



***BTC TRADE FOR DEVELOPMENT***



***WILD-COLLECTED  
BOTANICALS AND THE EU  
MARKET***



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# 1. Introduction

The Trade for Development Centre (TDC – [www.befair.be](http://www.befair.be)) of the Belgian Development Agency (BTC) aims at economic and social empowerment of small producer organisations, by both enhancing business knowledge and improving their access to markets.

TDC implements a Producer Support Programme through which financial and technical assistance is provided to producer organisations. Within the framework of this programme, TDC has decided to carry out a market study on wild-sourced botanicals and the EU market, thus anticipating the growing opportunities for these products in the food, cosmetics and pharmaceutical industries. The results of this study will be provided, among others, to ethical actors.

Harvesting and trading wild-sourced botanicals is a critical source of income for rural poor communities in developing countries (DCs). Source countries of these wild-collected botanicals are increasingly looking for ways to export these products to international markets as it contributes considerably to the national incomes of these countries. However, they generally suffer from having limited access to these markets as well as restricted knowledge of options to improve livelihood benefits for local communities.

In this context, the study focuses on wild-collected medicinal and aromatic plants (MAPs) which have a potential for livelihoods enhancement and conservation action locally, as well as a potential on the European market, and where producers may benefit from producer support programmes. Moreover, these species are assessed in terms of sustainable trade. The countries covered in this study are Algeria, the Palestinian Territory Senegal, Mali, Niger, Benin, Uganda, Rwanda, Burundi and Congo (DRC). For an overview of the long lists compiled per region, please refer to [Annex III](#).

## **Methodology**

The list of 20 botanicals investigated in this study is derived from a long list of prioritised species according to biodiversity and trade programmes in the 10 target countries. For a more elaborate description on how the final list of botanicals was derived, please refer to [Chapter 8](#). The narrowing down of these species, in consultation with local and European experts & organisations, was based on the following criteria:

- Marketing criteria: scale of production, market readiness, competition and certification potential.
- Ecological criteria: availability, sustainability of supply, resource management and access, certification (potential).
- Socio-economic criteria: local benefits, value addition potential, fair labour conditions.
- Technological criteria: (adherence to) processing and quality requirements, traceability and access to technology.

## **Product definition**

With the purpose of having a broad overview of trade and potential of wild-collected species, natural gums and resins and plant derived materials (herbal extracts, essential and vegetable oils) are included together with medicinal and aromatic plants (MAPs). In this study, these species and their derivatives are referred to as MAPs.

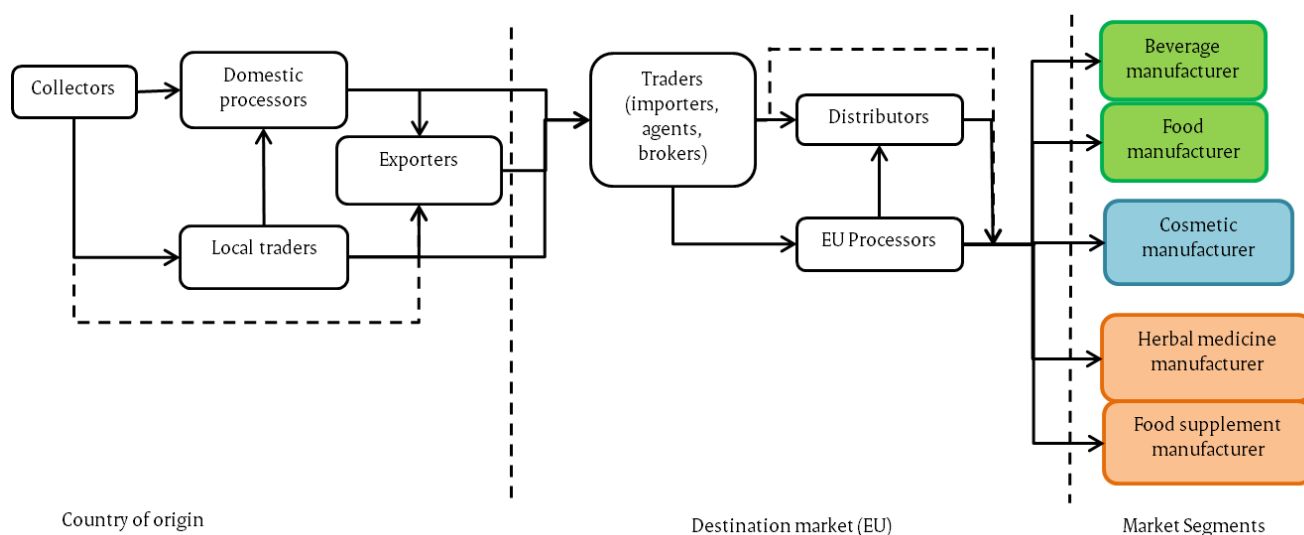
The potential of these species is based on their uses in food, cosmetic and health industries. For an overview of these segments, please refer to section 1.3 on segmentation. These industries remain dependent on wild-collected materials for various species, as a result of the high cost or difficulty of cultivation if only a limited quantity is needed.

## **1.1 Market channels**

Regardless of the final segment in which they are used, wild-collected MAPs have a similar value chain (Figure 1). In the country of origin, the MAPs are collected, after which they can be processed locally and traded to the EU. The products can be exported both as raw materials and as processed products, such as extracts or essential oils (see section 1.2).

Traditionally, most extraction has taken place in Europe. More recently, for certain MAPs, this is shifting towards the countries of origin, which offers good value addition opportunities for exporters in the region. Whether or not MAPs are processed at origin depends on various factors. Ingredients with most potential for at origin extraction are perishable botanicals with low technological barriers to enter the market and for which producers can ensure traceability and a consistent quality and quantity at a commercially attractive price.

**Figure 1 Overview of Market Channels for the food, cosmetic and health segments**



**Source: ProFound, 2014**

Industry consolidation in the food, cosmetics and health segments, as discussed in chapter 5, is changing the landscape for natural ingredients. This has an influence on the relevant market channels for these ingredients as well. Larger players have more market power, but smaller processors remain active as well. Therefore, it is important for small or community exporters in DCs to target the right partner in Europe. For specialised/premium or certified ingredients that are available in small volumes, specialised traders are most relevant. For these ingredients, value chains tend to be much shorter as importers generally source directly from the country of origin.

Most commonly, ingredients are exported through exporters or processors. As European companies are shortening their value chains, roles of local/community traders are becoming more limited. Depending on various factors, extraction at origin or in Europe is more prevalent. These factors include the complexity of the extract, associated risks, the specific (sub-) segment the extract is used in and feasibility of extraction in Europe. For certain raw materials, such as fruits, extraction in Europe is not an option as the product deteriorates too quickly. For all segments, an increased consumer interest in the story of ingredients offer opportunities for increased processing at origin. European companies increasingly use marketing stories to differentiate themselves from their competitors.

#### *Food industry*

In the food industry, especially in mature markets, manufacturers need more complex flavourings to differentiate from competitors. As they increasingly rely on European processors to develop new products, the role of these processors is becoming stronger. Particularly for botanical ingredients such as MAPs, traders and processors in Western Europe, in particular Germany and France, continue to play a main role. In order to match the demand of these processors, improvements in the value chains of DCs can be made, which consist of quality standardisation and a certain level of value addition (e.g. distillation).

#### *Cosmetic manufacturers*

For cosmetic ingredients, there is a divergence of processing locations. Basic cosmetic ingredients, which require simple process (e.g. cold pressing or essential oil production), are increasingly produced at origin. Moreover, for some raw materials it is too expensive to transport the raw material to Europe for extraction.

There is an increased concern over safety for these ingredients, which favours extraction in Europe. These concerns affect all actors throughout the chain, including producers, industries and consumers and can be split into technical/chemical safety and ethical safety. In addition, increasingly difficult technologies and processes are used in producing cosmetics, as consumers search for functionality in their products. Often, after first processing steps in DCs, these materials are further processed in Europe to obtain functional or active ingredients. These processes are often outside the scope of small producers in DCs.

*Health industry: herbal medicine and food supplement manufacturers*

For health ingredients, extraction in Europe is still most common. As a result of safety concerns and the resulting strict EU legislations, some companies still prefer to import raw materials instead of herbal extracts. Additionally, certain complicated processes are beyond the scope of small DC producers. At-origin production of essential oils offers better value-addition possibilities. However, it is key for exporters to comply with necessary, well-established certification standards. It is often up to small community producers to determine whether such lengthy and costly certification schemes are worthwhile.

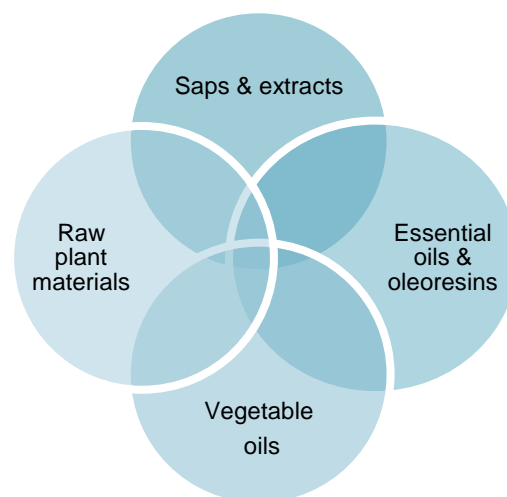
For health products, even after first processing at origin, further processing in Europe is important as well. Activities undertaken in Europe include purifying of the extracts, improving quality or extracting active ingredients.

## 1.2 Raw materials vs. processed materials

For this study, both raw materials and derived products are of importance (see Figure 2). As was demonstrated in section 1.1 on market channels, for certain products and segments, there are opportunities for value addition in the country of origin. If and where value addition is feasible in the form of extracts, essential or vegetable oils, these species have an increased commercial potential for small producers in the target countries.

Raw plant materials include Medicinal Aromatic Plants (MAPs), natural gums and resins and oil seeds and nuts, as is reflected in the trade data. For convenience, this study refers to these different product groups as MAPs. MAPs can be processed in various derivatives. Extraction of MAPs commonly results in herbal extracts: essential oils, oleoresins and extracts (including saps). Natural gums and resins can also be processed into essential oils, while oil seeds and nuts can be processed into vegetable oils. International trade in raw materials and derivatives is recorded separately.

**Figure 2 Overview of raw materials and derivatives**



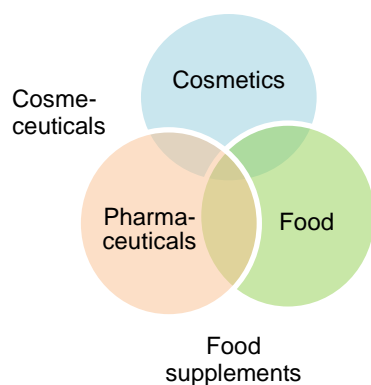
**Source: ProFound, 2014**

## 1.3 Market Segmentation

As mentioned above, the different market segments included in this study are food, cosmetics and health (see chapter 3 for more information). Within these segments, various cross-segments exist. The most interesting ones for trade in wild-collected MAPs are cosmeceuticals (combination of cosmetics and pharmaceuticals) and food supplements (combination of food and pharmaceuticals) as can be seen in Figure 3. These cross-segments are increasing in popularity as they combine the functionality of pharmaceutical ingredients with lower required legislations of food and cosmetic industries. As such, they offer an added benefit, without having to comply with stringent pharmaceutical legislative requirements.

The food segment can be further divided into food and beverage manufacturers. Within the cosmetics industries, sub-segments are skin care, hair care, decorative, fragrances and toiletries. The health segment consists of both herbal medicines and the cross-segment food supplements.

**Figure 3 Overview of relevant segments and cross-segments**



**Source: ProFound, 2014**

With respect to the (extensive) use of wild-collected species on the one hand, and cultivated species on the other hand, there are differences between these segments. In general, cosmetics and food industries rely more on cultivation than the herbal medicine industry. Variations in the kinds of buyers influence the use of wild-collected or cultivated species as well. For example, conventional cosmetics are more prone to using synthetic ingredients and rely on cultivation if large quantities are needed. In fragrance industries, several wild MAPS are used, which can amount to significant quantities. As such, especially as CITES (see chapter 4) applies to several of these species, sustainable trade becomes essential to safeguard future availability of these species. At the same time, proof of sustainable trade and harvest is a prerequisite of trade and for obtaining export and import permits for CITES-listed species.



## 2. Country backgrounds

This section gives an overview of the wild botanical sector of the ten countries in this study (Palestinian Territory, Algeria, Senegal, Mali, Niger, Benin, Uganda, Rwanda, Burundi and Congo (DRC)). Most of these countries have an extensive traditional use of MAPs, often even as a primary source of medicine. The countries differ in terms of the development of industrial use of MAPs. According to industry sources, the industries for processing MAPs are most developed in Algeria, Uganda and Senegal, whereas in Benin, Niger and Rwanda these industries were least developed. Political stability seems to be an important factor in the sustainable development of these industries, which is why they are underdeveloped in certain countries.

Moreover, biodiversity systems in the ten countries vary from Mediterranean climates, deserts and tropical climates. Countries with rich biodiversity include Congo (DRC), Algeria, Benin, Senegal and Uganda.

Information availability differed greatly between the countries, depending on: available biodiversity, industrial use of MAPs, political stability, donor activities, research and international development interest, and sustainability actions.

This section discusses the countries' biodiversity, traditional use of MAPs and its translation into commercial use and current and potential exports based on wild collection. For an overview of the long lists compiled per region, please refer to [Annex III](#). Furthermore, these country backgrounds consider issues around access and sustainable use of wild resources, looking at legislation relevant to wild-collection and an overview of sustainability issues in the country.

Due to data availability the content of these country backgrounds is neither exhaustive nor conclusive, nor does it replace need to further investigation and stakeholder consultation if activities in the wild botanicals sector are considered.

### 2.1 Palestinian Territory

#### ***Topography, climate and biodiversity***

The Palestinian Territory is high in biodiversity, both in terms of wild species, as well as the high number of landraces. The Territories consists of the West Bank and the Gaza Strip, while wild collection of MAPs only occurs in the West Bank; the rich biodiversity base in this region, coupled with a long history of plant use, makes it important for MAPs.

In only 5,800 km<sup>2</sup>, the West Bank includes three main bio-geographical areas (Mediterranean, semi-desert, extreme desert) and a large altitude range. The West Bank counts around 1,600 species, counting dozens of endemic and near-endemic species, including MAPs, wild-relatives of commercial crops (olive, pistachio, almonds, fruits) and spice species of commercial value (NARC, 2014).

#### ***Use of MAPs***

A study by ARIJ (Applied Research Institute Jerusalem) estimated wild collection of MAPs at around 700 tonnes (ARIJ, 2006). It is estimated that 65% of the local market (estimated at 5,000 tonnes fresh-equivalent) is based on imported MAPs. This excludes large quantities of garden-production and collection for household use (around 1,000 tonnes fresh), as these do not enter the supply chain (GEF 2005).

In general, transparency (and knowledge) on the type of species is limited; whether it is imported or not, and whether it is cultivated or wild. In terms of volume, most species are cultivated. In terms of wild-collection, relevant MAPs include: sage (*Salvia fruticosa* and *S. officinalis*), which is mostly wild-collected (GEF 2005), fennel (*Foeniculum vulgare*), nigella or black cumin (*Nigella sativa*), chamomile (*Matricaria chamomilla*), laurel (*Laurus nobilis*), caraway (*Carum carvi*) and anise (*Pimpinella anisum*) (GEF, 2006). Next to MAPs, seeds, nuts and (stone) fruits and spices are also collected in the wild, amounting to around 800 tonnes.



**Scale and potential of industrial use of MAPs**

Around 850 to 950 households in the West Bank collect from the wild on a regular basis. For these households wild-collection constitutes a substantial part (up to 70%) of their income. Around a quarter of these collectors are women (GEF, 2006). Middlemen are used to sell gathered quantities (fresh or dried) to 'attarin (traditional herbalists selling dried herbs and basic distillates), wholesalers and larger processors. Some 'attarin, in addition to their retail activities, are important wholesalers, buying directly from Bedouins and villagers. 'Attarin are always men.

Companies in the natural ingredient sector in the Palestinian Territory vary in terms of business sophistication, products, value addition and market orientation; these vary from highly professional companies which have overcome issues around traceability and quality, with advanced logistics and marketing capabilities, to companies depending on support from NGOs and those that are not ready for exports.

**Export potential and trade**

Of the approximately 70 types of MAPs which are traded on a substantial scale, around 50 are cultivated and/or collected locally (valued at USD 40 million). Most natural ingredients that find their way to the European market are certified organic and/or fair-trade and are traded through specialised sales channels. Agents are used to facilitate their entry to the European market as well as to facilitate logistics in Israel.

One of the main advantages for the Palestinian Territory in trading with Europe is that the products are known within the EU and will not be affected by Novel Food legislation, because of the long historic ties between Europe and the Middle East. The long tradition of trade between the two regions can be used as a marketing story for Palestinian MAPs. Main importers of Palestinian MAPs are European, such as Germany, France, the UK and Italy ([ITC Trademap](#)).

**Institutional framework**

There are two relevant institutions for wild-collection of MAPs in the Palestinian Territory. These are the Ministry of Agriculture (MoA), which implements national policies on agricultural and rural development, and the Environment Quality Authority (EQA), which develops regulations, strategies and management and monitoring plans for the sustainable use and conservation of the environment.

Public institutions focus on biodiversity conservation, not on sustainable use. There is no legislation and implementation for sustainable wild collection in Palestinian Territory. Not only is a bylaw to regulate access not yet approved, there are also no capacities to assess resources and resource management plans, administer permit systems, and inspect in the field. The need for institutionalisation of wild collection for sustainable use and rural income generation is recognized, especially by EQA, but not included for the work planning 2014. As such, there are currently no permit systems and enforcement mechanisms in place to control wild collection.

**Sustainability**

Several threats exist that could jeopardize future sustainability of wild collection and livelihoods of those dependent on wild collection. Quite a few of these are outside of the scope of collectors and require action at community and institutional level. These include intensification and modernisation of agriculture (increasing use of chemical fertilizers and pesticides, land reclamation, disappearance of traditional groves), overgrazing, quarrying, encroachment of urban areas and settlements due to high population growth, and pollution (NARC, 2014).

Illegal logging and overharvesting are more related to community action, and call for sustainable use of natural resources to give value to its protection. Although cultivation has been praised as a conservation option, most species are only sourced from the wild.

Overharvesting is considered the main threat (NARC, 2014). Around 65% of harvesting areas are visited by collectors several times annually and plants are harvested repeatedly, leading to destruction of regeneration capacity. Rotation of collecting areas is not practiced and collecting methods are crude and wasteful, reducing quality and market value (for example, fruits/nuts are harvested unripe) (GEF, 2006). According to industry sources and reports, current harvesting practices and the lack of sustainable

practices and standards are due to short-term rent seeking, lack of formalisation and organisation of collectors, loss of traditional knowledge and open access systems.

## 2.2 Algeria

### **Topography, climate and biodiversity**

Due to its location in Northern Africa, Algeria includes regions with different topographies and climates which allow for a rich biodiversity. Such regions include mountains, coastal and maritime regions, as well as a portion of the Sahara desert. The country has around 16,000 known species, both flora and fauna. Northern Algeria has a Mediterranean climate growing progressively dryer towards the interior. It has a desert climate in the Sahara in the south.

### **Use of MAPs**

As the rest of Northern Africa, Algeria has a rich tradition in using medicinal plants ([IUCN, 2005](#)). In Algeria, medicinal and aromatic plants (MAPs) are used by local communities and traditional medical practitioners. Rural communities rely heavily on MAPs and herbal remedies for their healthcare needs. Commonly used MAPs include *Adansonia digitata*, *Faigherbia albida*, *Acacia nilotica*, *Balanites aegyptiaca*, *Anogeissus leiocarpa*, *Salvadora persica*, *Commiphora africana*, *Prosopis juliflora* and *Sclerocarya birrea* (UNIDO, 2004). Moreover, many wild herbs are (also) used for culinary purposes, such as rosemary (*Rosmarinus officinalis*) and thyme (*Thymus vulgaris*).

### **Scale and potential of industrial use of MAPs**

In Algeria, extraction of MAPs to create ingredients for cosmetics, food and pharmaceuticals is underdeveloped ([Reguieg, 2011](#)). Knowledge on distillation of plants is sufficiently available, but can be exploited more.

### **Export potential and trade**

In general, Algerian exports of medicinal plants are small and mainly regional; according to [ITC Trademap](#) these are destined at Senegal, Mali and Niger.

One of the main advantages for Algeria in trading with Europe is that products are known within the EU and will not be affected by Novel Food legislation. This is due to the long historic ties between Europe and North Africa. European importers of MAPs are France and, on occasion, the UK ([EU Export Helpdesk](#)).

### **Institutional framework**

Algeria values the conservation of biodiversity, which is reflected in its institutional framework. In 2011, a law was adopted to protect representative samples of Algerian biodiversity. The country also created a legal framework to set conditions for access to biological resources and its circulation, transfer and valuation.

Algeria's Ministry of Agriculture and Rural Development has introduced development projects which focus on conservation of local biodiversity. Such projects put rural communities in the centre and emphasise on environmental protection. Conserving and sustainable use of biodiversity is also an important aspect of rural employment programmes, which are implemented in seven mountain provinces.

### **Sustainability**

Biodiversity in Algeria is endangered. According to the [CBD](#), the country has 121 listed CITES species, of which 75 are highly endangered species (mostly fauna species). Most threatened plant species include the Tassili cypress (*Cupressus dupreziana*), black pine and thuriferous juniper (*Juniperus thurifera*). Main threats to biodiversity in Algeria are related to human action. These include destruction and/or overexploitation of biological resources, extension of cultivated areas at the expense of natural vegetation, urbanisation and resulting infrastructure development, pollution, tourism, and hunting.

In order to safeguard biodiversity, Algeria has put a network of protected areas in place which covers 36.5% of the natural territory and represents most of its ecosystems ([CBD](#)). Currently, 550 plant species are protected, a list that has been developed by the Ministry of Land Planning, Environment and City. Of these species, some might not be tradable, whereas others may be traded with conditions. Trade in vulnerable species is regulated by national legislation, which is based on CITES.

## 2.3 Senegal

### **Topography, climate and biodiversity**

The northern part of Senegal lies in the 'Sahel' belt and is very dry, with sparse vegetation. Towards the south, vegetation is richer, particularly along the delta of the four main rivers; the Sénégal, the Saloum, the Casamance and the Gambia. The main types of ecosystems in Senegal are lands, rivers and lakes, coastal and marine ecosystems and the specific ecosystems of the mangroves, Niayes and the Djoudj area. These latter areas are of particular interest in terms of biodiversity, ecological importance and fragility. Senegal contains around 2,500 species of flowering plants. Of these, 31 are endemic.

### **Use of MAPs**

The government of Senegal has officially recognised the practice of traditional medicine. Currently, almost every village has a traditional medical practitioner. The Ministry of Health also advocates the promotion and restoration of traditional medicine and pharmacopoeia. In Southern Senegal alone, around 100 plants are used as a source for medicines. MAPs that are used extensively include *Cassia sieberiana* D.C., *Khaya senegalensis* (Desr.) A. Juss. and *Cola nitida*.

### **Scale and potential of industrial use of MAPs**

According to industry sources, Senegal has, compared to the countries covered in this study, one of the most developed industries for MAPs. Senegal, as well as Uganda, has developed its processing industry for botanicals to a greater extent than countries such as Benin, Niger and Rwanda. The country has the potential to become an increasingly important producer of MAPs and essential oils, because of the availability of raw material, good climatic conditions, proximity to Europe, low cost of labour, availability of simple and accessible production techniques and free trade agreements with main importing countries.

Activities are undertaken in Senegal to include local communities in the production and marketing of MAPs, demonstrating the importance of MAPs for specific organisations, such as Enda Medicinal Plants. Part of the international NGO [Enda](#), this organisation was founded to coordinate health programmes in Senegal and develop economic value chains on MAPs, phytosanitary research and herbalism ([BTC, 2011](#)). Enda promotes small cultivation projects of threatened MAPs by producer groups (mostly women) and supports a network of herbalists to support the marketing of MAPs grown and prepared in villages and communities.

### **Export potential and trade**

Compared to the other countries discussed, Senegal is a relatively more experienced exporter of MAPs. The country exports to various regional and international destinations. Regionally, these include countries such as Congo and Ghana, while the country exports most MAPs to Mexico ([ITC Trademap](#)). The largest European importers are France, Germany and Italy ([EU Export Helpdesk](#)). In recent years, the Netherlands has been a growing importer of MAPs from Senegal. Senegal is also an exporter of gum Arabic, although main exports originate from Sudan.

### **Institutional framework (for wild-collection)**

Senegal has transferred the responsibility of environmental management to local levels. A legal and institutional framework has been established that encourages full expression of local competences, together with community parks and reserves, to support local governance. For plant resources, forests have been given the greatest attention with the Forest Code. In this code, local populations have a right of ownership on plantations that they established on the national domain. In biodiversity management, the role of women is increasingly important. They are important partners for ecotourism activities and ecosystem management in several community parks.

### **Sustainability**

Main causes of biodiversity losses in Senegal include drought, soil degradation, bush fires, habitat fragmentation, over-exploitation of biological resources, poaching, pollution, invasive species, an insufficient legal framework to protect biodiversity, a lack of cooperation in managing park border areas, and a lack of knowledge on the status of nature reserves. Over 10% of the country's territory is under protection. Senegal has also created several parks and natural reserves, which have the first priority in terms of biodiversity.

Senegal aims to stop biodiversity loss by reintroducing species, protecting threatened species and promoting useful wild species. With respect to indigenous and local knowledge, the country gives special

attention to areas of significance for biodiversity, especially high-density sites, by creating national parks and natural reserves.

## 2.4 Mali

### **Topography, climate and biodiversity**

Mali is located south of the Sahara; two-thirds of its territory consists of desert. It is characterised by high temperatures and low levels of rain. The existence of various biological activities is mainly due to large rivers such as Niger and Senegal as well as mountain areas. The country has identified 1,739 species of vascular plants and 8 endemic species, most of them located in the Sudano-Guinean area ([CBD](#)).

### **Use of MAPs**

About 75% of Mali's population relies on traditional medicine and more specifically on medicinal plants for their health care needs ([WHO, 2002](#)). There is approximately one traditional medicine practitioner (TMP) for every 500 habitants. Traditional remedies based on plants exist for illnesses such as malaria, stomach ulcer, hepatitis, eczema and others. The most commonly used MAPs are *Faidherbia lbida*, *Prosopis africana* and *Ziziphus mauritana*. According to industry sources, there is a large scale harvesting of shea butter in Mali, as well as *Acacia nilotica* leaves for natural colouring.

### **Scale and potential of industrial use of MAPs**

Despite recent years' conflict that affected the country greatly, Mali is committed to the advancement of the traditional medicine sector. Efforts have been made towards the further development of the technical know-how of the semi-industrial and industrial units that transform the raw material into herbal products. Research and Development plays an important role for Mali, in an effort to educate physicians and pharmacists on traditional medicine and traditional pharmacopoeia.

### **Export potential and trade**

Mali's exports of MAPs are very limited. According to [ITC Trademap](#), the total value exported in 2012 was destined to Senegal. In Europe, France is the main importer of MAPs from Mali ([EU Export Helpdesk](#)). Other, incidental, European importers are located in Eastern Europe, e.g. Croatia and the Czech Republic.

### **Institutional framework**

One of Mali's objectives is to empower indigenous communities to actively participate in the country's natural conservation plans. Already, local communities play an important role in elaborating biodiversity inventories, managing the different uses of biodiversity and implementing activities related to the conservation of biodiversity. As such, the local population is working towards developing a plan for the sustainable management of the country's biodiversity.

### **Sustainability**

The country's biodiversity is threatened by human activities such as forest clearance, overgrazing, poaching, overfishing, bush fires and use of chemical pesticides and fertilisers.

*Parinari excels* Sabine and *Khaya nyasica* Stapf ex baker f. are two species reported to be rare and one is endangered (*Securidaca longipedunculata* Fresen). Under article 17<sup>th</sup> of the Forestry Law, nine species are protected from extinction.

Several measures have been taken to protect local plant varieties. 4% of Mali's territory is already protected, which the country aims to increase to 15% ([CBD](#)). In order to achieve that goal the country is planning to promote traditional knowledge and practices; capacity building; implementation of CITES and exotic species management; fight against the effects of climate change; and reduce of pollution.

## 2.5 Niger

### **Topography, climate and biodiversity**

Niger is an arid country; 75% of the country's territory is covered by desert ecosystems, such as the Ténéré desert. There are 2,124 known plant species in Niger, of which 210 are important because of their

nutritional components. Forest cover in Niger amounts to 8% of the national territory (11.2 million ha) and includes managed and degraded forests.

### **Use of MAPs**

In Niger, approximately 80% of the population resort to the traditional pharmacopoeia for their healthcare needs ([WHO, 2002](#)). Most commonly used species include *Khaya senegalensis* (Desr.) A. Juss., *Guiera senegalensis* Gmel., *Cassia sieberiana* DC., *Senna siamea* (Lam.) H.S. Irwin & Barneby), *Senna singueana* (Delile) Lock, *Eucalyptus camaldulensis* Dehnh. and *Azadirachta indica* A. Juss.

### **Scale and potential of industrial use of MAPs**

Rural communities collect MAPs for both personal use and marketing purposes (UNIDO, 2004). Industry sources indicated that the industry for MAPs in Niger is one of the least-developed compared to the other countries covered in this study. There are some companies offering soap and cosmetics, traditional medicine (for local use), Arabic gum, shea, and moringa oil.

### **Export potential and trade**

Exports of Niger of MAPs are very low, even when compared to the low exports of other countries in this report. [ITC Trademap](#) recorded some regional exports to Nigeria. European imports from Niger have been volatile, alternating between Croatia, France and Germany ([EU Export Helpdesk](#)).

### **Institutional framework**

In terms of an institutional framework, Niger has created or adapted legal texts to include elements for the protection of wild fauna and flora. These include frameworks on hunting and fauna protection regimes, laws on the institutionalisation of environmental impact assessment, forest regime and environmental management. These texts form the basis of regulations of sustainable management of Niger's environment. The country has yielded management of specific tourist camps directly to local populations to combat poverty in riverside populations in protected areas. Niger supports traditional practitioners in promoting innovation and traditional knowledge. The national commission on biodiversity includes representatives of indigenous groups; as such they are involved in discussions.

### **Sustainability**

Main threats of biodiversity in Niger include population growth and soil degradation. The country has developed a Rural Development Strategy, which has the following objectives for protected areas: reduction in loss of certain species, sustainable exploitation of resources, restrictions for commercial trade of threatened species, reduction of habitat degradation, adaptation to climate change and reduction of pollution ([CBD](#)).

Protected areas in Niger cover 6.6% of the total national territory, at 8.5 million hectares. Niger has a participatory approach to protecting biodiversity, where riverside populations are involved in managing protected areas. Of the protected areas, the W National Parc houses 70% of Niger's biodiversity and the Ténéré desert is the largest protected area of Niger, home to many threatened species. Objects for protected areas are focused on the following types of biodiversity: agricultural; inland water; arid and sub-humid land; forest; and mountain biodiversity.

## **2.6 Benin**

### **Topography, climate and biodiversity**

Benin holds several vegetation zones, which houses an estimated 3,000 vascular plant species. These vegetation zones include semi-deciduous forests, dense, dry forests, clear forests, savannahs, meadows in mountainous areas, humid regions, coastal areas and mangroves. Benin's forest cover is mostly made up of forest and wooded areas, followed by protected areas, and plantations (coconut, palm and teak).

### **Use of MAPs**

Around 80% of the population of Benin relies on traditional medicine for their health care needs (UNIDO, 2004). Additionally, people from other countries use Beninese traditional medicine.

Studies on the practices of indigenous communities were carried out ([CBD](#)). The country used traditional knowledge evaluation tools to reinforce the capacities of local communities. Additionally, seminars and workshops were organised for local communities so they are valued for their knowledge, practice and



ideas. To evaluate the state and evolution of the knowledge, innovations and traditional practices of local communities, as well as the threats facing them, Benin supports studies on land used by local communities.

### **Scale and potential of industrial use of MAPs**

Regarding industrial use of MAPs, Benin is one of the least developed countries in this study, according to industry sources. Several companies exist which produce traditional medicine, although mostly for local and regional use. Additionally, there are some companies which produce shea butter, medicinal plants, essential oils and cosmetics.

### **Export potential and trade**

In recent years, Benin has exported MAPs to Central Africa, i.e. Congo and Gabon ([ITC Trademap](#)). In Europe, France is the main importer of MAPs originating in Benin. Other European importers include (alternatingly) Germany, Italy, Latvia and the Netherlands ([EU Export Helpdesk](#)).

### **Institutional framework**

Benin has developed measures, directives, legislation and other initiatives to include local communities in decision-making, policy planning and developing conservation measures and sustainable use of energy resources at local, national, (sub-)regional and international levels.

### **Sustainability**

The main threats to biodiversity in Benin are the erosion of soils, withdrawal of forest cover, impoverishment of consumable natural resources (especially fauna and fish), climate change, migration and expansion of the cotton industry and a lack of protected areas ([CBD](#)). In the last decades, some vegetation zones significantly reduced in size, most notably savannahs (-1,946 thousand ha) and forest areas (-987 thousand ha).

About 12% of the national territory is classified as protected areas, which are mostly located in the north of Benin. In the south, some small isolated islands of dense forest are protected by law as well. There are four categories of protected areas; national parks, game reserves, forests and the Biosphere Reserve (national park and game reserves).

Benin has decided to create more wildlife reserves in the south of the country. The country also plans to increase the protected areas, implement reforestation, restore natural biological resources to a higher level than what is currently needed to enable a contribution to economic development, increase the value of biological diversity and genetic resources and create a framework for the management of biological diversity.

## **2.7 Uganda**

### **Topography, climate and biodiversity**

Uganda is located between the East African savannah and the West African rain forests. The country's major ecosystems include forests, woodlands, savannahs, wetlands, open water and mountain ecosystems. It is one of the countries with the highest biological diversity on the African continent. There are 5,000 species of flowering plants recorded, while 30 different plants are endemic to the country ([CBD](#)).

### **Use of MAPs**

Traditional medicine is extensively practiced in urban areas of Uganda. Around 300 plant species are used in the traditional systems of medicine and nine MAPs are collected for sale. Some of the most popular MAPs which are collected and sold are: *Prunus africana*, *Psorospermum febrifugum* and *Albizia coriaria* (FAO, 2011).

### **Scale and potential of industrial use of MAPs**

According to industry sources, Uganda is one of the most developed countries covered in this study in terms of industrial use of MAPs. Individuals and groups engage in extracting essential oils from plants, which are sold to both the local and international markets (UNCTAD, 2004). Additionally, the Ministry of Health has launched a project to identify valuable MAPs with potential to cure malaria, dysentery, skin

infections and other diseases. Diseases which can be tackled with the use of MAPs have already been identified.

### **Export potential and trade**

According to the [ITC Trademap](#), Uganda is exporting MAPs to various countries, including the United States, Taiwan, Colombia, United Arab Emirates, Kenya and Tanzania. According to the [EU Export Helpdesk](#), the major EU importers of Ugandan MAPs include Spain, Germany, UK and Belgium. Information on international trade in specific species is limited. Uganda's best-known export product falling under MAPs is *Prunus africana* (Hook. f.) Kalkman (Cunningham et.al, 1997).

### **Institutional framework**

Laws and policies have been put in place to promote biodiversity conservation. A National Strategy for the Control and Management of Invasive Species is being developed. Herbal gardens and cultivation of rare MAPs are essential in order to sustain the benefits of these MAPs. Policies to promote and protect MAPs, such as controlling the cutting of trees with medicinal value for construction or charcoal, are currently inadequate. Other policies, e.g. on agricultural zoning, farmer cooperatives and commercial farming, could also be adjusted to ensure the sustainability of MAPs (CCFU, 2008).

