

**Guidelines for the Development and Implementation of Management  
Plans for Wild-collected Plant Species used by Organizations  
Working with Natural Ingredients**



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## Foreword

The UNCTAD BioTrade Initiative has worked to support, facilitate and implement BioTrade activities as an incentive to the conservation and sustainable use of biodiversity. The sustainable management of natural resources is therefore one of the fundamental tenets that guides the BioTrade Initiative's activities.

Within the framework of the UNCTAD BioTrade Initiative, the value chain of natural ingredients has become one of the most advanced chains developed, when compared to other biodiversity ones. This is due, to a large extent, to the positive social impact it can have on local communities and the management of wild and cultivated natural resources, as well as the opportunities for innovation and potential markets it has to offer. Experiences from working with the value chain of natural ingredients have shown that the management of wild resources often falls short because of the limited knowledge available on a particular species, lack of tools to facilitate the design and implementation of management plans, and inadequate management of raw materials along the productive chain.

It is in this context that different actors along this value chain have collaborated to define a number of methodologies that can support producers, suppliers and purchasing companies in the implementation of good management practices for wild raw materials. This publication brings together experiences from the BioTrade Facilitation Programme (BTFP) in its development of methodologies to support a number of different actors in their implementation of the BioTrade Principles and Criteria for natural ingredients.

With this publication, UNCTAD and its BioTrade Initiative aim to contribute to the work on sustainable management of wild resources that are used for the food, cosmetics and pharmaceutical industries, and provide guidelines that can be used by a number of different actors involved in the promotion and implementation of BioTrade activities, in both the public and private sectors.

## Introduction

BioTrade comprises all activities of collection, production, transformation and commercialization of goods and services derived from native biodiversity (genetic resources, species and ecosystems), which implement practices of conservation and sustainable use, using criteria of environmental, social and economic sustainability. These sustainability policies are represented by the BioTrade Principles and Criteria that constitute a guide for initiatives and organizations in the implementation of BioTrade activities (UNCTAD, 2007).

The need to develop tools to guide value chain actors in the implementation of BioTrade Principles and Criteria was identified through supporting activities to organizations and value chains developed by BioTrade national programmes and UNCTAD, through its BioTrade Facilitation Programme (BTFP).

In the case of BTFP, specific product groups have been identified and are currently promoted in international markets, most of which are derived from wild raw materials. The experiences of these companies in implementing quality assurance programmes have exposed existing difficulties in the management of this kind of species, as well as the need to rely on practical tools to facilitate their commercialization in line with international market requirements and national regulations. Some of the problems identified are: obtaining collection permits, instability in the provision of raw materials, traceability, and lack of knowledge on the management systems required and the loss of quality of raw materials from the time it is collected until it reaches the final consumer.

In light of issues, and based on the work of the BioTrade Initiative and BioTrade national programmes, it became clear that there was a need to define a methodology for species' management. These guidelines have therefore been developed with this objective: to guide BioTrade actors in the processes of elaboration and implementation of plans so they can effectively manage species derived from wild sources.

The principles behind this proposal for a methodology are to:

- (a) Guide compliance with the BioTrade Principles and Criteria;
- (b) Propose and ensure the implementation of methods to promote adaptive management approaches along value chains that use wild species;
- (c) Support compliance with national legislation and the implementation of good agricultural practices defined by the World Health Organization (WHO);
- (d) Use a participatory approach that facilitates information exchange among collectors, intermediaries and companies;
- (e) Fulfill the minimum requirements of conservation and sustainable use (based on international standards and national regulations);
- (f) Enable implementation at various levels (large and small companies and communities); and
- (g) Complement quality standards required along the supply chain (in line with existing guidelines to implement good collection practices).

This proposal has been made possible thanks to the participation of BioTrade national programmes, national environmental authorities, non-governmental organizations (NGO) and companies from the natural ingredients sector.

This document provides a series of general guidelines to develop management plans for wild species, which are *documents to manage* the natural resources used by BioTrade organizations. UNCTAD's interest is to ensure that the contents of this publication correspond to the fulfillment of BioTrade

Principles and Criteria, and that it provides special support for the implementation of principle 2 on the sustainable use of biodiversity. For this reason, particular emphasis has been placed on organizations (e.g. communities, associations and companies) that are interested in implementing the BioTrade Principles and Criteria.

### **Defining the methodology**

These guidelines are based on experiences from natural ingredients companies at the national level in implementing management plans and good agricultural practices. A preliminary proposal for a methodology was elaborated with the objective of developing management plans for wild species. In addition to these experiences, the proposal uses WHO Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants (box 1), and relevant inputs taken from a wide literature survey (see Bibliography). The methodology proposed uses the following five steps:

- (a) Identification of collection areas and collectors;
- (b) Assessment of managed resources;
- (c) Definition of good practices to be implemented;
- (d) Definition of follow-up and monitoring systems; and
- (e) Implementation of documentation systems.

Case studies were compiled with companies producing natural ingredients in Colombia, Ecuador and Peru, which were supported in elaborating management plans. Results were presented and discussed in a technical workshop entitled “Experiences in elaborating management plans for wild medicinal plants”, held in Ecuador in May 2006.

#### **Box 1. General specifications based on WHO Guidelines on Good Collection Practices for Medicinal Plants<sup>1</sup>**

##### **Collection permit**

- (a) Where necessary, a permit for collection should be acquired as well as other documentation from the relevant authorities and owners of the land.

##### **Technical planning**

- (a) The medicinal plant’s geographical distribution and its population density should be identified;
- (b) Essential information on the species should be compiled;
- (c) Research should be carried out on morphology and variability with the purpose of creating a “pattern of research” for the species;
- (d) Transport for personnel and raw material should be available;
- (e) Collection should be done by those who have the technical training; and
- (f) The social impact of activities should be evaluated.

##### **Selection of medicinal plants for collection**

- (a) Species should be the same as those specified in the national (or other relevant) pharmacopeia; and
- (b) Collectors should prepare botanical specimens.

<sup>1</sup> This is a brief summary of specifications provided by WHO Guidelines on Good Agricultural and Collection Practices for Medicinal Plants. More detailed information can be found in these guidelines, as well as more general aspects of management and quality control that can be applicable to collected and cultivated species.

**Collection**

- (a) The collection of scarce or rare species should be avoided – good practices should make reference to the quantities collected, plants used and seasons of collection;
- (b) Ecological systems of collection, rather than destructive systems that vary considerably from one species to another should be applied;
- (c) Medicinal plants should not be collected in or near zones where activities involving pesticides or polluting substances are being carried out;
- (d) Unnecessary parts of the plant should be removed during collection;
- (e) Raw materials should not have contact with the ground – where subterranean plant parts are used, the clinging soil should be removed;
- (f) Plants can undergo a suitable preliminary cleaning process during which they should be protected from animals (e.g. insects, rodents, pests and domesticated animals);
- (g) The species should be collected separately and transported independently; and
- (h) Tools for collection should be kept clean and stored in a suitable place.

**Personnel**

- (a) Personnel in charge should have received technical training;
- (b) Local experts should work together with collectors and members of the communities *in situ*; and
- (c) The collection team should take measures to guarantee the well-being and security of workers during each stage, from the collection of the raw material to its commercialization.

Based on the case studies mentioned above, tools to elaborate and implement management plans for species derived from wild sources are proposed and adapted to companies working with natural ingredients. These tools are a basis for the proposal of sustainable management of wild collected plant species at national or international levels. These guidelines are general in their scope; nevertheless, tools must be adapted according to the managed species and the areas exploited.

Discussions with national authorities in beneficiary countries concluded that the proposal should provide guidance to companies, but that this should not imply that all the suggested activities are to be added as a requirement in the regulatory national frameworks. Specifically, steps 1, 2 and 3 of this proposal contain the information required to facilitate environmental authorities' procedures for monitoring and control at the national level. Steps 4 and 5 are activities that the company can engage in to obtain the required information for monitoring and traceability, so as to continuously improve on the practices defined in steps 1, 2 and 3.

