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CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Sixty-sixth meeting of the Standing Committee
Geneva (Switzerland), 11-15 January 2016

Interpretation and implementation of the Convention

Trade control and traceability

STUDY TO ASSESS THE APPLICABILITY OF "TRACK AND TRACE" SYSTEMS FOR CITES ORNAMENTAL PLANTS WITH A FOCUS ON THE ANDEAN AND OTHER LATIN AMERICAN COUNTRIES

This document was prepared by the BioTrade Initiative of the United Nations Conference on Trade and Development (UNCTAD) and is submitted by the Secretariat in relation to agenda item 34 on *Traceability*.

DRAFT ADVANCE COPY

The applicability of traceability systems for CITES ornamental plants with a focus on the Andean and other Latin American countries - A Preliminary Assessment

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NOTE

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For further information on the UNCTAD BioTrade Initiative, please see http://www.unctad.org/biotrade or write to biotrade@unctad.org.

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1 Introduction

1.1 UNCTAD-CITES relationship

The United Nations Conference on Trade and Development (UNCTAD) and the CITES Secretariats have a long standing partnership, defined by their MoU signed in 2010, that commits both organizations to ensure the conservation of species, enhance the livelihoods of the poor in remote and marginal areas, and promote business opportunities for entrepreneurs that comply with CITES requirements and relevant national legislations. 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. This collaboration was enhanced by a second MoU signed in 2014 with a view to enhance cooperation in areas related to promoting the automation of customs control and monitoring of trade in specimens of CITES-listed species of wild fauna and flora, in particular within the UNCTAD ASYCUDA automated system.

At the 15th and 16th meetings of the Conference of the Parties (CoP) to CITES, CITES Parties recognized traceability[1] as a key issue for the sustainable management of CITES-listed species (for a list of relevant resolutions and decisions, see SC66 Doc. 34.1[2]). In response, UNCTAD and the CITES Secretariat have collaborated with technical documents and workshops on traceability issues to track the species through the supply chain, from the origin all the way to the market and final consumption by consumers.

Within non-timber plant species, CITES Parties and BioTrade partners have been implementing traceability systems, but no comprehensive study has yet been undertaken. In view of this lacuna, UNCTAD is preparing, in consultation with the CITES Secretariat and its BioTrade focal points, a comprehensive study to facilitate the tracing of sustainable trade of CITES-listed non-timber forest plant species, focusing on ornamental and medicinal plants.

The study will provide additional guidance on the use of a potential ‘umbrella model’ for developing traceability systems for CITES-listed species, for consideration by the CITES Parties. This is in line with the Secretariat’s ongoing 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 (see AC28 Doc 14.2.1[3] and SC66 Doc 34.1[2]). Such a specification would provide guidance on the use of a potential ‘umbrella model’ for developing traceability systems for CITES-listed species. The current study will provide an additional information base for CITES to consider in its work.

This UNCTAD study will be developed in two distinctive phases. As a first phase, the study will focus on ornamental plants in the Latin American region, with emphasis in the Andean region. A second study will be developed early in 2016 to assess the traceability systems of medicinal plants in the Mekong region. In consultation with relevant value chain stakeholders, the study will also assess the applicability of traceability systems that are applied to non-timber plant species (ornamental and medicinal plants) included in CITES Appendices I, II and III. The analysis, findings and recommendations of the work undertaken will be presented and discussed through interviews with key stakeholders, as well as at different stages in 2016 (the content presented will vary according to the different stages of completion of the study), as follows:

1. The ornamental plants study will be discussed with the Parties to CITES during the 66th CITES Standing Committee in January 2016;
2. The findings and recommendations of the studies on ornamental and medicinal plants will be discussed with relevant stakeholders involved in traceability systems for CITES-listed species, including government officials, relevant private business and international organisations, during a regional workshop organized by UNCTAD in consultation with CITES Secretariat and other stakeholders, in mid-2016 (location and date will be announced in due course).
3. The final study will be presented to and discussed with the Parties to CITES during the 17th meeting of the Conference of the Parties (CoP17) in Johannesburg, South Africa, in October 2016; and
4. The final study will also be shared with relevant stakeholders, including BioTrade partners, during the fourth BioTrade Congress to be held at the 13th session of the Conference of the Parties to the Convention on Biological Diversity (CBD) in December 2016.

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[1] *See Section 7.1 for a definition of traceability.*

[2] *https://cites.org/sites/default/files/eng/com/sc/66/E-SC66-34-01.pdf*

[3] *https://cites.org/sites/default/files/eng/com/ac/28/E-AC28-14-02-01 per cent28Rev1 per cent29.pdf*

This submission only refers to the preliminary assessment from the study on ornamental plants included in CITES Appendices I, II and III in the Latin American region, with emphasis on the Andean region.

1.2 Study to assess the applicability of traceability systems that are applied to ornamental plants included in CITES Appendices I, II and III

The study to assess the applicability of traceability systems that are applied to ornamental plants included in CITES Appendices I, II and III, in the Latin American Region with emphasis on the Andean region is timely, following the submission from the Management Authority of Switzerland and Liechtenstein at the 22nd meeting of the CITES Plants Committee in Tbilisi on October 2015, suggesting the exemption of finished goods packaged and ready for retail trade which contain components of Appendix-II orchids (PC22 Doc. 22.1[4]). Following this submission, a working group was established to further study potential risks and/or benefits of an exemption for orchid components, particularly with regard to wild-collected specimens (PC22 Doc. 22.1 – p. 3[4]) and the advisability of submitting a proposal to the CoP17 to amend the annotation #4 paragraph for Appendix-II orchids to include such an exemption.

Limited information is available on orchids, aside from what is available in PC22 Doc22.1[4] and in the document prepared by the IUCN (PC22 Inf.6[5]). Particularly, gaps identified referred to trade in orchid products from source to final product, identification of major industry sectors, how non-detriment findings are made, traceability along the chain, trade reporting, orchids' parts and derivatives used in products, conservation concerns for wild populations, among others (PC22 Com. 1[6]).

At CoP17, the outcomes of the Working Group's work will be reviewed.

2 Aim and scope

This study aims to contribute to the traceability work being implemented by CITES and its Parties. In particular, it provides information on the trade of CITES-listed ornamental plants originating in the Andean countries, in particular in the Plurinational State of Bolivia, Colombia, Ecuador and Peru, as well as other Latin American countries, including Argentina, Brazil, Chile, Costa Rica, Guatemala, Mexico, Panama and the Bolivarian Republic of Venezuela, which are major regional exporters.

The study focuses on ornamental plants and in particular bromeliads, cycads, euphorbias and orchids from the above listed CITES Parties. The aim is to support sustainable trade in CITES listed non-timber forest ornamental plant species through traceability.

The terms of reference of the study cover the following core activities:

- In-depth review of existing information on the supply chains for ornamental plants in the Latin American region, with emphasis in the Andean region, focusing on specimens of CITES-listed species and those being supported by BioTrade partners.
- Interviews on an on-going basis with key stakeholders from sourcing countries (governments, companies, producers, NGOs, etc.), industry members that are importing those species, as well as United Nations organizations in order to obtain detailed information on the benefits, best practices, lessons learned, challenges and requirements of traceability systems, particularly for small farmers and land-owners, and validate the findings of the study.
- Identification and review of existing traceability systems for ornamental plants, and determine those to be further analysed in the framework of the study.
- Mapping of the value chains for ornamental plants in the selected region, including the identification and role of key stakeholders involved in defining and implementing traceability systems, and the identification of livelihood benefits obtained by upstream and downstream stakeholders.
- Analysis and assessment of 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 of the species, etc.,). The selected systems will then be categorized according to criteria defined jointly with UNCTAD and the CITES Secretariat and other relevant partners.
- Assessment of the socio-economic implications (benefits, cost and practical feasibility) of the selected systems, particularly considering the needs of small farmers and land-owners, governments and

[4] *https://cites.org/sites/default/files/eng/com/pc/22/E-PC22-22-01.pdf*

[5] *https://cites.org/sites/default/files/eng/com/pc/22/Inf/E-PC22-Inf-06.pdf*

[6] *https://cites.org/sites/default/files/eng/com/pc/22/Com/E-PC22-Com-01.pdf*

industries, in order to define their capacity-building needs and a fair distribution of benefits being generated throughout the value chain.
- Practical recommendations on how a traceability system should be defined and implemented for non-timber flora species within the CITES framework. A roadmap for taking the recommendations of the study forward within CITES (and other relevant intergovernmental bodies) will also be developed.