In Uganda, the protection of natural resources can be found in several regulations. However, the Draft National Environment Regulation is the only regulation with more focused attention to issues of both conservation and utilization, although with a focus on genetic materials mainly for scientific purposes.

### **Sustainability**

The country's biodiversity is threatened by unsustainable harvesting, inadequate enforcement of legislation, deforestation, invasive alien species and inadequate community involvement. The lack of a national land use policy and a national biodiversity conservation/management policy adds to the mentioned issues.

About 200 species of plants and animals are included in the IUCN Red-List, requiring global importance for conservation efforts. Consequently, the country has a range of protected areas, including National parks, Wildlife Reserves, Wildlife Sanctuaries, Community Wildlife Areas, Central Forest Reserves and Local Forest Reserves. Also, the Ugandan government has introduced protected area systems to enhance conservation of biodiversity.

The role of the community is key in the effort to enhance sustainable management of the country's natural resource. Communities are being empowered and sensitized on sustainable management of forests and other biological resources occurring on their land through a collaborative forest management arrangement.

## **2.8 Rwanda**

### **Topography, climate and biodiversity**

Rwanda is located in Central Africa and is covered by forests, savannahs, lakes, rivers and marshes. Forests, including natural and planted forests, cover 12% of the national territory. The country belongs to a zone of global ecological importance called 'Albertine Rift Eco-Region' and is home to a variety of plant and animal species.

### **Use of MAPs**

Ethno botanical studies have identified hundreds of medicinal plants exploited in Rwanda. FAO counted 59 medicinal plants used in traditional medicine for both human and veterinary use (FAO, 1999d). About 20 MAPs species are commonly used for indigenous systems of medicine to manufacture herbal medicines. Most of them are collected from the grasslands and some are cultivated, such as *Allium sativum* L., *Clematis hirsute* Perr. & Guill.

The leading MAPs in Rwanda are: *Acacia senegal* (L.) Willd, *Agave sisilana* Perrine, *Capsicum annum* L., *Capsicum frutescens* L., *Carica papaya* L., *Cathranthus roseus* (L.) G. Don, *Chenopodium ambrosioides* L., *Cinchona ledgeriana* (Howard) Bern. Moens ex. Trimen, *Cucurbita pepo* L., *Cymbopogon citratus* (DC.) Stapf, *Datura stramonium* L., *Eucalyptus globulus* Labill., *Lycopodium*



*clavatum* L., *Melaleuca leucadendron* (L.) L., *Nerium oleander* L., *Ocimum basilicum* L., *Rheum officinale* Baill., *Ricinus communis* L. and *Sesamum indicum* L. (UNIDO, 2004).

### **Scale and potential of industrial use of MAPs**

Due to inadequate local production and over reliance on imports of finished products, Rwanda cannot yet take advantage of its rich biodiversity. However, Rwanda has a sufficient quantity of MAPs to initiate a pilot scale production of medicines which are in great demand. Additionally, Rwanda has made an organised effort to study the traditional pharmacopoeia and the MAPs used as medicinal products.

Research & Development activities are concentrated in the Traditional Pharmacopoeia Aromatic and Medicinal Plant Centres. They focus on developing technologies for essential oil extraction and processing plant materials for the production of drugs.

### **Export potential and trade**

According to [ITC Trademap](#), the majority of MAPs exports are directed to regional countries, such as Congo, South Africa, Tanzania and Uganda but also to the US, Mexico and New Zealand. Exports of MAPs to Europe are minimal and are directed towards the Netherlands, Italy and Belgium ([EU Export Helpdesk](#)). Despite the fact that trade in MAPs is minimal, potential for trade exists.

### **Institutional framework**

Legislation has been established in order to promote sustainable management of natural resources. Furthermore, the polluter-pays principle is a basic element of the National Policy on the Environment. Despite the developments of limited legislative framework, biodiversity is still insufficiently protected.

### **Sustainability**

Major threats to Rwanda's biodiversity include erosion, floods and droughts, disease and pests, as well as population pressure and resettlement, overexploitation, poaching, and bush fires. The 1994 genocide also had a big impact on Rwanda's biodiversity ([CBD](#)). Rwanda's National Biodiversity Strategy has five major aims: to improve conservation of protected areas and wetlands; to achieve sustainable use of biodiversity in natural ecosystems and agro-ecosystems; to promote rational use of biotechnology; to develop and strengthen policies, institutional, legal and human resources frameworks; and to make sure that benefits derived from the use of biological resources will be equally shared.

Approximately 10% of Rwanda's national territory is dedicated to the protection of natural ecosystems and their biodiversity. This territory includes the Nyungwe National Park, the Volcanoes National Park, the Akagera National Park and the Rugezi wetland. There are also programmes promoting agro-forestry, while the national objective is to increase the area covered by forest from 12% to 30% by 2020.

## **2.9 Burundi**

### **Topography, climate and biodiversity**

The ecosystems of Burundi cover an area of over 27,000 km<sup>2</sup>. Most of this area is categorised as agricultural land (50%) and planted forests (5%). The remainder consists of natural ecosystems, such as forests, savannahs, steppes and wetlands. At least 4,555 known species are found in Burundi, of which vascular flora account for 2,909 species. At higher altitudes, relatively more species, which are endemic to Burundi, are found. A variety of medicinal plant species grows on the Imbo plains.

### **Use of MAPs**

The majority of Burundi's population uses traditional medicine as primary healthcare (UNIDO, 2004). Over 90% of medicinal plant material is sourced from wild collection. In Burundi, there are several species of MAPs which are well-established and for which uses are listed in pharmacopoeias (UNIDO, 2006). These include: *Chenopodium ambrosioides* L., *Ricinus communis* L., *Ocimum basilicum* L., *Sesamum indicum* L., *Phytolacca dodecandra* L'Her, *Capsicum frutescens* L., *Datura stramonium* L., *Cinchona succirubra* Prav. Ex Klotzsch, *Eucalyptus globulus* Labill., *Cymbopogon citratus* (DC.) Stapf., and *Catharanthus roseus* (L.) G. Don.

### **Scale and potential of industrial use of MAPs**

Since its independence in 1962, Burundi has experienced four wars, which have disrupted the country's economic performance. Currently, the country's main sector is the agricultural sector. It is assumed that

the industrial use of MAPs, other than for local traditional and herbal medicine, is limited. Projects have been undertaken to revive the country's essential oil production, but the country does not have an agency or institution that promotes the utilisation of MAPs. Burundi does have two premier institutes which undertake R&D activities in MAPs, the Laboratoires Pharmacologiques du Burundi and the Institute for Agronomic Science of Burundi (ISABU).

### **Export potential and trade**

Exports of MAPs from Burundi are small, volatile and decreasing in recent years. Regional exports by Burundi are aimed at Rwanda and Congo (DRC), and have included Congo and Swaziland in the past ([ITC Trademap](#)). European countries importing MAPs from Burundi on a more regular basis are Germany and Belgium ([EU Export Helpdesk](#)).

### **Institutional framework**

Due to several challenges to conserve biodiversity (see “Sustainability”), the institutional framework for biodiversity in Burundi is limited. There are some programmes which systematically monitor activities seen as main threats to biological diversity. The Ministry of Health has also developed a draft strategy on traditional medicine, which includes the conservation of medicinal plants. For all development projects in Burundi, impact studies are required.

### **Sustainability**

Burundi has an extreme rate of biodiversity degradation, which is mainly due to the rapid growth in population ([CBD](#)). The main threats to biodiversity in Burundi include deforestation, bushfires, water pollution, poaching and introducing invasive alien species, as well as climate change. Reforestation attempts, traditionally used to increase forest cover, have not been very successful as this is considered less profitable than other activities.

Burundi has several challenges to conserve biodiversity. These include limited financial resources; a lack of integration of biodiversity issues in political sectors aside from those traditionally dealing with the environment; a lack of human resources; a lack of indicators and aspects related to access and benefit-sharing (ABS); and inadequate means to involve the population in managing protected areas.

Although they do not have management plans, Burundi has 14 protected areas. These cover 5.6% of the total national territory, which translates to 31% of the area with natural ecosystems. These protected areas contain 55% of endemic species. The biodiversity in unprotected ecosystems is highly threatened. Of the country's known species, 56 plant species are considered vulnerable.

## **2.10 Congo (DRC)**

### **Topography, climate and biodiversity**

The Democratic Republic of Congo (DRC) lies across the Equator, with a tropical climate that makes it the most biologically diverse country of the Congo basin. Its rich biodiversity incorporates important freshwater, forest and soil resources, including sub-soils highly valued for their mineral content ([CBD](#)). The Congo basin is one of the world's rare rainforests, which is home to about 10,000 species of flowering plants of which around 3,000 are endemic to the region.

### **Use of MAPs**

DRC has been through many years of conflict, which has also affected people's access to medicine. Infrastructure for imported medicines has broken down, while even if they were imported, the population could not afford them. Therefore, traditional medicine is very important for the country, especially for the struggle against malaria. Apart from malaria, several MAPs have been identified to help against burns, infected wounds, rheumatic pain, constipation, bronchitis, dysentery, nausea and sleep disorders. Some of the most commonly used are: *Aloe ferox*, *Artemisia annua*, *Carica papaya*, *Capsicum frutescens*, *Eucalyptus globulus*, *Euphorbia hirta*, *Passiflora edulis* and *Zingiber officinale*.

### **Scale and potential of industrial use of MAPs**

According to industry sources, the industry for MAPs in DRC is relatively well-developed, although less so than in Uganda and Senegal. A new department has been established within the Congo National Research and Development Board, which deals with botany, pharmacology, ethnomedicine, psychopathology and anthropological aspects of medicinal plants (UNIDO, 2004). It is also important to

note that a wide range of MAPs from the lowland forest are transported to Beni (a trade city in DRC) as well as traded in the local market. Some of them include: *Piper guineensis*, *Cola acuminata*, *Garcinia cola*, *Aframomum* spp and *Pentadiplandra brazzeana* (FAO, 2014).

### **Export potential and trade**

No detailed information is available for specific MAPs exports, apart from the fact that DRC exports *Cinchona* spp. and *Prunus africana* (Hook. f.) Kalkmanto to Europe. According to [ITC Trademap](#), the DRC exports MAPs to Indonesia, India, China and Rwanda. Its exports also target EU countries, with Germany being the largest destination market. Others include Belgium, France, Italy and Spain ([EU Export Helpdesk](#)).

### **Institutional framework**

DRC has not yet established a system to review and monitor biodiversity or a set of indicators for this purpose. A framework for agricultural policy has been created, with a related law currently in development. In 2002, a forest code was developed, which was the government's first effort to develop a new vision of forest resource management.

### **Sustainability**

The country's rich biodiversity is threatened by human activity. More specifically, the population's strong dependence on wood energy, extensive slash and burn farming practices, anarchic establishment of mining quarries, severe demographic and economic pressures, and the unsustainable use of resources have put enormous pressure on the country's natural resources. However, there is no national regulation for the protection of threatened plant species such as *Millettia laurentii* De Wild., *Afrormosia elata* Harms, *Diospyros* spp. and *Eremospatha* spp. (UNIDO, 2004).

### 3. Potential market segments

In Europe, wild-collected MAPs from the ten countries covered in this study are most often used in food (supplements) and cosmetics. This chapter also discusses the health segment and several high potential cross- and sub-segments, such as organic and fair trade.

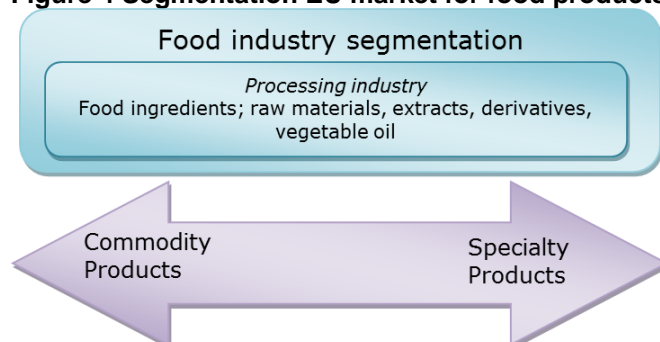
#### 3.1 Food industry

Food ingredients are sold to the processing industry as ingredients, and are used in the manufacturing of different food products. MAPs are used for various functions: as flavouring (e.g. essential oils), thickeners (e.g. natural gums) or colouring (e.g. extracts).

Ingredients for food can be further segmented into specialty ingredients and commodity ingredients. Specialty products can be of premium quality, certified, or exotic and (relatively) new to the market. Commodity products are of a standard quality, traded in large quantities (some even through futures markets).

Wild-collected MAPs have most potential in the specialty food segment, as it commands lower quantities and higher prices than the commodity segment. In the food segment there is an increasing demand for natural health and lifestyle options. Introducing new species for the food segment can result in legislative hurdles, for example the Novel Food Regulation (see chapter 4).

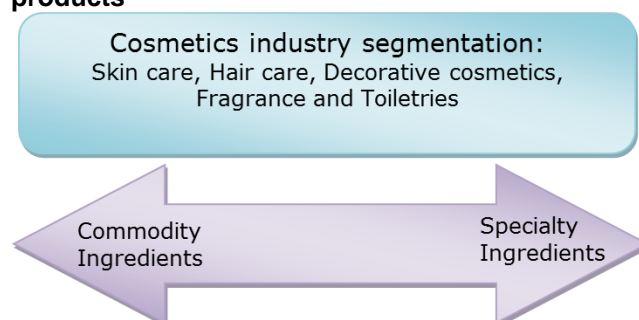
**Figure 4 Segmentation EU market for food products**



#### 3.2 Cosmetic industry

DCs supply many different natural ingredients to cosmetic producers in the EU, often through intermediaries (traders, brokers, processors). The cosmetic industry is divided into five segments: skin care, hair care, decorative cosmetics, fragrances and toiletries. Of these, toiletries and skin care represent the largest segments (both around 25%), followed by hair care (21%), fragrances (15%) and decorative cosmetics (13%).

**Figure 5 Segmentation EU market for cosmetic products**



MAPs and their derivatives are often used as active (e.g. anti-aging) or functional ingredients (e.g. preservative or fragrance). The cosmetics segment has a strong drive for innovation and is a more flexible industry than the pharmaceutical and food industries, as legislation is less stringent.

Demand can be divided between conventional (commodity) and specialty ingredients.

Cosmetics ingredients have most potential as

specialty ingredients. More specifically, this is the case if they are natural, induce a feeling of exotic, luxury or health, have active properties and have been produced in an environmentally and socially sustainable manner. These aspects are often used for marketing stories. As such, wild-collected MAPs which encompass these aspects have strong potential in this sector. When these ingredients offer additional marketing or story-telling opportunities, such as exclusivity, certifications, demonstrating benefits for local communities in the country of origin, the ingredient can be used as specialty ingredient and has a stronger competitive edge.

However, some words of caution need to be given on the use of these ingredients in cosmetics. New, less-established ingredients depend on trends in product introductions, which can change quickly. Sustainable wild-collection is of extra importance in this respect, to ensure future supplies of attractive ingredients. Not all markets are equally receptive to MAPs, especially if these are new. In Europe, countries like France, the UK and Germany offer most potential for these ingredients. In order to develop markets for sustainably produced MAPs, these need to be available to cosmetic producers in high volumes and in a wide range of ingredients. Finally, for producers of certified natural cosmetics, which require a certain threshold of natural content, cheaper vegetable oils can be of more interest than expensive MAPs or extracts.

### 3.3 Health industry

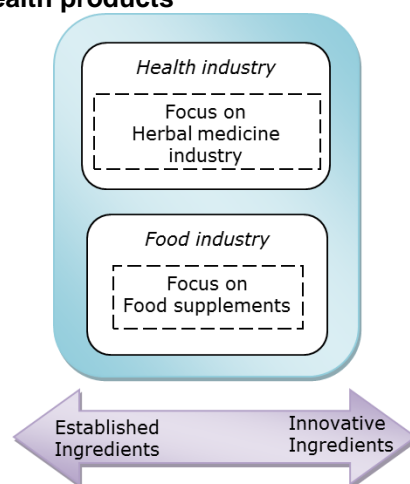
Within the health industry, the most relevant segments are herbal medicine and dietary industries (e.g. food supplements), as opposed to the pharmaceutical industry. In the latter, local community benefits are quite low as the pharmaceutical industry prefers to synthesize new ingredients, rather than sourcing the natural ingredient. Innovation is most feasible and welcomed by companies in the dietary industry. This market segment offers most opportunities for exporters of wild-collected MAPs or extracts.

Due to very high research and market authorisation costs to establish new ingredients for herbal medicine (efficacy, safety), herbal medicine products focus on ingredients that have community monographs with either documented well-established or traditional use. Most ingredients have established markets as they have been used for a long time. In addition, these markets focus on quantity and competitive prices and companies do not easily switch suppliers.

For less established wild-collected species, like many species covered in this study, legislative requirements will pose a challenge. The adoption of the Traditional Herbal Medicine Product Directive (THMPD) in Europe, which provides a simplified regulatory approval process for traditional herbal medicines, could negatively affect the demand for these less established species. Most importantly, in registering traditional herbal medicine products, the directive requires an evidence of safe use of 30 years, of which 15 years in the EU. If the market per product is too small, a marketing authorisation may not be worthwhile. Moreover, for products containing multiple herbs or non-herbal ingredients, registration is difficult, as all ingredients need to be authorised jointly.

Dietary industries offer more opportunities for innovation and/or market entry. Regulatory hurdles are lower, as these products are regulated as food and not as pharmaceuticals. Companies in these industries are looking for new ingredients to diversify and distinguish themselves on the market. However, legislative requirements for food products can still be a significant bottleneck for producers of new ingredients. As food supplements are covered in legislation for food, Novel Food Regulation applies for these products as well (see chapter 4). Additionally, these markets are rather competitive and price-sensitive. New ingredients compete with established herbal medicine ingredients as these are used in food supplements as well. In general, product standards are lower than in herbal medicine products, consequently, prices tend to be lower as well.

**Figure 6 Segmentation EU market for health products**



### 3.4 High potential cross- and sub-segments

Within these segments, four high-potential sub-segments are identified. An overview of these is added below.

**Food supplements (health):** in the health segment, food supplements offer most opportunities for innovations. Since these products are regulated as ‘food’, regulatory hurdles are much lower than for

herbal medicine, while the European market is considerably larger than for medical nutrition. In Europe, sales of food supplements grew by 6.2% in 2013. Italy represents the largest market in Europe (€ 1,211 million), followed by Germany (€ 935 million), France (€ 611 million) and the UK (€ 538 million). The rest of Western Europe accounted for € 2.1 billion, with Eastern Europe bringing in another € 2 billion in 2012. Manufacturers are interested in product development to set them apart on the market and increase their profit margins.

**Cosmeceuticals (cosmetics):** in this segment, which combines cosmetics and pharmaceuticals, cosmetic producers can offer products that enhance health and beauty, without making medicinal claims. These products contain at least one bioactive ingredient, and botanical ingredients can be an interesting proposition for manufacturers, as these combine functionality with 'naturalness'. Market growth is the result of the introduction of new ingredients and changing consumer demand.

**Natural and organic cosmetics:** natural, and in particular organic cosmetics, are expected to grow in the coming years, by almost 10% annually in the global market until 2018. In 2013, the global market for natural cosmetics reached € 23 billion. In the mature natural markets in Europe, sales of natural cosmetics increased by 6.5% in 2013. European natural cosmetics companies are active outside the continent, adding to their demand for natural ingredients. Globally, Germany represents the third largest market for organic personal care products, behind the U.S. and Japan. In 2013, skin care products represented the largest segment of global organic personal care products market, followed by hair care.

**Organic/fair trade ingredients (food and cosmetics):** overall, organic and fairtrade markets are most developed in Western Europe, but some East-European countries show strong growth. The European market for organic products was € 22.8 billion in 2012, an increase of 6% compared to 2011 (€ 21.5 billion), in terms of retail sales. Interest in organic products is stimulated by consumers' concern about the environment, health and nutrition, and food safety.



## 4. Market access requirements

For an overview of the relevant market access requirements for the food, cosmetics and health segments, as well as direct links and sources for more practical information, please refer to [Annex I](#) of this report. Additionally, as this study specifically covers wild-collected botanicals, certain (non-) legislative requirements are relevant for all segments. Be aware that requirements for medical products are the most stringent, followed by food products/ingredients and cosmetics.

### 4.1 Legislative requirements

Legislative requirements are the minimum requirements, which must be met by exporters of food, cosmetic, or health products marketed in the EU and EFTA countries. Products that fail to meet these requirements are denied market access. The EFTA States, with the exception of Switzerland, take part in the European Economic Area (EEA). This means that Liechtenstein, Norway and Iceland follow EU legislation in general. In Switzerland, the legislation deviates on some aspects, but it is increasingly becoming harmonised to EEA provisions.

The rest of this section provides a brief overview of the most important legislation for wild-collected botanicals, as well as a comparison of the legislations applicable to the different segments.

#### ***Wild-collected botanicals and derivatives***

For wild-collected botanicals, the most important legislative requirements are the [EU Wildlife Trade Regulations](#), [CITES](#), [GACP](#) (Good Agriculture and Collection Practices) and [Access and Benefit Sharing](#) (ABS). The latter refers to the rules and principles on the use of genetic resources and associated traditional knowledge, established by the Convention on Biological Diversity. Countries regulate access to genetic resources in different ways and requirements can be quite stringent, either in terms of reaching “prior informed consent” with governments or in terms of how benefits (financial, expertise) are shared. These “mutually agreed terms” detail the terms and conditions of access and use of genetic resources and/or traditional knowledge between the company seeking plant material for research and development, and the collectors, growers, or associations which would be able to supply such material.

If these botanicals are further processed into essential oils or extracts the EU legislation on extraction solvents and [REACH](#) become important as well. In addition, the EU has laid down legislation on packaging, labelling, classification, as well as specific legislation for the segments covered in this study; food, cosmetics and health products.

#### ***Food***

Food products and ingredients are covered by an extensive body of legislation. The most important aspects deal with food safety, which includes hygiene, pesticide residues, contaminants, microbiological criteria, permitted additives, and processes and systems to control these requirements. In addition, buyers can demand food safety, traceability and sustainability standards beyond legislative requirements. However, the need for this depends on the wishes of the buyer. Organic certification is available for wild-collected MAPs as well. Legally, this regulation only applies to food products; non-legislative organic certification in the other segments is based on this legislation.

#### ***Cosmetics***

For cosmetic products, legislative requirements are less stringent than for the other segments in this study. However, non-legislative requirements, which are discussed in section 4.2, are of key importance.

#### ***Health***

Compared to the other two segments, regulations for the health industry are the most difficult to comply with. The requirements relevant for this segment focus on herbal medicine products and food supplements. For natural ingredients aimed at the herbal medicine segment, producers need to comply with specific legislation from the start of the value chain. For herbal medicine, these include the legislative requirements on Good Agriculture and Collection Practices (GACP) for raw materials, and Good



Manufacturing Practice ([GMP](#)) for further processed ingredients. For more information please refer to [Chapter 3](#) which further discusses the EU Directive on Traditional Herbal Medicinal Products.

Although food supplements fall under the same regulation as food products, in marketing terms they are more aligned to the health sector. The main legislative difference compared to other food products can be found in specific labelling and composition requirements.

## 4.2 Non-legislative requirements

Non-legislative requirements include a variety of certifications (e.g. organic), standards and/or Corporate Social Responsibility (CSR) requirements, but also include issues such as having the right documentation and promotional materials to entice specific buyers. These requirements often go beyond legislation, as buyers can have stricter requirements. Certifications or standards can be expensive, difficult or time-consuming to comply with; therefore, it is important for SME producers to determine whether specific schemes are relevant for specific segments/buyers. In general, these requirements are more relevant for food and cosmetics segments, as well as food supplements. Legislative requirements for herbal medicine products are already more specific and definite in terms of standards, documentation and certifications.

Certification schemes oriented at wild-collection focus on the supply and/or market side. From a supply-side perspective, certifications aim at changing / improving operations of small producer organisations. From the market-side perspective, certifications can be used to distinguish the botanicals or extracts sold from similar non-certified products. Standards specifically aimed at wild-collected MAPs include [FairWild](#) standards, [FairForLife](#), and [Ethical BioTrade](#). [Rainforest Alliance](#) and [Utz](#) certifications do not apply to wild-collected MAPs and are not included in the analysis below.

Moreover, for all segments, but in particular for cosmetics and food supplements, non-legislative requirements are very relevant, as these segments strongly revolve around the story of products. Additional certifications, marketing materials (such as those promoting the origin or benefits to local communities) etc. can be used to differentiate products from those of competitors, but can also be demanded by buyers. Please refer to chapter on market segmentation (chapter 3) for more information on the marketing potential of ingredients in these segments.

### **Certifications and programmes**

Certification standards available for wild-collected MAPs include FairWild, Fair for Life, organic and Fairtrade. The Union of Ethical BioTrade does not provide certification yet. However, it has declared plans to introduce a certification scheme for herbal tea in collaboration with UTZ. First, an overview is given on the aim and underlying principles of the certifications or programmes. After that, these certifications are analysed in terms of opportunities for collectors and small producer organisations.

The **FairWild Standard** has been developed to promote sustainable management and supply chain development specifically for wild-collected natural ingredients and products. The [core requirements](#) of the standard include management planning, sustainable collecting practices, cost calculation along the supply chain, traceability and fair trading practices. The standard is based on best practice harvesting and trading of wild-collected plants and resources. Additionally, a distinction is made based on low, medium or high risk of unsustainable wild-collection, with the latter resulting in more rigorous requirements for management and monitoring of collection. In terms of increased income to collectors, the FairWild standard requires a FairWild Premium paid to the collectors, and a FairWild premium price for buyers being above market prices for non-certified wild-collected. Final manufacturers wishing to certify ingredients with the FairWild standard are required to pay a license fee.

The **Union for Ethical BioTrade (UEBT)** promotes the “Sourcing with Respect” principle for natural ingredients. This principle is not based on a certification programme, but rather addresses companies, NGOs, community producers or collectors, which can become trading or affiliated members. Since UEBT is not a certification standard, it can have a wider scope and offers a potential for companies to differentiate themselves and their products on the market. [Membership of UEBT](#) is based on a verification system. Members commit to the following principles and criteria of UEBT: conservation and sustainable use of biodiversity, fair and equitable sharing of benefits, socio-economic criteria, compliance with national and international regulations, respect for the rights of actors involved in BioTrade activities and clarity about land tenure, use and access to natural resources and knowledge. Trading members

need to meet minimum requirements, pay an annual membership fee based on turnover and commit to the verification system, which includes third party verification, developing and implementing a work plan and commit to continuous improvement after compliance.

**EU Organic certification** is covered by a specific European Council Regulation. This [regulation](#) covers imports from third countries, as well as standards for organic production and labelling. Organic legislation prohibits the use of genetically-modified organisms and restricts the use of chemical synthetic pesticides, synthetic fertilisers and antibiotics. Compliance with this legislation is required for all products that carry the EU organic logo. Additionally, labels of organic products need to include the name or code number of the certification body to allow for traceability. Auditees undergo a conversion period of two to three years in order to label their product as organic. Independent third party certification is used for the implementation of the regulation in member states. The legislation specifies that wild-collection of plants can be considered as organic production. To qualify as such, the collection area cannot have been treated with products not allowed for organic production for at least 3 years. Additionally, collection cannot affect the natural habitat or the maintenance of species in the collection area.

**Fairtrade International** promotes sustainable development and poverty alleviation, by developing [Fairtrade standards](#) for compliance by producers. Fairtrade certification is most relevant for food products and ingredients. Standards include a Fairtrade Premium (additional funds above selling price) paid to collectors and a Fairtrade Minimum Price (minimum price available for producers to cover average costs of sustainable production). These levels are set at country, regional or global levels. Before producer organisations can apply to Fairtrade certification, they need to adhere to core requirements which reflect Fairtrade principles.

**Fair for Life** is a certification programme which covers the chains of custody from production to final brand holder, requiring fair working conditions at all stages. Although the certification focuses on social accountability and fair trade in agricultural, manufacturing and trading operations, the programme includes a separate [module on wild-collected products](#). This module includes criteria for working and labour conditions, social and environmental responsibility, together with Fair for Life FairTrade criteria. In order to obtain certification, operators must fulfil certain core criteria; 90% needs to be reached in the first year, 95% in the second and 100% in the third year. A FairTrade sales price above market prices ensures that collectors receive sufficient income. Additionally, buyers pay a FairTrade Development Premium on top of the sales price to allow for social and other development in the producer operation's community.

### ***Comparison of certifications and programmes***

These certifications and programmes are analysed regarding their possibilities on the sustainable supply and ecological aspects, as well as income improvement of wild-collected MAPs (Table 1). A distinction can be made between certifications or programmes which focus on sustainable supply and ecological aspects of wild-collected products (UEBT and organic) and those that focus on the working conditions and income improvement of collectors and producers (Fairtrade and Fair for Life). FairWild Standard, however, combines these aspects; although compliance requires a substantial investment at first, it provides producers with benefits in terms of available future supplies, a price premium and market access.

UEBT and organic certification offer benefits in terms of sustainable management of resources, even though these programmes do not offer a guaranteed premium to collectors. Their benefits are in terms of guaranteeing future supply of wild-collected MAPs. Membership of UEBT and organic certification requires an investment, although organic certification may be less difficult to obtain. Wild-collected MAPs are often organic by default, as such, certification becomes a matter of proving this with audits.

Of the remaining certifications, Fairtrade certification is the least relevant to collectors. With some exceptions (e.g. baobab and marula from the 2013 study, [BTC Wild-Collected Botanicals and the EU market](#) and [shea](#)), Fairtrade standards do not exist for wild-collected MAPs, as they focus on producers / producer cooperatives instead of collectors of natural ingredients. As such, it is often impossible to obtain Fairtrade certification. Fair for Life certification has more potential, but has limited use in terms of sustainable management of natural resources.

**Table 1 Certification standards and programmes and applicability for wild**

<b>Certification / programme</b>	<b>Sustainable supply and other ecological components</b>	<b>Income improvement</b>
<i>FairWild</i>	Sustainable management and collection	FairWild premium sales price and FairWild Premium Fund
<i>Union of Ethical BioTrade</i>	Conservation and sustainable use of biodiversity	Not specified but focus is on fair and equitable sharing of benefits
<i>Organic</i>	Minimising environmental impact of inputs	Usually involves a market-driven premium
<i>Fairtrade</i>	No specific focus, unless combined with other certifications	Fair Trade Premium / Minimum Price (standard)
<i>Fair for Life</i>	Monitoring of environmental aspects of collection	Pre-defined fair trade development premium and fair prices

Alternatively, collectors of wild MAPs can demonstrate that they apply sustainable collection practices without specific certifications, for example in documentation (e.g. well-documented best practices, standard operating procedures, evidence of sustainable resource management). As will be discussed in chapter 6, European buyers do not necessarily require certifications to use sustainably wild-collected MAPs, which is specified as such in their sourcing policy.

## 5. Trends and developments for different segments

### ***Sustainable wild-collection and ethical sourcing***

The importance of sustainable sourcing in wild-collection is growing as a result of legal (Convention on Biodiversity), CSR and economic perspectives. Sustainability can be beneficial to companies in terms of supply (ensuring future availability) and marketing (premium, market access) and can be ensured by meeting certification standards.

Sustainability of supply, in terms of quantity and quality (e.g. consistency in active content), is increasingly relevant to EU buyers of ingredients, especially when they need to make large investments in product development and documentation. Subsequently, European buyers are becoming more involved in the sustainable management of natural resources to secure supplies. This requires exporters to make their supply chains more transparent and take more responsibility to ensure sustainability of raw material production. These measures are particularly relevant for wild-collected MAPs. Reduced availability of wild-collected materials is caused by encroaching cities and agricultural zones, less interest of young rural populations in collecting, retiring collectors, low prices and overharvesting.

In addition, there is increasing consumer awareness of the effects which purchasing behaviour has on social conditions in production countries and an increasing interest in the source of ingredients, resulting in an increased demand for ethically produced products. However, consumers do not always require certification of these products; e.g. cosmetic products with interesting stories on ethical sourcing which go beyond certifications, are also popular.

### ***Healthy and natural***

Consumer demand for natural and healthy products is increasing. Often, natural products (including food ingredients) are seen as healthier alternatives to synthetic products, a view which companies increasingly use in marketing strategies. To respond to this trend, producers move away from chemical to natural ingredients. Companies across all segments are highlighting their use of natural ingredients, which can include certifications to formalise this 'naturalness'. This is of particular importance in cosmetics, food products and food supplements.

This trend is relevant for a range of "functionalities" required by industries; e.g. improving taste and smell (offering opportunities for MAPs or extracts to replace flavour additives and salt), safety and shelf-time (preservatives) and efficacy (active properties such as antioxidant, anti-ageing, medicinal properties etc.). It also relates to adequate preservation of taste, nutrients and vitamins in processed products.

### ***Organic***

Helped by an increase in demand for natural products and ingredients, the market for organic products is increasing as well. This trend is most relevant for food and cosmetics, but is also present in food supplements.

Moreover, some European herbal medicine companies (only) use organic ingredients to adhere to their company philosophy, for example when a company values sustainability. Often organic products represent a small part of the overall market; however, this depends on the specific product. The most mature markets in the EU are Northwest European countries, such as Germany, the UK and the Nordic countries. The highest growth is observed in East European countries. For small producers of wild-collected MAPs, organic certification may be more difficult, depending on the origin of the ingredient. For example, if ingredients are collected from a wide geographical area or from areas that are difficult to reach.

**Safety**

Safety of ingredients in these segments has always been important, but through various legislative and buyer requirements, safety has increasingly been placed at the forefront in these segments. In pharmaceutical legislation, efficacy and safety substantiation have been fully established. In the other segments, safety concerns of consumers and legislators are increasing.

**Substantiation of claims**

Product claims towards consumers are under increased scrutiny. For food, the EU harmonised the use of nutrition and health claims across the EU, which has led to many claims being rejected, negatively affecting the markets for these products. In fact, the evaluation by the European Food Safety Authority (EFSA) of some 1500 health claims concerning botanicals, had as a result a 97% rejection rate. This system of evaluation, based largely on a pharmaceutical model for proof of efficacy, is the very system that was used in EFSA's initial evaluation of some 1500 health claims concerning botanicals. The result was a staggering 97% rejection rate. In terms of health products, efficacy and safety substantiation is fully established in pharmaceutical legislation, while for food supplements, claims for botanical ingredients have not yet been harmonised. Cosmetics legislation is also narrowing down on product claims. On the one hand, this offers opportunities to make use of such grey areas, while on the other hand it causes uncertainty to buyers and producers, negatively affecting innovation.

**Vertical integration of supply chains - Responsibility for quality enforced along the chain**

Decreasing margins in competitive markets, combined with increasing demands on safety and quality, have prompted various European manufacturers to integrate their supply chain management in their processing operations and rationalise their value chains. This results in:

- 'Middlemen' (local traders, brokers/agents), with a limited value addition function are cut out of value chains as capacities in countries of origin increase
- Manufacturers and retailers are generally shortening their chains and work with fewer preferred suppliers (importers and producers) in whose hands they place the responsibility for product quality.
- A tighter control over the chain allows them to improve traceability, monitor product safety and quality and achieve process improvements. This also leads to the increasing adoption of quality management systems, which are discussed below.

