilities in Vanuatu significantly increased royalty rates from the minimum of VT300 (USD 2.69) in 2003 to VT1 000 (USD 8.98) per kilogram in 2010. The industry pays an average of VT1 500 (USD 13.47) per kilogram of wood and this is a significant incentive for farmers and landowners to invest in sandalwood planting. The industry has also been involved in sandalwood planting and in efforts to raise awareness about sandalwood among communities.

There is a great deal of optimism about the sandalwood industry in Vanuatu due to the significant amount of sandalwood being planted at the village level by smallholders, as well as investment schemes throughout the country which have led to a 900 percent increase in the price of sandalwood seeds from VT500/kilogram in 2004 to VT5 000/kilogram in 2007. This high demand for seeds and seedlings has stimulated the development of a nursery industry that provides a short-term cash flow for sandalwood owners. This development may help to preserve sandalwood trees that bear good seeds, as they are potentially a source of regular cash income (Gillieson et al. 2008). It is estimated that smallholder plantings in Vanuatu since 2000, which have resulted in the establishment of 270–550 hectares, plus 150 hectares of commercial plantings, could provide a sustainable annual yield of approximately 300 tonnes by 2030. These plantings are expected to become the main source of harvest that would eventually offset the harvest from wild sources, improve export volume resulting in improved balance of trade and government tax revenues, and stimulate the local cash economy and ultimately improve this livelihood in Vanuatu (Page et al. 2012).

The National Forestry Act, Order No. 3 (The Sandalwood Order) addresses the management and control of the sandalwood trade and export in Vanuatu. The Act outlines the license requirements, conditions, fees and other details related to the sandalwood trade. It also gives the Minister the power to declare a sandalwood trading season, upon advice from the Director of Forests, by specifying the periods during which sandalwood can be traded and cut.

Table 8. Sandalwood exports (mt & FJ$)

Year	Species	Volume (mt.)	Value (FJ$)
2011	Santalum yasi	14.641	$ 1 647 557.85
2012	Santalum yasi	37.616	$ 2 872 307.99
2013	Santalum austrocaledonicum	9.313	$ 950 427.40
	Santalum yasi	9.165	$ 1 227 896.33
2014	Santalum austrocaledonicum	0.05	$ 66 000.00
	Santalum yasi	0.04	$ 39 224.00

Source: Forestry Dept., Fiji – 2015.
(* FJD 2 = USD 1)

Table 9. Sandalwood exports (kg)

Destination	2006	2007	2008	2011	2012	2013	2014	2015
Fiji				1 2278.34	1 373.09	124.9997		
China		11 630		9 210.96	1 100.16	2 161.682	4 768.63	1 745.59
Taiwan POC	41 000	19 4097	28 486.28	7 686.85			9 804.02	554.06
Viet Nam				25 000				

Source: MAFFF, Tonga, 2015.

In recognition of the economic importance of sandalwood in Vanuatu, in December 2014, the Lord Mayor of Port Vila and the Agriculture Minister of Vanuatu signed a Memorandum of Agreement declaring Port Vila as Sandalwood City (Ligo, 2014). This development paved the way for more sandalwood growing throughout Port Vila, both for the beautification of Port Vila City, as well as for the economic benefit of the residents living in the city. The agreement also spells out the management and ownership conditions as well as the benefits for tree planting throughout Port Vila as an ongoing programme between the Municipality and the Ministry.

In Fiji, sandalwood exports appear to be diminishing. The main export destinations for sandalwood are China, Dubai and Hong Kong Special Administrative Region.

In Tonga, there are a number of significant threats to the development of a sustainable sandalwood industry. Overcutting and low levels of replanting have depleted the resource; checking of immature stems causes windthrow and decay; and the theft of trees discourages many landowners from planting sandalwood. There are now hardly any significant stocks of mature sandalwood trees left in the natural habitat. But, sandalwood exports are still being recorded.

In 2006, the global trade in sandalwood was about 5 100 tonnes with India as the major producer (90 percent of world production) and user of sandalwood oil. China, Taiwan Province of China, Singapore, Republic of Korea, Japan and India are the main markets for sandalwood oil. Global production has declined significantly over the past 20 to 30 years, while production from the

Pacific has been highly variable since exploitation commenced in the early 1800s (Thompson 2006).

The Times of India, in an article in 2012, noted reduced global production of sandalwood at about 4 000 tonnes, with India officially producing 400 tonnes and the rest coming mainly from Australia (1 800 tonnes), and about 350 tonnes from Indonesia, Malaysia, Cambodia, Thailand and Myanmar. Sandalwood production in India has declined significantly from 4 000 to 400 tonnes per year in the past decades due to government restrictions on the planting and felling of sandalwood. Likewise, Indian farmers are obtaining scant returns from their sandalwood plantings and the risk of poaching is very high (Times of India 2012).

The most important development in recent years is the establishment of large sandalwood plantations in Australia. Started in 1997, Quintis (formerly Tropical Forestry Services Corporation) has planted 5.4 million *S. album* trees covering 12 182 hectares with an estimated current annual production of 300 tonnes. The company plans to increase its output to 10 000 tonnes per annum. Global demand for sandalwood, however, is expected to increase to 20 000 tonnes by 2025 with the Chinese market accounting for half of the increase (Keenan and Parija 2017).

With a steadily growing demand for sandalwood in the world market, there are good opportunities for commercial growers and smallholders (farmers and landowners) to supplement the limited supply of native sandalwood from the wild with plantation grown trees. Although sandalwood grows in some parts of Asia and the Pacific, the natural stands are rapidly disappearing and insufficient to satisfy worldwide demand.

The cultivation of sandalwood is, however, not an easy matter, as all species of *Santalum* are semiparasitic. This means that natural regeneration or artificial establishment is dependent on the presence of suitable host plants, as well as suitable environmental conditions. In addition, sandalwood is vulnerable to fire and browsing, which are both common factors of the environment of all species. Nearly all species of *Santalum* have been heavily exploited in the past, to the point where there are grounds for concern for the survival of some species (McKinnel 1993).

Recommendations and conclusions

The sandalwood industry has a bright future in the Pacific region, with high and increasing levels of planting across the region that could eventually lead to greater export volumes. This would lead to improved balance of trade, government tax revenues, local economic activities and smallholders' livelihoods.

The ever-growing economic interest in sandalwood, particularly through smallholder planting schemes, is allowing the sandalwood resource in Pacific island countries, especially in Fiji, Vanuatu and Tonga, to grow and expand exponentially. Governments are now promoting the planting of sandalwood as a viable means to enhance the livelihoods of farmers and landowners in rural areas.

A certification system for legally sourced sandalwood from the Pacific is now being promoted to reduce, if not totally eliminate, the problem of poaching and illegal trade of sandalwood in the region.

In a regional meeting on sandalwood held in Port Vila, Vanuatu in November 2010, the workshop delegates fully recognized and unanimously agreed that sandalwood has the potential to contribute to the improvement of living standards of people in Pacific island countries and territories. However, in order for this to happen, there must be critical assessment, continuous cutting-edge research and development, improved management practices and policies, and the development of marketing initiatives and promotions in the key markets of East Asia, India, the Near East, Europe and the United States.

The delegates further agreed on the following:

- Sandalwood needs to be prioritized in government forestry policy, research and development, extension, rural development and trade activities;
- Sandalwood is a high-value, non-perishable export product, which can be grown to provide substantial cash income. This would improve the standard of living of farmers and families living in remote islands with very limited income-generating opportunities;
- National sandalwood extension programmes need to be established in each current and aspiring producer country. In order to optimize extension benefits, these should be led by a full-time sandalwood extension officer, and should include extension materials, demonstration plots, media and awareness programmes, and sandalwood farmer networks;
- Poorly regulated and unsustainable exploitation of sandalwood has resulted in its commercial extinction in some locations. Pacific countries can learn from the sandalwood regulations and policies of New Caledonia and Vanuatu, which have enabled continued, sustainable production of sandalwood from native populations. Furthermore, regulations ensuring the conservation of core natural populations need to be implemented; and
- An expanded and well-resourced Pacific regional research and development programme aimed at optimizing sandalwood growth, heartwood formation and oil quality is needed to increase economic benefits to the region.

The Pacific Community (SPC), an international organization in the Pacific, has played an important role in the conservation and management of sandalwood resources and in revitalizing the sandalwood industry in the Pacific. SPC, in collaboration with its development partners, has organized regional workshops on sandalwood to address issues and challenges being faced by the industry. They provide excellent opportunities to share and discuss

current information on sandalwood and discuss the future direction of the industry, including improved conservation and sustainable use of sandalwood.

Sandalwood is of great social, cultural and economic importance to many communities in the Pacific. The conservation of sandalwood is an increasingly important issue, especially given the pressure on forest and tree resources, from unregulated harvesting and land-use conflicts. As a priority species for income generation in rural communities, sandalwood deserves added inputs and interventions to support and ensure its long-term sustainability.

Figure 48. A spikenard plant

Discussions and conclusions: challenges and way forward

Natural ingredients are finding growing use in the beauty industry. Whereas many ingredients are cultivated, others are still collected from wild or uncultivated sources. Emerging aspects from the chapters and case studies are discussed below.

Re-emergence of traditional knowledge: Old wine in new bottles

The beauty and cosmetics industry is reviving and using traditional ingredients used by communities. Some of these are used 'fresh' and seasonally when collection is possible. Traditional prescriptions usually cannot be stored for long periods and the industry has addressed this by preserving ingredients for longer and packaging them in convenient containers. Aloe vera, honey, turmeric in skin creams and soapberry in shampoos have become commonplace globally. Markets are also developing for sea buckthorn and langsat extracts from China and Indonesia respectively, which are traditionally known to moisturize and brighten skin.

Low returns to forest communities

Most of the NWFPs used in the cosmetics industry and collected from wild sources have low returns for the gatherer. For products such as spikenard in Nepal and forest honey in Indonesia, NWFPs provide a large contribution to rural households through their significant contributions to income. Unfortunately, for many forest-dependent communities, returns are low and contributions to income are dwindling, despite the growing demand for natural inputs in the beauty industry.

Some NWFPs are still traded in a very crude and raw form, in bulk, such as soapberry and Manila elemi, thus resulting in low prices. The disparity in prices across the value chain is glaring, as exemplified by Manila elemi, which fetches large sums when processed into high-grade perfumes. Often, forest-based NWFP gatherers are disadvantaged due to lack of processing facilities and capital. For example, in a few locations in India the collection of soapberry has stopped as the co-operatives did not have sufficient funds for procurement. Other concerns at the community level are quality control, storage, packaging and inadequate marketing information and strategies in combination with market price fluctuations. Disorganized trade and lack of incentives for value adding to products at source undermine the potential to support the livelihoods of marginalized communities.

However, when processing technology and capital can be mobilized, especially with support to efforts from NGOs or governments, the case studies show that the returns to local communities increase significantly. These cases, for example medicinal spa in Viet Nam, are important examples where local employment, income and skills are enhanced through value addition.