The outcome of the study will be a report on the traceability systems for CITES-listed non-timber flora species based on international standards and norms, which includes, inter alia:
- a technical overview of traceability systems available for ornamental plants;
- recommendations on how a traceability system should be defined and implemented and on how to address the capacity-building requirements for the related small farmers and land-owners; and
- a roadmap for taking the study recommendations within CITES (and other relevant intergovernmental bodies).

3 Methodology

The study analyses significant trade of CITES-listed ornamental plants in Appendices I, II and III with the attempt to identify products derived from species that dominate the trade from the selected countries. The study considers the following ornamental plant families: Bromeliaceae, Cycadaceae, Euphorbiaceae and Orchidaceae in a relatively recent timeframe of 2010-2014. An analysis of the trade flows, in particular identifying main trade partners, trade volumes and trade value will also be undertaken, where possible.

The study also reviews existing traceability and control systems of ornamental plants under CITES Appendices I, II and III in the Andean and other Latin American countries through the CITES Management and Scientific Authorities. In addition, it reviews traceability systems used in other contexts, in particular those already being developed in the context of CITES for other species.

From the comparison, the study will recommend a traceability system for ornamental plants of CITES-listed species under Appendices II and III, taking into consideration the following:
- The varying technical capabilities of supply chain partners, in particular small-scale growers;
- The varying availability of technologies used in traceability, in particular related to automated identification and data capture (AIDC) technologies and data exchange technologies;
- The wild or artificially propagated origin of the materials as well as its applicability to derivatives;
- The robustness of the system with respect to fraudulent activities involving CITES-listed species of ornamental plants; and
- The impact on supply chain players, in order to mitigate the risk of undue barriers to trade.

The recommendations will then be assessed in light of the socio-economic impact, in particular on small-scale growers. Moreover, a roadmap will be developed to define how to address the capacity-building requirements of small-scale growers and landowners, CITES Management and Scientific Authorities, as well as industries.

4 The market chain

4.1 Introduction

The worldwide demand for floricultural products has grown significantly in recent years. Global exports of cut flowers, cut foliage, living plants and flower bulbs have grown from USD 8.5 billion in 2001 to USD 18 billion in 2010 and USD 21.5 billion in 2014[7] (UN Comtrade 2015). The relative proportion of exporting nations is shown

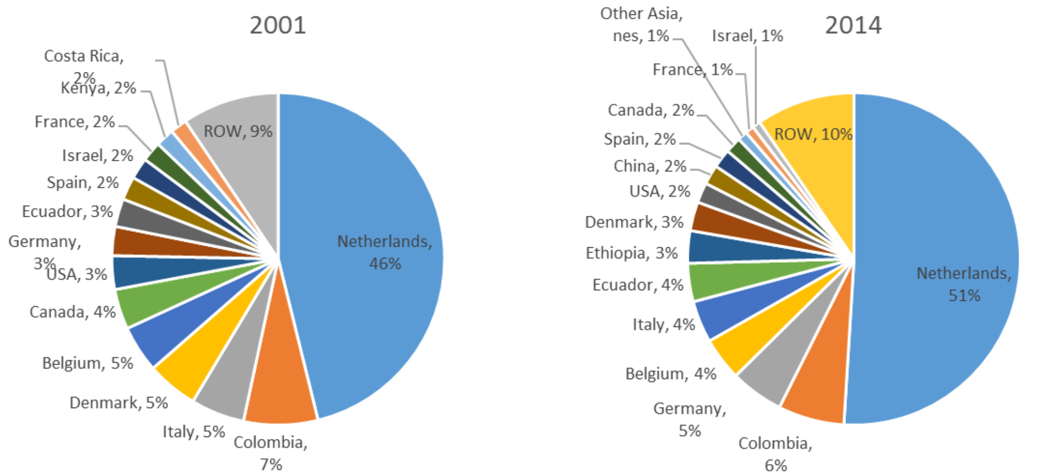

Figure 1 World export of cut flowers, cut foliage, living plants and flower bulbs, 2001 and 2014 based on value. Please note that the total market in 2014 is 2.5 times larger than in 2001. Source: UN Comtrade

in Figure 1.

Together with this strong growth of the general floricultural market, international trade of ornamental plants is also growing. Latin American and Andean countries are among the most important regions exporting CITES-listed plants species, as the region has a rich biodiversity, due to extensive rain forests and the tropical climate. For example in Colombia and Ecuador there are about 9,000 orchid species – or 30 per cent of all known species (Givnish et al. 2015; Pridgeon et al. 2014).

In the time frame of 2010-2014[8], the cumulative reported quantity of four CITES listed plant families from the countries considered in this report[9], was over 32 million specimens[10]. Figure 2 shows the relative proportion of the exported families. From a total export quantity of 32 million specimens, 26 million were cycads and 4 million were orchids (CITES 2015). In addition, during the selected time period of 2010-2014, Costa Rica and Guatemala were the only exporters of cycads as per their own report; see Figure 3. For the four Andean countries at the focus of this study, orchids are the most important exported ornamental plants.

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[7] *Values are not corrected for inflation.*

[8] *Note that the 2014 data is not fully complete, as some Parties are still to submit their annual reports for that year.*

[9] *Argentina (AR), Plurinational State of Bolivia (BO), Brazil (BR), Chile (CL), Colombia (CO), Costa Rica (CR), Ecuador (EC), Guatemala (GT), Mexico (MX), Panama (PA), Peru (PE), Bolivarian Republic of Venezuela (VE)*

[10] *When referring to "specimen" in the context of the CITES Trade Database, we refer to all those entries that have no unit. Unfortunately, it is not possible to differentiate between different trade terms such as live plants, leaves, cultures, roots, or trunks.*

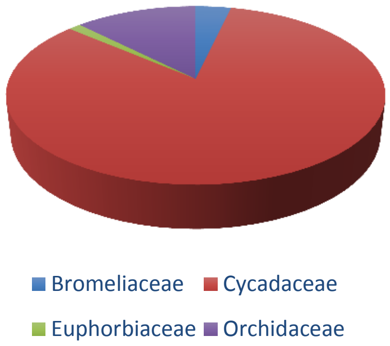

Figure 2 Bromeliaceae, Cycadaceae, Euphorbiaceae and Orchidaceae exports from selected Latin American countries between 2010-2014. Source: CITES Trade Database

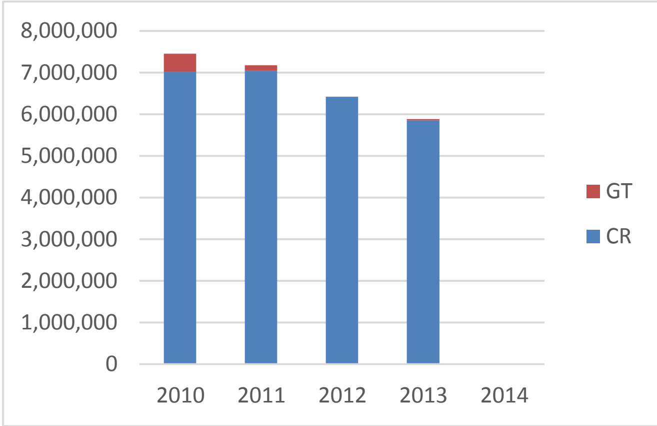

Figure 3 Exported specimens of cycads as reported by the exporter. Source: CITES Trade Database

4.2 Products

Cycads comprise two families and 343 species. They are plants that have stout, woody trunks and large, stiff evergreen leaves. Cycads can have underground trunks (similar to a tuber), and so can appear to lack a trunk. Varying greatly in shape and size (ranging from 30cm to 13m tall), they grow in various climatic zones from rainforest to semi-desert. Similar to orchids, cycads are being used in variety of products.

Cycads are traded mainly as ornamental plants, with nearly 50 million specimens being traded between 2002 and 2011 (CITES 2015). CITES records show that there has been substantial trade in leaves, especially from species of *Cycas spp*, which are used for floral arrangements. The bulk of trade is in cultivated plants from Costa Rica, the principal exporter. Of all exports together, 90 per cent belong to only one species: *Cycas revoluta*. *Cycas revoluta* is native to Japan and not to Latin America, so there is no risk of wild harvesting in the countries of this study. The remaining trade is almost exclusively *Cycas circinalis* or *C. thouarsii*, which are endemic in India and West Africa, respectively[11]. Zamiaceae, the other suborder of cycads, is also traded but the trade volume is much lower than *Cycas* (1.5% of *Cycas* trade volume) and the main exporters are Costa Rica and Guatemala.