**Quality management – traceability**

As a result of legislative and buyer requirements (e.g. certification schemes), quality management within value chains has become increasingly important to producers. Significant aspects needed for quality management are traceability and transparency. Following guidelines on harvesting and processing are of growing importance to access the European market. Suppliers who are able to offer full traceability to their buyers are at a competitive advantage. In this context, the adoption of verifiable/documented quality management systems become increasingly important for suppliers. Examples are the [British Retail Consortium \(BRC\)](#) for processing plants, the [International Food Standard \(IFS\)](#) and [ISO 22000](#). Be aware that especially for small producer organisations and exporters in DCs complying with these certifications is a costly process.

**Shift in processing at origin**

A shift in processing towards origin countries is observed, as producers in these countries are increasingly able to comply with strict requirements in the EU. At first, this trend was apparent for lower-value extracts and products, but recently, further processed extracts are included as well. The European market is increasingly receptive to them and offers great opportunities for exporters from DCs. Producers' potential to process botanicals into extracts themselves depends on their ability to comply with EU requirements, as well as the complexity of the extraction process (see chapter 3). Some

examples for the food industry are extracts used as food additives, such as essential oils as flavourings.

### **Companies look for differentiation**

In mature EU markets, companies are increasingly trying to differentiate themselves from their competitors. This can be done in various ways. Relevant to ingredients, possible approaches are certification, including more specialty ingredients in products, adding functionalities to products or building the product's story. For example, cosmetic producers are increasingly including exotic antioxidant ingredients as consumer awareness of functional properties grows.

**Overlap between product groups:** Intermediate industry categories, such as food supplements and cosmeceuticals are growing strongly. These products are marketed as “health products”, without having to deal with regulatory hurdles for pharmaceutical products. They contain active ingredients, but cannot make medicinal claims.

**Technology (innovation/processing):** To respond to global competition and signs of saturation, companies make use of innovations in technology. These innovations are aimed at improving performance, increasing efficiency, enhancing sustainability/yields of processing and to launch new and innovative products. In European countries, these technologies are continuously updated.

**Marketing stories:** Companies are exploiting marketing stories to differentiate themselves on the market as well. These can cover specific certification standards, functionality of the product but also the origin of the ingredient and benefits to local communities.

### **Supply constraints**

For certain MAPs, supply constraints exist in the European market. This can be the result of either increased global demand from other regions or decreased supply because of over exploitation in certain areas. In this report, some species exist that have sustainability issues, such as dry-zone mahogany (*Khaya senegalensis*), but no species has been added to the appendices of CITES. For species listed in CITES, countries can restrict supplies to counter overexploitation.

### **Industry consolidation and horizontal integration**

EU retail and manufacturing sectors are consolidating, which, in turn, leads to consolidation at the processing and trade level, both between and within segments. While some processors now supply conventional and organic product lines to food, cosmetic and health product producers, others still only offer ingredients to a specific segment. This makes the landscape less clear and more difficult to find truly specialised companies. However, such diversified companies can also offer good market entry opportunities.

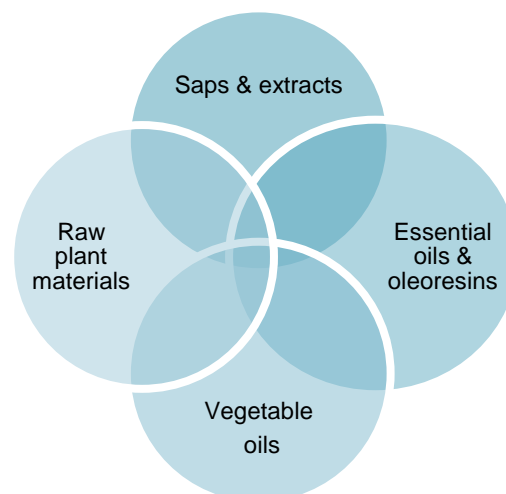
Larger players have more market power, enabling them to demand more services and lower prices from their suppliers, which smaller suppliers will have difficulty meeting. Larger players also strive to limit their suppliers to those that offer reliable (large) quantities and qualities. In contrast, many smaller processors remain. There are also limited quantities for many specific natural ingredients, such as certain MAPs, for which a large processing scale is not necessary and can thus be processed by smaller companies. Sourcing through smaller, specialised importers therefore remains vital to EU industries.



## 6. Potential European markets

As mentioned before, species covered in this study can be exported as raw material or as derivatives (Figure 7). The raw materials include MAPs, natural gums and resins, and oil seeds. These can be processed into (herbal) extracts, including saps, essential oils, oleoresins and vegetable oils. For a more complete overview of trade in these species, both raw materials and derivatives are included in this analysis.

**Figure 7 Overview of raw materials and derivatives**



As a distinction between the two is not made in international trade statistics, data on trade for these species consist of both wild-collected and cultivated products. In addition, as species covered in this study often do not have a separate product group, traders have some 'room' in determining the classification of these species. Consequently, trade statistics on MAPs only include species which traders classified as MAPs. Thyme (*Thymus* spp.), for example, can be defined as an aromatic plant, but also as a spice (when dried).

An analysis of the trade in MAPs alone would therefore be too restrictive.

Table 2 provides an overview of the product groups included in this analysis, as classified in the Harmonised system (HS). This chapter focuses on European imports, current trading partners of the countries in this study and provides an overview of promising European export markets for these countries. An overview of European exports is given in [Annex II](#).

**Table 2 Overview HS codes and Group Description**

<b>HS code</b>	<b>Commodity Group Description</b>
1211	Plants and parts of plants, of a kind used primarily in pharmacy or perfumery, or for insecticidal, fungicidal or similar purposes, fresh or dried
1301.20	Gum Arabic
1301.90	Natural gums (excl. gum Arabic), resins, gum-resins & oleoresins
1302.12 and 1302.19	Herbal extracts and vegetable saps: liquorice extracts and other extracts
1515.90	Fixed vegetable fats & oils & their fractions, whether or not refined but not chemically modified
3201	Tanning extracts of vegetable origin (e.g. myrobalan extract, quebracho bark extract)
3301	Essential oils (terpeneless or not), including concretes and absolutes; resinoids; extracted oleoresins; concentrates of essential oils in fats, in fixed oils, in waxes or the like, obtained by enfleurage or maceration

### 6.1 European imports

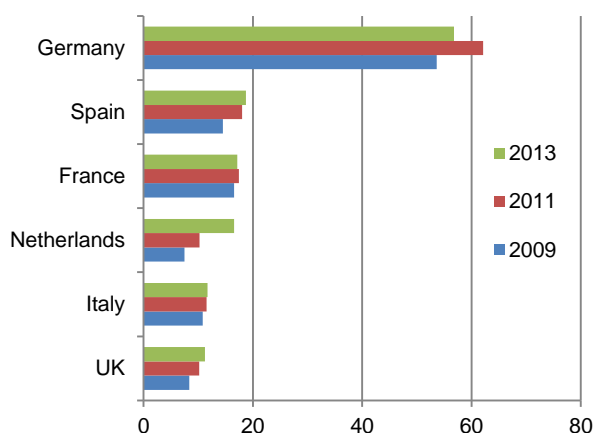
#### **MAPs and extracts**

As trade in MAPs and extracts is not further specified into particular species or whether the sources are cultivated or wild-collected, these trade flows provide the only indication of trade in these products. On the other hand, studies have shown that over 70% of trade volume in MAPs is sourced from wild collection. However, it is important to take into account that a substantial proportion of herbal medicine and plant processing companies have their own cultivation in hand, either locally or internationally. Furthermore, it is estimated that most species traded internationally, between 80 and 90%, are obtained through wild-collection. Less than 1,000 medicinal plant species are cultivated, with fewer than 400 on a commercial



scale.

**Figure 8 Leading European importers of MAPs, 2009-2013, in 1,000 tonnes**



Source: Eurostat, 2014

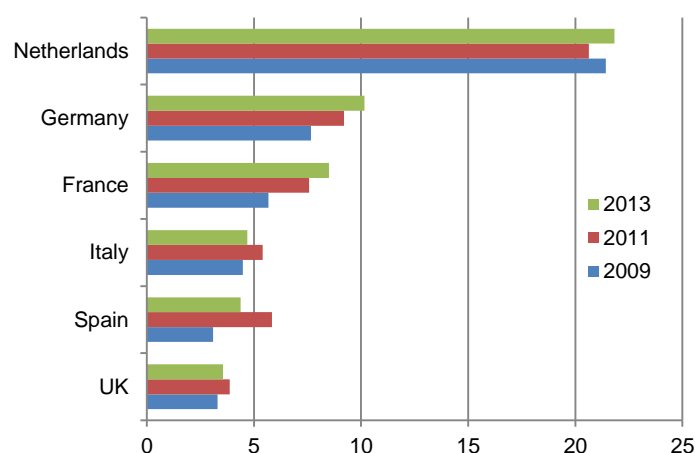
In 2013, total European imports of **MAPs** (raw materials) amounted to 180 thousand tonnes / € 635 million. From 2009 to 2013, these imports increased by 4% annually in terms of volume and 7% in terms of value. In the same time frame, Portugal, as well as several Eastern European countries, steeply increased imports of MAPs. However, as these markets represent a smaller share of the total European market, total imports are still much smaller when compared to other countries. Examples of these fast-growing importers are Poland, the Czech Republic and Hungary.

More than half of imports of MAPs originated from outside Europe in 2013. Main non-European suppliers were Egypt, India, Morocco, China, the USA, Turkey and Israel.

Imports of **extracts (liquorice and other vegetable)** amounted to 66 thousand tonnes in 2013, representing a value of € 583 million, growing annually by over 2% from 2009 to 2013. This product group consists for almost half of liquorice extracts (42% in 2013) in terms of volume. However, the value of other vegetable extracts in this group is almost ten times as high as that of liquorice, as import price per unit is much higher.

As for the main importers (Figure 9), the Netherlands is mainly an importer of liquorice extracts, which make up 81% of the country's imports of 2013. Half of Germany's imports consisted of liquorice in 2013, whereas the other countries imported a higher degree of other vegetable extracts. Fast-growing importers are France and Belgium, as well as various East European countries, such as Lithuania, Slovakia and the Czech Republic. Main non-European suppliers of extracts were the United States, China and Israel for all extracts, Iran for liquorice and Brazil and Mexico for other vegetable extracts.

**Figure 9 Leading European importers of extracts, 2009-2013, in 1,000 tonnes**



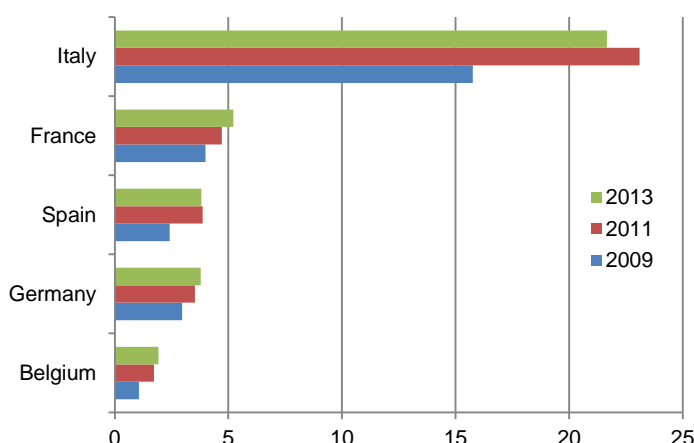
Source: Eurostat, 2014

### Tanning extracts

From 2009 to 2013, European (EU+EFTA) imports of tanning extracts increased annually by 6% in volume and 12% in value, indicating an increase in import price. In 2013, imports reached 43 thousand tonnes at € 80 million.

Most European countries increased imports of tanning extracts, with highest growth in Belgium, Slovakia and Estonia. Most imports originated from non-European suppliers (73% in 2013); non-European suppliers included Argentina, Brazil, South Africa, India, Turkey and Kenya. Main European suppliers were Slovenia and Italy.

**Figure 10 Leading European importers of tanning extracts, 2009-2013, in 1,000 tonnes**



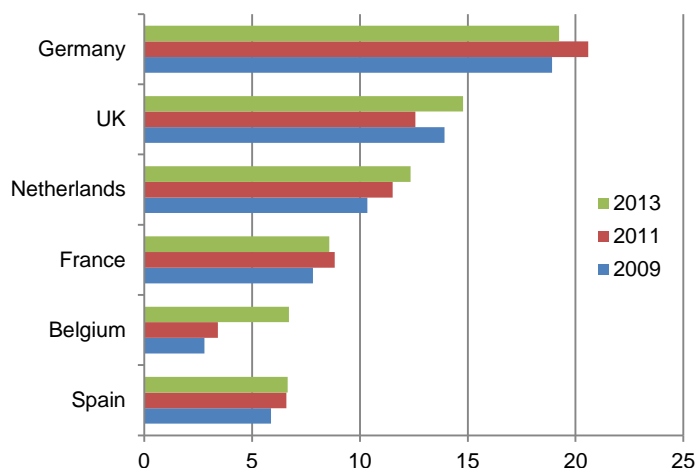
Source: Eurostat, 2014

### Essential oils

The EU and EFTA imported 87 thousand tonnes of essential oils in 2013, at € 1.1 billion. Imports in volume increased by 5% annually in terms of volume and 11% in terms of value from 2009 to 2013. This indicates an increased average import price for essential oils.

Outside of the leading European importers (Figure 11), imports of essential oils increased considerably from Ireland, Austria, Poland, Romania and Portugal. Main suppliers of essential oils are located outside of Europe. In 2013, the largest non-European suppliers were Brazil, the USA, China, Argentina and India.

**Figure 11 Leading European importers of essential oils, 2009-2013, in 1,000 tonnes**



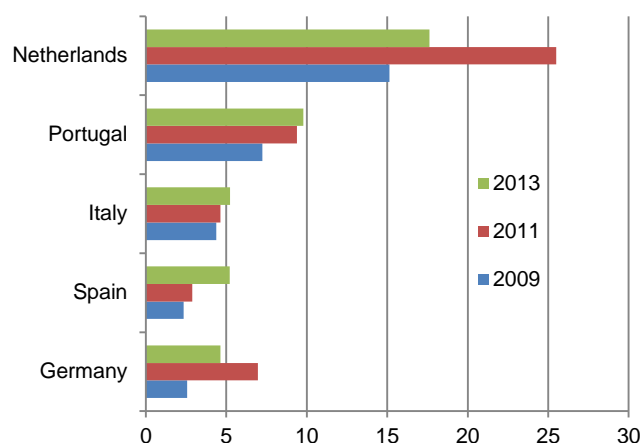
Source: Eurostat, 2014

### Natural gums and resins

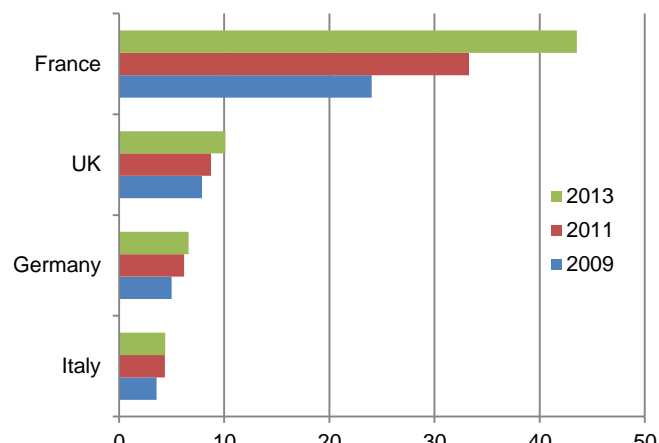
European imports of natural gums and resins are divided into gum Arabic, one of the main products in the product group, and other natural gums and resins. In this section, this division has been included to demonstrate the trade in these two groups.

Total European imports (EU + EFTA) of natural gums, excluding gum Arabic, amounted to 49 thousand tonnes in 2013, representing a value of € 114 million. Compared to 2009, this was an annual increase of 6% in volume 17 % in value, indicating an increase in import price. To compare, import price of gum Arabic was stable as both value and volume of imports increased annually by around 10%. In 2013, European imports of gum Arabic amounted to 78 thousand tonnes / € 143 million.

Gum Arabic cannot be produced in Europe, whereas the group of other natural gums and resins contains products that can be sourced from within Europe. Of the latter product group, only 34% originated outside of Europe, with Brazil and India as the main suppliers. Sudan is the main supplier of gum Arabic, followed by Chad and Nigeria. Senegal and Mali, two of the target countries of this study, were recorded as small suppliers of gum Arabica as well.

**Figure 12 Leading European importers of natural gums and resins, 2009-2013, in 1,000 tonnes**

Source: Eurostat, 2014

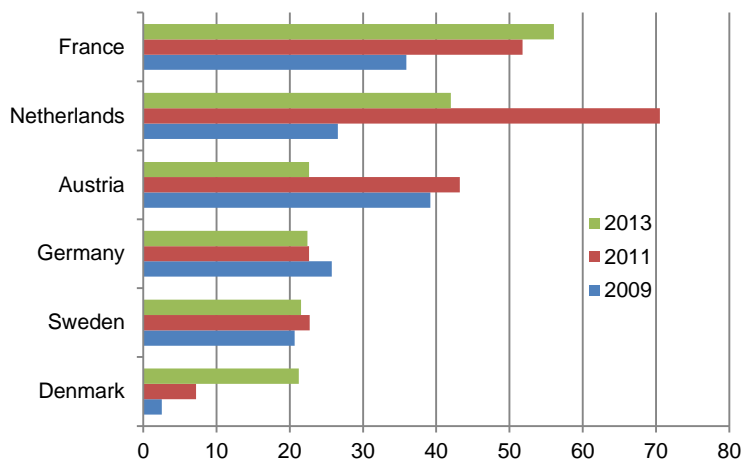
**Figure 13 Leading European importers of gum Arabic, 2009-2013, in 1,000 tonnes**

Source: Eurostat, 2014

**Fixed vegetable fats**

Fixed vegetable fats, 'not elsewhere specified', increased by almost 5% in volume and 11% in value between 2009 and 2013, amounting to 261,000 tonnes / € 551 million in 2013. It is important to note that European exporters play a major role in trade in this product group, with only 22% of supplies originating from outside Europe in 2013.

Aside from fast growth in Eastern Europe, various West European countries considerably increased imports as well. These countries included Denmark, the UK, Portugal, Spain and Ireland. In 2013, main suppliers outside of Europe were Ghana, India, the USA and Togo.

**Figure 14 Leading European importers of fixed vegetable fats, 2009-2013, in 1,000 tonnes**

Source: Eurostat, 2014

**Trading partners of target countries**

In the following table (Table 3), an overview is presented of total exports of the ten countries covered in this study. For this overview, the most recent available data is used. Additionally, major trading partners have been identified, in terms of share of total exports. This is divided into European and other trading partners, to indicate the countries' prevalence of trading with European countries. For most countries, trade with Europe is limited when compared to trade with regional or Asian countries. Main export products for these countries are petroleum, uranium, minerals (gold and various ores), and agricultural commodities (cotton, coffee and tea). Algeria has most experience in trading with European countries. Switzerland and France are common European trade partners for the countries in this study, followed by the UK.

**Table 3 Main current trading partners of target countries**

Countries in study	Total exports; value (2013)	Major European trading partners (% of total exports 2013)	Other major trading partners (% of total exports 2013)	Main export products
Palestinian Territory	€ 608 million (in 2012)	- UK (0.3%) - Belgium (0.3%)	- Israel (82%) - Jordan (7%)	Stone and iron
Algeria	€ 49.7 billion	- Spain (16%)	- USA (8%)	Petroleum

		- Italy (14%) - UK (11%)	- Canada (5%) - Brazil (4%)	
<i>Senegal</i>	€ 1.9 billion	- Switzerland (9%) - France (4%)	- Mali (15%) - India (7%)	Petroleum, gold and fish
<i>Mali</i>	€ 2 billion (in 2012)	- Switzerland (12%) - France (3%)	- South Africa (52%) - China (8%)	Cotton
<i>Niger</i>	€ 1 billion	- France (40%) - Switzerland (4%)	- Burkina Faso (16%) - Nigeria (15%) - USA (9%)	Uranium and petroleum
<i>Benin</i>	€ 478 million	- Netherlands (2%) - Denmark (2%)	- China (19%) - India (11%) - Nigeria (11%)	Cotton and cashew nuts
<i>Uganda</i>	€ 1.8 billion	- Switzerland (7%) - Netherlands (4%) - Germany (3%)	- North and South Sudan (17%) - Kenya (13%) - DRC (11%)	Uranium and petroleum
<i>Rwanda</i>	€ 467 million	- Italy (0.5%) - UK (0.3%)	- Tanzania (41%) - DRC (22%) - Uganda (14%)	Ores, tea, coffee and petroleum
<i>Burundi</i>	€ 157 million	- Switzerland (7%) - Belgium (2%)	- UAE (58%) - Kenya (6%) - DRC (6%)	Gold, coffee and tea
<i>Congo (DRC)</i>	€ 7.9 billion	- France (5%) - UK (4%)	- China (40%) - Australia (12%) - Angola (8%)	Petroleum and ships

Source: ITC, 2014

## 6.2 Promising EU export markets

Based on the analyses in section 6.1 and Annex II, an overview of most promising European export markets is given below. Moreover, these markets are described regarding imports, production and exports of MAPs and the segments they are used in.

### **Germany:**

Germany is the largest European importer of MAPs and extracts, with a large extraction and trading sector. Moreover, it is a leading market, producer and exporter of essential oils. In general, German buyers have strict specification requirements and value sustainability and organic certification in MAPs. Demand for herbal medicine is strong. It is the second largest EU producer of cosmetics products and the country is known as being the most advanced EU market for natural cosmetics. Germany is also the largest vegetable oil consumer.

### **France:**

France is the EU's largest pharmaceutical and cosmetic producer, and play an important role in the global flavour industry as well. As a result, it is the second largest EU importer of MAPs and a main importer of extracts and essential oils (largest in terms of value). In addition, France is the market entry point for most gum Arabic in Europe. Even though the country has a large processing industry and is the

largest European producer of essential oils, it is increasingly importing extracts instead of raw materials. Moreover, regarding essential oils, France is one of the leading EU countries importing from DCs.

#### **UK:**

Both the natural cosmetics market and industry in the UK are expanding quickly. It is one of the largest European pharmaceutical markets and has a strong herbal medicine sector. Combined with its extraction industry, this makes the country an important MAP buyer. Compared to other countries, the UK has a relatively stronger focus on tropical MAPs outside of traditional Western medicine. In addition to being a main producer and exporter of essential oils, the country is the EU's third largest importer of essential oils, and the second largest importer of essential oils from DCs. Finally, the UK represents a major market for thickeners.

#### **The Netherlands:**

The Netherlands is a major European re-exporter of MAPs, and has a particular focus on vegetable oils, extracts and essential oils. As such, it is a viable option to export these product groups to the Netherlands. The country is the second largest European importer of essential oils and oleoresins, with a large part sourced from DCs. It has an important role in trade in the largest vegetable oils, for which it functions as a trade and refining hub. For smaller vegetable oils, other countries such as Italy, France, the UK and Belgium have a larger role.

The Netherlands has a limited and mature cosmetics market, as well as a dwindling cosmetics industry. At the same time, herbal remedies are becoming increasingly popular, with a focus on traditional western herbal medicine and homeopathy. On this market, domestic producers have a strong position, with larger businesses being mostly foreign owned.

#### **Italy:**

Italy is a leading market for MAPs, but mainly for MAPs that are traditionally available in Italy. It has a large extraction and trading industry for MAPs, but is increasingly importing extracts instead of raw materials. Compared to other Western European countries, it is a smaller importer of essential oils, with a small but growing share from DCs. The country is the fourth major producer and exporter of essential oils in the EU.

In terms of markets, Italy is an important pharmaceutical market with international players and a sizeable processing industry for natural ingredients for pharmaceuticals. Moreover, its cosmetics market is the third largest in Europe and consists almost exclusively of SME companies, resulting in a very fragmented industry.

#### **Spain:**

Spain is a producer of several MAPs, a major exporter of extracts and an important producer of essential oils. Most import potential for MAPs and essential oils stems from tropical species that are not available in Spain and Europe. Imports of essential oils from DCs make up more than half of total essential oils imports. Essential oils produced in Spain consist mainly of citrus varieties. The country has a large pharmaceutical and cosmetics industry, although smaller than France, Germany, Italy and the UK, with a good international reputation for cosmetics.

#### **Belgium:**

Belgium is a leading European distributor in the global pharmaceutical industry and MAPs. Compared to other, larger, West European countries, it is a modest importer and exporter of essential oils, with low local production. In imports of essential oils, DCs play a smaller role than in imports of other countries. Production of cosmetics is limited in Belgium.

#### **Poland:**

As an important MAPs producer and the largest market for MAPs in Central and Eastern Europe, most opportunities in Poland exist for tropical species or supplies outside of the Polish growing season. It has the largest pharmaceutical market in Central and Eastern Europe and plays an important role in production and trade of natural ingredients and final products. The country is a traditional market for herbal medicines and a large share of its pharmaceutical market consists of self-medication products.

### 6.3 European buyer perspective

European buyers indicated several points of interest regarding wild-collected MAPs. Aspects such as sustainability, supply availability, price, certifications and marketing stories are very different compared to cultivated raw materials.

- European buyers indicated a great interest in **sourcing wild-collected MAPs**. Their quality was seen as higher than their cultivated counterparts. Also, they indicated the marketing potential of wild-collected MAPs. However, buyers also mentioned that there was a limited range of wild-collected MAPs which are available at sufficient volumes on the market.
- **Sustainability** also plays a role in cultivated MAPs, with a focus on soil quality (which influences raw material quality). In wild-collected varieties, sustainability is important to ensure future supply security of specific MAPs. European buyers value sustainability in wild-collected MAPs and have included it in their sourcing policies. As buyers do not always have the resources to check sustainable collection of MAPs, they often rely on instruments such as third party certification, sending questionnaires to collectors or working with local control bodies. Problems in ensuring sustainable supplies stem from cultural differences between European buyer and collectors, as well as a lack of understanding of what sustainable collection entails due to insufficient research.
- Not all **standards and certifications** which are used for cultivated species are available for wild-collected varieties as well. For wild-collected MAPs, certifications that focus on sustainable collection are most important, according to European buyers. Of these, particularly FairWild is of increasing interest among European buyers and their customers. Additionally, organic certification is used for various species. Fairtrade certification is more difficult, as standards do not focus specifically on collectors. Fairtrade ([FLO](#)) standards for wild collected species are very uncommon; for the 20 species covered in this study, only shea has a Fairtrade standard. Especially for cosmetic manufacturers, the **marketing story** of wild-collected ingredients is important. These marketing stories revolve around the benefits to the local collectors' community, available pictures to visualise the story and information on the value chain. For example, if, aside from collection of natural ingredients, further processing steps (e.g. processing raw materials into essential oils or extracts) also take place in the country of origin, this can add to the story. Certifications can provide strong backing for such marketing stories. The marketing story is most important to demonstrate to end consumers that companies are achieving a positive impact. This can increase consumers' willingness to pay for sustainably collected wild-collected MAPs, which are often higher priced than cultivated species.

## 7. Opportunities and Threats

Based on the information provided in the previous chapters, various opportunities and threats have been identified for small producer organisations. These general opportunities and threats are listed in the table below. They range from market components, for example changing trends and requirements in the European market, to issues related to the supply, such as availability, sustainable collection and value addition. For the priority species (chapter 8), more specific opportunities and threats are provided.

**Table 4 Opportunities and threats for small producer organisations**

Opportunities	Threats
<b>Growing markets:</b> increased demand for wild-collected ingredients especially for cosmetics and health segments.	<b>Short-lived trends:</b> especially in cosmetic products, demand for specific MAPs can change substantially as a result of changes in trends.
<b>Sustainability:</b> particularly for wild-collection, sustainability is a major issue. Sustainable wild collection is an opportunity to add value to products or facilitate market access.	<b>Unreliable supply and/or collection:</b> limitations in supply quantity can be the result of unsustainable collection and fewer collectors as younger generations have a limited interest in wild collection. Wild-collected species can also differ in quality, whereas industry buyers need a constant quality and quantity.
<b>Supply restrictions:</b> for certain overexploited species in certain regions, there are restrictions concerning their trading. If these species can be collected from other regions, offering them to the European market would be a great opportunity.	
<b>Value addition at origin:</b> there are increasing opportunities for value-added products, in terms of processing botanicals into essential oils or extracts, for DCs (sections 1.2 and 1.4). Value addition is of particular interest for simple extracts (e.g. essential oils) with low safety risks, and those which need to be processed close to harvesting.	<b>Technological improvements:</b> technological improvements to increase or improve processing at origin might be out of reach for small producer organisations, in terms of capital and skilled labour. This can become a significant disadvantage compared to European or other competitors, who have made these improvements.
<b>Certifications:</b> specific certifications exist for wild-collected botanicals (chapter 4). Examples are FairWild and Fair for Life, the latter having a module for wild collection operations. These certifications can improve transparency in the value chain.	<b>Complying with strict (non-)legislative requirements:</b> both legislation and increasingly strict buyer requirements form the main threats to collectors and small producers (chapter 4). These include EU legislation, compliance with certifications from internationally recognised sources to improve traceability in the value chain, as well as requirements for development of innovative natural ingredients for the various sectors.
<b>Marketing stories:</b> interesting marketing stories on the collection of botanicals and community involvement are of particular importance for specialty products and ingredients in food and cosmetic segments.	<b>Limited awareness of new origins:</b> among importers, there is a limited awareness of new origins and less established wild-collected MAPs.
<b>Specialty segments:</b> specialty segments (quality, innovation, certified) offer market opportunities for small exporters of wild-collected MAPs. The markets for these products outperform general markets, products often carry a premium and they are traded in lower volumes.	<b>Vertical &amp; horizontal integration:</b> Manufacturers and retailers are generally working with a more limited number of preferred suppliers. Additionally, industry consolidation leads to increasingly large companies, with higher volume requirements, often higher and company specific requirements as well as more limited knowledge of products and processes. As such, it is difficult for small producer



	organisations to enter these markets.
<p><b>Healthy and natural:</b> make use of the increasing consumer trend towards healthy and natural ingredients for food, cosmetics and health.</p>	<p><b>Competitors:</b> Other countries or regions can offer the same MAPs or extracts; compare for example the Palestinian Territory and Algeria in this study with other Mediterranean countries. Depending on the origin, these other Mediterranean countries might offer a competitive advantage over the countries covered in this analysis. Moreover, the increasing demand for wild-collected ingredients can raise competitiveness and prices.</p>
<p><b>New market segments/product groups:</b> Marketing ingredients towards new product groups such as industry crossovers and new markets for MAPs and extracts offer opportunities for small producer organisations. These segments can be more open to less established ingredients (see chapter 3).</p>	<p><b>Cultivation:</b> cultivation of species can pose a threat to wild-collected MAPs, as producers of cultivated species can more easily control quantity of supplies and often offer species at a lower price. However, not all species are suitable for cultivation.</p>

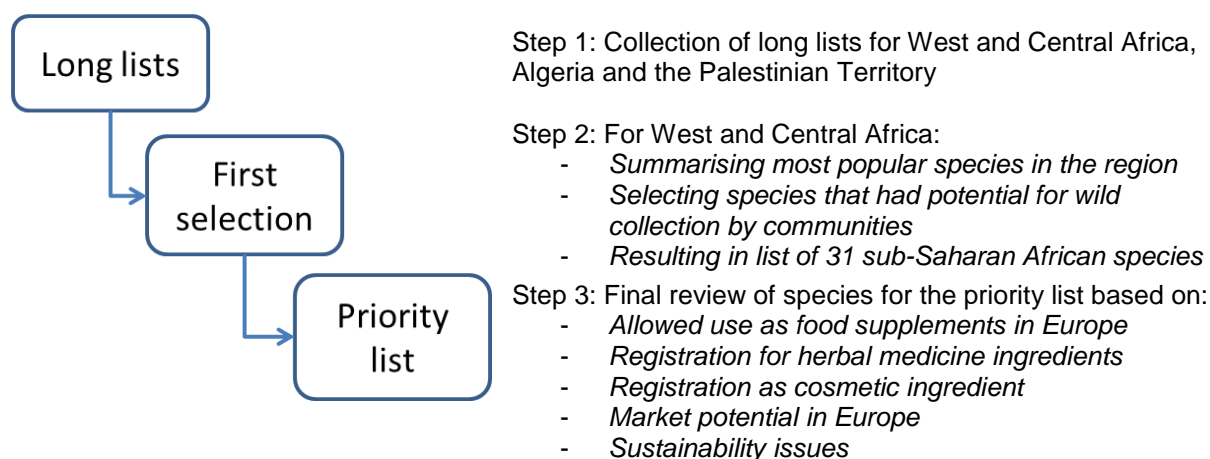
## 8. Priority list

This chapter provides fact sheets for 20 different botanicals. Below follows an explanation of how a selection process was carried out to come to a range of species, which are interesting and relevant for the 10 countries covered.

At the start of the collection and selection of the species, the 10 countries were separated into four groups: West Africa (Senegal, Mali, Niger and Benin), Central Africa (Congo (DRC), Uganda, Rwanda and Burundi), Algeria and the Palestinian Territory. For these four groups, long lists were created (Annex III), which served as a basis for the priority list (Table 5). The sub-Saharan countries were divided into two groups due to the geographical and climatic similarities between them.

To validate the reselection from different viewpoints on species priorities in the decision-making process, the collection and selection process was conducted together with a botanist (local use and supply of species) and an industry expert (European market potential of species). The process is depicted in Figure 15 and was divided into two separate processes, one for West and Central Africa, and one for Algeria and the Palestinian Territory.

**Figure 15: Collection and selection process**



### *Long lists of West and Central African species*

For the two sub-Saharan African regions, collection of species was done through [Prelude](#), a database on plants used in traditional medicines in Africa. Species from this database were not restricted to potential in health segments in Europe; interesting species for cosmetic use were also included.

The database generated lists of 250-400 species per sub-Saharan country. In order to prioritise these species, proxies were used as indications of local use (# of cited references and # of indications of use). The number of cited references illustrates how extensively a species has been researched and, in this respect, how much interest exists for it. The amount of indications listed per species is an indication of how much potential applications exist. The scores on these two proxies were added together and the species were prioritised accordingly. An overview of the two long lists for West and Central Africa is given in Annex III.

The next step in the selection process, was to create one list for sub-Saharan Africa (Figure 15 – Step 2). This was based on the prioritisation based on the proxies and potential for wild-collection. Here, commercially-cultivated species were excluded. This resulted in a pre-selection of 31 sub-Saharan African species, which were used for the selection of priority species.

### *Long lists of Algeria and the Palestinian Territory*

For Algeria and the Palestinian Territory a different approach was taken. The long list for Algeria was created by referencing the Algeria entries of the Prelude database (80 species) with Journal articles on popular use in the country. The long list for the Palestinian Territory was based on prior research

performed by ProFound for [CBI](#) (Value Chain Analysis for the Palestinian Territory, 2014). At the same time, priority species were selected in cooperation with local stakeholders and the CBI consultants for the Palestinian Territory.

#### *Priority list selection*

The three lists created in Step 1 and 2 (Figure 15) were used to select priority species, in cooperation with the two experts mentioned above. The species for sub-Saharan Africa, Algeria and the Palestinian Territory were judged on their potential of livelihood enhancement and economic potential, as determined by industry experts. The following criteria were used to determine the social, environmental and economic feasibility of interventions for specific wild-collected MAPs and origin countries:

#### **Selection criteria**

- Marketing criteria: scale of production, market readiness, competition and certification potential.
- Ecological criteria: availability, sustainability of supply, resource management and access, certification (potential).
- Socio-economic criteria: local benefits, value addition potential, fair labour conditions.
- Technological criteria: (adherence to) processing and quality requirements, traceability and access to technology.

In Step 3 (Figure 15), the potential of species in cosmetics, health and food segments was determined, for which several databases were consulted, as described below.