Unsustainable harvesting and unstable supply

For most NWFPs used in the beauty and cosmetics industries, high demand linked with unsustainable harvesting usually reduces the population in the wild. Most of them are then targeted for cultivation. This trend is also seen in the medicinal plants sector. Some of the NWFPs that have a 'Threatened' status in the IUCN Red List are still being collected and used in the beauty industry, for example spikenard. This could be because in parts of Nepal it is found abundantly and forms an important source of income for local communities. Conservation of certain species is also often poorly understood or appreciated. This is similarly a concern for products such as turmeric, medicinal spa ingredients and sandalwood.

There are several factors other than unsustainable harvesting that hinder the further development of NWFPs for the beauty industry. Supply security is a major concern as larger industries have difficulty in preparing standardized NWFP prescriptions where supply is not predictable. Lack of stability in supplies can be attributed to weather-related changes affecting production, seasonality and issues of shelf-life, among other reasons. This leaves an opportunity for niche markets, however, for 'limited edition' and 'hard-to-find' ingredients, especially for conscientious and passionate consumers. As many NWFPs have quite low collection prices, their purchase cost may not be an issue; however, access to remote forest areas may be a concern. Another factor that may potentially affect supplies of some NWFPs for beauty products are rapid land conversion and illegal logging. In Cambodia, for example, these factors have affected the availability of D. alatus resin as forests have been converted to plantations and as the price of selling timber has been perceived to be more lucrative than the resin trade. NWFPs with relatively high costs of production, like forest honey, may struggle to gain acceptance for use in beauty products unless they can be specifically differentiated from other, more cheaply produced, kinds of honeys.

Cultivation of NWFPs for the beauty industry

Some of the NWFPs used in the beauty industry are targeted for cultivation in plantations or agroforestry systems. Some examples are sandalwood, thanaka, hazel sterculia and langsat, the latter being a common fruit. At the industrial or local level, these products are usually of high value and do not have significant wild populations. Technical knowledge relating to cultivation may also constitute a barrier to cultivation. Although it may appear to be easy, cultivation and management is not necessarily as simple

as policies may suggest, including for example, cultivating parasitic sandalwood. Lack of landownership or clear tenure may constrain production of certain NWFPs, like thanaka for example, and may prevent benefits from flowing to poor rural households.

Erosion of local knowledge and adulteration of remedies

Erosion of local knowledge and adulteration of remedies are also noted constraints to effective utilization and marketing of some NWFPs for beauty and cosmetic purposes, as is particularly noted in the medicinal spa case study. This is also a concern for thanaka products so most consumers prefer buying fresh thanaka stems because then they can be sure the thanaka has not been adulterated.

Some proposed interventions

Looking at the sector as a whole, it is necessary to streamline many aspects along the value chain. Some relate to community benefits and others to traders, processing industries and government policies.

Recognising traditional knowledge

Documentation of knowledge, traditional preparation and intellectual property right aspects need to be brought to the forefront and considered during planning and policy formation. The example of Manila elemi is important in this matter. Where traditional and indigenous prescriptions are being commercialized, the industry should be able to compensate indigenous knowledge and comply with free and prior informed consent norms. Cases of thanaka and wild turmeric are especially relevant here. In countries like India, many small and medium cosmetic and herbal industries use ingredients and prescriptions from traditional sources; however, it is difficult to trace their origin.

Conservation Measures

Some plants get locally endangered due to large scale and unsustainable harvesting. In the case of Viet Nam's wild hazel sterculia, where there was a drastic reduction in wild population, propagation has been promoted. Similar interventions may be necessary in ingredients used in the cosmetics industry. In the case of gurjum balsam, the tree is already listed as endangered across Cambodia and Viet Nam and needs special efforts to save the habitat and the species through setting up nurseries and planting.

Institutional support for producer-owned companies and local value addition

We have seen from the case studies that in cases like spikenard, soapberry and sea buckthorn, the collection is unorganised and benefits a series of traders instead of the harvester. In cases like forest honey, medicinal spa or gurjum balsam where the producers have been organised for collection, value addition and marketing, the returns are higher to the producer. In order to increase gains for NWFP gatherers, more value addition and better organization at the collectors' level are

needed. In most cases for NWFPs used, efforts could be made to support such groups of other NWFP gatherers and producers around Asia and the Pacific.

Quality standards, minimum support prices and market regulations

NWFPs used in the cosmetics industry need to have quality standards and regulations with respect to harvesting. The cosmetics industry can help to set these standards for harvesting different NWFPs.

Due to irregular trade and informal market arrangements for NWFPs across Asia, rural incomes from sale of NWFPs are low for example in the case of soapberry. Some countries like India are making efforts to streamline trade and fix minimum support prices for these products. There are a few products, like forest honey, which are already of high value, so it is important to highlight their niche values and uniqueness to make them more attractive for development in the cosmetic industry. Geographical Indication can be one of the ways to trace the authenticity of the product to the unique ecosystem and its people.

Community-based arrangements for beauty NWFP promotion

Given steady demand, certain NWFPs used in the cosmetic sector can be promoted for cultivation. Private initiatives in this respect are already being carried out for medicinal plants in India. Community forestry arrangements that grant individual plots to poor and landless households, for example, could allow thanaka farmers and marginalized groups to benefit more from thanaka production. Similar trials could be tried with hazel sterculia in Viet Nam and sandalwood in the Pacific islands. Rural development and land allocation schemes can consider this as a good and lucrative option for community development.

"Now new market analysis released by Persistence Market Research has shown that with the year-on-year growth in organic beauty, the global market should be worth just under USD 22 Bn by 2024. Those figures suggest approximate growth of 8–10% per year. The current natural and organic beauty market is estimated to reach the value of USD 11 057.1 Mn in 2016, which means that analysts expects the market's value to double in the next 8 years" (Dallmeier, 2017).

Given this global scenario, it seems a huge opportunity for communities involved in gathering of NWFP for the cosmetic industry to be a part of this growth. It also throws open opportunities for cultivation of ingredients and have a tied-up market linkage with assured returns. This also calls for larger afforestation and restoration programmes to consider needs of a fast-growing sector and include forest species which are ingredients for cosmetics. For governments this would mean a sectoral integration and incentivization strategy for forestry, trade and industry sectors on cosmetic products.

References

FORESTS AND BEAUTY: OVERVIEW AND SYNTHESIS

Business Wire. July 27, 2015. *Research and markets: Global cosmetics market 2015-2020: market was $460 billion in 2014 and is estimated to reach $675 billion by 2020.* Available at: http://www.businesswire.com/news/home/20150727005524/en/Research-Markets-Global-Cosmetics-Market-2015-2020-Market.

Global Wellness Summit. January 24, 2018. *Global Wellness Trends.* Available at: https://www.globalwellnesssummit.com/2018-global-wellness-trends/.

McDougall, A. ***Cosmetic Designs-Europe.*** *December 9, 2015.* Available at: https://www.cosmeticsdesign-europe.com/Article/2015/12/09/Health-and-wellness-a-big-influence-on-top-4-beauty-trends-for-the-next-decade.

Ostrom, E. 1990. *Governing the commons: the evolution of institutions for collective action.* Cambridge University Press.

Smeh, N.J. 1995. *Creating your own cosmetics – naturally: The alternative to today's harmful cosmetic products.* Alliance Publishing Company.

CHAPTER 1: INTRODUCTION TO NWFPs IN ASIA

Belcher, B.M. 2003. What isn't a NTFP? International Forestry Review 5(2), 161–168.

De Beer, J.H. & McDermott, M.J. 1989. *Economic value of non-timber forest products in Southeast Asia.* Amsterdam, Netherlands Committee for IUCN.

Dembner, S.A. & Perlis, A. (Eds.) (1999). Unasylva No. 198 – Non-wood forest products and income generation, 50(3). Retrieved from http://www.fao.org/docrep/x2450e/x2450e0d.htm#TopOfPage.

Food and Agriculture Organization of the United Nations (FAO). 2013. *Forests for improved nutrition and food security.* Available at: http://www.fao.org/forestry/27976-02c09ef000fa99932eefa37c22f76a055.pdf. Accessed 15 April 2015.

Kabra, A. 2009. Conservation-induced displacement: A comparative study of two Indian protected areas. *Conservation and Society,* 7(4): 249. Doi:10.4103/0972-4923.65172.

Mohler, C. 2016. *12 cosmetic ingredient trends to watch in 2016.* Available at: http://blog.mixerdirect.com/12-cosmetic-ingredient-trends-to-watch-in-2016. Accessed 15 April.

Molnar, A., Scherr, S. & Khare, A. 2004. *Who conserves the world's forests? Community-driven strategies to protect forests and respect rights.* Washington, DC, Forest Trends and Ecoagriculture. Partners.

Nomad RSI, NTFP-EP, CNWG, IADC, ICC. 2012. *Participatory needs assessment on wild foods diversity. Towards food security and climate change adaptation in Ratanakiri Province. Cambodia.*

CHAPTER 2: TRADITIONAL USES OF NWFPs FOR COSMETICS AND HEALTH CARE

Ahmad, M., Khan, M.A. & Zafar, M. 2008. Traditional herbal cosmetics used by local women communities in district Attock of Northern Pakistan. *Indian Journal of Traditional Knowledge,* 7(3): 421–424.

Karuppusamy, S. 2007. Medicinal plants used by Paliyan tribes of Sirumalai hills of southern India. *Natural Product Radiance,* 6(5): 436–442.

Shaheen, H., Nazir, J., Firdous, S.S. & Khalid, A.U.R. 2014. Cosmetic ethnobotany practiced by tribal women of Kashmir Himalayas. *Avicenna Journal of Phytomedicine,* 4(4): 239–250.

Case 1: Wild turmeric

Aggarwal, B.B., Sundaram, C., Malani, N. & Ichikawa, H. 2007. Curcumin: the Indian solid gold. *Adv. Exp. Med. Biol.,* (595): 1–75.

Chempakam, B. & Parthasarathy, V.A. 2008. *Turmeric. Chemistry of spices.* UK, CABI Publishing. pp. 97–123.

Fischer, C.E.C. 1928. *In* Sykes, J.S. *The flora of the presidency of Madras*. Pt 8. London.

Kojima, H., Yanai, T., Toyota, A., Hanani, E. & Saiki, Y. 1998. Essential oil constituents from Curcuma aromatica, C. longa and C. xanthorrhiza rhizomes. *In* Ageta, H., Aimi, N., Ebizaka, Y., Fujita, T. & Honda, G. *Towards natural medicine research in the 21st century,* pp. 531–539. Amsterdam, Elsevier.

Linnaeus, C. 1753. *Species plantarum.* London.

Muraleedharan, P.K. et al. 1999. *Biodiversity in tropical moist forests: a study of sustainable use of non-wood forest products in the Western Ghats, Kerala: monitoring and evaluation of ecological and socio-economic variables.* KFRI Research Report. p. 162.

