



APPLICABILITY OF TRACEABILITY SYSTEMS FOR CITES-LISTED MEDICINAL PLANTS (APPENDICES II AND III) - GREATER MEKONG: PRELIMINARY ASSESSMENT



Note

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Acronyms

ABS	access and benefit sharing
AEO	authorized economic operator
ASYCUDA	Automated System for Customs Data (UNCTAD Programme)
B&C	book and claim
BSE	bovine spongiform encephalopathy
BT (P&C)	BioTrade Principles and Criteria
CAB	conformity assessment body
CART	capacity-building requirements table
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COP/CoP	Conference of the Parties
CSR	corporate social responsibility
CTEs	critical tracking events
EU	European Union
FAO	Food and Agriculture Organization
GAP	good agricultural practice
GCL-MP	Global Checklist of Medicinal Plants
GIP	good inside portal
GIZ	German Society for International Cooperation
GMP	good manufacturing practice
HACCP	hazard analysis and critical control points
ISO	International Standards Organization
ITC	International Trade Centre
KDEs	key data elements
KPI	key performance indicator
LAFs	legal acquisition findings
MAPs	medicinal and aromatic plants
MEA	Multilateral Environmental Agreement
MoU	memorandum of understanding
MSY	maximum sustainable yield
NDFs	non-detriment findings
NOP	National Organic Program (United States of America)
NTF	non-timber forest
NWFP	non-wood forest products
PC22	22nd meeting of the Plants Committee (CITES)
PPP	public-private partnership
RFID	radio-frequency identification
SDGs	Sustainable Development Goals
SFDA	State Food and Drug Administration (China)
SWOT	strengths, weaknesses, opportunities and threats
TCM	traditional Chinese medicine
ToR	terms of reference
UEBT	Union for Ethical BioTrade
UI	unique identification
UN/CEFACT	United Nations Centre for Trade Facilitation and Electronic Business
UNCTAD	United Nations Conference on Trade and Development
UNECE	United Nations Economic Commission for Europe
UNEP-WCMC	United Nations Environment Programme - World Conservation Monitoring
UNIDO	United Nations Industrial Development Organization
USDA	United States Department of Agriculture
WCO	World Customs Organization
WHO-GACP	World Health Organization Good Agricultural and Collection Practices
SC66	66th Standing Committee (CITES)

Executive summary

This document analyses the use of traceability systems as a tool to strengthen existing CITES processes, in particular legal acquisition findings (LAFs) and non-detriment findings (NDFs), for non-timber plant species, particularly medicinal plants, listed under CITES Appendices II and III. In particular, the study focuses on the trade in CITES Appendix II-listed medicinal plants (*Aquilaria crassna* – agarwood, *Gastrodia elata* and *Dendrobium nobile*) from the Greater Mekong subregion countries: Cambodia, China, Lao People's Democratic Republic, Myanmar, Thailand and Viet Nam.

Main findings:

1. There are globally over 60 000 species of plants mainly collected from the wild that are used for their medicinal properties.
2. 33 CITES-listed medicinal plants were identified originating in the Greater Mekong region countries. CITES trade data analysis was conducted for these. Two species, *Aquilaria crassna* and *Gastrodia elata*, were selected for in-depth study, while *Dendrobium nobile* was selected for desktop review.
3. Medicinal plants are a source of many traditional and modern medicines, and make an important contribution to rural livelihoods, as well as having cultural value. Harvesters are often among the poorest and most vulnerable members of society. Wild plants can provide a supplementary source of income for households, providing seasonal work for villagers in rural areas.
4. The wild harvesting that occurs for medicinal plants is difficult to track back to its source and its value hard to estimate due to long trade chains. Trade can be illegal, unregulated and/or unreported and is sometimes known as the “hidden harvest”. Tracking is made more complex by the different forms that species are traded in and their aggregation in export codes.
5. Of the selected CITES-listed medicinal plants (*Aquilaria crassna*, *Gastrodia elata* and *Dendrobium nobile*) and their derived plant products exported (mainly for commercial use) from the Greater Mekong subregion countries studied during 2005–2014, *Aquilaria crassna* accounted for 99 per cent of global trade with 3 547 666 specimens; *Gastrodia elata* 91 per cent with 80 140 specimens and *Dendrobium nobile* 26 per cent with 215 626 specimens registered.
6. Trade of CITES-listed *Aquilaria crassna* has been consistent since 2011 with some fluctuation in quantities traded. Thailand and Viet Nam have been the major exporters with produce destined mainly for China, Indonesia, Lao People’s Democratic Republic and Myanmar. The questions and complexity over the legality of wild-harvested agarwood suggests that under current definitions, some trade may be deemed illegal. Seizure data show an increase in the illegal trade of agarwood products from wild-harvested *Aquilaria crassna*. Difficulties in distinguishing between wild and propagated harvesting makes enforcing legal compliancy difficult.
7. Trade of CITES-listed *Gastrodia elata* shows export fluctuations: the data suggest a shift in either trading of the commodity (roots, derivatives and medicines, averaging 100 tons per year: see Figure 3.4) or reporting practices over the period. 90 per cent of exports of this species are from the Greater Mekong subregion, with more than 99 per cent originating from China (mainly for commercial purposes). In China, declarations of suspicion of illegal harvesting leads to additional authorization processes. The Republic of Korea was the main destination (82 per cent) followed by Japan (9 per cent). Mismatches in trade data are reported which complicates the assumptions made about trade analysis of *Gastrodia elata*.
8. Trade of CITES-listed *Dendrobium nobile* has increased slightly each year in the chosen countries, though again with fluctuations reported. Most exports originate from China, Thailand and Viet Nam for a majority of trade in propagated live plants. Noteworthy were 2009 and 2013 when two extraordinary export records were registered, showing a sharp spike in trade above the average. The major importers were the Republic of Korea and Singapore.

9. Market assessment is complex due to the inconsistent reporting between exports and imports. Within the studied period (2005–2014), for example, only 13 per cent of *Dendrobium nobile* imports were recorded from exports shipped.
10. In the studied countries, *Dendrobium nobile* represents an important family within the trade of medicinal plants; the traded plants are practically all artificially propagated, with 88 per cent reported as live exports.
11. Regarding existing control systems, the CITES Management Authorities in Thailand have just implemented a control system based on the issuance and control of operating licences.
12. Importing nations have a significant role to play in refusing the purchase of illegal and unsustainable agarwood and other medicinal plants by encouraging the sourcing of sustainable and legal products/ingredients.
13. Traceability can clearly contribute to the robustness of legal acquisition findings (LAFs), and can also generate useful trade data to improve non-detriment findings (NDFs) with strong collaborative partnerships between the private and public sectors.
14. A traceability system is proposed based on the United Nations Economic Commission for Europe (UNECE) traceability architecture, i.e. by recognizing policy claims, defining entry/exit points for supply chains, and an audit process to support CITES data requirements for the issuance of export permits and certificates to registered stocks.
15. Recording of reception of plant material at nurseries or plantations, creation of a database of properly identified parental plants and linking export permits to identified parental plants, can significantly strengthen the CITES Management Authorities permitting process, especially if coupled with risk management systems in the controls for an operating licence and in the issuance of CITES import and export permits and certificates.
16. A traceability system is proposed that renders stricter control on the early stages of the value chain where risk of introduction of illegally harvested material is greatest. For later stages in the value chain, controls may be less tight and adapted to the realities of the mixing of medicinal plant species in final products.
17. A key principle of the UNECE traceability architecture is that it recognizes the role that the private and public sectors play in developing a traceability system, and that the management of this relationship is one of the keys to the successful implementation.
18. The possible socioeconomic impacts arising from the use of any traceability system, and in particular the one proposed in this study, must be properly understood. A practical pilot project may be the most appropriate way to do address this need, since costs and benefits are not easily estimated from theoretical deliberations.
19. Forming a traceability project partnership with a wild-collected plant species standard (FairWild, Union for Ethical BioTrade-UEBT or similar) and a certification or similar scheme might also help to facilitate the implementation of a traceability system by introducing financial benefits to local stakeholders, particularly small farm holders or local wild collectors (see sections 4.6., 4.7 and 5.5).
20. Recommendations for the development of a pilot study are made to deepen understanding of the best approach for implementing traceability in non-timber plant species, as well as the right mix of positive and negative incentives.

1 Introduction

1.1 Background

UNCTAD and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Secretariats have a long-standing partnership, defined by their memorandum of understanding (MoU), signed in 2010. The MoU commits both organizations to ensuring the conservation of species, enhancing the livelihoods of the poor in remote and marginal areas, and promoting business opportunities for entrepreneurs that comply with CITES Management Authorities requirements and relevant national legislation. In addition, UNCTAD and the CITES Secretariat agreed to collaborate on matters related to implementing special automated customs procedures for CITES-listed species of wild fauna and flora within the UNCTAD Automated System for Customs Data (ASYCUDA) system for electronic customs management and, recently, CITES permit management.¹

Particular attention is paid to the role of economic incentives for sustainable management of CITES Appendices II- and III-listed species and benefit sharing with resource owners. UNCTAD channels its contribution through its BioTrade Initiative. The BioTrade Initiative is concerned with activities of production, transformation and commercialization of products and services derived from native biodiversity (species and ecosystems) under social, economic and environmental sustainability criteria.²

At the 15th and 16th meetings of the Conference of the Parties (CoP) to CITES in 2010 and 2013, it was decided to consider the possible development of traceability systems to assist in ensuring the sustainable use of CITES-listed species. In response, UNCTAD and the CITES Secretariat have collaborated in drafting technical documents and organizing workshops on traceability issues to better understand the requirements in developing such systems for species through the supply chain, from sourcing all the way to the market and final consumption by consumers.

Within non-timber plant species, CITES Parties and BioTrade partners have been considering or implementing traceability systems but no comprehensive study of the medicinal plant sector specifically has yet been undertaken. In response, UNCTAD has prepared, in consultation with the CITES Secretariat, selected CITES Management and Scientific Authorities, and its BioTrade partners, comprehensive studies to facilitate work related to the tracing of CITES-listed non-timber forest plant species, focusing on ornamental and medicinal plants.

The two studies are intended to contribute to efforts to the ongoing traceability discussions to provide an umbrella traceability mechanisms for CITES-listed species of flora and fauna as noted in the Standing Committee document SC66 Doc. 34.1 (Rev. 1)³ considered at the 17th meeting of the Conference of the Parties (CoP17) to CITES. This complements the Secretariat's discussions with the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) regarding the possible development of a business requirement specification for international trade in wildlife (AC28 Doc 14.2.1,⁴ SC66 DOC. 34.1 (Rev.1)).

The first study focused on **assessing the applicability of a traceability system for ornamental plants in the Latin American region with an emphasis on the Andean subregion**. Preliminary findings and recommendations were submitted to the CITES Secretariat (document SC66 Inf.16 (Lehr H, 2016b) at the 66th Standing Committee meeting (SC66) in January 2016, and discussed at a side event. Additionally, the draft study was further discussed with experts and CITES Parties through bilateral consultations, and a peer review process that took place in the summer of 2016. The second study **assessed the applicability of traceability systems for medicinal plants in the Asian region, particularly the Greater Mekong subregion**. The countries included in the study are: Cambodia, China, Lao People's Democratic Republic, Myanmar, Thailand and Viet Nam. The results of this latter study are presented in this report.

The findings and recommendations of both studies were discussed and validated during the workshop on traceability systems for CITES-listed non-timber forest plant species (ornamental and medicinal plants) on 22 September 2016 in Johannesburg, South Africa. The event was organized on the margins of the CITES CoP17 held in Johannesburg from 24 September to 5 October 2016. Further information on the workshop is available at: <http://unctad.org/en/Pages/MeetingDetails.aspx?meetingid=1182>.

The results of the studies were also be disseminated at the IV BioTrade Congress on 3 December 2016, in Cancun, Mexico, organized in the context of COP 13 of the Convention on Biological Diversity (CBD) and its Biodiversity and Business Forum.

1.2 Aim and scope

This study aims to contribute to the traceability work on identified traceability systems being undertaken by CITES Management Authority Parties to support sustainable and legal trade in CITES listed non-timber forest plant species, regarding in particular, the trade of CITES-listed medicinal plants originating from Asia with emphasis on the Greater Mekong subregion, including the countries of Cambodia, China, Lao People's Democratic Republic, Myanmar, Thailand and Viet Nam.

The study's terms of reference (ToR) covered the following core activities:

- Develop an outline and methodology to carry out the study, which will be discussed and validated with UNCTAD and the CITES Secretariat.
- Discuss with the United Nations and other organizations working on traceability systems, possible standards for use in the development of a CITES traceability system for medicinal plants in the Asian region, with an emphasis on the Mekong subregion.
- Carry out an in-depth review of existing information on the value chains for medicinal plants in the Asian region, with emphasis on the Greater Mekong subregion focusing on CITES-listed species and those being supported by BioTrade partners.
- Identify and review existing traceability systems for medicinal plants, and determine those to be further analysed in the framework of the study.
- Map the value chains for medicinal plants in the above-mentioned region. This would include identifying key stakeholders and their role in defining and implementing traceability systems, as well as identifying livelihood benefits obtained by upstream and downstream stakeholders.
- Analyse and assess how the selected systems are being implemented, including their internal control systems (documentation and methodology used, as well as key intervention points and actors throughout the value chain to ensure the system's effectiveness to limit illegal harvesting and trade in the species, etc.) and categorize them according to criteria defined jointly with UNCTAD and the CITES Secretariat.
- Assess the socioeconomic implications and benefits of the selected systems, particularly considering the needs of small farmers and landowners, governments and industries, to define their capacity-building needs and a fair distribution of benefits being generated throughout the value chain.
- Provide practical recommendations on how a traceability system should be defined and implemented for non-timber flora species within the CITES framework, taking into account previous technical studies developed by UNCTAD and others, including UNCTAD's study on ornamental plants in Latin America.
- Prepare a first draft on the initial findings and recommendations of the study to be peer reviewed with relevant stakeholders.
- Review the study to address the peer review comments received. This second draft should be revised and approved by UNCTAD and the CITES Secretariat before being presented at the regional workshop (mentioned below)
- Present the second draft of the study and validate its findings and recommendations with relevant stakeholders involved in traceability systems for CITES-listed species at a regional workshop to be organized by UNCTAD in consultation with the CITES Secretariat and other stakeholders on 22 September 2016.
- Prepare a short factsheet and a PowerPoint presentation on the study and its key findings for dissemination at relevant UNCTAD events.
- Participate and present the study at UNCTAD dissemination events as required.

The outcome of this study, which is based on international standards and norms, includes, *inter alia*:

- A technical summary of traceability systems available for medicinal plants.
- Recommendations on how a traceability system should be defined and implemented and on how to address the capacity-building requirements for the associated small-scale farmers and landowners, CITES Management and Scientific Authorities.
- Recommendations for advancing with the study's (and other relevant studies including the one on ornamentals) outputs and recommendations within CITES (and other relevant intergovernmental bodies).

1.3 Methodology

This study analyses significant trade of CITES-listed medicinal plants listed in Appendix II and identifies products derived from these species that dominate the trade from the selected countries.

The report introduces the global trade in medicinal plants, identifies CITES-listed medicinal plant species from the Greater Mekong subregion, analyses CITES and other available trade data. It describes the status, trade and value chains of *Aquilaria crassna* (agarwood) and *Gastrodia elata* as two examples of CITES-listed

medicinal plant species from this subregion. It also includes a desktop study on the *Dendrobium nobile* orchid to link with the study on ornamental plants. Where possible, information about the socioeconomic baseline for key stakeholders and their capacity-building needs is presented. Recommendations for the effective implementation of CITES controls and traceability systems are included. In section 4.7, the report presents a case study of the FairWild Standard and its certification scheme that supports the full traceability of goods and finances derived from wild plant collection. The FairWild Standard has been developed specifically to verify the sustainability of harvest and trade in wild-harvested medicinal and aromatic plants (MAPs) whilst ensuring the long-term survival of wild species in their habitats, respecting traditions, cultures and supporting the livelihoods of all stakeholders through benefit sharing along the value chain. A case study on the traceability requirements of the Union for Ethical BioTrade (UEBT) Standard is also included.

The report also tackles the question of whether CITES processes can be strengthened by implementing a traceability system. Previous traceability studies conducted on sharks and ornamental plants have been used as a baseline reference to define a potential traceability system. In particular, the study on shark traceability (Lehr, 2015b), which lay the foundations for the development of the proposed architectural framework in the position paper by the United Nations Economic Commission for Europe (UNECE) Secretariat, has been adapted to show how such an architecture could be designed to support CITES processes.

The research was divided into three elements:

- a) **The collection of secondary data:** Secondary information was derived from CITES trade data, published articles and relevant reports, and web-based research on companies and relevant stakeholders.
- b) **The collection of primary data:** Primary data were obtained by means of interviews with relevant stakeholders in July 2016. The aim of the interviews was to obtain information about the medicinal plant trade chains, the implementation of CITES controls, the existing traceability systems, as well as to obtain feedback on the traceability system proposed in this report.
- c) **Exploration of other potential traceability methodologies and strategies, and adapting them to the study needs:** The consultant adapted the UNECE traceability architecture in relation to the characteristics of medicinal plants. Consultation was carried out with key stakeholders and analysis on the applicability of third-party certification systems to complement the development of a traceability system. The experience with the FairWild system is outlined, but similar systems focusing on wild-collected plant species could be further analysed to assess their feasibility to support the implementation of traceability systems.

The stakeholder groups consulted for this study were: government personnel, BioTrade programme staff, companies, non-governmental organizations and research organizations. Annex 1 provides the list of persons contacted and interviewed.

2 The market chain

2.1 Trade in medicinal plants: Introduction

Overall worldwide demand for floricultural products is on the rise (UN Comtrade, 2015). Demand for medicinal plants has increased as well with over 60 000 plant species, the majority collected from the wild, being used for their medicinal properties globally (Schippmann et al., 2006), providing sources of both traditional and modern medicines. Sometimes referred to as the “hidden harvest”, these wild plants provide a source of raw materials for local use and for the manufacture of a wide variety of pharmaceutical, herbal, food, cosmetic and fragrance products. They also provide a critical source of household income, particularly for the rural poor. A complete list of all plants used in traditional medicine does not exist, but at least 30 000 species of plants with a use documented in traditional systems and national pharmacopoeias are included in the Global Checklist of Medicinal Plants.⁵ Plants used in traditional medicine are not only important in local health care, many (an estimated 4000–6000) (Iqbal, 1993) are important in international trade based on broader commercial use and value.

Trade chains for these species are typically long and complex, making it difficult to link products to the source of supply. End users may be unaware of wild collection being the source of ingredients, or even the country of origin. As much of the trade is unreported and/or unregulated, estimating the scale of wild harvest is difficult. Species are traded in different forms (raw, processed) and are often aggregated in export codes – complexities that make comprehensive trade monitoring or separation by species or origin (wild or cultivated stocks) close too impossible (Shanley et al., 2015). However, their economic importance is clear. According to the Food and Agriculture Organization of the United Nations (FAO)(FAO, 2015), the global value of non-wood forest products (NWFP) of plant and animal origin was estimated at US\$20.6 billion in 2010. This is likely a substantial underestimate as NWFPs are rarely captured in national statistics (Shackleton and Pandey, 2014). Estimates of the scale of trade are dependent on customs codes, which can be challenging to include comprehensively in trade estimates given the variety of species involved and difference between how they are captured in national reporting. In a recent International Trade Centre (ITC)-TRAFFIC study (ITC, 2016), the export of MAPs (both wild collected and cultivated) from China was estimated at over 1.3 billion kilograms, with a reported customs value of over US\$5 billion. The global reported trade in plants for medicinal purposes alone (customs code HS1211, a subset of those analysed in the ITC study) was valued at over US\$3.4 billion in 2014 (UN, 2016), and has been increasing.

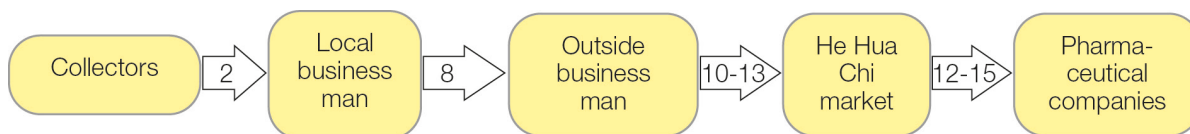
Pressures on wild resources can pose major ecological and socioeconomic challenges. The conservation status of medicinal plants is poorly known (Secretariat of the CBD, 2010), but for plants globally, it is estimated that one in five plant species is threatened with extinction in the wild (Brummitt et al., 2015). Plants have been used by humans over millennia and, in that time, have been fairly resistant to collection pressures. However, the existing and growing market demand creates an important driver of increased harvesting pressure, for both long-traded species and species that were not traded internationally in the past (e.g. for superfoods or cosmetics).

Medicinal plants make an important contribution to rural livelihoods, as well as having cultural value. Harvesters are often among the poorest and most vulnerable members of society. Wild plants can provide a supplementary source of income for households, providing seasonal work for villagers in rural areas. There is a need to improve the contribution these resources make to livelihoods, increasing both the amount and the security of income from the trade, and supporting value addition locally.

The medicinal plant trade chains may include multiple stakeholders with the minimal value captured at the level of primary producers (for example Figure 2.1).

The nature of the processing and trade in these ingredients often adds to the complexity of tracing the trade, as one ingredient may be used in multiple products by multiple manufacturing companies in different sectors. For example, liquorice (*Glycyrrhiza* spp. root), often sourced from the wild, is an important ingredient in herbal medicinal products, food (e.g. teas), and traditional Chinese medicine, and its extract is used in cosmetic products. The tobacco industry is also a significant user of this ingredient.

Figure 2.1 Simplified trade chain for *Schisandra sphenanthera* in Pingwu County and Chengdu, Sichuan, China



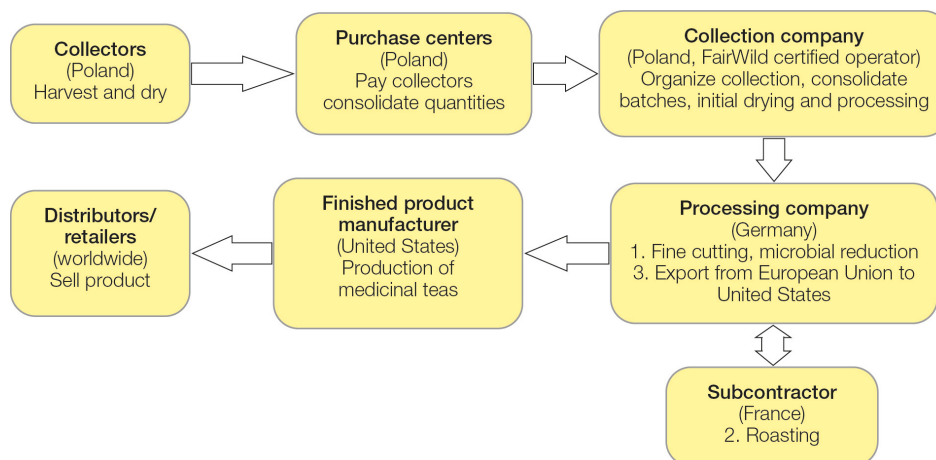
Source: Adapted from Guo, Liu, Kanari, 2012.

Note: Numbers indicate purchase/sale price in CNY/kg in 2009. He Hua Chi market is in Chengdu.

From the perspective of traceability of medicinal plant ingredients, it is not uncommon for trade chains to cross borders and be handled by multiple companies for the various stages of processing and consolidation (for example see Figure 2.2). Specifically, standards and certification schemes can be used to support the traceability of medicinal plants, e.g. the FairWild Standard was developed for sustainable wild harvesting and equitable trade in plants and requires full traceability of ingredients to the harvesting site (see section 4.7 for more details).

Illegal and unsustainable harvesting and trade of medicinal plants may have an impact on national economies and local livelihoods, as well as the conservation of forests and species. Estimating the levels of illegal trade is challenging, given that there is little regulation and monitoring of legal trade. For these species, there is generally less control and enforcement of legality and sustainability, e.g. compared with the trade in timber species, and a lack of management planning for the majority of species harvested and traded (Laird et al., 2010). CITES controls for medicinal plants provide, in many cases, the major (or only) legal instrument to address the legality of trade. The example of a useful mechanism is a non-detriment finding (NDF), a requirement to determine that exports are both legal and sustainable before they are permitted for Appendix II-listed species.⁶

Figure 2.2 Simplified trade chain for FairWild-certified dandelion root (*Taraxacum officinale*) sourced from Poland



Source: TRAFFIC (based on stakeholder interviews).

A number of medicinal plant species are listed in the CITES Appendices. These include: African cherry (*Prunus Africana*) bark, harvested in a number of African range states, mostly for exports to the European Union (EU) pharmaceutical industry where it is used as an ingredient in a prostate cancer drug; ginseng (*Panax quinquefolius*), the root of which is harvested in the United States of America and Canada and traded internationally mainly to supply traditional Asian medicine demand; and East African sandalwood (*Osyris lanceolata*), harvested from range states in Eastern Africa and traded for its valuable essential oil.

2.2 CITES-listed medicinal plants from the Mekong subregion

The list of CITES-listed plant species (PLANTAE) from the Greater Mekong subregion countries Cambodia, China, Lao People’s Democratic Republic, Myanmar, Thailand and Viet Nam was downloaded from the

CITES Checklist,⁷ resulting in 1244 entries. This list was compared with the sub-set of the Global Checklist of Medicinal Plants (GCL-MP) of the priority 5000 medicinal plants species.

The limitation of the CITES species checklist data is that they do not allow the selection of regions within the target countries, which means that some of the species selected may not be available in the Greater Mekong subregion. The limitation of the used selection of GCL-MP is that only 5000 priority plant species for which the medicinal uses are documented were included, however CITES-listed species are included in this list. The resulting overlap was the list of 33 CITES-listed species (see Annex 2). Several species were excluded from the list and trade data analysis as their source areas are outside of the Greater Mekong region, including: *Cistanche deserticola*, *Panax quinquefolius* and *Taxus sumatrana*.

2.3 Trade in CITES-listed medicinal plants from the Mekong subregion

To narrow down the list further, CITES trade data analysis was conducted, using the reported data from CITES trade data base, covering the period 2005–2014. Annex 3 summarizes the reported export trade records of medicinal plants from all countries and from the Greater Mekong subregion countries for this period.

Of 33 CITES-listed medicinal plant species (Annex 2), 24 had trade reported in the period. Of the 24 species reporting trade, 6 species were not reported by exporters, with trade being identified by importer records. These were included in the table in Annex 3, with the number of export records zeroed (for example, *Aquilaria subintegra* and *Dioscorea deltoidea*). Nearly all trade reported was for commercial purposes.

Based on initial trade analysis for 2005–2014 that identified the two species with major trade, as well as based on discussions with BioTrade partners, CITES Management Authorities in the region, UNCTAD and the CITES Secretariat, the two species prioritized for in-depth case studies were *Aquilaria species* (focusing on *Aquilaria crassna*) and *Gastrodia elata*. *Dendrobium nobile* was earmarked for a desktop study to link the first study on ornamental plants to this study on medicinal plants.

It may also be useful to note that since 1992, the only data on artificially propagated Appendices II- and III-listed plants held in the CITES Trade Database have been those that can be directly entered electronically, and therefore data may be incomplete.⁸

2.4 Case study of a CITES-listed medicinal plant value chain: *Gastrodia elata*

2.4.1 Species name and distribution

Gastrodia elata Blume (tall gastrodia) is a saprophytic perennial herb in the Orchidaceae family, growing at elevations of 400–3200m. Two fungi play an important role during the life history of *Gastrodia elata*: *Armillaria mellea* (Vahl. Ex Fr.) Quel. and *Mycena osmundicola* Lange.