[Cosing](#) is the European Commission database with information on cosmetic substances and ingredients, lists under their INCI names. This database was used to determine whether MAPs could be used in cosmetic products in the EU.

For use in medicinal products in the EU, ingredients need to be registered in the [European Pharmacopoeia](#). Additionally, a search was done in [Herbmed](#), a database by the American Botanical Council specifically for herbal medicine. This database provides information on traditional use, clinical trials and filed patents for specific species. Traditional use is based on specific historical or cultural practices, including organised systems such as Traditional Chinese Medicine practice. Clinical trials offer an evaluation of the safety and effectiveness of herbal formulations, by monitoring their effects on large groups of people. This information should be used as an indication only, as it is not updated frequently. European countries also provide lists on which ingredients are allowed as food supplements. These lists were used to determine the potential for wild-collected MAPs in food supplements.

Finally, [Novel Food Regulation](#) is an indication as to whether species are allowed for food use (chapter 4). Food ingredients that have not been used in the EU before 15 May 1997 are considered novel foods and novel food ingredients. As such, these foods or ingredients need authorisation by the EU Commission for which scientific information and safety assessment reports need to be presented. MAPs which do not have authorisation for use on the EU market, have limited potential in the food segment, as Novel Food application is deemed beyond the scope of SME producers. If species have been used before 15 May 1997, such as Selim pepper (*Xylopiya aethiopica*) on the priority list, they do not require authorisation as they are not novel foods.

Table 5 provides the priority species as listed according to their potential in cosmetic, health and food segments.

Table 5 Priority list of wild-collected MAPs

Region/ Country	Botanical name	Common name	Cosing	European Pharmacopoeia	Herbmed <sup>1</sup>	Food supplement	Novel Food
<b>Sub-Saharan Africa: West Africa (WA) and Central Africa (CA)</b>							
Countries: Niger (N), Senegal (S), Benin (Be), Mali (M), Congo (C), Uganda (U), Rwanda (R) and Burundi (Bu)							
<b>WA, CA</b> N,S,Be,M	<i>Acacia nilotica</i>	Babul acacia	Only related species	Only related species	Yes	Yes	No
<b>WA, CA</b> N,Be,M,C, U	<i>Aframomum melegueta</i>	Grains of Paradise	Yes	No	No	Yes	No
<b>WA, CA</b> N,S,Be,M, C	<i>Anogeissus leiocarpus</i>	African birch	Yes	No	No	Only related species	No
<b>WA, CA</b> N,S,Be,M, U,C	<i>Butyrospermum paradoxum</i>	Shea	Yes	No	No	No	No
<b>WA, CA</b> Bu,C,R,U, N,S,Be,M	<i>Indigofera arrecta</i>	Natal indigo	Only related species	No	No	No	No
<b>WA, CA</b> N,S,Be,M, U	<i>Khaya senegalensis</i>	Dry-zone mahogany	Yes	No	No	No	No
<b>WA, CA</b> N,S,Be,M, C,U	<i>Parkia biglobosa</i>	African locust bean	Yes	No	No	No	No
<b>WA, CA</b> N,S,Be,M, C,U	<i>Daniellia oliveri</i>	African copaiba balsam	Yes	No	No	No	No
<b>WA, CA</b> N,S,Be,M, Bu,C,R,U	<i>Piliostigma thonningii</i>	Camel's foot	No	No	No	No	No
<b>WA, CA</b> U,C,N,S, Be,M	<i>Xylopia aethiopica</i>	Selim pepper	Yes	No	Yes	No	No
<b>WA, CA</b> Bu,C,R,U, Be,N	<i>Vernonia amygdalina</i>	Bitter leaf	Only related species	No	No	No	No
<b>WA</b> S	<i>Cola nitida</i>	Cola tree	Yes	Yes	No	Yes	Yes
<b>WA</b> N,S,M	<i>Combretum micranthum</i>	Kinkeliba	Yes	No	No	Yes	No
<b>WA</b> N,S,Be,M	<i>Pterocarpus erinaceus</i>	African rosewood	Only related species	No	No	No	No
<b>CA</b> Bu,C,R,U	<i>Desmodium adscendens</i>	Desmodium	Yes	No	No	Only related species	No
<b>CA</b> Bu,R	<i>Tagetes minuta</i>	Tagetes	Yes	No	No	No	No
<b>North Africa, Middle East: Algeria (ALG) and the Palestinian Territory (PAL)</b>							
<b>ALG, PAL</b>	<i>Artemisia herba- alba</i>	White wormwood	Yes	Only related species	Yes	No	No
<b>ALG, PAL</b>	<i>Rosmarinus officinalis</i>	Rosemary	Yes	Yes	Yes	No	No
<b>ALG, PAL</b>	<i>Thymus vulgaris</i>	Thyme	Yes	Yes	Yes	No	No
<b>PAL</b>	<i>Ceratonia siliqua</i>	Carob	Yes	No	Yes	Yes	Yes

The rest of this chapter discusses the priority species in depth. It is divided into the product definition, potential market segments (cosmetics, food and health), relevant trends, EU demand for the species, a price indication or development where available, opportunities and threats for SME producers of the species, focusing on sustainability (where available based on [IUCN Red List](#) assessments), closing of with several recommendations for SME producers. Some of these species are also cultivated, such as *Rosmarinus officinalis*, *Ceratonia siliqua*, *Thymus vulgaris* and *Cola nitida*. This is elaborated below as well.

<sup>1</sup> Data from Herbmed is added where publically available.

## ACACIA NILOTICA

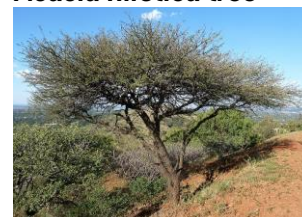
**Two products of the babul acacia tree have potential on the European market: babul acacia gum and bark. The bark has antioxidant activities and has potential in food supplements and cosmetics. Babul acacia gum could have potential in food and cosmetics. Research needs to point out whether its composition and properties are comparable to gum Arabic.**

### Product definition

The multipurpose tree *Acacia nilotica* is also known as babul or Indian gum Arabic tree. The tree grows in an area from Western tropical Africa eastwards to India, where it is more commonly known as *A. arabica*. In India, the tree is widely cultivated, whereas in Africa the tree grows in the wild. Since the tree can withstand high temperatures and drought, and grows fast, it is used in the rehabilitation of dry land.

It is part of a very large genus of shrubs, growing all over the world. There are numerous inconsistencies in the classifications and use of botanical names of *Acacia* species. Until recently, this genus consisted of over 1,300 species ([Encyclopedia of Life](#)). These were divided into five groups in 2005: *A. nilotica* was reclassified as *Vachellia nilotica*. The main sources of gum Arabic are: *Acacia senegal* and *A. seyal* (renamed as *Senegalia senegal* and *S. seyal*, respectively), which are related species. Sudan is the leading producer of gum Arabic, which is all collected from the wild. It is extensively used as a thickener, emulsifier and glazing agent in food and finds similar uses in cosmetics and medicine. If the chemical composition and properties of babul acacia gum are similar to gum Arabic, it could be used as an alternative source. Locally, babul acacia gum is sometimes used as a substitute to gum Arabic, though it is sweeter and considered of lower quality.

**Acacia nilotica tree**



Source: Commons

In Africa, the babul acacia tree has been an important tree in economic terms, as it is a source of tannins, gums, timber, fuel, fodder and medicine. Traditionally, the tree's bark is used to treat conditions such as diarrhoea, colds, haemorrhages, and leprosy (Bargali and Bargali, 2009). This bark and its derivatives have most potential on the European market. Bark contains tannins, terpenoids, alkaloids, saponins and glycosides (Mohammad et al., 2014). Additionally, the bark has been shown to have high levels of antioxidant activities (Ali et al., 2012).

### Segments

In Europe, the fruit, bark and gum of babul acacia are allowed for use in food supplements. The gum is used as an emollient, digestive aid and to support the metabolism. Regarding the tree's bark, because it contains high levels of antioxidant activities, it can be used in food supplements for overall and immune health, as well as to support digestion. The fruit has traditionally been used in gastrointestinal problems.

Babul acacia, as *Acacia nilotica*, is not yet registered for use in cosmetics. However, *A. arabica* (stem) bark powder and extract are registered with skin conditioning properties. This species is considered a synonym of *A. nilotica* ([The Plant List](#)). Potential use of babul acacia in cosmetics depends on whether cosmetic companies accept *A. nilotica* as a synonym of *A. arabica*.

Although gum Arabic is allowed for use in (herbal) medicine, babul acacia is not registered for this use.

### Trends

- European buyers are looking for sources of gum Arabic outside of Sudan, so their production becomes less dependent on production in Sudan, where supply is prone to disruptions due to the political situation.
- Food supplements which help improve the immune system and digestive health, are increasingly popular to prevent illnesses and to ensure general health and well-being. This is further supported by Europe's aging population and rising health care costs. Increasing awareness of the link between the immune system, stress, energy and sleep supports year-round consumption, instead of during flu season. Furthermore, consumers are also increasingly aware that there is a link between good digestion and the support of general health.

**EU demand**

Babul acacia bark is collected from the wild; it can be dried and powdered in the country of origin. Its extract, of use in cosmetics, is produced in Europe. Babul acacia gum, as most gums, is only cleaned and graded before export to Europe. Here, it is processed further, e.g. mixing, blending and refining. European demand for gum Arabic is steadily increasing. Industry sources stated that it is a positive sign that babul acacia is already allowed for use in food supplements. Furthermore, there is even more potential for babul acacia if it has a similar composition and use as gum Arabic. Around 80% of global production of gum Arabic is destined for Europe. Companies working with gum Arabic are concentrated in France, such as [Nexira](#) and [Alland & Robert](#).

Currently, use of babul acacia products in Europe is limited. There is a significant interest in acacia trees aside from *Acacia senegal* and *A. seyal* (sources of gum Arabic). Babul acacia is no exception; several research studies have been conducted to determine the properties of the leaves, gum, bark, fruits, flowers and pods of the babul acacia tree. Among others, these have demonstrated antimicrobial, antibacterial, anti-spasmodic and antioxidant activities (Ali et al., 2012). Product development should leverage these properties.

**Opportunities and threats**

Opportunities:

- Babul acacia bark has a potential in food supplements to support immune and digestive health, due to its high levels of antioxidant activities.
- If producers can determine whether babul acacia gum has similar properties and composition to gum Arabic, it can be used as an alternative to gum Arabic.
- Future supplies of babul acacia are estimated to be stable, as the tree grows fast and can withstand extreme temperatures and drought.

Threats:

- Babul acacia is extensively cultivated in India. Collectors of wild babul acacia in Africa may face competition from these cultivated sources.
- Production of babul acacia bark extract is deemed beyond the scope of most SME producers in Sub Saharan Africa, therefore, value addition options are limited.

**Business and sustainability needs of SME producers**

Business needs:

- Producers need to identify, verify and document the exact species and its relation to European standards (e.g. compared to Pharmacopeia etc.) through herbarium vouchers confirmed by competent authorities. As various *Acacia* species grow in West and Central Africa, it is important that producers determine which species they are collecting. For segments such as (herbal) medicine, this is of key importance as only gum Arabic is allowed here.
- Linking up with EU companies could facilitate the process for marketing babul acacia on the European market. Producers can stress the properties of the bark of babul acacia (especially antioxidants) to position this new product on the market. The tree's use in dry land rehabilitation can be used as an interesting marketing angle as well.
- Producers of babul acacia need to position their product as a wild-collected ingredient, to compete with cultivated sources from India. Elements that can add to the marketing of babul acacia are aspects of wild collection and the tree's sustainability image as a fast-growing tree.
- Both in positioning babul acacia on the European market and in competing with cultivated sources, certifications such as FairWild and/or organic can add to the marketing story. Before applying, producers first need to determine whether the costs of certification are worthwhile.
- Producers need to find out whether cosmetic producers accept babul acacia as a synonym to *Acacia arabica*, which can be used in cosmetics. A first step is to determine the composition of their babul acacia gum in relation to gum Arabic to determine whether it could serve as an alternative. They can use this analysis to verify whether European buyers accept it as a substitute for gum Arabic.

An overview of business recommendations and support needs is provided at the end of this chapter.



**Sustainability needs:**

Babul acacia is a fast-growing tree that can withstand extreme weather conditions. Therefore, it faces no sustainability issues at the moment. Depending on which part of the tree is harvested, in the future there might be need for sustainable harvest practices. This is especially relevant if the tree's bark and gum are collected. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

**AFRAMOMUM MELEGUETA**

**‘Grains of Paradise’ (*Aframomum melegueta*) can provide opportunities to exporters to food and cosmetics industries. As a spice it is not yet widely used in Europe. Therefore, it has a good potential to be promoted as a gourmet food. Also, the seed extract is widely used as a cosmetics ingredient. Potential opportunities for value addition could include organic/FairWild certification.**

**Product definition**

‘Grains of Paradise’ (GOP) is a tropical herbaceous plant from the ginger family. It is native to West African countries, and is mainly found in Nigeria, Liberia, Sierra Leone, Ghana, Cameroon, Ivory Coast and Togo. Its flowers are purple and develop into 5- to 7-cm long pods, which contain small, reddish-brown seeds. Flowering begins in September and fruiting in December. The seeds are aromatic with a grainy ‘coating’ and white kernel. They have a very hot taste which resembles that of pepper. GOP extract is obtained with the use of solvents from the plant's seeds.

GOP is only cultivated outside Europe, in African and South American regions. Its collection from the wild takes place in the coastal regions of West Africa, where the plant originates from. As a tree, it grows in mangrove forests. It is a valuable agro-forestry crop with potential to protect the biodiversity of the mangroves.

In Africa, it has been used in herbal medicine against many cardiovascular diseases and diabetes, as well as against stomach aches, snake bites, diarrhoea, cough, colitis, bronchitis, syphilis, colds and rheumatism. Its main active substance is 6-paradol.

**Segments**

In Europe, GOP is mostly used in the food and cosmetics segments. Its use as a spice is regaining popularity after its disappearance in Europe, when it was used as a replacement for the overpriced pepper in the 14<sup>th</sup> and 15<sup>th</sup> centuries. Particularly in “gourmet cuisine”, GOP is now increasingly used as an alternative to pepper.

Furthermore, its seed extract is used in the cosmetics industry, and has a good potential for further use. In the European market, GOP extract is registered for cosmetics use under the name ‘*Aframomum melegueta* seed extract’, offering skin conditioning properties.

Finally, because GOP extract has been found to help with testosterone boost, it is marketed as a libido stimulant in the food supplement sector. Marketability is currently limited to its stimulating features.

**Trends**

- Consumers are increasingly looking for natural ingredients in food products. Different spices are used to replace or complement regular spices. This is especially relevant for exotic spices, which are more popular among consumers.
- The need for sustainable botanicals is increasing. Consumers demand more transparency in terms of how products are produced, particularly when it comes to products coming from developing countries. To ensure the sustainability of products, European buyers increasingly demand traceability along the value chain, not only of quality, but also increasingly of documentation ensuring such practices.
- Raw materials are increasingly processed into extracts in the country of origin.

**Grains of *Aframomum melegueta***

Source:  
[spicestationsilverlake.com](http://spicestationsilverlake.com)

- In Europe, there is an increasing consumer interest for natural ingredients in cosmetics, to answer to the increasing demand from the global natural cosmetics sector, which is estimated to grow by 5-9% annually.

### **EU demand**

GOP's seeds and extracts are regaining attention in the European market. Several companies already use it in their products. These include:

- Spices: e.g. [Steenberg Grains of Paradise](#)
- Cosmetics: e.g. [Avon company](#), [Lancome](#)
- Food supplement: e.g. [Vigorplex®](#)

### **Opportunities and threats**

#### Opportunities

- GOP can be used in a wide range of segments with potential for the seeds in the food segment and for the extract in the cosmetics segment.
- On the European market, demand for ethically sourced ingredients is increasing. You can build a USP and add value to your product using FairWild and organic certification to show your products are produced in an ethically sound manner.
- Since GOP is not yet a very well-known ingredient on the European market, you could market it by building on the story behind it. The exotic origin and the collection from the wild, as well as its numerous health properties, will attract consumers if marketed well.

#### Threats:

- Solvent extraction of the GOP, which is relevant for its use in cosmetics, can be beyond the scope for SMEs.
- Most consumers outside of West Africa are not very familiar with GOP. It will require significant marketing efforts to build demand.

### **Business and sustainability needs of SME producers**

#### Business needs:

- A feasibility study on the exporters' capacity is needed to determine the segment(s) that they can successfully export to.
- It is important that producers/exporters determine if they are able to source a stable supply of consistent quality.
- SME producers need to build a strong marketing story, which can help position the product on the market. Traditional use and exotic origin can contribute to this marketing story.
- For the competition with cultivated sources of GOP, SME producers need to develop a marketing story. This can be based on the wild collection of the seeds, as well as the mangrove areas where the trees grow.
- SME producers need to determine whether they currently have the capacity to extract the seeds, or whether they can manage to install such capacities in the future. If this is not feasible, partnerships with processors and exporters in the region could be an option.
- Since they compete with cultivated sources,

An overview of business recommendations and support needs is provided at the end of this chapter.

#### Sustainability needs:

Currently, there are no sustainability issues for GOP. However, with increased popularity of GOP seeds, overharvesting of the valuable seeds may become an issue in the future. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

- It is important to avoid overharvesting of the plant since the seeds are needed for the growth of the new plant and thus are vital for sustainable future supplies.
- Additionally, producers should determine the possibility to use the GOP tree as a sustainable agroforestry crop, for the collection of the valuable GOP seeds. Because GOP grow in mangrove areas, with high biodiversity value, their protection can mean the protection of the mangroves.

**ANOGEISSUS LEIOCARPUS**

**African birch (common name for *Anogeissus leiocarpus*) can provide opportunities for ingredients coming from the tree's bark and leaves. Opportunities arise mostly in the European market for cosmetics. Value-addition opportunities can be found in certification (such as organic and FairWild) and in further processing the bark to obtain its extract.**

**Product definition**

African birch is a tall evergreen tree native to savannahs of Tropical Africa belonging to the Combretaceae family. It can be found in a large range of ecosystems, from dry savannah to wet forest borders, and on riverbanks in Eritrea, Ethiopia, Sudan, Cameroon, Congo-Kinshasa, Benin, Ivory Coast and Gambia among others. It can reach up to 15–30 m in height and its flowers bloom in the rainy season, from June to October. Traditionally, it is used to combat asthma, cough, tuberculosis and gonorrhoea. Additionally, in West Africa, the plants' leaves are used for a traditional method of textile dyeing. Until today, the plant is mainly harvested from the wild, but in Mali and Burkina Faso, commercial cultivation has started.

**Flowering African birch**



Source: Virboaa

The plants' bark contains tannins, saponins, phenols and anthraquinone, which have antioxidant and antimicrobial properties. The extract of the bark is obtained by solvent extraction in Europe,

**Segments**

African birch extract is registered for use in cosmetics. The extract may come from the leaves, stems, seeds, bark, flowers and so on. In the European market, African birch extract is registered for cosmetics use under the name '*Anogeissus leiocarpus* bark extract' for skin protecting properties. European cosmetics companies report they use the extract of African birch for its antioxidant properties, since it helps concentration of vitamin C and prevents the degradation of collagen. Also, an active ingredient harvested from the bark extract (anogelline) has started to be used by large cosmetics companies in Europe and the US. These developments build the basis for their wider use in the cosmetics segment in the future.

The use of African birch is not allowed in food and medicinal products. However, the use of its related species *Anogeissus latifolia* is allowed as a food supplement. This is the source of Indian gum and native to India, Myanmar and Sri Lanka, and can form a good basis to obtain a future registration for African birch as a food supplement. Analysis to show that they have a similar chemical profile and terms of use are, however, still necessary.

**Trends**

- Raw materials are increasingly processed into extracts in the country of origin.
- Consumers are more and more concerned over ethical sourcing and sustainability of botanicals produced in developing countries. Consequently, demand is increasing for sustainably certified botanicals for use in cosmetics. Organic certification is becoming popular, especially in the cosmetics sector.
- In Europe, there is an increasing consumer interest for natural ingredients in cosmetics, while the global natural cosmetics sector is estimated to grow by 5-9% annually.
- For cosmetics products, especially for skin care, there is an increasing demand for products rich in antioxidant activities.
- As products with interesting stories are becoming increasingly popular among European consumers, European companies are looking for ingredients potentially providing (traceable, documented) community and environmental benefits.

**EU demand**

The extract of African birch is gaining importance in the European market for cosmetics. Several companies use it in their products, such as [Soliance](#). The limited use in Europe can be partly explained

by the [patent](#) issued by an American cosmetics company, regarding the extract used for production of fibrillin in the skin (skin elasticity stimulant). US companies using the extract in their cosmetics include [Jurlique](#) and [Origins](#).

### **Opportunities and threats**

#### **Opportunities:**

- The growing interest in ethically sourced and sustainable products offers an opportunity for local value addition in terms of organic and FairWild certification.
- If producers can guarantee sufficient quality, they can add value to African birch by processing its bark into an extract.
- Since African birch is not yet a very popular ingredient in the European market, you could market it using a story behind it. Its exotic origin as well as its numerous health properties will attract consumers in the market for cosmetics.

#### **Threats**

- Production of extracts from the bark of the African birch, which is relevant for its use in cosmetics, are often beyond scope for SMEs.
- Since African birch is mainly wild-collected and only cultivated in a few areas in Mali and Burkina Faso, stable supply might not be achieved.
- Sustainability issues can arise regarding the harvesting of the bark from the African birch, since the bark cannot regenerate and the tree dies.
- Although there is no extensive cultivation of African birch, [LVMH](#) claims that it will proceed with the cultivation of 1,500 African birch trees in order to harvest their barks, in Komo, Burkina Faso. This project aspires to provide a sustainable way of acquiring 'Anogelline', an active ingredient used in cosmetics, while ensuring replenishment of the trees and with the involvement of the local community. This may become a future source of competition.

### **Business and sustainability needs of SME producers**

#### **Business needs:**

- Further processing of the African birch, especially according to GMP standards, will probably be outside of the scope of SMEs and collectors' communities. Building such capacities at a sustainable scale might not be feasible considering limited raw material availability. Partnerships with exporters and processors in the region could be an option.
- It is important that producers/exporters determine if they are able to source a stable supply of consistent quality.
- Improved marketing stories can be used to position the product. Traditional use and exotic origin can contribute to this marketing story.
- To ensure a stable, future supply of African birch, there is a need to research and develop sustainable harvest practices of the tree's bark.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### **Sustainability needs:**

Currently, there are no sustainability issues for African birch. However, overharvesting issues may occur in the future, due to the harvest of bark. To prevent such sustainability issues, it is essential to develop sustainable harvesting methods. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

### **ARTEMISIA HERBA-ALBA**

**White wormwood and its essential oil have a good potential oil on the European market. At the moment, it is restricted to the cosmetics segment for use as a fragrance and skin conditioning agent (extract). However, white wormwood may have potential in the food supplement segment as well. Many related *Artemisia* species are allowed for use in food supplements, which may be used to build a case for *Artemisia herba-alba*.**

**Product definition**

Also known as white or desert wormwood, *Artemisia herba-alba* is a shrub which grows in the dry land areas of the Mediterranean: northern Africa, Western Asia and South-western Europe. The name of the genus comes from the Greek goddess Artemis. There is some cultivation of the plant, e.g. in Tunisia, but main production is from wild-collection. At the moment, there are no known sustainability issues. It is particularly abundant in Spain, but also grows extensively in Algeria and some parts of the Palestinian Territory. In Northern Africa, the plant is used in traditional medicine to treat various diseases.

***Artemisia herba-alba* plant**



Source: Wikipedia

Most uses in Europe are for its essential oil, which is distilled from the aerial parts of the plant. Many researches have been done on its content, which varies considerably between origins and habitats. Major components are 1,8-cineole, chrysanthenone and chrysanthenol,  $\alpha/\beta$ -thujones and camphor. Of these, particularly  $\alpha/\beta$ -thujones are of value for use in perfumery. To compare: plants found in the Judean desert were high in 1,8-cineole (50%), followed by  $\alpha/\beta$ -thujones (27%), whereas essential oil from Algeria were high in camphor,  $\alpha/\beta$ -thujones, 1,8-cineole and chrysanthenyl derivatives. Regarding competing sources of white wormwood, oils from Spain contain lower quantities of  $\alpha/\beta$ -thujones and Moroccan plants contain higher quantities of  $\alpha/\beta$ -thujones and camphor (Mohamed et al., 2010).

**Segments**

Currently, white wormwood is registered for use in cosmetics, and has a potential for use in herbal medicine in the future, as various related species are registered for such uses. In cosmetics, *Artemisia herba-alba* (herb/leaf) oil is registered with masking and perfuming properties. Additionally, the flower extract has skin conditioning properties. For use in perfumery, white wormwood essential oil is valued for its thujone content.

Although white wormwood is as of yet not allowed for use in food supplements or herbal medicine, the species has a potential in these market segments. Several species form the *Artemisia* genus are registered in these market segments. According to industry sources, these can form a good basis to obtain a future registration for white wormwood, if analyses show that they have a similar chemical profile and terms of use. Studies have confirmed that white wormwood has a similar composition as e.g. *A. absinthium* and *A. scoparia*, but as composition varies depending on origin, these need to further analysed. For this, SME producers should work together with EU companies (see 'Recommendations when supporting the white wormwood chain').

Related species, *Artemisia absinthium* and *A. scoparia*, are registered as medicinal ingredients. Of these, *A. absinthium* has a herbal monograph in the EU, its registered uses are for a temporary loss of appetite and in mild dyspeptic/gastrointestinal disorders. In food supplements *Artemisia* species are registered for a wide selection of indications, ranging from digestive function, antioxidant, joint function and menstrual cramps. The medicinal properties of white wormwood has been researched extensively and are similar to these (Lamharrar, 2007). It has been included in a [patent for medicinal tea](#) for menstrual, digestive and respiratory symptoms.

**Trends**

- Raw materials are increasingly processed into extracts or oils in the country of origin, but quality (e.g. purity) and quality consistency remains a bottleneck.
- There is a strong interest for active and functional ingredients for the growing natural cosmetics market, such as the antioxidants, anti-inflammatory and antimicrobial activities from white wormwood.
- Supplement producers are looking for ways to differentiate their products on the market, for example with unique natural ingredients. A strong dossier of traditional use at the origin is important to communicate to consumers.
- There is a growing interest in ethically sourced and sustainable products in cosmetics. In addition, consumers are interested in the story beyond ethical certification. In their marketing, cosmetic producers actively communicate the best stories for their ingredients, to improve the connection with the consumer. Communication is done graphically, with short stories on the product, or in the producer's corporate image.



**EU demand**

In the last decades, various researches have been conducted on the composition and possible applications of white wormwood, demonstrating the species' potential (Moufid, 2012; Aziz et al., 2012; Mohamed et al., 2010). Found properties include antimicrobial, antioxidant, anti-inflammatory and anti-spasmodic activities, as well as antihypertensive and anti-diabetic effects which may be interesting in health products. Existing food supplements and herbal medicines based on other *Artemisia* species mainly focus on aiding digestive and menstrual cramps, for which the anti-spasmodic properties of white wormwood are of good use.

Although white wormwood is not consumed in large quantities, several companies can be found on the European market that sell this or related species. French company [Biolandes](#), a producer of essential oils and extracts, sources white wormwood from Morocco. The related species *Artemisia vulgare* is sold on the market as well, for example as essential oil ([Pro Aroma and Naturamole](#)); food supplements ([Esprit Santé](#); [Flor'Eden Nutrition](#)); and herbal tea ([Mountain Fresh](#)).

**Opportunities and threats**

Opportunities:

- If producers can guarantee a sufficient quality, they can add value to white wormwood by processing it into essential oil.
- White wormwood oil has several researched properties that make it interesting for use in cosmetic and health products.

Threats:

- Morocco is an established supplier of white wormwood and other *Artemisia* species, especially to France. New producers/exporters from other countries like Algeria will experience competition from this country.
- Although white wormwood is gathering interest on the European market, the applications of this particular species outside of cosmetics is still limited. Producers/exporters will need to work with European companies to target this segment.

**Business and sustainability needs of SME producers**

Business needs:

- It is important that producers/exporters verify if they are able to source a stable supply of consistent quality and oil composition. According to research studies, the main issue for white wormwood is to obtain an essential oil of a constant composition, as this varies considerably based on origin.
- White wormwood producers should focus first on targeting the cosmetics segment in Europe, as the essential oil is already used here. Linking up with EU companies could facilitate the process for clarifying the regulatory framework for use in food supplements and/or herbal medicine. EU companies might have the capacity to do so, when additional research shows sufficient potential in these segments, whereas this is deemed beyond the scope of SME producers/community capacities. In order to register white wormwood in health segments, a comparative analysis on the chemical properties and terms of use is essential. Only if this proves to be similar to *Artemisia* species on the market, does the species have a potential to get registration here.
- SME producers need to determine their current or potential future capacity of distillation of white wormwood. If distillation is not feasible, partnerships with processors and exporters in the region could be an option.
- Clear communication in a marketing strategy is needed. Producers can use marketing stories that focus on the story of wild-collection and its benefits to local communities etc. For example, as the genus was named after the Greek goddess Artemis, you can use this as an image, while also focusing on the essential oil's long tradition of use.
- Producers should explore/determine their potential to obtain Fairtrade, FairWild or organic certification. This can add to the marketing story of the product and consequently increase its marketing potential.

An overview of business recommendations and support needs is provided at the end of this chapter.

Sustainability needs:

Currently, there are no sustainability issues for white wormwood. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.



**BUTYROSPERMUM PARADOXUM**

**Shea trees, managed traditionally in parklands across sub-Saharan West, East and Central Africa, bear seeds which yield a creamy waxy fat: shea butter. The extraction of shea butter in Africa takes place in either handcrafted or mechanical facilities. In the European market, shea butter finds important applications in the food and cosmetics segments, and has an important potential as a palm oil substitute.**

**Product definition**

*Butyrospermum paradoxum* or *parkii* (syn. *Vitellaria paradoxa*) is a tropical African sapotaceous tree, usually reaching a height of 7-15 m, though it may reach 25 m and a trunk diameter up to 2 m ([Ecocrop, FAO](#)). This tree bears seeds (i.e. shea nuts) which yield a creamy, pale-yellowish or ivory coloured waxy fat. The species is recorded as indigenous to 21 countries<sup>2</sup> of sub-Saharan West, East and Central Africa ([CBI, 2014](#)). The trees are not intensely cultivated, but are managed traditionally in parklands across the region ([Global Shea Alliance](#)). Recently, a decline of shea trees has been noted, threatening the future supplies of shea butter. Decline of the trees is attributed to population growth, land fragmentation as well as the use of the tree as a source for charcoal. FairWild Standard application would allow looking at the sustainable wild harvesting issues.

**Distribution of shea trees in Africa**

Source: PROTA

The dry shea kernel is collected by either individual collectors or collectives and is then sold to local traders/agents or traditional local processors. The majority of extraction and refining of shea butter has traditionally been undertaken at the plants of large-scale European companies, but there has been a significant shift of shea butter extraction toward shea-producing countries in Africa in the past years. Currently, West Africa has the capacity to process at least half of its exported crop into butter ([CBI, 2014](#)). The nuts are crushed in either handcrafted or mechanical facilities to extract the shea butter. The shea butter is then boiled, cleaned, packaged and traded. The [Scientific Animation without Borders \(SAWBO\)](#) shows an animation on good production practices for shea butter.

Shea butter is rich in fatty acids and vitamins A and E, and has moisturizing, anti-microbial and anti-inflammatory properties.

**Segments**

It is estimated that, out of the total shea butter exports from Africa, 85-90% goes into food products and the rest is used in the cosmetic sector. The primary application of shea in the European food industry is in the form of shea stearin, used as an ingredient in cocoa butter equivalents (CBEs) and cocoa butter improvers (CBIs). CBEs are estimated to cost 30-40% less than cocoa butter. In addition, shea butter and its fractions have several potential applications as a palm oil substitute in a wide range of food products ([CBI, 2014](#)).

**Shea nut and butter**

Source: Koils by Nature

Shea butter is also commonly used in the European cosmetics industry, mainly in skin and hair-related products. *Butyrospermum paradoxum* is not registered as a cosmetics ingredient in [CosIng](#), but its synonym *Butyrospermum parkii* ([Plant List](#)) has various registered functions. For instance, *Butyrospermum parkii* butter is registered for skin conditioning and viscosity controlling; *Butyrospermum parkii* butter unsaponifiables are registered for hair and skin conditioning; *Butyrospermum parkii* oil is

<sup>2</sup>Benin, Burkina Faso, Cameroon, Central African Republic, Cote d'Ivoire, DRC, Ethiopia, Gambia, Ghana, Guinea-Bissau, Guinea-Conakry, Mali, Niger, Nigeria, Sierra Leone, Senegal, South Sudan, Sudan, Tchad, Togo and Uganda

registered as an emollient and skin conditioning agent; *Butyrospermum parkii* seed cake extract is registered for skin protecting, etc. Producers should check the CosIng database for 'shea' to learn more about other applications in cosmetics.

### **Trends**

- European governments and civil society pay increasing attention to the sustainability challenges inherent to the palm oil industry, such as massive deforestation, loss of biodiversity, water pollution and greenhouse gas emissions. This has led certain segments of the food industry to search for palm oil alternatives, which is a great potential for shea butter ([CBI, 2014](#)).
- There is a growing demand in Europe for cocoa butter equivalents (CBEs) derived from a mix of shea stearin and palm mid fraction by confectioners ([Global Shea Alliance](#)).
- In Europe, there is an increasing consumer interest for natural ingredients in cosmetics, while the global natural cosmetics sector is estimated to grow by 5-9% annually.
- The popularity of traditional craftsmanship is increasing in Europe. Traditional products, with a simple, artisan character are growing in popularity among consumers. Especially for cosmetics, traditional manufacturing techniques give a more natural and personal character to the product.
- There is a growing interest in ethically sourced and sustainable products in cosmetics. In addition, consumers are interested in the story beyond ethical certification. In their marketing, cosmetic producers actively communicate the best stories for their ingredients, to improve the connection with the consumer. Communication is done graphically, with short stories on the product, or in the producer's corporate image.

### **EU demand**

Currently, most demand for shea butter within the food industry stems from its application in cocoa butter equivalents (CBEs) and cocoa butter improvers (CBIs), which are sourced mainly from large-scale companies such as [AAK](#), [IOI-Loders Crocklaan](#) and [Wilmar](#). However, the use of CBEs in the EU is restricted to a maximum of 5% of chocolate ([EUR-Lex](#)). Shea butter also has potential applications as a palm oil substitute in a wide range of food products, especially in light of [Regulation \(EU\) No 1169/2011](#), which has entered into force in December 2014 and requires food labels to carry complete information on the content of products. This will require manufacturers to disclose whether products contain palm oil rather than the general term 'vegetable oil' that was accepted before; as mentioned previously, palm oil is under heavy sustainability debate in the EU.

Within the cosmetics market, shea butter has been adopted as an ingredient by some of the major (natural) cosmetics companies in Europe, such as [Body Shop](#), [Lush](#) and [L'Occitane en Provence](#).

The [Global Shea Directory](#) has a list of some of the EU companies and organisations involved in the shea butter industry.

### **Opportunities and threats**

Opportunities:

- The product has great potential in the food industry, either as a CBE/CBI or in wider applications as a palm oil substitute. The food industry offers especially interesting opportunities for producers who can supply higher volumes.
- Shea butter has extensive applications in the European cosmetics market, and offers value addition opportunities in terms of certification. Shea is a widely known ingredient in Europe, and provides wide opportunities for producers in terms of marketing and sustainability propositions.