Nair, K.P. 2013. *The agronomy and economy of turmeric and ginger: the invaluable medicinal spice crops.* Newnes.

Parry, J.W. 1969. *Spices.* Vol. I. *The story of spices and spices described.* Vol II. *Morphology, histology and chemistry.* New York, NY, Chemical Publishing.

Prabhakaran Nair, K.P. 2013. *The agronomy and economy of turmeric* and. *ginger: the invaluable medicinal spice* crops. Elsevier Insights.

Ravindran, P.N., Babu, K.N. & Shiva, K.N., eds. 2007. *Turmeric–The genus curcuma. Botany and crop improvement of turmeric.* Boca Raton, FL, CRC Press. pp. 15–70.

Schippmann, U., Leaman, J.D. & Cunningham, A.B. 2002. *Impact of cultivation and gathering of medicinal plants on biodiversity: Global trends and issues.* Rome, Inter-Departmental Working Group on Biological Diversity for Food and Agriculture.

Schmidt, B.M. 2012. Responsible use of medicinal plants for cosmetics. *HortScience,* 47: 985–991.

Van Rheede, H.A. 1678. *Hortus indicus malabaricus.* Vols. 1–12. Amsterdam.

Weil, J. 2012. *Beauty's top 100. WWD (Women's Wear Daily).* New York, Condé Nast, Inc.

Case 2: Indian soapberry

International Centre for Integrated Mountain Development (ICIMOD). 2015. *Sustainable livelihoods in the Kailash sacred landscape: Promotion of the rittha (soap nut) value chain in Nepal.*

Kuniyal, C.P., Kuniyal, P.C., Butola, J.S., Sundriyal, R.C., 2013. Trends in the marketing of some important medicinal plants in Uttarakhand, India. *International Journal of Biodiversity Science, Ecosystem Services & Management,* DOI: 10.1080/21513732.2013.819531.

ITCOT Consultancy and Service Ltd. No date. *Study of the identification and utilization of sustainable minor forest produces of Tamil Nadu.* Vol. 2. Department of Scientific and Industrial Research (DSIR). p. 7.

Mali, R., Kumar, A., Singh, A.K. & Talwar, A. 2010. Formulation of herbal shampoos from *Asparagus racemosus, Acacia, concin, Sapindus Mukorossi. International Journal of Pharmaceuticals Sciences Review and Research,* 4(1): 39–44.

Santhosh, C.N., Ambika, D. & Arun, R. 2014. Anti-inflammatory activity of Sapindus laurifolius leaf extract in wistar rats. *Journal of Medicinal Plants Studies,* 1(1). Available at: www.sciencedirect.com/science/article/pii/S0001706X11000040.

Setty, S.R. 2015. Soapberry (Sapindus laurifolia Vahl) fruit harvest by Soliga community and its sustainability in South India. *In* Shackleton, C., Pandey, A. & Ticktin, T., eds. *Ecological sustainability for non-timber forest products,* pp. 126–143. Earthscan.

Zauba Technologies & Data Services Private Limited. 2013. www.zauba.com

Case 3: Thanaka

Foppes, J., Aung, M. & Paing, S. 2011. *Market research and enterprise development for community forestry (CF) in Myanmar.* Consultancy report for Pyoe Pin.

Khine, M.K. 2014. *Mandalay make-up.* The Myanmar Times. 12 October 2014. Available at: http://www.mmtimes.com/index.php/national-news/10546-cultural-heritage-set-for-global-recognition.html.

Se-Hwan, J., Sang-Cheol, L. & Seong-Ki, K. 2004. UV absorbent, marmesin, from the bark of thanakha, Hesperethusa crenulata L. *Journal of Plant Biology,* 47(2): 163–165.

Yeni. 2011. *Beauty that's more than skin deep.* The Irrawaddy. 5 August 2011. Available at: http://www2.irrawaddy.org/article.php?art_id=21842.

CHAPTER 3: BENEFITS THAT NWFPs PROVIDE TO THE BEAUTY SECTOR

Datamonitor Consumer Survey. 2013. *Beauty devices and trends to watch.* Available at: http://www.vietbeautyshow.com/Portals/6/Beauty%20devices%20Trends%20to%20watch.pdf.

Mahmood, M.A., Asif, I.M., Alam, M.S., Islam, M.S., Eti, S.A., Hossain, F., Moniruzzaman, M. & Khan, M. 2013. Extraction and characterization of oils from Sapindus trifoliatus Linn seed of different origin of Bangladesh. *Merit Research Journal of Environmental Science and Toxicology,* 1(5): 99–104.

Sari, R.K. & Bertoni, R. 2014. Kajian manfaat madu hutan anggota jmhi terhadap penyakit kangker dan anti aging. Bogor, NTFP-EP and JMHI.

Case 4: Forest honey

Aesthetics Journal. 2015. Global cosmeceuticals outlook 2016. Available at: http://www.aestheticsjournal.com/news/item/global-cosmeceuticals-market-outlook-2016 Last accessed 15 October 2016.

Andaya, E. 2014. *Regional wild honey certification study.* Manila, NTFP-EP.

Bradbear, N. 2009. *Bees and their role in forest livelihoods: A guide to the services provided by bees and the sustainable harvesting, processing and marketing of their products.* Rome, FAO.

Centre for the Promotion of Imports from Developing Countries (CBI). 2009. *The honey and other bee products market in the EU.* Netherlands, CBI.

Cosmetic Business. 29 May 2015. *Europe's leading natural cosmetics market.* Available at: http://www.cosmetic-business.com/news/287467 Last accessed 25 June 2016.

Cosmetics Info. 2015. *Honey.* Available at: http://www.cosmeticsinfo.org/ingredient/honey-0#sthash.X2C45kvJ.dpuf. Last accessed 25 June 2016.

Ediriweera, E.R.H.S.S.N. & Premarathna, Y.S. 2012. Medicinal and cosmetic uses of bee's honey – a review. *International Quarterly Journal of Research in Ayurveda,* 33: 178–182.

Environmental Working Group (EWG). 2015. *EWG's skin deep cosmetics database.* Available at: http://www.ewg.org/skindeep/ingredient/702870/HONEY_EXTRACT/. Last accessed 25 June 2016.

Euromonitor International. 2015. Global *beauty sustains growth momentum*. Available at: www.euromonitor. com: http://blog.euromonitor.com/2015/04/global-beauty-sustains-growth-momentum.html. Last accessed 22 June 2016.

Hadisoesilo, S. 2001. *Diversity in traditional techniques for enticing Apis dorsata colonies in Indonesia.* Forest and Nature Conservation Research and Development. Apimondia Conference.

International Trade Centre (ITC). 2015. *Trade map international trade statistics. List of exporters for the selected product.* Available at: http://www.trademap.org/Country_SelProduct_TS.aspx. Last accessed 26 June 2016.

Kearney, A.T. 2014. *Nutracueticals: The front line of the battle for consumer health.* Available at: https://www.atkearney.com/documents/10192/4306155/Winning+the+Battle+for+Consumer+Healthcare+-+Nutraceuticals.pdf/e4c67b42-cb4b-436a-b50d-7b35c0508b95 Last accessed 25 June 2016.

Kline and Company. 2015. Available at: www.kalekimiya.com: http://www.kalekimya.com/admin/hizmetler_dokuman/1431086160_in cos15_D2_The_race_to_outpace_The_global_natural_and_organic_cosmetics_market_Agnieszka_Saintemarie.pdf. Last accessed 22 June 2016.

Le Conte, Y. & Navajas, M. 2008. *Climate change impact on honey bee populations and diseases.* Available at: https://www.researchgate.net/publication/23285587. Last accessed 24 June 2016.

Magazine Monitor. 2014. *Why are so many drinks flavoured with honey?* 28 December 2014. Available at: http://www.bbc.co.uk/news/blogs-magazine-monitor-30295762. Last accessed 25 June 2016.

Osbeck, M. & Wojciechowska-Shibuya, M., eds. 2007. Forest partnerships. Enhancing local livelihoods and protecting the environment in Southeast Asia and the Pacific. Bangkok, Thailand, IUCN. 48 pp.

PR Newswire. 2015. *Anti aging products market growing at 7.71% CAGR to 2019 - analysis of skin care, hair care and others in new research report.* Available at: http://www.prnewswire.com/news-releases/anti-aging-products-market-growing-at-771-cagr-to-2019---analysis-of-skin-care-hair-careand-others-in-new-research-report-523922331.html. Last accessed 25 June 2016.

Rakib, M. 2014. *Creating market access for forest honey in Indonesia. Lessons from the forest honey network Sumbawa.* Forest Asia Summit. Jakarta, Indonesia.

Rumah Madu Jogja. 2014. *Madu hutan komposisi kandungan khasiat fungsi manfaat.* Available at: https://rumahmadujogja.wordpress.com/2014/04/02/madu-hutan-komposisi-khasiat-fungsi/. Last accessed 24 June 2016.

Sari, R.K., Bertoni, R. & Praptami, T.A. 2013. *Kajian mutu, nilai gizi serta potensi pada antibakteri dan antioksidan (manfaat) madu hutan Indonesia*. Bogor, Indonesia.

Sari, R.K. & Bertoni, R. 2014. *Kajian manfaat madu hutan anggota jmhi terhadap penyakit kangker dan anti aging.* Bogor, NTFP-EP and JMHI. Bogor.

Sihombing, T.I. 2014. *Lessons from internal control system development in the Sentarum lake region Indonesia. Internal control system must be based upon common accord*. Lessons from Internal Control System. Practitioners' Track, IFOAM Organic World Congress 2014, 'Building Organi Bridges', 13–15 October, Istanbul, Turkey.

Sulaiman, S.A., Hasan, H., Deris, Z.Z, Abdul Wahab, M.S., Yusof, R.C., Naing, N.N. & Othman, N.H. 2010. The benefit of tualang honey in reducing acute respiratory symptoms among Malaysian Hajj pilgrims: a preliminary study. *Journal of ApiProduct and ApiMedical Science,* 3(1): 38–44 (2011). IBRA 2011DOI 10.3896/IBRA.4.03.1.07. Available at: http://www.academia.edu/1380282/The_Benefit_of_Tualang_Honey_in_Reducing_Acute_Respiratory_Symptoms_Among_Malaysian_Hajj_Pilgrims. Last accessed 24 June 2016.

Technavio. 2015. *Global Anti-aging Products Market 2015-2019.* Available at: Global Anti-aging Products Market 2015–2019.

Utama, J.W. 2014. *Value chain of Indonesian forest honey (perspectives for a private sector partners).* Forest Asia Summit. Jakarta, Indonesia.

Yeomans, M. 2012. *Global beauty market to reach USD 265 billion in 2017 due to an increase in GDO.* Available at: Cosmeticsdesign.com. http://www.cosmeticsdesign.com/Market-Trends/Global-beautymarket-to-reach-265-billion-in-2017-due-to-an-increase-in-GDP.