Synonyms: *Gastrodia mairei* Schltr (China Plant Specialist Group, 2004) and *Gastrodia elata* fo. *alba* S. Chow, *Gastrodia elata* fo. *flavida* S. Chow, *Gastrodia elata* fo. *glauca* S. Chow, *Gastrodia elata* fo. *pilifera* Tuyama, *Gastrodia elata* fo. *viridis* (Makino) Makino, *Gastrodia elata* var. *gracilis* Pamp., *Gastrodia viridis* Makino.⁹

Trading names: Rhizoma gastrodia, Elatae, míng tian má, dǐng feng cao, tenma, ch'onma, gastrodia rhizome, Chi Jian, Tian Ma.

Countries/territories of occurrence: Bhutan, China (Anhui, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Tibet [or Xizang], Yunnan) (China Plant Specialist Group, 2004), Democratic People's Republic of Korea, India, Japan, Nepal, Republic of Korea, Russian Federation, Taiwan, Province of China (Schippmann, 2001).¹⁰

2.4.2 Population status, conservation, ex situ production

Gastrodia elata is assessed as Vulnerable A2c in the IUCN Red List Category and Criteria (version 3.1) (China Plant Specialist Group, 2004). In China it is assessed as vulnerable in the China Red Data Book (Schippmann, 2001).

The successful cultivation of *Gastrodia elata* started in China in 1970, once its life history had been understood. However, pressure on wild populations remained from over harvesting because of its high medicinal value (Chen et al., 2014). In addition to this, deforestation leading to habitat destruction affected

wild *Gastrodia elata* populations in China. A recent study (Chen et al., 2014) of the genetic diversity of the *Gastrodia elata* population in Hubei province demonstrated relatively low levels of genetic diversity and genetic structure of the species, which are important factors to take into account in the development of ex situ and in situ conservation strategies. *Gastrodia elata* cultivation sites have also been established in the Republic of Korea (Lee et al., 2014).

2.4.3 Use of *Gastrodia elata*

Gastrodia elata has a long history of use in the traditional Chinese medicine (TCM) system, and is among the designated geo-authentic (Dao Di) medicinal materials in Guizhou province (Liu et al., 2016). It is also used in other traditional medicine systems and herbal medicinal products, and its root extracts have cosmetic applications. Sources of *Gastrodia elata* are both wild collected and cultivated. The wild-sourced *Gastrodia elata* appears to be the preferred ingredient in some traditional medicine systems. Recorded (Brinckmann, 2014) commercially traded forms and uses of *Gastrodia elata* include:

- Rhizome (tubers) for medicinal uses in traditional Chinese, Japanese (Kampo) and Korean systems of medicine;
- Aerial parts for medicinal uses (included in the Korean Herbal Pharmacopeia);
- Powdered dried tuber for medicinal uses;
- Extract of the roots (cosmetic uses; listed in the International Nomenclature of Cosmetic Ingredients system);
- Fermented root extract (cosmetic uses); and
- Gastrodin purified from the extract of rhizomes for herbal medicinal products.

The selected finished products, containing *Gastrodia elata* in the European market include cosmetic products and medicinal products (Brinckmann, 2014).

No precise trade data on the volume/value or size of production of *Gastrodia elata* in China are available, however, it is estimated by the CITES Scientific Authority of China that an annual production of approximately 10 000 tons of dried tubers of *Gastrodia elata* from cultivated origin would be available, based on the information from various sources (Zhang, 2016).

A consultancy company¹¹ in China collects information daily about both the primary production quantity (from cultivation and wild harvesting), location sources, price trends in production sites, annual rate of returns, as well as commercial, market prices for all the main TCM ingredients in trade (including *Gastrodia elata*). Such information is collected through a state-wide network of informants and field monitoring stations. While the summary and analysis of such information can be made available on a commercial basis, it was not accessed during the preparation of this present report. The availability of fully quantifiable production data down to the first point of sales is important in ensuring trade in species is sustainable and traceable.

2.4.4 History of Appendix II listing and CITES controls exemptions

Gastrodia elata was included in CITES Appendix II in 1975; from 1986 onwards it appears in the annual reports of China and Hong Kong SAR, China as “roots”; and from 1990 onwards as “derivatives” (Schippmann, 2001). All parts and derivatives of *Gastrodia elata* are subject to CITES controls with the following exemptions (annotation #4):¹²

- Seeds (including seedpods of Orchidaceae), spores and pollen (including pollinia);
- Seedling or tissue cultures obtained in vitro, in solid or liquid media, transported in sterile containers;
- Cut flowers of artificially propagated plants.

The prevailing reported trade in *Gastrodia elata* is in roots and derivatives, extracts and medicine, hence it is not covered by the exemption and must be accompanied by appropriate CITES documents.

2.4.5 [International trade: CITES trade data and other sources of information](#)

2.4.5.1 [CITES trade data analysis](#)

Box 1 Summary for *Gastrodia elata* reported trade between 2005 and 2014

- Approximately 90 per cent of exports are from the Mekong subregion, with more than 99 per cent coming from China.
- 100 per cent of trade was for commercial purposes.
- 100 per cent of exports and more than 99 per cent of re-exports were reported as derived from artificially propagated specimens.
- Roots, medicine, derivatives and extract make up 90 per cent of all trade by weight (1070 tons).
- The Republic of Korea was the main destination (82 per cent) followed by Japan (9 per cent).
- Data suggest a shift in either trading commodity or reporting practices over the period; roots and derivatives being the principal commodities in trade in 2005–2010, and extract and medicine taking their place in 2011–2014.
- Importers, predominantly the United States of America and New Zealand, reported more than 90 seizures; most were extract (13 tons from the Republic of Korea) and derivatives and medicine (23 500 specimens from China).

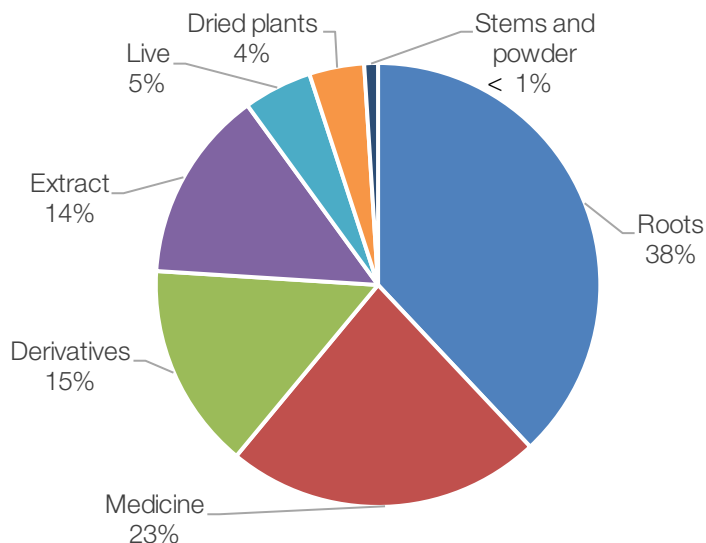
Source: CITES Trade Database.

Based on export records, globally, there were 258 records of exports of *Gastrodia elata* between 2005 and 2014, and 45 records of re-exports. Of these, 234 records were exports from the Greater Mekong subregion and 44 of the re-export records were of specimens originating from the Greater Mekong subregion (all from China). All reported exports from the Greater Mekong subregion were for commercial purposes and the source of *Gastrodia elata* specimens traded between 2005 and 2014 were predominantly artificially propagated (A), with only a small quantity potentially being wild sourced (source code not provided, blank) – 923 kilograms of medicine and extract re-exported from Hong Kong SAR, China between 2009 and 2014. Most export records were reported in weight (kilograms) or as individual specimens, except for 12 760 bottles, 60 cartons and 5.6 litres of derivatives and 4 litres of extract, exported from China between 2005–2014.

Export data were used as the main source of data for the more detailed analyses of commercial trade of artificially propagated *Gastrodia elata* by both weight and individual specimens, described below, with import data only analysed briefly to highlight any major discrepancies.

Nearly all (99.99 per cent) of commercial exports of artificially propagated *Gastrodia elata* from the Greater Mekong subregion were reported by China (over 1192 tons and over 80 000 individual specimens). Figure 2.3 shows the various commodities reportedly exported by China from 2005–2014, as reported by weight. Roots, medicine, derivatives and extract make up 90 per cent of all trade by weight (1070 tons). A similar distribution of commodities was also found for trade reported in individual specimens – 37 per cent medicine, 36 per cent roots and 27 per cent derivatives. According to importer records, a greater number of specimens were traded (212 000 specimens), but a lower quantity by weight (600 tons). Between 2005 and 2014, 82 per cent of all exports of *Gastrodia elata* from the Greater Mekong subregion by weight were destined for the Republic of Korea and 9 per cent went to Japan. Other destinations included the United States of America, Canada, Germany and Australia.

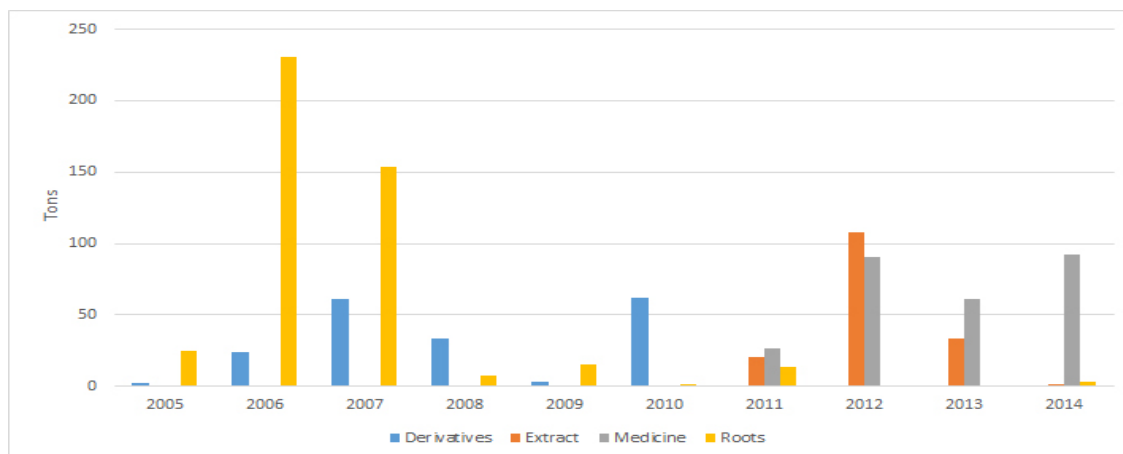
Figure 2.3 Commercial exports of *Gastrodia elata* from China in tons, 2005–2014, by commodity type



Source: CITES Trade Database.

Figure 2.4 shows the annual trade of the four main commodities of *Gastrodia elata* reported by China between 2005 and 2014, by weight. The data suggest a shift in either trading commodity or reporting practices, with roots and derivatives being the principal traded commodities from 2005 to 2010, and extract and medicine taking their place from 2011 to 2014. Annual trade was below 100 tons for most years (2005, 2008–2011 and 2013–2014), with trade peaking in 2006 (255 tons), 2007 (215 tons) and 2012 (200 tons).

Figure 2.4 Commercial exports of *Gastrodia elata* from China in tons, 2005–2014, by principal commodity type



Source: CITES Trade Database.

Finally, there were over 90 seizure records reported by importers. These included nearly 18 tons of various *Gastrodia elata* commodities, including derivatives, dried plants, extract, medicine and roots. 99.9 per cent of all seizures by weight were reported by the United States of America (see Table 2.1), mostly extract (16.4 tons), with seized extract coming from the Republic of Korea in 2009 (13 tons) making up a significant proportion of this. Another 30 000 specimens of various commodities were also seized between 2005 and 2014, with the majority being derivatives and medicine (23 500) coming from China. Most seizures of individual specimens were reported by New Zealand, with seized derivatives coming from China in 2010 (21 000 specimens) making up a significant proportion.

Table 2.1 *Gastrodia elata* seizures, reported by the United States CITES biennial reports¹³ between 2009 and 2014

Year	Plant inspection authorities seized the following shipments of CITES-listed <i>Gastrodia elata</i> specimens upon import into the United States of America
2009	4 shipments total: 3 shipments imported from the Republic of Korea containing 13 002 kilograms of extract; and 1 shipment imported from an unknown country, containing 15 grams of extract.
2010	13 shipments total: 4 shipments imported from China, containing 200 kilograms of extract, 48 290 kilograms of medicinal products, and 300 kilograms of powder; 4 shipments from an unknown country of origin, imported from China, containing 61 medicinal products; 2 shipments imported from the Republic of Korea, containing 1166 kilograms of extract; 2 shipments imported from Viet Nam, containing 2 kilograms of medicinal products; and 1 shipment from an unknown country of origin, imported from Viet Nam, containing 80 medicinal products.
2011	18 shipments total: 1 imported from Cambodia; 13 from China; 1 from Hong Kong SAR, China; 2 from the Republic of Korea; and 1 from an unknown country; containing 300 kilograms of derivatives, 257 kilograms of extract, 134 kilograms of root and 282 medicinal products (quantities relate to total number of shipments).
2012	18 shipments total: 13 imported from China; 4 from Hong Kong SAR, China; and 1 from the Republic of Korea; containing a total of 89 kilograms of extract, 10 kilograms of root, and 654 medicinal products and 9 kilograms of medicinal products (quantities relate to total number of shipments).
2013	22 shipments total: 2 imported from Cambodia; 16 from China; 1 from Hong Kong SAR, China; and 3 from Viet Nam; containing a total of 240 extracts, 32 roots and 519 kilograms of root and 2014 medicinal products(quantities relate to total number of shipments).
2014	4 shipments total: 2 imported from China; and 2 from Hong Kong SAR, China; containing a total of 300 medicinal products (quantities relate to total number of shipments).

2.4.5.2 [CITES trade data analysis](#)

In 2001 a CITES-listed medicinal plants significant trade study (Schippmann, 2001) highlighted the discrepancies between the international trade volumes in *Gastrodia elata* reports in national customs statistics and the CITES annual report data (with annual reports underreporting the trade on the scale of 20–24 times lower between 1992 and 1995). A recent study confirmed the mismatch of trade data reported in the national statistics (of China and the Republic of Korea), both in terms of volumes traded and destinations (J Brinckmann, personal communication, 11 July 2016). China has species-level harmonized codes for selected medicinal plants in trade, including *Gastrodia elata*, which allow this information to be captured at the national level (Brinckmann, 2014).

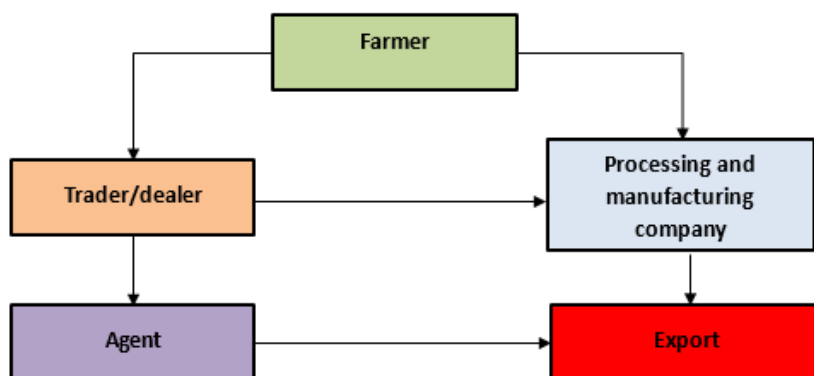
It is also suggested (Subedi et al., 2013) that an undocumented trade in wild-harvested *Gastrodia elata* tubers exists from Nepal to China, starting in late 1990s.

2.4.6 [Gastrodia elata value chain, involved stakeholders, existing traceability systems and their benefits](#)

Gastrodia elata cultivation plantations in China are registered with government agencies, which is a pre-requisite for granting CITES export permits. The export of *Gastrodia elata* is subject to a CITES export permit from the CITES Management Authority of China under the following process (Zhang, 2016):

To receive a CITES export permit, an exporter submits an application to the forestry department at the provincial level in which the applicant is located. The forestry department, on behalf of the State Forestry Administration, verifies the application and makes a positive or negative decision, notifying the applicant in writing. Upon granting the approval document from the forestry department, the applicant applies to the designated branch office of the CITES Management Authority in which the applicant is registered on a territorial basis, for the issuance of a CITES permit, provided the application materials comply with the provisions of CITES. During the process, the principle that the forestry authorities and the CITES Management Authority follow is to strictly restrict the export of wild-harvested specimens of *Gastrodia elata* for commercial purposes. If the shipment is declared or suspected as wild-harvested specimens, additional authorizations both from the State Forestry Administration and the headquarters of the CITES Management Authority are required prior to issuing a CITES export permit. The NDF by the CITES Scientific Authority is not required if the CITES Management Authorities is able to ascertain the specimens were sourced from cultivated origin. Figure 2.5 presents a generalized cultivated *Gastrodia elata* trade chain up to the point of export.

Figure 2.5 Typical *Gastrodia elata* trade chain from production area to export



Source: Adapted from Zhang, 2016.

There does not appear to be established monitoring by the government agencies of existing plantations, nurseries or wild populations of *Gastrodia elata*, as the conservation risk imposed by the collection from the wild populations is perceived as limited (Zhang, 2016). Monitoring programmes (of both wild populations and those in artificial propagation) have been established for other CITES-listed medicinal plants by forestry authorities, including *Taxus* spp. and *Aquilaria sinensis*.

Box 2 The Nepalese experience

The Nepalese experience of wild-harvested orchids (not specific to *Gastrodia elata*) used for medicinal and floricultural purposes is found to be relevant to this study. Collection of wild orchids starts (Subedi et al., 2013) when a purchase order from a middleman is received, with collectors frequently travelling more than 10 kilometres on foot through the forest. Collectors would sometimes receive advance payment. Middlemen occasionally come from distant districts or even abroad, providing printed photographs of desired species or small samples of live orchids. Reportedly all orchids are collected, whether similar looking to the sample or not, but none are discarded at selling points. Consolidated at these selling points, wild orchids are traded via several trade hubs in Nepal, including internationally and illegally to China or India. None of the trade chain actors involved in a recent study (Subedi et al., 2013) reported they had received permission from local authorities.

Wild-harvested *Gastrodia elata* in trade has been observed at medicinal plant markets in China (J Brinckmann, personal communication, 11 July 2016). The wild-harvested *Gastrodia elata* is apparently primarily used for TCM consumption within China. Most *Gastrodia elata* reported as wild collected originated from Yunnan province, and wild-harvested tubers are a few times more expensive on the markets in comparison to cultivated *Gastrodia elata*.

The peculiarity of the TCM trade chains in China is that companies producing the final product often simultaneously sell TCM formulas or ingredients for onwards trade to interim traders. One ingredient may simultaneously be used for domestic trade as part of a TCM final product (e.g. dispensed via a practitioner or clinic) or dozens of TCM formulas, and be in the international trade as an ingredient to multiple products (J Brinckmann, personal communication, 11 July 2016).

The international trade in CITES-listed species is subject to the Regulations of the People’s Republic of China on the Administration of the Import and Export of Endangered Wildlife. Beyond this, a wide range of laws, policies, statutes and standards cover the production, trade, quality and safety of TCM in China (Timoshyna, 2015). For example, China’s national plan to protect and develop TCM for 2015–2020 was published in 2015, defining a set of tasks closely linked to the assurance of the traceability of products, including a survey of TCM resources and the establishment of a monitoring network, TCM modernization and innovation, improvement of the quality assurance system, and better communication within and outside the production sector.

The Good Agricultural Practice (GAP) for Chinese Crude Drugs was enacted in China in 2002, with further implementation regulations developed in 2003, with the broad objective of standardizing TCM production in China and ensuring the traceability and quality management of TCM ingredients. Reported in 2010, 99 GAP production bases and species were certified by the State Food and Drug Administration (SFDA), including one production base for *Gastrodia elata* in Lueyang County, Shaanxi province (Zhang et al., 2010).

As an example of the implementation of a voluntary market standard – organic certification – with a traceability system attached to it, seven records of United States Department of Agriculture (USDA) National

Organic Program (NOP) certified operators trading in *Gastrodia elata* rhizomes were identified.¹⁴ Organic certification requires full traceability of the origin of products and full documentation of the process. Companies identified as handling USDA NOP organic certified *Gastrodia elata* are: 900LH.Com.Food Co., Ltd, Draco Natural Products, Inc., Kunming Junous Agricultural Science & Technology CO.LTD, Naturaline Co., Ltd, Nuherbs Co., Nutringredient Corporation Limited and Shanxi Bio-Herb Health Technology Co., Ltd. Further records of *Gastrodia elata* sold as a certified organic ingredient are available.¹⁵

DNA barcoding has been suggested as a potentially effective way to identify plant species in products, both to address health safety concerns and the legality of the use of CITES-listed species, including in TCM products (Lammers et al., 2014; Coghlan et al., 2012).

2.4.7 Stakeholders' recommendations on CITES controls, traceability systems and capacity-building needs

The following section was compiled based on stakeholder interviews and communication with the authors of the report as part of the collection of primary data for the study in July 2016. For the list of contacts and interviewees see Annex 1.

Assignment of species-specific customs codes for CITES-listed medicinal plants was noted as an example of a tool to track source and trade data. Accurate trade data could, for example, facilitate monitoring if trade hubs like Hong Kong SAR, China, consolidated and shared such information.

In terms of traceability systems, the implementation of international standards (for example organic, FairWild, Fairtrade – FLO) leading to certification, provided a useful entry point to ensuring the traceability of medicinal plants in trade, including through the verified requirements of mapping harvesting areas, independent inspection and the reconciliation of product quantities through the trade chain. Other certification systems, based on the geographical indication of products include specific requirements of documented origin down to the sourcing area or plantation, also leading to better traceability.

The exemption of finished products packaged and ready for retail trade from CITES controls could on the one hand create incentives for greater value addition to products in the countries of origin, however, the controls over sustainability of harvest and trade will need to be enforced at local levels. Such an exemption could work if it is complemented by strengthened mechanisms to monitor and ensure the sustainability of trade within the country of origin as an intra-country system. It is argued that one of the current drawbacks of CITES control measures is that the controls apply to the export point, with limited ability to control production process up to this point. For CITES Appendix II-listed species, if NDFs are being made rigorously, then there should be an understanding of the export's origin.

The implementation of any complete supply chain traceability system will be difficult, as a significant proportion of trade is organized not via established enterprises, but through local harvesters selling raw materials to brokers for consolidation and onwards trade and processing.

Given the difficulties of identification and building capacity of multiple wild harvesters, it is important to hold companies further up the trade chain accountable for demonstrating the traceability and sustainability of traded medicinal plant products, including through legal compliance requirements, good auditing and the system of incentives (e.g. certification).

Regarding capacity-building needs, the following were highlighted:

- Overall awareness of CITES-listing and requirements, including of documentation, both between government agencies and companies in trade chains, and among stakeholders in trade chains;
- Availability of tools and identification materials; and
- Industry associations playing an active role in supporting their members to carry out their businesses and engage in legal and sustainable international trade.

2.5 Case study of a CITES-listed medicinal plant value chain: *Aquilaria crassna*

2.5.1 Species name and distribution

Aquilaria crassna Pierre ex Lecomte (family: Thymelaeaceae), eagle wood or agarwood, is one of the agarwood-producing tree species among the two genera of *Aquilaria* and *Gyrinops*. The CITES Checklist currently recognizes some 25 species of *Aquilaria* and eight of *Gyrinops*. In some trees, a combination of

wounding, vectors of infection (bacterial infection, fungus) and resinous response induces the formation of a resinous heartwood (agarwood), which is traded in a number of forms, and is highly valuable (IUCN/TRAFFIC, 2016).

Aquilaria crassna is distributed in Cambodia, southern Lao People's Democratic Republic, northern Thailand and central and southern Viet Nam (Mohamed, 2016). Other *Aquilaria* spp. and *Gyrinops* spp. are distributed from northeast India east through South East Asia, including parts of southern China, to Papua New Guinea.

2.5.2 Population status, conservation, ex situ production

Illegal harvesting of the agarwood-producing tree species for its trade is the primary threat to remaining wild populations, driven by the high value of the commodity. In the past, agarwood source trees were used sustainably (non-lethally), for example by the Orang Asli (indigenous people of Peninsular Malaysia) and Penan (indigenous forest people of Sarawak, Malaysia), but commercial pressure has led to widespread illegal felling in the search for the resinous agarwood deposits (Wyn and Anak, 2010; UNODC, 2016). The growing demand for agarwood has led to both illegal offtake and trade (as evidenced by seizures data) (UNODC, 2016) and the launch of cultivation operations across the range states.

Complete data on the population status of *Aquilaria crassna* in its range states are not available.

Aquilaria crassna is assessed as Critically Endangered A1cd in the IUCN Red List Category and Criteria (version 2.3) (Nghia, 1998). This assessment (published in 1998 and now considered out of date) is largely based on the situation in Viet Nam, where the species is distributed sparsely but widely throughout the country.

Documented assessment of *Aquilaria crassna* populations in Lao People's Democratic Republic in 2004–2005 using distance sampling suggested an overall reduction of the density of standing trees at the four surveyed sites of around 60 per cent, assuming that very little harvesting took place prior to 1998 (Jensen and Melly, 2012). The results of the study are thought to apply to 2011 as well, since it is believed that no harvesting took place in the study between 2005 and 2011.

In Cambodia, *Aquilaria crassna* is found in the Cardamom Mountains area of southwest Cambodia. Following the extensive offtake of agarwood from these trees for the valuable *Aquilaria crassna* Cambodian oil in the 1990s, it was reported in 2008 that the Cardamom region has been producing significantly less oil, as the trees became scarce (Ashwell and Watson, 2008). Another estimate suggested that the distribution area of *Aquilaria crassna* in Cambodia covered 1 million hectares in 2001, but has since declined, and that plantations for *Aquilaria crassna* were established, although their total area is unknown (ITTO, 2015).

The result of a projection matrix analysis of the *Aquilaria crassna* population on a plot in Khao Yai National Park, central Thailand, reported in 2008, suggested that the population could at the time be deemed reasonably stable, even in the face of moderate illegal harvest (Zhang et al., 2008).

A recent report (UNODC, 2016) compiled the data about the known agarwood populations (all species) in the Greater Mekong subregion (see Table 2.2).

Table 2.2 Known agarwood populations (all species) in selected Greater Mekong countries

Country	Known population
China	About 130 000 trees in the wild
Myanmar	34 475 trees in home gardens; 680 hectares in plantations
Thailand	Unknown
Viet Nam	18 000 hectares in plantations; 1 million trees in home gardens

Source: Adapted from UNODC, 2016; based on ITTO data.

Aquilaria species have been actively cultivated in plantations in several range states, using a variety of methods to induce agarwood formation in the trees. The effectiveness of these methods is still imprecisely understood. Present capacity to produce cultivated agarwood is unclear, and it has been suggested that the claims of high-volume production from plantations should be scrutinized (UNODC, 2016). Current concerns for management of harvest and trade include a risk of potential laundering of wild-harvested *Aquilaria* spp. through the legally registered plantations, particularly those vertically integrated with companies producing final products (UNODC, 2016).

2.5.3 Use of *Aquilaria crassna*

The primary source of agarwood in CITES trade is *Aquilaria malaccensis*, and CITES reporting also shows agarwood trade reported without specifying the species (as *Aquilaria* spp.).