Threats:

- Shea butter still commands relatively high prices, which impedes its wider application within the food industry (e.g. as a palm oil substitute).
- Certified shea butter (e.g. organic, fair trade) still finds limited opportunities in the European food market due to the high price differential. This leads to a situation where, for instance, a large part of shea butter processed organically ends up being sold on the conventional market as a non-certified product ([CBI, 2014](#)).
- Certain markets and industries in Europe (e.g. high quality chocolate industries in France, Italy and Belgium) are expected to remain resilient to using CBEs ([CBI, 2014](#)).
- The cosmetics sector commands much lower volumes than the food sector and can only absorb a small part of the shea butter production.

- Due to population growth, land fragmentation and use for charcoal production, the supply of shea is threatened.

### ***Business and sustainability needs of SME producers***

#### **Business needs:**

- There are various existing initiatives to support the needs of shea producers. Producers should link up with the [Global Shea Alliance](#) to engage in sustainability, value addition and processing activities in their region.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### **Sustainability needs:**

The Global Shea Alliance has identified three main sustainability challenges in the shea industry:

- *The quality of shea nut production has been declining. Falling quality is detrimental to the image of the industry and decreases profitability for shea nut processors, thereby diminishing competitiveness for the whole industry.*
- *Shea nut collectors are prevented from fully reaping the benefits of their labour and have been alienated from markets. Their labour is instrumental to the industry, and must be developed.*
- *Observers have identified a decline in the number of shea trees that is foreseen to continue in the future. This trend has been attributed to rapid human population growth, increasing land fragmentation and the use of the tree for charcoal production. ([Global Shea Alliance, 2014](#)).*

Read more about the [GSA Sustainability Program](#) on its website.

### **CERATONIA SILIQUA**

**Carob, or rather locust bean gum (LBG), is used extensively on the European market as a thickener in food and cosmetics. The market offers opportunities for wild-collected and processed LBG from the Palestinian Territory in niche markets for cosmetics and organic food products. A good marketing story is important to buyers. Potential for wild-collected carob is more limited for conventional food products.**

#### **Product definition**

*Ceratonia siliqua*, better known as the carob tree or locust bean, is a shrub that is native to the Mediterranean region: Southern Europe, Northern Africa and the Middle East into Iran. It is widely cultivated; the main producers are Spain, Italy, Morocco, Portugal and Greece. In the East Mediterranean region, including the Palestinian Territory, and, to a lesser extent in Algeria, carob trees offer opportunities for wild-collection.

Parts of the tree that are used in Europe are the dried pods and seeds. Carob gum, or locust bean gum (LBG), is a white powder which is extracted from the carob seeds.

#### **Carob seeds and pods**



Source:  
[Marksdailyapple.com](#)

#### **Segments**

Most consumption of LBG takes place in the food industry. Here, it is used as a thickener and gelling agent. It's "E-number" (E410) signifies that it can be used as a food additive in the EU. It is used in a wide range of food products, such as (frozen) dairy, beverages, condiments and bakery products.

LBG can also be used in cosmetics, where it has a similar stabilising function and is registered as an emollient. In cosmetics, LBG is used in skin care products, e.g. lotions, creams and conditioners.

Carob pods are used in food products as well, as a replacement of cocoa and for their high sugar content. These pods can be processed into a syrup, which is used locally as a food ingredient or sweetener. European companies prefer to use carob pods from cultivated sources as food ingredients, as these have lower variations in their sugar content (Biner et al., 2007).

#### **Trends**

- Many Europeans consume more fat than is healthy for them. Therefore, demand for low-fat food products is growing. In response to this trend, European companies are reformulating their food products with fat replacers, such as thickeners.
- Additionally, natural sweeteners are increasingly marketed in food products as a 'healthier' alternative to sugar.
- The popularity of natural ingredients in food products is rising.
- There is an interest in ethically sourced and sustainable cosmetic products.

### ***EU demand***

Producers of wild-collected carob have two main options in reaching the food segment European market. They can supply carob seeds to one of the large thickener producers or make their own LBG from them.

According to industry sources, producers of thickeners often have large-scale factories which can make blends of different gums (e.g. xanthan or guar gum). Companies such as Danisco (owned by [DuPont](#)) or [Cargill](#) process carob seeds into LBG. These companies produce specialised blends, thickening or gelling agents (e.g. CESAGUM® by [Tate & Lyle](#)) and give extensive advice to their clients on how to use these blends. SME producers could try to target these large companies.

Alternatively, SME producers can produce their own LBG from wild-collected carob seeds. As such, they can target companies who are looking for a simple thickener for their products and do not require a specialised blend. According to industry sources, they could distinguish themselves from the large-scale thickener producers and there are probably agents who would sell those products.

Aside from its use as an emollient in various lotions and creams, cosmetic companies have found new applications for carob seeds as well. For example, the French company [Silab](#) has developed a moisturising and repairing ingredient based on carob seeds. The Spanish company [Biosearch Life](#) even offers a supplement based on carob that has a beneficial effect on glucose metabolism.

### ***Opportunities and threats***

Opportunities:

- The growing interest in ethically sourced and sustainable ingredients for food and cosmetics offers an opportunity for local value addition in organic and/or FairWild certification.
- The growing interest in low-fat food offers opportunities for thickeners such as LBG. Food manufacturers use these products to reduce fat in their products while not compromising on taste.
- Additionally, carob pods offer opportunities in food products as a natural sweetener.
- Producers of wild-collected carob seeds can process this to LBG and target European companies that are looking for a simple thickener. As such, SME producers can distinguish themselves from large existing processors of carob, who specialise in producing intricate blends with other gums.

Threats:

- There is an extensive cultivation of LBG in Southern Europe.
- The food industry prefers cultivated carob pods over wild-collected ones, due to the large variation of sugar content in the latter.

### ***Business and sustainability needs of SME producers***

Business needs:

LBG has an established market in Europe, particularly in the food industry mostly supplied by cultivated sources. Therefore, SME producers of wild-collected LBG need to focus on their marketing story and carefully consider their position in the market:

- SME producers who have set up a company in both collecting and processing carob, need to find European companies who are interested in buying a simple LBG thickener, instead of specialised blends. Alternatively, they could use agents to sell on their behalf.
- SME producers need to develop a positioning strategy for their wild-collected LBG. This can be positioned as a product which helps conserve forests. This positioning is important on the European market, to compete with cultivated sources. In the Palestinian Territory, farmers collect carob seeds from the forest. What's more, the tree is actually used in reforestation practices, as it is considered a productive species.

- Producers need to develop a convincing marketing story, which can help positioning. Marketing should focus on the origin of the product and its benefits to local communities. Producers in the Palestinian Territory could also make use of Pro-Palestinian attitudes in Europe.
- Targeting niche markets with certifications such as organic and/or FairWild can add to this marketing story in the cosmetics and food segments. Here, the marketing story of wild-collection suits better than in mainstream markets. Producers need to determine their potential to obtain these certifications.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### Sustainability needs:

Currently, there are no sustainability issues for carob. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

### COLA NITIDA

**The seeds and seed extracts of the Cola tree are widely used in Europe. Collection and processing of the tree's seeds offer great opportunities to exporters in developing countries, since the seeds can both be used as a food supplement and as an ingredient for cosmetics. As the Cola tree is widely cultivated, exporters and processors who can position themselves clearly separated from cultivated species, can benefit from the opportunities of wild collection. Value addition can occur through organic and FairWild certifications. The former is more relevant for cosmetics.**

#### Product definition

The Cola tree (*Cola nitida*) is an evergreen forest tree, native to the rainforests of West Africa. It is a medium-sized tree (<25m), has yellow flowers and star shaped fruits. A similar species from the same genus is the *Cola acuminata*, which also grows in Africa. The caffeine-rich seeds from both trees have similar properties and can be used as natural alternative sources for caffeine products. The Cola tree is grown both in the wild and under cultivation. It grows in the wild in the rainforest belt of Nigeria and the coastline of West Africa. At the same time, cultivation is extensive, due to the seed's widespread domestic consumption. Currently, cultivation takes place in Africa (from Senegal, Guinea, Liberia, Ivory Coast and Ghana towards the western part of Nigeria), South America and South East Asia.

*Cola nitida* fruits



Source: Wikipedia

The main active ingredients of the Cola tree seed are alkaloids: caffeine and theobromine. These are powerful stimulants which counteract fatigue, suppress thirst and hunger and are believed to enhance intellectual activity. Traditionally, the leaves, flowers and bark of the tree were used as a remedy for coughs, dysentery, diarrhoea and vomiting. After a trunk of a mature Cola tree is cut, regeneration is possible, since new sprouts are grown. This process indicates that Cola tree is a renewable species.

#### Segments

Dried Cola seeds are exported to Europe for different uses. The seed's extracts are predominantly used in food supplements as energy boosters. Very popular is their use in the food and beverage industry, where they are used as flavourings in soft drinks, energy drinks, mineral waters and wine. Claims of wild-collected Cola seeds are gaining popularity, particularly in the food-supplements segment, where consumers are increasingly looking for natural and pure ingredients.

Furthermore, the seeds of the Cola tree have properties which can be of use in the cosmetics sector. By stimulating blood flow they act as a skin conditioner. In the European market, *Cola nitida* is registered for cosmetics use under the name '*Cola nitida* seed extract' with skin-conditioning properties. Additionally, these ingredients are also reported to help restore skin after anti-cellulite treatments. Due to their properties, Cola seeds have potential to be used further in the cosmetics segment.

Finally, *Cola nitida* is registered as a medicinal ingredient. Together with *C. acuminata*, it has an EU herbal monograph, with registered uses against symptoms of fatigue and sensation of weakness.



Registered use concerns the powdered herbal substance and its liquid preparations, destined for oral use. However, there is limited potential for the use of *Cola nitida* as a medicinal ingredient.

### **Trends**

- Supplement producers are looking for ways to differentiate their products on the market and attract consumers. Marketing the aspect of wild-collected Cola seeds can play this role. Another example includes marketing the ancient use of Cola seeds to restore vitality.
- Consumers are increasingly concerned with their health and thus they prefer natural ingredients in food supplements and cosmetics. Natural alternatives to coffee, which are used as energy boosters are shown to be gaining popularity.
- Natural ingredients and sustainable products are gaining popularity in the European market. Organic Cola seed extract is gaining popularity as a cosmetics ingredient.

### **EU Demand**

Cola seeds are grown in West Africa, where they are dried and exported to Europe. Here, the seed extract is produced. It is important for exporters and processors of wild-collected Cola seeds, to target buyers in the EU market who are willing to offer a price premium for the wild-collection aspect. The alkaloid caffeine, which can be obtained from the extract, usually comes from cultivated species, in order to reduce risks of quality inconsistencies. Several companies use the seed extract in their products. Examples include:

- Food supplements: e.g. [Mountainfresh](#), [Isostar](#) and [Gerimax](#)
- Food ingredients: e.g. [Hausman](#) and [Sinalco](#)
- Cosmetics: [Estee Lauder](#), [Alta Care Laboratories](#), [Centerchem](#)

### **Opportunities and threats**

Opportunities:

- Cola seeds and their extracts can be used in a wide variety of segments.
- The growing interest in ethically sourced and sustainable products offers an opportunity for local value-addition in terms of organic and FairWild certification. Organic certification, particularly in the cosmetics segment, is already becoming popular.
- As a source of natural caffeine, Cola seed extract can be used as an alternative to caffeine extracted from coffee beans.

Threats:

- Processing cola seeds into extract, which is relevant for use in cosmetics, is often beyond the production capacity of SME producers and processors.
- Cultivation of cola tree is extensive and therefore, competition between cultivated and species grown in the wild will be significant.
- Caffeine, as one of the main ingredients of the cola seed, has been associated with some negative health consequences. Therefore, its demand among European consumers might decrease in the future.
- Cola seeds from cultivated species usually offer lower prices and better quality to EU buyers, which can provide an additional competition barrier for exporters of wild-collected cola seeds.

### **Business and sustainability needs of SME producers**

Business needs:

Since cultivation of the Cola tree is extensive, producers and exporters of wild-collected Cola seeds need to position themselves against cultivated sources.

- SME producers need to develop a marketing campaign, in which wild collection of Cola seeds can be a focal point. Since cultivation is wide-spread, marketing the unique characteristics of wild grown Cola seeds, can give exporters a comparative advantage against cultivated species.
- To position their Cola seeds on the market as new food supplements or food ingredients, producers need to develop a marketing story to increase marketing potential. Elements for such a marketing story are: the revitalising properties of Cola seeds as well as the fact that they provide an alternative natural source for caffeine.



- SME producers need to determine their potential capacity for organic or FairWild certification to add to the marketing story and as an opportunity for value addition; for example in terms of a premium for their product.
- SME exporters should focus on targeting buyers in the EU market who are willing to pay price premiums for wild collected Cola seeds.
- For use in food supplements and cosmetics, producers need to identify and document which is the exact species that they use. There is a herbal monograph covering both *Cola nitida* and *Cola acuminata*.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### Sustainability needs:

Currently, there are no sustainability issues for Cola seeds. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

- Additionally, kola tree is capable of producing new sprouts when the trunk of a mature tree is cut. Due to its regeneration process, producers should cut the trunk of dying Cola trees to ensure the tree's revival.

### COMBRETUM MICRANTHUM

**The kinkeliba shrub is already marketed in Europe. Particularly its leaves and their extract are applied in the food and cosmetic sectors. Because of its multiple applications, kinkeliba exporters have many opportunities to promote their products. Value addition through organic and FairWild certifications should be considered.**

#### Product definition

The *Combretum micranthum* (commonly known as kinkeliba) is a bushy shrub, which can grow up to 6 m high. The species grows in the wild, from Sudan to Nigeria and from Gambia to the Republic of Congo, while it has been successfully introduced for cultivation in South Vietnam. Sustainability concerns arise due to the extensive local use of the shrub's branches and stems for firewood and charcoal. The high value that kinkeliba leaves have for locals' livelihoods can function as protection for the preservation of the whole shrub.

Kinkeliba shrub



Source: Wikipedia

In West Africa, kinkeliba leaves are chewed fresh or used as a herbal infusion or tea to treat many conditions such as coughs, bronchitis, hepatobiliary diseases, hepatitis and malaria. The leaves are also traditionally used to promote the production of bile by the liver and aid digestion. The kinkeliba contains flavonoids, catechins, tannins, quaternary amino acids and alcohol acids. The catechins and flavonoids are the active compounds with antioxidant properties. The kinkeliba tree is marketed in the European market for its leaves and leaf extract. Leaf extraction is done through solvent extraction.

#### Segments

The kinkeliba leaves are used widely in the food supplements and cosmetics sectors. In Europe, it is registered as a food supplement and it is marketed as having glucose-lowering properties. Further research is taking place to investigate kinkeliba's anti-diabetic properties since its compounds indicate antidiabetic activity. Finally, there is some activity in Europe within the herbal tea sector, where dried kinkeliba leaves are used.

Furthermore, kinkeliba leaf extract is used in the cosmetics segment and has potential because of its antioxidant properties. In the European market, it is registered as '*Combretum micranthum* leaf extract' with skin-conditioning properties.

Kinkeliba leaf extract is not allowed for use as medicine.

#### Trends

- The EU markets for supplements, and in particular for products aiding digestive health, is vibrant, but competition is fierce. As such, supplement producers are looking for ways to differentiate their products on the market, for example by using products such as kinkeliba, with a long tradition of use.
- The aging European population, in combination with an increased awareness of and trust in natural health options, have resulted in an increased popularity of natural and healthy supplements. Therefore, claims that food supplements are 100% natural will prove popular among consumers.
- In Europe, there is an increasing consumer interest in natural ingredients for cosmetics. The global natural cosmetics sector is estimated to grow by 5-9% annually. Within this segment, organic cosmetics are becoming increasingly popular.
- Antioxidants are increasingly becoming popular in cosmetic products, in particular in those which combat (the signs of) aging.

### **EU demand**

Kinkeliba leaves are exported to Europe in dried and/or powdered form. Here, the leaf extract is produced. Several companies use the leaf extract in their products. Examples include:

- Food supplements: [Dermoxylia](#), [Soin et Nature](#)
- Cosmetics: [Dynapharm](#), [Etura](#)

As mentioned before, there is also some use of the kinkeliba leaves as herbal tea in the European market. Companies which sell kinkeliba herbal tea include [Redhibis](#) and [Joanna's Garden](#).

### **Opportunities and threats**

Opportunities:

- There is potential for further use of the kinkeliba leaves and their extract mainly in anti-aging and conditioning cosmetics and food supplement segments.
- As demand for ethically sourced ingredients is increasing, producers can add value to their product using FairWild and organic certifications.
- There is potential for the use of kinkeliba as tea in the European market, since it is already traditionally used as a herbal tea.

Threats:

- Processing kinkeliba leaves into an extract for cosmetics and food supplements can be beyond the scope of SME producers in Sub-Saharan Africa. This means that value addition within countries of origin remains limited.
- A market effort is needed because the use of kinkeliba in Europe still remains limited.

### **Business and sustainability needs of SME producers**

Business needs:

- A feasibility study on the exporters' capacity is needed to determine the segment(s) which they can successfully enter (cosmetics/food supplements).
- Building a strong marketing story can help better position the product on the market. Traditional use, exotic origin as well as the aspect of wild collection can contribute to kinkeliba's marketing story.
- SME producers need to determine whether they can develop extraction capacities in the future. If this is not feasible, partnerships with processors and exporters in the region could be an option.

An extra overview of business recommendations and support needs is provided at the end of this chapter.

Sustainability needs:

- Sustainability is a main issue for kinkeliba: extensive harvesting needs to be addressed, in order to safeguard supplies of wild-collected leaves. SME producers need a counter-incentive for cutting kinkeliba down for firewood and charcoal. Valorising kinkeliba's leaf as a livelihood option can work as a protection for the shrub.
- Sustainable harvesting of the tree's leaves and establishing marketing channels is essential to protect and valorise the species. Resource mapping and management is needed to ensure sustainable wild-collection according to GACP standard. The FairWild standard is a certifiable process to achieve this.
- SME producers need to determine their potential to obtain FairWild and/or organic certification to help to support the credibility of sustainability schemes to buyers.

## DANIELLIA OLIVERI

***Daniellia oliveri* is a source for resin and bark extracts, which have potential in European cosmetics. These products offer opportunities for cosmetic companies to diversify their products on the European market. As the tree is exclusively collected from the wild and used for timber, producers need to be alert on future sustainability issues.**

### Product definition

The African copal tree (*Daniellia oliveri*) is a fire-tolerant species native to tropical Africa. It is the largest tree of the wooded savannahs and grows in an area stretching from Senegal eastwards to Sudan and Uganda. Currently, there is no significant cultivation of the tree, with most harvesting stemming from wild populations. There are indications that tree management, such as weed removal, improves growth of new stems from tree trunks after being cut down (Houehounha et al., 2010).

The species is harvested from the wild for its timber and firewood, which is used locally. Moreover, the tree's gum, stem bark, roots and leaves are widely used in traditional medicine in Africa. Here, African copal is used to treat or alleviate skin disease, gonorrhoea, gastrointestinal ailments, rheumatism and pains.

The tree's resin, also known as African copaiba balsam, is registered for use in cosmetics in Europe. The resin is rich in essential oils; the main compounds are diterpene oleoresin daniellic acid, ozic acid and the alcohol ozol (Lemmens et al., 2012). Additionally, other parts of the tree have been researched to determine their properties and possible applications. Leaves have antimicrobial activities (Ahmadu et al., 2004) and the stem bark has been shown to have anti-inflammatory properties (Jegade et al., 2006).

### Daniellia oliveri tree



Source: Central African Plants Senckenberg.de

### Wild distribution of Daniellia oliveri



Source: Prota4U.org

### Segments

At the moment, the most potential for African copal lies in the cosmetic segment. Here, *Daniellia oliveri* resin extract is registered as having skin-conditioning, skin-protecting and emollient properties. As such, it has potential in skin care products, particularly in anti-aging products. Stem bark extract has a potential in cosmetics as well, due to its anti-inflammatory properties, this extract needs to be registered.

Several studies have been conducted to determine the tree's potential in herbal medicine, examining the leaves, bark and roots. However, the tree's products are not allowed for use in either health segments (food supplements and herbal medicine) or food segments.

### Trends

- For cosmetics products, especially in skin care, there is a continuous strong demand for ingredients which help combat the signs of aging.
- Cosmetic producers are looking for ways to differentiate their products on the market, amongst others in terms of specific marketing stories. In their marketing, cosmetic producers actively communicate the best stories for their ingredients, to improve the connection with the consumer. Communication is done graphically, with short stories on the product, or on the producer's corporate image.

### EU demand

According to industry sources, African copal resin is still a small product on the European market. There is also a [US patent](#) for the use of the resin extract as an anti-wrinkle agent in cosmetics, applied for by [LVMH Recherche](#). Cosmetic companies need to be aware of this because they cannot use the resin in exactly the same way as specified in this patent. Natural extracts producer [Flavex](#) produces a CO<sub>2</sub> extract from the bark, which is marketed for use as a fragrance ingredient ([SpecialChem](#)).

### Opportunities and threats

#### Opportunities:

- The African copal tree offers several ingredients that have a potential in the cosmetics segment: resin, bark and leaf extracts. Bark and leaf extracts would need to be registered for use in cosmetics first.
- The skin-conditioning and protecting-properties of the extract have potential in the continuously highly demanded anti-aging cosmetics.
- European cosmetic companies can use derivatives from the African copal tree to diversify their products on the market.

#### Threats:

- Producing an extract of African copal resin, particularly with CO<sub>2</sub> extraction, is deemed beyond the scope of SME producers.
- Since African copal is not very well-known on the European market, producers need to develop an effective marketing story.

### **Business and sustainability needs of SME producers**

#### Business needs:

- SME producers are recommended to focus on the marketing of this species and to cooperate with EU companies to register the tree's bark extract for use in cosmetics.
- Producers need to work on a convincing marketing campaign wherein they focus on the aspect of wild collection and the potential use in cosmetics, especially in anti-aging skin care products. Before committing to specific certification standards, producers need to determine whether these add to their marketing story.
- Since the tree is not widely cultivated, but is commonly cut down for timber and fire wood, it is important that producers survey available tree resources to ensure future supplies. Producers should keep an eye on possible upcoming sustainability issues.

An extra overview of business recommendations and support needs is provided at the end of this chapter.

#### Sustainability needs:

Currently, there are no sustainability issues for African copal tree. However, due to its use for timber, potential threats for the African copal tree may arise in the future. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

### **DESMODIUM ADSCENDENS**

**Desmodium leaf extract, produced from *Desmodium adscendens*, has potential on the European market as a food supplement. It is mainly used to support liver functions. Additional potential exists in food supplements in terms of supporting overall health, based on the species' detoxification and antioxidant activities.**

#### **Product definition**

*Desmodium adscendens* is a shrub that is native to the Equatorial areas of Africa and South America. It grows in the tropics of the Amazon in South America and in West Africa. The IUCN Red List classified the wild population *D. adscendens* as being of Least Concern; it is stable and currently no major threats are known ([IUCN Red List](#)).

In African traditional medicine, the plant is used to treat or alleviate asthma, fever, epilepsy and pain. A decoction of the leaves has also been used to prevent and treat liver damage.

Desmodium leaves are of interest for the European market as they contain various active ingredients, including soyasaponins (Soyasaponin I and II, Dehydro soyasaponin I and soyasapogenol B) alkaloids (hordenin, dimethyltriptyamine, dimethoxyphenylethylamine and salsoline) and flavonoids (Baiocchi et al., 2012). Extracts of desmodium leaves exhibit high levels of antioxidant activities, because of their flavonoid content (Marcel et al., 2012).

***Desmodium adscendens* leaves**



Source: Liberian Fauna

### Segments

In Europe, desmodium is registered for cosmetics and allowed for use in food supplements. Of these two segments, the most potential for the plant lies in food supplements, where extracts and tinctures of the leaves are used to support liver function.

In cosmetics, *Desmodium adscendens* extract is registered with skin conditioning properties. This extract is produced from the entire plant: flowers, leaves and stems. However, its potential in this segment is expected to be limited; few companies use it as an ingredient. In cosmetics, the high antioxidant activities of desmodium could have an application, but these would compete with the many antioxidant extracts already on the market.

### Trends

- The EU markets for supplements is vibrant. As such, supplement producers are looking for ways to differentiate their products on the market. These producers can use a strong dossier of traditional use at the origin to support their marketing story to consumers.
- In a society where consumers are increasingly aware of the importance of healthy lifestyles, detox food supplements are becoming more and more popular.
- There is an increased consumer awareness and interest in antioxidants in food products, such as food supplements.
- Although still a niche segment, organic food supplements are gaining in popularity; consumers believe that these are healthier and work better than non-organic ones.

### EU demand

As stated under 'Segments', desmodium has the most potential in food supplements. For this use, several companies can be found in Europe. Most of these market desmodium, in the form of capsules (containing the extract) or tinctures, as treating or preventing liver damage.

Some companies use desmodium as a single ingredient (e.g. [Fitiform](#), [Dieti Natura](#) and [Phyto Italia](#)), or as part of multi-herb food supplements, to support the liver and other functions (e.g. [SuperDiet](#)). Desmodium is also sold as a powder or dried herb (e.g. [l'Herbier du Diois](#) and [Île aux plantes](#)) for use as a herbal tea or concoction. Companies also use the African origin as part of their marketing strategy. For example, the French company Centre de Recherches Phytothérapiques uses the fact that it imports directly from small producers African villages to position its product ([Desmopar](#)).

### Opportunities and threats

Opportunities:

- Desmodium has a long tradition of use in supporting liver functions, which can be used to position the product in Europe.
- Due to its high content of antioxidants, desmodium leaf extract has a potential for use in other food supplements as well, for example in immune health.
- Wild availability of desmodium is expected to remain stable, as no major existing threats to the population are known.
- Organic certification can add value to desmodium while also adding to the marketing story.

Threats:

- Although food supplements are increasingly popular, this is a rather small product category compared to other food supplements used for other indication areas. As such, this use of desmodium may become saturated in the future.
- Processing desmodium leaves into an extract is deemed beyond the scope of SMEs.

### Business and sustainability needs of SME producers

Business needs:

- For use in food supplements, producers need to identify and document the exact species and its relation to European standards through herbarium vouchers confirmed by competent authorities. Likewise, producers need to carry out a chemical analysis determine the product's chemical properties. This is important because several *Desmodium* species grow in West Africa (e.g. *Desmodium repandum*), which are not allowed for use in food supplements. *D. gangeticum*, alternatively, is allowed.



- A feasibility research based on SME/community capacities is needed to determine whether they can extract desmodium leaves themselves in the future. Alternatively, partnerships with processors in the region may be an option.
- Producers need to develop marketing stories to position the product on the European market. The long tradition of use for liver support, benefits to the local communities and high antioxidant activities can contribute to this marketing story.
- SME producers of desmodium should determine their possibility to obtain organic certification of their products to enter the European market. This can add to the marketing story; various existing food supplements already have this certification in place.
- Producers should link up with European companies which can facilitate the process to develop new food supplements based on the antioxidant activities of desmodium. This can be built on the detoxing properties of desmodium.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### Sustainability needs:

Currently, there are no sustainability issues for desmodium. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

### INDIGOFERA ARRECTA

**The extract of Natal indigo has a range of interesting applications. In Europe, most opportunities can be found in the textile industry, as a natural dye. Natural dyes follow a general industry trend for sustainability and provide an alternative to synthetic products. However, the indigo dye still commands very low trade volumes and caters for a very specific niche market.**

#### Product definition

*Indigofera arrecta* (common names: Bengal indigo, Java indigo, Natal indigo) is a large shrub up to 3 m tall with 2-2.5 cm long straight pods containing 6-8 seeds. Natal indigo is native to East and southern Africa, but it has also been introduced in Laos, Vietnam, the Philippines and Indonesia. It is usually grown for cover crops and green manure, but also used as an ornamental shrub. It is a chief source of blue dye as well. Other species commonly used to obtain the indigo dye are *Indigofera tinctoria* (true indigo) and *Indigofera suffruticosa* (añil).

The indigo dye is obtained from the indigo leaves through a long extraction process involving a series of tanks whereby a thick paste is obtained. When dried, this paste is made into cakes, which subsequently result into a powdered extract.

India and El Salvador are the largest producers of natural indigo dye worldwide. Currently, India does not trade significant quantities of indigo on the international market, since its enormous domestic market absorbs the existing production. India's domestic demand for indigo dye is essentially shaped by its cosmetic use as hair dye and tattooing.

Production of natural indigo dye in Europe derived from plant sources of the genus *Indigofera* does not exist. The very small-scale production of indigo is derived from species such as woad (*Isatis tinctoria* L., *Brassicaceae*) which, however, is not produced on a commercial scale and does not offer competition to indigo.

#### Segments

#### Distribution of wild *Indigofera arrecta* in Africa



Source: PROTA

#### *Indigofera arrecta* shrub



Source: Flora of Zimbabwe



The most promising segment for Natal indigo within the EU lies in the textile sector, where natural dyes are experiencing increasing demand.

Generally, the large-scale production of (chemically-identical) synthetic indigo created a much cheaper alternative for the industry. Natural indigo requires a large quantity of raw material, as its pigment content is fairly low when compared to the synthetic equivalent. In addition, the results achieved by synthetic indigo dye are more consistent and reliable. Natural indigo dye is known to bleed and fade with time.

However, synthetic dyes are subject to increasingly stricter legislation in the EU, especially since the enactment of REACH in 2007. Legislative scrutiny has also led to a ban on different vat and azo dyes in Europe.

Within the cosmetics industry, natural indigo dye has the potential application as a hair dye. However, large cosmetic companies have mostly switched back to synthetic alternatives. Henna is by far the main competing product as a natural alternative. *Indigofera arrecta* is not registered under [CosIng](#), but the leaves and leaf extracts of *Indigofera tinctoria* are registered for uses in masking, toning and skin conditioning.

Within the food industry, Indigotin (E 132) was recently assessed by the European Food Safety Authority (EFSA) as part of the re-evaluation of food additives. The full *Scientific Opinion on the re-evaluation of Indigo Carmine (E 132) as a food additive* can be found on the [EFSA website](#). However, the use of Natal indigo dye as a food colouring remains unclear under the EU legislation, and does not present any immediate prospects.

In a different traditional application, Natal indigo leaves are used in traditional medicines for epilepsy and nervous disorders and to heal sores and ulcers. Although the use of *Indigofera arrecta* in health products is not authorised in the EU, the leaves of *Indigofera tinctoria* are registered for use in food supplements in a number of EU countries (e.g. it integrates the BELFRIT list).

### **Trends**

- Consumers are increasingly aware of the potential environmental and health hazards caused by synthetic dyes. In this manner, natural dyes gain attention by offering a safe choice for both the cosmetics and textile industries. In addition, synthetic dyes are subject to increasingly stricter legislation in the EU, especially since the enactment of REACH in 2007.
- Natural dyes accompany a general industry trend for sustainability. The increasing popularity of eco-textiles (e.g. derived from organic cotton), for instance, provides room for expanding initiatives in this respect.

### **EU demand**

The bulk of the trade in colours, pigments and dyes is controlled by big multinational companies, but natural indigo caters for very specialised markets commanding low trade volumes. In the EU market, general ingredient importers such as [Roeper](#) and [Galke](#) are some of the largest traders of indigo dye. However, the specific species offered by these companies is *Indigofera tinctoria*, commonly sourced in India or El Salvador. The indigo dye is mostly used in textile products, most remarkably in jeans, such as in the case of UK company [Monkee Genes](#).

### **Opportunities and threats**

#### Opportunities:

- The awareness of consumers concerning the potential environmental and health hazards caused by synthetic dyes might lead to a growing market demand for natural alternatives such as (Natal) indigo dye in the textile and cosmetics industries.
- The expanding market for sustainable products, such as in the case of organic textiles, provides opportunities for natural dyes. For indigo dye, specifically, companies producing jeans products could provide interesting prospects.

#### Threats:

- Synthetic indigo dye is still considered to be a relatively cheap and effective alternative for the textile industry.
- Natural indigo dye has been mostly reduced to artisanal applications and command very low trade volumes.
- While there is increasing interest for natural ingredients in the cosmetics sector, natural colours remain very costly to cosmetic companies.
- The shortage of natural indigo dye in the market, combined with the anticipated increase in the demand for this raw material, creates an important need for higher production.
- The most common indigo dyes available in the EU market correspond to the (cultivated) species *Indigofera tinctoria*, which represents a great threat to wild-collected *Indigofera arrecta*.

### **Business and sustainability needs of SME producers**

#### Business needs:

- SME producers need to determine whether they currently have the capacity to extract the indigo dye appropriately, or whether they can manage to install such capacities in the future. If this is not feasible, partnerships with processors and exporters in the region could be an option.
- Producers need to develop marketing stories to help position the product on the European market. In order to compete with cultivated species of indigo, the origin and wild-collection aspects of *Indigofera arrecta* must be emphasized.
- Producers should link up with ingredient traders in Europe to facilitate the contact with innovative textile companies which apply natural dyes in their products.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### Sustainability needs:

Currently, there are no sustainability issues for natal indigo. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

### **KHAYA SENEGALENSIS**

**Dry-zone mahogany is used heavily, mostly as timber. Recently, the tree's bark and wood extract are finding increasing use in the European cosmetics industry. However, the tree's over-exploitation in the wild calls for sustainable resource management and harvest practices, building on a business case of using the wild-collected bark and wood. Certifications, such as FairWild, can help to achieve and valorise such practices.**

#### **Product definition**

*Khaya senegalensis*, commonly known as dry-zone or African mahogany, is a medium-sized tree which can grow up to 15-30m high. It is native to Western Africa. It grows in the wild, in regions spreading from Senegal to Sudan and Uganda. It is also widely cultivated all around the world, to meet increased demand for timber. In fact, plantations of dry-zone mahogany are found in Australia, Cuba, India, Indonesia, Puerto Rico, Singapore, South Africa and Vietnam.

#### **Dry-zone mahogany**



Source: Prota4u

Sustainability issues are widespread and are caused by the tree's over-exploitation in the wild for its use as timber. Logging is largely uncontrolled and local harvest practices are hurting wild populations and remain poorly monitored. Therefore, it is classified as vulnerable on the [IUCN Red List for Threatened Species](#); wild populations have decreased by over 20% over the past three generations. To safeguard wild availability, overexploitation needs to be addressed. Sustainable harvesting of the tree's bark is possible, without destroying the tree. Dry-zone mahogany has a wound recovery rate of 10cm<sup>2</sup> per year, causing a relatively quick regeneration of the bark (Delvaux, 2009).

The tree's bark has been found to have anti-inflammatory properties, which is why dry-zone mahogany was traditionally used in Africa against fever. Additionally, polyphenols isolated from the tree's bark show

high antioxidant activity. The extract is obtained from the tree's bark and wood with solvent extraction. Finally, the tree's seeds are rich in omega-9 fatty acids (66%) and their properties are being researched, especially for potential use in the cosmetics sector (MacDonald Idu, 2014).

### **Segments**

In Europe, dry-zone mahogany wood and bark extracts are registered for applications in the cosmetics sector. They are registered as '*Khaya senegalensis* wood extract' with skin conditioning properties and '*Khaya senegalensis* bark extract' with skin protective properties. Research is being conducted regarding the potential use of the seed oil in the cosmetics sector.

Dry-zone mahogany is not allowed for use in the European market for herbal medicine and food supplements.

### **Trends**

- Consumers are increasingly concerned about traceability and sustainability of botanicals, particularly for those produced in Africa and in areas which are considered vulnerable, such as the Sahel zone. Dry-zone mahogany fits this picture well. This development is increasing the demand for ethically and sustainably-produced / harvested wild collected products.
- Antioxidants, such as those found in dry mahogany extract, are increasingly used in cosmetic products that combat (the signs of) aging.
- Wild collected, sustainably sourced dry-zone mahogany bark can be an important selling point when it comes to the cosmetics sector.