Interviews

Barwa, Nuning S. Martha Tilaar Group of Companies. 2015.
Pangaribuan, Hotma Barinah. BPDAS Riau. 2015.
Utama, Johnny W. Dian Niaga. 2015.

Case 5: Sea buckthorn

Li, X.Y., Zhang, Y. & Shi, X. 2010. Cosmetic product for market development situation at home and abroad. *China Cosmetics Review*.

Liu, X., Quan, Y.R. & Xu-hua, C. 2012. Sea buckthorn products development and application prospect of. *Journal of Anhui Agricultural Sciences Sci.2012,* 40(16).

Quinni, K. W. & Gerard, D. 1993. Sea-buckthorn pulp and kernel oils: Valuable lipids for skin care Unpublished report, Flavex Naturextrakte Co. 8 pp. *In* Ciesla, W.M. (2002). *Non-wood forest products from temperate broad-leaved trees.* Rome, FAO. p. 64.

Wang, S. & He, L. 2005. The ecological and economic benefit evaluation and its development and utilization of sea buckthorn. *Journal of Inner Mongolia Forestry Science and Technology* 2005(1): 46–48.

Yi, Q.W., Yuan, J. & Fan, Y.C. 2007. Wuqi sea buckthorn fruit become increasing farmers' income to become rich, so money. *The Shaanxi Daily,* (1)4: 5.

Case 6: Manila elemi

Biesalski, H.K., Dragsted, L.O., Elmadfa, I., Grossklaus, R., Müller, M., Schrenk, D., Walter, P. & Weber, P. 2009. Bioactive compounds: Definition and assessment of activity. *Nutrition,* 25(11–12): 1202–1205.

Chung, P.Y., Navaratnam, P. & Chung, L.Y. 2011. Synergistic antimicrobial activity between pentacyclic triterpenoids and antibiotics against Staphylococcus aureus strains. *Ann Clin Microbiol Antimicrobials,* 10:25.

Coppen, J.J.W. 1995. *Gums, resins and latexes of plant origin.* Rome, Food and Agriculture Organization of the United Nations.

De la Cruz-Cañizares, J., Domenech-Carbo, M.T., Gimeno-Adelantado, J.V., Mateo-Castro, R. & Bosch-Reig, F. 2005. Study of Burseraceae resins used in binding media and varnishes from artworks by gas chromatography–mass spectrometry and pyrolysis-gas chromatography–mass spectrometry. *J. Chrom. A.,* 1093:177–194.

Ella, A.B. 2000. Improved tapping for sustained production of resin from Philippine-resin producing timber species. Lecture paper presented in the Short Training Course on NWFP held at TREES, UPLBCFNR, College, Laguna. 1 February to 7 March, 2000.

Ella, A.B. 2003. Sustainable harvesting of non-timber forest products: the role of gender in the Philippines. *In Proceedings of the regional workshop on forest for poverty reduction: can community forestry make money?* Beijing, China, 1–2 September 2003.

Ella, A.B. & Domingo, E.P. No date. *Improved tapping of Philippine Canarium trees for Manila elemi.* Available at: http://www.itto.int/files/itto_project_db_input/2910/Promotional/Improved%20 tapping_canarium%20 [Compatibility%20Mode].pdf.

Fabiyi, O.A., Atolani, O., Adeyemi, O.S. & Olatunji, G.A. 2012. Antioxidant and cytotoxicity of β-amyrin acetate fraction from Bridelia ferruginea leaves. *Asian Pacific J. Tropical Biomed.,* 2(2): S981–S984.

Halliwell, B. 2012. Free radicals and antioxidants: updating a personal view. *Nutrition Reviews,* 70(5): 257–265.

Krishnan, K., Mathew, L.E., Vijayalakshmi, N.R. & Helen, A. 2014. Anti-inflammatory potential of β-amyrin, a triterpenoid isolated from Costus igneus. *Inflammopharmacology,* 22(6): 373–385.

Mccullough, J.L. & Kelly, K.M. 2006. Prevention and treatment of skin aging. *Ann. NY. Acad. Sci.* 1067: 323–331.

Melo, C.M., Morais, T.C., Tom., A.R., Brito, G.A.C., Chaves, M.H., Rao, V.S. & Santos, F.A. 2011. Antiinflammatory effect of α, β-amyrin, a triterpene from Protium heptaphyllum, on cerulein-induced acute pancreatitis in mice. *Inflammation Research,* 60(7): 673–681.

Musini, A., Rao, J.P. & Giri, A. 2015. Isolation of potential antimicrobial compounds from salacia oblonga wall and their synergistic effect on human pathogens. *J. Microbiology, Biotech. Food Sci.* 5(1): 7–11.

National Greening Program (NGP). 2016. *NGP accomplishment by site.* Available at: http://ngp. denr.gov.ph/ index.php/tree-seedlings/ngp-accomplishment-by-site

Only Natural Essential Oil. 2015. Available at: http://www.onlynaturalessentialoil.com/elemi-oil.html.

Pillai, S., Oresajo, C. & Hayward, J. 2005. Ultraviolet radiation and skin aging: roles of reactive oxygen species, inflammation and protease activation, and strategies for prevention of inflammation induced matrix degradation – a review. *Intl. J. Cosmetic Sci.,* 27(1): 17–34.

Santiago, L.A., Dayrit, K.C., Correa, P.C.B. and Mayor, A.B.R. 2014. Comparison of antioxidant and free radical scavenging activity of triterpenes α-amyrin, oleanolic acid and ursolic acid. *J. Nat. Prod.,* 7: 29–36.

Singh, R.P. & Agarwal, R. 2009. Cosmeceuticals and silibinin. *Clin. Dermatol.,* 27(5): 479–484.

Singh, D., Arya, P.V., Sharma, A., Dobhal, M.P. & Gupta, R.S. 2015. Modulatory potential of α-amyrin against hepatic oxidative stress through antioxidant status in Wistar albino rats. *J. Ethnopharmacol.,* 161: 186–93.

Soković, M., Glamočlija, J., Marin, P.D., Brkić, D. & van Griensven, L.J.L.D. 2010. Antibacterial effects of the essential oils of commonly consumed medicinal herbs using an in vitro model. *Molecules,* 15: 7532–7546.

Sunil, C., Irudayaraj, S.S., Duraipandiyan, V., Al-Dhabi, N.A., Agastian, P. & Ignacimuthu, S. 2014. Antioxidant and free radical scavenging effects of β-amyrin isolated from S. cochinchinensis Moore leaves. *Industrial Crops Products,* 61: 510–516.

Tamilarasi, T. & Ananthi, T. 2012. Phytochemical analysis and antimicrobial activity of Mimosa pudica Linn. *Res. J. Chem. Sci.,* 2(2): 2–74.

Tulasi, C.D.S.L.N., Swaroopa, R.A. & Manjula, B. 2015. Screening of phytochemicals, TLC profiling, total flavonoid and phenolics content, anti-oxidant activity and anti-microbial activity of Ficus benghalensis Linn. and Ficus religiosa Linn. latex. *Intl. J. Pharmacy Pharmaceutical Sci.,* 7(9).

West, A. & Brown, W.H. 1929. *Philippine resins, gums, seed oils and essential oils.* Manila, Bureau of Printing.

World Conservation Monitoring Centre (WCMC). 1998. *Canarium luzonicum.* The IUCN Red List of Threatened Species 1998: e.T33352A9779122.

Zhang, L., Ravipati, A.S., Koyyalamudi, S.R., Jeong, S.C., Reddy, N., Smith, P.T., Bartlett, J., Shanmugam, K., Münch, G. & Wu, M.J. 2011. Antioxidant and anti-inflammatory activities of selected medicinal plants containing phenolic and flavonoid compounds. *J. Agric. Food. Chem.,* 59 (23): 12361–12367.

Interviews

Escareal, Rodrigo. Manila elemi resin collector. Manapao, Gubat, Sorsogon. October 2015.
Esperanzate, José. Barangay Chairperson. Manapao, Gubat, Sorsogon. October 2015.
Estolas, Salvacion. Nagtatalaga. Manapao, Gubat, Sorsogon. October 2015.
Paniargo, Genaro. Nagtatalaga. Manapao, Gubat, Sorsogon. October 2015.

CHAPTER 4: TRENDS IN THE INDUSTRY

Barwa, N. 2016. *Global market and beauty trends.* Presentation made at the FAO Asia Pacific Forestry Week 2016 in Clark, Pampanga, Philippines, 23–26 February 2016.

Carrera-Martinez, C.A., Rosas-Lopez, R., Rodriguez-Monroy, M.A., Canales-Martinez, M.M., Roman-Guerrero, A. & Jiminez-Alvarado, R. 2014. Chemical composition and in vivo anti-inflammatory activity of Bursera morelensis Ramirez essential oil. *J Essential Oil Bearing Plants,* 17(5): 758–768.

Cosmetic Business. 29 May 2015. *Europe's leading natural cosmetics market.* Available at: http://www. cosmetic-business.com/news/287467 Last accessed 25 June 2016.

Data Monitor Consumer. 2015. *Data Monitor consumer survey 2013.* Available at: http://www.vietbeautyshow.com/Portals/6/Beauty%20devices%20Trends%20to%20watch.pdf Accessed 26 June 2016.

d'Alessio, P.A., Ostan, R., Bisson, J.F., Schulzke, J.D., Ursini, M.V. & Béné, M.C. 2013. Oral administration of d-Limonene controls inflammation in rat colitis and displays anti-inflammatory properties as diet supplementation in humans. *Life Sci.,* 92: 1151–1156.

Foppes, J., Aung, M. & Paing, S. 2011. *Market research and enterprise development for community forestry (CF) in Myanmar.* Consultancy report for Pyoe Pin.

ITCOT Consultancy and Service Ltd. No date. *Study of the identification and utilization of sustainable minor forest produces of Tamil Nadu.* Vol. 2. Department of Scientific and Industrial Research (DSIR). p. 7.

Kazemi, M. 2015. Phenolic profile, antioxidant capacity and anti-inflammatory activity of Anethum graveolens L. essential oil. *Nat. Prod. Res.,* 29(6): 551–3.

Kline and Company. 2015. Information available from www.kalekimiya.com: http://www.kalekimya.com/admin/hizmetler_dokuman/1431086160_in-cos15_D2_The_race_to_outpace_The_global_natural_and_organic_cosmetics_market_Agnieszka_Saintemarie.pdf. Last accessed 22 June 2016.

Kummer, R., Fachini-Queiroz, F.C., Estevão-Silva, C.F., Grespan, R., Silva, E.L., Bersani-Amado, C.A. & Cuman, R.K.N. 2013. Evaluation of anti-inflammatory activity of Citrus latifoliatanaka essential oil and limonene in experimental mouse models. *Evidence-Based Complementary and Alternative Medicine,* 2013: 8 pp.