Agarwood is used in perfumes, traditional medicines, incense, and as an essential oil, distilled from the wood. Agarwood is traded under many synonyms, including eaglewood, *oudh* and *gaharu*, and in a variety of qualities of both wood and oil, which influences the value of traded products. The commercial value of agarwood depends on many factors including scent, shape, weight and colour. There are three principal ways that pure agarwood is traded internationally: resinous timber and wood chips, distilled oil for perfume and exhausted powder for incense. Additionally, raw agarwood, often in the form of wood chips can be an end use product. Wood is also used to produce carvings, including prayer beads. The exhaust powder – the residue left after the distillation process – is often compressed to make incense sticks and small statues.

The standard CITES terminology used for specimens of relevance to agarwood are (Wyn and Anak, 2010):

- Chips (CHP): Chips of timber, especially *Aquilaria malaccensis* and *Pterocarpus santalinus*. International Nomenclature for Cosmetic Ingredients (INCI) terminology: LIGNUM RESINATUM;
- Derivatives (DER): Not elsewhere specified;
- Live (LIV): Live plants;
- Logs (LOG): All wood – bark stripped or not stripped, sapwood, roughly squared for processing notably into sawn wood, pulpwood or veneer sheets;
- Medicine (Med): Medicine;
- Oil (OIL): INCI term: OLEUM;
- Powder (POW); and
- Sawn wood (SAW): Wood simply sawn lengthwise or produced by a profile-chipping process; normally exceeds 6 mm in thickness.

Aquilaria crassna is reportedly one of the most sought after agarwood species, commanding higher prices (J Jurgens, personal communication, 20 July 2016). “Cambodian” agarwood was also found to be one of the most popular in the United Arab Emirates market (Antonopoulou et al., 2010).

Agarwood oil extraction reportedly involves one of three methods: hydro-distillation, pressured steam distillation and super critical CO₂ extraction. However, techniques are considered proprietary and often closely guarded, as they can affect the quality of oil significantly (UNODC, 2016).

Several reports were compiled in fulfilling CITES Decision 12.71 on further field research on trade dynamics, including in the major import and re-exporting states and territories, and covering the use and trade of agarwood in Japan (Compton and Ishihara, 2004), Taiwan, Province of China (TRAFFIC, 2005), and United Arab Emirates (Antonopoulou et al., 2010).

Several distinct destination markets exist for agarwood, which include the Arabic market for oil, high quality chips and lesser quality products for *bakhoor*,¹⁶ and the Asian market for high quality incense products, exhausted powder, used for making incense joss sticks, small solid wood products (including prayer beads and small sculptures) and medicinal products.

In addition to this, there is a growing market in the EU and the United States of America for agarwood oil used in cosmetics and perfumery (used for example by some high-end perfume houses having oud agarwood (also called oud) blended scents, including Tom Ford, Yves Saint Laurent and others¹⁷).

2.5.4 History of Appendix II listing and CITES controls exemptions

All agarwood-producing taxa are currently listed in CITES Appendix II. *Aquilaria malaccensis* was listed in 1994, and the rest of the genus *Aquilaria* and all *Gyrinops* species in 2004. All agarwood-producing taxa are currently covered by the annotation #14, which includes all parts and derivatives except:¹⁸

- Seeds and pollen;
- Seedling or tissue cultures obtained in vitro, in solid or liquid media, transported in sterile containers;
- Fruits;
- Leaves;
- Exhausted agarwood powder, including compressed powder in all shapes; and

- Finished products packaged and ready for retail trade; this exemption does not apply to beads, prayer beads and carvings.

A proposal for the amendment of the listings of *Aquilaria* spp. and *Gyrinops* spp. in Appendix II was made by the United States of America to amend annotation #14f) with the underlined text: “finished products packaged and ready for retail trade, this exemption does not apply to wood chips, beads, prayer beads and carvings” (CITES Secretariat, 2016b). The decision about this amendment was accepted by consensus¹⁹ during CITES CoP17 in September/October 2016.

2.5.5 International trade: CITES trade data and other sources of information

2.5.5.1 CITES trade data analysis

Box 3 Summary and highlights for *Aquilaria crassna* trade, 2005–2014

- 100 per cent of exports of this species are from the Greater Mekong subregion.
- 95 per cent of trade was for commercial purposes.
- Some 99 per cent exports and 75 per cent re-exports were reportedly derived from artificially propagated specimens.
- More than 3 million live specimens were exported from Thailand and Viet Nam, destined mainly for Indonesia, China, Lao People’s Democratic Republic and Myanmar.
- Powder (926 tons), sawn wood (308 tons), chips (254 tons) and logs (46 tons) were the main commodities in trade by weight.
- For powder and chips, Thailand and Viet Nam were the principal exporters, and Taiwan, Province of China, Saudi Arabia, Malaysia, China and United Arab Emirates were the principal importers.
- For sawn wood/logs, Thailand was the principal exporter, and Taiwan, Province of China, mainland China and Saudi Arabia were the principal importers.
- There were no reported exports of *Aquilaria crassna* from Lao People’s Democratic Republic but it was reported as source country in several import and re-export records.

Based on export records in the UNEP-WCMC CITES Trade Database, there was a global total of 705 records of exports of *Aquilaria crassna* between 2005 and 2014, and 155 records of re-exports. All export records (except one from the United Arab Emirates) were from the Greater Mekong subregion and 97 per cent of re-export records (151) involved specimens originating in the Greater Mekong subregion, the remainder with origin reported as Indonesia. It is also important to note that *Aquilaria crassna* trade may be reported to the genus level only (as *Aquilaria* spp.); however, there is minimal export data from the Greater Mekong subregion reported as *Aquilaria* spp. (more commonly reported by importers).

Over 95 per cent of all CITES trade records of *Aquilaria crassna* between 2005 and 2014 were for commercial purposes (indicated by the purpose code T or blank²⁰) – other purposes include personal, scientific and educational. Most records are reported by weight (g or kg), liquid volume (ml or l) or as individual specimens (no unit). With regards to records without units, these include live individuals and carvings, but also a number of different commodity types which would normally be expected to be reported with units (e.g. extract, derivatives, chips, logs and oil²¹) and without units it is impossible to analyse the data in more detail. The sources of specimens were predominantly artificially propagated (A) and wild (including records reported as W, O, U or blank). There was only one record of a “seized” shipment (source code I), which involved 50 live *Aquilaria crassna* specimens imported from Indonesia to the United States of America in 2007 for personal purposes.

More detailed trade analysis for this species focuses on exports of wild and artificially propagated specimens for commercial purposes from the Greater Mekong subregion, reported by weight and liquid volume (all commodities), and number of specimens (only for carvings and live plants). At CITES CoP16 in 2013, the annotation accompanying the CITES listing of all *Aquilaria* species changed to exclude “...e) exhausted agarwood powder, including compressed powder in all shapes; and f) finished products packaged and ready for retail trade (exemption not applying to beads, prayer beads and carvings)”. This change in annotation has led to exhausted powder and wood chips (which are usually considered finished products when packaged and ready for retail trade) being excluded from CITES trade controls from 2013 onwards. This was amended in 2016 (at CoP17).^{22, 23}

Exporter data are used as the main source for analysis, with importer data analysed briefly to highlight any major discrepancies. A number of major *Aquilaria* importers are either not Parties to CITES (Taiwan, Province

of China) or have taken out reservations for these species,²⁴ and therefore do not report their trade. Re-exports (of specimens originating from the region) are also briefly analysed, however, they were removed from the totals for further analysis. Finally, it is important to note that at the time of writing, of the six Greater Mekong subregion countries, only Lao People’s Democratic Republic had not yet submitted its CITES annual report for 2014 and 2015.²⁵

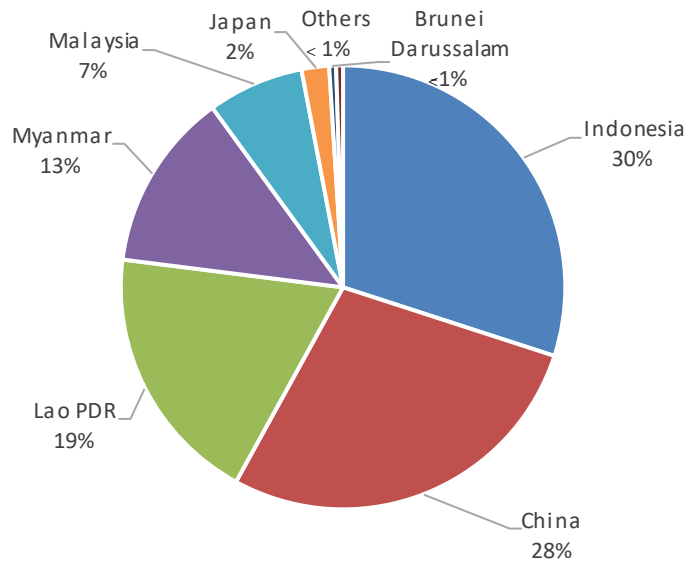
Between 2005 and 2014, there were 694 records of commercial exports for *Aquilaria crassna* from the Greater Mekong subregion and 135 records of commercial re-export for specimens originating from the region. Most records were reported by weight and these are analysed in more detail by commodity and source type below. Of the remaining records, 460 litres of oil, 60 m³ of logs, 236 carvings and over three million live specimens were exported from the Greater Mekong subregion 2005–2014 (see below). Most of the oil was exported from Viet Nam to United Arab Emirates, with over 50 per cent traded in 2014 alone. All the 60 m³ of logs and 236 carvings were exported from Viet Nam to China, again, most in 2014.

Between 2005 and 2014, nearly all live *Aquilaria crassna* were reportedly exported from Thailand (around 2.2 million specimens) and Viet Nam (1.1 million specimens), with only 100 specimens reportedly exported from Cambodia. According to importer data, very few live specimens were imported between 2005–2014, but these included 2000 live specimens imported from Lao People’s Democratic Republic into Thailand in 2007. All live specimens were reportedly artificially propagated. There was a considerable increase in the number of live specimens exported in recent years – between 2005 and 2009, the region reported exporting under 100 000 specimens; this increased to over three million specimens in the following five years, with a significant amount of trade occurring in 2012 and 2013 (over two million specimens). Figure 2.6 shows the main destinations of the live plant trade over this period – 30 per cent were exported to Indonesia, 28 per cent to China, 19 per cent to the Lao People’s Democratic Republic and 13 per cent to Myanmar.

Of the trade reported by weight, 96 per cent of *Aquilaria crassna* exported from the Greater Mekong subregion over the past decade was made up of four main commodities: powder (926 tons), sawn wood (308 tons), chips (254 tons) and logs (46 tons). Other commodities reported in trade by weight (around 1 per cent in total) included oil, live specimens, carvings, timber, derivatives, timber pieces, roots, leaves, extract, stems, seeds and medicine. As with live specimens, reported trade by importers was considerably less over the same period: powder (141 tons), sawn wood (1 ton), chips (70 tons) and logs (9 tons). Re-exports of *Aquilaria crassna* by weight originating in the Greater Mekong subregion were predominantly made up of chips (92 per cent), with smaller quantities of logs, sawn wood, oil and powder.

Nearly all trade reported by weight (99.97 per cent) was in artificially propagated specimens, with only very small quantities of wild-sourced chips traded between 2005 and 2009 (0.3 tons) and oil between 2010 and 2013 (0.1 tons). Another 100 000 specimens of derivatives (source code O, pre-Convention, presumed wild sourced) were also exported from Viet Nam to United Arab Emirates in 2014. However, 25 per cent of re-exports of *Aquilaria crassna* reported by weight and originating in the Greater Mekong subregion were reported as being wild-taken specimens. A large proportion of these were chips with reported origin from the Lao People’s Democratic Republic and being re-exported in 2013–2014 from India (8.7 tons), United Arab Emirates (0.5 tons) and Singapore (0.3 tons). There are no reported exports of *Aquilaria crassna* by Lao People’s Democratic Republic for the entire period of 2005–2014. However, importer records show that 1.7 tons of chips (0.2 tons wild sourced) were imported from Lao People’s Democratic Republic into Singapore between 2009 and 2013, and 15 tons of chips (all wild sourced) into India in 2013.

Figure 2.6 Destinations of commercial exports of live *Aquilaria crassna* from Viet Nam and Thailand, 2005–2014

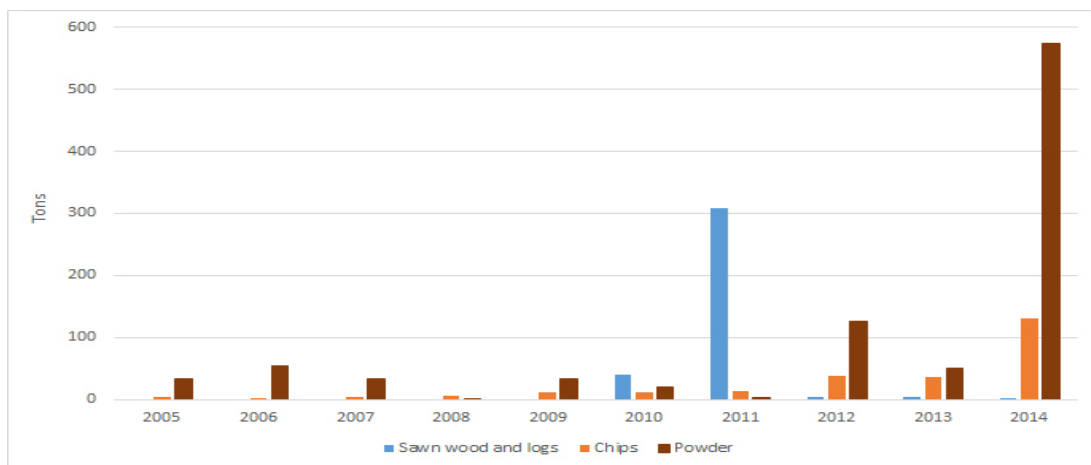


Source: CITES Trade Database.

Figure 2.7 shows the changes in trade quantities by weight over the 10 years (2005–2014) for the three main commodities (sawn wood and logs combined into one, chips and powder), according to exporter data. Exports of sawn wood and logs were only recorded from 2010 onwards, with most trade occurring in 2011 alone (over 300 tons). Annual exports of powder averaged 25 tons in 2005–2011, but they increased to over 125 tons in 2012, 50 tons in 2013 and over 570 tons in 2014. Exports in chips also increased during the decade, with average annual exports prior to 2011 of 7 tons and increasing to 36 tons in both 2012 and 2013, and 130 tons in 2014. Exports of both powder and chips increased in 2013 and 2014.

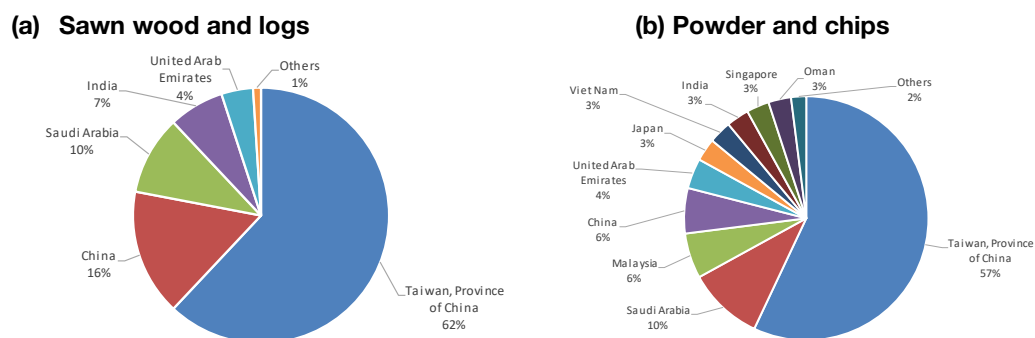
Between 2005 and 2014, Thailand and Viet Nam reported exports of the majority of powder and chips (931 and 249 tons respectively) and Thailand the majority of sawn wood/logs (311 tons). Figure 2.8 shows the main export destinations of sawn wood and logs (87 per cent of all trade going to Taiwan, Province of China, mainland China and Saudi Arabia) and powder and chips (85 per cent of all trade going to Taiwan, Province of China, Saudi Arabia, Malaysia, mainland China and United Arab Emirates) from the Greater Mekong subregion between 2005–2014.

Figure 2.7 Commercial exports of the main commodities of *Aquilaria crassna* from the Greater Mekong subregion in tons, 2005–2014



Source: CITES Trade Database.

Figure 2.8 Destinations of commercial exports of *Aquilaria crassna* from the Greater Mekong subregion, tons, 2005–2014



Source: CITES Trade Database.

CITES trade data analysis (FAO, 2015) across all agarwood-producing species from the entire range and all trade Parties showed that between 2005 and 2013 only 30 per cent of agarwood exports were from cultivated sources, despite the cultivation in a number of range states. This may also be linked to the time it takes to establish plantations, as trees need to reach certain age before they can be inoculated and begin to form the resinous heartwood. The same analysis shows that over 75 per cent of the cultivated exports were reported from Thailand, and legal wild-sourced exports more than doubled in the same period (primarily exported from Indonesia and Malaysia).

2.5.5.2 [Other trade data](#)

The recent analysis of agarwood seizure data showed the increasing illegal trade in agarwood products (UNODC, 2016), even considering that only a small share of illegal trade is detected. Countries of origin of agarwood in most reported seizures were Indonesia, Malaysia, India and United Arab Emirates. Of seizures for which the destination was known, over 90 per cent by weight went to Saudi Arabia and United Arab Emirates.

2.5.6 [Aquilaria crassna value chain: Stakeholders, existing traceability systems and their benefits](#)

Limited information is available on the valuation and in-depth analysis of *Aquilaria crassna* (or other agarwood-producing species) value chains.

An exception is a 2009 published survey and analysis (Jensen, 2009) of *Aquilaria crassna* value chains in Lao People's Democratic Republic, which documents the value chains for wild-harvested *Aquilaria crassna*. The data collected for the study estimated a global retail market valued at between US\$666 and US\$2300 million, of which Lao People's Democratic Republic agarwood (primarily from *Aquilaria crassna*) accounted for about 2 per cent (US\$33 million). For this, the export value to Lao People's Democratic Republic was about US\$14 million (43 per cent of total retail value).

Based on interviews with stakeholders along this trade chain, four distinct value chains were identified, from Lao People's Democratic Republic: agarwood, high quality essential oil, medium quality essential oil and low quality essential oil. In-country processing involves: carving out the valuable wood for the agarwood value chain, and the distillation of essential oil for the remaining three value chains. The agarwood value chain carried an estimated 82 per cent of all agarwood products trade. The study collected data throughout the value chain from harvesters up (see Figure 2.9), demonstrating its complexity. At every stage, a variety of stakeholders were involved in both horizontal (i.e. from harvester to harvester) and vertical trade. At the harvesting level, stakeholders involved a range of actors, from those harvesting illegally to those harvesting legally under customary rights; from local short-range harvesters (who only operate in village forests) through long-range harvesters (who operate in their own village forests and adjacent forests with *de facto* open access, often national parks), to foreign harvesters (e.g. Vietnamese) who have no harvesting rights. The annual value at harvesting/income from point(s) of harvest varied (in 2004) between US\$100 for local short-range harvesters to US\$3000 for foreign harvesters. The total value retained by harvesters in comparison to retail value was 13 per cent.

Figure 2.9 Generic value chain identified by the Lao People’s Democratic Republic study



Source: Adapted from Jensen, 2012.

The legality of wild-harvested agarwood trade is a complex issue in itself, and may have different aspects to it. Jensen (2009) illustrates this with an example from Lao People’s Democratic Republic. If the illegal harvesting was defined as harvesting without a legal permit or with no customary rights, 80 per cent of the value and 60 per cent of volume in trade would be deemed illegal.

The value of wild-harvested agarwood enables the creation of trade chains that are not dissimilar to the trade in other valuable and illegally traded wild flora and fauna. It may involve a trader in an importing country sending buyers to the countries of origin, where communities would be paid in advance for a placed order, and scouting primarily in the protected areas, staying for a few months at a time (J Jurgens, personal communication, 21 July 2016). Some of the wild harvesting of agarwood may also be a result of a “by-catch” during hunting or harvesting of other species.

In Viet Nam, only artificially propagated *Aquilaria crassna* can receive CITES export permits and be legally exported. Viet Nam has a system of ranger agencies (linked to provincial or district level forest protection departments) which require the registration of *Aquilaria crassna* plantations by companies or households, and it is reported that the cases of exports are verified by the local enforcement staff. The first *Aquilaria crassna* plantations were established in Viet Nam in the 1980s. Trade in wild-harvested agarwood is forbidden in Viet Nam, although illegal harvesting may occur driven by the high demand and prices (ITTO, 2015). There may also be cases of under-reporting of the volumes of cultivated agarwood production to avoid paying tax or administrative fees (Son Ta Minh, personal communication, 19 July 2016).

The potential implementation challenges for CITES controls include the lack of ability to differentiate wild and artificially propagated agarwood, the lack of standardized inoculation processes, and the lack of knowledge of the administrative procedures by small households to comply with the legal requirements (CITES, n.d.). Given the scale of the established agarwood plantations, full inventory of cultivated stock in the range states and ongoing monitoring is recommended. In terms of the differentiation between wild and cultivated agarwood (*Aquilaria* spp.), examples of ongoing research include the direct analysis in real time (DART™) and time-of-flight mass spectrometry (Espinoza, et al., 2014).

In Thailand, both wild and plantation populations of agarwood exist (mainly in the east and west of the country), including *Aquilaria crassna*. However, harvesting from the wild is not permitted (in protected areas, but is allowed on private land). Thailand has no quota for exporting agarwood from the wild and there is little or no domestic trade. As reported by the Thailand Department of Agriculture (ITTO, 2015), wild populations of *Aquilaria crassna* were surveyed (date of survey not established), as were all agarwood plantations in the country. All plantations are registered, verified and have management plans, allowing for sustainability assessments. When considering an application for an export permit, land ownership licences are checked and export is permitted for agarwood produced on land not classified as a protected area. Before export, all shipments are inspected by customs and quarantine departments.

The Government of Thailand has recently implemented a law to support the implementation of controls for CITES-listed plants and the Department of Agriculture has launched a system to manage *Aquilaria crassna*. The new law requires growers of agarwood to register with local authorities including providing the nursery number, parent plant stock number and the quantity to be traded. The registration process takes place electronically via the Department of Agriculture and the information is later validated and approved via nursery inspections and the monitoring of the number of plants (Duangduen Sripotar, personal communication, 29 July 2016).

2.5.7 Stakeholders' recommendations on CITES controls and traceability systems and capacity-building needs

The following section was compiled based on stakeholder interviews and communication carried out as part of the collection of primary data for this study in July 2016. For the list of contacts and interviewees see Annex 1.

The correct botanical identification of species in trade, particularly when the specimen is at least partly processed, with no seeds, leaves or fruits to support the identification, has been observed as an important obstacle to traceability of ingredients.

Aquilaria crassna wild harvesters are not significantly benefiting from its trade, as wild specimens are primarily traded illegally. Livelihoods of first-tier producers/harvesters is the primary root cause of the unsustainable offtake of agarwood and other medicinal plants, and addressing this issue is fundamental to the effective implementation of CITES provisions.

Opportunities may exist for working on the primary stages of value chains to add value to products in trade, and increase the income of primary producers. This could be supported via piloting best practices and/or a certification approach (for example the World Health Organization Good Agricultural and Collection Practices (WHO-GACP), the FairWild Standard and UEBT Standard. See section section 4.7 for more information), which could be implemented as a market tool, where demand for niche verified sustainably harvested products exists in developed country markets (e.g. EU or the United States of America). Such pilot application would need to build on the interest of importers willing to recognize the associated social and environmental efforts and costs that are being incurred by primary producers (e.g. through premium values). This may also generate additional synergies with other Multilateral Environmental Agreements (MEAs) such as the CBD and its Nagoya Protocol, as well as other relevant national regulations related to access and benefit sharing (ABS) from harvest and utilization of genetic resources.²⁶

Programmes and projects in the Greater Mekong subregion exist that may support the implementation of pilot exercises in the future (for example, national, regional and international BioTrade projects being developed by UNCTAD and partners). The limitation of such pilot programmes is that the main markets for agarwood are in the Middle East and East Asia, which have less existing demand for verified sustainable products.

Importing nations have a significant role to play in refusing the purchase of illegal and unsustainable agarwood, and in encouraging the sourcing of traceable and legitimate agarwood products. It is a complex issue, given that the identification of the agarwood products in trade is difficult, making the training of customs officers an important capacity-building opportunity. Law enforcement training, specific to agarwood, for government officials in countries involved in the trade should be continued. In terms of the market for premium, potentially certified agarwood products, the EU and United States of America would be likely first destinations. Given the importance of the Middle East and East Asia as major agarwood markets, further advocacy to governments regarding greater control of imports and facilitation of the capacity of industry to buy legal and sustainable agarwood are important considerations.

In Viet Nam, although the Ministry of Health prioritizes regulation of the quality of medicinal plants, including encouraging and regulating the implementation of the national strategy for implementation of WHO-GACP, trade issues and the sustainability of sourcing requires collaboration between different government agencies, including the Ministry of Agriculture, Ministry of Industry and Trade, and Customs, which could be strengthened. The Ministry of Natural Resources and Environment would play an important role as well, given the mandate of implementing national regulations on ABS.

For building the capacities of stakeholders along the agarwood and other medicinal plants trade chains in Viet Nam overall, there are significant capacity-building needs in: a) applying standards in medicinal plants production in a systematic way; and b) enhancing value chain stakeholders' (trading and processing companies) skills in working directly with primary producing communities to develop the value chains. At the moment most of the raw materials come through middlemen, and trade is not traceable.

There was favourable feedback from Thailand to the usefulness of traceability systems to support the management of trade in *Aquilaria crassna*, particularly as the baselines already exist with the initiation of the permit system. Implementation itself would initially prove challenging as stakeholders in the supply chain

need to be convinced of the benefits of a traceability system, which should be defined and well elaborated. It was also suggested that a pilot project may be a good way of showing stakeholders that a traceability architecture could improve the state of trade through a working example.

Further, it has been noted that for the actors involved in the trade chain, building stronger understanding and trust between the production sector and CITES authorities, beyond law enforcement controls, could support collaboration and implementation of regulations.

As the available agarwood trade data show, the market remains relatively opaque, due to its structure, and the limited nature of the data as a whole. Recommendations to address this are:

- Undertake a full global market analysis to ascertain the price of agarwood, by grade, by species and by country, which will improve estimates as to global market size and the production capacity of artificial propagation in different countries. Such analysis may involve working with agarwood trading associations to gain greater insight into market functioning, including estimating the scope of the illegal trade.
- CITES trade data shows no exports records by Lao People's Democratic Republic, while importer records show Lao People's Democratic Republic as origin, as well as re-export including of *Aquilaria crassna* of wild-sourced origin. A specific study may be needed to fill in these gaps.
- Further insights into the scale of potential wild harvesting and trade in *Aquilaria crassna* from outside protected areas would be valuable.
- Clarification and greater understanding is needed on how much agarwood is produced from inoculation of *Aquilaria* spp., including to assist the identification of the likelihood of laundering wild agarwood through plantations.
- Invest in partnerships with organizations seeking to achieve greater consensus and clarification around the agarwood-producing genera: *Aquilaria*, *Gyrinops* and, to a lesser extent, *Gonystylus*.
- Invest in/partner with organizations, which may include agarwood trading associations, keen to understand the effects of large-scale cultivation on the agarwood-producing species, including the wild population status, genetic diversity of seed stock, quality of production and other aspects.
- Collaborate with research institutions and botanic gardens to develop a methodology for remote sensing and identification of existing agarwood-producing plantations, as well as to produce greater insight into agarwood biology and ecology.
- Develop an inexpensive and reliable system of differentiating cultivated from wild-sourced agarwood.
- Carry on with developing and implementing methodologies for inexpensive and efficient identification of the agarwood-producing species by traders and CITES Management and Scientific Authorities.
- Work with market actors to identify grading systems and assess whether global grading systems are viable; understanding such standardization processes is likely to be difficult.