**Implementation of the BioTrade Principles and Criteria**

This document provides specific support towards compliance of principles 1 and 2 on biodiversity conservation and sustainable use. This proposal for a methodology aims to guide organizations that are interested in complying with the BioTrade Principles and Criteria and the verification framework for natural ingredients (Union for Ethical BioTrade (UEBT), 2007).

The proposal gives guidance in the development of a “management document” that includes an extraction rate lower than the species' regeneration capacity, monitoring systems and productivity indexes according to criterion 2.1 of the BioTrade Principles and the verification framework of natural ingredients. In the same way, it promotes the definition of good practices that ensure the conservation of the species and ecosystem, as laid out in principle 1 of BioTrade. However, it includes other considerations that support

the implementation of other environmental, social and economic criteria (UNCTAD/BioTrade, 2007; UNCTAD 2007).

As the proposed steps aim to facilitate the companies' work on managing wild resources, it is recommended that company staff (i.e. biologists, agronomists and engineers) take charge of the implementation of these steps.

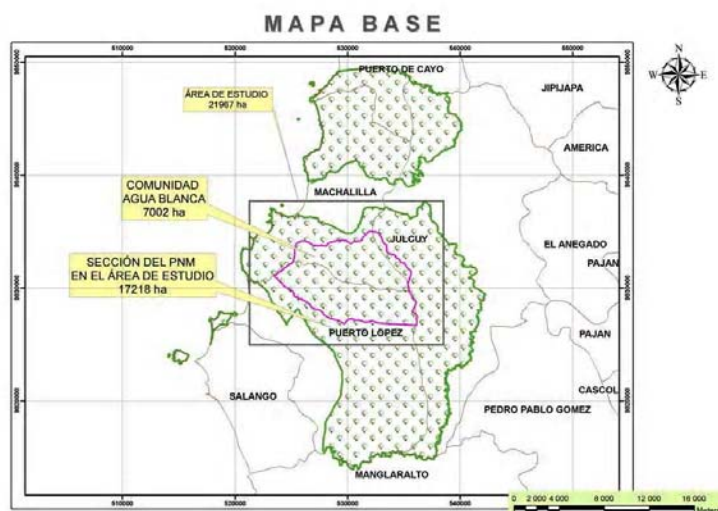
### **Structure of the guidelines**

The following chapters describe each of the steps comprised in this methodology. The first provides guidance in how to identify and describe a collection area. The second identifies what should be included in a resource assessment and gives guidance in gathering the required information. The third provides help in defining good collection practices based on information from steps 1 and 2. The fourth contains guidelines to define follow-up and monitoring systems. Finally, the fifth provides guidance in defining and implementing documentation systems to ensure product traceability.

Boxes that highlight relevant aspects have been included in each chapter. These boxes are based on the field experience and suggestions of participants at the workshop held in May 2006.

To complement these chapters, content guides have been provided in the annexes. These define standard operating procedures and registers that can be adapted according to the needs of companies and organizations that use these tools.

## 1. Identification of collection areas and collectors



*The identification of collection areas begins with the definition of areas from which the resources are being extracted and their relevant information.*

To begin drawing up a management strategy for wild raw materials, companies need to identify their providers and collectors, as well as the areas from which each commercialized species is collected.

*Companies should take the lead in identifying collection areas, in close cooperation with their providers. This is essential to planning the species' management and the commercialization of derived products.*

The identification of collection areas begins with the definition of areas from which the resources are being extracted and the relevant information on these areas. Some examples of relevant information on collection areas are (see Bibliography<sup>2</sup>):

- (a) Geographical location (maps of collection areas and geo-referencing), access to collection and climatic characteristics;
- (b) Administrative units that could influence productive aspects of transformation and commercialization;
- (c) Ecosystems involved and dominant vegetation;
- (d) Identification of existing landscape matrixes and life zones;
- (e) Status of conservation and vulnerability of ecosystems;
- (f) Rights of tenure, access and use of collection areas; and
- (g) Existing ordinance maps, management plans, etc., that include the collection areas.

Box 2 provides a list of the minimum information required – gained from field experiences and discussions with authorities and companies.

<sup>2</sup> Examples are taken from sources cited for each point. For more detailed information, please refer to the documents listed in the Bibliography.

**Box 2. Minimum information required to define a collection area**

- (a) Name of the land owner;
- (b) Property name;
- (c) Location;
- (d) Size of the collection area;
- (e) Altitude and temperature;
- (f) Precipitation;
- (g) Topography;
- (h) Description of habitat;
- (i) Land tenure regime; and
- (j) Scaled map of the area according to the extent of the property.

Annex I provides a guide for organizations to document the correct information on collection areas, identification and a census of providers, including the confirmation of the species' botanical identification.

**Box 3. Identification of collectors and collection areas in the case of *Pipper carpunya* in Chiriboga, Pichincha, Ecuador**

- (a) Talking maps and interviews with local groups and field visits; and
- (b) Use of cartographic information and the geo-referencing of areas.

## 2. Assessment of managed resources



*The assessment starts with research on biological and ecological information relevant to the species and other specific data found in the collection areas or similar/nearby areas. The assessment always takes into consideration the possible changes required due to the particular characteristics of each area.*

The resource assessment consists of gathering information on variables related to the biology and ecology of the species that affect, in one way or another, the productivity of the species in the wild, either at ecosystem or population levels.

*The resource assessment is the basis for the definition and justification of suitable harvest rates and good practices to implement and assure the management sustainability, and reduce the impacts of production activity. This is the basis for the implementation of an adaptive management approach.*

Information required for the assessment could be taken from:

- (a) Existing studies on the biology and ecology of the species;
- (b) Collectors' experiences;
- (c) Research carried out in the field; and
- (d) Use of methodologies for ecological modeling implemented on a regional or local scale.

In order to acquire the relevant information for the assessment, the possibility of using participatory methodologies that facilitate information exchange among collector, intermediaries, buyers and authorities should be considered. By discussing information held by each of these actors in relation to species management, platforms can be established that contribute to the joint development of the management plan proposal.

*The assessment process identifies existing information from scientific studies or traditional knowledge. This allows for the identification of information gaps. Work assumptions are then defined and monitoring procedures are designed to fill them.*

Below are important issues that should be included in the elaboration of the assessment:

**Legal issues:** Before making a decision regarding resource management, an analysis of applicable legislation and the possible restrictions that apply to species management is required. This includes, for instance, management plans that control the managed areas, requirements for management permits and licenses to commercialize the species. It is important to highlight that the organization that uses the resource should be aware of the applicable legislation and requirements from the beginning. It is therefore recommended that the management plan provide the information required by environmental authorities.

**Analysis of existing information and gaps:** The assessment begins with the research of relevant biological and ecological information on the species, and other relevant data in the collection areas or similar/nearby areas; possible changes are always taken into consideration due to the specificity of an area. Further data is generated based on this research that can support the decision-making processes and identify information gaps. Depending on the case, this data should be completed with a short biological

study<sup>3</sup> or by implementing a follow-up system (see step 3). The information below is highly relevant to making these decisions:

- (a) Density/abundance (number of individuals per area unit);
- (b) Distribution (for example, the individuals can be grouped or dispersed in an area);
- (c) Reproduction strategies: seed dispersal (by animal, wind or water), growth strategies (fast or slow growth), pollination (for example, animal-dependent or special pollination mechanisms), seasonality (seasonal or perennial plants), reproduction (sexual or vegetative);
- (d) Demography (ratio of young and adult, male and female); and
- (e) Growth rates (average growth of individuals per year).