Li, X.Y., Zhang, Y. & Shi, X. 2010. Cosmetic product for market development situation at home and abroad. *China Cosmetics Review.*

Obadiah, A., Kannan, R., Ramesh, P., Ramasubbu, A. & Vasanth, K.S. 2012. Isolation of carvone and phellandrene from Murraya koenigii and study of their antioxidant activity. *Chem. Nat. Compounds,* 48(1).

Pinheiro, M.M.G., Miltojević, A.B., Radulović, N.S., Abdul-Wahab, I.R., Boylan, F. & Fernandes, P.D. 2015. *Anti-inflammatory activity of Choisya ternata kunth essential oil, ternanthranin, and its two synthetic analogs (methyl and propyln-methylanthranilates).* PLoS ONE. US National Library of Medicine.

Sari, R.K. & Bertoni, R. 2014. *Kajian manfaat madu hutan anggota jmhi terhadap penyakit kangker dan anti aging.* Bogor, NTFP-EP and JMHI.

Singh, D., Arya, P.V., Sharma, A., Dobhal, M.P. & Gupta, R.S. 2015. Modulatory potential of α-amyrin against hepatic oxidative stress through antioxidant status in Wistar albino rats. *J. Ethnopharmacol.,* 161: 186–93.

Sumiwi, S.A., Sihombing, O.S., Subarnas, A., Abdassah, M. & Levita, J. 2015. A study to predict anti-inflammatory activity of eugenol, myristicin, and limonene of Cinnamomum sintoc. *Intl. J. Pharmacy Pharmaceutical Sci.,* 7(12).

van Vuuren, S.F. & Viljoen, A.M. 2007. Antimicrobial activity of limonene enantiomers and 1,8-cineole alone and in combination. *Flavour and Fragrance Journal,* 22(6): 540–544.

Yousefzadi, M., Riahi-Madvar, A., Hadian, J., Rezaee, F., Rafiee, R. & Biniaz, M. 2013. Toxicity of essential oil of Satureja khuzistanica: In vitro cytotoxicity and anti-microbial activity. *J. Immunotoxicol.,* Early Online: 1–6.

Case 7: Langsat

Anonymous. 1998a. *Manual instruction for corneometer CM 820.* Germany, Courage + Khazaka electronic GmbH.

Anonymous. 1998b. *Manual instruction for Mexameter MX 16.* Germany, Courage + Khazaka electronic GmbH.

Arbiastutie, Y. & Muflihati. 2008. Isolasi dan uji aktivitas kandungan kimia bioaktif dari biji duku (Lansium domesticum Corr.). *Jurnal Penelitian Universitas Tanjungpura, Edisi Pertanian dan Kehutanan,* 10(2): 70–86.

Arung, E.T. 2015. Evaluation of medicinal plants from Central Kalimantan for antimelanogenesis. *Journal of Natural Medicines,* 63(4): 473–480.

ASEAN Standard for Lansium. 2008. *ASEAN Stan 8: 2008.*

Curry, A.S., Getting, S.D. & McEwen, G.N. 1991. *CTFA's safety testing guidelines.* Washington, DC, The Cosmetic Toiletry, and Fragrance Association. pp. 1–5.

Heyne, K. 1987. *Tumbuhan berguna Indonesia II.* Jakarta, Badan Litbang Departement Kehutanan. pp. 1126–1128.

Jantan, I., A.S, Ahmad, and A.R. Ahmad. 1990. "Tapping of Oleo-Resin from Dipterocarpus Kerrii", Journal of Tropical Forest Science 3(4): 348–355.

Luepke, N.P. 1985. Hen's egg chorioallantoic membrane test for irritation potential. *Food Chem. Toxic.,* 23(2): 287–291.

Marfori, E.C., Kajiyama S., Fukusaki, E., Kobayashi A. 2015. Lansioside D, a new triterpenoid glycoside antibiotic from the fruit peel of Lansium domesticum Correa. *Journal of Pharmacognosy and Phytochemistry.* Japan, Osaka University.

Multilingual Multiscript Plant Name Database. Sorting Lansium Names (MMPND). Available at: http://www.plantnames.unimelb.edu.au/Sorting/Lansi um.html (consulted 29 November 2007).

Najamuddin. 2001. *Studi etnobotani jenis-jenis tumbuhan obat pada masyarakat Dayak Ngaju di Kabupaten Kapuas.* University Palangkaraya.

Pantastico, M. & Abilay, R.M. 1969. Some chemical and physiological changes during storage of lanzones Lansium domesticum Correa. *Philippine Agriculture,* 52: 505.

Scientific Committee on Cosmetic Products and Non-Food Products (SCCNFP). 2000. *European Commission opinion on guidance for testing of cosmetic ingredients for their safety evaluation.* (Adopted by the SCCNFP during the plenary meeting of 24 October 2000.)

Serup, J. & Jemec, G.B.E. 1995. *Handbook of non-invasive methods and the skin.* London, CRC Press. London, UK. pp. 168–169, 587–589, 598–600.

Shimada, K., Fujikawa, K., Yahara, K., & Nakamura, T. 1992. Antioxidative properties of Xanthan on the autoxidation of soybean oil in cyclodextrin emulsion. *J. Agric. Food Chem.,* 40: 945–948.

Tilaar, M., Wong, L.W., Ranti, A.S., Wasitaatmadja, S.W., Suryaningsih, Jjunardy. f.d. & Maily. 2007. *In Search of naturally derived whitening agent - pragmatic approach.* Asian Societies of Cosmetic Scientists 8th Conference, ASCS 2007. Delivering Science to the Depths of Asian Skin. Singapore. pp. 116–117. – EDITED.

Tilaar, M., Wong, L.W., Ranti, A.S., Wasitaatmadja, S.W., Suryaningsih, Junardy. F.D. & Maily. 2008. Review of Lansium domesticum Corrêa and its use in cosmetics. *Boletin Latinoamericano y del Caribe de Plantas Medicinales y Aromáticas,* 7(4): 183–189.

Vanni, A., Gastaldi, D. & Giunata, G. 1990. Kinetic investigation on the double enzyme activity of the tyrosinase mushroom. *Annalli di Chimica,* 80: 35–60.

Verheij, E.W.M. & Coronel, R.E., eds. 1992. *Plant resources of South-East Asia No.2. Edible fruits and nuts.* Bogor, Prosea Foundation. pp. 186–190.

Verheij, E.W.M. & Coronel, R.E. 1997. Sumber Daya Nabati Asia Tenggara, Buah-buahan yang Dapat Dimakan. Terjemahan S. Somaatmadja. Gramedia Pustaka Utama, Jakarta.

Whiterskin. 2009. Available online at: http://whiterskin.info/global-skin-lightening-market-predicted-toreach-10-billion-by-2015/. Last accessed 22 June 2016.

Case 8: Gurjum balsam

Andaya-Milani, N. 2011. *Market scan for oleoresin.* NTFP-EP and NatureWild Report.

Ankarfjard, R. and M. Kegl. 1998. "Tapping Oleoresin from Dipterocarpus Alatus in a Lao Village", Journal of Economic Botany: 52(1) 7–14.

Baird, I.G. & Dearden, P. 2003. *Biodiversity conservation and resource tenure regimes: A case study from northeast Cambodia.*

Bann, C. 1997. *An economic analysis of tropical forest land use options, Ratanakiri Province, Cambodia.* Economy and Environment Program for Southeast Asia (EEPSEA) Research Report.

Bun, Y. 2010. *Analysis of trade related legislation and procedures.* UNDP Creative Industries Support Programme.

Evans, T, Hout, D., Phet, P. & Hang, M. 2003. *A study of resin-tapping and livelihoods in Southern Mondulkiri, Cambodia, with implications for conservation and forest management.*

Prom, T. & McKenney, B. 2003. Trading forest products in Cambodia: Challenges, threats, and opportunities for resin. *In Working Paper 28. Forest product trade in Cambodia: A case study of resin.* CDRI Natural Resource and Environment Program.

Prom, T. 2009. *Beyond subsistence: Trade chain analysis of resin products in Cambodia.* NTFP-EP and CNWG.

Royal Government of Cambodia. 2002. Forestry Law.

Royal Government of Cambodia. 2005. Prakas 132.

Interviews

Femy Pinto, Non-Timber Forest Products Exchange Program (NTFP-EP).
Independent transport companies in Banlung and Veun Sai
Olivier Guillot, Narita Logistics Co. Ltd.
Pisey Pech and Inariddh Var, UNDP.
Seyla Tith, Nature Wild (NTFP-EP).
Soun Chiem and his son Veun Sai Veun Sai.
Tom Evans, Wildlife Conservation Society (WCS).
Virath Chan, French-Cambodian Chamber of Commerce.
37 resin tappers of the village of Kang Nuok (Ratanakiri Province, Veun Sai District & Commune).
Working group of resin tappers of the villages of Itub (Ratanakiri Province, Veun Sai District & Commune), Talae and Kapin villages (Stung Treng Province, Siemapang District, Santepheap Commune).

Case 9: Hazel sterculia

Dang, D.B. & Bui, A.T. 2004. *Sterculia foetida, a precious plant developed in Ninh Thuan province.* Department of Agriculture and Rural Development in Ninh Thuan Province.

Dang, V.T. 2009. Planting techniques for Sterculia foetida. *Forest Science Institute of Vietnam, Journal of Forestry.*

Pham-hoang, H.H. 2000. *Plants in Vietnam I.* Ho Chi Minh City, Viet Nam, Youth Publishing House.

CHAPTER 5: CONTRIBUTIONS TO RURAL/FOREST LIVELIHOODS IN ASIA AND THE PACIFIC

Angelsen, A. & Wunder, S. 2003. Exploring the forestry-poverty link: key concepts, issues, and research implications. *In CIFOR Occasional Paper No. 40.* Bogor, Indonesia, CIFOR Available at: http://www.cifor.org/publications/pdf_files/occpapers/op-40.pdf.

Wunder, S., Angelsen, A. & Belcher, B. 2014. Forests, livelihoods, and conservation: broadening the empirical base. *World Development,* 64: S1-S11. Elsevier.

Case 10: Medicinal spa

Cuc, L.T. & Rambo, T. 2001. *Northern mountainous areas in Vietnam – environmental and socioeconomic issues.* National Politic Publishers.

Hop, T.D. & Quang, L.H. 2000. *Community development: theory and practice.* Information and Cultural Publishers.

National Assembly of the Socialist Republic of Vietnam. 2004. Laws on Forest Protection and Development (passed on December 3th 2004).

Wandschneider, T. & Yen, N.T.K. 2007. *Guidelines on agricultural encouragement in accordance with market orientation – Model 2: Group marketing.* Viet Nam, SADU (CIAT), ETSP (Helvetas).