Orchids, on the other hand, comprise the largest family of flowering plants with 25,000 to 35,000 species belonging to 600-800 genera (Givnish et al. 2015). According to the CITES Trade Database[12], orchids are widely traded for ornamental reasons; the main purpose of trade is commercial with a small portion belonging to scientific and personal purposes.

Table 1 summarizes the main traded products (both national and international) from the two main families of ornamental plants exported from the selected countries and their trade purposes.

Table 1: Products and main purposes of trade. Source: own

	Plant parts	Products	Trade purposes
Cycads	Whole plant Leaves Trunks Seeds Root Derivatives and cultures Dried plants	Ornamental plants Medicinal plants Hand crafts Food or ingredients to food products	Commercial, Scientific, Personal (i.e. private collectors)
Orchids	Whole plant Foliage	Ornamental plants Medicinal plants	Commercial, Scientific, Personal (i.e. private collectors)

[11] *When using trade data as reported by the importer, the United States of America report in 2010 import of 54,150 specimens and in 2011 of 52,739 specimens of* Cycadaceae spp *from Guatemala.*

[12] *http://trade.cites.org/*

	Cut flowers Root Dried plants Derivatives and cultures	Ingredients for personal care products Food or ingredients to food products	

For ornamental products, the three main traded products are:

- Whole plants
- Seedlings, seed pods, cultures or plant parts for propagation
- Cut flowers
- Trunks and leaves in the case of cycads

For traceability purposes, whole plants are fundamentally different from the remaining products since they are individually identifiable[13]. Traceability systems based on individually identified trade items are the most robust systems. Seedlings or plant parts are usually packaged in groups of specimens, while cut flowers must be considered as a bulk good, which are always the most difficult to trace – although certainly not impossible. Traceability of cut flowers is well known, e.g. as part of fair trade schemes (e.g. Fair Flowers Fair Plants[14]), private certification schemes (e.g. GLOBALGAP Floriculture or the MPS TraceCert[15]) or national traceability systems (e.g. the Kenyan National Produce Traceability System).

Special consideration needs to be given to the fact that (a) wild species – which in the case of orchids cannot be traded commercially - are difficult to distinguish from artificially propagated species; (b) the requirement of artificial propagation "under controlled conditions" adds further complexity because it refers to a process characteristic that is not necessarily reflected in the plant itself; and (c) plants are often traded without reproductive material and species identification is therefore very difficult even for trained botanists.

4.3 International trade

For orchids, export data shows that within the countries considered, Costa Rica is the largest exporter in the selected timeframe with 70 per cent of the total volume, followed by Brazil (20.6 per cent) and Ecuador (5.7 per cent). Figure 4 shows the cumulative volumes of exported orchids over the period of 2010-2014 as reported by exporters. The significant decrease in export of orchids in 2014 is likely due to incomplete reporting as of the

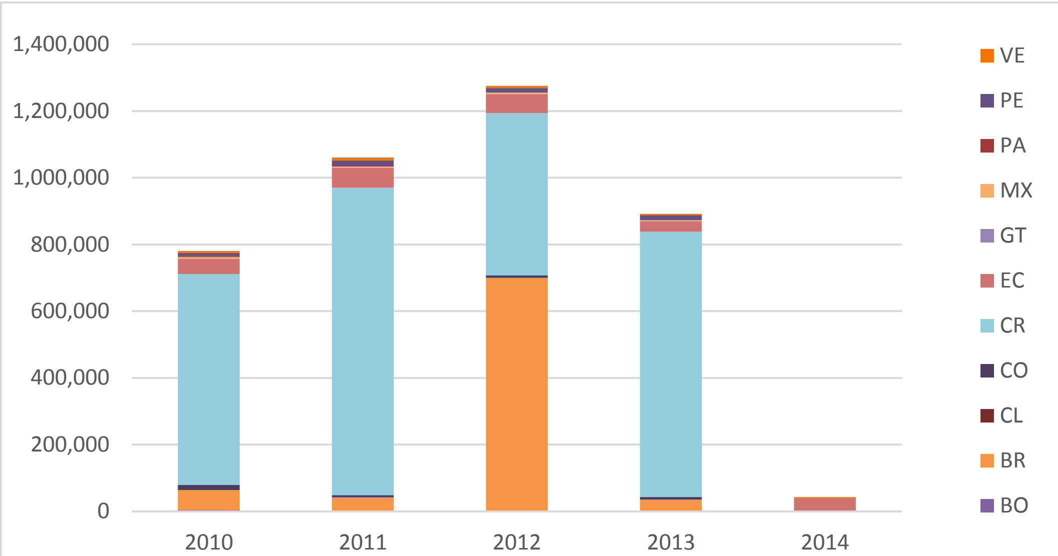

Figure 4 Quantities of exported orchids as reported by the exporter (for country abbreviations, see Table 3), source: CITES Trade Database

date of consultation (November 2015).

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[13] *Identification refers here to the ability to identify an individual specimen, not the taxonomic identification.*

[14] *http://www.fairflowersfairplants.com/home-en.aspx*

[15] *http://www.my-mps.com/en/certificates-trader/mps-florimark-tracecert-trader*

The main importers of Andean and Latin American orchids –as reported by exporters- are the United States of America followed by Japan, Germany and Canada. The main importers are shown, sorted by quantity, in Figure 5.

To study orchid markets more in depth, the authors chose to further investigate trade data with the European Union (EU28), since Europe is a main trade hub (import/export) for floriculture products and, in particular, orchids, as can be seen from Figure 1.

Figure 6 shows the exports of Harmonised System (HS) codes 06012030[16] and 06031300[17] from countries considered in this study to the European Union (EU28). Ecuador is the largest exporter to EU28 in weight (with the exception of 2011, where Guatemala was the largest exporter). Please note that the applied HS codes include other ornamental plants. Unfortunately, there are no dedicated HS codes for the ornamental plants of interest in this study.

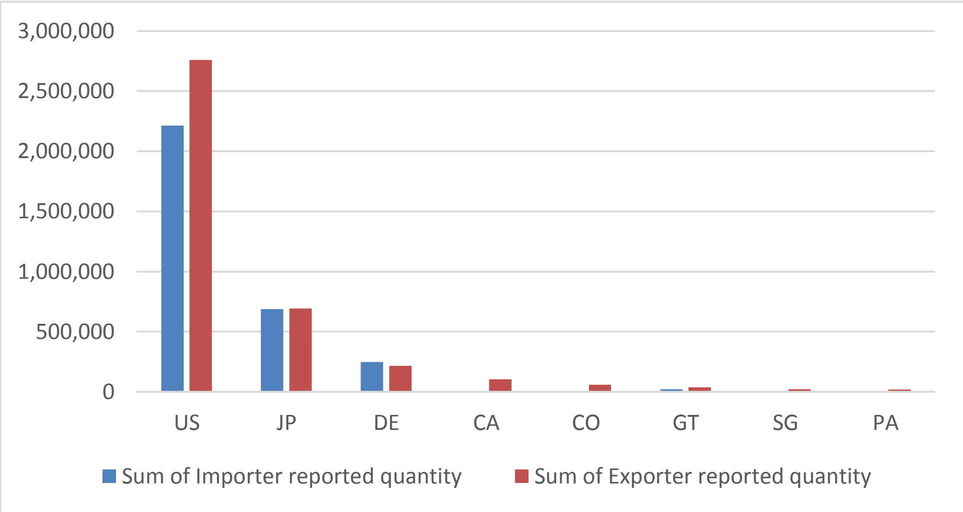
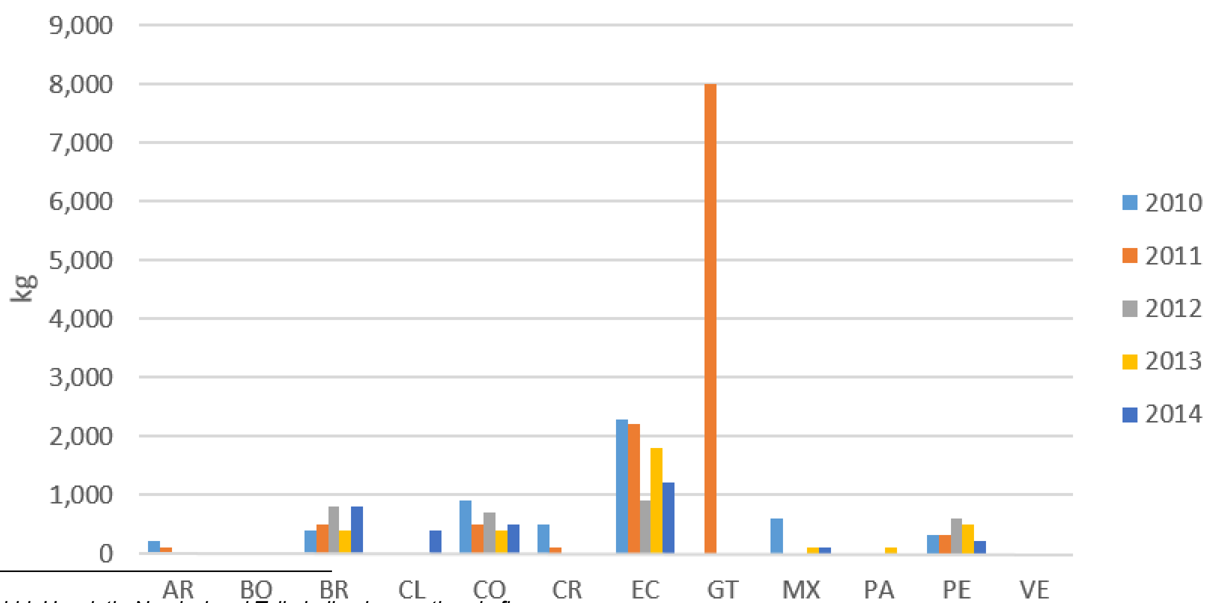