**Inventory of the managed population:** The number of individuals in the collection areas must be calculated so the amounts of raw materials that are available for management can be established. This information is based on both population density data and the approximate density of the resource to be managed (e.g. quantities of leaves, fruits, stems and complete individuals per area unit). Depending on the size of a collection area, the company could work on a total census of individuals, use estimates based on the sampling of defined areas (e.g. 0.1 ha, 1 ha) or use geographical simulation tools (for bigger areas that would need a regional approach).

**Definition of extraction quotas or harvest rates:** Taking into account the approximate density data of the managed resource, a planned quantity per area per unit of time can be defined – for example, kg/ha per month or ton/ha per year – corresponding to the resource harvest rate. The definition of this rate depends on the resource's regeneration capacity, which will assure its sustainability and extraction year after year. The same amounts of raw materials can therefore be extracted annually; these amounts can even be increased when the regeneration of managed resources are over and above the minimum rates of growth.

The extraction rate could be based on a chosen percentage of the whole resource. This percentage would then be monitored to make sure that the population is able to regenerate up to 100 per cent of the managed resource. For this to happen, the extraction rate must be lower than the regeneration rate of the resource. *This process is important to justify the harvest rate, based on existing literature, and inventory and population studies.* For example, one community fixed its harvest rate at 60 per cent for fruits that are harvested seasonally; the remaining 40 per cent of the resource was left for seed germination and the growth of new individuals, so as to conserve the habitat of wild animal populations and maintain the characteristics of the managed population. On the other hand, a 100 per cent harvest rate could cause changes in these animal populations, and the ratio of young and adult individuals of the population could be affected in future. It is therefore important to monitor the established rate (in this case, 60 per cent), to ensure that the future availability of raw materials and resources for dependent animals is not affected.

It is important to bear in mind that harvest rates depend very much on the part of the managed plant being used and how abundant the resource actually is. Where populations are in abundance, an estimated harvest rate can be defined based on a percentage of the total density per unit of time (i.e. year, month, day and season). Once this rate has been established, a monitoring system should be used to assess the impact of the defined rate and make appropriate changes over the course of time.

When resources are scarce<sup>4</sup>, it is advisable to set lower harvest rates and, where possible, increase the size of the managed area to assure sustainable harvesting in the long term. In such cases, it is recommended

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<sup>3</sup> It refers to a population study, between 2 and 6 months, which would allow the gathering of relevant information to define good collection practices and an estimate of the harvest rate that could be monitored in a longer period.

<sup>4</sup> The abundance of the resource can be estimated by primarily using the inventory. However, secondary sources of information or knowledge gleaned from those working with the resource could provide inputs. The concept of abundance or scarcity can vary from one species to another; nevertheless, in this case, only resources that have few individuals and a low production rate per

that detailed studies be carried out on the species<sup>5</sup> so that appropriate decisions can be made based on this information.

**Relevant social issues affecting resource management:** The basic social conditions of local communities managing a species need to be identified, as well as traditional practices employed and whether these have an effect on wild collection. Such practices can either enhance or threaten the conservation of natural populations. The most important social aspects of these communities should therefore be understood in order to establish proper policies to contract or enter into agreements with collectors. At the same time, it is recommended that a participatory programme be designed to support the implementation of good management practices and the assessment of potential social impacts. Where a formal supply system of raw material is introduced, discussions with providers regarding the estimated production and supply capacities of raw materials are recommended.

**Fundamental economic issues:** This information is linked to data collected on social issues. It is extremely important to divide the work up among the collector community and to bring clarity to issues of raw material prices, current and previous quantities traded, and information on seasonal demand and sales trends in recent years. This data is extremely useful in coming to grips with the traditional processes used in commercializing raw materials and the possible changes that a management plan could bring.

Economic aspects include an analysis on the prices of raw material under normal conditions, and real production costs including the necessary steps to implement the management plan.

#### **Box 4. Basic information required to start species management**

- (a) Information on species to be managed;
- (b) Inventory to determine the natural offer in sampling plots, according to the area and species to be managed;
- (c) Population productivity according to the part of the plant used (volume, weight, quantity);
- (d) Harvest rate (justification);
- (e) Relevant social issues that affect the management of the resource; and
- (f) Legal issues.

To carry out an assessment, annex II provides a technical sheet to help companies standardize procedures, the information required on collection areas and the biological characteristics of the species, in order to ensure sustainable management and justify the harvest rates established for each species.

#### **Box 5. Examples of methodologies**

##### *Inventories*

- (a) Participatory inventories;
- (b) Analysis of characteristics of a habitat and the influence it has over the managed species; and
- (c) Vegetation studies using representative transects or plots.

##### *Census*

Censuses (of individuals) using methodologies according to the part of the plant being managed and the species' spatial distribution (e.g. quadrants, circles and linear transects).

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square hectare are considered scarce. Scarce resources could have been identified as such beforehand by local authorities or non-governmental organizations (NGOs). It is therefore recommended that secondary information on the species be compiled, and that the species in question be considered a species under threat in the local area.

<sup>5</sup> Number of individuals per unit of area, ratio of young against adult population, birth and death rates and possible threats (e.g. plagues, fungi and herbivores).

### *Establishing harvest rates*

- (a) Analysis of existing harvest data on the species and its regeneration capacity;
- (b) Ecological modeling; and
- (c) Planning based on the quantities of the resource available for harvesting and the supply required for current and potential markets.

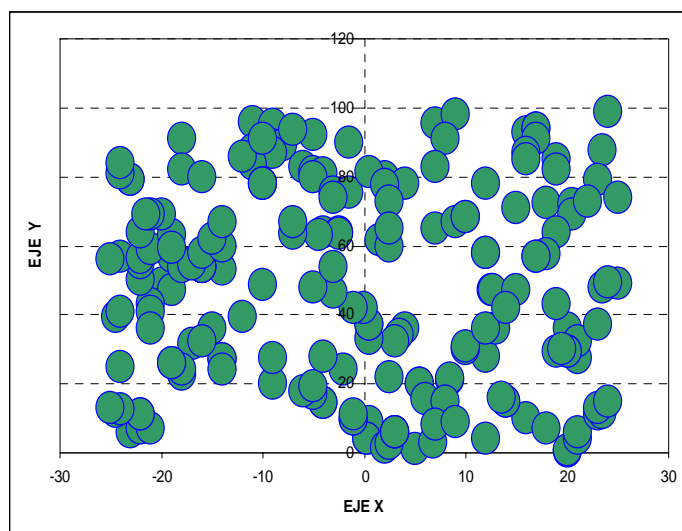
## **Box 6. Methodology and results for the *Genipa americana* resource assessment (Chocó, Colombia)**

### **1. Knowledge on the area's overall ecological conditions and documentation on species:**

- (a) Land tenure and type of community agreements;
- (b) Methodology and work plan; and
- (c) Technical training of local staff.

### **2. Sampling methodology:**

- (a) Cartographic analysis;
- (b) Available human and economic resources (team field work); and
- (c) Designated sampling area (preliminary sampling) and plot parameters (0.5 ha).



*Plot JAGUAI (Alluvial Dike ) dispersion diagram*

### **3. Collection and data analysis:**

#### Data collection:

- (a) Rectangular sampling plots in terraces and alluvial dikes 50m x 100m (0.5 ha) according to Atrato's estimated total area (1–2 per cent sampling according to the Natural Forest Corporation);
- (b) Gathering information on phenological data (flowering, fructification);
- (c) Costs of data collection and transport of jagua fruits;
- (d) Perception and value of jagua from the perspective of traditional knowledge; and
- (e) Workshops and talks for knowledge exchange and to identify criteria for jaguar silvicultural practices.