Case 11: Spikenard

Agro Enterprise Center/Federation of Nepalese Chamber of Commerce and Industry (AEC/FNCCI). 2006. *A report on compilation and prioritization of ten important NTFPs of Nepal for commercial promotion through private sector investment.* AEC/FNCCI.

Asia Network for Sustainable Agriculture and Bioresources (ANSAB). 1999. *Socio-economic and institutional impacts of Community-based Ecosystem Management Project in Humla, Nepal.* A socio-economic monitoring report to BCN. Kathmandu, Nepal, ANSAB/Enterprise Works Worldwide/SEEPORT.

Asia Network for Sustainable Agriculture and Bioresources (ANSAB). 2015. *Price list – October 2015.* Kathmandu, Nepal, ANSAB.

Asia Network for Sustainable Agriculture and Bioresources (ANSAB). SNV Nepal. 2003. *Commercially important NTFPs of Nepal.* Kathmandu, Nepal, ANSAB/SNV Netherlands Development Organisation. Kathmandu, Nepal.

Department of Forest (DoF). 2007. *Revenue record of forests products.* Kathmandu, Nepal, Ministry of Forest and Soil Conservation, Government of Nepal.

Department of Plant Resources (DPR). 2006. *Prioritized medicinal plants for economics development of Nepal.* Kathmandu, Nepal, Department of Plant Resources, Ministry of Forest and Soil Conservation, Government of Nepal.

Subedi, B.P., Ojha, H.R., Nicholson, K. & Binayee, S.B. 2006. *Community-based forest enterprises in Nepal: Case studies, lessons and implications.* Kathmandu, Nepal, ANSAB.

Subedi, B.P., Ghimire, P.L., Koontz, A., Khanal, S.C., Katuwal, P., Sthapit, K.R. & Mishra, S.K. 2014. *Private sector involvement and investment in Nepal's forestry: status, prospects and ways forward.* Kathmandu, Nepal, Multi Stakeholder Forestry Programme – Service Support Unit.

United States Agency for International Development (USAID). 2006. *Role of natural products in resource management, poverty alleviation and good governance. A case study of jatamansi and wintergreen value chains in Nepal.* Washington DC, USAID.

Ved, D., Saha, D., Ravikumar, K. & Haridasan, K. 2015. *Nardostachys jatamansi.* The IUCN Red List of Threatened Species 2015: e.T50126627A50131395.

Interviews

Jatamansi traders

Case 12: Sandalwood

Applegate GB, Chamberlain JC, Daruhi G, Feigelson JL, Hamilton L, Mc Kinnell FH, Neil PE, Rai SN, Rodehn B, Statham PC, Stemmermann L 1990. Sandalwood in the Pacific: a state-of-knowledge synthesis and summary. In: Hamilton L, Conrad CE (eds) Proceedings of the symposium on Sandalwood in the Pacific, vol. 122. Honolulu, HI. USD A Forest Service Gen Tech Rep PSW, pp. 1–11.

Applegate, G. & McKinnel, F. 1993. Management and conservation status of santalum species occurring in Australia. *In* McKinnel, F.H., ed. *Sandalwood in the Pacific region,* pp. 5–12. Proceedings of a symposium held on 2 June 1991 at the XVII Pacific Science Congress, Honolulu, Hawaii. ACIAR Proceedings No. 49.

Brennan, P. & Merlin, M. 1993. Biogeography and traditional use of santalum in the Pacific region. *In* McKinnel, F.H., ed. *Sandalwood in the Pacific region,* pp. 30–38. Proceedings of a symposium held on 2 June 1991 at the XVII Pacific Science Congress, Honolulu, Hawaii. ACIAR Proceedings No. 49.

Doran, J. 2012. Review of Santalum album seed pre-germination treatments with a focus on low cost methods. Proceedings of International Sandalwood Symposium, 21–24 October, 2012, Honolulu, Hawaii.

Gillieson, D., Page, T. & Silverman, J. 2008. *An inventory of wild sandalwood stocks in Vanuatu. Final report.* Small Research and Development Activity. ACIAR, Canberra, Australia 53 pp.

Gjerum, L., Fox, J.E.D. & Ehrhart, Y. 1995. *Sandalwood seed, nursery and plantation technology.* Proceedings of a Regional Workshop for Pacific Island Countries, 1–11 August 1994, New Caledonia. UNDP/FAO South Pacific Forestry Development Programme. RAS/92/361 Field Document No. 8. Suva, Fiji. 304 pp.

Jiko, L.R. 1993. Status and current interest in sandalwood in Fiji. In 'Sandalwood in the Pacific Region'. (Ed. FH Mckinnel) pp. 13–18. (ACIAR: Canberra).

Keenan, R. & Parija, P. 2017. This sandalwood plantation is about to make its owners a lot of money. Available at: https://www.bloomberg.com/news/features/2017–02-21.

Ligo, G. 2014. Formalizing agreement on sandalwood city. Vanuatu Daily Post. December 12 2014.

McKinnel, F.H., ed. 1993. *Sandalwood in the Pacific region.* Proceedings of a Symposium held on 2 June 1991 at the XVII Pacific Science Congress. Honolulu, Hawaii. ACIAR Proceedings No. 49. Canberra, Australia. 43 pp.

Merlin, M. & Van Ravenswaar, D. 1990. The history of human impact on the genus santalum in Hawaii. *In* Hamilton, L. & Conrad, C.E., technical coordinators. *Proceedings of the symposium on sandalwood in the Pacific, April 9–11, 1990, Honolulu, Hawaii.* Gen. Tech. Rep. PSW-122. Berkeley, CA. Pacific Southwest Research Station, Forest Service, USD A. 84 pp.

Merlin, M.D., Thomson, L.A.J., & Elevitch, C.R. 2006. *Santalum ellipticum, S. Freycinetianum, S. haleakalea,* and *S. paniculatum* (Hawaiian sandalwood). *In* Elevitch, C.R., ed. *Traditional trees of Pacific islands: Their culture, environment, and use,* pp. 675–694. Honolulu, Permanent Agricultural Resources.

Page, T., Tate, H., Bunt, C., Potrawiak, A. & Berry, A. 2012. *Planted sandalwood development in Vanuatu.* Research Online. James Cook University. pp. 57–60.

Shineberg, D. 1967. *They came for sandalwood: a study of the sandalwood trade in the South-West Pacific 1830–1865.* Carlton, Melbourne University Press.

Times of India (2012), Demise of Sandalwood. Available at: https://timesofindia.indiatimes.com/city/bengaluru/Demise-of-sandalwood/articleshow/12078008.cms.

CHAPTER 6: DISCUSSIONS AND CONCLUSIONS

Dallmeier, L., (**2017**) Natural and Organic Beauty Market to reach $22bn by 2024. Retrieved 10 February 2018. Available at https://formulabotanica.com/global-organic-beauty-market-22bn-202.

Annex: Initial list of NWFPs used as beauty products

Scientific name	Common name	Parts used	Use	Distribution	References
Apis dorsata	Giant rock bee	Honey and wax	Cosmetics and soap-making	India, Pakistan, Nepal, Myanmar, Bangladesh, Sri Lanka, Thailand and mainland Asia	http://cambodia.panda.org/projects_and_reports/sustainable_use/non_timber_forest_products/
Apis florea	Dwarf honey bee	Honey and wax	Cosmetics and soap-making	Southern and southeastern Asia	Ibid
Dipterocarpus alatus	Chheuteal teuk	Resin	Used in the production of varnishes, adhesives, incense and perfumes	Thailand, Cambodia, Lao PDR, Viet Nam and the Philippines	The potential non timber forest products for trading in Cambodia. www. itto.org
Dipterocarpus costatus	Chheuteal breus	Resin	Used in the production of varnishes, adhesives, incense and perfumes	Bangladesh, Myanmar, India (Andamans), Indochina, Malay Peninsula, Lao PDR (Khammouane)	Ibid
Shorea guiso	Chor chong	Resin	Used in the production of varnishes, adhesives, incense and perfumes	Thailand, Viet Nam, Sumatra, Peninsular Malaysia, Borneo and the Philippines	Ibid
Shorea siamensis	Red lauan/rang phnom	Resin	Used in the production of varnishes, adhesives, incense and perfumes	Indonesia, Malaysia, Myanmar, Viet Nam and Thailand	Ibid
Litsea glutinosa	Bolly beech/kropul bay	Resin	Used in the production of varnishes, adhesives, incense and perfumes	Native to India, South China to Malaysia, Australia and the western Pacific islands	Ibid
Beeswax		Wax	Polishes, cosmetics, candle-making		http://www.fao.org/docrep/014/am612e/am612e00.pdf
Styrax tonkinensis	Gum benjamin.	Gum	Medicinal: skin ointments, incense	Lao PDR and Viet Nam	http://lad.nafri.org.la/fulltext/3742-0.pdf
Pinus merkusii	Merkus pine	Resin	Pharmaceuticals and cosmetics	Native to the Malesia region of Southeast Asia, mainly in Indonesia in the mountains of northern Sumatra	http://lad.nafri.org.la/fulltext/3742-0.pdf
Pinus kesiya	Khasi pine	Twigs	Oil used in pharmaceuticals and cosmetics	South and east from the Khasi Hills in the northeast Indian state of Meghalaya, to northern Thailand, the Philippines, Myanmar, Cambodia, Lao PDR, southernmost China and Viet Nam	

Scientific name	Common name	Parts used	Use	Distribution	References
Dipterocarpus spp.	Kisi	Resin	Used to make torches, to preserve wood and bamboo and for waterproofing umbrellas. Freed of residual resin, the volatile oil is used in manufacturing paint, vanish and printing ink Mixed with powdered gum and kneaded to a proper consistency, damar forms a dark brown paste which is widely used to caulk boats and waterproof bamboo baskets	South and Southeast Asia	http://lad.nafri.org.la/fulltext/3742-0.pdf
Shorea spp.	Mai si/damer oil	Seeds	Soap-making	Indonesia, Malaysia, Myanmar, Viet Nam and Thailand	http://mekonginfo.org/assets/midocs/0003651-environment-the-use-of-non-timber-forest-products-in-lao-p-d-r.pdf
Nothalphoebe umbellifiora	Yang bong tree	Bark	Joss sticks and insect-repellent coils	Southeast Asia?	http://lad.nafri.org.la/fulltext/3742-0.pdf
Dipterocarpus alatus	Yang oil, nam man yang	Resin	High-quality varnishes and as a non-alcohol base in perfume production	Thailand, Cambodia, Lao PDR and Viet Nam, reported in the Philippines	http://mekonginfo.org/assets/midocs/0003651-environment-the-use-of-non-timber-forest-products-in-lao-p-d-r.pdf
Aquilaria crassna	Eaglewood, mai dam or mai ketsana or po heuang	Heartwood	Perfumery	Southeast Asia and in Papua New Guinea	Ibid
Boehmeria malabarica	Sapan or peuak meuak,	Bark	Make incense sticks and glue	Indomalaya ecozone	http://www.tabi.la/articlemapper/resources/NTFP%20Lao%20docs/Livelihoods,%20food%20security,%20social,%20gender%20impacts%20of%20NTFPs/Livelihoods%20and%20NTFPs%20in%20Laos/The%20role%20of%20NTFPS%20in%20CBNRM%20in%20Laos.pdf
Mansonia gagei	Karamet	Bark/wood	Used in fragrances, scented sticks and medicines	Myanmar and Thailand	http://www.fao.org/docrep/X5336E/x5336e0r.htm
Pterocarpus santalinus	Red sandalwood/ nanthani	Bark/wood	Used in fragrances, scented sticks and medicines	Native to Southern India, widely cultivated	Ibid
Santalum album	Sandalwood/santagu	Bark/wood	Used in fragrances, scented sticks and medicines	Australia, India, Indonesia, introduced to Kenya	Ibid