### **EU demand**

Dry-zone mahogany is exported to Europe as dried and/or powdered wood and bark. Here, the extract is produced to be used in the European cosmetics market. The extract is not yet widely used in European cosmetics. A company that already uses the extracts in its products is [Laboratoires Séro biologiques](#).

### **Opportunities and threats**

Opportunities:

- Local value addition for wild-collected bark from the dry-zone mahogany can be enhanced in terms of organic and FairWild certification.
- Sustainably harvested bark from the wild can contribute to the tree's protection. When well-marketed, such a promotional story will attract consumers who are concerned with sustainability issues and are interested in the preservation of local livelihoods.
- There is potential for the use of the seed's oil in the European cosmetics sector.

Threats:

- Cultivation of dry-zone mahogany is widespread and, therefore, competition between cultivated and species grown in the wild will be great.
- Producing wood and bark extracts is often beyond the scope of most SME producers in Sub-Saharan Africa.
- The tree's over-exploitation can be a threat towards securing a sustainable, stable supply of bark and wood for use in cosmetics.

### **Business and sustainability needs of SME producers**

Business needs:

- Building a strong marketing story can help position the product on the market. Since the dry-zone mahogany is widely cultivated, promoting sustainability and income generating aspects of its wild collection can help to position the product in the market next to raw materials derived from plantation systems. Sustainably harvested bark from the dry-zone mahogany can be a very important marketing aspect.
- SME producers should link up with European cosmetics ingredients traders and processors to investigate the potential use of the tree's seeds in the cosmetics sector. An assignment of an INCI (International Nomenclature for Cosmetic Ingredients) name for the seed's oil is a first condition for its use in the European market for cosmetics.

- For exporters of wild-collected dry-mahogany wood and bark, it is recommended to target European buyers and cosmetics manufacturers which will offer price premiums for wild collected products.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### Sustainability needs:

- Sustainability is a main issue for dry-zone mahogany: overexploitation needs to be addressed, in order to safeguard supplies of wild-collected bark and wood. Sustainable harvesting of the tree's bark and establishing marketing channels is essential to protect and valorise the species. Resource mapping and management is needed to ensure sustainable wild-collection according to GACP standard. The FairWild standard is a certifiable process to achieve this.
- SME producers need to determine their potential to obtain FairWild and/or organic certification to help to support the credibility of sustainability schemes to buyers.

### PARKIA BIGLOBOSA

**The seeds from the African locust bean could have potential to be the new superfood in Europe. They contain a wide range of nutrients and a high level of antioxidant activities. However, before the seeds can be marketed in Europe, they need to be registered under Novel Food, which is costly. In cosmetics, its extract can be used as a thickener or for skin protection.**

#### Product definition

The African locust bean tree (*Parkia biglobosa*) grows in West and Central Africa, in an area that stretches from Senegal eastwards to southern Sudan and northern Uganda. The trees are commonly found throughout Africa's Sahel zone and also grows in national parklands. The tree is common (Komolafe et al., 2013) and current harvesting levels are sustainable, indicating that future supplies should remain stable. The seeds of the tree are used, rather than detrimental harvest of bark or wood, which could lead to sustainability issues.

***Parkia biglobosa* pods and leaves**



Source: World

Locally, African locust bean seeds are used as a famine food and the seed pods as animal fodder. They are also well-known as a local dietary supplement. The seeds are rich in polysaccharides, proteins, vitamin C, minerals and amino acids. Research has indicated that the seeds are a good source of most essential amino acids (Hassan and Umar, 2005).

#### Segments

Currently, African locust bean products are not allowed for use in food (supplements) and herbal medicine. However, because of their composition, it is expected that the seeds may have a potential in food supplements, once Novel Food registration is cleared. Within food, the seeds have potential as a new superfood. For this use, a concentrated extract of the seeds needs to be produced.

In cosmetics, the ingredient *Parkia biglobosa* oligosaccharides is registered, for skin protecting properties. This is the carbohydrate fraction which is isolated from the whole plant. Current use in cosmetics is limited, but because of the polysaccharides content of the seeds, the extract has potential as a thickener in skin care products.

#### Trends

- In food products, as well as in food supplements, superfoods are increasingly popular. These food products have a high content of essential nutrients and antioxidant activities.
- Cosmetic producers are looking for ways to differentiate their products on the market, amongst others in terms of specific marketing stories.

#### EU demand

Currently, products of African locust bean tree are not common in international trade. However, there is a sizeable trade within Western Africa, especially regarding the seeds. Additionally, several research

studies have been done on the properties and potential applications of African locust bean products, showing interesting results for the tree and its derivatives. Among others, these studies determined immune-modulating properties; antibacterial, analgesic and anti-inflammatory activities; and even protection from cardio oxicity (Komolafe et al., 2013).

### **Opportunities and threats**

#### Opportunities:

- Future availability of African locust bean is estimated to be stable.
- African locust bean seeds have potential as a new superfood if a European company is willing to go through the Novel Food registration.
- There is a potential for African locust bean seeds in cosmetics, for use as a thickener.

#### Threats:

- Producing concentrated seed extracts is often beyond the scope of most SME producers in Sub-Saharan Africa.
- In Europe, current allowed uses of African locust bean products are limited, which may hamper interest from EU buyers.
- Currently, African locust bean seeds (other than the oligosaccharides) are not registered for use in cosmetics. To achieve this, SME producers would need to find a European company interested to register it as such. To be used in cosmetics, the seeds would first need to be registered, requiring substantial investments in product development and (safety, efficacy) testing.

### **Business and sustainability needs of SME producers**

#### Business needs:

- Before the African locust bean can be used in food (supplements) on the European market, it needs to be registered as a Novel Food. For this registration, elaborate safety testing is required. Organising different producers and linking up with EU companies could facilitate this process for Novel Food registration. EU companies are needed, as registration is beyond the scope of SME producers/communities.
- For use as a thickener in cosmetics, SME producers should link up with European cosmetics ingredients traders and processors to investigate the potential use of the tree's seeds in the cosmetics sector. For the seeds, producers must apply for an INCI (International Nomenclature for Cosmetic Ingredients) name at the [Personal Care Products Council](#), which is a first condition for its use in the European market for cosmetics.
- As African locust bean seeds are new to the European market, SME producers need to make use of a marketing story to position these products. Elements of this marketing story include the seeds' nutrient content and antioxidant activities; use and popularity on the local African markets; and the process of wild-collection. However, nutritional and health claims which cannot be substantiated should not be made.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### Sustainability needs:

Currently, there are no sustainability issues for African locust bean. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

### **PILIOSTIGMA THONNINGII**

**Camel's foot is not yet used in the European market, but traditionally, its stems, bark, leaves and pods find several applications in Western and Central Africa. Potential for entering the European market can be found in the segment for cosmetics, since the tree's pods are used regionally as soap substitute. To make it an attractive case for cosmetic buyers, much attention needs to be given to a strong marketing story.**

**Camel's foot tree**



Source: [plantzafrica.com](http://plantzafrica.com)



**Product definition**

The camel's foot tree (*Piliostigma thonningii*), can reach up to 6 m high and is common in open woodland and wooded grasslands. It is native to African countries as diverse as Botswana, Kenya, Namibia, Senegal and South Africa. The tree has also been cultivated, but only in the regions where it already grows in the wild.

Camel's foot plays an important role in sustaining regional biodiversity, and is used for nitrogen fixing. This makes it suitable for intercropping with other crops, such as maize. Its deep roots have access to subsoil nutrients which assists in the soil's regeneration. At the same time, the tree can be used in soil protection initiatives, with its roots working against soil erosion.

Many parts of the tree are used extensively; the leaves, fruit and seeds are edible and are chewed to relieve thirst; the bark provides dyes; and unripe pods are used as a substitute for soap. Finally, it is used as firewood, while it provides shade in the savannah woodland areas.

The tree's root bark has also been used in traditional medicine, for treating a variety of diseases such as ulcers, and gastric and heart pains. In Zimbabwe and Tanzania, a cough remedy is prepared from the tree's root bark which contains polyphenolic fractions. The camel's foot seed has been found to contain antioxidant micronutrients, saponins, flavonoids and phenolics.

**Camel's foot pods**

Source: *prota4u*

**Segments**

Camel's foot is not yet used in Europe. However, some of its traditional uses have potential for the European market. Such an example are the tree's pods which are used for soap making. Traditional soap making could potentially provide a niche within the cosmetics segment.

Research has shown that camel's foot seeds, leaves and bark have anti-viral and anti-bacterial properties. In 1994, the extraction of the bark of the root, trunk and leaves and the use of their extract in medicinal preparations, was patented, but this patent has lapsed. Today, there is little potential for the use the camel's foot tree in herbal medicine. Neither is camel foot allowed as a food supplement nor as a food ingredient.

**Trends**

- In Europe, there is an increasing consumer interest for natural ingredients in cosmetics, while the global natural cosmetics sector is estimated to grow by 5-9% annually.
- The popularity of traditional craftsmanship is increasing in Europe. Traditional products, with a simple, artisan character, are growing in popularity among consumers. Particularly for cosmetics, traditional manufacturing techniques give a more natural and personal character to the product.

**EU demand**

Camel's foot is not consumed yet in the European market. However, there is potential for the tree's pods in the cosmetics industry. Traditional soap-making is possible in the country of origin, so the export to Europe of an end product, offers significant value-addition opportunities.

**Opportunities and threats**

Opportunities:

- Processing the camel's foot pods into soap will create value-addition opportunities.
- The growing interest in ethically sourced and sustainable products offers an opportunity for local value addition in terms of organic and FairWild certification, especially for cosmetics.

Threats:

- There is limited potential for the use of camel's foot in the European market.
- The use of camel's foot is not allowed yet in the European market, in any segment. This will make it harder for exporters to establish access, especially in food and health markets with their relatively high entry barriers.



## Business and sustainability needs of SME producers

### Business needs:

- As a first step to export the product as a cosmetic ingredient to Europe, producers must apply for an INCI (International Nomenclature for Cosmetics Ingredients) name at the [Personal Care Products Council](#).
- For use in cosmetics, SME producers should link up with European cosmetics ingredients traders and processors to investigate the potential use of the tree's seeds in the cosmetics sector. Partnerships with processors and ingredient traders in Europe can also help to do the necessary tests for registration and continue with product development.

An overview of business recommendations and support needs is provided at the end of this chapter.

### Sustainability needs:

Currently, there are no sustainability issues for Camel's foot. When the tree is continually harvested sustainably, it can contribute to the enhancement of biodiversity and sustainability since it can be used against soil erosion and for intercropping. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

## PTEROCARPUS ERINACEUS

***Pterocarpus erinaceus* is a tree growing in West Africa. As a popular source of timber, it is over-exploited, both for local and for Asian markets. Its non-timber products, resin and bark, have potential on the European market. The resin can be used in food supplements, where it can be marketed as an ingredient for immune support products. Also, while not yet registered as a cosmetic ingredient, the tree bark has been shown to have antioxidant and anti-inflammatory activity, for which there can be a potential in cosmetics.**

### Product definition

*Pterocarpus erinaceus* is a tree that is native to West Africa. It is commonly found in open forests and woody savannahs. It grows widespread in an area that ranges from Senegal in the west, up to the Central African Republic in the east. It has many common names, including Senegal or African rosewood, vene, madobia and kino. In traditional African medicine, the tree is used to treat or alleviate tooth and mouth conditions (bark), diarrhoea and dysentery (bark and resin) and coughs (roots).

The tree faces sustainability issues as it is over-harvested for its use as timber. The extent to which the tree is endangered is unclear; research suggest it is endangered in Benin but that it still grows abundantly in other West African countries (Swier, 2012).

*P. erinaceus* is used as a substitute of 'real' rosewood (*Aniba rosaeodora*), which is listed on CITES. Wood of the tree is used locally and is also particularly popular among Asian buyers. However, because the tree grows relatively fast and can be cultivated, it is also used in reforestation projects. Commercial cultivation of the tree is not extensive and most harvesting still stems from wild sources.

The use of the tree's resin is allowed in Europe. Additionally, other parts of the tree have been researched to determine their properties, particularly the stem bark. Research identified that stem bark extracts have antimicrobial activities (Gabriel and Onigbanjo, 2010) as well as anti-inflammatory, analgesic and anti-oxidant activities (Noufou et al., 2012; Ouédraogo et al., 2011).

### Wild distribution *Pterocarpus erinaceus*



Source: Prota4u

### *Pterocarpus erinaceus*



Source: Wikipedia

After the bark is harvested, the bark can regenerate, indicating a potential for sustainable harvest of the bark (Delvaux, 2009). What's more, research has indicated that, when cut down in the right way (for timber), new trees grow from the remaining trunk (coppicing). This can be used in the tree's management, to secure future supplies.

### **Segments**

Currently, the resin of *P. erinaceus* is allowed for use in food supplements in Europe, where it can be marketed as supporting the immune system.

*P. erinaceus* is not allowed for use in (herbal) medicine, nor is it registered for use in cosmetics.

### **Trends**

- Consumers are increasingly concerned about traceability and sustainability of botanicals, especially for those that are produced in Africa and from areas which are considered vulnerable, such as the Sahel zone. *P. erinaceus* fits this picture well. This is increasing the demand for ethically and sustainably-produced / harvested wild-collected products.
- Food supplements which help improve the immune system are increasingly popular to prevent illnesses and to ensure general health and well-being. This is further supported by Europe's aging population and rising health care costs. Increasing awareness of the link between the immune system and stress, energy and sleep supports year-round consumption, instead of during Europe's flu season.

### **EU demand**

Current European demand for *P. erinaceus* resin is small. However, if SME producers can position the resin as a sustainably managed and harvested product from the wild tree, there may be an interest from companies who can use this in their marketing.

Research has shown the existence of antioxidant and anti-inflammatory properties of the bark extract, which can be of interest in the cosmetics industry.

### **Opportunities and threats**

Opportunities:

- By valorising and sustainably harvesting the resin or bark of *P. erinaceus*, instead of using the wood as timber, SME producers can ensure the tree's future availability and maintain it as part of Western Africa's biodiversity. Additionally, other techniques, such as coppicing, can add to sustainable management of the tree. Certifications, such as FairWild, can help support attempts towards sustainable management.
- The resin of *P. erinaceus* can be marketed in food supplements towards supporting immune health.
- *P. erinaceus* bark extract has demonstrated interesting properties which may have potential in cosmetics. The tree has also been included in several patents, as self-tanning ingredient for artificially colouring of the skin. This indicates an interest in the tree and its derivatives. For use in this segment, this extract, or other tree parts used, would need to be registered first.

Threats:

- Producing bark extracts is often beyond the scope of most SME producers in Sub-Saharan Africa.
- Currently, bark extracts are not registered for use in cosmetics. To be used in cosmetics, the extract would first need to be registered requiring substantial investments in product development and (safety, efficacy) testing. To achieve this, SME producers would need to find a European company interested to do the registration process.

### **Business and sustainability needs of SME producers**

Business needs:

- SME producers are recommended to cooperate with EU companies to register the tree's bark extract for use in cosmetics.
- SME producers need to promote protection of wild trees through habitat protection and coppicing techniques as a sustainable harvest method.
- Working together with EU companies can help to register *P. erinaceus* bark extract for use in cosmetics. In order to spark an interest, SME producers can use the researched properties of this product, such as its antioxidant and anti-inflammatory activities.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### Sustainability needs:

- Sustainability is a main issue for *P. erinaceus*: overexploitation needs to be addressed, in order to safeguard supplies of wild-collected bark. Sustainable harvesting of the tree's bark and establishing marketing channels is essential to protect and valorise the species. Resource mapping and management is needed to ensure sustainable wild-collection according to GACP standard. The FairWild standard is a certifiable process to achieve this.
- SME producers need to determine their potential to obtain FairWild and/or organic certification to help support the credibility of sustainability schemes to buyers.

### ROSMARINUS OFFICINALIS

**Rosemary is a popular ingredient in the food, health and cosmetic segments. Wild-collected rosemary from Algeria and the Palestinian Territory offers two interesting products with potential on the European market: dried leaves and essential oil. Producers of dried rosemary can add value with certifications, whereas producers with sufficient capacities can add value by producing high-quality rosemary oil or even rosemary extract. A good marketing story on wild collection is important for dried rosemary and rosemary oil used in cosmetics.**

#### Product definition

*Rosmarinus officinalis*, commonly known as rosemary, is an herb native to the Mediterranean region, including Algeria and, to a lesser degree, the Palestinian Territory. In the latter region, the plant is wild-collected. Rosemary can be sold as a fresh or dried herb, whereas the essential oil can be extracted from the fresh flowering tops and twigs by steam distillation. The most effective time for collection of the tops is the flowering period, when flavonoids content is high, which have antioxidant activities. The main components of rosemary oil are eucalyptol,  $\alpha$ -Pinene and Camphor. The exact composition of rosemary oil varies per variety and habitat. Solvent extraction of rosemary yields the rosemary extract, which is used for its antioxidant activities.

**Flowering rosemary**



Source: Medical News

#### Segments

Rosemary is used in food, health and cosmetic segments. In the food segment, both the dried leaves (home cooking) and rosemary derivatives (food industry) are used. In the food industry, rosemary oil is used in flavourings for products such as meat and fish, baked goods, soups, packaged foods and beverages. In confectionary, meat and fish products, rosemary oil is also used as a preservative due to its high antioxidant content. Rosemary extract can be used as a food preservative as well, which has a formal "E number" (E392), indicating that it can be used as a food additive in the EU.

As a health product, rosemary can be used in herbal medicine and food supplements. The leaf extract is used internally to treat gastrointestinal problems and externally (as a bath additive and topical) to help relief muscular, articular and joint pain as well as to support peripheral circulation and help relief minor circulatory disorders.

The main uses of rosemary derivatives (oil and extract) are as fragrance, antioxidant and skin conditioning agent. Hence, rosemary derivatives are used in numerous cosmetic products. Examples include perfumes, skin and hair care products, soap and hand, face and body wash. Additionally, rosemary oil is used in aromatherapy, to improve memory and cognitive function.

#### Trends

- Raw materials are increasingly processed into extracts or oils in the country of origin, but quality (e.g. purity) and quality consistency remains a bottleneck.
- There is a strong interest for active and functional ingredients for the growing natural cosmetics market.

- The popularity of natural ingredients in food products is rising. Dried herbs and essential oils are used as flavourings to replace salt.
- Due to the increase in European consumers' dietary requirements and awareness of food, there is an increased demand for health food. As such, consumers are including healthier items to their food intake in order to achieve a more balanced diet.
- There is an increased consumer awareness for and interest in antioxidants in food products. Antioxidants, such as rosemary extract, can be used to substitute synthetic preservatives, which is particularly relevant in organic food segments, such as organic.
- There is a rising trend for natural and healthy food supplements. This is the result of a combination of an aging population, an increased awareness of health and prevention of illnesses and a growing belief that botanical supplements are healthier and safer options for long-term use than synthetic alternatives.
- For dried rosemary and rosemary oil used in aromatherapy, there is a growing interest in ethically and sustainably sourced rosemary. In particular, there is an increased interest in organic certification.

### **EU demand**

As rosemary has an established product on the European market, many companies use it in their products. Examples include:

- Ingredients for cosmetics, herbal medicine and food: e.g. [Martin Bauer](#), [Naturex](#), [Flavex](#)
- Cosmetics: e.g. [Lush](#), [Neal's Yard Remedies](#), [Rituals](#), [Weleda](#)
- Food supplements: e.g. [Medicura AG](#),
- Aromatherapy: e.g. [Primavera](#), [Docteur Valnet](#)

### **Opportunities and threats**

Opportunities:

- Instead of focusing solely on the mainstream market for fresh/dried rosemary, producers of rosemary have good opportunities on markets for value-added products as well. Options include FairWild and/or organic certifications for dried rosemary and further processing into oil or extract, if quality can be assured.
- For wild-collected rosemary, it can be relatively easy to obtain organic certification, as the plants are isolated from chemical pollution. This may vary per region, as in some areas populations may be contaminated by aerial spraying (insecticides).
- Rosemary can be used as a substitute for synthetic food preservatives, which is relevant for organic food.

Threats:

- For rosemary oil, adulteration is a major issue; natural adulterants that are used include eucalyptus or camphor oil or fractions of these oils (e.g. linalool or camphor).
- Solvent extraction of rosemary, relevant for use in as antioxidant, is often beyond the scope of SME producers.
- There are several competing sources of both wild-collected (Morocco and Tunisia) and cultivated (Southern Europe) rosemary.

### **Recommendations when supporting the rosemary chain**

Business needs:

Cultivated rosemary has an established market in Europe. For producers of rosemary oil and leaves, the focus is on the production (rosemary oil/extract) and marketing (dried leaves) of the wild collected herb.

- A feasibility study based on SME/community capacities is needed to shed light into where producers can compete (food, cosmetics or pharmaceuticals) and whether they could export themselves or should be linked to exporters. As requirements on product quality standards are lower for cosmetic ingredients, it might be more feasible to initially target cosmetic ingredient buyers.
- SME producers need to determine their current or potential capacity of distillation of rosemary, as well as solvent extraction. If these processing steps are not feasible, partnerships with processors and exporters in the region could be an option.
- For use in aromatherapy, food supplements and herbal medicine, producers need to identify and document the exact species and its relation to European standards (e.g. compared to Pharmacopeia etc.) through herbarium vouchers confirmed by competent authorities. Likewise, producers need to

carry out a chemical analysis of their rosemary oil or extract to determine the product's chemical properties.

- Producers need to ensure that they supply unadulterated, high-quality rosemary oil. According to industry sources, buyers are willing to pay a higher price if they can be guaranteed that rosemary oil is unadulterated. This needs to be verified by testing of the oil.
- Mostly for dried rosemary, producers should determine their potential to obtain FairWild and/or organic certification. Some consumers consider such certified ingredients to be of a higher quality than non-certified rosemary. SME producers can benefit from this perception, if costs of certification can be kept low. These certifications can also add to the marketing story of dried rosemary leaves (culinary herb). They can also add to the marketing story of rosemary oil/extracts for use in cosmetics, if quality of these products can be safeguarded.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### Sustainability needs:

Currently, there are no sustainability issues for rosemary. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

### **TAGETES MINUTA**

**Tagetes oil, distilled from the plant *Tagetes minuta*, has a unique chemical profile, which has potential in the flavour and fragrance industry. Though the oil has a small total market, compared to other essential oils, there are insufficient supplies on the European market. Producers need to ensure a high quality oil, which also fetch much higher prices on the market than those of low quality.**

#### **Product definition**

*Tagetes minuta*, also known as Southern Cone Marigold, is a marigold plant with small flowers. Native to Latin America, the plant has been introduced to many other parts of the world. In most of Africa, it grows as a weed. Tagetes is both cultivated and collected from the wild.

With distillation, an essential oil is obtained from the stems, leaves and/or flowers of tagetes. Composition of this oil depends on the part of the plant used and the extraction method itself. Good quality tagetes oil contains cis-beta-ocimene (40-55%), cis-tagetenone and trans tagetenone (10-30%), dihydrotagetone (5-20%), cis-tagetone and trans tagetone (5-20%) and limonene (3-9%). The oil contains antimicrobial and antifungal agents which act as preservatives.

The main producers of tagetes oil are India, Zimbabwe, France, Argentina and China, with decreasing production in South Africa and Egypt. Of these, South Africa produces a high-quality oil, whereas oils from India and China are of relatively low quality. As the cultivation and harvesting of the delicate tagetes flowers is too expensive, European production of the tagetes plant is negligible.

***Tagetes minuta***



Source: Africa museum

#### **Segments**

Tagetes oil can be used in food, food supplements and cosmetics. Of these three segments, the oil has the most potential in the cosmetics segment, where it is used as a fragrance. Two derivatives of tagetes are registered for use in cosmetics: *Tagetes minuta* flower extract, with perfuming properties, and *Tagetes minuta* flower oil, which also has masking and skin conditioning properties. This oil is used in perfumery and in high end (natural) cosmetic products, as a fragrance.

In the food industry, tagetes oil is used as a flavouring, in high value products. Here, tagetes oil with a high tagetone content (20%) fetch the highest prices. End products that the oil is used in vary from alcoholic beverages and soft drinks to frozen desserts. Tagetes oil gives an apple and banana flavour to these products and serves as a preservative.



Compared to the two segments mentioned above, use of tagetes in food supplements is limited. The plant and its derivatives are not allowed for use in herbal medicine.

### **Trends**

- Current supplies of tagetes oil are insufficient to meet European market demand.
- European food manufacturers aim to distinguish their products from the bulk of the market and are under pressure to use more complex or unique flavours, such as *Tagetes minuta*.
- The global fragrance industry is interested in natural products to replace synthetic ingredients, but quality consistency, sufficient supplies, stability, and user friendliness need to be assured.
- In Europe, there is an increasing consumer interest for natural ingredients in cosmetics, the global natural cosmetics sector is estimated to grow by 5-9% annually.

### **EU demand**

According to industry sources, there is a significant interest in tagetes oil in Europe; importers are having difficulty to source sufficient volumes. Global demand for tagetes oil, for all applications, is estimated to be over 12 tonnes annually. Demand for the European flavouring industry is small, around a few tonnes, as most demand is for use as a fragrance. France is considered the largest European importer of tagetes oil. In Europe, tagetes oil is generally standardised by flavour and fragrance manufacturers, such as [Robertet](#), before selling it, by blending oils. Cosmetic companies, such as [Lush](#), use tagetes oil as a fragrance and preservative in low-preservative cosmetics.

In terms of prices on the European market, high quality tagetes oil can fetch FOB prices of € 150-190 per kg. Low quality oil, such as tagetes oil from India, are much lower: between € 70 and 80 per kg.

### **Opportunities and threats**

Opportunities:

- There is an insufficient supply of tagetes oil on the European market.
- Tagetes oil has a unique composition and is difficult to replace in existing products.
- No synthetic substitutes are available for tagetes oil.
- Collection and distillation of the tagetes plant are not very complicated.
- Because tagetes oil has antimicrobial and antifungal properties, it can act as a preservative in cosmetic and food products. This aspect has a particular use in the growing segment of natural cosmetics.

Threats:

- European companies prefer tagetes oil of a consistent quality, which may be difficult to achieve with wild-collection.
- European trade in tagetes oil is concentrated, with very few buyers controlling most of the market. It follows that their negotiating power is strong.

### **Business and sustainability needs of SME producers**

Business needs:

- Producers need to identify, verify and document the exact species of tagetes that they collect. Alongside *Tagetes minuta*, *T. erecta* also grows in Africa, which is mostly used as a food colourant.
- SME producers need to determine their current or potential future capacity of distillation of tagetes, to obtain a sufficient quality of tagetes oil. Partnerships with processors in the region could be an option, also if distillation is not feasible.
- Producers need to determine whether they can offer a good quality tagetes oil. Especially for reaching the European market, this is essential. Particularly for new exporters, it is essential that they document the oil's composition. Prices for high quality oil are also much higher than for low quality oil.
- To enter the market as a new supplier, producers have two options. They can target existing importers who have insufficient supplies for their products, or they can target new buyers. For the former, special focus needs to be on assuring a consistent quality of tagetes oil. For the latter, producers should focus on the unique qualities of tagetes oil: their exclusive fragrance and their additional potential as a preservative for use in natural cosmetics.
- Suppliers should have a certificate of analysis and specifications available upon request.
- To compete with tagetes oil from cultivated sources, producers need to develop a marketing story, which can help to position their product on the European market. Elements that can add to the



marketing story are the story of wild-collection, including the benefits to local communities, and the origin of the plant.

- Certifications (organic or FairWild) are not in very high demand for tagetes oil, as the oil's quality and unique composition are of most importance. SME producers need to discuss their options for certifications with (prospective) buyers before committing to a specific standard.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### Sustainability needs:

Currently, there are no sustainability issues for tagetes. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

### THYMUS VULGARIS

**Wild-collected thyme from Algeria and the Palestinian Territory offers two interesting products with potential on the European market: dried leaves and essential oil. Producers of dried thyme can add value through certifications, whereas producers who have sufficient capacities to safeguard quality of thyme oil, can add value by producing thyme derivatives.**

#### Product definition

*Thymus vulgaris* (thyme) is a species from the mint family, native to the Mediterranean region. In the Palestinian Territory and Algeria, other (local) varieties are also present, which are often interchangeably called 'thyme'. Examples include *Thymus bovei* (Palestinian Territory), *T. serpyllum* (Eastern Mediterranean region) and *T. saturejoides* (North Africa). Thyme is a bushy, woody evergreen subshrub, with grey-green leaves and purple or pink flowers in early summer. Thyme is also cultivated in various European countries, but wild-collection still offers sufficient opportunities for local communities in the Palestinian Territory and Algeria, where wild populations of thyme are abundantly available. According to the [IUCN Red List](#), the global wild population of *T. vulgaris* is of Least Concern, because of its wide distribution, stable populations and as there are no major threats. Some thyme species were assessed as vulnerable, mostly because these have a restricted distribution (commonly Spain or Portugal).

**Flowering thyme**



Source: Prota4u

One of the main active ingredients in thyme oil is thymol, which has anti-bacterial properties as well as an expectorant effect. Other flavonoids include luteolin, apigenin, thymonin and naringenin, which are antioxidants. The exact composition of thyme oil may differ per region. Thyme essential oil is extracted using steam distillation. For this use, the leaves should be harvested just before they flower.

#### Segments

In Europe, dried thyme leaves and essential oil can be used in food, health and cosmetic segments. Dried thyme leaves are predominantly used in cooking. The main use for thyme oil is in aromatherapy. Here, its uses are in increasing focus and concentration, cough, colds and asthma, to treat symptoms of rheumatism, arthritis and gout.

In herbal medicine and food supplements, thyme is mainly used as cough and cold medicine and to relieve respiratory problems. Additionally, it is used for treating indigestion problems. In food supplements, thyme is also used to prevent illnesses and improve overall health. Thyme is less popular as a cosmetic ingredient. Here, thyme oil is used for its antiseptic and anti-bacterial properties, whereas thyme extract can be used for its skin conditioning properties.

#### Trends

- Raw materials are increasingly processed into extracts or oils in the country of origin, but quality (e.g. purity) and quality consistency remains a bottleneck.
- The popularity of natural ingredients in food products is rising. Essential oils are used as flavourings to replace salt.

- The increase in European consumers' dietary requirements and food awareness have established a high demand for health food. As such, consumers are including healthier items to their food intake in order to achieve a more balanced diet.
- There is a rising trend for natural and healthy supplements. This is the result of a combination of an aging population, an increased awareness of health and prevention of illnesses and the perception that botanical supplements are healthier and safer options for long-term use than synthetic alternatives.
- There is an increased consumer awareness and interest for antioxidants in food products.
- There is a strong interest for active and functional ingredients for the growing natural cosmetics market.

### **EU demand**

As thyme is an established product on the European market, many companies use it in their products. Examples include:

- Food supplements: e.g. [Vitotaal® Thyme](#)
- Herbal medicine: e.g. [Bronchoforce from A. Vogel](#) and [Alpenkraft® Herbal Cough Syrup](#) by Salus Haus
- Cosmetics: e.g. [Bubble Bar by Lush](#) and [Dr. Organic](#) cosmetics
- Aromatherapy: thyme oil is marketed as a stimulating, reviving oil, e.g. [Primavera](#) and [Health Aid](#).

### **Opportunities and threats**

Opportunities:

- Thyme can be used in a wide range of segments and products.
- In the European market, there is a growing interest in ethically sourced and sustainable ingredients for food (supplements) and cosmetics. This offers an opportunity for local value addition in organic or FairWild certification.
- If producers can guarantee sufficient quality, they can add value to thyme by processing it into essential oil.
- The active properties of thyme and its derivatives make them interesting for food (supplements), in particular its antioxidant activities.
- Though the cosmetic segment offers less opportunities for thyme oil and extract than the food and health segments, these products do have a potential in this segment. For the cosmetics segment, a marketing story of wild-collected thyme is particularly relevant.

Threats:

- SME producers of thyme face competition from both wild-collected and cultivated sources. Main competition stems from Mediterranean countries, both in South Europe and North Africa.
- Solvent extraction of thyme, relevant for use in cosmetics, is often beyond the scope of SME producers.
- For producers in the Palestinian Territory, there are several threats to exporting to the European market related to the Israeli occupation; for example delayed deliveries.

### **Business and sustainability needs of SME producers**

Business needs:

Cultivated thyme has an established market in Europe. For producers of thyme oil and leaves, the focus is on the production (thyme oil) and marketing (dried leaves) of wild-collected thyme.

- A feasibility based on SME/community capacities is needed to shed light into where producers can compete (dried thyme or thyme oil) and whether they could export themselves or should be linked to exporters.
- SME producers need to determine their current or potential future capacity of steam distillation of thyme leaves, to obtain a sufficient quality of thyme oil. Solvent extraction of the leaves may be beyond the current scope of SME producers. Partnerships with processors in the region could be an option, also if distillation is not feasible.
- Further processing, especially according to GMP standards, will probably be outside of the scope of SMEs and collector's communities. For further processing, producers need to look for partnerships with exporters and processors in the region.
- Several species of thyme grow in Algeria and the Palestinian Territory, which are not all included in the European pharmacopoeia. For use in aromatherapy, food supplements and herbal medicine,

producers need to identify and document the exact species and its relation to European standards (e.g. compared to Pharmacopeia etc.) through herbarium vouchers confirmed by competent authorities. Likewise, producers need to carry out a chemical analysis of their thyme oil or extract to determine the product's chemical properties.

- Principally relevant for dried thyme, producers need to focus on the marketing story of wild-collected thyme to compete with cultivated sources. The marketing story should focus on the origin of the product and its benefits to local communities. This is particularly relevant for thyme from the Palestinian Territory, where producers can make use of Pro-Palestinian attitudes in Europe. Targeting niche markets with certifications such as organic and/or FairWild can add to the marketing story in this segment.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### Sustainability needs:

Currently, there are no sustainability issues for thyme. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

### VERNONIA AMYGDALINA

**Bitter leaf is a widely used ingredient in Africa, where not only does it serve as a vegetable and culinary herb, but is also used medicinally for a number of indications. Despite its market potential, the product still faces the Novel Food barrier in the EU, which has to be overcome before effective market entry can be achieved.**

#### Product definition

*Vernonia amygdalina*, commonly known as bitter leaf, is an African vegetable which grows as a shrub or small tree, having green leaves with a characteristic odour and bitter taste. The species occurs wild in most countries of tropical Africa. It is also commonly grown as a vegetable in Benin, Nigeria, Cameroon, Gabon and DR Congo. In addition, the species has been introduced in India, where it is cultivated in Central and Eastern parts of the country.

*Vernonia amygdalina*



Source: Africa Museum

Bitter leaf is a popular food vegetable and culinary herb in soup, particularly in Nigeria. The leaves and young shoots are cooked as vegetables, rich in proteins, vitamins and mineral elements. The extract of *Vernonia amygdalina*'s leaves is traditionally used in the treatment of diarrhoea, dysentery and other gastrointestinal conditions. It is also commonly used as a vermifuge. There are several other health benefits attributed to bitter leaf (e.g. anti-cancer, blood sugar reduction, etc.), but, at present, little scientific evidence is available to substantiate such claims.

#### Segments

Bitter leaf finds a number of food applications in Africa, but the species is still considered to be novel in Europe. As such, its potential in the European food / food supplement industry is restricted by legislation. Refer to the European Commission's [RASFF Portal](#) for an example of a border rejection for bitter leaf from Nigeria.

Bitter leaf does not have any formal registration for use in food supplements in Europe. However, company [edoBotanics](#) (USA) offers bitter leaf as a food supplement for the following indication areas: breast and immune system health, general health and well-being, and prostate health.

There is no registered use of bitter leaf in cosmetics.