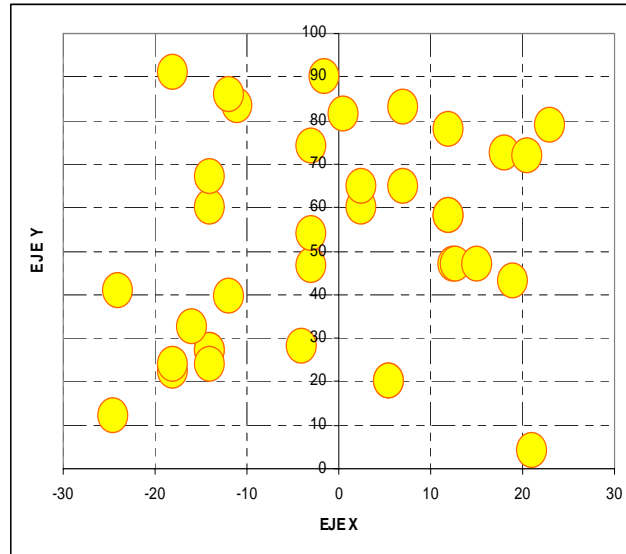
#### Data Analysis:

- (a) Descriptive analysis of data;
- (b) Documentation of traditional knowledge on species management and uses;
- (c) Adjustment to basic cartography through areas' social cartography and geo-referencing;

- (d) Alliances with research centers and Universities (generating additional information – designing prototypes for processing); and
- (e) Joint development of the resource assessment with private company (ECOFLORES LTDA).

**4. Results: Potential production areas and extraction rates:**

- (a) Distribution and location of the species (ecology);
- (b) Classification of production areas according to management possibilities;
- (c) Strategies for the sustainable management of the resource; and
- (d) Production capacity of fruits (dikes= 15,400 kg/ha; terraces = 7,700 kg/ha).



*Plot Jagua 1: Dispersion diagram of jagua (G. americana).*

### 3. Definition of good practices to be implemented



*The Collectors' Manual and collection sheets for managed plants are the recommended tools to implement good collection practices.*

Good collection practices are those that maintain the basic conditions of managed populations and the quality of raw materials in the long term. Good practices must ensure the survival of wild populations and their corresponding habitat.

According to WHO Guidelines on Good Agricultural and Collection Practices, management plans for wild species must establish management levels and describe suitable collection practices for medicinal plants and the plant parts used. WHO also recognizes that medicinal plant collection causes many environmental and social problems, with a certain measure of complexity that must be addressed at the local level, since they are not addressed in the guidelines.

It is therefore recommended that good collection practices be implemented, taking into consideration three key factors: (a) the direct management of species; (b) management of impact on habitat; and (c) interaction of actors managing the species along the value chain (from collection to the marketplace).

Practices for direct species management: The following activities should be implemented to ensure the good management of populations:

- (a) Identification and description of collection techniques: Collection techniques are defined according to biological information and knowledge already available on the species' management. This includes tools that should be used and how the collection and extraction of raw material should be carried out without affecting individuals and/or their habitat;
- (b) Description of characteristics of individuals to be collected: To ensure that collectors manage the species correctly and the part of the plant used, it is recommended that a description and pictures be recorded to provide further information;
- (c) Seasons of harvest: A great variety of medicinal plant species are produced seasonally. The best time for harvesting the required part of the plant should be duly noted. A collection plan can then be defined in line with periods of higher yield;
- (d) Practices for habitat and ecosystems management<sup>6</sup>: Although related to the management of species, these practices take a different approach, focusing on the management and conservation of the natural characteristics of collection areas and their surrounding habitats and ecosystems.
- (e) Zoning of management, monitoring and conservation areas: It is advisable to zone off the collection area, clearly defining the management areas used for data collection and monitoring populations, and those designated for species preservation (i.e. areas that are not managed or partially managed). Moreover, in forested areas, zoning should include precise access paths for each area so as to avoid the movement of people outside managed areas, or the invasion of a high number of roads into areas of the forest. In open areas, zoning should take into account human settlements and collectors' access routes;
- (f) Rotation of collection areas: Sub-zones should be defined within the managed area that has been zoned off. Rotation organizes the use and recovery of certain areas while others are being managed.

<sup>6</sup> Practices related to principle 1 of the UNCTAD BioTrade Principles and Criteria (UNCTAD, 2007).

Practices for promoting work among supply-chain actors: These practices guide the work undertaken with collectors, respecting their social environment and defining appropriate productive activities to this end.

- (a) Prevention of negative impacts on local communities: As collection activities are often developed by local communities, the study of socio-economic information obtained in the assessment is important in identifying the possible effects that activities will have on issues such as income generation, local employment, the amount of time the community dedicates to collection and different production activities, all of which are based on the characteristics of the community;
- (b) Collection practices in line with the social and cultural context of collectors: It is very important to define good practices in line with work possibilities at the local level, adapting traditional practices to appropriate methods that ensure the species' sustainability in the long term. The value of analyzing industrial security measures should therefore be highlighted, related to the WHO definition in its guidelines on good collection practices;
- (c) Organizational mechanisms required for collection: Once proper techniques for species, habitat and ecosystem management have been defined and adapted according to the social conditions of communities, collectors should be encouraged to have open discussions to establish the organizational conditions necessary to ensure that good practices can be implemented. It is recommended that collection processes be defined, as well as times, seasons of work and roles of different actors in the community regarding these processes (collectors, record keepers, processors, etc.). Where communities are not organized into appropriate producer associations, support could be provided to create organizations that have a structure relevant to collection and to the relationship between communities and buyers.

The recommended tools to implement good collection practices are the Collectors' Manual and collection data sheets for the plants being managed. The Collectors' Manual is a very important tool as it provides useful information to ensure that both collectors and providers are implementing good practices, and that they are gathering relevant information for the conservation of raw materials. Other documents may also be developed by companies with the objective of guiding their collectors and providers in the implementation of good practices in order to facilitate the organization of a community around its collection activities. The Collectors' Manual also offers support by complementing existing tools (contained in annex III), which can be used in standardized procedures for buyers.

#### **Box 7. Good practices for the management of *Equisetum bogotense***

Good collection practices for wild species are requirements that assure both sanitary quality and resource conservation in the long term by taking environmental issues, welfare and the health of partner organizations into consideration. GACP is applicable from the initial selection of material to be collected (which and what quality material to harvest) to its transportation to the buyer company. Practices avoid raw material contamination and ensure the resource for future generations. Good collection practices related to habitat management, collection and post harvest are described below.

##### **Habitat management**

A habitat is the environment in which species develop. It is therefore very important that guidelines are set out to ensure habitat conservation (riparian areas with vegetation and irrigation channels). These guidelines should be applied to other zones where plant collection is being carried out, with the following conditions:

- (a) No cattle or herd farming takes place in collection areas;
- (b) The vegetation in riparian zones is maintained;
- (c) At the time of harvest, the ground is left undamaged as the plant has an extensive

underground, perennial root;

- (d) So that the resource can be managed near to people's homes, areas next to water channels that have shrubs could be fenced off to avoid cattle from trampling and/or eating the plants;
- (e) The species could be grown in irrigation channels and humid places near to homes, having the correct protection against animals.






### **Species management during collection**

- (a) It is recommended that harvest begin in winter so that the plants' epigeous branches can grow back quickly;
- (b) High impact tools should not be used (e.g. sickle), since roots are superficial and the force used to cut them could damage aerial roots and even the plant itself;
- (c) Collection should be done using both hands, holding and placing pressure on the lower part with one hand and pulling up with the other. To avoid undue stress to the plant, the root should not come under any pressure;
- (d) Only adult-sized plants should be collected (dark-green in color and a height of more than 30 cm). Avoid collecting young plants (light-green in color and a height of less than 20cm) to give time for the resource to regenerate;
- (e) Avoid harvesting species with strobili. This practice could affect the dissemination of spores. When individuals with strobili are collected, spores could be artificially disseminated manually;
- (f) For each collection area, leave at least 1m<sup>2</sup> not harvested or ensure that at least four plants with strobili are not collected so that spores can be disseminated naturally;
- (g) Avoid harvesting damaged plants: i.e. do not to harvest stems or leaves that are damaged;
- (h) Raw materials located within ravines used for waste waters should not be collected. Such materials could be contaminated and pass infection on to the consumer.