2.6 Desktop study of a CITES medicinal plant: *Dendrobium nobile*

A desktop study was carried out for *Dendrobium nobile* to link this study to the recent report on ornamental plant traceability (Lehr, 2016b). The purpose is to highlight similarities and differences between the trade in ornamental and medicinal orchids, and to highlight the complexity of the medicinal plants' trade; which naturally has an impact in considering implementing a traceability system.

2.6.1 Species name and distribution

Dendrobium nobile (var. *nobile*) is a epiphytic or occasionally lithophytic perennial herb which is a tropical or subtropical species found in the Orchidaceae family growing at elevations of 1,500–2,000 meters in seasonal deciduous forest in the foothills of the Himalayas and elsewhere (Hiep et al., 2007).

Synonyms:

Callista nobilis (Lindl.) Kuntze, *Dendrobium coerulescens* Wall. ex Lindl, *Dendrobium formosanum* (Rchb.f.) Masam., *Dendrobium lindleyanum* Griff, *Dendrobium nobile* var. *alboluteum* Huyen and Aver, *Dendrobium nobile* var. *formosanum* Rchb.f, *Dendrobium nobile* var. *nobilius* Rchb.f, *Dendrobium nobile* f. *nobilius* (Rchb.f.) M.Hiroe, *Dendrobium nobile* var. *nobilus* Burb.27

Trading name:

Dendrobium nobile Lindl.

Chinese name:

shí hú (Chinese: 石斛) or shí hú lán (Chinese: 石斛兰).

Countries/territories of occurrence:

China, Lao People's Democratic Republic, Myanmar, Thailand, Viet Nam, and India, Bhutan and Nepal (Hiep et al., 2007).

2.6.2 Population status, conservation and ex situ production

Dendrobium nobile is one of the most widespread and common species of the genus in mainland Asia. There are a number of varieties in cultivation, including *Dendrobium nobile* var. *virginale* and *Dendrobium nobile* var. *cooksonianum*. Known as the “beginner’s orchid” (Royal Botanic Gardens Kew, n.d.), this species is considered to be durable and dependable and hence has become very popular in cultivation. Although in countries such as Viet Nam, where wild collection continues, over collection has meant that populations are highly depleted and on the verge of extinction especially in areas where primary forests have been deeply degraded. The species is included in CITES Appendix II and in Viet Nam it is an officially protected plant and has been included in the Red Book of Vietnam (Hiep et al., 2007) and recognized as having a global conservation status according to the IUCN Red List.

To preserve the species in the wild in Viet Nam, it has been recommended in the NDF (Hiep et al., 2007) that synthetic alternatives for medicinal compounds be identified along with the development of artificial propagation. Protection of species habitat and tighter controls on local collection are also recommended.

Dendrobium nobile was one of several orchidaceous species in South China that has been developed commercially over the last ten years on a large scale (Yun J, 2016, in litt.). However, even with this commercialization, wild harvesting pressure has not slowed due to the belief in China that wild plants are much better than cultivated ones in terms of quality. Large quantities of illegally supplied plants are reported to be coming from Lao People's Democratic Republic, Thailand, Myanmar, as well as China itself (Yun J, 2016, in litt.).

2.6.3 Use of *Dendrobium nobile*

This species is used both ornamentally and medicinally. It has been used in Chinese medicine for many centuries to treat illnesses such as fever, diabetes, infection and cancer. *Dendrobium nobile* is currently being used in medicinal products, cosmetic products and food and dietary supplements (Brinckmann, 2014) for improving athletic performance.²⁸

2.6.4 History of Appendix II listing and CITES controls exemptions

Dendrobium nobile was included in CITES Appendix II in 1975. All parts and derivatives of *Dendrobium nobile* are subject to CITES controls with the following exemptions (annotation #4) (CITES Secretariat, 2016a):

- Seeds (including seedpods of Orchidaceae), spores and pollen (including pollinia);
- Seedling or tissue cultures obtained in vitro, in solid or liquid media, transported in sterile containers; and
- Cut flowers of artificially propagated plants.

2.6.5 International trade: CITES trade data on *Dendrobium nobile*

2.6.5.1 CITES trade data analysis

Box 4 Summary for *Dendrobium nobile* reported trade, 2005–2014

- Around 26 per cent of exports of this species are from the Greater Mekong subregion, of those over 88 per cent are from China.
- 99.78 per cent of trade was for commercial purposes.
- Live specimens, roots and dried plants make up 97 per cent of all trade by weight (26.54 tons: excluding live specimens).
- Singapore was the main destination (97 per cent) followed by Republic of Korea (2.33 per cent). Both destinations were the recipients of two large orders in 2009 and 2013 as is shown in Figure 2.12.
- Data suggest that reporting practices are inconsistent though live plants and stems have been the predominant items recorded and exported with ad hoc sales of derivatives, dried plants and roots recorded up until 2008.

Source: CITES Trade Database.

In terms of trade data, recorded exports and imports are shown to be inconsistent, and except for one matching record for the export of live plants from Myanmar to Japan, do not match between exporting and importing countries. Not matching can either mean that there is an under reporting of export/import amounts between trading nations, or that one trading nation has reported simply reported nothing of the trade. Table 2.3 demonstrates this inconsistency of missing trade records from both exporting and importing nations. Note that this is a cumulative assessment of exporters for the period of 2006 to 2014 and an in-depth review of the trade figures would show a wider range of importing nations making up the import results.

Table 2.3 Cumulative data from 2006 to 2104 for export/import comparison of product type and export countries

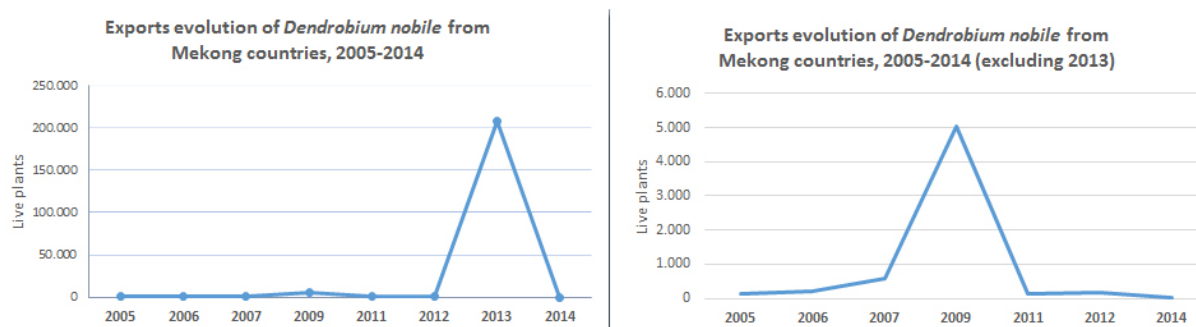
Country	Type	Exports reported	Unit	Imports reported	Unit	Difference	Status
Viet Nam	Roots	20 100	kg	23 489	kg	-3389	Export understatement
China	Roots	0	kg	0.5	kg	-0.5	Export not recorded
Viet Nam	Dried plants	6436	kg	4000	kg	2436	Import understatement
China	Medicine	88	g	0	g	88	Import not recorded
China	Stems	162.98	kg	250	kg	87.02	Export understatement
China	Derivatives	500	kg	8.96	kg	491.04	Import understatement
China	Powder	0	kg	249.49	kg	-249.49	Export not recorded
Viet Nam	Roots	1000	Pieces	0	Pieces	1000	Import not recorded
China	Live plants	213 690	Pieces	0	Pieces	213690	Import not recorded
Myanmar	Live plants	5	Pieces	5	Pieces	0	No difference in exports and imports
Thailand	Live plants	931	Pieces	2757	Pieces	-1826	Export understatement

Source: CITES Trade Database.

According to the CITES Trade Database, 99.9 per cent of globally traded orchids are from CITES Appendix II and mainly sourced from artificially propagated plants (Lehr, 2016b), which for *Dendrobium nobile* is demonstrated mainly by trade in live plants and in particular by the 213 metric tons of live plants exported from China to Singapore and the Republic of Korea. The percentage of *Dendrobium nobile* being traded from the wild in the Greater Mekong subregion is recorded at 7 per cent of total recorded exports as is shown in Annex 3. When compared with global trade in orchids, wild trade in the Greater Mekong subregion is still quite substantial, with Table 2.3 showing the trade data from Viet Nam where 27 tons of both wild collected roots (20 100 kg) and dried plants (6,436 kg) have been exported to the Republic of Korea. Even though in total, both import and export data for these transactions are similar, the data indicate that mismatches are recorded between the exporting and importing records.

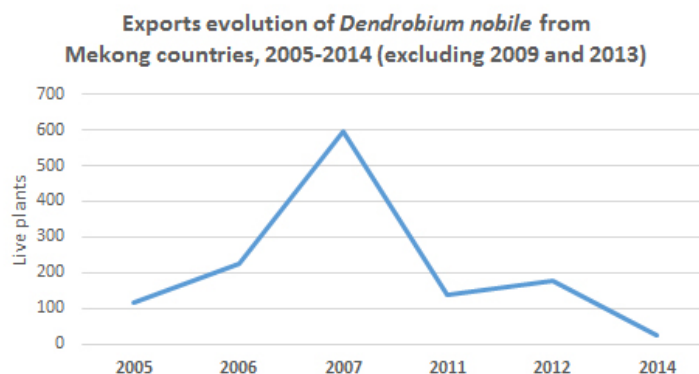
The trade data for the last 10 years (2005–2014) show large inconsistencies or spikes in recorded trade. Figure 2.10 demonstrates the impact of the two large data spikes (or outliers) during this 10-year period and how they distort the overall trade data for the period. In 2009 there was a spike in trade of live plants from China to the Republic of Korea. In 2013 there was another spike of trade in live plants from China to Singapore.

Figure 2.10 *Dendrobium nobile* exports 2005–2014: 2009 and 2013 spikes in trade



Source: CITES Trade Database.

Figure 2.11 *Dendrobium nobile* exports, excluding 2009 and 2013



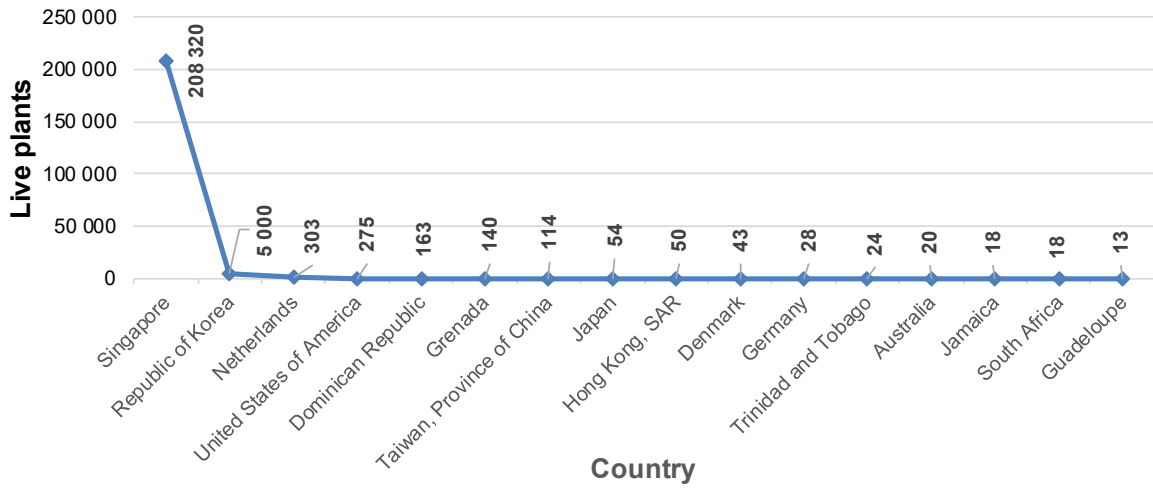
Source: CITES Trade Database.

In Figure 2.11, after removing the data spikes from the graphs for the years 2009 and 2013, a more even trading spread can be observed for exports and imports and comparisons are more easily made between trade in wild and artificially produce commodities. Note that in 2007 the export of 597 kg of live plants was exported from China and Thailand and several other locations around the world. Reviewing the trade data after removing the years 2007, 2009 and 2013, trade is mainly in live plants with some quantities recorded for roots, derivatives, stems, powder and medicine.

Finally, Figure 2.12 shows the breakdown of importing nations and illustrates how trade in general has been spread evenly over the years 2005–2014 for most trading nations except for the two largest, Singapore and the Republic of Korea.

The inconsistency of the current record keeping displayed here shows the necessity for developing a process for improving the recording practices of both exporting and importing nations to ensure that plant species are being recorded and sourced sustainably for trade and that indigenous livelihoods are protected. Taking into consideration that trade in medicinal plants has additional supply chain complexities around harvesting in the wild, extra processing such as drying and grinding, and the variety of stakeholders involved, a traceability architecture could perhaps improve not only CITES processes but also the overall reporting and tracking of the movement of traded species both internally and externally between nations. Traceability will be explored in further sections.

Figure 2.12 Importing nations of *Dendrobium nobile* from the Greater Mekong subregion



Source: CITES Trade Database.

3 Short review of the CITES regulatory framework

3.1 Introduction

CITES uses permits and certificates to regulate international trade in species listed in the CITES Appendices. Trade of listed species is controlled on a specimen level.²⁹

All Parties to the Convention must designate a Management Authority that issues permits or certificates for exports and imports of specimens of CITES-listed species per Article IX of the Convention. To obtain such a permit for Appendix II species, entities have to apply for it, either through a national Single Window³⁰ or directly with the Management Authority. In deciding whether or not to issue a permit/certificate, the Management Authority must consider the following:

- The legality of the trade process; and
- The sustainability or the “non-detriment” of trade for the survival of the species in the wild (as determined by the Scientific Authority of the same country).

3.2 General framework for species of interest to this study (orchids and *Aquilaria* spp.)

In 1975, orchid specimens from the wild were under such pressure that fear over their conservation status led to listing the entire family in the Appendices of the newly adopted CITES.

In 2008, the following species of the Orchidaceae family were added to Appendix I, giving them the highest level of protection: *Aerangis ellisii*, *Dendrobium cruentum*, *Laelia jongheana*, *Laelia lobata*, *Paphiopedilum* spp., *Peristeria elata*, *Phragmipedium* spp. and *Renanthera imschootiana*. The rest of the Orchidaceae family is in Appendix II, where international trade may be authorized by the granting of an export permit or re-export certificate.

Over 25 million orchids are traded annually in the world, 95 per cent of which are artificially propagated Appendix II species or hybrids (Africa and Muñoz, 2009). Exemptions from CITES controls facilitate trade in these artificially propagated specimens in some cases. Exemptions also apply to certain parts and products (seeds, pollinia, plants in vitro cultures, cut flowers of artificially propagated plants, fruits, parts and derivatives of artificially propagated *Vanilla* plants: for this study refer to sections 2.4.4, 2.6.4) that can be traded without harming Appendix II-listed species. The related study of ornamental plants from the Andean regions, reviews in some detail the CITES framework for orchids (Lehr, 2016b) and in particular also highlights CITES’s definition of artificial propagation and identification of artificially propagated plants.

Aquilaria spp. on the other hand is a genus of 15 species of trees in the Thymelaeaceae family which are native to South East Asia. *Aquilaria malaccensis* is one of the main sources of the resin-suffused agarwood when it becomes infected with a particular mould.

Aquilaria spp. is listed in Appendix II, together with two other genera *Gonystylus* spp. and *Gyrinops* spp. *Aquilaria malaccensis* was listed already in 1995 at CoP9. At CoP13, however, the whole genus was listed. The listings entered into force on 12 January 2005. This study will focus on the species *Aquilaria crassna* (section 2.5).

Subsequently, at CoP16, decisions regarding agarwood-producing taxa were made.³¹ For example Decision 16.155 calls for exporting and importing Parties to produce an identification manual for agarwood products. More importantly, Decision 16.156 requests that the Plant Committee assess the applicability of the concept of artificial propagation to mixed and monospecific plantations of tree species.

The Plant Committee established an intersessional working group³² on the matter which in turn has issued a questionnaire to Parties³³ for information gathering on production systems. A report was presented at CoP17.

3.3 The case for finished goods

3.3.1 Orchids

At the 22nd meeting of the Plants Committee (PC22) in Tbilisi (Georgia), 19–23 October 2015, the Management Authority of Switzerland and Liechtenstein submitted document PC22 Doc. 22.1³⁴ that concerns itself with the proposal to amend the Convention with a view to exempt finished products packaged and ready for retail trade which contain components of Appendix II orchids.

The Management Authority reported in the document on the results of a short trade survey (published as PC22 Doc. 22.1 Annex I35). The short study found 39 species of the Orchidaceae family present in European commerce in different forms (Brinckmann, 2014).

The Management Authority referred to guiding principles for annotations of medicinal plants that were adopted at CoP13 (Doc. 5836). These are:

- a) Controls should concentrate on those commodities that first appear in international trade as exports from range states. Those commodities may range from crude to processed material; and
- b) Controls should include only those commodities that dominate the trade and the demand for the wild resource.

Such guiding principles have been used in the past to amend annotation #4 (which applies to a series of genera and species) and limits the listing in Appendix II to all parts and derivatives, except:

- a) Seeds (including seedpods of Orchidaceae), spores and pollen (including pollinia). The exemption does not apply to seeds from Cactaceae spp. exported from Mexico, and to seeds from *Beccariophoenix madagascariensis* and *Neodypsis decaryi* exported from Madagascar;
- b) Seedling or tissue cultures obtained *in vitro*, in solid or liquid media, transported in sterile containers;
- c) Cut flowers of artificially propagated plants;
- d) Fruits, and parts and derivatives thereof, of naturalized or artificially propagated plants of the genus *Vanilla* (Orchidaceae) and of the family Cactaceae;
- e) Stems, flowers, and parts and derivatives thereof, of naturalized or artificially propagated plants of the genera *Opuntia* subgenus *Opuntia* and *Selenicereus* (Cactaceae); and
- f) Finished products of *Euphorbia antisiphilitica* packaged and ready for retail trade.

Based on the similar amendment with *Euphorbia antisiphilitica*, the Management Authority of Switzerland and Liechtenstein suggested studying the potential risks and/or benefits of an exemption for orchid components, in particular for wild-collected specimens, and the advisability of submitting a proposal to CoP17 to amend the above cited annotation #4 for Appendix II orchids. After PC22, the Committee established a working group on annotations for Appendix-II orchids (agenda item 22.1) with the following mandate: "To draft the terms of reference for an intersessional working group of the Plants Committee on annotations for Appendix-II orchids addressing, *inter alia*, the relationship between the Plants Committee's intersessional working group on annotations for Appendix-II orchids and the Standing Committee's Working Group on annotations."

At CoP17, Document 83.3 'Annotations for Appendix II orchids' has been submitted to CITES Secretariat by Canada and prepared by the Acting Chair of the Plants Committee and Co-Chair of the Working Group of the Plants Committee on Annotations for Appendix-II orchids. Regarding to Doc. 83.3, two draft decisions, with amendments by the Secretariat as described in document CoP17 Doc. 83.3, had been accepted by Committee II and were adopted.

3.3.2 *Aquilaria* spp.

For *Aquilaria* spp. a corresponding annotation already exists. Annotation #14 limits the listing of *Aquilaria* spp. to all parts and derivatives except:

- a) Seeds and pollen;
- b) Seedling or tissue cultures obtained *in vitro*, in solid or liquid media, transported in sterile containers;
- c) Fruits;
- d) Leaves;
- e) Exhausted agarwood powder, including compressed powder in all shapes; and
- f) Finished products packaged and ready for retail trade, this exemption does not apply to beads, prayer beads and carvings.

In section 2.4.7 stakeholder feedback suggests that there could be benefits for exempting finished products packaged to create value addition in the countries of origin.

3.4 CITES and traceability: Beneficiaries

The core purpose of this report is to evaluate whether CITES processes can be strengthened through the implementation of a traceability system to support sustainable trade, and if so, to recommend ways to

implement it. Consequently, the aim is to assess the development of a traceability system that improves the ability to protect and control CITES-listed species. Although permit systems already control trade in listed species, this alone cannot guarantee legal sourcing of raw materials; implementing a traceability system might significantly strengthen the Parties' ability to control the source.

Traceability systems also can support fair pricing and other social initiatives as has been the case with some certification schemes such as the FairWild Standard. Forming a partnership between a certification system, and a CITES traceability system could further protect trade in CITES-listed species by increasing the benefits of stakeholders participating in the traceability system. This aspect will be given further consideration later in this report.

The beneficiaries of the implementation of a traceability system in medicinal trade would be the Parties implementing the Convention. Not only would governments be better able to protect long-term economic viability of legal trade in CITES-listed species, but also the government agencies who are assigned the task of controlling that trade would have additional tools to enforce and audit their CITES-related laws and regulations.

Other beneficiaries would be the local inhabitants who rely on CITES-protected species for their livelihood and long-term economic survival. Better management of species through traceability systems would help to ensure that illegal trade is limited and poachers of protected species less easily able to profit from illegal harvesting thus protecting the long-term sustainability of trade in those species.

The national economy as a whole stands to gain from the legal trade in protected species by ensuring that taxation is not lost through illegal and cash-based trade. This in turn benefits the whole of society by ensuring that there is extra capital to invest in a country's infrastructure and further development of trade, and in particular, trade in listed species through investments in plantations and improving transport infrastructure.

Customers of medicinal-based products with traces of CITES-listed species are also beneficiaries by knowing that the product that they are purchasing is both sourced legally and that the ingredients on the packaging are what they say they are. This directly benefits those companies who trade in medicinal goods by ensuring that they are creating beneficial customer good will for their products and ensuring the future profitability of their company.

Traceability systems also enable authorities to be able to track back along a supply chain, and to identify the point on a supply chain where a rogue ingredient may have entered the chain and contaminated a product. This indirectly adds extra pressure on stakeholders along the supply chain to ensure that they abide by government legislation or consumer concerns with regards to processing standards.

Other benefits, though not readily measurable in monetary terms, are the species themselves, protecting species diversification, associated cultural activities, as well as businesses such as sustainable tourism and other related industries.

4 Existing traceability systems

4.1 Definition of traceability

Traceability is most commonly defined as “the ability to access any or all information relating to that which is under consideration, throughout its entire life cycle, by means of recorded identifications” (Olsen & Borit, 2013). In other words, traceability is a system identifying and connecting all entities in the supply chain of a product unit and thereby making it traceable at every point in time.

The International Standards Organization (ISO) defines traceability as “the ability to trace the history, application or location of an object” in a supply chain.³⁷

GS1, an international not-for-profit organization that develops and maintains standards for supply and demand chains across multiple sectors, defines traceability as “the ability to track forward the movement through specified stage (s) of the extended supply chain and trace backward the history, application or location of that which is under consideration” (GS1, 2012).

These and other relevant definitions have been collected by the CITES Secretariat and published as E-SC66 Doc. 34.1 (Rev. 1) (CITES Secretariat, 2016c).

4.2 Short summary of supply chain traceability

In the UNCTAD study on ornamental plants from the Andean region (Lehr, 2016b), the basic components of traceability were explained – mainly from the viewpoint of the private sector. In particular, reference was made to unique identification (UI), critical tracking events (CTEs) and key data elements (KDEs).

Unique identification (UI): Refers to the principles of UI which states that elements necessary to establish traceability, such as products or product lots, companies, storage locations etc. need to be uniquely identified. Ideally, companies employ international standards in identifying suppliers, products, trade and logistics units, in particular, ISO/IEC 15459 is applied to make that identification *globally* unique. However, for internal information elements, i.e. those that are not passed along the supply chain, uniqueness within the context (of a company, district or country) may be sufficient. Since UI is such an important ingredient to traceability, multiple coding systems have been proposed and multiple organizations founded to supply the market with unique identifiers. An important example is GS1, a global provider of UI products. GS1 also partners with the ITC in the Blue Number Initiative³⁸ which provides farmers and agricultural supply chain partners with globally unique identifiers in an attempt to upscale adoption of globally unique identifiers by farmers. Other providers of globally unique codes can be found.³⁹

Critical tracking events (CTEs): Sometimes also called tracepoints – assume that supply chain operations can be split into a series of operations relevant to traceability (tracking events). Some of these tracking events are critical to achieve the purpose of the traceability system. These are denominated CTEs. To decide which tracking events are critical, the principle of recorded transformations of traceability (Lehr, 2013b) can be used, which states that all transformations such as split, merge, change of nature are critical tracking events.

Key data elements (KDEs): The theory of CTEs also assumes that independent of the individual firm KDEs can be formulated – at least within the context of one sector. KDEs consist of the most important information from a traceability perspective at each CTE. One could argue that the international standards ISO12785:2011 and ISO12877:2011 on traceability of finfish products are a collection of KDEs.

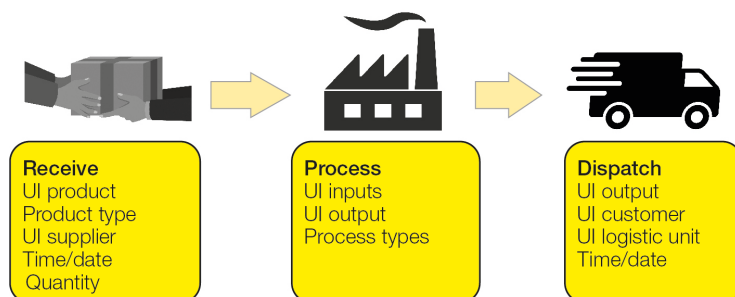
Typically, there are three main categories of CTEs per entity: reception, processing and dispatch, as depicted in Figure 4.1. A traceability system must define the KDEs to be recorded at each of these CTEs, as well as the degree of differentiation between the CTEs. For example, a processor of medicinal plants might define separate processing CTEs for mixing and drying, as the former process changes the composition of the good and the latter does not. To achieve traceability, it is essential that KDEs recorded at the beginning and end of a transformation process link inputs to outputs.

The length of the supply chain covered by a traceability system is called *depth* and depends on its purpose. In some cases, certain supply chain steps, such as distribution, are excluded from traceability systems.

KDEs must be defined such that tracking and tracing through the CTE is possible. Furthermore, they must include information that is necessary to achieve the purpose of the traceability system. For example, KDEs

for artificially propagated or plantation medicinal plants might be the species, the propagation method, the operator and the code of the parent plant.

Figure 4.1 Typical CTEs with their most common KDEs



KDEs will differ along the supply chain as the product is transformed and different information becomes relevant. In general, KDEs might include basic descriptive elements, origin and destination, processes applied to the product or legal status. A traceability system should define specific KDEs for every CTE. The amount of information recorded at each KDE is commonly called the *breadth* of a traceability system.