Figure 5 Cumulative trade volumes of orchids in Andean and Latin American regions, 2010-2014 (in specimens). Blue bars refer to import volumes as reported by the importer, red bars to export volumes as reported by the exporter. Countries: United States of America (US), Japan (JP), Germany (DE), Canada (CA), Colombia (CO), Guatemala (GT), Singapore (SG) and Panama (PA). Source: CITES Trade Database.

Value of exports (in EUR, for the same HS codes) from the countries considered in this study to EU28 is shown in Table 2. Ecuador shows the highest export value.



[16] *Orchid, Hyacinth, Narcissi and Tulip bulbs, in growth or in flower*

[17]*Figure 6 Exports (in kg) of ornamental plants contained in HS codes 06012030 and 06031300 from Andean and other Latin American countries to the European Union (EU28), as reported by the importers. For full country names, please refer to Table 2. Source: EUROSTAT*

Table 2 Export value in EUR of ornamental plants contained in HS codes 06012030 and 06031300 from Andean and other Latin American countries to the European Union (in EUR). Source: EUROSTAT

Exporter	2010	2011	2012	2013	2014
Argentina (AR)	3,808	1,774	0	0	0
Plurinational State of Bolivia (BO)	0	0	0	0	0
Brazil (BR)	28,475	15,655	16,270	12,442	17,746
Chile (CL)	0	0	0	0	31,132
Colombia (CO)	20,287	11,181	20,410	17,228	16,048
Costa Rica (CR)	1,275	2,487	2,862	646	0
Ecuador (EC)	92,755	17,112	130,697	118,662	101,409
Guatemala (GT)	0	14,324	0	0	0
Mexico (MX)	6,063	0	0	7,190	7,481
Panama (PA)	72	0	0	5,248	0
Peru (PE)	12,010	9,866	12,675	16,708	13,223
Bolivarian Republic of Venezuela (VE)	0	0	650	0	1,505

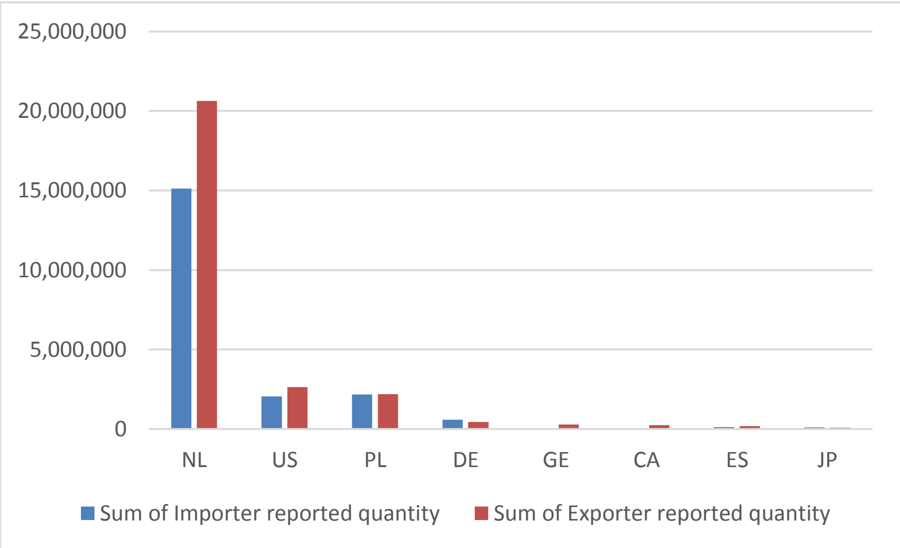


Figure 7 Cumulative trade volumes of Cycas *of Andean and Latin American origin (as reported by exporter in red, as reported by importer in blue). Countries: The Netherlands (NL), United States of America (US), Poland (PL), Germany (DE), Canada (CA), Spain (ES), Japan (JP) for 2010-2014. Source: CITES Trade Database.*

For *Cycas*, the only exporters within the chosen time period and from the selected countries of the study were Costa Rica and Guatemala (CITES 2015), as shown in Figure 3. There is substantial trade in leaves, live plants and trunks, but for live *Cycas* the description of specimen used in CITES permits and certificates are reported to be potentially misleading (Kew & CITES 2004). *Cycas*, traded as ornamental plants destined for landscaping can be of considerable size and often shipped as trunks without leaves or roots. However, they are reported as trunks, logs or timber. Similarly, trade in small plants with subterranean trunks, as well as young plants with a large proportion of root, may be reported as roots. CITES records from 2010 to 2014 show that over 20 million leaves were traded from *Cycas spp. Or C. revoluta* only (CITES 2015). The main importers of *Cycas* from this region –as reported by exporters- are The Netherlands, USA, Poland and Germany. Figure 7 shows the main importers, sorted by quantity.

4.4 Issues in market assessment

When analysing and assessing the trade data for orchids and *Cycas*, some discrepancies were observed, especially in terms of reported quantities by importers and exporters. As can be seen in Figure 5 and Figure 7, quantities reported by exporters and importers are not identical. Almost in all cases, however, the quantity reported by exporters is higher than the quantity reported by importers. In the case of orchids for the considered countries, in the timeframe of 2010-2014, 663,053 additional specimens were reported by exporters (that were not reported by importers), representing about 19.5 per cent of all trade. For *Cycas,* this difference is 6,709,745 specimens or about 33.1 per cent of all trade.

Reasons for the differences could be (i) not all export permits being used, (ii) misalignment in reporting periods, (iii) using different product classifications, (iv) data quality issues (such as incomplete reporting), (v) trade fraud, (vi) incomplete reporting and (vii) other reasons.

The issue of inconsistency in trade data is not limited to the CITES Trade Database. Reported quantities by exporters and importers for HS code 060313 (fresh orchids) in the UN Comtrade database[18] are also not identical.