### **Post-harvest management**

- (a) **Cleaning:** As soon as harvested materials are taken from the ground, they must be washed with fresh clean water in a place designated solely for this purpose;
- (b) **Selection:** Vegetative, damaged and dried-up parts should be removed when harvesting;
- (c) **Transport:** A sack or canvass should be used to transport the cleaned, raw material from the collection area to the collector's house, then from the house to the place of purchase. Mules or horses can be used to transport the material, but bags must provide adequate protection from the material coming into contact with the animal (avoiding contamination from the animal's sweat);
- (d) **Storage:** Storage areas must be free from rodents and domesticated animals.

**Box 8. Pages from the Collectors' Manual used in community workshops for providers of *Equisetum bogotense***

<p style="text-align: center;"><b>MANUAL PARA RECOLECTORES</b></p> <p>Las Buenas Prácticas de Recolección (BPR), son un conjunto de procedimientos que ayudan a hacer más eficiente la cosecha y la preservación de las especies en el tiempo, conservando los ecosistemas y mejorando la calidad del producto.</p> <p style="text-align: center;"><b>MANEJO DEL HABITAT</b></p> <p>En las áreas de recolección evitar el pastoreo de vacunos y ovinos.</p>  <p>No cortar la vegetación de las riberas de ríos y quebradas.</p> <p>No pisar desordenadamente el suelo en las áreas de recolección.</p> <p>Cercar en torno a las quebradas, acéquias, sienegos, cerca de las casas para tener el recurso más cercano.</p> 	<p style="text-align: center;"><b>¿COMO COSECHAR?</b></p> <p>Cosechar a la entrada de las lluvias ya que estas favorecen la regeneración de la planta.</p>  <p>No recolectar con herramientas (oz) dañan sus rizomas (raíces).</p>  <p>Recolectar con las dos manos, sujetando y presionando apuestamente.</p>  <p>Evitar cosechar la especie con estróbilos (frutos) ya que impide la diseminación de esporas (semillas).</p>  <p>Solo recolectar plantas maduras que son de color verde oscuro, ramificadas y mayor de 20 cm de altura.</p> 
<p>Dejar por área de recolección 1 m<sup>2</sup> sin cosechar o cuatro plantas al azar que estén maduras o con estróbilos (frutos).</p>  <p>No recolectar cola de caballo en quebradas que sean recolectoras de aguas servidas.</p> <p style="text-align: center;"><b>EN LA POST COSECHA</b></p> <p>Tan pronto salga la cosecha del campo debe someterse a una labor de limpieza mediante un lavado con agua fresca, limpia y en un área adecuada.</p>  <p>Tener un saco o lona destinado para el transporte desde el área de recolección a la casa.</p>  <p>Proteger del contacto de animales domésticos y roedores.</p>	

#### 4. Definition of follow-up and monitoring systems



*The implementation of a monitoring system should be based on an adaptive management approach. This type of management anticipates the appropriate adjustment of management systems, including the alteration or suspension of activities that are deemed detrimental to managed populations and their habitats.*

The objective of having follow-up and monitoring systems is to analyze the variables associated with the

species' production. With this information, harvest rates and collection practices can be adjusted, and the management plan is continually updated.

To design a system with such characteristics, these two basic concepts should be defined:

- (a) Follow-up: In order to guide management decisions, data is gathered on a regular basis measuring variables related to the general characteristics of the species and, if possible, the collection techniques employed. For example, by measuring the biomass variables of a species and its growth or regeneration rate, the harvest rate can be adjusted. Based on follow-up, harvest rates, collection practices and ecosystem management practices can be adjusted. Follow-up could be implemented by gathering data in sampling plots from managed and non-managed areas;
- (b) Monitoring: This is done to establish trends in the harvest by collecting data on a continual basis to evaluate changes between its initial and current conditions. For example, an analysis of trends provides information on the production capacity of a managed area. Such decisions are based on data from an analysis of trends, complementary to the follow-up data (see Elzinga *et al.*, 2002).

Adaptive management comprises the integration of design, management and monitoring in order to systematically evaluate management assumptions and implement a process of "learning and adaptation". This is a process that should be adjusted periodically to assure the information from one level feeds into the next. Adjustment to collection systems could be made based on results derived from the follow-up and monitoring systems. This way, the continuous recording and analysis of data are incorporated into the management decisions-making process. For this reason, the definition of variables for these systems is fundamental to obtaining the required information for implementation.

The implementation of a monitoring system should use an adaptive management approach. This type of management anticipates the appropriate adjustment of management systems, including the alteration or suspension of activities that are deemed detrimental to managed populations and their habitats. Adaptive management is applied based on:

- (a) Traditional and scientific knowledge;
- (b) Iterative and time-sensitive feedback derived from monitoring use and environmental, social and economic impacts, as well as the ecological status of the managed species; and
- (c) Adjustment of management practices based on the monitoring system.

Based on discussion workshops, it was suggested that the follow-up and monitoring systems should generate information for the following levels:

- (a) Impact on the managed resource, which should be known before management activities begin;
- (b) The biology of the species: information to calculate and adjust harvest rates and analyze additional information;
- (c) Yield, to establish whether or not production capacity (in terms of quality and quantity) of a final product is in line with the raw materials available. For example, if one ton of dry raw material is needed to extract one liter of essential oil, follow-up should determine whether or not the raw materials available can maintain or improve on the quality needed to guarantee the expected production of essential oil; and
- (d) Sales and production costs.

Variables, that are part of the follow-up system, are therefore defined in order to facilitate monitoring. The main variables to be considered in this system are:

- (a) Harvest rate: quantity harvested per time unit;
- (b) Harvest efficiency: quantity harvested per sampling effort unit (time spent collecting, number of people needed, accessibility of collection areas);
- (c) Sale/purchase price of raw materials;
- (d) Production costs (extraction and management of raw material, records, transportation)
- (e) Income generation; and
- (f) Employment generation and participation.

Variables that could be involved in a follow-up system are:

- (a) Variables related to natural productivity (that affect the production of managed biomass) of the managed species, e.g. size, weight, regeneration rate, mortality rate (depending on the product or plant part used);
- (b) Variables related to collection techniques employed; and
- (c) Variables related to yield and product quality.

**Table 1. General guidelines and analysis of variables needed to design follow-up and monitoring systems**

Variable	Objective (trend to be monitored)	Activity (methodology)	Frequency of data collection	Frequency of analyzing the variable	Indicator (measurement unit)	Responsible entity
<i>Follow-up variables</i>						
Productivity						
Produced biomass	Follow-up to the production capacity of the managed population	Permanent plots (non-managed areas)	(Depends on the species' characteristics)	Each harvest season	Biomass/area unit	(Company, with support from collectors)
Growth, regeneration, natality, fructification, mortality rates.	Follow-up to variables of biomass regeneration	Specific methodology according to the species and the parts used	According to the species' biology	According to the species' biology	Biomass regenerated/ individual/area	(Company, with support from collectors)
Collection techniques	Implementation of suggested techniques	Records	Every time the plant is harvested	At the end of each season	Implementation percentage Percentage of raw material rejected	Collectors
Yield	Maintenance of the quality of the final product	Records	For each final production lot	Analysis per lot	Volume or weight of the final product/volume or	Company