Scientific name	Common name	Parts used	Use	Distribution	References
Premna integrifolia	Taungtan-gyi	Bark/wood	Used in fragrances, scented sticks and medicines	Southeast Asia and Pacific islands	Ibid
Aquilaria agallocha	Agarwood/thit-hmwe	Bark/wood	Used in fragrances, scented sticks and medicines	Assam, Northeast India, Bhutan, Sumatra, Myanmar, Malaysia and the Philippines	Ibid
Apis dorsata	Giant rock bee	Honey and wax	Soap-making, cosmetics	South and Southeast Asia	Ibid
Apis indica	Indian honey bee	Honey and wax	Soap-making, cosmetics	India, Pakistan, Nepal, Myanmar, Bangladesh, Sri Lanka, Thailand and mainland Asia	Ibid
Hesperethusa crenulata	Thanatkha	Bark/wood	Used in facial cosmetics	Native in the Indomalaya ecozone to Bangladesh, India, Pakistan, Sri Lanka	Ibid
Cyperus rotundus	Purple nut sedge	Tubers	Perfumery	Native to Africa, southern and central Europe and southern Asia	Krishnamurty, T. 1993. *Minor forest products of India*
Cyperus longus	Sweet cyperus	Roots and stems	Perfumery	Worldwide	Ibid
Cyperus articulatus	Jointed flatsedge	Roots	Perfumery	Worldwide	Ibid
Ferula asafoetida	Asafoetida	Roots	Perfumery	Native to central Asia, eastern Iran to Afghanistan. Today it is grown chiefly in Iran and Afghanistan	Ibid
Hedychium spicatum	Spiked ginger lily	Rhizomes	Perfumery	Endemic to the Himalayan region	Ibid
Luvunga scandens	Indian luvunga	Dried fruits, roots	Perfumery	Tropical and humid environments throughout China, Cambodia, India, Lao PDR, Indonesia, the Philippines, Malaysia, Myanmar, Thailand and Viet Nam	Ibid
Matricaria chamomilla	Chamomilla	Whole plant	Perfumery	Europe and temperate Asia, widely introduced in temperate North America and Australia.	Ibid
Santalum album	Sandalwood	Wood	Perfumery	Indonesia in the east to Juan Fernandez Islands (Chile) in the west and from the Hawaiian Archipelago in the north to New Zealand in the south	Ibid
Cymbopogon citratus	Lemongrass	Leaves and stems	Perfumery	Native to South Asia and maritime Southeast Asia	Ibid
Microtoenia insuavis	Khasia patchouli	Leaves	Perfumery	From India through Myanmar to S. China; in Malesia: N. Sumatra	Ibid
Michelia champaca	Champak	Flowers	Perfumery	Native to the Indomalaya ecozone, consisting of South Asia, Southeast Asia-Indochina and southern China	Ibid
Myristica fragrans	Nutmeg	Fruit, mace	Soap-making/cosmetics	Tropics Including Guangdong and Yunnan in China, Taiwan POC, Indonesia, Malaysia, Grenada in the Caribbean, Kerala in India, Sri Lanka and South America	Ibid

Scientific name	Common name	Parts used	Use	Distribution	References
Origanum vulgare	Oregano	Leaves	Soap-making/perfumery	Native to temperate western and southwestern Eurasia and the Mediterranean region, cultivated widely	Ibid
Pandanus tectoris	Pandan	Leaves, flowers	Perfumery	From Port Macquarie in New South Wales to northern Queensland, Australia and Indonesia east through the islands of the tropical Pacific Ocean to Hawaii	Ibid
Saussurea lappa	Costus	Roots	Perfumery	South Asia; including the Himalayas, Kashmir, Jammu, Western Ghats and the Kishenganga Valley	Ibid
Valeriana officinalis	Garden valerian	Flowers	Perfumery	Native to Europe and parts of Asia,	Ibid
Valeriana wallichii	Indian valerian	Flowers	Perfumery	Native to India. Nepal and China	Ibid
Vetiveria zizanioides	Khus	Roots	Perfumery	Native to India, widely cultivated	Ibid
Centella asiatica	Asiatic pennywort	Leaves	Hair growth promoter	Tropical Asia and Africa	Ibid
Sterculia urens	Gum karaya	Gum	The film-forming property of gum karaya makes it useful in the hair setting preparations of hair-dressing lotions and finger wave lotions for the beauty trade	Native to India and has been introduced into Myanmar	http://www.rd.ap.gov.in/marketing/mkt_doc_gumkaraya.pdf
Boswellia serrata	Indian frankincense	Resin	Incense sticks	Native to much of India and the Punjab region that extends into Pakistan	Ibid
Saurauia roxburghii	Singkrang	Leaves	Hair pomade	Northeast India - Manipur, Mizorm, Assam	Krishnamurty, T. 1993. *Minor forest products of India*
Commiphora mukul	Indian bdellium tree	Resin	Perfumery and incense	Northern Africa to Central Asia	Ibid
Liquidambar orientalis	Oriental sweetgum	Sap	Soap-making/perfumery	Native to the Mediterranean region	Ibid
Aphanamixes polystachya	Rohituka tree	Seeds	Soap-making	Native to India, Pakistan, Nepal, Bhutan, Bangladesh, Myanmar and Sri Lanka	Ibid
Azadirachta indica	Neem	Leaves	Soap/face wash	Native to India, Myanmar, Bangladesh, Sri Lanka, Malaysia and Pakistan, grows in tropical and semitropical regions	Ibid
Diploknema butyraceae	Nepali butter tree	Seeds	Soap-making	Native to Nepal, distributed from Gharwal Himalaya to Sikkim and uo to Bhutan	Ibid
Garcinia echinocarpa	NA	Fruit	Soap-making	Endemic to Western Ghats	Ibid
Madhuca longifolia	Mahua	Seeds	Soap-making	Peninsular India	Ibid
Madhuca malabarica	Illipe butter tree	Seeds	Soap-making/hair fixer	India and Sri Lanka	Ibid
Melia azedarach	Persian lilac/ chinaberry	Fruit	Soap-making/hair oil	Indomalaya and Australasia	Ibid

Scientific name	Common name	Parts used	Use	Distribution	References
Moringa oleifera	Drumstick	Fruit	Cosmetics	Native to the southern foothills of the Himalayas in northwestern India, widely cultivated	Ibid
Myrica nagi	Bay berry	Bark	Soap-making	Native to the hills of northern India and Nepal	Ibid
Palaquium ellipticum	Indian gutta percha	Seeds	Soap-making	Endemic to Western Ghats	Ibid
Sapium sebiferum	Chinese tallow	Seed-aril	Soap-making	Native to eastern Asia, and in China, Taiwan POC and Japan	Ibid
Sapindus emarginata	Soapberry	Fruit	Shampoo	Indian subcontinent	Ibid
Schleichers oleosa	Kusum	Seeds	Soap-making/ stimulating agent for scalp	Native of tropical Asian countries	Ibid
Shorea robusta	Sal	Seeds	Soap-making	Peninsular India	Ibid
Terminalia bellerica	Belleric myrobalan	Seeds	Hair oil	Southeast Asia	Ibid
Xylocarpus moluccensis	Cedar mangrove	Seeds	Soap-making	Sundarbans of India and Bangladesh through Indochina and Malesia to tropical Australia	Ibid
Cannabis sativa	Cannabis	Seeds	Antidandruff/ hair growth promoter	Worldwide	Ibid
Apis dorsata	Honey	Honey	Soap-making/facewash	India, Pakistan, Nepal, Myanmar, Bangladesh, Sri Lanka, Thailand and mainland Asia	Ibid
Curcuma longa	Turmeric	Rhizomes	Facial moisturizer/ treatment; body wash/ cleanser; anti-ageing; moisturizer; sunscreen: moisturizer; eye-circle cream; shampoo; sunless tanning; facial cleanser; baby soap.	South or Southeast Asia	Ibid
Gleditschia australis	Cây bồ kết	Seeds	Hair shampoo	Native to North America and Asia	La, D.M. et al. 2009. *The plants contain compounds having biological activity - Vietnamese plant resources Part I & II.* The Natural Sciences and Technology Publisher. The Vietnam Academy of Science and Technology (VAST)
Streptocaulon juventas	Hà thủ ô	NA	Hair shampoo	India and Indochina	Ibid
Eleusine indica	Goosegrass/cỏ mần trầu		Hair shampoo	Throughout the warmer parts of the world	Ibid

Scientific name	Common name	Parts used	Use	Distribution	References
Ocimum gratissimum	Clove basil/Hương nhu trắng	Leaves	Hair shampoo	Native to Africa, Madagascar, southern Asia, the Bismarck Archipelago and naturalized in Polynesia, Hawaii, Mexico, Panama, West Indies, Brazil and Bolivia	Ibid
Eclipta prostrata	False daisy/cỏ nhọ nồi	Whole plant	Hair shampoo	Native of Asia, but has a general distribution over the world	Ibid
Ageratum conyzoides	Goat weed, cỏ cứt lợn (ngũ sắc)	Leaves	Hair shampoo	Cosmopolitan	Ibid
Sterculia foetida	Java olive/trôm	Fruit	Skin care/face scream	East Africa to north Australia, *S. foetida* grows freely in Myanmar and Sri Lanka.	Ibid
Abrus precatorius	Crab`s eye, dây cam thảo	Seeds, roots	Skin care	Native to India and grows in tropical and subtropical areas of the world	Ibid
Imperata cylindrica	Cogon grass/cỏ tranh	Whole plant	Skin care/bath ingredient	Native to East and Southeast Asia, India, Micronesia, Melanesia, Australia and eastern and southern Africa	Ibid
Aquilaria crassna	Trầm hương	Wood	Perfume	Southeast Asia and in Papua New Guinea.	Ibid
Melaleuca cajeputti	Cajaput/tràm	Leaves and twigs	Perfume/essential oil	Australia, Southeast Asia, Papua New Guinea and the Torres Strait islands	Ibid
Dysoxylum loureirii	Hoàng đàn	Wood	Perfume	Endemic to Cambodia and southern Viet Nam	Ibid
Pinus spp.	Thông	Wood	Hair care	Native to the Malesia region of Southeast Asia, mainly in Indonesia in the mountains of northern Sumatra	Ibid
Fokienia hodginsii	Fujian cypress/pơ mu	Wood	Perfume/cosmetics	Native to China (Chongqing, Fujian, N Guangdong, Guangxi, Guizhou, S Hunan, W Jiangxi, southeast Sichuan, southeast Yunnan, S Zhejiang), Lao PDR and Viet Nam	Ibid
Cinammomum spp.	Quế	Wood	Oil/massage	Native to China south of the Yangtze River, Taiwan POC, southern Japan, Republic of Korea, and Viet Nam, and has been introduced to many other countries	Ibid
Litsea cubeba	Mountain pepper/ màng tang	Fruit	Oil/massage	Native to China, Indonesia, Taiwan POC and other parts of Southeast Asia	Ibid
Cinnamomum camphora	Camphor laurel/ long não	Wood and leaves	Oil/massage	Native to China south of the Yangtze River, Taiwan POC, southern Japan, Republic of Korea, and Viet Nam, and has been introduced to many other countries	Ibid
Calocedrus macrolepis	Chinese incense cedar/bách xanh	Wood	Skin care/anti-ageing	Native to southwest China, northern Viet Nam, northern Lao PDR, extreme northern Thailand and northeastern Myanmar	Ibid
Camellia spp.	Trà	Leaves	Skin care/weight loss/ cosmetics/toothpaste	Eastern and southern Asia, from the Himalayas east to Japan and Indonesia	Ibid