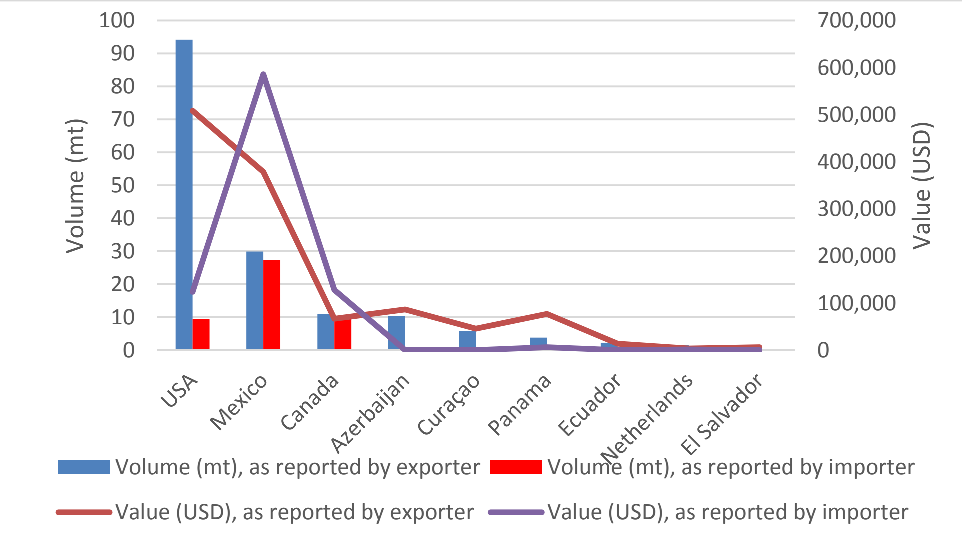


Figure 8 Volume and value reported by top importers and exporters in 2010-2014, HS code: 060313. Source: UN Comtrade database.

From the UN Comtrade statistics, USA, Mexico and Canada are the top importers from the considered countries, which is not the case when looking at the trade volumes reported by importers. Figure 8 shows the volume of trade for 2010-2014. Table 3 shows the top six destinations by value of HS code 060313 from the considered countries in dependence on whether the exporters' declarations are used as a base (left hand side) or the importers' declarations are used (right hand side). As can be appreciated, there is a very significant difference in ranking.

Table 3 On the left hand side, sum of export value 2010-2014 for the top six export destination for HS code 060313 for the countries considered in this study as reported by themselves. In comparison, sum of import value 2010-2014 of the top six importers of HS code 060313 from the countries considered as reported by the importers. Source: UN Comtrade database.

Country	Sum of trade value (USD) as reported by exporter	Country	Sum of trade value (USD) as reported by importer
USA	508,675	Mexico	586,024
Mexico	378,550	Australia	417,699
Azerbaijan	86,356	Czech Rep.	180,409
Panama	77,055	Canada	127,765
Canada	66,658	USA	124,227
Curaçao	45,880	Guatemala	91,303

Considering these inconsistencies in trade data, there could be other markets for orchids and their products which are not correctly reflected in the statistics shown above.

A well-designed and comprehensive traceability system could significantly improve such trade data, e.g. by recording the CITES certificate number at import.

[18] *http://comtrade.un.org/*

5 Examples of existing traceability systems for CITES-listed species, ornamental plants and other relevant trade goods

Recently, a study was undertaken by TRAFFIC on traceability systems in the CITES context (Mundy & Sant 2015). The study reviews efforts of CITES Parties to implement traceability for:

- Caviar,
- Crocodile skins,
- Queen conch, and
- Timber.

In addition, a study on python skins from South-East Asia has also been undertaken by UNCTAD (Ashley 2014). The content of this study is being used for discussions at the CITES Animals Committee (AC) (see for example AC27 WG4 Doc. 1[19] and AC28 Doc. 14.2.1[20]).

Caviar is similar to the trade of cut flowers since it undergoes primary but not secondary processing, has a short supply chain until export, has high unit value, and is very difficult to identify individually (but it can be when grouped, e.g. in the form of a batch identification). CITES Resolution Conf. 12.7 (Rev. CoP16) recommends labelling of caviar in primary countries with species, source (wild/harvested), country of origin, year of harvest, official registration code of the processing plant, and lot identification code.

For python skins, it was concluded that skins need to be marked in order to ensure legal, sustainable and verifiable trade (Ashley 2014). A two-tier system was suggested with the first tier coming from dried snakes' skins to the finished leather and the second tier being from manufacturing to final product. For the first tier, a low-cost, barcoded "button style" tag was put forward as identification means. For the second, RFID[21] marking was considered. However, the report suggests a thorough review before markings are made mandatory. Snake skins have the distinct advantage of being processed by relatively few internationally relevant tanneries, so that the implementation process should be relatively easy. The system is currently being piloted by the Management Authority of Switzerland in conjunction with GS1 Switzerland (see AC28 Inf. 33[22]).

Crocodile skins as well as some of the CITES-listed ornamental plants have a high unit value, which provides a margin for the use of more advanced technologies, such as unit labelling. CITES Resolution Conf. 11.12 (Rev. CoP15) recommends tagging all raw or processed skins individually with information on the country of origin, a unique serial number, species, (where appropriate) year of production or harvest. Pieces of skin that are not easily marked, such as tails, throats, feet, backstrips and other, should be traded in clearly marked transparent containers, where the marking should additionally contain the weight.

Queen Conch is caught wild as an artisanal activity involving small-scale boats. Traceability has not yet been implemented successfully. Catch Documentation Schemes (CDS) – in place for tooth fish governed by the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), bluefin tuna governed by the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) and for all fish exports to the European Union - have been proposed for consideration as potential traceability systems. Similarly, Queen Conch and ornamental plants are sometimes sold in pieces, requiring conversion factors between a legal Queen Conch and parts being used in processed products.

Timber shares with wild harvested ornamental plants its origin. However, timber differs greatly in size and processing (timber is comparatively highly processed). For timber species, CITES has not yet prescribed a traceability system, but is studying the matter together with the International Tropical Timber Organization (ITTO). Systems used for other compliance purposes (such as the Forest Law Enforcement, Governance and Trade, FLEGT, or private label certification like the Forest Stewardship Council, FSC, among others) vary between requirements, labelling systems and claims that can be made.

More specifically for orchids from the Andean and other Latin American countries, within the Perúbiodiverso (PBD) Project (SECO-GIZ) developed under the framework of the National BioTrade Programme in Peru, a pilot traceability study for greenhouses, from propagation (in vitro or otherwise) to final sales of orchids, was undertaken. The trial was conducted together with GS1, a global organisation engaging in global identity

[19] *https://cites.org/sites/default/files/eng/com/ac/27/wg/E-AC27-WG-04.pdf*.

[20] *https://cites.org/sites/default/files/eng/com/ac/28/E-AC28-14-02-01%28Rev1%29.pdf*

[21] *Radio-frequency identification, an Automated Identification and Data Capture (AIDC) technology that does not require line of sight.*

[22] *https://cites.org/sites/default/files/eng/com/ac/28/Inf/E-AC28-Inf-33%20%281%29.pdf*

products and traceability. This provided the company immediate access to GS1's suite of identifiers, such as the Global Location Number (GLN) and the Global Trade Item Number (GTIN), as well as its representation as GTIN13 as a Code 128 barcode of the type that is usually found on retail products. Whole plants were identified with a barcoded GTIN13, allowing immediate identification of: (a) the plant species (if mapped as different products), and (b) the originating greenhouse through the company code prefix. The company maintains records of entries and exits, allowing for traceability through the company.

All the above traceability systems rely on record keeping. However, such systems are inherently vulnerable to falsification, either by mislabelling or by false record keeping. Some researchers have therefore proposed what can be called Natural Feature Identification. In the case of ornamental plants, DNA barcoding might be a promising technology (Lahaye et al. 2008), although for cycads some studies report limited usefulness (Sass et al. 2007). In any case, DNA barcoding techniques continue to require substantial time and resources and are therefore not likely to be used comprehensively in export processes of ornamental plants or plant parts. However, for derivatives such as oils, extracts and essences this might be considered separately.

6 Requirements for a traceability system for ornamental plants

6.1 Introduction

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.

While the ISO definition is flexible towards different applications, e.g. different methods of “recorded identifications” such as paper records or electronic records, all traceability systems depend on Unique Identification (UI), Critical Tracking Events (CTEs) and Key Data Elements (KDEs). Thus, the key questions to be answered when establishing a traceability system are

- What to trace?
- When to record?
- What to record?

Traceability aims to establish links between business operators in the supply chain of a particular product unit and therefore requires that both the product unit and the business operator - most commonly a combination of

	SSCC (Serial Shipping Container Code)		
Application Identifier	Extension Digit	GS1 Company Prefix → ← Serial Reference	Check Digit
0 0	N_1	N_2 N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12} N_{13} N_{14} N_{15} N_{16} N_{17}	N_{18}

Figure 9 Example of a unique identification code combining business operator identification with product unit identification. Source: GS1.

the two - be identified uniquely. For an example, see Figure 9.