4.3 The UN/CEFACT architectural modelling traceability framework for large-scale traceability systems

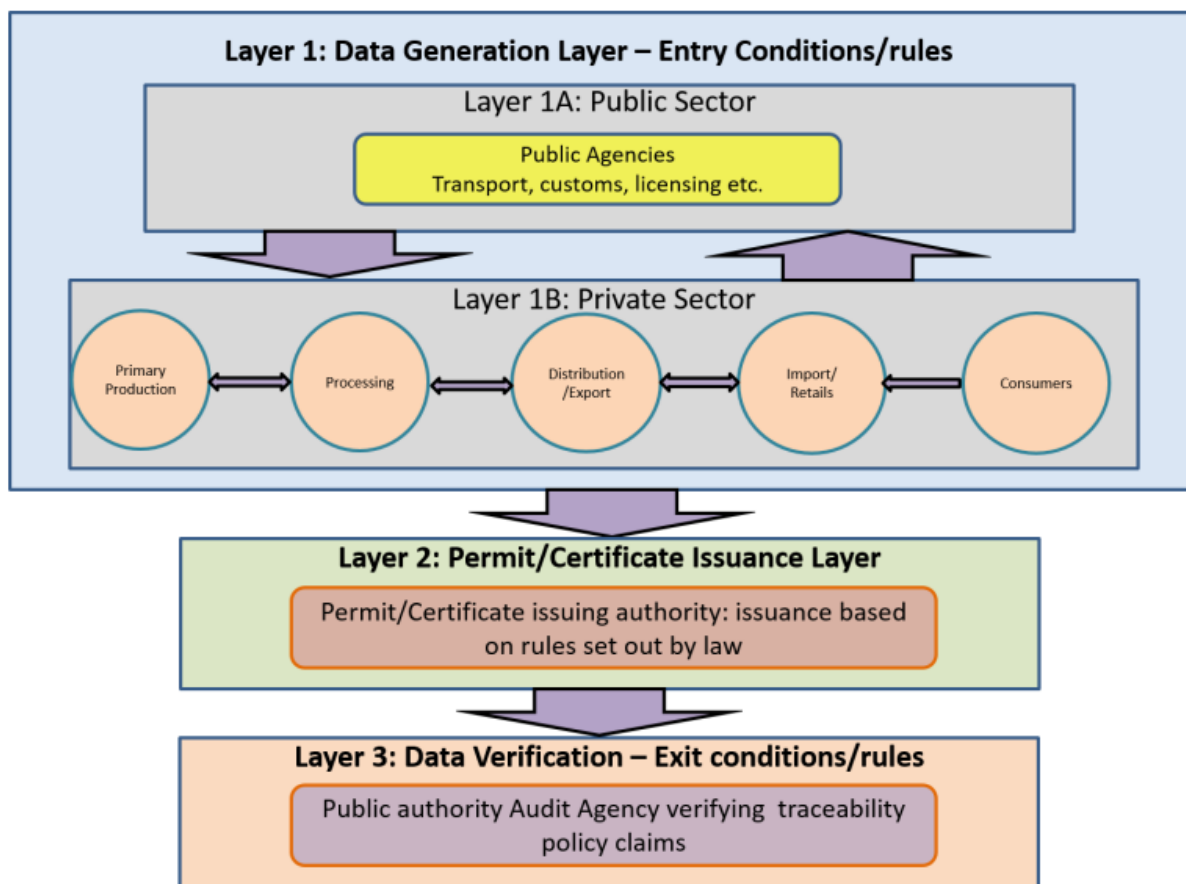
While the above definitions seem straightforward enough, actually obtaining information on a particular object, be it a product or an ingredient in a product, requires the coordination of a variety of parties, as well as a means to obtain that information. “The ability to access” therefore refers to a potentially significantly complex mechanism that might span both private and public stakeholders.

It has long been argued (Lehr, 2013a, Lehr, 2013b; Lehr, 2015a) that in order to build large-scale traceability systems for global supply chains, especially those crossing borders, traceability systems should be split up into layers; see Figure 4.2 or two-tiers as has been described in the UNCTAD study on python skins (Ashley, 2014). One such layer is represented by the data generation layer which includes the private sector where entities make contracts detailing the information elements that need to be passed on between supply chain steps. Another layer is the issuance layer where a permit or certificate is issued allowing for the trading of the supply chain asset whose information elements formed the data verification requirement. Finally, there is the verification layer where information contained in the data generation layer is corroborated by independent parties e.g. auditors of a particular certification scheme. The purpose of the verification layer is to make sure that the information contained in the private sector layer is (reasonably) correct. Part of that information will be made available to the public sector, contained within the data generation layer, which can use the information provided for its mandate (e.g. ensuring food safety or legal trade).

At the 27th United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) Forum (25–29 April 2016), this subject was brought to the agricultural domain subcommittee in a position paper elaborated by the UNECE Secretariat. The paper examines the implementation of large-scale traceability systems from the perspective of the public domain, for example it provides guidance on how to structure the second and third layer as described in Figure 4.2.

A key aspect of the UNECE paper is the realization that the definition of traceability is different for the public sector layer. Traceability is a method to substantiate a claim or statement related to a product, service or business process that formed the product based on information that has been made available. In a traceability system where government agencies are involved, these claims typically relate to certain values of society, many of which are related in one way or another to one of the goals of the United Nations Sustainable Development Agenda.

Figure 4.2 The three-layer approach to large-scale traceability systems – adapted for the UNECE architectural model approach



Source: Lehr, 2015a.

The statement to be supported by traceability system is called a *policy claim*:

“A policy claim is a high level statement, usually about an intangible feature or a process that is associated with a traceable asset that requires tracing of a supply chain and is supported by data collection.”

Where a *traceable asset* takes the position of “that which is under consideration” in the definition provided by (Olsen & Borit, 2013) or (GS1, 2012):

Traceability is then defined as:

“The ability of substantiating a policy claim that implicates a public authority via the collection of relevant data-sets along supply chains for cross border trade.”

Given that CITES is a Convention between countries (“Parties”), traceability within a CITES Management Authority of a specific country should be considered to be part of Layer 1 (see Figure 4.2) and the above definition therefore should apply. The data generation layer in Figure 4.2 was adapted from the original three layered approach defined by Lehr (2015a) to make reference for the UN/CEFACT traceability architecture. It also emphasises the importance of collaboration between the public and private sector stakeholders to formalize KDE collection agreements to aid the validation of a policy claim. In the next section, the traceability framework of UN/CEFACT is adapted and used for the definition of a traceability system for CITES-listed medicinal plants.

Policy claims implemented by a competent authority within a given country are linked to a segment of the supply chain. This segment is marked potentially by an *entry point* where the traceability will start and an *exit point* where traceability will stop. CITES as a trade Convention is not directly concerned with internal consumption (other than it potentially influences the NDF) and therefore there must be at least one entry-

exit point pair to guarantee legal orientation (collection and/or creation of a medicinal and aromatic plant – MAP) and to ensure the accurate capture of KDEs for tracking and auditing purposes. In the related UNCTAD study on ornamental plants, for example, it was suggested that traceability to origin should be limited to the purview of a single CITES Management or Scientific Authority, and that all subsequent authorities in the chain should rely on CITES certificates. In that sense, we suggested the existence of a single entry-exit point pair (and no corresponding entry point) to reduce complexity and to ensure that items can be tracked under one set of rules. Section 5 will assess its feasibility for medicinal plants.

Associated with entry and exit points are *entry and exit point conditions*. Entry point conditions ensure that a traceable asset meets certain features that qualify it to enter the traceability system. An entry point condition might be the legal acquisition of a raw material from a sustainable source or that a stakeholder possesses a valid trading permit. The corresponding exit point condition lays out what conditions are required to be met for the traceable asset to exit the supply chain. They might require the issuance of an export certificate or certain documentation to be kept in order (such as purchase receipts, collection permits, records of entry into a warehouse). They might also restrict the need to demonstrate compliance with the entry condition, by e.g. exempting small-scale operators from providing documentary evidence.

Transformation rules describe the rules that must be applied when processing a traceable asset between the entry and exit points of a supply chain so that the policy claim is met. An example of a transformation rule is the requirement that the weight of wood chips or quantity of oil produced at a processing factory should match the weight of the wood chips or quantity of oil that is ready for export. Another example may be that no traceable asset has entered the supply chain between an entry and exit point without being registered in the traceability system via the entry point: e.g. the asset must be traceable within the supply chain.

An audit agency needs to be set up by the competent authority to verify adherence to entry/exit point conditions and transformation rules. This will often be the CITES Management and Scientific Authorities in coordination with customs and other agencies. The audit agency could potentially also be from the public sector, e.g. an accredited conformity assessment body (CAB) or implemented using a public-private partnership (PPP). The outcome of such an audit would be, for example, the issuance of the relevant CITES and export permits.

4.4 Policy claims and policy briefs

A traceability project can be born from a policy claim that is derived from a government mandate or societal objective that aims, for example, to improve the long-term viability of trade in a particular sector. To validate a policy claim, there will be a requirement to implement a data gathering process to collect KDEs which in turn will be used by an audit agency to verify if a policy claim has or has not been satisfied.

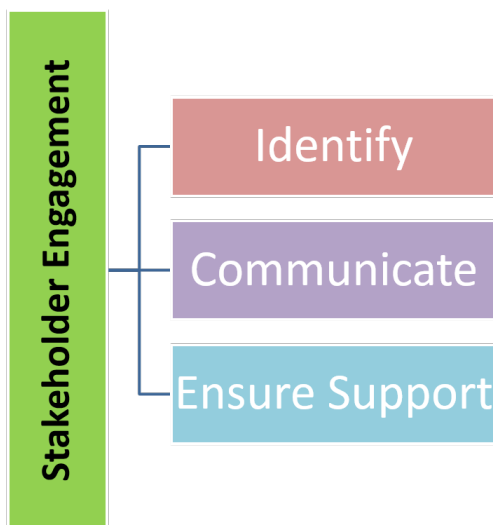
For example, an organization such as CITES may have issued a requirement to collect data elements on international trade for a particular medicinal plant species. A Party (i.e. a country that is a signatory to CITES), is then required to substantiate the policy claim by implementing a traceability system along a defined segment (entry/exit points) of a supply chain. Other organizations could issue similar requirements that are particular to their industry and related supply chains. Examples of policy claims could be:

- Oils used in the production of medicinal goods that are sourced in accordance with the rules of CITES; and
- Medicinal oil that can be fully traced back to oil mills, compliant to national legislation and not engaged in illegal practices.

The first step in preparing for a traceability project is to prepare a policy brief based on the policy claim. The policy brief provides an opportunity for key stakeholders to define an approach linking the policy claim to technical events that can be recorded in a traceability system. Project success in satisfying a policy claim will be dependent on creating strong collaborative agreements through organized discussions between the public and private sector stakeholders. The policy brief should also be used to identify what KDEs are required to verify the policy claim. As is depicted in Figure 4.3, to create a policy brief, the project owners⁴⁰ should ensure that all relevant stakeholders from both the public and private sectors have been identified and necessary communication channels created to ensure stakeholder collaboration to find common agreement for satisfying the implementation of a traceability project and other tasks (e.g. identifying private sector standards). The aim is to create an open atmosphere where communication and feedback loops

operate freely and effectively to ensure that the project team can promote continuous decision-making without getting stuck on any particular point.

Figure 4.3 Process of stakeholder engagement



A core task of the project owners will be to ensure stakeholder buy-in at each point along the identified supply chain. Ideally, the private sector will be afforded the autonomy to define how their data are collected and managed from their supply chain point to the specified public authorities. The public sector stakeholders would ideally be concerned with the collection of the supplied data elements and subsequent auditing.

Note that for cross-border supply chains, the ideal scenario is to allow each country to manage their own supply chain's traceability system where the exit point of the exporting nation (where all exit point conditions/transformation rules have been met) meets the entry point rules/conditions of the importing nation. In this way, the public authorities of each trading nation only need to be concerned with the management of data element collection along their local supply chains. Consequently, they must entrust the competent authority from the previous supply chain to ensure that the correct audit checks have been performed.

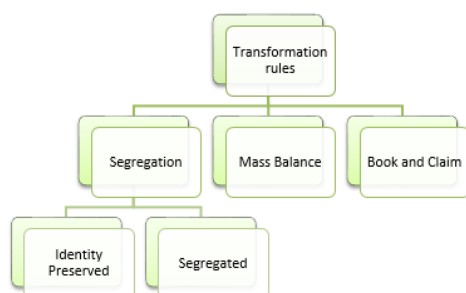
4.5 Types of transformation rules

In international traceability and supply chain visibility systems, different types of transformation rules are in use (although not under that name). Three models (segregation, mass balance, and book and claim) are of particular interest and are shown in Figure 4.4.

The **product segregation model** operates by physically separating materials subject to the policy claim and those not subject to it throughout the supply chain. This approach ensures that 100 per cent of the product at the exit point is derived from the entry points that are part of the traceability system. This approach can be used at item level where products use material from a single source (identity preserved). It can also allow for mixing between sources, however only between materials subject to the policy claim (segregated). This approach is often used where the policy claim is highly valued by importers/customers. Examples may be crocodile skins for export or live CITES-listed ornamental plants.

In the identity preservation approach, mixing of certified commodities from different sources is strictly forbidden. This ensures that the product can be traced back to its origin without any uncertainty. However, identity preservation is often highly impractical and costly and only used when consumers are explicitly interested in the specific origin of the product, e.g. food.

Figure 4.4 Types of transformation rules for traceability systems



Where mixing is a natural process (due to grading for example), the segregated approach is more practical, where certified commodities can be mixed, but only between certified sources.

The **mass balance model** is less strict than the segregation one, as it allows for mixing of certified and non-certified commodities. Every operator records the amount of input subject to the policy claim, either for every production facility or for the company as a whole, and is allowed to declare equivalent amounts of a product which is compliant with the policy claim. Customers cannot know exactly whether a particular asset they receive is from a compliant source, but know that on average the product contains a given percentage of compliant ingredients. This is commonly used in business where segregation is considered too costly.

In the **book and claim (B&C) model** certificates are issued for every compliant entry. Such certificates then become tradable independently of the good. Buyers of certificates can use them to communicate to the public that they support the policy claim, e.g. by labelling their products. This makes claims such as “product supports the sustainable sourcing and production of essential commodities” possible. B&C models are mainly used to foster uptake of compliance schemes when there are insufficient incentives in the supply chain to drive adoption. While they do not constitute a traceability system per se, B&C models can help increase their attractiveness to early stage operators.

4.6 Chain of certification type within traceability systems

Policy claims often require a time element related to the object under consideration. Compliance with food safety regulations for example, typically requires knowledge of the sources of particular ingredient batches and destination of product batches (the “one step up, one step down” system).

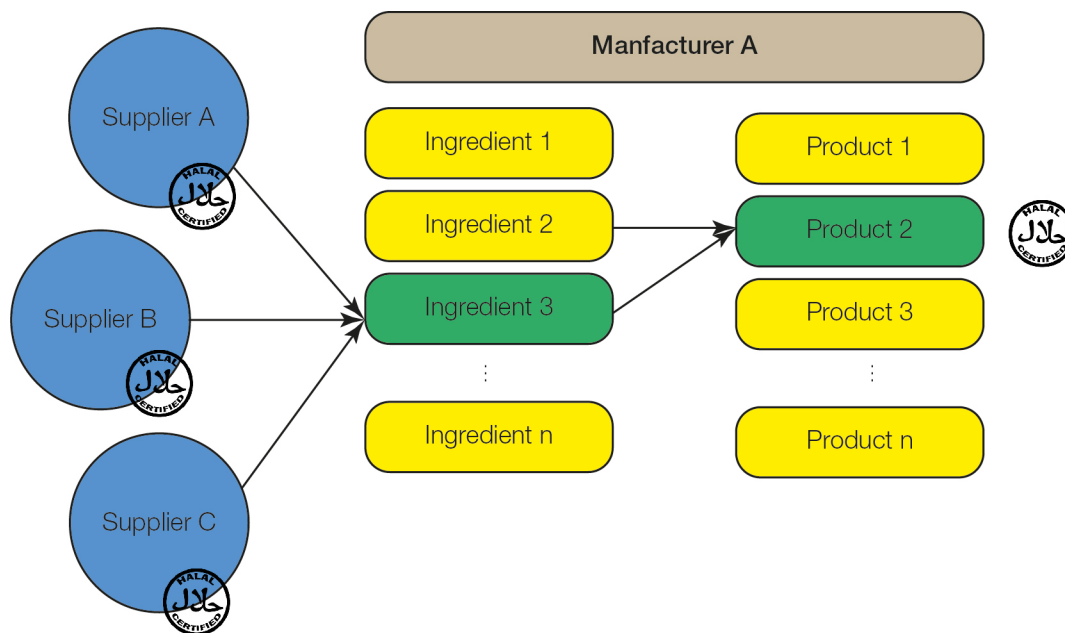
Some policy claims, however, simply require the presence or absence of certain procedures, processes or products, independently of a timing factor. An implementation of a policy claim on child-labour free products for example would not require necessarily a timing component, but simply assurance that product streams are free of materials produced by children.

One such system is Halal certification which is schematically represented in Figure 4.5. Individual products of a manufacturer can be Halal certified. To qualify, the manufacturer submits to the certifier a list of ingredients of the product and a list of suppliers of each of the ingredients.

The certifier classifies ingredients into those where there is no or very little risk of contamination with unlawful substances and those where there may be contamination. For the latter, the certifier inspects the Halal certificate of all suppliers of that ingredient. If all suppliers of that ingredient are Halal certified for it, the ingredient is deemed Halal.

Certifiers then proceed to inspect the manufacturing facilities and confirm whether requirements are met at company A.⁴¹ If the ingredients are Halal and the company operates according to the rules of the certification scheme, the combination of the product and its suppliers is considered Halal. If Manufacturer A wishes to exchange Supplier A for another supplier not on the Halal certificate, it will have to amend its certificate. There is, however, no need to document from which supplier ingredients were used in a particular product batch. Halal certification constitutes therefore a chain of certification where the certificate of a particular product depends on correct operation at the manufacturer, and on certificates of suppliers of ingredients for that product.

Figure 4.5 Schematic representation of Halal certification



On the former, where there is no or very little risk of contamination of the ingredients, certification considers certain ingredients as innocuous and omits its suppliers from the requirement of certification.

4.7 The role of certification schemes in supporting traceability

4.7.1 FairWild Standard

4.7.1.1 The FairWild Standard and traceability

The FairWild Standard is a private standard managed by the FairWild Foundation applicable to wild plant collection operations wishing to demonstrate their commitment to sustainable collection, social responsibility and fair trade principles. TRAFFIC was one of the founding organizations of the FairWild Standard, and is now supporting its implementation under the Partnership Agreement with the FairWild Foundation. The FairWild certification is a third-party audited system. The purpose of the standard is to ensure the continued use and long-term survival of wild species and populations in their habitats, while respecting traditions and cultures, and supporting the livelihoods of all stakeholders, notably, collectors and workers by providing benefit-sharing throughout the value chain.

Full traceability of goods (wild plant ingredients) and finances are the basic principles of the FairWild Standard and its certification scheme. In terms of the traceability of goods, Principle 10 of the Standard (FairWild Foundation, 2010) reads:

Applying Responsible Business Practices:

Collection of wild resources shall be undertaken to support quality, financial and traceability requirements of the market without sacrificing sustainability of the resource.

It requires a set of documented practices through each point of the trade chain and the “Storage and handling of the target resources is managed to support traceability from the collection area to sales” (Principle 10.2). Some of the key traceability requirements under the 10 principles pertinent to forming a potential traceability partnership include:

- 1) Market needs identified (e.g. buyer orders, specification sheets, etc.);
- 2) Buying records are reliable and adequate, with details of collectors’ name, quantities and collection area. Collectors are issued receipts;
- 3) Documentation of central processing/packing activities to allow traceability of batches is adequate;
- 4) An effective system that ensures traceability to collection area is established;
- 5) Labelling procedures, well documented purchase and sale of products under the certification scope (as relevant) are established; and

- 6) If certified, the status of the products is indicated on the invoices and shipping documents.

Key systems and documents to demonstrate the implementation of traceability requirements include:

- Traceability system (labels; harvest, processing and sales records); and
- Storage labelling.

In terms of the practical application of these requirements, the information is traced through every stage of harvesting, processing and trade. This usually starts from wild collectors delivering raw collected products to the purchase centre/point, in some cases via an intermediate step of primary processing (e.g. drying, rough cutting). The FairWild-harvested product from this stage onwards is specifically labelled (on bags). Purchases are required to be registered in a buying record which states at least the date, collectors' name or code, collection area, delivered quantity and product details and the FairWild certification status. Also, the collectors are issued receipts, which indicate at least the date, collectors' name (or code), species and product, delivered quantities and FairWild certification status.

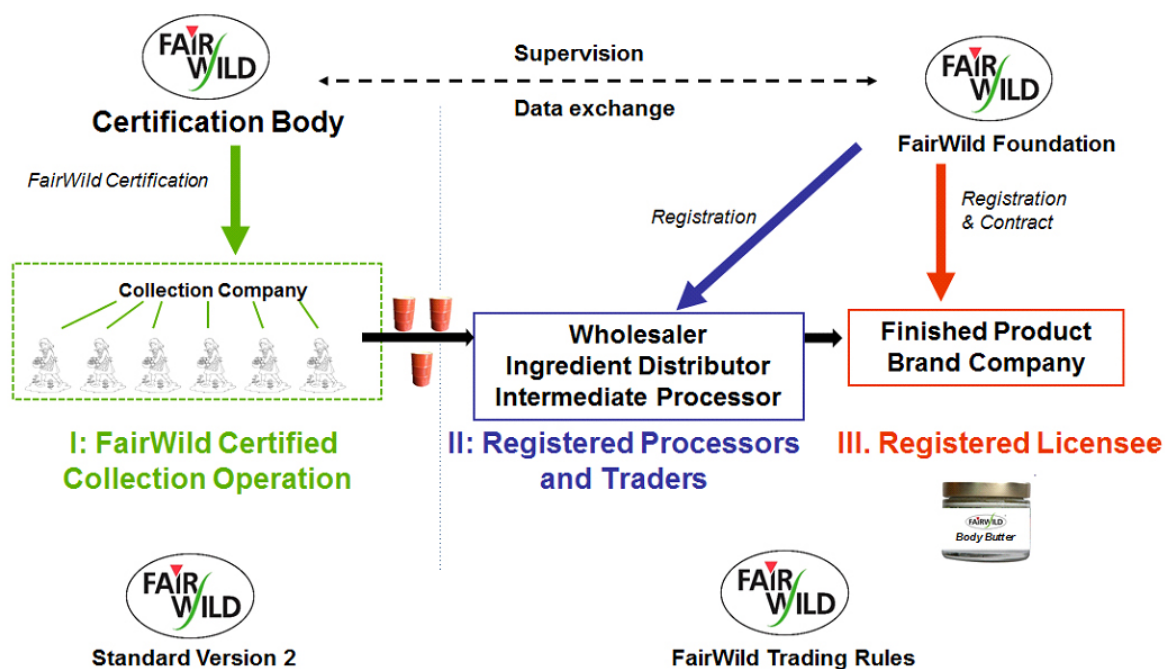
From this point onwards in the trade chain, products are consolidated into batches. There is a requirement of an appropriate documentation of central processing/packing activities (processing/packing diary) to allow traceability of batches. Batch codes are required to be traceable throughout all processing stages, and for every processed product (i.e. cleaned, sorted, cut, sifted material) the processing ratio (collected quantities to final processed weight) and composition (in case of multi-ingredients products) must be known and documented. It is not unusual for some batches to be processed several times given the nature of final products (which may be medicinal, food or cosmetic). Collection and post-collection identification, labelling and record keeping procedures must allow tracing back each goods batch to the area where it was collected.

Within the FairWild certification system, it is important that the same ingredient coming from other producers or certified under a different system, is separately stored and processed. Products must further be labelled correctly when leaving the collection operation to the next buyer. The labels are company-specific, but would as a minimum include the FairWild certification status of the products, name of product, lot number or code of purchase centre.

In terms of the compliance check, the FairWild certification scheme requires an annual audit by an accredited certification body, which conducts a full trace-back of the sample batch to the collection area. FairWild performance indicators are used as the basis of the audit (FairWild Foundation, 2013). The audit visit includes, as applicable, visiting collectors' homes, as well as storage facilities. The declared quantities traded are at the same time checked against the sustainable harvesting quantities available from the completed resource assessment, management plan and permit (if applicable). The compliance of collection operation with the legal requirements is also checked within the certification audit.

Under the FairWild chain of custody approach (Figure 4.6), "the registration of all traders and manufacturers with the FairWild Foundation is required" (Fairwild Foundation, 2013). All registered entities are required to submit the annual turnover declaration form to the FairWild Foundation, which details the species traded and quantities. This information is used by the FairWild Foundation to calculate trader fees and substantiate need for "spot-check" audits of the chain of custody (e.g. in case of miss-information where declarations appear to be inaccurate).

Figure 4.6 Model chain of custody for FairWild



Source: FairWild Foundation.

There are a variety of FairWild certified operators certified as “organic wild” good manufacturing practice (GMP)-compliant or certified against hazard analysis and critical control points (HACCP) where traceability is controlled from a processing step. FairWild also requires and provides for traceability to the collection site, which is important in considerations of the sustainability of wild-harvesting practices on the ground.

This is an important distinction and why the FairWild Standard is potentially compatible with the UNECE traceability architecture model. Both processes support the implementation of policy claims, seek to define entry and exit points whilst requiring entry/exit point conditions and transformation rules to be met and auditable to ensure that the wild-harvested goods are being protected as well as ensuring fair payment and supportive social benefit outcomes. If adopting the FairWild Standard as a tool in the traceability architecture, then the project owners may also be able to offer more benefits to ensure private stakeholders that an investment into a traceability system will be worthwhile. The following are examples of such benefits:

- Fair premium prices for collectors;
- FairWild sales prices (based on transparent and fair cost calculations);
- FairWild premium fund;
- ABS both for genetic resources and/or derivatives depending on the case;
- Gender equality;
- No discrimination or child labour; and
- Mutually beneficial trade relations.

The FairWild Standard is supporting the implementation of all three objectives of the CBD: biodiversity conservation, sustainable use of biodiversity and the fair sharing of benefits that come from the exploitation of those resources. The comprehensive nature of the FairWild Standard enables it to be a partner for those stakeholders involved in the Global Strategy for Plant Conservation working towards the fulfilment of its targets. The FairWild Standard also supports the implementation of the Nagoya Protocol. At CBD COP 10 in 2010 the Nagoya Protocol was adopted and entered into force on 12 October 2014.⁴²

4.7.1.2 FairWild implementation

The FairWild Standard has been implemented by partners such as TRAFFIC in a variety of countries,⁴³ including those related to the study priority countries: China and Viet Nam. It is particularly relevant that the

FairWild Standard, through TRAFFIC, has been implemented through TCM supply chains in China and in a community implementation project for the harvesting of traditional Vietnamese medicine ingredients in Viet Nam.

In China, TRAFFIC worked with TCM companies towards more sustainable supply chains for medicinal plants and wider sectoral change, including through engaging with TCM industry associations and supporting industry leadership in the uptake of good practices (Timoshyna et al., 2015). The project partners included an important TCM manufacturer in Zhejiang province, the association of TCM societies and civil societies. Over a two-year period, the project created opportunities for greening current TCM plant ingredient sourcing practices. This included the development and delivery of extensive supplier training programmes, the development of innovative TCM sector corporate social responsibility (CSR) guidelines and testing their application for an enterprise implementation roadmap, as well as convening the first forum on CSR and sustainability in the TCM sector.