Scientific name	Common name	Parts used	Use	Distribution	References
Lotus	Sen	Flowers	Perfume/skin care	Native to tropical Asia and Queensland, Australia, commonly cultivated in water gardens.	Ibid
Clausena lansium	Hồng bì	Leaves, flowers, fruit	Shampoo	Native to Southeast Asia.	Ibid
Baeckea frutescens	Chổi xuể	Aerial parts	Skin powder for babies	Southeast Asia – southern China, Myanmar, Thailand, Lao PDR, Viet Nam, Malaysia, Indonesia, the Philippines, Papua New Guinea, northern Australia	Ibid
Dipterocarpus spp.	Dầu	Resin	Soap/fragrance	South and Southeast Asia	Ibid
Acorus calamus	Sweet flag, thủy xương bồ	Root	Bathing ingredient	Probably indigenous to most of Asia, introduced worldwide	Ibid
Mentha spp.	Bạc hà	Leaves	Oil/massage	Native to temperate regions of Europe and western and central Asia, east to the Himalayas and eastern Siberia and North America	Ibid
Amomum spp.	Sa nhân	Fruit	Perfume/oil	Native to China, the Indian subcontinent, Southeast Asia, Papua New Guinea and Queensland	Ibid
Pogostemon spp.	Hoắc hương	Leaves	Perfume	Native to tropical regions of Asia, and is now extensively cultivated in China, Indonesia, Cambodia, Myanmar, India, Maldives, Malaysia, Mauritius, Madagascar, Taiwan POC, the Philippines, Thailand, Viet Nam, South America and the Caribbean.	Ibid
Curcuma aeruginosa	Nghệ ten đồng	Rhizomes	Skin care/weight loss	India and Myanmar	Ibid
Saurauia napaulensis	Sổ dả Nepal	Fruit	Hair/shampoo	Garwhal to Arunachal Pradesh in the Himalayas, Nepal and as far as Indochina and west China	Ibid
Homalomena occulta	Thiên niên kiện	Rhizomes	Herbal bathing	Lao PDR, Thailand, Viet Nam, Guangdong, Guangxi, Hainan, Yunnan	Ibid
Lactuca sp.	Bồ công anh	Whole plant	Herbal bathing	Tropical	Ibid
Drynaria spp.	Basket fern/ cốt toái bổ	Whole plant	Herbal bathing	Native to tropical Africa, South Asia, East Asia, Southeast Asia, Australia and Oceania	Ibid
Schefflera elliptica	Climbing umbrella tree/ngũ gia bì	Bark	Herbal bathing	Andamans, Australia, Papua New Guinea and parts of Malaysia	Ibid
Apis dorsata	Giant rock bee	Honey and wax	Honey is used as food or sweetener in medicines.	South and Southeast Asia	http://www.fao.org/docrep/x5334e/x5334e0b.htm
Apis cerana	Asiatic honey bee	Honey and wax	Wax is used for polish, cosmetics, candles, and comb foundations for beehives	Southern and southeastern Asia, including China, Pakistan, India, Republic of Korea, Japan, Malaysia, Nepal, Bangladesh, Papua New Guinea and Solomon Islands	Ibid

Scientific name	Common name	Parts used	Use	Distribution	References
Apis florea	Dwarf honey bee	Honey and wax	Cosmetics and soap-making	Southern and southeastern Asia	Ibid
Apis mellifera	Western honey bee	Honey and wax	Cosmetics and soap-making	Europe, Asia and Africa, North America	Ibid
Dipterocarpus alatus	Gurjan or yang oil	Resin	Used to produce balsam oil for perfume base	Thailand, Cambodia, Lao PDR, Viet Nam and the Philippines	Ibid
Aquilaria sp.	Agarwood	Wood	Used in the perfume and tobacco industries	Assam, northeast India, Bhutan, Sumatra, Myanmar, Malaysia and the Philippines	Ibid
Curcuma domestica	Turmeric/ kunyit	Rhizomes	Cosmetics, pharmaceuticals	Native to southern Asia	Ibid
Curcuma xanthorriza	Java ginger/ temulawak	Rhizomes	cosmetics, pharmaceutical	Originated from Indonesia, more specifically from Java island, out of which it spread to several places in Malesia	Ibid
Aquilaria sp.	Agarwood oil, gaharu	Wood	Perfumery, cosmetics, pharmaceuticals	Assam, northeast India, Bhutan, Sumatra, Myanmar, Malaysia and the Philippines	Ibid
Cymbopogon nardus	Sereh wangi	Leaves and stems	Perfumery, soap-making	Tropical Asia	Ibid
Canangium odoratum	Cananga, kenaga	Flowers	Perfumery, cosmetics, aromatherapy	Indonesia, Malaysia and the Philippines	Ibid
Clausena aristata	Clausena	Leaves, flowers	Perfumery, toothpaste, chewing gum	Tropical	Ibid
Syzygium aromaticam	Malabar plum/ cengkih	Flower buds	Perfumery, flavouring	Originating in Southeast Asia and occurring widely	Ibid
Mentha arvensis	Wild mint, permen	Leaves	Perfumery, toothpaste, candy	Native to temperate regions of Europe and western and central Asia, east to the Himalayas and eastern Siberia and North America	Ibid
Piper cubeba	Tailed pepper/ kemukus, cubeba oil	Fruit	Perfumery, soaps, detergents, pharmaceuticals	Native to Southeast Asia, introduced in India	Ibid
Foenicum vulgare	Adas, fennel oil	Seeds	Perfumery, soaps, cosmetics, pharmaceuticals	Indigenous to the shores of the Mediterranean but has become widely naturalized	Ibid
Jasminum sambac	Arabian jasmine/ melai	Flowers	Perfumery, cosmetics, aromatherapy	Native to a small region in the eastern Himalayas in Bhutan and neighbouring India and Pakistan. It is cultivated in many places, especially across much of South and Southeast Asia	Ibid
Citrus hystrix	Kaffir lime/ jerukpurut, lemon oil	Leaves	Perfumery, food	Native to tropical Asia, including India, Nepal, Bangladesh, Thailand, Indonesia, Malaysia and the Philippines.	Ibid
Cymbopogon citratus	Sereh dapur, lemongrass	Leaves and stems	Soap-making, pharmaceuticals	Native to South Asia and maritime Southeast Asia	Ibid

Scientific name	Common name	Parts used	Use	Distribution	References
Rosa sp.	Mawar, Rose	Flowers	Perfumery, sweetener	Native to Asia, with smaller numbers native to Europe, North America, and northwestern Africa. Species, cultivars and hybrids are all widely grown	Ibid
Pinus merkusii	Sumatran pine/ tusam, turpentine oil	Needles	Cosmetics, pharmaceuticals	Native to the Malesia region of Southeast Asia, mainly in Indonesia in the mountains of northern Sumatra	Ibid
Vetiveria zizanioides	Akar wangi	Roots	Perfumery, soap, cosmetics	Native to India, widely cultivated	Ibid
Gaultheria fragrantissima	Fragrant wintergreeen/ gandapura	Leaves	Perfumery, pharmaceutical	The Himalayas, from Uttarakhand to southeast Tibet Autonomous Region and Myanmar	Ibid
Canangium odoratum	Ylang-ylang	Flowers	Perfumery	Indonesia, Malaysia and the Philippines	Ibid
Aleurites moluccana and *A. trisperma*	Candlenut/ lumbang, bagilumbang	Seeds	Oil from seed used for soap manufacture	Worldwide	http://www.fao.org/docrep/x5334e/x5334e09.htm
Canangium odoratum	Ilang-ilang	Flowers	Perfumery	Indonesia, Malaysia and the Philippines	http://www.fao.org/docrep/014/am255e/am255e00.pdf
Cymbopogon nardus	Citronella	Leaves and stems	Perfumery, soap-making	Tropical Asia	Ibid
Cymbopogon citratus	Lemongrass	Leaves and stems	Perfumery	Native to South Asia and maritime Southeast Asia	Ibid
Entada rheedii	African dream her/gogo gogo	Stems	Hair and scalp cleansing agent	Tropical and subtropical countries	Ibid
Artocarpus blancoi	Antipolo or gumihan	Seeds	Hair oil	Endemic to the Philippines	Ibid
Pogostemon cablin	Patchouli, kablin	Leaves	Perfumery	Native to tropical regions of Asia, and is now extensively cultivated in China, Indonesia, Cambodia, Myanmar, India, Maldives, Malaysia, Mauritius, Madagascar, Taiwan POC, the Philippines, Thailand, Viet Nam, South America and the Caribbean	Ibid
Vetiveria zizanioides	Vetiver grass/ moras	Roots	Perfumery, soap, cosmetics	Native to India, widely cultivated	Ibid
Acacia farnesiana	Sweet acacia/ needle bush	Flowers	Perfumery	Pantropical	Ibid

The use of cosmetic and beauty products derived from forests has a history dating back more than 6 000 years. Traditional beauty products were almost invariably derived from plants, animal or surface mineral sources, including many forest products. Today, the vast majority of ingredients in commercially available cosmetics are synthetic compounds mainly derived from petroleum and natural gas. Nonetheless, plant-based products are increasingly popular choices in modern markets. There is significant potential for products derived from forests to capture an increased share of the global beauty and cosmetic market. This publication contributes to the awareness of the value and potential of forest products in the cosmetic industry.

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