Without unique identification, traceability systems will not be able to supply specific information. For example, if a trader were to buy an identical raw material 123 from three suppliers (A, B, C), store that indiscriminately in the raw material storage and then produce a product 459 from it, the knowledge which supplier’s raw material was used would be lost. If, on the other hand, the supplier is identified together with the raw material, traceability back to the supplier is possible.

Since unique identification is such an important ingredient to traceability, multiple coding systems have been proposed and multiple organisations founded to supply the market with unique identifiers.

Ideally, companies employ international standards in identifying suppliers, products, trade and logistics units.

Traceability aims to identify the path of a product throughout its production process and supply chain. To achieve this goal, it is essential that every business operator records its actions and makes the information available. The principle of recording transformations says that any transformation of the product has to be recorded such that the traceability system is able to trace and track a product unit throughout the process. Examples for such transformations are mixing, processing or splitting. For example, when traders mix flowers from different origins, they have to record which origins were put into which box.

Critical Tracking Events (CTEs) define the actions that trigger data recording. Typically, there are three main categories of CTEs per entity: Reception, Processing and Dispatch, as depicted in Figure 10. A traceability system must define the Key Data Elements to be recorded at each of these CTEs as well as the degree of differentiation between the CTEs. For example, a processor of ornamental 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 covers is called its *depth* and depends on its purpose. In some cases, certain supply chain steps, such as distribution are excluded from traceability systems.

Key Data Elements (KDEs) consist of the most important information from a traceability perspective at each CTE. KDEs have to be defined such that tracking and tracing through their assigned event is possible. Furthermore, they have to include information that is necessary to achieve the purpose of the traceability system. For example, KDEs for artificially propagated ornamental plants might be the species, the propagation method, the operator and the code of the parent plant.

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

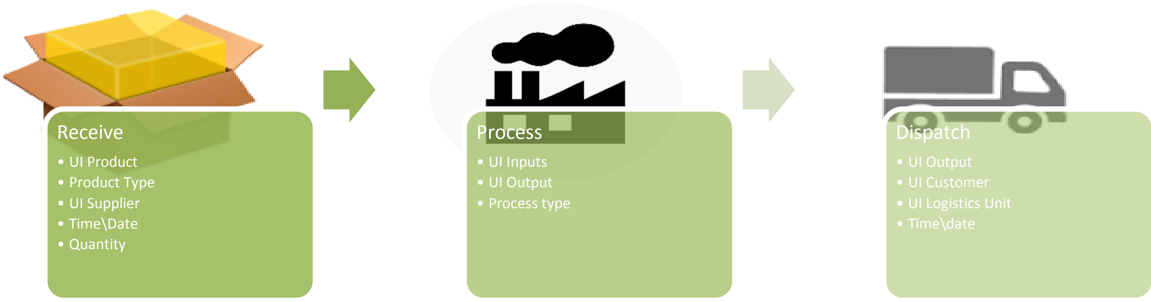


Figure 10 Typical CTEs with their most common KDEs.

6.2 <u>Criteria to be considered in a traceability system</u>

A successful traceability system for ornamental plants from the Andean and other Latin American countries will need to be built considering existing experiences, such as those mentioned above, in addition to own capabilities and national circumstances. It will also need to comply with the following criteria:

1. Strengthen CITES processes, in particular Legal Acquisition Findings and the Non-Detriment Findings, so that the Management Authorities of originating countries can better ensure compliance with laws, regulations and CITES recommendations.
2. Not represent a barrier to legal trade and, in particular, not exclude small-scale operators from legal international trade.
3. Create a documentation trail that shows the accountability of operators and can be used for enforcement of laws and regulations.
4. Limit the laundering of illegal origin material into legal supply chains.
5. Can be integrated into existing CITES permit and certificate issuance processes without compromising the resources of private operators or the CITES Management Authority.
6. Can be used for other purposes such as the fulfilment of phytosanitary and sanitary measures or control of invasive species.
7. Be consistent with international standards in traceability and other traceability systems used within CITES.
8. Be supportive of other projects to develop traceability systems for CITES-listed species; in particular, also contribute to the goal of developing a potential 'umbrella model' for traceability systems for CITES-listed species.
9. Improve the quality of data kept on exported or re-exported species for statistical purposes.

6.3 <u>Paper-based versus electronic traceability systems</u>

A particular area that requires careful discussion is the question of electronic versus paper-based traceability systems. Paper-based traceability systems are vulnerable to falsification, because it is not practical (or possible) to consult the original information source on a regular basis. Electronic traceability systems create a two-way authentication of goods by providing an electronic system independently of the product flow. Information can therefore be cross-checked; falsification requires changing the physical information (e.g. contained in a label) and the information in the electronic system. In general, therefore, electronic traceability systems tend to be safer than paper-based traceability systems. However, requiring electronic traceability systems may be considered difficult and costly for countries and a pathway into electronic systems or other is required; otherwise small-scale operators might find it too burdensome (and might resort to fully illegal trade, not controlled by any means).

Mixed paper/electronic traceability systems have been implemented (Lehr 2009; Lehr 2013). Such systems rely on the fact that information is made electronic at a suitable stage of the supply chain. Supply chain partners up to that point can operate on paper. Afterwards, the "caretakers" of the electronic system convert information collected in earlier stages to electronic records.

In cases where legal origination is the main concern, such a system can be simplified to the point where the paper-based system can be reduced to the simple use of pre-printed labels, issued with an identification number that indicates the operator, the originating country, source (wild/harvested), the species, a serial number and the year of production.

6.4 Other general considerations for a traceability system

Another area that needs to be considered carefully is the desired precision of the traceability system. Traceability systems are usually characterised by: (a) their depth, i.e. which supply chain steps are included in the system, (b) their breadth, i.e. how much data they carry at each step, and (c) their precision, i.e. how small the smallest traceable units are.

With respect to precision, three fundamentally different systems can be differentiated:

- unit identification, where each trade unit is identified uniquely and can be traced back to its origin,
- batch traceability systems, where groups of trade units produced under the same conditions are the smallest traceable unit, and
- mass balance systems, which do not identify physical goods, but attempt to identify leakages (or "laundering") by comparing the input to the output volumes (and the corresponding conversion factors).

In the above examples, the caviar system represents a batch traceability system, the crocodile and python skin systems unique identification systems, and most timber systems use mass balance at least as part of their toolbox.

In the case of ornamental plants, both unique identification of whole plants, as well as batch identification of seedlings could be considered, while cut flowers could be covered either by batch identification or by a mass balance system.

It is important that the standards and structures used for a CITES traceability solution are compatible with international trade data exchange standards, in particular with the standards recommended by the United Nations Economic Commission for Europe (UNECE) and the WCO to ensure the integration of the CITES tractability solution in the overall supply chain management. This is of particular importance if a CITES traceability solution will be used for risk management systems as the risk management system compares electronic information from different documents and sources to assess the risk of the export and import process.

UNECE, through its Centre for Trade Facilitation and electronic Business (UN/CEFACT) has already developed an international standard for track and trace of fish and meat products that meets the above requirements. UN/CEFACT has started to work with the CITES Secretariat to extend this standard for trade in CITES listed species. It is recommended to consider this standard for the development of a detailed solution for the traceability of CITES-listed ornamental plants.

6.5 Elements of a potential traceability system for ornamental plants

The traceability system that considered in this study for use by Parties to CITES links the export/import permit or certificate process to a legal origination process and combines it with a risk-based control method. Legal origination for ornamental plants refers to either the legal collection of a specimen from the wild, the legal purchase of a specimen or the legal creation of a specimen, e.g. through artificial propagation.

A legal origination process for ornamental plants could consist of the following steps:

1. All receptions of CITES-listed ornamental plants, plant parts and seeds at the nursery are recorded with
    a. Date,
    b. Supplier (Name, business registration number or similar),
    c. CITES permit information (if applicable),
    d. Species,
    e. Number of specimens, and
    f. Identification codes (see point 2).