In Viet Nam, a project partnership between TRAFFIC, the government and company, was funded by the Darwin Initiative, focusing on community-level capacity building in the sustainable use of medicinal plant resources.⁴⁴ The project, conducted with the provincial level Bac Kan Forest Protection Department as well as the Traditional Medicine Association of the Ministry of Health, provides a practical pilot illustration of how conservation benefits from the sustainable use of important medicinal plants can be realized in the context of community-level resource management. CITES-listed *Cibotium barometz* is among the project’s target species. The project aims to reach the wider traditional medicine sector raising awareness of the benefits of sustainable sourcing.

At the moment there are no cases of the FairWild certification being applied to CITES-listed species, although over the years of the FairWild scheme’s existence, interest in the certification of CITES Appendix II species has been expressed. Considering the relevance of the FairWild Standard to the verification of sustainability of harvesting and trade in wild plants, including MAPs, it would be useful to pilot the use of the FairWild certification in trade in CITES Appendix II-listed wild-harvested medicinal plants, complementing the existing CITES control measures.

4.7.2 [Union for Ethical BioTrade \(UEBT\) Standard](#)

As an alternative, the UEBT, may also be worth considering for a traceability project partnership. UEBT aims to contribute to a process of market transformation in the cosmetics, food and natural pharmaceutical sectors. Through Ethical BioTrade concepts and tools, it provides a model and platform for businesses to contribute to local development and biodiversity conservation, in support of the implementation of the Sustainable Development Goals (SDGs) and CBD objectives. The UEBT visions and vision statements are identified below:

UEBT vision	To be the leading association of companies that are involved in biodiversity-based innovation and sourcing, driving sustainable business growth, local development and biodiversity conservation.
UEBT mission	To promote Ethical BioTrade practices by offering UEBT members independent verification, technical support and networking opportunities for biodiversity-based innovation and sourcing.

UEBT promotes private sector engagement in the sourcing of natural ingredients with respect for people and of biodiversity. It was created in 2007, with the support of the UNCTAD BioTrade Initiative, and brings together companies and non-profit sector organizations such as NGOs committed to Ethical BioTrade. UEBT member companies are active in the cosmetics, food and pharmaceutical sectors. They may collect or grow plant material (for example, through wild collection, agroforestry or agriculture), produce plant-based ingredients such as extracts, vegetable and essential oils, tinctures, and active ingredients, or conduct research and development into new ingredients and products. For all these activities, the Ethical BioTrade Standard, managed by UEBT, guides company practices and drives sustainable business growth, local development and biodiversity conservation.

Box 5 The Ethical BioTrade Standard⁴⁵

The Ethical BioTrade Standard defines practices that advance sustainable business growth, local development and biodiversity conservation. It encapsulates:

- Practices that promote biodiversity conservation by maintaining and restoring ecosystems and by using biological resources sustainably. This includes measures that contribute positively and proactively to biodiversity conservation in sourcing areas, as well as measures that actively reduce any potentially negative impacts raised by sourcing activities.
- Practices that aim to contribute to local development by equitably sharing the benefits generated through the use of biodiversity. This takes place through equitable trade practices, and through the sharing of benefits derived from innovation based on biodiversity and associated traditional knowledge.
- Practices that seek to respect human rights, the rights of workers and local and indigenous communities, and other rights linked to natural resources.
- Practices that address sourcing risks and improve the economic viability of companies and their products, so that Ethical BioTrade companies and their supply chains are sustainable in socioeconomic terms.

Source: UEBT.

UEBT has over 40 member companies in approximately 15 countries. There are over 80 suppliers certified against the Ethical BioTrade Standard around the world, offering 260 natural ingredients from agroforestry, wild collection and agriculture.

Traceability requirements apply to UEBT members and certified suppliers, which are externally audited. In addition to this, chain-of-custody certification is required for ingredients for which claims are made on consumer products. Section 4 of the BioTrade standard (UEBT, 2012) sets out traceability requirements to ensure that:

- The organization knows and documents the flow of natural ingredients it uses within its own operations.
- The organization sets critical control points to monitor traceability within its organisation and its supply chains.

Also of interest is the UEBT/UTZ certificate programme⁴⁶ for herbal teas which is built upon the UEBT Standard. A core component of this programme is the traceability requirements (see point 11 Annex 4) which must be adhered to in supporting the auditing process to verify claims and confirm certification (UEBT/UTZ, 2015). The strong focus on traceability in the UEBT Standard makes it a possible partnership candidate for a UNECE traceability architecture project (see section 5.3). Key to aligning the Ethical BioTrade Standard with the UNECE traceability architecture is the UEBT requirement to identify, monitor and record critical points along their supply chain. These requirements potentially complement the architecture requirements for identifying entry points, entry rules and conditions as well as transformation rules. By also taking advantage of UEBT principles such as “fair and equitable benefit sharing”, project owners have a potential tool to leverage stakeholder buy-in to a traceability system.

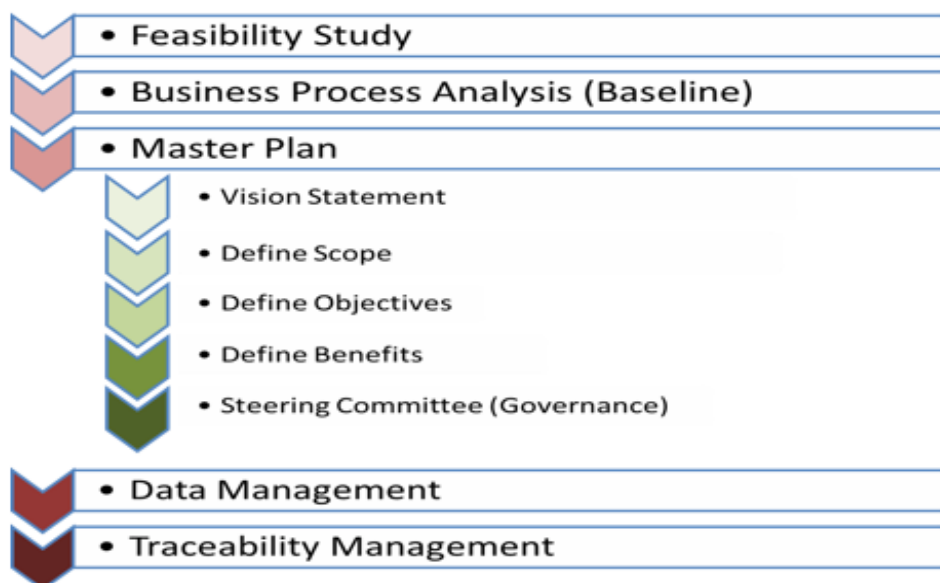
4.8 Implementation of public sector traceability systems

It has been highlighted earlier that implementation of traceability is a complex operation that often lacks in three areas (Lehr, 2015a):

- Integration of all supply chain players, especially small-scale operators;
- Standardization; and
- Governance of the traceability system.

To collect international experience in public sector driven traceability system implementation, UNECE presented another position paper to the agricultural domain subcommittee at the 27th UN/CEFACT Forum (25–29 April 2016). The paper was produced by the UN/CEFACT Secretariat in collaboration with experts from the public and private sector.

Figure 4.7 Process of implementation of public sector traceability systems



Source: UNECE.

The agreed process is depicted in Figure 4.7. Of critical importance is the determination of pre-conditions and limitations through the feasibility study and of the *status quo* through the baseline study. Based on this, a master plan can be developed. Two critical aspects in the development of the master plan are the definition of benefits to all stakeholders and finding good enough (perceived) benefits that will be the motor driving the implementation. Data management is concerned with the more technical task of identifying the data sets required to satisfy the policy claim and rights to access them, while traceability management is then concerned with the actual management of the system itself (operation, reporting, etc.).

5 Traceability for CITES-listed medicinal plants

5.1 The potential role of traceability in CITES processes

The CITES Secretariat presented an overview of traceability⁴⁷ at the 66th meeting of the Standing Committee in Geneva (Switzerland). In that overview, the Secretariat made references to the following potential benefits to Parties:

- Improved compliance with the Convention on legal acquisition and non-detrimental trade;
- Ability to confirm the legal origin of the specimen in trade;
- Generation of data for use in NDFs, review of significant trade, and development of indicators;
- Prevention of laundering of illegally harvested species into the legal supply chain;
- Ability to track and trace⁴⁸ a specimen throughout the entire CITES Management Authority supply chain;
- Increased confidence in the supply chain by the CITES community; and
- Improvements to CITES processes and procedures.

In addition, another major traceability benefit that could strengthen CITES processes is the avoidance of entry of illegal material into legal chains, e.g. the avoidance of “laundering” (Lehr, 2015b; Lehr, 2016b).

5.2 Limitations of the use of traceability systems in the trade of medicinal plants

As in the case of ornamental plants from Latin America, but very likely to a much larger extent, a portion of the medicinal plant trade is illegal, unregulated and/or unreported; for these black market activities, traceability is not an ideal tool (For further information and analysis, see UNCTAD study on CITES ornamental plants (Lehr 2016b)). If both buyer and seller act knowingly outside of the law, they are very unlikely to document transactions and make that information available in some form or another.

In addition, in medicinal plants from the Greater Mekong region, there is also presence of informal trade within borders or cross border. For further information on orchids (see Fay, 2015; Subedi et al., 2013).

Traceability can help law enforcement activities to some extent because (a) the analysis of product flows may provide hints of illegal activity if volume data can be collected; and (b) companies can be held accountable based on the data they have previously submitted (see also section 2.4.7). The impact of traceability on reducing black market transactions should not be overestimated although highlighting the significant role that competent authorities of importing nations can play in refusing the entry of illegally acquired plant products could help (see also section 2.5.7).

However, the medicinal plant supply chains are significantly more complex than the ornamental plant supply chains, given the processing and re-processing of plant material. Also in medicinal and personal care products, medicinal plants are often a minor ingredient if measured by weight.

Making laundering more difficult can have several consequences. It can raise awareness within supply chains and push semi-legal chains into legality. It can also, however, convert (semi-)legal chains into illegal chains because of additional data requirements and the associated burden of complying with them. This might be the case for example if (a) current business models are interrupted (e.g. small-scale production); (b) the additional documentation requirements exceed the capacity of the supply chain stakeholders; and/or (c) the transaction costs associated with the additional requirements reduce the profit margin.

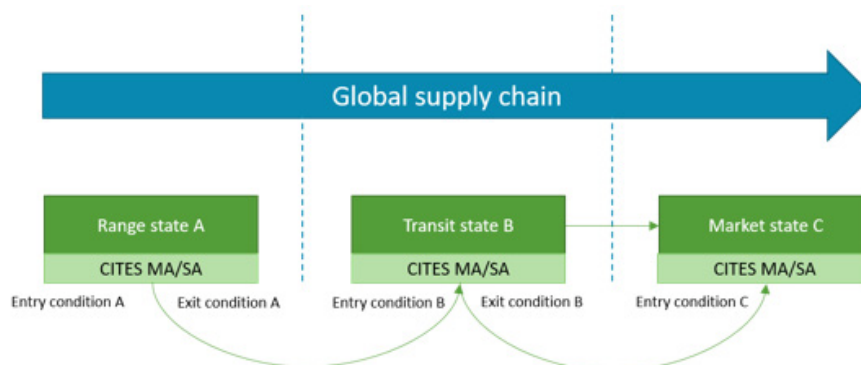
A lot of care needs to be taken therefore to keep requirements on supply chain partners in balance with benefits they might perceive from operating within the legal framework.

5.3 Applying the UN/CEFACT traceability framework to medicinal plants

Applying the UN/CEFACT traceability framework to trade in medicinal plant products containing the species of interest, it is suggested to break down the international supply chain into pieces that are under the control of a single CITES Management Authority.

Breaking up the full global supply chain into smaller entry and exit point pieces allows the application of the framework, but also places goods under the responsibility of a Management Authority at every point in the chain. The definition of entry/exit point conditions and transformation rules will then allow the creation of traceability subsystems under a suitable agency with links to CITES Management Authorities.

Figure 5.1 Breaking up the global supply chain



The first step is the formulation of a policy claim or statement. While the concrete formulation of the policy statement will fall within the purview of the Party or Parties the CITES Management Authority belongs to, a template statement could read:

“Medicinal and aromatic plants (MAPs) are harvested and traded in accordance with applicable national and international rules and regulations. In particular, CITES-listed MAPs and products thereof [destined for export] can be traded only if legally acquired and where such trade will not be detrimental to the survival of contained species. Records must be kept by all operators to demonstrate legal acquisition, whereas non-detrimental levels of trade will be determined by the corresponding competent authority.”

Such a policy statement without the square brackets would effectively extend CITES rules to domestic trade. Parties not wishing to go quite as far could include the square brackets.

The policy statement clearly links the requirement for legal acquisition to record keeping and implicitly implements a one-step up system, where each operator has to keep records linking itself to its suppliers or another legal source of materials (e.g. a collection permit).

The entry point for a range state, where the material originates, is called “origination” in earlier studies, pre-dating the traceability framework. The traceability system for shark products (Lehr, 2015b) and ornamental plants (Lehr, 2016b) both relied on the existence of a *legal origination process*. A legal origination process is an origination process that is covered by an official control to increase the reliability that a certain material effectively was “created” (for further processing in the chain) legally. Within the traceability framework a legal origination process is equivalent to an entry point condition.

In the case of shark products, the legal origination process (entry point condition) was the landing inspection that is mandatory in many countries, e.g. in Costa Rica (Lehr, 2016a), for all but small-scale fleet. In the case of ornamental plants from Latin America, the UNCTAD report suggested an annual operating licence based on an inspection and supported by a registry (e.g. a computerized registry) of mother plants as the legal origination process (Lehr, 2016b).

Given the importance of safeguarding the natural resource, it seems to make sense to differentiate between unprocessed plants, plant parts and products thereof and treat them somewhat differently. By “unprocessed” the author understands “in continuation” as in a form that does not alter significantly the natural resources. For example, drying, cleaning, splitting etc. are not considered significant alterations; however, extraction and distillation are.

Plants and plant parts of the species under consideration in this report can on the one hand originate either by collection from the wild, plantations or by artificial propagation (or the natural extension of this concept, currently being studied as mentioned in section 3.2).

This leads us to the following entry point condition:

The acquisition of unprocessed CITES-listed MAPs are subject to the issuance of an operating permit.

For wild-harvested material, records must be kept about collection date, species and quantities harvested. [Associations of collectors can be issued a joint permit if individual members are identified and the total volume collected is not significant.⁴⁹] An annual summary record needs to be filed with total quantity harvested per species.

The entry point condition rules could be along the following lines:

Permits for wild collection and/or artificial propagation of CITES-listed MAPs are issued by the competent authority and are identified uniquely by a permit number. Permits are controlled via inspections.

Small-scale collectors⁴⁹ are exempt of [a collection permit and] keeping harvesting records, but their sales must be recorded by their immediate clients and include sales date, species, weight and price. An annual report must be filed with total purchased quantity per species from small-scale collectors.

For artificially propagated specimens, a registry of parent plants must be kept of all propagated plants linked to their parent plants. An annual report must be filed detailing total sold volumes per species.

Additionally, material can originate elsewhere (e.g. in another country) and be imported. For this material, a different entry point condition would apply along the following lines:

The import of processed or unprocessed CITES-listed MAPs and its derivatives [with exception of finished products packaged and ready for retail trade] are subject to a permit.

The entry point condition rules could be along the following lines:

All imports of processed or unprocessed CITES-listed MAPs have to be covered by a CITES permit or certificate issued according to the rules of CITES [with exception of finished products packaged and ready for retail trade].

Importers are required to have an operating permit which identifies them uniquely.

Purchasers of unprocessed plant products may either continue to trade with the unprocessed goods or process them; their clients may trade or further process their already processed goods. For these, the entry point condition and transformation rules would apply. A suitable entry point condition could be:

Trading and processing of CITES-listed MAPs is subject to an operating permit.

The transformation rules could be along the following lines:

Operating permits for trading and/or processing of CITES-listed MAPs and derived products are issued by the competent authority and are identified uniquely by a permit number. Operating permits are controlled via inspections.

Traders of unprocessed MAPs are required to keep purchase records detailing supplier, species, quantity and date of purchase. An annual report has to be filed detailing total quantity of purchased material per species. Small-scale traders⁴⁹ are exempt from [an operating permit and] keeping purchase records, but their sales must be recorded by their immediate clients and include sales date, species, weight and price. An annual report must be filed with total purchased quantity per species from small-scale traders.

For processing, an annual report must be filed detailing total purchased volumes per species and total volume of products containing CITES-listed MAPs.

For trading and further processing of products containing CITES-listed MAPs a list of suppliers identified unequivocally (e.g. through their respective permit numbers) must be supplied annually. Voluntarily, permit holders may declare purchased quantities from those suppliers.

The traceability stops at the exit point which in our case is the customs export declaration. At the exit point, the exit point conditions need to be audited. Suitable exit point conditions to be satisfied might be:

(Re-)Export of products [other than finished products packaged and ready for retail trade] containing MAPs is subject to a permit. CITES rules for issuance of such permits apply.

Permits for (re-)exporting of CITES-listed MAPs and derived products are issued by the competent authority and are identified uniquely by a permit number. Permits are issued per

shipment and controlled via inspections. [Finished products packaged and ready for retail trade are exempt from permits.]

Unprocessed CITES-listed MAPs are considered to be legally acquired if (a) the trader holds a valid operating permit; (b) has filed the annual report the year before applying for an export permit; and (c) can demonstrate upon request purchase records that allow for export of the species under consideration. Small-scale traders are not eligible for export permits.

Products containing CITES-listed MAPs are considered to be legally acquired if (a) the trader holds a valid operating permit; (b) has filed the corresponding annual report the year before applying for an export permit; and (c) the exported quantities can reasonably be substantiated given the supply base of the trader.

Since there are already generic entry rules for import, the same set of rules will apply to a transit state and a market state.

Table 5.1 summarizes the application of the UN/CEFACT traceability framework to the case of CITES-listed MAPs, designed for the particular case of the species under consideration.

Table 5.1 Summary of the application of the UN/CEFACT traceability framework to CITES-listed medicinal plants

Framework element	Definition	Process	Description
Policy claim	The statement that the traceability system supports.	Internal, but ideally coordinated with other Parties	Policy claim example: “Medicinal and aromatic plants (MAPs) are harvested and traded in accordance with applicable national and international rules and regulations. In particular, CITES-listed MAPs and products thereof [destined for export] can be traded only if legally acquired and where such trade will not be detrimental to the survival of contained species. Records must be kept by all operators to demonstrate legal acquisition, whereas non-detrimental levels of trade will be determined by the corresponding competent authority.” The policy claim therefore falls within the authority of one Party, i.e. “a State for which the Convention has entered into force.” ⁵⁰
Traceable asset	Any item (object, product or service) that needs to be tracked along a supply chain at any given state or moment.	Import, (re-)export and internal	i. Unprocessed MAPs; ii. Processed MAPs without mixing species; iii. Products containing MAPs; iv. Finished products packaged and ready for retail.
Entry point	A process that is a starting and end point of the traced supply chain.	Import or internal	The origination of materials either by: i. Import; ii. Wild harvest; iii. Plantation; iv. Artificial propagation. ⁵¹
Entry point conditions	Certain conditions that assets must meet when they enter the traceability system.	Import	Presence of CITES certificate(s), with the potential exception of Traceable Assets of type (ii)
		Internal	Traceable assets of type (i): <ul style="list-style-type: none"> - Operators require a uniquely identified operating permit; - For wild-harvested specimens, records must be kept on collection date, species and quantities; - For artificial propagated specimens, a registry of parent plants must be kept and of all propagated plants linked to their parent plant; - An annual summary record needs to be filed with total quantity harvested or sold per species; - Small-scale collectors are excluded from [a collection permit and] harvest records. Traceable assets of type (ii) and (iv): <ul style="list-style-type: none"> - See transformation rules or import; - Clients of small-scale operators selling traceable assets of type (i) have to record sales date, species, weight and price. An annual report must be filed with total purchased quantity per species from small-scale collectors. Traceable assets of type (iv): Potentially excluded from CITES control; if not identical to traceable assets of type (ii).
Exit point	A process that is an end point of the traced supply chain.	(Re-)Export	(Re-)Export of products [other than finished products packaged and ready for retail trade] containing CITES-listed medicinal and aromatic plants.

Framework element	Definition	Process	Description
Exit point conditions	Conditions that assets meet when they leave the traceability system.	(Re-)Export	<p>Must be legally acquired and trade non-detrimental for the survival of the species.</p> <p>Traceable assets of type (i) are considered to be legally acquired:</p> <ul style="list-style-type: none"> - The trader holds a valid operating permit; - Has filed the annual report the year before; - Can demonstrate upon request purchase records; - Small-scale traders are not eligible for export permits. <p>Traceable Assets of type (ii), (iii) and (iv) are considered to be legally acquired:</p> <ul style="list-style-type: none"> - The trader holds a valid operating permit; - Has filed the annual report the year before; - The exported quantities can reasonably be substantiated. <p>Traceable Assets of type (iv): Potentially excluded from CITES control; if not identical to Traceable Assets of type (iii).</p>
Transformation rules	Rules that must be applied when processing the assets between the entry point and the exit point.	Internal	<p>All operators [with possible exception of buyers of finished goods] require an operating permit.</p> <p>Traceable assets of type (i):</p> <ul style="list-style-type: none"> - Purchase records detailing supplier, species, quantity and date of purchase must be kept. An annual report has to be filed detailing total quantity of purchased material per species; - Small-scale traders are exempt from [an operating permit and] keeping purchase records, but their sales must be recorded by their immediate clients and include sales date, species, weight and price. An annual report must be filed with total purchased quantity per species from small-scale traders. <p>Traceable assets of type (ii):</p> <ul style="list-style-type: none"> - An annual report must be filed detailing total purchased volumes per species and total volume of products produced containing CITES-listed MAPs. <p>Traceable assets of type (iii) and (iv):</p> <ul style="list-style-type: none"> - A list of suppliers identified unequivocally (e.g. through their respective permit numbers), must be supplied annually; - Voluntary declaration of purchased quantities from those suppliers. <p>Traceable assets of type (iv): Potentially excluded from CITES control; if not identical to traceable assets of type (iii).</p>
Audit agency	An agency that controls the assets that meet the entry and exit point conditions and the transformation rules. It will request information such as traceability event data from stakeholders.	Import, (re-)export and internal	A CITES Management and Scientific Authority supported by an agency with a mandate to control internal trade.

The traceability system differentiates between four different traceable assets:

- i. Unprocessed MAP;
- ii. Processed MAP without mixing species;
- iii. Products containing MAP; and
- iv. Finished products packaged and ready for retail.

The reasoning is that to avoid entry of illegal material, the source (e.g. collection) needs to be controlled more closely than later production stages. In addition, users of processed goods (e.g. essential oils or even more processed goods like formulae) might not be aware of the specific species included in the raw materials they purchase. In some cases, their suppliers might consider this to be confidential information and/or trade secrets. This is even truer for finished products packaged for retail.

The latter, presents a conceptually difficult case. On the one hand, attempting to control (by species) external trade of products possibly containing small or very small amounts of CITES-lists MAP seems very difficult. The study undertaken by Brinkmann (Brinckmann, 2014) showed that members of the Orchidaceae family were present in a whole series of consumer products in very small amounts. Their control seems difficult. Also, it could be expected that heavy mixing of sources occurs in the production of extracts and oils which will make controlling the sources very difficult.

On the other hand, the exclusion of finished goods would potentially remove supply chains entirely from CITES control if processing and packaging is done in the range state. The removal of the requirement of a CITES certificate could also result potentially in the removal of the need for a NDF and, if not substituted by other control mechanisms, lead to a total loss of control over the impact of production and trade on the survival of species. While the purpose of this study is not to review national legislation and their effectiveness on conservation and sustainable trade within a State, it is clear that one cannot presuppose that such regulations exist everywhere.

A potential solution could be to exempt finished products containing orchids only in the case where production occurs in one State using raw materials from another – i.e. where the raw material has been at least through one border with the associated border control processes. However, this would, (a) discriminate States, (b) potentially introduce artificial (re-)exports, and (c) require that the State(s) of origin be known at the moment of producing the consumer good. As reasoned above, it is very likely that mixing occurs along the supply chain and that the information on the State(s) of origin will be difficult to maintain and transport through the chain, particularly where the source raw materials of multiple state origins are mixed at different points along the supply chain.

Since CITES is limited to international trade and has no mandate over internal/domestic trade, it also seems problematic to suggest that finished goods can be exempted only if internal trade leading up to the finished good is non-detrimental to the survival of CITES-listed species.

Supply chains that use certification, such as those stated above, which include components of traceability and are based on sustainable trade, could provide such control outside of laws and regulations. Seeking synergies between CITES Management Authorities and relevant schemes might provide an interesting alternative to requiring control of internal trade (see also section 5.5).

In any case, it is evident from the application of the traceability framework that some control over internal/domestic trade needs to be exercised. This was also true for the other studies on ornamental plants and sharks (Lehr, 2015b; Lehr, 2016b), as well as traceability systems already in place for caviar, for example.

In the case of shark products in Costa Rica, the national Institute for Fisheries and Aquaculture (INCOPECA) has the mandate to control landings of sharks. The traceability system proposed (Lehr, 2015b) and assessed (Lehr, 2016a) suggested the CITES Management Authority ensure that an export permit was only issued in cases where a clear link could be established between material to be exported and catch certificates issued by INCOPECA. Likewise, in the case of ornamental plants and particularly orchids from Latin America, the traceability system proposed in the UNCTAD study required an operating permit based on the registry of parental plants, and issued and audited by the departments of forestry, agriculture or a similar agency. It also recommended that the CITES Management Authority issue a permit or certificate only in the case where a clear link could be established between the exported plants and a registered parent plant. In both cases, agencies other than CITES Management Authorities must intervene and exercise some control over domestic trade.

For processed and re-processed goods like MAPs, the supply chain is longer and more complex, therefore providing ample opportunity for laundering of illegal material. Some (risk-based) control of local supply chains therefore seems unavoidable if the purpose is to avoid illegal material being “legalized” by a CITES certificate (see section 5.4).

As has been shown in this section, the traceability framework can be applied to the species under study in this report. The resulting traceability system is able to differentiate the materials of very different nature existing upstream and downstream in the value chain. It provides a balance between the need for close control of the natural resource, and the difficulty of transporting information along complex supply chains, such as that of MAPs.

The above described traceability system provides information for a generic traceability system, because it applies to raw materials, processed goods (in different stages of processing) and finished goods. It is based on the specificities of a MAPs chain, but could easily be adapted to other value chains. Both the traceability systems designed for shark products (Lehr, 2015b) and for ornamental plants (Lehr, 2016b) are contained as special cases in the above traceability system. Other traceability systems designed for CITES, such as the caviar system and the proposed system for python skins (Ashley, 2014), crocodile skins (Mundy & Sant, 2015) can be adapted to the traceability framework. The control mechanisms employed in the traceability system (e.g. non-removable tags, DNA tests, etc.) are part of the toolbox of the auditing agency and will be species and product dependent, while the framework will be largely identical.

5.4 Auditing the traceability system

Traceability in general is a system of claims (Lehr, 2015a) and requires verification to demonstrate implementation of the policy claim. An audit agency is the entity that protects the integrity of the policy claim. Its main role is to:

- Collect and record data on the relevant entry/exit points on the supply chain;
- Collect data on the business processes between entry and exit points; and
- Monitor and safeguard traceability by ensuring that traceable assets meet entry/exit conditions and rules are applied correctly.