#### Trends

- There is an increased demand for health food because of the increase in European consumers' dietary requirements and awareness of the importance of food. As such, consumers are including healthier items to their food intake in order to achieve a more balanced diet.

- There is a rising trend for natural and healthy food supplements. This is the result of a combination of an aging population, an increased awareness of health and prevention of illnesses and a growing belief that botanical supplements are healthier and safer options for long-term use than synthetic alternatives.

### **EU demand**

The EU market for bitter leaf can be characterised as latent. Based on the local use of the species, there is specific potential in the food and/or food supplement markets in Europe. Nonetheless, there is very little or no evidence of the plant or one of its derivatives being sold in Europe due to legislative restrictions (i.e. related to food safety).

### **Opportunities and threats**

Opportunities:

- Bitter leaf has a long history of traditional use and it is widely used in food and medicinal applications in tropical Africa. This creates a solid precedent for future introduction of the species into the European market.
- Bitter leaf does not present pressing sustainability issues.

Threats:

- *Vernonia amygdalina* is a novel species in the EU and it cannot be used in food products (incl. food supplements).
- The species has been introduced in India, where it is cultivated in Central and Eastern parts of the country. It is also cultivated as a vegetable in some parts of Africa. As such, collectors of wild bitter leaf in Africa may face competition from these cultivated sources.

### **Business and sustainability needs of SME producers**

Business needs:

- Before the bitter leaf can be used in food (supplements) on the European market, it needs to be registered as a Novel Food. For this registration, elaborate safety testing is required. Organising different producers and linking up with EU companies could facilitate this process for Novel Food registration. EU companies are needed, as registration is beyond the scope of SME producers/communities.
- As bitter leaf is new to the European market, SME producers need to make use of a marketing story to position these products. Elements of this marketing story include the species' nutrient, protein and mineral content (supported by the appropriate technical documentation); use and popularity on the local African markets; and the wild-collection process. However, nutritional and health claims which cannot be substantiated should not be made.

An overview of business recommendations and support needs is provided at the end of this chapter.

Sustainability needs:

Currently, there are no sustainability issues for bitter leaf. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.

### **XYLOPIA AETHIOPICA**

**The fruit (i.e. seed pods) of *Xylopiya aethiopica* (Selim pepper) finds several applications in tropical and highlands of Africa. In Europe, its use is restricted to niche markets for specialty / exotic spices, with potential application in the cosmetics industry. Selim pepper offers an interesting value-addition proposition through certification, but opportunities in terms of essential oil extraction should also be investigated.**

#### **Product definition**

*Xylopiya aethiopica* (Dunal) A. Rich (common names: Ethiopian pepper, Guinea pepper, Spice tree, Negro pepper, Selim pepper) is a slim, tall

**Unripe Selim pepper pods**



Source: Gernot Katzer's

tree of about 60–70 cm in diameter, which can reach up to 15–30 m tall, with a straight stem and a slightly stripped or smooth bark. The fruits are small and resemble twisted bean-pods. When dry, the fruit is dark brown, cylindrical, 2.5 to 5 cm long and 4 to 6 mm thick. Each pod contains 5 to 8 kidney-shaped seeds of approximately 5 mm in length ([Agribusiness in Sustainable Natural African Plant Products](#)).

Selim pepper is native to tropical and highlands of Africa; its native range incorporates the following countries: Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Mozambique, Nigeria, Senegal, Tanzania and Uganda ([World Agroforestry Centre](#)). The part of *Xylopia aethiopica* which is most commonly used for commercial application is the fruit (i.e. seed pods). The dried Selim pepper pods are widely used for local cooking as a flavouring agent. The seeds are also mixed with other spices, rubbed on the body as cosmetic and scent, and as perfume for clothing. In traditional medicine, the fruits are used as medicine against cough and pain, and as a calmate and purgative ([Agribusiness in Sustainable Natural African Plant Products](#)).

### Segments

In the past, Selim pepper was used as a (black) pepper substitute in Europe, but the product is infrequently available on the market nowadays ([Gernot Katzer's Spice Pages](#)). The current use and potential for Selim pepper within the food industry lies in niche markets for specialty spices.

The fruit extract of *Xylopia aethiopica* is registered under [CosIng](#) for use in cosmetics, with skin conditioning properties, but no reference has been found to it being used in end products in Europe. The antioxidant activity of Selim pepper essential oil has also been researched (Karioti, et al., 2004), thus enhancing its potential as a cosmetic ingredient.

Although Selim pepper is used locally for a number of medicinal applications, its use in health products in Europe is not registered (i.e. as a food supplement or as a medicine).

### Dried Selim pepper pods



Source: Herbie's spices

### Trends

- The European market for exotic food ingredients is increasing. Although specialty products such as Selim pepper and other exotic spices still correspond to a niche market, consumers are more and more inclined to incorporate them in their diets.
- In Europe, there is an increasing consumer interest for natural ingredients in cosmetics and the global natural cosmetics sector is estimated to grow by 5-9% annually.
- Antioxidants are increasingly becoming popular in cosmetic products that combat (the signs of) aging.

### EU demand

As mentioned above, the market for Selim pepper in Europe is characterised by niche applications within the specialty market for spices. The product is currently marketed by British companies [Steenbergs](#), [Camstar Ingredients](#) and [Edélices](#), and German companies [Galke](#), [Orlandosidee-Spices](#) and [PfefferHaus](#) as an exotic pepper.

### Opportunities and threats

Opportunities:

- The European market offers (increasing) niche opportunities to market Selim pepper as a specialty spice.
- The market for specialty / exotic species is conducive to ethical sourcing, thus providing interesting opportunities for value addition through certifications such as organic and possibly FairWild.
- Investigating further applications of Selim pepper essential oil can be interesting, since there are potential applications for this product within the cosmetics industry.

Threats:

- Selim pepper competes with mainstream black pepper and other specialty / exotic peppers found in the European market. Most of these products come from cultivated sources, which makes it difficult for wild-collected Selim pepper to compete in terms of volume and price.
- Processing Selim pepper into an essential oil so as to capture opportunities within the cosmetics industry can be beyond the scope and capacity of SME producers.



### ***Business and sustainability needs of SME producers***

#### **Business needs:**

- For Selim pepper to compete successfully with other peppers and spices in the European market, the product needs support in building a strong marketing story. The traditional use, exotic origin as well as the aspect of wild-collected Selim pepper can contribute to its marketing story.
- Alongside the marketing story, support needs to be given in terms of certification (e.g. organic, FairWild) for producers of Selim pepper, which is essential in terms of value addition and in targeting niche markets in Europe.
- SME producers need to determine whether they can develop oil extracting capacities in the future. If this is not feasible, partnerships with processors and exporters in the region could be an option.
- The contact between producers of Selim pepper and EU cosmetics companies needs to be facilitated so as to enhance opportunities for product development and other future cooperation.

An overview of business recommendations and support needs is provided at the end of this chapter.

#### **Sustainability needs:**

Currently, there are no sustainability issues for Selim pepper. An overview of sustainability recommendations and support needs for producers is given at the end of this chapter.



## Recommendations

### Support needs for producers

The 20 species factsheets provide a range of recommendations on how producers can engage with specific species in terms of sourcing, production, processing, certification, marketing and promotion. In many cases, individual producers or community enterprises will not have the capacity to take on these recommendations individually. As such, these recommendations translate into support needs for producers, as is shown in the table below.

Business recommendations identified	Support needs
SME and/or community producers need to identify and document the exact species and its relation to European standards (e.g. for medicinal use in needs to be compared to the European Pharmacopeia) through herbarium vouchers confirmed by competent authorities.	Support could be needed to finance analyses and the preparation of documentation and/or to facilitate this process in terms of EU requirements.
SME and/or community producers need to conduct a feasibility study to verify market demand, identify segment-specific market requirements and determine their possibilities to meet them.	Support could be needed to conduct or support such a study as it requires research at the demand (EU market) and supply (local production) side.
SME and/or community producers need to ensure a sustainable supply of wild materials at a consistent quality, for example through trainings and implementation support.	Support is needed in terms of supply chain management, ensuring and documenting good agricultural and collection practices (GACP) and following the FairWild Standard requirements.
SME and/or community producers need to determine whether they can meet quality requirements for extracts in terms of technology and human resources. Investments in processing should be preceded by a feasibility study into the economic viability of local extraction.	Outside support could be needed to provide technical expertise or to organise producers to reach sufficient scale to make processing viable. Support could also be needed to link producers to local processors and exporters.
For new products, SME and/or community producers may need to link up with EU companies to facilitate the process required for approval for use in the selected market segment. EU companies have the capacity to do so, whereas this is deemed beyond the scope of SME producers/community capacities.	Outside support could be needed to connect producers with EU companies willing to clear legal frameworks for products new on the European market.
SME and/or community producers need to build an enticing, sector specific, marketing story for the EU market. These can revolve around: <ul style="list-style-type: none"> <li>- <u>Traditional use</u>: where possible this should be accompanied by data on efficacy and safety</li> <li>- <u>Product composition or properties</u>: when useful or demanded in segments</li> <li>- <u>Origin</u>: show where a product originates from</li> <li>- <u>Imagery</u>: images of species/collection can make this</li> </ul>	Outside support could be needed in terms of marketing expertise, funding for R&D and in building market linkages.

resonate with consumers, especially in case of iconic species

- Sustainable collection: e.g. by helping to maintain biodiversity in a region/country
- Fair benefits to collectors: show benefit to local communities
- Certifications: e.g. FairWild or organic

### Support needs for sustainability

Many species in this report do not currently have sustainability issues. However, especially for species where bark, roots or wood is collected, wild availability can quickly become problematic when a species becomes in demand and the resource becomes more valuable. As such, it is important that producers establish systems of sustainable collection and resource management from the onset to ensure continued availability. This is also important for buyers, who want to ensure that a product range based on the species is not at risk from future availability constraints.

For species which currently face sustainability constraints, establishing such systems is even more pressing as availability is already a risk to possible buyers. This does not mean that species with sustainability constraints should not be focused on; what is important is that sustainable collection practices and resource management is established from the onset. In many cases where species already find commercial use in Europe, establishing a sustainable supply, and documenting this in an appropriate way, can actually be a very strong unique selling point on the European market.

Certification of sustainable wild collection, for example according to the FairWild standard, can support such efforts by better communicating about the sustainability of supply to buyers and by securing more favourable prices on the market.

### Sustainability recommendations identified

Based on the species factsheets, SME and/or community producers need to obtain closer insight into (possible) sustainability constraints of their species:

- What are current harvesting practices in the region? Are current practices a risk to future availability if demand increases and the plant's value rises?
- The factsheets provide basic sustainability information. What is the local situation of the SME/Community producer?
- Who is the resource owner? What influence can resource users have on sustainable collection and resource management?

### Support needs

Support could be required to help determine the sustainability situation and future sustainability risks.

SME and/or community producers need to establish sustainable collection practices to ensure continued availability. This requires:

- Resolving and formalising resource access
- Resource mapping
- Resource management plans
- Standard operating procedures (SOPs)
- Documentation of practices
- Training on SOPs

Such practices need to reflect the magnitude of sustainability risks. High-risk species, and especially protected or restricted species, need much more thorough systems in place than low-risk species. Getting buyers on board at an early stage is important for such systems to be viable in the future.

Support is often needed for the different steps in moving to sustainable collection practices. Moreover, support can be needed in terms of market access and bringing relevant stakeholders together at the local level. In order to ensure sustainable harvesting there is a need for trainings as well as technical and/or financial support. The [FairWild website](#) provides detailed information on these different steps.

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SME and/or community producers need to determine the business case of certifying their sustainable collection processes. Will it benefit their unique selling point and help them to position their product in their market segment? Will it provide sufficient return on investments?



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Outside support could be needed to comply with relevant certifications, in terms of information and guidance.

## 9. Conclusions

This study focused on the question “What is the commercial potential for wild-collected botanicals for BTC target groups through sustainable trade schemes?”, focusing on 10 countries in sub-Saharan Africa, North Africa and the Middle East. Furthermore, Chapter 8 recommended 20 key botanicals which allow for “the development of viable economic alternatives for the local communities”.

To portray different biodiversities in the focus countries appropriately, the study interpreted the term “botanicals” from a broader perspective. As such, not only were medicinal and aromatic plants for medicine included, but a wider diversity of wild plants (oil seeds and fruits, resins) for a variety of segments, including cosmetics, food supplements and herbal medicine were also taken into account.

### European demand for wild-collected botanicals

European demand for botanicals is increasing, both for the raw material and their derivatives, as was identified in Chapter 6: Potential European markets. Suppliers in developing countries play a particularly large role in supplies of MAPs (raw materials), (tanning) extracts, essential oils and natural gums and resins. Regarding wild-collected botanicals and their derivatives, industry sources across the food, health and cosmetic segments indicated that there is a growing demand for these ingredients in Europe.

### Supply of wild-collected MAPs in target countries

This study focused on wild-collected botanicals from 10 countries: Algeria, the Palestinian Territory, Senegal, Mali, Benin, Niger, Uganda, Rwanda, Burundi and Congo (DRC). The industries processing botanicals vary from well developed (Algeria, Uganda and Senegal) to relatively underdeveloped sectors (Benin and Niger), whereas the industries in the other countries are in a transitional stage.

There are many similarities in biodiversity in neighbouring countries. Therefore, rather than looking at the 10 individual countries, we decided to divide them into four regions: West Africa, Central Africa, Algeria and the Palestinian Territory. Generally, botanicals are spread across state borders. Consider, for example, the Sahel or tropical zones and the Congo basin, where similar species are found. In another example, Algeria and the Palestinian Territory are both part of the Mediterranean, thus several similar species can be found in both countries.

### Product range from focus countries

From the 10 focus countries, a wide range of species was selected as priority species (Chapter 8: Priority list) which have potential in cosmetics, food and health segments. They ranged from dried herbs and spices, to essential oils, (tanning) extracts, thickeners and vegetable fats. They also ranged in terms of novelty on the European market, from completely new products (e.g. *Vernonia amygdalina* and *Parkia biglobosa*) to those extensively used in all segments (e.g. *Rosmarinus officinalis* and *Thymus vulgaris*). Compared to the 2013 study, [BTC Wild-Collected Botanicals and the EU market](#), this edition puts a stronger focus on new and innovative species. As a result, not all species identified had an existing and/or established use in Europe.

For several priority species, a latent European market was identified. Since the selection of priority species in sub-Saharan Africa was based on popularity of species in those countries, many of the selected species have an extensive local and traditional use. However, this has not yet been automatically translated into use in Europe. This is either due to restrictions in the regulatory framework or simply due to the underutilisation of species; that is, the properties, applications and risks of specific species are not well known among Europeans. In order to realise the potential of these species on the European market, several support needs have been identified for SME producers. These include needs in overcoming technical issues, identifying value addition propositions and developing the right promotional message.

### Technical support needs

Technical support needs are classified into three issues: product development within the regulatory framework; species identification and composition; and feasibility studies and assessment of local capacities. For some species, these may be more relevant than for others.

### Regulatory framework

Some species, such as *Piliostigma thonningii* (Camel's foot) and *Vernonia amygdalina* (bitter leaf), are not (yet) allowed on the European market. Such species need to be approved and registered by regulatory agencies and legislative frameworks before they can be used in Europe. This involves species identification and composition analysis (described below) as well as product development based on additional efficacy and safety testing. SME producers would need to find a European company interested to register such species, as the approval process is beyond the scope of SME producers and communities in terms of costs and documentation. Additionally, since traditional knowledge of use is important in these and other species, regulations regarding the Nagoya protocol on Access and Benefit-sharing become relevant as well. Whether these regulations become a future barrier to develop new products depends greatly on how respective countries implement the Nagoya protocol.

### Species identification and composition

For all species, it is important that producers determine which exact species they collect. According to industry sources, various related species are often used interchangeably, for example *Desmodium adscendens* and *D. repandum*. While in the cosmetics sector it is often less problematic for buyers to consider alternative related species, the food and especially the health segments are working with frameworks with authorisation of specific species, in this case only *D. adscendens*. *D. repandum* cannot be used in these segments; producers need to be aware of this.

Analyses of the composition and properties of species was found relevant for two main reasons: to support market access and to uncover potential applications.

In the case of species already sold in Europe, a chemical analysis of the product's composition may help to support access to the European market. For example, in the case of rosemary or thyme oil, such an analysis is used to demonstrate that the applicability of the exported product is the same as the one available on the market. Moreover, it is also used as a quality assessment.

For new species or for a new application of a species already on the market, an analysis of the product's composition and properties is needed to uncover potential applications in Europe. Additionally, to register a species for use in a new segment (see 'Regulatory framework'), elaborate safety and efficacy testing is required. These are most stringent for the pharmaceutical sector and food (Novel Food registration), followed by cosmetics. Species from the study that require such analyses and testing include *Pterocarpus erinaceus* for use in cosmetics and *Parkia biglobosa* (African locust bean) for use in food.

This is also applicable to species where a related species is allowed and used in a certain segment, which is relevant for several species in this study. For example, *Artemisia absinthium* is allowed for use in food supplements and herbal medicine, whereas its related species *A. herba-alba* (white wormwood), is not. If analyses show that they have a similar chemical profile and terms of use, that could form a basis for registering *A. herba-alba* for use in these segments. Nonetheless, this still requires significant testing and analyses.

### Feasibility and assessment of local capacities

As mentioned above, there is a great variation in terms of products in this report. This extends to the difficulty in processing raw material as well. For some, such as *Butyrospermum paradoxum* (shea) and *Ceratonia siliqua* (carob), a relatively simple process is required to produce a value-added product. Producing essential oils or extracts is a more difficult process, which can require significant investments. SME producers need to do an assessment of local capacities, in terms of technical requirements, human resources (for quality management and documentation) and economic viability. This is needed to determine if they can produce a high quality essential oil or extract. To compare the two, extraction of essential oils can in cases be done a community level, while producing other extracts (especially solvent extraction) is not viable. If they do not have the capacities to process the raw materials, producers need to determine whether they can partner up with processors in the region.

Certain species, such as *Cola nitida* (cola) and *Rosmarinus officinalis* (rosemary), can be used in different segments on the European market. SME producers need support to conduct a feasibility study so as to determine which segment they should target. This depends on quality standards, requirements and producer capacities to produce a value-added product. For example, dried rosemary is used in the food segment as a culinary herb; rosemary oil is used in cosmetics, food and health segments; and rosemary extract is mostly used in the food industry as an active ingredient (preservative).

### **Competitive edge and value addition proposition**

In addition to technical support needs, producers need support to determine what their competitive edge is and how to articulate it in terms of value addition for their specific species. This depends greatly on the complexity of processing the raw material (see 'Feasibility and assessment of local capacities'), as well as on the potential of certifications from the market perspective.

### Sustainability and certification schemes

Industry sources indicated that sustainability and CSR are becoming important across the different segments. In terms of company sourcing policies and procedures, this often involves sending questionnaires to suppliers in order to determine how they address sustainability in their own sourcing and production processes. These issues are also included in supplier audits, if/when they take place. In general, however, companies lack active engagement with their suppliers in creating a joint sustainable supply chain; the physical distance to suppliers cannot always be compensated by virtual communication, and buyers often find it difficult to dedicate the same amount of time and resources to individuals in their wide supplier base. In addition, questionnaires/auditing processes do not always make a distinction between cultivated or wild-collected supplies.

What becomes apparent when considering these different segments, is that the value of sustainability is different, but that it adds value in all of them. This can be, for example, in terms of higher prices, product differentiation, facilitated market access or increasing trust with buyers.

In order to demonstrate sustainability claims, third party certification schemes can be of great value (Chapter 4.2 – Non-legislative requirements). The opportunities for specific schemes will vary according to species, market segments and the inherent applicability of the scheme. For example, in the cosmetics market certification showing sustainable production is growing the fastest. Entering the market with new ingredients, especially products originating from biodiversity will bring a certain sustainability expectation from consumers. The most established is organic certification.

Within the food market, organic certification is also increasingly popular, especially in niche segments. In the case of rosemary and thyme, for instance, the market for high-end culinary herbs is very conducive to organic certification, and provides possibilities for FairWild certification. Nonetheless, the industrial market, dealing with higher volumes and lower prices, does not offer similar opportunities for certification.

### Further processing

For some species, further processing may be beyond the capacities of SME producers compared to marketing the raw material. This depends on feasibility in terms of human resources and economic viability. If further processing is not viable, certifications offer an interesting value addition proposition, such as FairWild and/or organic certification. Such certifications offer value addition propositions to various species, especially when they compete with cultivated sources (e.g. *Thymus vulgaris* – thyme).

### Other opportunities to create a competitive edge

In addition to further processing and sustainability certifications, the following opportunities in terms creating a competitive edge were identified:

- Quality management and traceability: Different quality management systems apply (Chapter 4), depending on the segment selected. Some (e.g. GACP, GMP for pharmaceuticals; HACCP for food) are required, others (GMP for cosmetics) could facilitate market access by building trust among buyers, or might be required by particular buyers.
- Proper documentation: As mentioned above, proper identification of the species and compliance with documentation requirements for the segment targeted and the type of ingredient provided is vital to be successful on the European market and add value to products.
- Building the right story for the right segment: Manufacturers in Europe, especially those of supplements and cosmetics, need to differentiate themselves from their competition, as described in the section below

### **Marketing and positioning products on the European market**

As was observed in the 2013 study, [BTC Wild-Collected Botanicals and the EU market](#), marketing and positioning of species are key in accessing the European market. Stories on traditional use and



production practices, community and ecological benefits are important tools for companies to do so. Producer organisations can help in building these stories. Especially stories that build connections, for example illustrating the interdependence of people, plants and animals are powerful communication tools. Marketing and positioning are also relevant for the species included in this study for the following reasons:

- To position species as a new product on the European market: it is most important to stress the potential uses, based on traditional use and product composition or properties
- To compete with cultivated sources: the story of wild-collection is vital and how the species benefits local communities.

For both species types, relevant certifications (e.g. FairWild or organic) can add to the marketing story. Additionally, imagery and origin of a species can be used in developing the marketing.

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## Annex I

Legislative requirements are the minimum requirements which must be met by exporters of food, cosmetic or health products marketed in the EU and EFTA countries. Products which fail to meet these requirements are denied market access. The EFTA States, with the exception of Switzerland, take part in the European Economic Area (EEA). This means that Liechtenstein, Norway and Iceland follow EU legislation in general. In Switzerland, the legislation deviates slightly, but it is increasingly becoming harmonised to EEA provisions.

The main legislative and non-legislative requirements are listed in the tables below. These are separated into requirements for natural ingredients for food, cosmetics and health products. Please note that there are overlaps across the different industries in some cases. Food supplements are categorised as food ingredients and thus have to adhere to the legislation of food in addition to legislation specific to food supplements. Medical nutrition products are classified regulated as dietary foods for special medical purposes. For these two product groups in particular, authorised health claims are of importance. Cosmeceuticals are classified as cosmetics, except if they make a medicinal claim in which case they are considered as medicinal products.

Requirements listed below are categorised in the different segments; food, cosmetics and/or health products (which includes food supplements, medical nutrition and herbal medicine). Moreover, the applicable legislation is added, as well as sources for more information.

Legislative requirements	Applicable legislation	Food, cosmetics or health products
The EU sets requirements on the <b>classification, labelling and packaging (CLP)</b> of substances and mixtures. This covers packaging of chemical substances, as well as required symbols and phrases warning users and providing safety advice that should be used on the labels.	Regulation (EC) 1272/2008 <a href="#">More information</a> <a href="#">Information from ECHA</a>	All product groups
EU <b>packaging</b> legislation restricts the use of certain heavy metals, among other requirements	Directive 94/62/EC <a href="#">More information on packaging</a>	
The EU sets requirements for <b>wood packaging materials</b> , such as packing cases, boxes, crates, drums, pallets, box pallets and dunnage	Directive 2000/29/EC	
<b>CITES</b> regulates trade in (among others) wild-collected plants and gives a detailed list of species of which trade is prohibited, restricted or bound to certain rules.	Regulation (EC) 338/97, Regulation (EC) 865/2006 <a href="#">More information</a>	
<b>Access and Benefit Sharing (ABS)</b> covers mutually agreed terms (rules and principles) on the access and use of genetic resources and associated traditional knowledge.	Nagoya Protocol on Access and Benefit-sharing <a href="#">More information</a>	
The <b>Novel Food Regulation</b> covers foodstuffs from new plant sources, but also “exotic” natural foodstuffs or ingredients which were not “consumed to a significant degree within the EU before 15 May 1997”. Ingredients for food supplements and medical nutrition which do not meet these requirements will need to be approved under this legislation.	Regulation (EC) 258/97; Recommendation 97/618/EC <a href="#">More information</a> <a href="#">Novel Food Catalogue</a>	Food
The EU has set a list of <b>permitted additives and enzymes</b> and a number of requirements for <b>flavourings</b> and their use in foodstuffs intended for human consumption.	Regulations (EC) 1331/2008; No 1332/2008; No 1333/2008; No 1334/2008 <a href="#">Information from</a>	















	<a href="#">EFSA</a>	
In the EU, there are rules for the marketing and use of <b>extraction solvents</b> used in the production of foodstuffs and food ingredients.	Directive 88/344/EEC <a href="#">More information</a>	
In the EU, <b>irradiation</b> of food is permitted only in specific cases. At the moment, the only food categories allowed to be irradiated under EU legislation are: dried aromatic herbs, spices and vegetable seasonings.	Directives 1999/2/EC; 1999/3/EC Decision 2002/840/EC <a href="#">More information</a>	
All food products entering the EU are subject to <b>official controls</b> to check whether they are in compliance with the relevant food legislation. Some specific products are subject to an increased level of control.	Regulations (EC) 882/2004; (EC) 669/2009 <a href="#">More information</a>	
The EU wants to prevent misleading claims by allying the use of <b>nutrition or health claims</b> to certain conditions related to nutritional profiles of foods.	Regulation (EC) 1924/2006 <a href="#">More information</a>	Food (supplements) and medical nutrition
<b>Food supplements</b> are subject to specific legislation, which lays down compositional (for minerals and vitamins) and labelling requirements, but still leaves composition beyond minerals and vitamins (e.g. essential fatty acids, fibre and various plants and herbal extracts) to the discretion of national authorities. Please note that nutrition labelling for foodstuffs mentioned below does not apply to foods supplements.	Directive 2002/46/EC <a href="#">More information</a>	Food supplements
EU established legislation concerning specific labelling and composition for <b>dietary foods for special medical purposes</b> . This legislation comes in addition to EU legislation on food labelling, which provides an overview of general food labelling requirements applicable to all foodstuffs. In addition, it outlines requirements related to nutrition and allergens labelling.  <i><b>Please note that Regulation (EU) No 609/2013 on 'Food for Specific Groups' was adopted in June 2013 and will apply from July 20<sup>th</sup> 2016. It aims to provide a better environment for businesses, better application of rules, and better protect consumers on the content and marketing of these "special" food products.</b></i>	Directive 1999/21/EC Directive 2006/82/EC Regulation (EU) 609/2013 <a href="#">More information</a>	Medical nutrition
Responsibility regarding data collection and registration on potential risks of chemicals ( <b>REACH</b> ) is on the importer, yet impact on the exporter. Within the natural ingredients for cosmetics particularly applicable to <b>essential oils</b> . The burden of proof rests with the EU manufacturer/importer that wishes to use this exemption.	Regulation (EC) 1907/2006 <a href="#">More information</a> <a href="#">ECHA Guidance to exemptions</a>	Herbal medicine and cosmetics
<b>Pharmaceutical or medicinal products</b> must be produced according to so called Good Manufacturing Practices ( <b>GMP</b> ).	Directive 2003/94/EC <a href="#">EU Guidelines to GMP for Medicinal Products for Human and Veterinary Use</a>	Pharmaceuticals (including pharmaceutical ingredients)
The EU has established procedures for <b>pharmaceutical products and ingredients</b> , in order to ensure that products are safe and effective.	Directive 2001/83/EC <a href="#">More information</a>	
Pharmaceutical ingredients must be produced according to <b>Good Agriculture and Collection Practices (GACP)</b> requirements. Pharmaceutical grade ingredients need to be supplied for use in medicinal products for human use. Quality and traceability standards for MAPs and extracts	<a href="#">Requirement on GACP for starting materials of Herbal Origin (Herbal Medicinal Products)</a>	

are much higher than for dietary market, where food grade ingredients are required.		
The <b>Traditional Herbal Medicinal Products Directive (THMPD) Directive</b> sets a simplified, 'fast-track' for herbal medicines that can demonstrate certain requirements. All herbal medicines marketed in the EU need a licence.	Directive 2004/24/EC Amending Directive 2001/83/EC <a href="#">More information</a>	Herbal medicine
A <b>marketing authorisation</b> for (natural) Pharmaceutical products is required. The EU has established procedures for pharmaceutical products and ingredients, in order to ensure that products marketed are safe and effective.	EU legislation on Marketing Authorisation for (Natural) Medicinal Products <a href="#">More information</a>	
The <b>Cosmetics Directive</b> includes, among other things, restrictions on substances in cosmetic product and labelling requirements.	Directive 76/768/EC <a href="#">More information</a>	Cosmetics

Additional non-legal requirements reach beyond legislation, as industries and companies can go further in their requirements than legislation. Again these requirements are categorised into the different segments covered in this study; food, cosmetics and/or herbal medicine (pharmaceutical) products. These requirements are more relevant for food and cosmetics than for herbal medicine industries, as legislation is already more specific in terms of standards, documentation and certification in those industries.

Non-legislative requirements	More information	Food, cosmetics or health products
ISO 9001:2008 sets out the criteria for a <b>quality management system</b> . The standard is based on several quality management principles including a strong customer focus, the motivation and support of top management, the process approach and continuous improvement.	- ISO 9001:2008 - <a href="#">ISO 22000</a> (food) - <a href="#">ISO 22716:2007</a> (Cosmetics)	All product groups
EU buyers may expect you to comply with their supplier <b>codes of conduct</b> regarding <b>social responsibility</b> , which are often based on the ILO labour standards. This can be the importer's own code of conduct or a code of conduct as a part of an initiative in which the importer is participating. The adoption of those standards is most common among large-scale importers, food manufacturers and retailers.	- <a href="#">Business Social Compliance Initiative (BSCI)</a> - <a href="#">Social Accountability 8000 (SA 8000)</a> - <a href="#">Occupation Health and Safety Assessment Series (OHSAS)</a>	
<b>Supplier Ethical Data Exchange (SEDEX)</b> offers an online database which allows members to share information on: Labour Standards, Health & Safety, The Environment and Business Ethics depending on the particular industry and role in supply chain.	Online database of <a href="#">SEDEX</a>	
Buyers need well -structured <b>product and company documentation</b> . Suppliers must have a detailed technical data sheet available upon request, including an analysis of the product, which confirms the absence of contaminants and show that you meet their product specifications.	Websites of European buyers with examples of Safety Data Sheets (SDS) <a href="#">Example of The Soap Kitchen</a>	
Your sampling method should result in lot <b>representative samples</b> on what you can deliver in the quantities, quality and lead time as specified by the buyer and in your technical data sheet.		



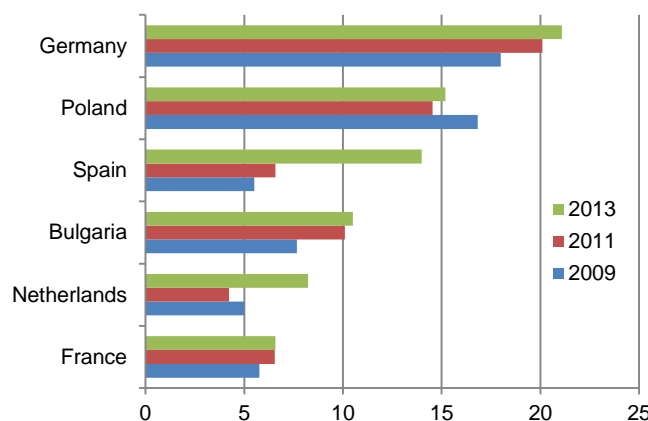
	Pay attention to strict compliance with <b>delivery terms</b> as agreed upon with your buyer.	<a href="#">International delivery terms</a>	
	There are also <b>non-legal requirements</b> related to <b>sustainable wild-collection</b> of MAPs and equitable sharing of benefits from biodiversity. Examples are the UNCTAD BioTrade Initiative Principles and Criteria or FairWild Principles and Criteria which collectors use to add value to their product. Furthermore, for food supplements, FairTrade certification can be relevant. Known labels are FLO or FairForLife, which has a separate module specifically for wild-collected products. Ethical BioTrade is also applicable to wild-collection.	<ul style="list-style-type: none"> <li>- <a href="#">UNCTAD BioTrade Initiative</a></li> <li>- <a href="#">FairWild Standard</a></li> <li>- <a href="#">FairForLife (Wild-collection module)</a></li> <li>- <a href="#">Union for Ethical BioTrade</a></li> </ul>	
	<p>In addition to mandatory HACCP standards, EU food industries increasingly demand compliance with more comprehensive <b>food safety standards</b>. The need for this depends on the profile of your buyer; usually large retailers and manufacturers and private label manufacturers are more demanding and will require compliance with for example,</p> <ul style="list-style-type: none"> <li>• <b>British Retail Consortium (BRC)</b>: it contains more extensive rules on Good Manufacturing Practices (GMP) than HACCP, e.g. regarding organisation and communication.</li> <li>• <b>International Food Standard (IFS)</b>: corresponds to ISO 9001, but with a focus on food safety, HACCP, hygiene, the manufacturing process and business surroundings.</li> </ul>	<ul style="list-style-type: none"> <li>- <a href="#">British Retail Consortium (BRC)</a></li> <li>- <a href="#">International Food Standard (IFS)</a></li> <li>- <a href="#">Prerequisite programmes (PRPs)</a></li> </ul>	Food (including food supplements and medical nutrition)
	<p>Standards for organic cosmetics mentioned below require certain thresholds of organically certified organic ingredients to be used in certified cosmetics products. <b>Organic ingredients</b> need to comply with requirements on the production and labelling for organic products as established by the EU. This regulation legally only applies to food products, but <b>standards for organic cosmetics</b> are based on this regulation.</p>	<p>Regulation (EC) 834/2007  <a href="#">More information on organic farming</a></p>	A non-legislative requirement for herbal medicine and cosmetics
	<p><b>International Fragrance Association (IFRA) Standards</b> form the basis for the globally accepted and recognized risk management system for the safe use of fragrance ingredients and are part of the IFRA Code of Practice.</p>	<a href="#">IFRA Code of Practice</a>	Cosmetics
	<p><b>Cosmos and NaTrue standards</b>, and other standards of national certification bodies, specify what cosmetic products need to comply with to be certified natural and organic. Although not directly applicable to ingredient producers, it is important to be aware of these standards in terms of permitted processes and additives.</p>	<ul style="list-style-type: none"> <li>- <a href="#">Cosmos</a></li> <li>- <a href="#">Natue</a></li> </ul>	
	<p><b>Good Manufacturing Practices (GMP)</b> is not obligatory for producers of cosmetics ingredients, but compliance can provide a competitive advantage on the European market GMP Guide for cosmetic ingredients.</p>	<p>The European Federation for Cosmetic Ingredients (EFfCI) provides a <a href="#">guide</a> with GMP principles.</p>	
			
			
			

## Annex II

### European exports

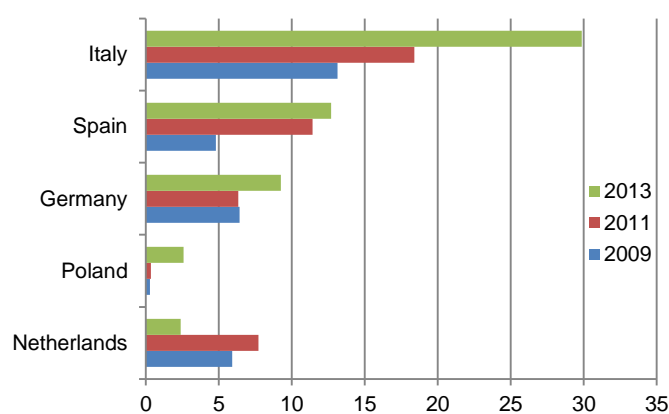
#### MAPs and extracts

**Figure 15 Leading European exporters of raw material, 2009-2013, in 1,000 tonnes**



Source: Eurostat, 2014

**Figure 16 Leading European exporters of extracts, 2009-2013, in 1,000 tonnes**



Source: Eurostat, 2014

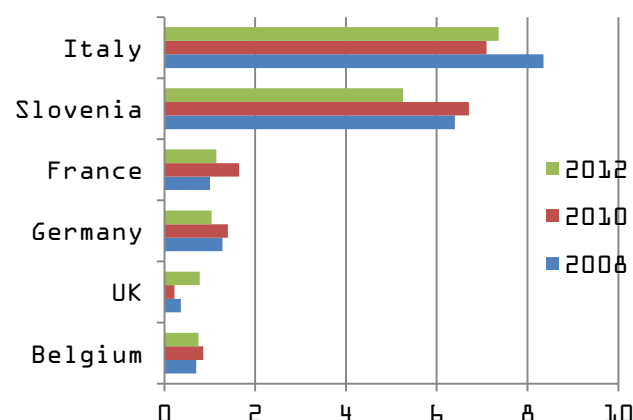
Exports of **MAPs** (raw material) amounted to 94 thousand tonnes and € 432 million in 2013. Compared to 2009, this was an annual increase of 5% in volume and 9% in value. Growing exporters were Spain, the Netherlands and Croatia. Main export destinations were European countries (84% in 2013), the USA, Russia and China.