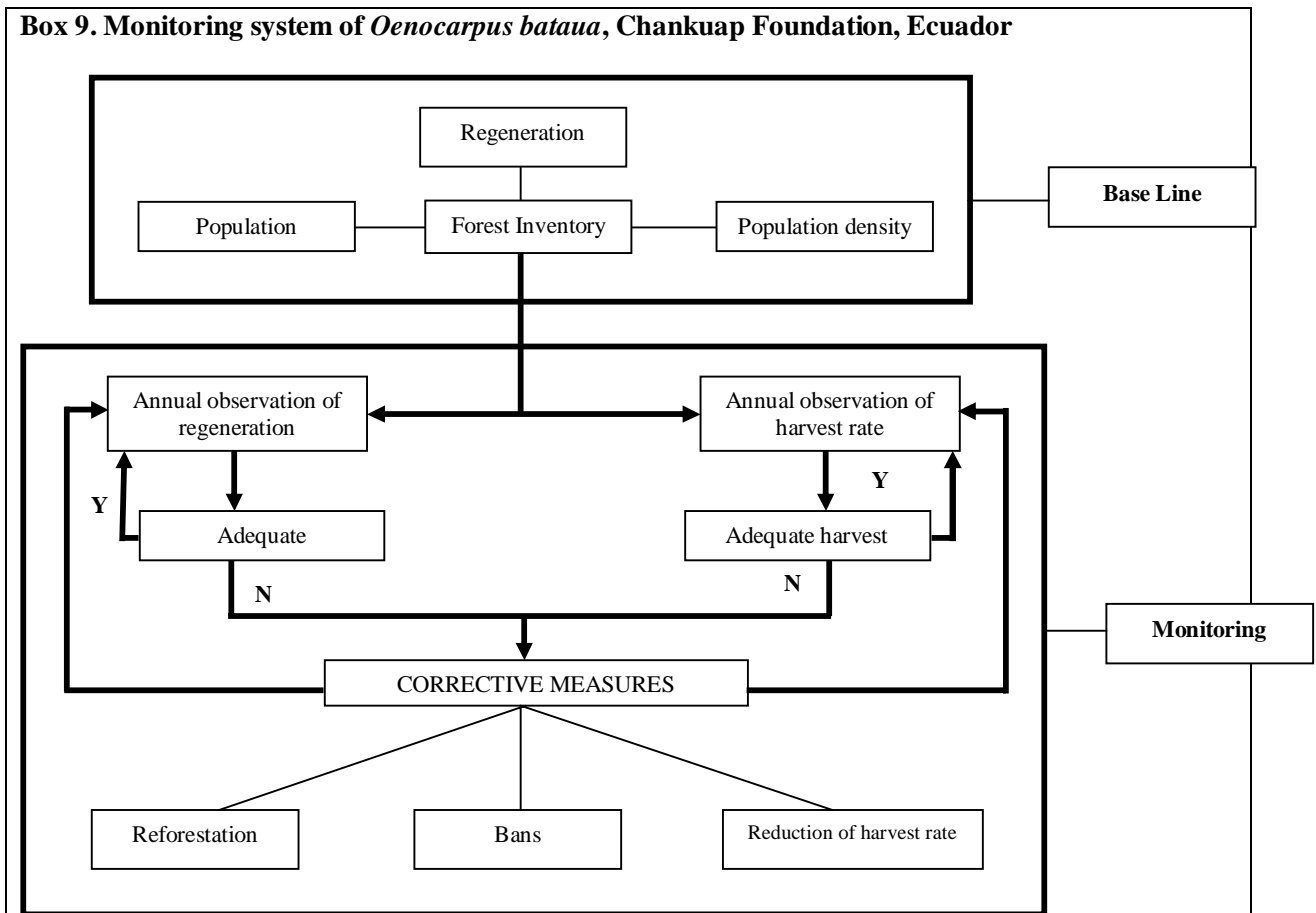
Variable	Objective (trend to be monitored)	Activity (methodology)	Frequency of data collection	Frequency of analyzing the variable	Indicator (measurement unit)	Responsible entity
					weight of fresh raw materials	
Quality	Assurance of the quality required by markets (established by buyers)	Records	Raw materials: every time it is harvested Final product: Per lot	Raw material: harvest seasons Final product: lot	Percentage of product that complies with quality requirements	Raw materials: collectors Final product: company
<b>Variables to be monitored</b>						
Harvest rate	Maintenance of the harvest rate	Records of weight/volume harvested	Every time raw materials are harvested	At the end of each harvest season	Weight or volume unity area/time(season)	Collectors (records), Company (analysis)
Efficiency	Maintenance of harvest efficiency	Records of weight/volume harvested Collection effort (time, distance, number of people involved)	Every time raw materials are harvested	At the end of each harvest season	Weight or volume/effort	Collectors (records), company (analysis)
Production costs	Maintenance or reduction of production costs (efficiency improvement)	Costs matrix	Every time materials and inputs are purchased	At the end of each harvest season	Cost/weight unity	Collectors (community) and company
Income generation	Keeping the economic feasibility at local level	Records of sale and purchase reports	Every time materials and inputs are purchased	At the end of each harvest season	Utility (purchase price, lower costs)	Collectors (sale records), company (purchase records)

Based on the information required to implement follow-up and monitoring systems, minimum responsibilities among public organizations, private actors and collector communities can be defined. Table 2 shows an analysis of such responsibilities.

**Table 2. Responsibilities of actors involved in the implementation of follow-up and monitoring systems**

Actor	Minimum obligation	Additional actions
Public actors (e.g. environmental authorities).	Control of validity and compliance with the monitoring system Planning the use of resources at national and local levels (policy)	Facilitation of alliances to follow up and monitor implementation
Private actors (e.g. raw materials buyers, processors, exporters).	Data analysis and resource management decision-making, which might be shared with local actors, according to their capacities Training of local actors in the implementation of the system and data collection	Support to local communities in the implementation of the follow-up and monitoring system
Local actors (e.g. collectors, local stores)	Data collection, up-to-date records and delivery of standardized information	

At this point, it is very important to set standard operating procedures to provide guidance on the methodologies, define the people responsible and fix times to implement the system. Annex V shows a suggested table of contents to elaborate the documentation required.



In the case of *Oenocarpus bataua*, a monitoring system was designed using an information base line derived from the resource assessment. From this information, variables were defined to monitor the biological characteristics of the *Oenocarpus* population, as well as practices to assure its conservation. It is important to note that this is a cyclical process and that the effectiveness of resource management should be evaluated, taking into consideration monitoring results and research needs related to ecological, production and social information.

The evaluation of the impact of management activities is based on the monitoring of ecological data resulting from the information base line of *Oenocarpus*, such as age structures (proportion of seedlings and adults), regeneration rates and population density. As a precautionary measure to the species conservation, and taking into account the lack of information there is on this, it is recommended that an annual monitoring process be elaborated in harvest areas over a period of five years. Once this has come to term and the information has been re-evaluated, time intervals between monitoring activities can be increased. The following are the recommended biological variables:

- (a) Age structure: With the objectives of establishing the current population status, regenerating capacity of new individuals and assessing the changes of the population over time as a consequence of *Oenocarpus* management, a system to systematically measure the age structure is designed and implemented in several sampling plots located in managed and non-managed areas;

- (b) Regeneration rates: These measure the quantity of young individuals that are incorporated into the population, based on the hypothesis that fruit harvesting or palm felling activities (management *in situ*) have a negative effect on the establishment rates of new seedlings. To evaluate regeneration, vegetation that has a Breast Height Diameter (BHD) of less than 10 cm is included and measured in defined sampling plots;
- (c) Population density: Population density indicates the quantity of individuals per area unit. This measure is very useful given that it indicates changes in population size due to the management employed. To measure this index, all those *Oenocarpus* individuals that have more than 10 cm BHD, or that are taller than 1.3 m, should be counted in the same permanent sampling plots (three in the harvest zone and one in a wild forest that has not been disturbed by the community);
- (d) Harvest rates: The assumption is made that each palm produces 1.5 liters of oil, extracted from approximately 1,343 palm trees. The value of annual harvest rates defined beforehand by the community will be used as a reference point. Based on the results generated by the monitoring system, next year's harvest rate can be determined whether to maintain, reduce or increase.