In the case of MAPs, the audit agency needs to work very closely with the CITES Management Authority but clearly has to have a mandate that goes beyond that of the CITES Management Authority. In the case of the countries of the Greater Mekong subregion, Table 5.2 shows the highest identifiable administrative units under which CITES Management Authorities are located. In most cases, the CITES Management Authority is under an easily identifiable and relevant ministry or department (e.g. agriculture, environment or trade). It is therefore feasible that an audit agency may exist that controls domestic trade to the extent necessary and coordinates with the CITES Management Authority for the issuance of certificates.

As a potential aid for an audit agency to control domestic trade, it may also be worth considering establishing partnerships with organizations promoting standards and certification schemes (see sections 5.6 and 5.7). For example, the FairWild Standard in conjunction with operations committed to sustainable wild plant collection is concerned with the full traceability of goods (see section 5.7.1). Annually there is a requirement for an audit by an accredited certification body, where a compliance check is conducted on a full trace-back of the related sample batch from the collection area. This compliancy information, with agreement from the FairWild Foundation, could be used to assist an audit agency substantiate the integrity of a policy claim involving traceable assets of types (i) and (ii).

In the traceability system that has been laid in subsection 5.3 above, tracing a particular lot of finished goods to its origin is not possible. Given the complexity of the supply chain of MAPs that may be unrealistic to require. Instead the traceability system mimics Halal and similar certification schemes (see section 4.6) for the downstream flow. It may have a product flow control only for the upstream that is operating with traceable assets that are unprocessed MAPs (type (i)) and processed MAPs without mixing species (type (ii)). For example, these include when no mixing of species occurs and only simple processing like drying, extracting or distilling. It may also deal with downstream stakeholders dealing in traceable assets that are products containing MAPs (type (iii)) and finished products packaged and ready for retail (type (iv)), such as those which are further processed and value added or even finished goods.

To confirm that a particular export shipment of traceable assets for type (iii) and (iv) has been legally acquired, is not possible. The certainty of segregated traceability systems has been substituted for operational reasons by an indication of a “reasonable” supply base.

To audit such a traceability system, a number of activities seem necessary:

1. Clearly the data (in particular, annual reports) will need to be available electronically for data analysis. Data analysis is necessary to detect potential inconsistencies between declared volumes, supply sources and exported volumes. Such analysis of the annual reports could be undertaken by the CITES Scientific Authority as part of a monitoring of a NDF detailing maximum sustainable yields (MSY) or any other scientific advice that analyses sustainable trade.
2. A risk-based control system needs to be implemented that controls the traceability system at different points to counter the risk of laundering. Such risk-based methodology has been laid out earlier (Lehr, 2015b; Lehr, 2016b) and it is considered as even more essential considering the MAPs complex chain (see section 5.4).
3. Notwithstanding the use of risk management principles to streamline the control system, for any kind of significant production, the number of private operators in the chain is likely to exceed the capacity of the audit agency. It is therefore highly desirable to create strong incentives for private operators to control their own and adjacent operations (see also section 5.5).
4. An important element in the above is capacity building, in particular, raising the level of knowledge about: (i) the concept of sustainable trade; (ii) artificial propagation and – where applicable – use of plantations for commercial purposes; (iii) identification of CITES-listed wild species; (iv) set-up of sustainable supply chains; (v) private sector certification or similar schemes; and (vi) ABS requirements.⁵²

Table 5.2 Administrative units of relevant CITES authorities in Greater Mekong subregion countries

Party	Management Authority is under	Scientific Authority is under	Enforcement is under
Cambodia	Ministry of Agriculture, Forestry and Fisheries	Forestry Administration	Forestry Administration Ministry of Agriculture, Forestry and Fisheries
China	The Endangered Species Import and Export Management Office of the People's Republic of China Foreign Trade Management Department <i>For Hong Kong SAR:</i> Agriculture, Fisheries and Conservation Department	The Endangered Species Scientific Commission of the People's Republic of China	Division of Law Enforcement and Training State Customs General Administration Forest Police Bureau
Lao People's Democratic Republic	Ministry of Natural Resources and Environment	Ministry of Science and Technology	Ministry of Agriculture and Forestry
Myanmar	Ministry of Environmental Conservation and Forestry	Ministry of Forestry	Ministry of Forestry
Thailand	Department of National Parks, Wildlife and Plant Conservation Department of Agriculture	Department of National Parks, Wildlife and Plant Conservation Department of Agriculture	Department of Agriculture Royal Customs Department Royal Thai Police Department of National Parks, Wildlife and Plant Conservation
Viet Nam	Ministry of Agriculture and Rural Development	Viet Nam Academy of Sciences and Technology Ministry of Agriculture and Rural Development (MARD) Viet Nam National University	Ministry of Agriculture and Rural Development Ministry of Public Security Viet Nam General Department Ministry of Industry and Trade

Source: CITES website.

In order to implement such comprehensive tasks without unreasonably loading the resources and capacity available, the inclusion of risk management principles in the control of the above traceability system seems very important.

The principles of risk management are based on the probability that a given system is vulnerable to acts of non-compliance. The idea is to carry out stricter control where there is more risk and less where the risk is reduced, thereby making better use of existing resources. The integration of risk management principles in CITES processes has been discussed in the shark and ornamental plants studies (Lehr, 2015b; Lehr, 2016b).

While traditional control systems attempt to correct existing non-compliances, a risk-based audit system attempts to prevent future non-compliances by systemic validation based on risk criteria. For example, see the application of risk management principles in the food value chain (Box 6).

Box 6 Application of risk management principles to food inspections

Risk management principles in food inspection are well established (FAO, 2008). A number of border control agencies worldwide use risk-management principles for the effective insurance of public health with limited resources (see e.g. Abu Dhabi Food Control Authority, 2008).

For food the goal of risk-based inspection is to apply adequate inspection intervals and methods to each food product and food producing or processing facility. Different categories of food are characterized by different degrees of risk for food-borne diseases that could hurt the consumer, e.g. cereals and grain products have a risk for mycotoxins while fresh produce is more likely to contain enteric pathogens such as salmonella (FAO, 2008). The risk-based inspection method attempts to evaluate these risks by measuring the frequency of occurrence, as well as the impact on the consumers. Also, these risk estimations could be the basis for food inspection. While traditional regulations on food inspections were aiming to correct existing food safety concerns, the method of risk-based inspections of food is aiming to prevent future violations.

Since food-borne disease risk is not universal even among the same product, risk-based inspection of food takes the origin, the processing facilities and transporting facilities into consideration as risk factors. Facilities that have a history of non-compliance with food laws are more likely to increase the risk of damage to the consumer. Environmental factors may vary greatly across countries and species/products under consideration. Other factors such as packaging might also be taken into consideration.

In the case of the traceability system outlined above, risk management principles should be applied across the whole productive process to limit the amount of resource required to control its implementation. Table 5.3 collects potential risk factors mapped to the different points of the traceability framework. While each Party should consider its own risk criteria, hopefully a general list of risks can inform Parties and lead to an exchange of views and ideally enhance coordination between Parties. We have refrained from providing quantitative indications of risk regimes for each risk factor because these depend on the Party's assessment of total risk and available resources.

From the viewpoint of strictness, the above outlined traceability system has tried to balance private operators' efforts and challenges of the market with the efforts made in the conservation of species, in order to not to block sustainable trade.⁵³

In the present case, striking that balance means reducing the control over later stages of production where knowledge of raw material sources is very difficult to obtain/maintain and where mixing occurs naturally. The downside of this approach is, however, that it opens doors for laundering of MAPs that do not adhere to the principle of sustainable trade. The existence of a strong audit agency is therefore essential in making sure that this traceability system is effective.

Table 5.3 Potential risk factors mapped to different points of the traceability framework

Process	Risk categories	Risk indicators
Entry		
Import	Importer risk	Past inspection results
	Product risk	Possibility of species substitution
	Country risk	Strength of control systems of origin
In-country production	Collector/nursery risk	Past inspection results
	Illegal entry risk	Higher in areas adjacent to porous borders or along known informal trade corridors
	Product risk	Possibility of species substitution
	Impact risk	Increases with larger quantities collected or propagated
	Origin risk	Higher for wild-collected than artificially propagated
Transformation		
Unprocessed MAPs and simple processed MAP – types (i) and (ii)	Operator risk	Past inspection results
	Product risk	Possibility of species substitution
	Impact risk	Increases with larger quantities collected or propagated
	Origin risk	Higher for wild-collected than artificially propagated
	Small-scale supplier risk	Higher if larger volumes purchased from small-scale operators
Products containing MAPs and finished products – types (iii) and (iv)	Supply risk	Higher for larger numbers of suppliers
	Operator risk	Past inspection results
	Product risk	Possibility of species substitution
	Impact risk	Increases with larger quantities purchased or produced
	Exit	
	Exporter risk	Past inspection results
	Product risk	Possibility of species substitution
	Country risk	Strength of control systems of destination
	Impact risk	Increases with larger quantities exported

5.5 Costs and benefits of the application of the traceability framework

This section will attempt to examine the implementation of the above outlined traceability system in the Greater Mekong subregion, and try to lay out critical success factors. For doing so, experiences from other implemented traceability systems are analysed as well.

Attempts to implement large-scale traceability systems have repeatedly shown the importance of the buy-in of the private sector (Lehr, 2015a). In most cases where public sector agencies have attempted implementation without collaboration from the private sector, traceability systems could not be sustained and ceased to exist after a “successful” pilot. Examples include national traceability systems in Greece, Indonesia, Malaysia and Viet Nam.

On the other hand, international experience shows that system implementation has been successful in two very distinct cases:

- If the resource or its production was significantly threatened by disruption due to consumer pressure (and where the productive process can be controlled with some ease); and
- If a clear business case can be made, so that the private sector wishes to participate.

One such example is the introduction of cattle traceability systems in Europe after the bovine spongiform encephalopathy (BSE) or “mad cow” crises. Currently, every cow has a passport and its life is registered from birth (“entry”) to slaughter or death (“exit”). Trans-border traffic is possible only with the passport (Lehr, 2011; Lehr 2013a). The system was implemented “top down” and is mandatory for cattle (and has been extended to other animals). The success of implementation hinges on several factors:

- (i) Backlash of consumers against beef and the resulting need to differentiate “good” from “bad” beef;
- (ii) Fear of loss of full herd due to contamination and therefore realization of the necessity of controlling animals;
- (iii) Reasonable cost of implementation for farmers (plastic ear tags rather than radio-frequency identification (RFID) chips, and a simple data capture via PC, phone or even postcard); and
- (iv) Simple chain (from farm to slaughterhouse), which is already registered and controlled with a high possibility of detecting incompliances.

Another example is the traceability system GrapeNet implemented by the Indian Agricultural and Processed Food Products Export Development Authority. GrapeNet is a fully electronic system to control the quality and safety of grapes exported to the EU (Shukla, 2014). The system is a very comprehensive control system that controls the origin of grapes on a plot level and collects results from various quality and safety management activities. An automated workflow allows purchase only of cleared raw material. All shipments are linked to the quality and safety controls and the original raw materials. The system has been very successful for the following reasons:

- (i) Participation in the system is mandatory for export chains leading to the EU. No material can be exported to the EU that has not been recorded and quality/safety managed on GrapeNet. Unwillingness to participate leads to immediate exclusion from the profitable export chain to the EU.
- (ii) Given the comprehensive control and the resulting excellent quality, importers in the EU consider India now a prime source of raw material. Participating farmers and exporters have increased their profits significantly.
- (iii) The system clearly lays out the requirements for high quality and safe production, as well as provides a clear framework for private and public stakeholders to work with. Since all actions are recorded against individuals, the system is very robust and reduces potential corruption.

In the case of MAPs from the Greater Mekong subregion, the identification of ideally quantifiable benefits is therefore very important. If the private sector does not realize that participation is in its own best interest, it will be very difficult to control such a complex supply chain effectively.

Early in the planning stages of a traceability project, identifying benefits should be one of the key tasks to drive private sector buy-in. The private sector will want to know that the investment of their time and money into traceability will provide them with some real and tangible reward. Benefits that could be seen as core returns on private sector investment into a medicinal supply chain are:

- (i) Compliance with legislative requirements;

- (ii) Cost savings through efficiency gains in the supply chain;
- (iii) Greater visibility/transparency of the supply chain;
- (iv) Ensuring the legal purchase and knowledge of ingredient's origin;
- (v) Improved supply chain management and collaboration (national/cross border);
- (vi) Improved economic reputation and development of consumer trust;
- (vii) Ongoing economic and environmental sustainability;
- (viii) Better long-term management of scarce resources; and
- (ix) Supportive of the fight against fraud and illegal trade.

Benefits also need to be measurable. Ideally they can be measured by key performance indicators (KPIs), so that benefits can be quantified once the traceability architecture is in place. It is important to consider “soft” and “hard” benefits, including the attempt to quantify the improvement of a company’s reputation or general feel good factor with its customers.

In general benefits can be classified into three categories (Lehr & Gregersen, 2015):

- (i) Tangible benefits, i.e. those that can be measured in monetary terms. Examples of tangible benefits are product premiums, access to high(er) value markets or exclusion from market.
- (ii) Semi-tangible benefits, i.e. those which have a positive financial impact, but whose quantity is difficult or even impossible to determine. Examples can be private certification (which may also have a tangible benefit), reduction of black market transactions (that increases the market size of the legal market) or sustainable raw material source (which has a tangible benefit if it ceases to exist, but is often considered semi-tangible by business operators).
- (iii) Intangible benefits, i.e. those that cannot be expressed in monetary terms. Examples are pride, satisfaction of workers and owners or environmental or social consciousness.

Especially in the early stages of production, but also generally across the supply chain, the role of semi- and intangible benefits must not be underestimated. One of the most successful tools in implementing good practices of any sort is social pressure – which is often linked to semi-tangible and intangible benefits of “doing the right thing”.

Ideally, a traceability system can be linked to all three different types of benefits. More often, however, the tangible benefits of traceability are difficult to pinpoint since traceability is simply an enabling technology behind a purpose. Also, often the societal damage (e.g. of a trade disruption) is difficult to estimate. Additionally, in the experience of the author, private operators rarely consider trade suspension as a real risk, unless they are facing it directly.

Delivering tangible benefits (or as near to tangible as possible) is often linked to market differentiation or avoidance of market disruption. For a company to differentiate itself on the market using the above stated policy claim, it would require some form of identification of legal operators that are operating within the above described traceability system, e.g. in the form of a distinctive mark and/or a certification scheme.

CITES has so far refrained from either certifying or producing a distinctive mark of compliance. First of all, CITES is concerned with the implementation of its Convention that in turn has to be translated into local laws and regulations for its Parties. Therefore, compliance with CITES regulation is equivalent to legal operation, while non-compliance is to operate outside the law. This is a difficult proposition for a certification scheme or distinctive mark. On the other hand, launching a successful label is a major endeavour, especially in the current environment of “label fatigue”. The Marine Stewardship Council is an example of a very successful label, but it has taken years to get to this point.

One option for implementing a traceability system is to partner with existing certification schemes or labels such as those analysed in section 4.7. Seeking synergies with operationally independent efforts, could provide the necessary benefits to the supply chain if enough market pull is there to ensure uptake of the traded material by environmentally conscious purchasers. Sustainable sourcing has become a major trend for consumer goods manufacturers in the light of consumer pressure in Europe and North America. For sustainable sourcing of MAPs see (ITC, 2016).

However, such certification efforts have been met with resistance in a number of commodities worldwide (e.g. palm, soy, cotton) and their implementation is quick only in cases where a premium is offered for certified materials. This premium increases the total cost of the raw material and therefore either the profit margin of the supply chain or the end price for consumers. Consumers to date have not shown consistent

demand to pay for sustainably sourced raw materials, in particular for small quantity or unknown ingredients, as can be seen in market uptake reports on sustainable palm oil.⁵⁴ Encouraging research does indicate that knowledge of the importance of biodiversity is on the rise around the world as has been shown by the UEBT Biodiversity Barometer 2009–2016.⁵⁵ A key result of the current survey shows that 93 per cent of respondents would be more interested in buying from companies that factor in biodiversity when sourcing their raw materials. Future advancements in product biodiversity may depend on the confidence of companies in consumer responsiveness to their investment into protecting biodiversity through a willingness to pay a little extra for their products. As mentioned previously, consumers have shown a reluctance to do this.

A slightly different angle is the combination of GAP or GMP that contain traceability as a pre-requisite. Food safety and other similar standards also require traceability, such as the ISO 22000 series. Good practices generally increase production efficiency and avoid generation of waste, thereby increasing the economic bottom line of the supply chain partners. The benefit is therefore internal performance increase and the adoption of a practice that pays for itself. Some certification schemes, such the Roundtable for Sustainable Palm Oil, attempt to demonstrate that its GAP component helps farmers and especially small-scale operators to increase their yield. Solidaridad, an international NGO, reports tripling of yields in Ghana,⁵⁶ for example.

Yet another angle can be taken by providing a combination of reputational and operational benefits. The author developed for the United Nations Industrial Development Organization (UNIDO) a concept called “conduits of excellence” (see Box 7). Conduits of excellence attempts to roll out an end-to-end quality and safety management system with full traceability by providing:

- (i) Operational efficiencies and access to high(er) value market;
- (ii) Preferential treatment by relevant public authorities, e.g. preferential border treatment or easier access to finance; and
- (iii) Reputation to the participants to increase their status amidst peers and the interested public.

Point (i) provides a tangible benefit, while point (ii) might be either tangible or semi-tangible; and point (iii) is a non-tangible benefit, but no less important. Being seen as successful amongst peers is a very powerful driver for all humans, but especially so in rural areas.

This concept can be immediately applied to the current case by adding the sustainability angle to the conduits of excellence. CITES Management Authorities can grant preferential processing of certificates for members of a conduit of excellence that over a trial period has shown to be acting in full compliance with local laws (and the Convention). For traders, this has been fully or partly implemented in some countries under the name of “approved trader scheme” or similar. For example, the World Customs Organization (WCO) SAFE Framework of Standards⁵⁷ recognizes “authorized economic operators” (AEO). The speedier transit through the border provides exporters with a competitive benefit that can translate either into directly more or better business, or less inefficiencies. The Private Sector Consultative Group has listed a number of benefits of the AEO programme (PSCG, 2010).

The considerations of this section can only provide a first line of thought and an initial strengths, weaknesses, opportunities and threats (SWOT) analysis, as presented in Figure 5.2. However, the best approach to incentivize supply chains to buy into the traceability system will only be discovered when actually implementing a few alternatives. It is likely that the exact set of required benefits will not be universal, but that every Party will have to adapt a core set of benefits until the private sector finds the total package attractive enough. Capacity building will be a very important part of it (see section 5.6), as will be stakeholder consultation.

Box 7 Conduits of excellence – a concept developed for UNIDO

Conduits of excellence attempt to connect key infrastructure elements, in particular storage, and motivated and educated value chain partners with quality infrastructures in order to address quality, safety and export issues. Conduits of excellence – through stakeholders’ dedication to product quality – will unlock key markets and economic benefits, partly through access to high-value markets; partly through a reliable offering into markets that values quality.

To build a conduit of excellence, value chain partners will be brought together around a key infrastructure element. Educated farmers, motivated to employ modern farming methods and to embrace a quality approach to production, will work with forward-looking processors who wish to produce high-quality goods for local and export markets.

Farmers will commit themselves to using GAP and consistent record keeping. At the same time, processors will commit themselves to operate a comprehensive quality management system to ensure the goods actually can reach high-value markets. Only processors and exporters willing to work with their supply base to produce high-quality and safe products will be part of the conduits of Excellence. Extension service will assist with record keeping and will act as information channels back to the farm.

Conduits of excellence implement a comprehensive end-to-end quality and safety management system with upstream guarantee of raw materials and downstream guarantee of finished products. Conduits of excellence build therefore on motivated and innovative supply chains which implement an end-to-end, comprehensive quality management system with full traceability.

The idea is to create a successful role model which others can and want to copy by, (a) providing preferential treatment by public bodies; (b) reputational advantages; (c) (preferential) access to high value markets; and (d) direct financial benefits through higher prices, guaranteed market access and operational efficiencies.

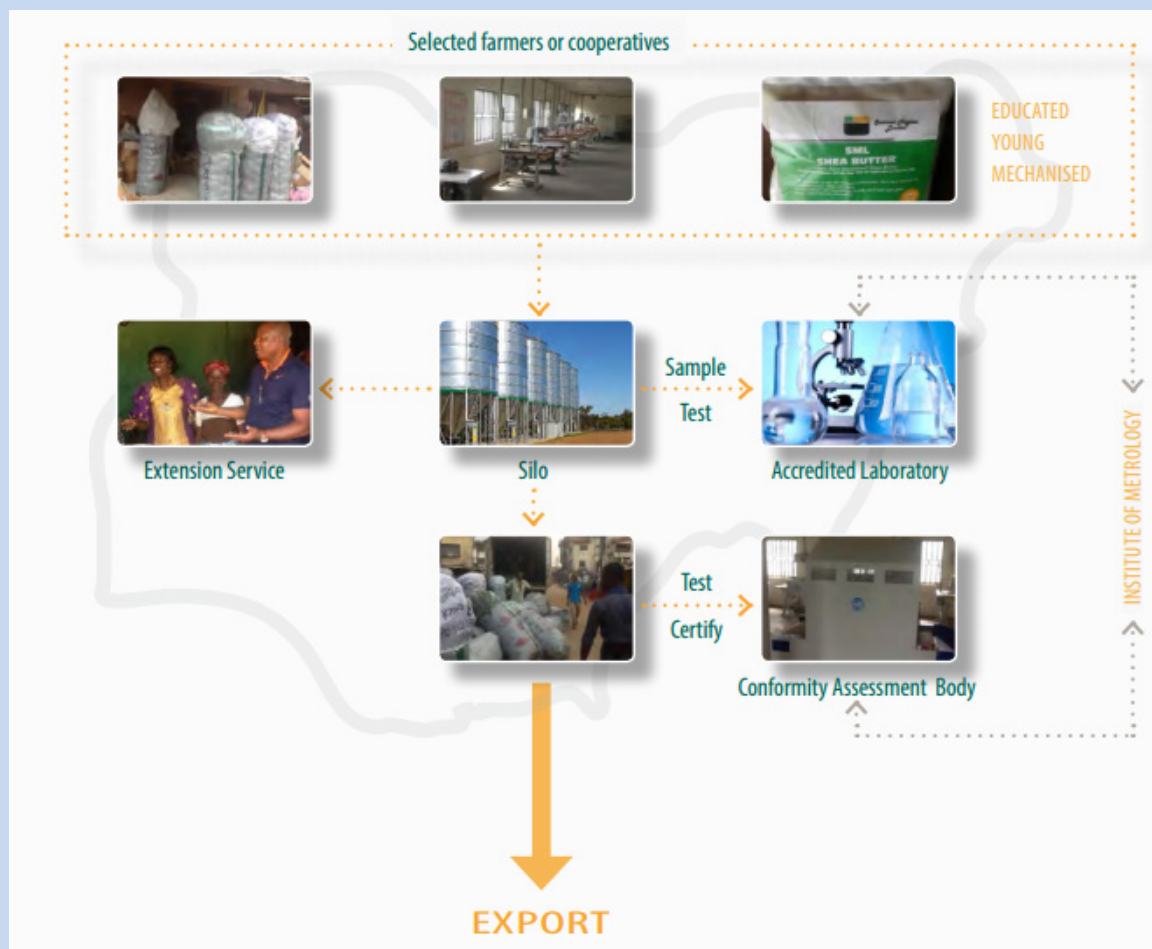
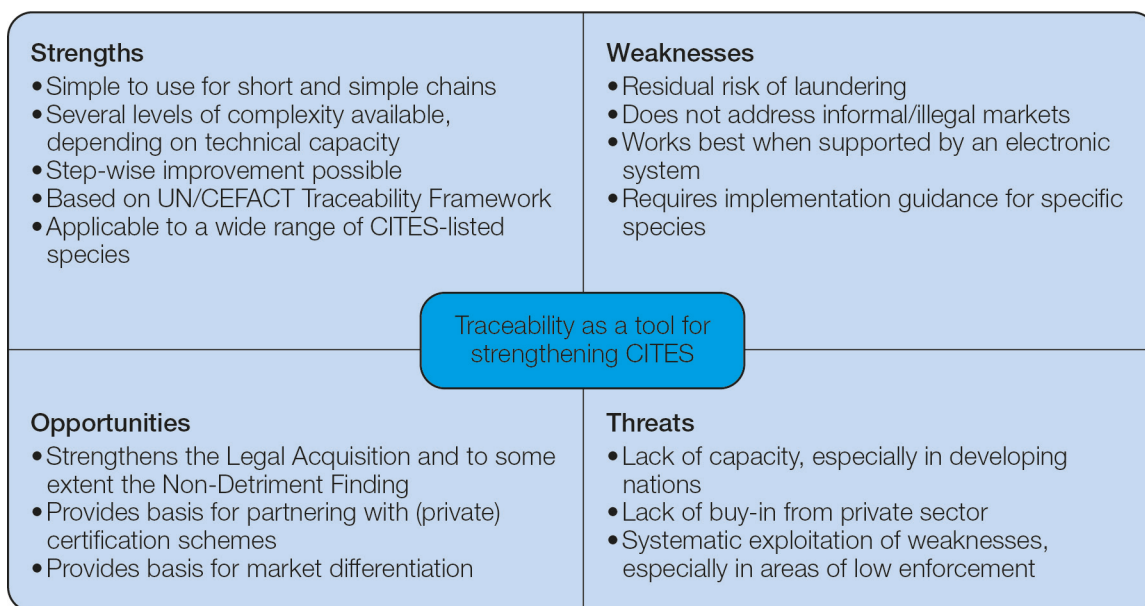


Figure 5.2 Short analysis of strengths, weaknesses, opportunities and threats



It is highly advisable, however, to work under the CITES framework and partnership jointly with other organizations such as the UNCTAD BioTrade Initiative – for piloting the traceability system and discovering a set of core benefits that the private sector will accept and that might create traction. This is also dependent on the decisions on traceability taken at CITES CoP17.

It is suggested that responsible buyers from Australia, Europe or North America be included – here consumers have stricter environmental (and social) requirements than in Asia, Africa or Latin America (with some notable exceptions). These buyers may also support the traceability effort to enhance their own market differentiation strategy and if so, potentially create a new “category” of assuredly legally sourced material.

5.6 Capacity-building requirements

Capacity-building is an important cog in a supply chain towards supporting the development of a traceability system. Key stakeholders (including small farmers and landowners, CITES Management and Scientific Authorities) along the supply chain need to have their capacity-building gaps identified so that plans can be made to improve or fix those gaps. This is also true for developing nations who lack the basic infrastructure to support the implementation of a traceability system. Various capacity-building gaps have been identified during the research for this document, particularly during the interviews conducted with stakeholders and presented as general recommendations in sections 2.4.7 and 2.5.7. The gaps identified so far are:

- Awareness of CITES listing and requirements and documentation, between and among government agencies, companies and other relevant stakeholders (producers, collectors, etc.) in the trade chains;
- Available tools and identification materials;
- Skills to support primary producing communities and develop of sustainable value chains;
- Available financing for capacity-building activities for wild collectors and collection operations (access to development services and processing equipment);
- Value addition (processing equipment), control and systems improvement;
- Awareness in industry associations of their role in supporting members to carry out their business legally, especially regarding sourcing raw materials from legal sources;
- The application of standards in medicinal plants production in a systematic way;
- Awareness in importing nations of their significant role in refusing the purchase of illegal and unsustainable agarwood;

- Training of customs officers to identify legally and illegally sourced medicinal goods; and
- Training of law enforcement officials in countries involved in the trade of medicinal goods

Other capacity-building gaps that are directly related to the functioning of a traceability system are:

- Developing project management communication skills to identify and communicate stakeholder benefits and reach private sector buy-in in traceability;
- Training in how traceability functions along a supply chain;
- Training in appropriate record keeping and product tagging (as required);
- Understanding supply chain actors in a one step up/down view;
- Clarification of legal/illegal sourcing of medicinal plants; and
- Education on supporting the implementation of sustainable development practices, for both environmental and business needs.