2. Registration of parental plants, i.e. specimens collected from the wild and plants purchased for propagation at the nursery. Plants of the same species can be registered as a batch if their origin is the same (i.e. they come from the same supplier under the same CITES permit). This also applies to seeds and plants parts. Preferentially, however, whole parental plants are individually identified. All identifiers should to be globally unique and must be unique within the context of the operator.
3. The inventory of parental plans, seeds and plant parts will be registered, ideally in an electronic system

It is then recommended to record the originating plant or batch identifier(s) in the export permit or certificate application. This is graphically represented in Figure 11.

A critical aspect is that identifiers are properly attached to plants and that the identifiers are checked during an

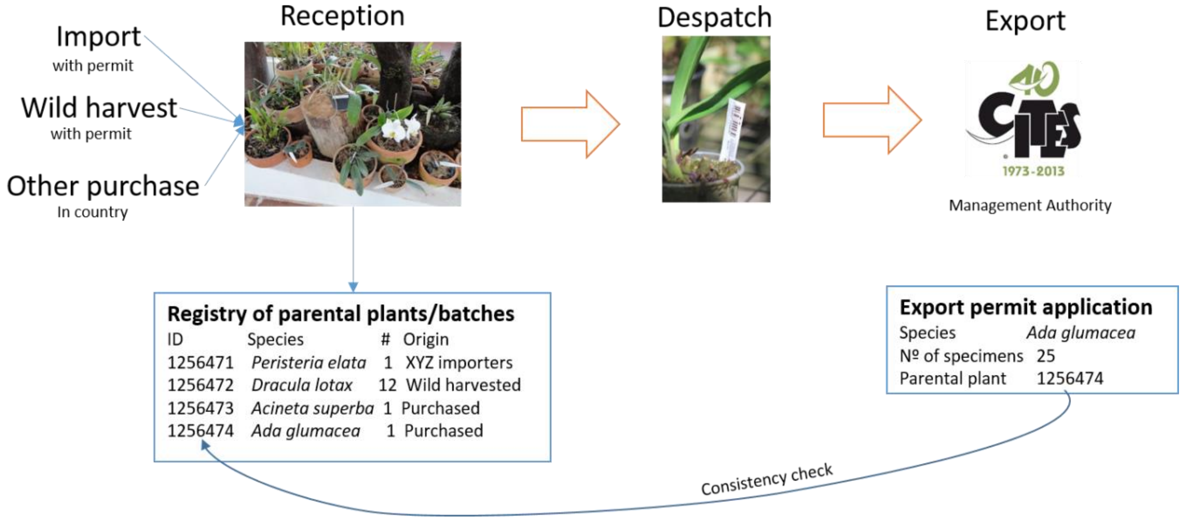


Figure 11 Strengthening CITES processes through traceability. Source: own.

annual inspection (on a sample basis).

In principle, the originating plant or batch could even be annotated in the permit itself. Taking the Standard CITES form[23], this would be possible using field 12b, for example. However, it is not clear whether traceability to the originating plant from the importing country adds any value, unless there was an externally accessible register of originating plants or batches.

Table 4 collects some of the ornamental plant products and their identification strategy for export permit applications.

Table 4 Some products and their recommended identification. Source: own.

Type of specimen to be exported	Identification
Artificially propagated from single plant or batch	Parental plant identifier or parental plant batch identifier
Artificially propagated from mixed parental plants	List of identifiers of individual plants or batches
Hybrid	List of identifiers of individual plants or batches
Plant parts or seeds	List of identifiers of individual plants or batches

In the case where an electronic register of plants is available, the identifiers used in the permit or certificate application can be verified. In addition, the following or similar checks can be made:

- Number of descendant specimens of plant or batch in total
- Number of descendant specimens of plant or batch in current year
- Parental plant identifier being used by more than one exporter
- Number of exported plants per species
- Quantity of exported plant parts and seeds

[23] *https://cites.org/sites/default/files/eng/res/12/E-Res-12-03R16-A2.pdf*

6.6 Integration with a risk-based approach to controls

In order to further strengthen the CITES processes without imposing a barrier to trade, it was recently suggested for another CITES-listed species (Lehr 2015), to couple the traceability system with a risk management system[24].

Risk management in the context of traceability for ornamental plants can be used for two purposes:

1. Control of inventory by local/regional representatives of the CITES MA, and
2. Control of the export permitting process

For inventory control, i.e. in order to strengthen what is called a "legal origination process", there is already an annual process in place in the form of an operating permit/production permit issued by the CITES MA.

The recommendation could be to combine the verification process with a risk management system and to make an electronically available record of the verification process.

Such a risk management system would provide two values, which can be used independently to some extent:

- The sample size of verification (0-100 per cent), and
- Which plants to check.

Table 5 Example risk factors determining the sample size. Source: own.

Factor	Sample size	
	Higher	**Lower**
Individual identification of plants		X
At least partly batch identification	X	
Any plants registered as wild harvested	X	
Significant amount of plants imported		X
Last control favourable		X
Issues with export permits since last control	X	
…		

From this, a sample size can be calculated (e.g. using a spreadsheet tool). This sample size will have an average according to the countries' current practice. However, in nurseries with a higher risk profile, ampler checks will be made than in nurseries that have less associated risk. Table 5 collects potential factors influencing the sample size without being exhaustive. In principle, a sample size of zero could be allocated for a particular year and nursery for a very low risk profile.

The sample size can be calculated as a percentage, keeping the proportion of plants checked in a nursery constant. It would then be applied to the total number of (parent) plants to obtain the actual number of plants to check. Alternatively, the sample size can be determined as a total number, keeping the average effort per nursery constant. The latter would proportionally check more plants for smaller nurseries than for larger ones, but would allow for easier planning by the authority undertaking the verification.

Regarding the individual plants to check, if the list of parental specimens is available electronically beforehand, a risk management approach can be taken to this, too. Potential risk factors are shown in Table 6.

Table 6 Exemplary risk factors determining which plants to check. Source: own.

Factor	Sample size	
	Higher	**Lower**
Individually identified plant		X
Batch identified plant or parts	X	
Wild harvested origin	X	
Imported origin under control of CITES		X
Imported from free trade zone	X	
Last control favourable		X
Significant number of descendants	X	

[24] A risk management system assesses risk using risk factors. The result of the risk assessment is then used to control more closely higher risk processes and less closely those with lower risk, with the aim to make controls more efficient and more effective.

Any earlier export issues with descendants of plant/batch	X	
…		

Applying these principles to a nursery inventory of parental plants, plant material and seeds would then identify individual plants or batches to check. Inspectors would be recommended to check the parental plant and its descendants.

For the permitting process, a risk-based process can be considered as an extension to the process shown in Figure 12. The above can then provide the basis for a further risk-based check, for example in the form of an alert to the border authorities to perform either a documentary check or a physical inspection. Alternatively, where CITES permits and certificate issuance is part of the issuance of a phyto-sanitary certificate (which require a physical inspection), inspectors could be alerted to additional checks to be undertaken; see Figure 12.