#### **Corrective measures**

Corrective measures are those activities oriented towards correcting the effects and ecological impact caused by management activities. They are designed based on monitoring results of biological variables. Optional measures are reduction of harvest rates, zoning of areas and/or reforestation. It is important to highlight that the decision taken by the Chankuap Foundation on adopting one of these measures, or a possible combination, will be made, depending on the size of the impact on the species, as well as social and economical feasibility of such practices in the implementation area.

## 5. Implementing documentation systems



*Records must be specific to collectors, intermediaries and processors.*

As presented throughout this document, each of the actors that take part in the raw material management, from collection process to commercialization, should provide information on these processes using standard operating procedures. The documentation of these activities provides

information on the implementation of management documents from phases 1 to 4, assures product traceability and provides information that can feed into the follow-up and monitoring systems.

A data registering system should be developed to complement documentation that reflects standard operating procedures. This would provide information to each actor that takes part in the productive chain, including the final consumer, on the origin of the product and the management that raw materials have undergone at each step of processing.

Records must be differentiated according to the actor that uses them, such as collectors, intermediaries or processors. For transporting raw materials, factory reception and processing, it is recommended that the records that companies are using to implement good agricultural practices (GAP) or good manufacturing practices (GMP) be revised. This is to ensure that relevant information related to wild species is also being gathered in those records.

The following paragraphs describe the recommended records that collectors, intermediaries and companies should provide. It is important to clarify that each actor is responsible for providing the information included in the register and making this available to the other actors of the supply chain that could find it to be of interest.

**Collectors' records:** These records provide data related to raw material collection. To ensure implementation, it is recommended that collectors be provided with proper training on compiling information and that a responsible person be assigned to manage such information. Collectors' records could contain the following information:

- (a) Name of collector (name code corresponding to the collector lists in step 1);
- (b) Date of collection;
- (c) Place, location of collection (zoning having already been carried out);
- (d) Quantity collected;
- (e) Quality of raw material;
- (f) Plant part collected;
- (g) Price; and
- (h) Date of sale to intermediaries or other buyers

**Intermediaries' records:** This record is required when the raw material needs be stored or managed by a new actor (intermediary). This will facilitate follow-up on the quality of the raw material when it was received and its maintenance during storage. This is an intermediate step, and the intermediary needs to base records on the information or records provided by the collectors.

- (a) Entry date into storage facility;
- (b) Name of provider;

- (c) Collector code (based on collector's records);
- (d) Place of collection (based on collector's records);
- (e) Plant parts (leaves, stems, roots);
- (f) Material type (dry, fresh);
- (g) Quantity/weight (at time of delivery);
- (h) Price paid;
- (i) Supplier's signature; and
- (j) Exit date from storage facility.

If the raw material has to undergo a form of processing during storage, such as drying or packing, this should be documented using the appropriate records.

**Buyer/company records:** As these actors are at the end of the chain, they receive raw materials or semi-processed raw materials. These actors should use separate records: one for collection areas and collectors, and another for processing activities.

**Collection areas and collectors' record:** This provides information on collection areas according to the issues presented in step 1 of these guidelines. The minimum data suggested for these records are:

- (a) Code of collection area;
- (b) Place (place name);
- (c) Political location (province/State and any other relevant information);
- (d) Geographic location (coordinates);
- (e) Collection area (surface);
- (f) Type of vegetation;
- (g) Land owner data; and
- (h) Borders (limits).

When a company is required to document information on a product's traceability, data on collection areas and collectors could be complemented with records provided by collectors and intermediaries.

**Processing record:** This contains information related to processing activities of raw materials. When the processor company has an ISO or good manufacturing practices systems in place, it is important to standardize implemented records in these systems and processing records, as well as any other information derived from the management of the raw material. The suggested content of such records is:

- (a) Harvesting lot;
- (b) Quantity (volume, weight) of raw processed material;
- (c) Quantity of final product obtained after processing;
- (d) Quality (physical and chemical characteristics);
- (e) Quantity of lost materials;
- (f) Total yield;
- (g) Energy expenditure;
- (h) Processing time; and
- (i) Other important variables for the company according to existing quality systems.

The responsibility in records management should be assumed by each actor according to the management used for the raw materials and processed products (collector, intermediary and buyer).

## **6. Conclusion**

Based on results of implementing the guidelines suggested in this publication, there are a number of conclusions related to their applicability and the responsibilities and costs of implementation.

### **Applicability**

With regard to the applicability of these guidelines, case studies and discussions with different actors have concluded they can be used as a general guide. Based on these, organizations interested in wild raw material management can elaborate a management document (management plan or plan of use, good practices protocol), which can define the conditions possible to ensure the adaptive management of these species. This is a tool that can be used to work closely with companies and communities, contributing to the implementation of national regulations.

Regarding the scale of work, the applicability of the guidelines at both the local and regional levels (for management that covers big areas) was highlighted, since they give guidance in decision-making processes – based on the results derived from their implementation – and are flexible enough to work with methods tailored to the scale of management, different responsibilities of actors and available information on the species.

Carrying out studies with a maximum duration of six months has proven that it is possible to obtain basic data in this period that can be used to elaborate an initial management document to guide resource management activities. The implementation of this publication and its follow-up and monitoring systems facilitates the continuous improvement of management practices, generates more detailed information on the species and, as a result, enables companies to frequently update their managed documents.

### **Responsibilities and implementation costs**

Results from the process of implementing guidelines highlight the importance of defining responsibilities for natural resource management (providers, buyers, exporters) and guide actors in the implementation of the necessary methodologies, according to the scale they are working with. Producers, intermediaries and buyers must identify their responsibilities for resource management and, in the case of final buyers, the activities required to ensure the implementation of good practices and traceability systems along the supply chain.

Interaction and information exchange among actors (producers, intermediaries and buyers) are very important to ensure good natural resource management, taking into account that the implementation of traceability and monitoring systems depends on their commitment to gather and register the appropriated information.

The participation of communities providing raw materials as resource managers was very important, since they hold a lot of relevant information on the ecological aspects of the species, as well as local market trends and other contributions necessary to facilitate decision-making processes.

One of the main conclusions regarding costs is that the implementation of guidelines should be as cost-effective as possible. The process should be developed by promoting collaboration among all actors involved in the supply chain, universities and scientific organizations interested in supporting the sustainable management of resources, working in close collaboration with national authorities.

Cooperation among companies or between companies, authorities and research organizations may translate into a reduction in costs by implementing activities such as:

- (a) Compilation of biological information on species and distribution areas. This can be an activity carried out at a regional or sector level to reduce costs;
- (b) Working closely with national authorities by studying species distribution at a national or regional level. The information will support the company in the elaboration and implementation of good management practices in the area where resources are collected;
- (c) Collaboration with research institutions and academia to generate the basic information required to manage priority species;
- (d) Before investment, the carrying out of analysis of the management possibilities of the species, according to its abundance and regeneration conditions.

In the field of business, implementation should be seen as a process integrated into a company's activities related to cost reduction and to strengthening of the monitoring and traceability systems. The management document (management plan, plan of use) would be an initial investment to ensure resource management in the long term, and monitoring as a tool to adjust management and create a suitable plan of production each year. The management document and monitoring system are two distinct tools.

Box 10 below shows the recommended rubric to calculate estimative costs involved in developing an initial management document and monitoring system. This is the result of a technical workshop that took place in May 2006 (UNCTAD 2006, newsletter).