At a project level, the capacity-building requirements identified could be outlined in an adapted capacity-building requirements table (CART) as is demonstrated below in Table 5.4. The CART (Ohiorhenuan and Wunker, 1995) is used to show requirements under what are considered critical dimensions for a project. Each row focuses on a primary objective (in this case of a stakeholder) which can be tracked across various capacity-building dimensions. This helps to ensure that all ramifications are taken into account even if weaker gaps are not considered. In this case, each stakeholder in the supply chain is identified and reviewed against each dimension, so that the capacity gap that needs to be addressed is identified.

A project coordinator or manager can review the CART and make the appropriate project plans to ensure that the key dimensions are being addressed so that a traceability project will be implemented successfully. As has been mentioned in previous sections, traceability projects frequently fail. This is partly due to the stakeholders involved in a traceability supply chain not having the skills or resources to enable them to succeed or understand and clearly identify its benefits to support implementation. The ultimate aim should be to ensure that all identified stakeholders' capacity-building needs are addressed, reducing their risk to potentially undermine the success of the traceability project.

Table 5.4 Capacity-building requirements table

Capacity-building dimensions						
Objectives in developing a traceability architecture	Financial support	Institutional reform	Skills training	Business benefits	Personnel resourcing	Value adding
Wild collector	X		X			X
Nursery			X	X		X
Customs		X	X		X	
Transportation			X	X		
Supply chain		X				
Public authority		X	X		X	
Private business	X			X		X
Project management			X		X	
Law enforcement		X	X		X	

5.7 Recommendations

The implementation of traceability is a very detailed and often difficult process, but it can be straightforward and successful when the private sector and government have the right motivation with win-win benefits for all stakeholders involved. In other cases, implementation has proven to be lengthy and complicated, with mixed results at best. A combination of public and private sector support is absolutely essential for success, and an open and collaborative discussion between them is highly recommended, e.g. in the form of national traceability round tables (see also Lehr, 2015a).

The medicinal supply chain is complex by nature due to (a) the number of stakeholders involved; (b) the high processing degree; and (c) the fact that there is still illegal or poorly controlled wild harvesting of Appendix II-plant species for medicinal purposes.

In section 5.3, we have shown how a robust traceability system could be implemented to support CITES policy claims, traceability data collection and allow for better documented NDFs. The system is based on the UNECE traceability architecture, which is currently undergoing the process to become a UN/CEFACT recommendation. The proposed system aims to balance the need to control the legality of the raw material source and the practicalities of businesses; but even so the system is quite complex.

Therefore, the implementation of the traceability system must be approached carefully and be embedded in a more general framework of activities, such as improving trade data collection, capacity building and awareness creation of stakeholders, and information dissemination, especially to smaller players, on market prices and other relevant data.

To ensure that all stakeholders in the medicinal plant supply chain see direct benefit and advantage of participation, consideration should be given to the formation of partnerships with sustainable schemes such as those identified in this report.

The following elements will contribute to the success of such an implementation:

- Obtaining the buy-in from Parties that there is indeed a need to strengthen CITES processes through the use of traceability systems for medicinal plants.
- Carrying out a local assessment of the recommended processes with respect to technical, economic and conservational aspects, for instance by conducting a socioeconomic impact analysis.
- Confirming that the proposed traceability architecture is indeed generic enough to be adapted to different types of supply chains in different countries and regions.
- Developing a traceability toolkit (or integration into the CITES e-permitting toolkit), so that traceability is easier to implement, yet meaningful to CITES Management and Scientific Authorities.
- Provisioning capacity-building initiatives and dedicate funds, particularly for countries lacking adequate infrastructure, to implement and use traceability systems.
- Within each country, identifying a strong project management team that can work collaboratively with the public and private sectors to ensure that both of their standards and requirements are considered.
- Designing the right mix of positive and negative incentives for the private industry to participate in traceability.
- Improving the cross-border reporting of exports and imports to ensure a better understanding of the traded volumes of medicinal species for effectively managing the reporting of endangered medicinal plant resources.
- Improving identification procedures for plant species sourced, either wild collected or artificially propagated.
- Adhering to international standards and norms when available, including joint work with standard-setting organizations; proactively engage with certification and good practices schemes as shown in this report (sections 4.6, 4.7 and 5.5) to ensure benefits for the small stakeholders in the supply chain.

This report is just a starting point to identifying the right approach to developing a traceability system for CITES-listed medicinal species, and non-timber plant species in general. It needs to be complemented with a practical implementation on the ground, e.g. through a pilot project. Ideally such a pilot would be embedded in a project already looking at sustainable trade with biological resources, e.g. within the framework of BioTrade.

This pilot project should have, *inter alia*, the following criteria:

- Large and long enough to have a measurable impact.
- Parties participating in the pilot should already have a control system in place. Ideally, they would also support electronic recording of traceability records. Parties supporting the use of risk-based methodologies in control systems would be ideal.
- It should involve at least one developing country, or more, in the technical feasibility assessment. Ideally – if enough financial resources are available – this may include a country with low technological capacity to gain practical experience on how such a process can be implemented under challenging circumstances.
- A socioeconomic impact assessment should be made that compares implementation and operational cost with the likely impact on CITES-listed species.

- It should attempt to quantify the amount of illegal and unreported trade using local expert knowledge.
- It should involve a trading partner with a history of strong interest in sustainable use of biological resources to provide better motivation to business operators.

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Annex 1: Persons and institutions consulted

Organization	Country	Individual
CITES		
CITES Secretariat	Switzerland	Tom de Meulenaer Haruko Okusu Milena Sosa Schmidt Markus Pikart
CITES Management Authorities		
Department of Agriculture	Thailand	Paweena Taraksa
Department of Agriculture	Thailand	Sumalee Thongdonae
Department of Agriculture	Thailand	Duangduen Sripotar*
Division of Flora Affairs	China	Yue Zhang
Academia		
Florida International University	United States of America	Hong Liu
Private sector stakeholders		
NuHerbs Ltd	United States of America	Wilson Lau
Traditional Medicinals Ltd	United States of America	Josef Brinckmann
Klaus Duerbeck Consulting	Germany	Klaus Duerbeck
BioTrade Implementation Group (BIG)	Viet Nam	Son Ta Minh
Center for Plant Conservation	Viet Nam	Nguyễn Tiến Hiệp
Non-governmental organizations		
TRAFFIC	United Kingdom	Anastasiya Timoshyna Thomasina Oldfield James Compton Chen Hin Keong
TRAFFIC	China	Zhou Fei Zeng Zhi
TRAFFIC	Viet Nam	Thuy Nguyen
Winrock International	United States of America	Joel Jurgens
FairWild	United Kingdom	Bryony Morgan
UEBT	Netherlands	Rik Kutsh Lojenga*
Plant experts		
Kadoorie Farm and Botanic Garden	Hong Kong SAR, China	Stephan Gale
Xishuangbanna Tropical Botanic Garden Chinese Academy of China	China	Gao Jiangyun
Experts		
Marcos Regis Silva (former-CITES staff)		

*Interviewed/provided information for sections 2.4.7, 2.5.7 and 4.7.2.

Annex 2: Greater Mekong subregion CITES-listed medicinal plants

Species name	CITES Appendices listing	Distribution
<i>Aquilaria baillonii</i>	II	Cambodia
<i>Aquilaria crassna</i>	II	Cambodia, Lao People's Democratic Republic, Thailand, Viet Nam
<i>Aquilaria grandiflora</i>	II	China
<i>Aquilaria malaccensis</i>	II	Bangladesh, Bhutan, India, Indonesia, Iran (Islamic Republic of), Malaysia, Myanmar, Philippines, Singapore, Thailand
<i>Aquilaria sinensis</i>	II	China
<i>Aquilaria subintegra</i>	II	Thailand
<i>Aquilaria yunnanensis</i>	II	China
<i>Bletilla striata</i>	II	China, Democratic People's Republic of Korea, Hong Kong SAR (China), Japan, Republic of Korea
<i>Cibotium barometz</i>	II	China, Hong Kong SAR (China), India, Indonesia, Japan, Malaysia, Myanmar, Papua New Guinea, Philippines, Taiwan (Province of China), Thailand, Viet Nam
<i>Cistanche deserticola</i>	II	China, Mongolia
<i>Dendrobium candidum</i>	II	Bhutan, China, India, Myanmar, Nepal
<i>Dendrobium crumenatum</i>	II	Australia, Bangladesh, Brunei Darussalam, Cambodia, China, India, Indonesia, Malaysia, Myanmar, Philippines, Seychelles, Singapore, Sri Lanka, Taiwan (Province of China), Thailand, Viet Nam
<i>Dendrobium fimbriatum</i>	II	Bhutan, China, India, Lao People's Democratic Republic, Malaysia, Myanmar, Nepal, Thailand
<i>Dendrobium nobile</i>	II	Bhutan, China, India, Lao People's Democratic Republic, Myanmar, Nepal, Taiwan (Province of China), Thailand, Viet Nam
<i>Dendrobium officinale</i>	II	China
<i>Dioscorea deltoidea</i>	II	Afghanistan, Bhutan, Cambodia, China, India, Lao People's Democratic Republic, Nepal, Thailand, Viet Nam
<i>Euphorbia antiquorum</i>	II	India, Myanmar, Pakistan, Sri Lanka, Thailand
<i>Euphorbia atoto</i>	II	Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, Thailand
<i>Euphorbia barnhartii</i>	II	India, Thailand
<i>Euphorbia prostrata</i>	II	Angola, Argentina, Australia, Austria, Bahamas, Bangladesh, Belize, Benin, Bermuda (United Kingdom), Bolivia (Plurinational State of), Botswana, Brazil, British Indian Ocean Territory (United Kingdom), Burkina Faso, Burundi, Cabo Verde, Cameroon, Cayman Islands (United Kingdom), Congo, Cook Islands, Côte d'Ivoire, Cuba, Cyprus, Democratic Republic of the Congo, Djibouti, Dominican Republic, Ecuador, Fiji, France, French Guiana [FR], French Polynesia, Gabon, Gambia, Germany, Ghana, Greece, Guatemala, Guinea Bissau, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Iran (Islamic Republic of), Italy, Jamaica, Japan, Kiribati, Liberia, Malawi, Mexico, Mozambique, Nepal, Netherlands Antilles, Nicaragua, Nigeria, Peru, Portugal, Puerto Rico, Romania, Rwanda, Saint Helena and Dependencies (United Kingdom), Senegal, Seychelles, Sierra Leone, Spain, Suriname, Switzerland, Thailand, Togo, Trinidad and Tobago, United States of America, Venezuela (Bolivarian Republic of), Zambia, Zimbabwe
<i>Flickingeria fimbriata</i>	II	India, Indonesia, Malaysia, Philippines, Singapore, Sri Lanka, Viet Nam
<i>Gastrodia elata</i>	II	Bhutan, China, Democratic People's Republic of Korea, India, Japan, Nepal, Republic of Korea, Russian Federation, Taiwan (Province of China)
<i>Malaxis acuminata</i>	II	China, India, Indonesia
<i>Nardostachys grandiflora</i>	II	Bhutan, China, India, Nepal
<i>Panax quinquefolius</i>	II	Canada, China, United States of America
<i>Pleione bulbocodioides</i>	II	China, Lao People's Democratic Republic
<i>Pleione yunnanensis</i>	II	China, Myanmar
<i>Podophyllum hexandrum</i>	II	Afghanistan, Bhutan, China, India, Nepal, Pakistan
<i>Rauvolfia serpentina</i>	II	Bangladesh, Bhutan, China, India, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Viet Nam
<i>Taxus cuspidata</i>	II	China, Democratic People's Republic of Korea, Japan, Republic of Korea, Russian Federation
<i>Taxus fuana</i>	II	China, India, Nepal, Pakistan

Species name	CITES Appendices listing	Distribution
<i>Taxus sumatrana</i>	II	Taiwan (Province of China)
<i>Taxus wallichiana</i>	II	Afghanistan, Bhutan, China, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Viet Nam

Annex 3: Reported exports of CITES-listed medicinal plants from the Greater Mekong subregion, 2005–2014

Species	No. export records: Global	No. export records: Greater Mekong (% of global)	No. re-export records: All origin	No. re-export records: Greater Mekong origin (% of global)	Percentage export records wild taken (I,O,U,W, blank): Greater Mekong	Principal commodities: Greater Mekong	Principal exporters: Greater Mekong	Principal destinations for exports from Greater Mekong	No. specimens exported: Greater Mekong	Weight exported: Greater Mekong, (tons)
<i>Aquilaria crassna</i>	705	704 (99%)	155	147 (95%)	3%	Chips, live, powder, sawn wood	Thailand, Viet Nam	China, Indonesia, Lao PDR, Myanmar, Taiwan (Province of China)	3 547 666	1608
<i>Aquilaria malaccensis</i>	555	268 (48%)	1319	78 (6%)	25%	Chips, live, powder, timber pieces	Thailand, Viet Nam	China, Malaysia, Taiwan (Province of China)	81 829	116
<i>Aquilaria sinensis</i>	29	29 (100%)	4	4 (100%)	31%	Derivatives, stems	China	Japan, USA	0	1.5
<i>Aquilaria subintegra</i>	0	0	0	0	n/a	n/a	n/a	n/a	0	0
<i>Bletilla striata</i>	112	13 (11%)	27	10 (37%)	0%	Derivatives, live, roots	China	Netherlands, Japan, Republic of Korea	46 210	3.6
<i>Cibotium barometz</i>	32	24 (75%)	4	2 (50%)	75%	Dried plants, powder	Viet Nam	Republic of Korea	1 973 516	1018
<i>Dendrobium candidum</i>	23	1 (4%)	0	0	0%	Extract	China	USA	0	<0.1
<i>Dendrobium crumenatum</i>	69	33 (48%)	0	0	0%	Live	Thailand	Germany, Hong Kong SAR (China), USA	359	0
<i>Dendrobium fimbriatum</i>	83	51 (61%)	2	1 (50%)	0%	Live	Thailand	Japan, Taiwan (Province of China), USA	960	0
<i>Dendrobium nobile</i>	266	69 (26%)	2	0	7%	Dried plants, live, roots	China, Viet Nam	Republic of Korea, Singapore	215 626	27.2
<i>Dendrobium officinale</i>	1	1 (100%)	0	0	0%	Derivatives	China	Malaysia	0	<0.1
<i>Dioscorea deltoidea</i>	2	0	0	0	n/a	n/a	n/a	n/a	0	0
<i>Euphorbia antiquorum</i>	1	0	12	0	n/a	n/a	n/a	n/a	0	0
<i>Euphorbia barnhartii</i>	1	0	0	0	n/a	n/a	n/a	n/a	0	0
<i>Flickingeria fimbriata</i>	9	1 (11%)	0	0	0%	Live	Thailand	Ireland	5	0
<i>Gastrodia elata</i>	258	234 (91%)	45	44 (98%)	0%	Derivatives, medicine, roots	China	Republic of Korea, Thailand, USA	80 140	1193
<i>Malaxis acuminata</i>	3	0	0	0	n/a	n/a	n/a	n/a	0	0
<i>Nardostachys grandiflora</i>	44	0	4	0	n/a	n/a	n/a	n/a	0	0
<i>Pleione bulbocodioides</i>	3	1 (33%)	0	0	0%	Live	China	USA	20	0
<i>Pleione yunnanensis</i>	6	1 (17%)	0	0	0%	Live	China	USA	20	0
<i>Podophyllum hexandrum</i>	35	3 (9%)	1	0	0%	Derivatives, live	n/a	n/a	0	110
<i>Rauvolfia serpentina</i>	14	6 (43%)	41	0	100%	Roots	Thailand	Germany, Italy	0	10
<i>Taxus cuspidata</i>	29	1 (3%)	83	3 (4%)	100%		n/a	n/a	0	<0.1
<i>Taxus wallichiana</i>	36	31 (86%)	75	72 (96%)	6%	Dried plants, live, roots	Myanmar, China	China, Japan, Republic of Korea	17	531

Source: CITES Trade Database.

Note: I=Confiscated or seized specimens; O=Pre-Convention specimens; U=Source unknown; W=Specimens taken from the wild; and Blank = no entry in trade data.

Annex 4: Certification protocol for UEHT/UTZ herbal teas⁵⁸

Internal monitoring system certification approach

Version 1.2, July 2016

2.2.6 Traceability Requirements

Policy

The UEHT member must have a system in place that ensures compliance with the traceability requirements outlined in Addendum V below. Critical control points in the supply chains must be identified and monitored for this purpose. Critical control points for traceability include all organizations involved in the supply chains which manipulate the ingredients in terms of drying, cleaning, mixing, extraction, (re-)packing, or any other activity that changes the structure or form of the product. These are also subject to external audits for traceability verification.

Procedure

The UEHT member must ensure that a traceability system is in place and functioning at all levels in the supply chains. The UEHT member must advise relevant personnel (procurement, purchasing, receiving goods, etc.) to ensure that traceability requirements are met and that the required information and documentation is provided and recorded. The UEHT membership coordinator must instruct monitoring personnel to monitor the critical control points with regard to compliance with the traceability requirements.

1. Addendum V: Outline of traceability requirements

Product traceability is a critical requirement for the UEHT/UTZ Certified Herbal Tea Certification. The UEHT member must have a system in place to ensure that all ingredient(s) subject to certification can be traced from the source of origin all the way through the UEHT member to its client.

Specifically, all of the following traceability requirements apply:

- 1) The UEHT member has a documented overview of the traceability system, which describes the procedures and record keeping process and the level of traceability⁵⁹ applied.
- 2) The UEHT member formally appoints the personnel who are responsible for ensuring the sound implementation of the traceability system.
- 3) There is documented information about each of the specific supply chains, including all stages of the production and transformation process. Critical control points for ensuring traceability of the Ingredients are identified for each of the supply chains.
- 4) The UEHT member has established procedures to assess compliance with the traceability requirements at each of the critical control points.
- 5) There is a product identification system (coding system) in place for the ingredients under the certification that allows tracing the ingredients back to the producer/supplier. *If organizations at source supply products originating from both certified and not certified field operators, then the system ensures that ingredients can be traced back to the level of the field operator.*
- 6) The UEHT member keeps records of the sales/purchase documents related to the ingredients under the certification, including information of the producer/supplier, volumes, varieties, qualities, area of cultivation/collection (if relevant), date of delivery and other relevant information. The documents can be linked to the respective producer/supplier. Records are kept for at least two years.
- 7) There is a system in place that assures, verifies and monitors that:
 - All products being sold as certified are indeed sourced from producers/suppliers included in the certification.
 - Volumes of ingredients sold as certified are never higher than the volumes supplied by the producers/suppliers under the certification.

- 8) If the ingredients are processed/transformed in any way that affects the volumes, information is available on the conversion rates and volumes before and after completion of the process. This applies to any stage in the supply chain.
- 9) If the organization sources ingredients from producers not part of the certification programme, then:
 - There is a way to distinguish between (UEBT/UTZ Certified) certified and non-certified ingredients in the sales/purchase documents.
 - There is a way to ensure that certified and non-certified ingredients are kept/handled separately in all stages of the sourcing and production process.
- 10) If services are outsourced to a service provider (i.e. for processing, transportation, storage) anywhere in the supply chain, there is a system in place that ensures that the ingredients remain traceable and that mixing with non-certified ingredients does not occur. Proof of compliance with the traceability requirements by the outsourced service provider is documented.
- 11) Ingredients that are sold as certified by the UEBT member are only those sourced from the suppliers that have been approved for certification and did not have a “suspended” status due to non-conformities, breaches of contract, or other at the moment of purchase.
- 12) The UEBT member makes available to the auditor at the annual full system audit an overview of the total annual volumes of certified ingredients (per ingredient) received, still in stock and the total annual volumes (per ingredient) sold as certified. This overview is cross checked with the volumes in the UTZ good inside portal (GIP).
- 13) Additional/changes of some of the requirements above may apply depending on the claims being made with the certification.

Notes

- 1 This is of particular relevance given the desirability to integrate any traceability system with automated custom management systems, such as ASYCUDA.
- 2 For further information, see www.biotrade.org.
- 3 <https://cites.org/sites/default/files/eng/com/sc/66/E-SC66-34-01-Rev1x.pdf>.
- 4 <https://cites.org/sites/default/files/eng/com/ac/28/E-AC28-14-02-01%28Rev1%29.pdf>.
- 5 An output of the Medicinal and Aromatic Plant Resources of the World (MAPROW) database, supported by the IUCN-SSC Medicinal Plant Specialist Group.
- 6 Known as NDF Guidance, provided by CITES through Resolution Conf. 16.7, although each Party may decide how they wish to make NDFs. The German Scientific Authority, together with TRAFFIC and WWF Germany have developed a nine-step guidance for NDFs for perennial plants (Leaman DJ, Oldfield TEE (2014). *CITES Non-Detriment Findings Guidance for Perennial Plants*. BfN: Bonn, Germany (currently being revised)). These nine steps include four dealing with conservation concerns; intrinsic biological risks, conservation status and impacts of harvesting and trade. Another step identifies the management measures that may be in place to mitigate these identified risks.
- 7 <http://checklist.cites.org/#/en>.
- 8 UNEP-WCMC (2013). A guide to using the CITES Trade Database. Version 8 October 2013.
- 9 Tropicos database 2009: <http://www.tropicos.org/>.
- 10 Species information at <http://www.speciesplus.net/>.
- 11 Chengdu Tiandiwang Information Technology Company Ltd. - Information about their services was provided to the TRAFFIC office in China.
- 12 CITES Appendices I, II and III (10/03/2016).
- 13 US CITES biennial reports accessed via: <https://cites.org/eng/resources/reports/biennial.php>.
- 14 <https://apps.ams.usda.gov/integrity/> (search words “gastrodia”, “tian ma”).
- 15 <http://www.jiaherbinc.com/Content/downloads/Jiaherb-Organic-Product-List.pdf>.
- 16 Scented bricks or chips that are burned in incense burners to perfume the house and clothing.
- 17 See for example, <http://www.gq-magazine.co.uk/article/best-mens-oud-fragrances-guide>.
- 18 CITES Appendices I, II and III (10/03/2016).
- 19 <https://cites.org/eng/cop/17/prop/index.php>.
- 20 Source: CITES Trade Database.
- 21 Guidelines for the preparation and submission of CITES annual reports: <https://cites.org/eng/notif/2011/E019A.pdf>.
- 22 <https://cites.org/sites/default/files/eng/cop/17/prop/060216/E-CoP17-Prop-60.pdf>.
- 23 <https://cites.org/eng/cop/17/prop/index.php>.
- 24 Details of reservations can be found here: http://www.speciesplus.net/#/taxon_concepts/27640/legal.
- 25 Annual reports, last updated 04/05/2016 https://cites.org/sites/default/files/annual_reports.pdf.
- 26 It must be borne in mind that ABS on genetic resources is subject to a specific framework under the CBD and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization, and it is subject to the issuing of access contracts and permits depending on the national regulations.
- 27 The Plant List (2013): <http://www.theplantlist.org/>.
- 28 <http://hprc-online.org/dietary-supplements/opss/operation-supplement-safety-OPSS/opss-frequently-asked-questions-faqs-1/what-is-dendrobium-and-why-is-it-being-used-in-dietary-supplement-products/>.
- 29 <https://www.cites.org/eng/disc/text.php>.
- 30 A Single Window facility, as stated by UN/CEFACT, "enables parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfil all import, export, and transit-related regulatory requirements. If information is electronic, then individual data elements should only be submitted once. This may also provide a platform for coordinating controls among the agencies involved and payment of relevant duties, taxes and fees." (UNCTAD, 2006).
- 31 <https://cites.org/sites/default/files/eng/dec/valid16/E16-Dec.pdf>.
- 32 <https://cites.org/sites/default/files/eng/com/pc/21/E-PC21-18-05.pdf>.
- 33 <https://cites.org/sites/default/files/eng/com/pc/22/E-PC22-17-05-02.pdf>.
- 34 <https://cites.org/sites/default/files/eng/com/pc/22/E-PC22-22-01.pdf>.
- 35 <https://cites.org/sites/default/files/eng/com/pc/22/E-PC22-22-01%20Annex.pdf>.
- 36 <https://cites.org/sites/default/files/eng/cop/13/doc/E13-58.pdf>.
- 37 <https://www.iso.org/obp/ui/#iso:std:iso:9000:ed-4:v1:en>.
- 38 <http://www.intracen.org/uploadedFiles/intracenorg/Content/Redesign/Events/29%20Blue%20Number-web.pdf>.
- 39 https://c.yimcdn.com/sites/aimglobal.site-ym.com/resource/resmgr/Registration_Authority/Register-IAC-Def_012516.pdf.
- 40 The management team assigned the responsibility of overseeing the implementation of a traceability project.

- 41 This would typically include the presence of a Halal committee, adherence to rules for slaughter (if applicable), proper warehousing and logistics, etc.
- 42 http://wwf.hu/media/file/1292600582_FairWild-Standard-in-Practice.pdf.
- 43 Latest list of FairWild-certified operators available at: http://www.fairwild.org/publication-downloads/other-documents/FairWild_species_products.pdf.
- 44 Project case study: <http://www.traffic.org/cbd-files/TRAFFIC-FairWild-VietNam-Case-Study.pdf> and press release <http://www.fairwild.org/news/2015/10/15/fairwild-standard-helps-sow-the-seeds-of-sustainable-harvest.html>.
- 45 http://ethicalbiotrade.org/dl/STD01_Ethical%20BioTrade%20Standard_2012.04.11_Eng.pdf.
- 46 For more information, see Annex 4.
- 47 <https://cites.org/sites/default/files/eng/com/sc/66/E-SC66-34-01-Rev1x.pdf>.
- 48 To “track” refers to the forward the movement of a specimen in trade through specified stage(s) of the extended supply chain and to “trace” refers to the backward tracing of the history, application or location of the specimen in trade. (Definition provided by the CITES Secretariat.)
- 49 A suitable definition must be found for each Party.
- 50 <https://cites.org/eng/disc/text.php#VI>.
- 51 Assuming that the concept (and potentially the term) will be accepted for *Aquilaria* spp.
- 52 As from the 16 September 2016, with the exception of Thailand, all Greater Mekong countries have ratified the Nagoya Protocol; and Cambodia, Lao People’s Democratic Republic, Myanmar and Viet Nam are Parties to it (see: <https://absch.cbd.int/>).
- 53 According to the definition by the Belgian Development Agency, sustainable trade occurs when the commercial exchanges of goods and services generate social, economic and environmental benefits in accordance with the fundamental principles of sustainable development:
- Creation of economic value;
 - Reduction of poverty and inequality; and
 - Conservation and reuse of environmental resources.
- 54 www.rspo.org.
- 55 <http://ethicalbiotrade.org/dl/Baro-2016-web.pdf>.
- 56 <http://annualreport.solidaridadnetwork.org/2015/en/palm-oil>.
- 57 <http://tfig.unece.org/contents/wco-safe.htm>.
- 58 http://ethicalbiotrade.org/dl/Certification%20Protocol%20for%20UEBT_UTZ%20Certified%20Herbal%20Tea.pdf.
- 59 Identity preserved (IP), segregation or other.