European exports of **extracts** increased at a much higher rate than raw materials, by 14% in volume and 9% in value, amounting to 67 thousand tonnes and € 527 million in 2013. Liquorice extracts only accounted for a small part of exports, at 7% of volume in 2013. Increased exports are mainly attributed to extracts not elsewhere specified. Main destinations of European exports in 2013 were other European countries (79% of total exports), such as France, Germany, the Netherlands, Belgium and Spain. Destinations outside of Europe included Guinea, Israel and the USA.

#### Tanning extracts

European exports of tanning extracts increased annually by 10% in volume and 8% in value from 2009 to 2013, amounting to 20 thousand tonnes / € 61 million in 2013. Export of tanning extracts is concentrated in Italy and Slovenia, which together accounted for 70% of exports in 2013. Though small, large growing exporters were Austria, the UK, Portugal, Romania and Switzerland. Destinations of European tanning extracts were mostly other European countries, such as Italy, France, Belgium and Spain. Non-European destinations in 2013 included China, Mexico, Turkey and Brazil.

**Figure 17 Leading European exporters of tanning extracts, 2009-2013, in 1,000 tonnes**

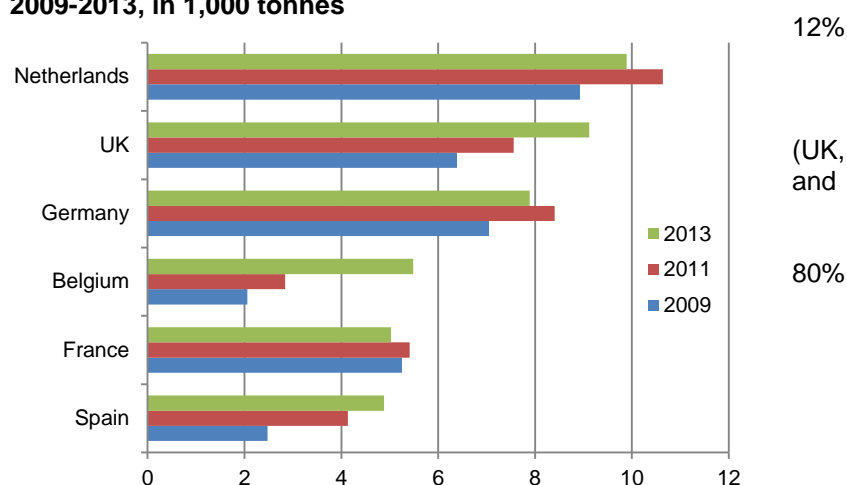


Source: Eurostat, 2014

### Essential oils

During 2009 to 2013, European exports of essential oils grew annually by 7% in volume and in value, reaching 53 thousand tonnes worth € 898 million in 2013. Leading exporters (Figure 18) are both producers (Germany, France and Spain) re-exporters (the Netherlands, Germany and Belgium) of essential oils, accounting for 80% of exports. Most exports are destined to other European countries (Germany and France) and the USA. Emerging destinations include Japan, China, Singapore and Turkey, with growing manufacturing industries.

**Figure 18 Leading European exporters of essential oils, 2009-2013, in 1,000 tonnes**



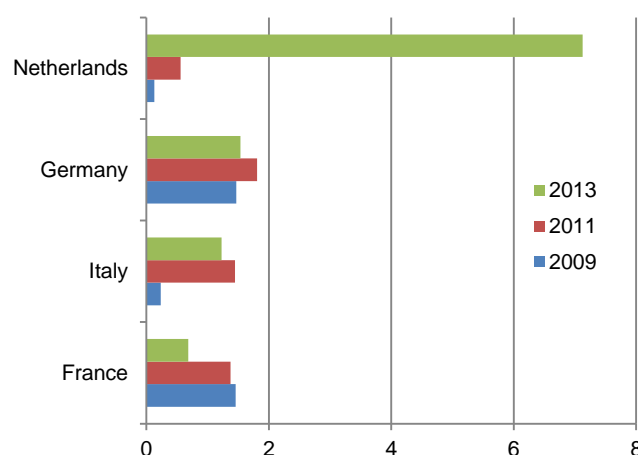
Source: Eurostat, 2014

### Natural gums and resins

Exports of **natural gums and resins** increased by 26% in volume and 14% in value from 2009 to 2013, resulting in 12 thousand tonnes and € 53 million in 2013. Over half of European exports were destined for Portugal, with other European countries as destination areas as well. Of total exports, 23% was exported to non-European countries, including Turkey, Egypt and Ecuador.

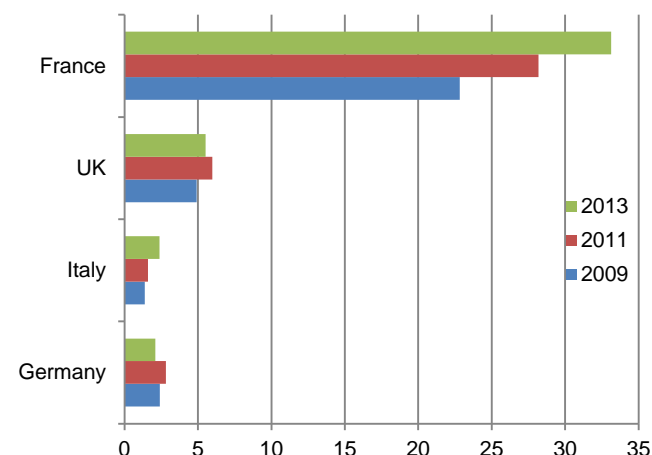
Exports of **gum Arabic** increased by 8% in volume and 8% in value, to 44 thousand tonnes at € 128 million in 2013. As the largest importer of gum Arabic, it is not unexpected that France is also the main exporter of gum Arabic, accounting for 75% of total volume of exports. Main destinations in 2012 were the US and China, as well as several European countries, such as the UK, Italy and Germany.

**Figure 19 Leading European exporters of natural gums and resins, 2009-2013, in 1,000 tonnes**



Source: Eurostat, 2014

**Figure 20 Leading European exporters of gum Arabic, 2009-2013, in 1,000 tonnes**



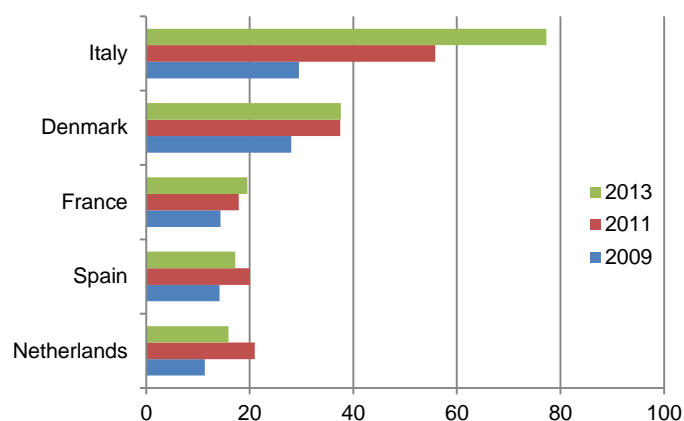
Source: Eurostat, 2014



**Fixed vegetable fats**

European exports of fixed vegetable fats saw significant growth from 2009 to 2013, of 12% in volume and 16% in value. In total, exports amounted to 213 thousand tonnes and € 503 million in 2013, with Italy and Denmark as the largest exporters. Main export destinations in 2013 were European countries (Germany, France, Poland and Spain), the US and Korea.

**Figure 21 Leading European exporters of fixed vegetable fats, 2009-2013, in 1,000 tonnes**



Source: Eurostat, 2014

## Annex III

Long list of wild-collected species identified per country (selected species highlighted in grey)

Species (Botanical name)	Source
<b>Central Africa</b>	
<i>Vernonia amygdalina</i> Delile	Prelude
<i>Bidens pilosa</i> L.	Prelude
<i>Momordica foetida</i> Schumach.	Prelude
<i>Ageratum conyzoides</i> L.	Prelude
<i>Chenopodium opulifolium</i> Auct. non Schrad.	Prelude
<i>Erythrina abyssinica</i> Lam. ex DC.	Prelude
<i>Phytolacca dodecandra</i> L'Hérit.	Prelude
<i>Cassia didymobotrya</i> Fres.	Prelude
<i>Indigofera arrecta</i> Hochst.ex A. Rich.	Prelude
<i>Leonotis nepetifolia</i> (L.) R.Br.	Prelude
<i>Microglossa pyrifolia</i> (Lam.) O. Ktze.	Prelude
<i>Securidaca longipedunculata</i> Fresen.	Prelude
<i>Tetradenia riparia</i> (Hochst.) Codd	Prelude
<i>Cassia occidentalis</i> L.	Prelude
<i>Mangifera indica</i> L.	Prelude
<i>Clerodendrum myricoides</i> (Hochst.) R. Br. ex Vatke	Prelude
<i>Conyza sumatrensis</i> (Retz.) E.K. Walker	Prelude
<i>Lantana trifolia</i> L.	Prelude
<i>Cajanus cajan</i> (L.) Millsp.	Prelude
<i>Carica papaya</i> L.	Prelude
<i>Vernonia lasiopus</i> O. Hoffm.	Prelude
<i>Crassocephalum mannii</i> (Hook.f.) Milne-Redh.	Prelude
<i>Crassocephalum vitellinum</i> (Benth.) S. Moore	Prelude
<i>Dichrocephala integrifolia</i> (L.f.) O. Ktze	Prelude
<i>Psidium guajava</i> L.	Prelude
<i>Ricinus communis</i> L.	Prelude
<i>Acmella caulirhiza</i> Delile	Prelude
<i>Celosia trigyna</i> L.	Prelude
<i>Ocimum gratissimum</i> L.	Prelude
<i>Bridelia micrantha</i> (Hochst.) Baillon	Prelude
<i>Datura stramonium</i> L.	Prelude
<i>Entada abyssinica</i> Steud. ex A. Rich.	Prelude
<i>Euphorbia hirta</i> L.	Prelude
<i>Guizotia scabra</i> (Vis.) Chiov.	Prelude
<i>Harungana madagascariensis</i> Lam. ex Poir.	Prelude
<i>Hoslundia opposita</i> Vahl	Prelude
<i>Hymenocardia acida</i> Tul.	Prelude

<i>Abrus precatorius</i> L.	Prelude
<i>Jatropha curcas</i> L.	Prelude
<i>Maesa lanceolata</i> Forssk.	Prelude
<i>Ocimum suave</i> Willd.	Prelude
<i>Psorospermum febrifugum</i> Spach	Prelude
<i>Rhus vulgaris</i> Meikle	Prelude
<i>Solanum aculeastrum</i> Dunal	Prelude
<i>Thunbergia alata</i> Bojer ex Sims	Prelude
<i>Acanthus pubescens</i> (Thomson ex Oliv.) Engl.	Prelude
<i>Achyranthes aspera</i> L.	Prelude
<i>Alchornea cordifolia</i> (Schum. & Thonn.) Müll. Arg.	Prelude
<i>Anisopappus africanus</i> (Hook. f.) Oliv. & Hiern	Prelude
<i>Carissa edulis</i> (Forssk.) Vahl	Prelude
<i>Gynandropsis gynandra</i> (L.) Briq.	Prelude
<i>Kalanchoe crenata</i> (Andr.) Haw.	Prelude
<i>Tephrosia vogelii</i> Hook. f.	Prelude
<i>Triumfetta rhomboidea</i> Jacq.	Prelude
<i>Acalypha villicaulis</i> Hochst.ex A. Rich.	Prelude
<i>Cardiospermum halicacabum</i> L.	Prelude
<i>Crassocephalum bumbense</i> S. Moore	Prelude
<i>Euphorbia tirucalli</i> L.	Prelude
<i>Myrica salicifolia</i> Hochst. ex A. Rich.	Prelude
<i>Nicotiana tabacum</i> L.	Prelude
<i>Ocimum americanum</i> L.	Prelude
<i>Plantago palmata</i> Hook. f.	Prelude
<i>Tithonia diversifolia</i> (Hemsley) A. Gray	Prelude
<i>Triumfetta cordifolia</i> A. Rich.	Prelude
<i>Acacia hockii</i> De Wild	Prelude
<i>Acacia sieberiana</i> DC.	Prelude
<i>Asparagus africanus</i> Lam.	Prelude
<i>Bothriocline longipes</i> (Oliv. & Hiern ) N.E.Br.	Prelude
<i>Clausena anisata</i> (Willd.) Hook. f. ex Benth.	Prelude
<i>Desmodium repandum</i> (Vahl) DC.	Prelude
<i>Dissotis brazzae</i> Cogn.	Prelude
<i>Ficus thonningii</i> Blume	Prelude
<i>Gouania longispicata</i> Engl.	Prelude
<i>Hibiscus cannabinus</i> L.	Prelude
<i>Lantana camara</i> L.	Prelude
<i>Pentas longiflora</i> Oliv.	Prelude
<i>Sesbania sesban</i> (L.) Merr.	Prelude
<i>Solanum nigrum</i> L.	Prelude
<i>Synadenium grantii</i> Hook. f.	Prelude
<i>Annona senegalensis</i> Pers.	Prelude
<i>Berkheya spekeana</i> Oliv.	Prelude
<i>Hygrophila auriculata</i> (Schumach.) Heine	Prelude
<i>Sida rhombifolia</i> L.	Prelude

<i>Aframomum sanguineum</i> (K. Schum.) K. Schum.	Prelude
<i>Euphorbia candelabrum</i> Trémaux ex Kotschy	Prelude
<i>Zea mays</i> L.	Prelude
<i>Cucurbita pepo</i> L.	Prelude
<i>Cynodon dactylon</i> (L.) Pers.	Prelude
<i>Dracaena afromontana</i> Mildbr.	Prelude
<i>Ensete ventricosum</i> (Welw.) Cheesman	Prelude
<i>Eriosema psoraleoides</i> (Lam.) G. Don	Prelude
<i>Urena lobata</i> L.	Prelude
<i>Desmodium adscendens</i> (Vahl) DC	Industry Experts
<i>Tagetes minuta</i> L.	Industry Experts
<b>West Africa</b>	
<i>Securidaca longipedunculata</i> Fresen.	Prelude
<i>Tamarindus indica</i> L.	Prelude
<i>Annona senegalensis</i> Pers.	Prelude
<i>Butyrospermum paradoxum</i> (Gaertner f.) Hepper	Prelude
<i>Calotropis procera</i> (Aiton) W.T.Aiton	Prelude
<i>Senna occidentalis</i> L.	Prelude
<i>Khaya senegalensis</i> (Desv.) A. Juss.	Prelude
<i>Guiera senegalensis</i> J.F. Gmel.	Prelude
<i>Mangifera indica</i> L.	Prelude
<i>Nauclea latifolia</i> Sm.	Prelude
<i>Parkia biglobosa</i> (Jacq.) R.Br. ex G. Don	Prelude
<i>Anogeissus leiocarpus</i> (DC.) Guill. & Perr.	Prelude
<i>Cassia sieberiana</i> DC.	Prelude
<i>Erythrina senegalensis</i> A.DC.	Prelude
<i>Jatropha curcas</i> L.	Prelude
<i>Spondias mombin</i> L.	Prelude
<i>Ximenia americana</i> L.	Prelude
<i>Adansonia digitata</i> L.	Prelude
<i>Anacardium occidentale</i> L.	Prelude
<i>Azadirachta indica</i> A. Juss.	Prelude
<i>Carica papaya</i> L.	Prelude
<i>Daniellia oliveri</i> (Rolfe) Hutch. & Dalziel	Prelude
<i>Fagara zanthoxyloides</i> Lam.	Prelude
<i>Piliostigma thonningii</i> (Schumach.) Milne-Redh.	Prelude
<i>Pterocarpus erinaceus</i> Poir.	Prelude
<i>Sclerocarya birrea</i> (A. Rich.) Hochst.	Prelude
<i>Xylopia aethiopica</i> (Dunal) A. Rich.	Prelude
<i>Acacia nilotica</i> (L.) Willd. ex Del.	Prelude
<i>Aframomum melegueta</i> (Roscoe) K.Schum.	Prelude
<i>Balanites aegyptiaca</i> (L.) Del.	Prelude
<i>Entada africana</i> Guill. & Perr.	Prelude
<i>Stereospermum kunthianum</i> Cham.	Prelude
<i>Ceiba pentandra</i> (L.) Gaertn.	Prelude

<i>Combretum micranthum</i> G. Don	Prelude
<i>Euphorbia hirta</i> L.	Prelude
<i>Mitragyna inermis</i> (Willd.) K.Schum.	Prelude
<i>Senna alata</i> (L.) Roxb.	Prelude
<i>Citrus aurantiifolia</i> (Christm.) Swingle	Prelude
<i>Hymenocardia acida</i> Tul.	Prelude
<i>Piliostigma reticulatum</i> (DC.) Hochst.	Prelude
<i>Vitex doniana</i> Sweet	Prelude
<i>Ziziphus mauritiana</i> Lam.	Prelude
<i>Combretum glutinosum</i> Perr. ex DC.	Prelude
<i>Crossopteryx febrifuga</i> (Afz. ex G. Don) Benth.	Prelude
<i>Detarium microcarpum</i> Guill. & Perr.	Prelude
<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	Prelude
<i>Diospyros mespiliformis</i> Hochst. ex DC.	Prelude
<i>Gymnosporia senegalensis</i> (Lam.) Loes.	Prelude
<i>Prosopis africana</i> (Guill. & Perr.) Taub.	Prelude
<i>Flueggea virosa</i> (Roxb. ex Willd.) Voigt	Prelude
<i>Alchornea cordifolia</i> (Schum. & Thonn.) Müll. Arg.	Prelude
<i>Cochlospermum tinctorium</i> Perr. ex A. Rich.	Prelude
<i>Leptadenia hastata</i> (Pers.) Decne.	Prelude
<i>Momordica charantia</i> L.	Prelude
<i>Newbouldia laevis</i> (P.Beauv.) Seemann ex Bureau	Prelude
<i>Psidium guajava</i> L.	Prelude
<i>Ricinus communis</i> L.	Prelude
<i>Strychnos spinosa</i> Lam.	Prelude
<i>Trichilia emetica</i> Vahl	Prelude
<i>Vernonia amygdalina</i> Delile	Prelude
<i>Abrus precatorius</i> L.	Prelude
<i>Allium cepa</i> L.	Prelude
<i>Bridelia ferruginea</i> Benth.	Prelude
<i>Capsicum frutescens</i> L.	Prelude
<i>Cassia tora</i> L.	Prelude
<i>Cola acuminata</i> (P. Beauv.) Schott & Endl.	Prelude
<i>Cymbopogon citratus</i> (DC.) Stapf	Prelude
<i>Ficus capensis</i> Thunb.	Prelude
<i>Lawsonia inermis</i> L.	Prelude
<i>Ocimum americanum</i> L.	Prelude
<i>Ocimum gratissimum</i> L.	Prelude
<i>Terminalia avicennioides</i> Guill. & Perr.	Prelude
<i>Terminalia macroptera</i> Guil. & Perr.	Prelude
<i>Waltheria indica</i> L.	Prelude
<i>Zingiber officinale</i> Rosc.	Prelude
<i>Azela africana</i> Smith ex Pers.	Prelude
<i>Boscia senegalensis</i> (Pers.) Lam. ex Poir.	Prelude
<i>Elaeis guineensis</i> Jacq.	Prelude
<i>Ficus thonningii</i> Blume	Prelude

<i>Kigelia africana</i> (Lam.) Benth.	Prelude
<i>Lannea acida</i> A. Rich.	Prelude
<i>Morinda lucida</i> Benth.	Prelude
<i>Sterculia setigera</i> Del.	Prelude
<i>Acacia seyal</i> Del.	Prelude
<i>Allium sativum</i> L.	Prelude
<i>Arachis hypogaea</i> L.	Prelude
<i>Cissus quadrangularis</i> L.	Prelude
<i>Euphorbia balsamifera</i> Ait.	Prelude
<i>Moringa oleifera</i> Lam.	Prelude
<i>Ocimum basilicum</i> L.	Prelude
<i>Opilia celtidifolia</i> (Guill. & Perr.) Endl.	Prelude
<i>Vernonia colorata</i> (Willd.) Drake	Prelude
<i>Zea mays</i> L.	Prelude
<i>Acacia albida</i> Del.	Prelude
<i>Ageratum conyzoides</i> L.	Prelude
<i>Detarium senegalense</i> J.F.Gmel.	Prelude
<i>Erythrophleum guineense</i> G. Don	Prelude
<i>Gardenia ternifolia</i> Schumach. & Thonn.	Prelude
<i>Heliotropium indicum</i> L.	Prelude
<i>Manihot esculenta</i> Crantz	Prelude
<i>Paullinia pinnata</i> L.	Prelude
<i>Rauvolfia vomitoria</i> Afzel.	Prelude
<i>Sida acuta</i> Burm. f.	Prelude
<i>Swartzia madagascariensis</i> Desv.	Prelude
<i>Acacia senegal</i> (L.) Willd.	Prelude
<i>Argemone mexicana</i> L.	Prelude
<i>Bauhinia rufescens</i> Lam.	Prelude
<i>Boscia angustifolia</i> A. Rich.	Prelude
<i>Bridelia micrantha</i> (Hochst.) Baillon	Prelude
<i>Cissampelos mucronata</i> A. Rich.	Prelude
<i>Cymbopogon giganteus</i> Chiov.	Prelude
<i>Ficus gnaphalocarpa</i> (Miq.) Steud. ex A. Rich.	Prelude
<i>Heeria insignis</i> (Delile) Kuntze	Prelude
<i>Holarrhena africana</i> DC.	Prelude
<i>Lophira lanceolata</i> Van Tiegh. ex Keay	Prelude
<i>Musa sapientum</i> L.	Prelude
<i>Saba senegalensis</i> (A.DC.) Pichon	Prelude
<i>Acacia macrostachya</i> Reichenb. ex DC.	Prelude
<i>Acanthospermum hispidum</i> DC.	Prelude
<i>Blighia sapida</i> Koenig	Prelude
<i>Bryophyllum pinnatum</i> (Lam.) Kurz	Prelude
<i>Feretia apodanthera</i> Del.	Prelude
<i>Lippia adoensis</i> Hochst.	Prelude
<i>Pteleopsis suberosa</i> Engl. & Diels	Prelude
<i>Acacia sieberiana</i> DC.	Prelude



<i>Afrormosia laxiflora</i> (Benth. ex Bak.) Harms	Prelude
<i>Cajanus cajan</i> (L.) Millsp.	Prelude
<i>Capsicum annuum</i> L.	Prelude
<i>Citrullus lanatus</i> (Thunb.) Matsumara & Makai	Prelude
<i>Ficus exasperata</i> Vahl	Prelude
<i>Hexalobus monopetalus</i> (A. Rich.) Engl. & Diels	Prelude
<i>Hibiscus sabdariffa</i> L.	Prelude
<i>Pseudocedrela kotschy</i> (Schweinf.) Harms	Prelude
<i>Boerhavia diffusa</i> L.	Prelude
<i>Bombax costatum</i> Pellegr. & Vuill.	Prelude
<i>Commiphora africana</i> (A. Rich.) Engl.	Prelude
<i>Hibiscus esculentus</i> (L.) Moench	Prelude
<i>Momordica balsamina</i> L.	Prelude
<i>Pergularia extensa</i> (Jacq.) N.E. Br.	Prelude
<i>Portulaca oleracea</i> L.	Prelude
<i>Striga senegalensis</i> Benth.	Prelude
<i>Vitex madiensis</i> Oliv.	Prelude
<i>Anchomanes difformis</i> (Bl.) Engl.	Prelude
<i>Cadaba farinosa</i> Forssk.	Prelude
<i>Cyperus articulatus</i> L.	Prelude
<i>Gossypium herbaceum</i> L.	Prelude
<i>Hyptis suaveolens</i> Poit.	Prelude
<i>Ipomoea repens</i> Lam.	Prelude
<i>Maerua angolensis</i> DC.	Prelude
<i>Spathodea campanulata</i> P. Beauv.	Prelude
<i>Cassytha filiformis</i> L.	Prelude
<i>Cissus populnea</i> Guill. & Perr.	Prelude
<i>Ficus platyphylla</i> Del.	Prelude
<i>Grewia mollis</i> Juss.	Prelude
<i>Terminalia laxiflora</i> Engl. & Diels	Prelude
<i>Vigna unguiculata</i> (L.) A. Walp.	Prelude
<i>Combretum nigricans</i> Lepr. ex Guill. & Perr.	Prelude
<i>Lonchocarpus laxiflorus</i> Guill. & Perr.	Prelude
<i>Phyllanthus discoideus</i> (Baill.) Muell. Arg.	Prelude
<i>Tribulus terrestris</i> L.	Prelude
<i>Cola nitida</i>	UNIDO (2006)
<i>Tagetes minuta</i> L.	Industry Experts
<b>Palestinian Territory</b>	
<i>Achillea santolina</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Adonis aestivalis</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Allium sativum</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Ammi majus</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Amygdalus communis</i>	GEF, ARIJ, UNIDO, VCA, CBI
<i>Anagyris foetida</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Anemone coronaria</i> L.	GEF, ARIJ, UNIDO, VCA, CBI

<i>Anisum vulgare</i> L. Gaertn.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Arbatus andrachne</i>	GEF, ARIJ, UNIDO, VCA, CBI
<i>Artemisia herba-alba</i> Asso	GEF, ARIJ, UNIDO, VCA, CBI
<i>Avena sativa</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Calotropis procera</i> (Aiton) W. T. Aiton	GEF, ARIJ, UNIDO, VCA, CBI
<i>Capparis spinosa</i>	GEF, ARIJ, UNIDO, VCA, CBI
<i>Carthamus tinctorius</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Carum carvi</i>	GEF, ARIJ, UNIDO, VCA, CBI
<i>Ceratonia siliqua</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Citrullus colocynthis</i> (L.) Schrad	GEF, ARIJ, UNIDO, VCA, CBI
<i>Commiphora opobalsamum</i> (L.) Engl	GEF, ARIJ, UNIDO, VCA, CBI
<i>Crataegus</i> spp	GEF, ARIJ, UNIDO, VCA, CBI
<i>Crocus</i> spp	GEF, ARIJ, UNIDO, VCA, CBI
<i>Cupressus sempervirens</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Datura innoxia</i> Mill.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Daucus carota</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Ficus carica</i>	GEF, ARIJ, UNIDO, VCA, CBI
<i>Ficus sycomorus</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Foeniculum vulgare</i> Mill.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Hyoscyamus aureus</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Hyoscyamus</i> spp.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Inula viscosa</i> (L.) Aiton	GEF, ARIJ, UNIDO, VCA, CBI
<i>Laurus nobilis</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Linum</i> spp.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Lupinus albus</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Majoran</i> spp	GEF, ARIJ, UNIDO, VCA, CBI
<i>Matricaria chamomilla</i> auct.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Matricaria recutita</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Mentha spicata</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Nigella sativa</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Olea europaea</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Origanum syriacum</i>	GEF, ARIJ, UNIDO, VCA, CBI
<i>Papaver somniferum</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Peganum harmala</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Phoenix dactylifera</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Pimpinella anisum</i>	GEF, ARIJ, UNIDO, VCA, CBI
<i>Pinus halepensis</i> Mill.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Pinus pinea</i>	GEF, ARIJ, UNIDO, VCA, CBI
<i>Pistacia terebinthus</i>	GEF, ARIJ, UNIDO, VCA, CBI
<i>Prunus ursina</i>	GEF, ARIJ, UNIDO, VCA, CBI
<i>Pyrus syriaca</i>	GEF, ARIJ, UNIDO, VCA, CBI
<i>Rhus coriaria</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Ricinus communis</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Robinia pseudoacacia</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Rosa canina</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Rosmarinus officinalis</i> L.	GEF, ARIJ, UNIDO, VCA, CBI

<i>Rubus sanctus</i>	GEF, ARIJ, UNIDO, VCA, CBI
<i>Salvia fruticosa</i> Mill.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Salvia officinalis</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Teucrium polium</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Thymus vulgaris</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Trigonella foenum-graecum</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Urginea maritima</i> (L.) Baker	GEF, ARIJ, UNIDO, VCA, CBI
<i>Verbena officinalis</i> L.	GEF, ARIJ, UNIDO, VCA, CBI
<i>Zizyphus</i> spp	GEF, ARIJ, UNIDO, VCA, CBI
<b>Algeria</b>	
<i>Acacia albida</i> Del.	Prelude
<i>Acacia raddiana</i> Savi	Prelude
<i>Acacia seyal</i> Del.	Prelude
<i>Aerva javanica</i> (Burm.f.) Juss.	Prelude
<i>Ageratum conyzoides</i> L.	Prelude
<i>Allium cepa</i> L.	Prelude
<i>Allium sativum</i> L.	Prelude
<i>Aloe vera</i> (L.) Burm.f.	Prelude
<i>Anastatica hierochuntica</i> L.	Prelude
<i>Anethum graveolens</i> L.	Prelude
<i>Anvillea radiata</i> Coss. & Durieu	Prelude
<i>Apium graveolens</i> L.	Prelude
<i>Artemisia absinthium</i> L.	Prelude
<i>Artemisia herba-alba</i> Asso	Prelude
<i>Atriplex halimus</i> L.	Prelude
<i>Balanites aegyptiaca</i> (L.) Del.	Prelude
<i>Boscia senegalensis</i> (Pers.) Lam. ex Poir.	Prelude
<i>Calligonum comosum</i> L' Hérít.	Prelude
<i>Calotropis procera</i> (Aiton) W.T.Aiton	Prelude
<i>Cannabis sativa</i> L.	Prelude
<i>Capparis decidua</i> (Forssk.) Edgew.	Prelude
<i>Capparis spinosa</i> L.	Prelude
<i>Capsicum annuum</i> L.	Prelude
<i>Capsicum frutescens</i> L.	Prelude
<i>Cassia italica</i> (Mill.) Lam. ex. F. W. Andr.	Prelude
<i>Cedrus atlantica</i> (Endl.) Carrière	Prelude
<i>Chamaerops humilis</i> L.	Prelude
<i>Chenopodium ambrosioides</i> L.	Prelude
<i>Citrullus colocynthis</i> (L.) Schrad.	Prelude
<i>Conyza bonariensis</i> (L.) Cronq.	Prelude
<i>Cornulaca monacantha</i> Del.	Prelude
<i>Cucumis melo</i> L. var. <i>agrestis</i> Naud.	Prelude
<i>Cucurbita pepo</i> L.	Prelude
<i>Cuminum cyminum</i> L.	Prelude
<i>Cymbopogon proximus</i> (Hochst. ex A. Rich) Stapf.	Prelude

<i>Cymbopogon schoenanthus</i> (L.) Spreng.	Prelude
<i>Cynara scolymus</i> L.	Prelude
<i>Cynodon dactylon</i> (L.) Pers.	Prelude
<i>Cyperus esculentus</i> L.	Prelude
<i>Cyperus papyrus</i> L.	Prelude
<i>Datura stramonium</i> L.	Prelude
<i>Dryopteris filix-mas</i> (L.) Schott	Prelude
<i>Eclipta prostrata</i> (L.) L.	Prelude
<i>Eucalyptus globulus</i> Labill.	Prelude
<i>Fagonia bruguieri</i> DC.	Prelude
<i>Ferula communis</i> L.	Prelude
<i>Heliotropium bacciferum</i> Forssk.	Prelude
<i>Juniperus oxycedrus</i> L.	Prelude
<i>Juniperus phoenicea</i> L.	Prelude
<i>Lactuca sativa</i> L.	Prelude
<i>Lagenaria siceraria</i> (Molina) Standley	Prelude
<i>Lawsonia inermis</i> L. (henna)	Prelude
<i>Lepidium sativum</i> L.	Prelude
<i>Leptadenia pyrotechnica</i> (Forssk.) Decne.	Prelude
<i>Maerua crassifolia</i> Forssk.	Prelude
<i>Marrubium vulgare</i> L.	Prelude
<i>Musa paradisiaca</i> L.	Prelude
<i>Nerium oleander</i> L.	Prelude
<i>Nicotiana rustica</i> L.	Prelude
<i>Nigella sativa</i> L.	Prelude
<i>Ocimum basilicum</i> L.	Prelude
<i>Olea europaea</i> L.	Prelude
<i>Opuntia ficus-indica</i> (L.) Mill.	Prelude
<i>Pergularia tomentosa</i> L.	Prelude
<i>Pinus halepensis</i> Mill.	Prelude
<i>Plantago lanceolata</i> L.	Prelude
<i>Portulaca oleracea</i> L.	Prelude
<i>Pulicaria crispa</i> (Forssk.) Benth. ex Oliv.	Prelude
<i>Retama retam</i> (Forssk.) Webb.	Prelude
<i>Ricinus communis</i> L.	Prelude
<i>Ruta chalepensis</i> L.	Prelude
<i>Salvadora persica</i> L.	Prelude
<i>Solanum nigrum</i> L.	Prelude
<i>Solenostemma argel</i> (Del.) Hayne	Prelude
<i>Tamarindus indica</i> L.	Prelude
<i>Tamarix aphylla</i> L.	Prelude
<i>Tamarix gallica</i> L.	Prelude
<i>Thuja articulata</i> Vahl	Prelude
<i>Traganum nudatum</i> Del.	Prelude
<i>Tribulus terrestris</i> L.	Prelude
<i>Trigonella foenum-graecum</i> L.	Prelude

<i>Urginea maritima</i> L.	Prelude
<i>Withania somnifera</i> (L.) Dun.	Prelude
<i>Zea mays</i> L.	Prelude
<i>Zingiber officinale</i> Rosc.	Prelude
<i>Ziziphus spina-christi</i> (L.) Desf.	Prelude
<i>Zygophyllum album</i> L.	Prelude
<i>Rosmarinus officinalis</i>	Boudjelal, A. et al.(2013)
<i>Thymus vulgaris</i>	Boudjelal, A. et al.(2013)
<i>Quercus prinus</i>	Sekkoum, K. et al. (2010)