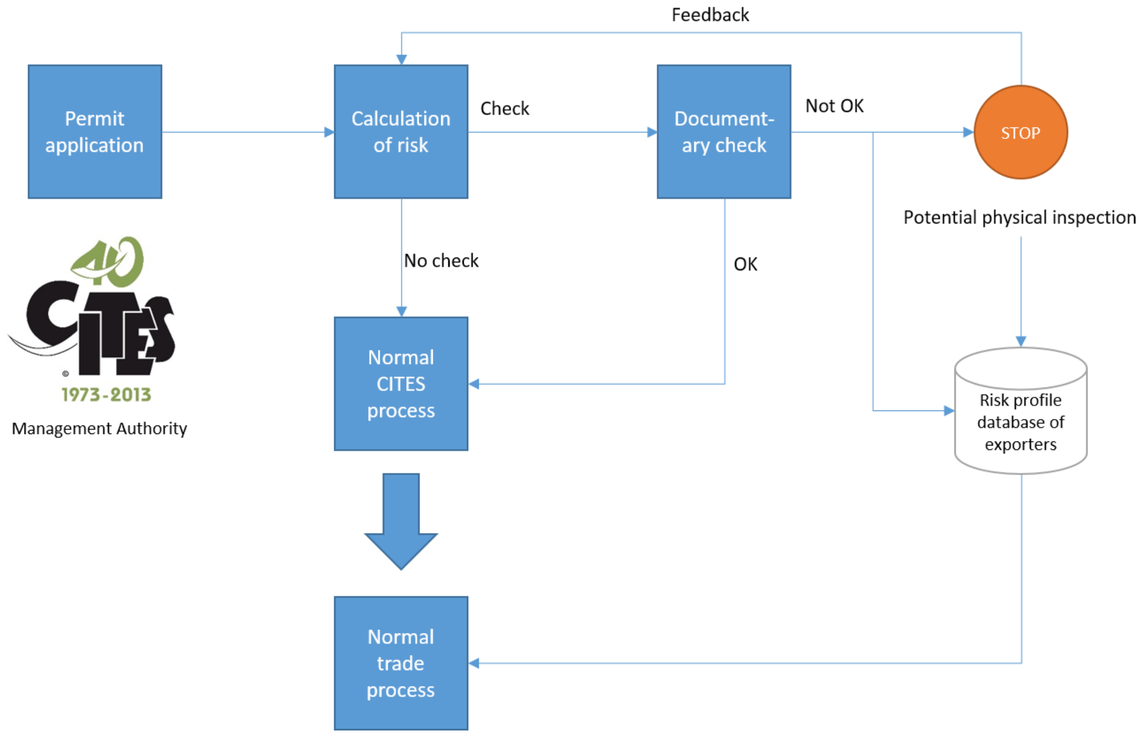


Figure 12 Risk-management based process to decide verification level. Source: own.

The CITES Management Authority could suggest to the phyto-sanitary inspectors and/or the border inspectors to perform an inspection on a certain percentage of goods with respect to CITES documentation. For a particular export process, the probability of being verified by the agents can then depend on risk factors such as the ones listed in Table 7.

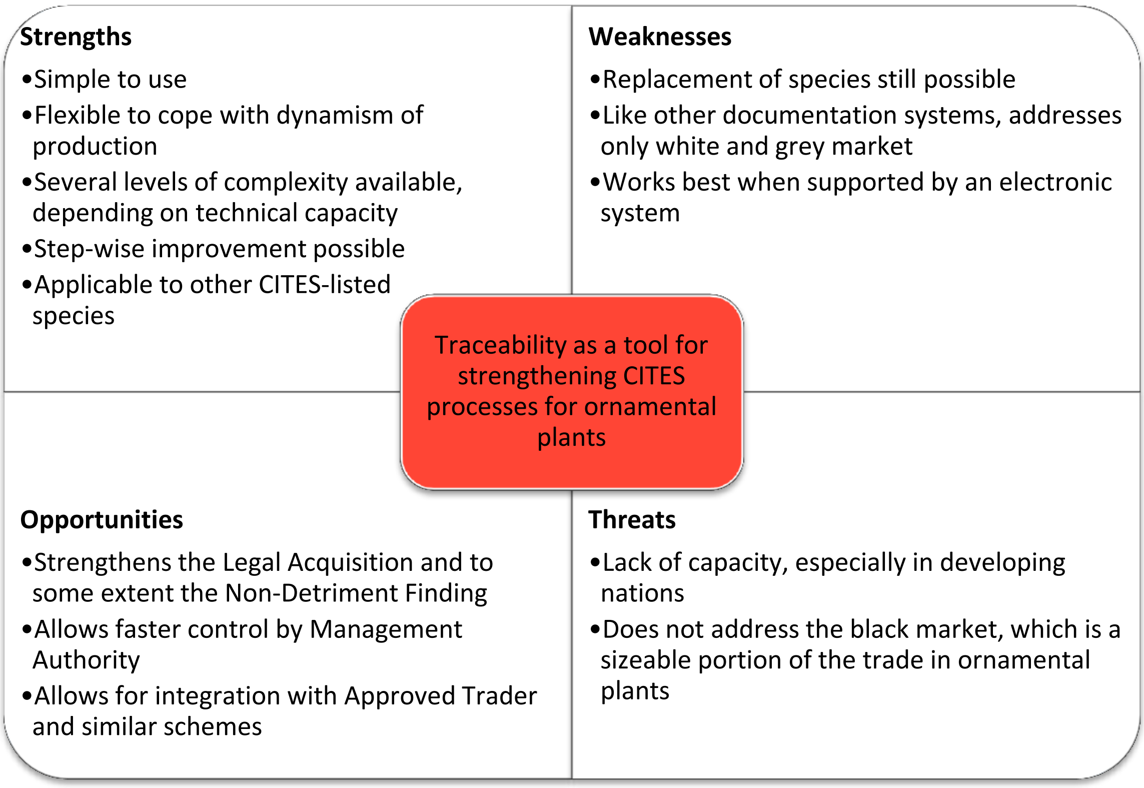
Table 7 Exemplary risk factors for export verification through a documentary check or a physical inspection. Source: own.

Factor	**Inspection**	**Documentary check**	**Control frequency**	
			Higher	**Lower**
Total number of exported plants higher than expected	Yes	Yes		
Number of plants inconsistent with inventory	Yes	Yes	X	
High number of imported plants	No	Yes		
Main exported species of exporter	No	No	X	
Any certificate issues in last 12 months	No	No	X	
Last control favourable	No	No		X
Parent plants identified individually	No	No		X
…				

Risk factors should ideally be coordinated between Parties, so that an importing Party can rely on the risk management process of an exporting Party. However, Parties might have different views on the details of the risk weighing and it would probably be necessary to account for some flexibility in this area.

7 SWOT Analysis: Strengths, Weaknesses, Opportunities and Threats

A SWOT analysis (alternatively SWOT matrix) is a structured planning method used to evaluate the strengths, weaknesses, opportunities and threats involved in a project or in a business venture (Lehr, 2015). The below matrix summarises the main benefits and challenges of the traceability system described above.



Further research, consultations and analysis is necessary and will be undertaken, in particular with respect to the details of the above system and their socio-economic impact on operators and the CITES Management/Scientific Authorities of the Andean Region and other Latin American countries.

8 Conclusions and summary of main findings

1. The floricultural trade world-wide has experienced a strong growth of 12 per cent per annum in the period of 2001-2014. The total trade in 2014 was USD 21.5 billion.
2. Of the CITES-listed ornamental plants exported from the considered countries, Cycadaceae represented 83 per cent with nearly 27 million exported specimens; Orchidaceae represented 12 per cent with 4 million specimens; Bromeliaceae represented 4 per cent with just over 1 million specimens and Euphorbiaceae represented the remaining 1 per cent with just under half a million specimens.
3. Most of the aforementioned ornamental plants are traded as whole plants or as plant parts (leaves, trunks, flowers or other parts).
4. Orchid exports from the chosen countries are also growing. Costa Rica is the largest exporter in the period of 2010-2014. Main markets are the United States, Japan and the European Union.
5. Trade of CITES-listed Cycadaceae on the contrary seems to be declining. Costa Rica is by far the most important exporter; trade from the only other trader Guatemala seems to have come to a standstill in 2013. The main markets are the European Union and the United States of America.
6. However, market assessment is made difficult by the inconsistent reporting between exporters and importers. Within the studied period of 2010-2014, exporters reported for a variety of reasons about 20 per cent more trade than importers in Orchidaceae and even 33 per cent more trade in Cycadaceae.
7. In most of the studied countries, Orchidaceae represent the largest traded family of the studied ornamental plants; traded plants are practically all artificially propagated.
8. Regarding existing control systems, the interviewed CITES Management Authorities operate a comprehensive control system based on operating licenses for nurseries, production plans and control of exported specimens. However, determining the species of exported plants is very difficult. This affects both the controls for operating licenses as well as the export control. Some examples of internal traceability systems of individual private operators have been observed.
9. Traceability can clearly contribute to the robustness of Legal Acquisition Findings, but also improve trade data and Non-Detriment Findings.
10. Recording of receptions of plant material at nurseries, creation of a database of properly identified parental plants and linking export permits to identified parental plants, can strongly strengthen the CITES permitting process. In particular, if coupled with risk management systems in the controls for an operating license and in the export process.
11. A traceability system is outlined based on the considerations under points 8-10; however, such a traceability system needs to be further assessed and consulted. Furthermore, the socio-economic impacts arising from the use of such a traceability system should be understood and integrated into a pilot project.

Further research, consultations and analysis is necessary and will be undertaken, in particular with respect to the details of the above system and their socio-economic impact on operators and the CITES Management/Scientific Authorities of the Andean Region and other Latin American countries.

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