<b>Box 10. Rubric for the development of management documents and the implementation of follow-up and monitoring systems</b>
<i>Rubric for the development of the management document (management plan and plan of use).</i>
1. Personnel: professional coordinator (with training in natural sciences), technical assistant, field assistants, preferably from the community.
2. Services to be acquired: cartography, taxonomic determination, laboratory analysis of biological samples, spatial modeling.
3. Materials: acquisition of relevant literature, hiring (or purchase) of equipment (GPS, other), stationery.
4. Daily subsidy allowance.
5. Red tape: permits (licenses), administrative processes.
6. Workshops and networking: food, material, travel costs of participants.
7. Transportation.
<i>Rubric for follow-up systems (annual or seasonal investment).</i>
1. Personnel: professional coordinator (with training in natural sciences), technical assistant, field assistants, preferably from the community.
2. Material.
3. Daily subsidy allowance.
4. Workshops and networking.
5. Transportation.

## Annex I. Identification of collection areas and providers

### A. Identification de collection areas and providers

The box below gives examples of information to be included to describe collection areas.

Information of collection areas
<i>General information</i>
(a) Name of landowner;
(b) Name of location;
(c) Location: district, province;
(d) Size of collection area (has);
(e) Altitude (metres above sea level);
(f) Temperature °C;
(g) Precipitation (mm/year);
(h) Topography; and
(i) Habitat and vegetation type. Dominant species.
<i>Social aspects</i>
Land tenure regime.
<i>Collection areas map</i>
Map of the collection area to proper scale according to its extension.

### B. Botanical identification

Contents of a document for standardized operating procedure:

- (a) Description of the collection method of herbarium samples (revision according to national standard);
- (b) Plants preservation and drying systems;
- (c) Storage; and
- (d) Documentation: each botanical sample should include specific information. The following box contains examples of the basic information that should be added to the botanical samples. (It is recommended that this information be systematized according to national herbaria procedures.)

Information of botanical samples
Sample number:
Scientific name:
Local name:
Pharmaceutical name:
Name of collector:
Date of sample's collection (dd/mm/yyyy):
Description of collection area:
Country, state, province or county
Distance and direction (km from nearest city or village)
Habitat or vegetation type: dominant, typical, or associated species, if possible
Latitude/Longitude, altitude (m.a.s.l.), GPS reading if available
Preservation method: take note of whether plants have been preserved in alcohol, or have received any other chemical treatment before drying
<i>Verification of botanical name</i>
Identification made by (Name of specialist):
Location of reference samples (name herbaria or research institutes):
Date of verification:

## **Annex II. Resource assessment**

Contents:

- (a) Locations of collection: codes according to the list of collection areas;
- (b) General information on the species harvested in each collection area;
- (c) Abundance/density of the managed plant species;
- (d) Plant part collected (leaves, fruit, bark);
- (e) Availability of the fresh material (quantities/season or month);
- (f) Quantities of dried material (year/area);
- (g) Harvest rates (e.g. number of individuals/ha/year);
- (h) Number of collectors involved (families in each collection area);
- (i) Justification of harvest rates.

### **Justification of harvest rates:**

- (a) Methods used for calculation of harvest rates;
- (b) Biological information on the species: variables of importance to define the harvest rates:
  - (i) Density and abundance;
  - (ii) Distribution (location of the individuals in the species, for instance grouped or isolated);
  - (iii) Reproduction strategies;
  - (iv) Demography (proportions of adults/young, males/females); and
  - (v) Growth rates (average growth of individuals per year).

Note: Methods and variables to be monitored change according to the species and the part of the plant collected. Records and monitoring systems can be defined using specialists.

### **Annex III. Good collection practices: collectors' manual and collectors' plant monograph**

Implementation of good collection practices can be supported by using two essential documents: the collectors' manual and the guide for the collection of plants.

#### **A. Collectors' manual**

The following points describe information that could be included in the development of a collectors' manual:

- (a) Identification of collection areas (rotation of collection areas, collection periods, hours of collection, seasons);
- (b) Plant part to be collected;
- (c) Collection and management techniques;
- (d) Quality standards to be implemented;
- (e) Transport and packing requirements;
- (f) Storage conditions;
- (g) Post-harvest management of the product; and
- (h) Maximum quantities to be collected.

It is recommended that the manuals be made as illustrative and practical as possible.

#### **B. Collectors' plant sheets**

Botanical identification:

Scientific name

Local name

Pharmaceutical name

Description of the species:

Relevant characteristics of the species

Pictures: for recognition by local collectors

Specifications: Individual characteristics to be taken into account at the moment of collection:

Months of collection

Plant part collected

Size, quantity and quality of the collected part

Maturity

Color or other relevant variables

Collection techniques:

Materials needed (tools recommended)

Harvesting methods

Specific areas of collection within the collection area according to the season

- Identification of collection sites
- Practices to maintain the quality of the habitat: management of paths, collection techniques that have a low impact on plant and animal populations, activities to maintain and enrich the quality of habitat
- Harvest rates per collection area

## Annex IV. Monitoring systems

To implement the monitoring system, a standard document must be created that can be used as a procedures manual. This can then be interpreted and applied in an appropriate way by any member of the organization. Recommended content for this document is as follows:

- (a) Person responsible;
- (b) Variables for follow up and monitoring;
- (c) Monitoring frequency;
- (d) Data analysis methods; and
- (e) Monitoring costs per year.

Variables to be monitored per specie (selection of variables related to plant productivity and sustainability):

- (a) Frequency of monitoring;
- (b) Methods of data analysis; and
- (c) Costs of monitoring per year.

This document can be developed based on the following table:

Variable	Objective (trend to be monitored)	Activity (methodology)	Frequency of data collection	Frequency of analyzing the variable	Indicator (measurement unit)	Responsible entity
<i>Follow-up variables</i>						
Productivity						
Produced biomass						
Growth, regeneration, natality, fructification, mortality rates						
Collection techniques						
Yield						
Quality						
<i>Variables to be monitored</i>						
Harvest rate						
Efficiency						
Production costs						
Income generation						

It is important that every variable must have a record and collection data system that considers the characteristics of the harvested species and the management practices implemented.

## Annex V. Implementation of documentation systems

The following records provide general guidance for supply chain actors implementing the management document.

*Record of collection areas and collectors:* to be implemented by collectors, those that store the material and companies in order to register their providers.

Collection area code	Name of the area	Political location (State, province, etc.)	Geographical location (coordinates)	Collection area (ha)	Vegetation type	Land owner	Demarcation boundaries

*Record of harvested material:* to be implemented by collectors.

Code of collection area	Date of collection	Time of arrival	Time of departure	Quantity collected	Collection techniques (according to collectors' manual)	Collector (code)	Lot code

*Records for delivery of raw materials:* to be managed by collectors at the moment of delivery to storage personnel or buyers.

Quality (according to manual)	Date of delivery	Quantity of raw material delivered (accepted by the buyer)	Reasons for rejection	Value of sale	Receipt number of sale	Lot code

*Record of reception of raw materials:* to be implemented by storage personnel and buyers.

Production lot	Place of reception	Date of reception	Person responsible for the delivery (collector code)	Quantity (weight, volume)	Quality of raw material	Amount paid	Receipt number of sale	Person responsible (name and signature)

*Processing record:* to be implemented by companies or organizations that use any kind of processing (from the packaging of fresh material to drying or other more complex processes).

Production lot	Quantity (weight, volume) of raw material processed	Quantity of final product derived from processing	Quality (physical and chemical characteristics)	Lost materials	Reasons for loss	Total yield	Energy consumption	Processing time (other variables of interest to the company)

### Other useful registers

Below are additional suggestions for records that can be used by a BioTrade company.

#### *Records of botanical samples*

Code	Collection number	Scientific name	Local name	Specialist	Location of reference samples

*Records of permits/licenses:* As part of the resource assessment and with the aim of complying with legal requirements, it is important to have a record of the legislations and permits necessary and the status of their implementation by the company. Based on this, the company can follow up on the approved quantities of raw materials to be harvested and the expiration dates.

Code of the collection area	License No.	Date of issue	Date of expiration	Authorized quantities	Observations	Person/entity responsible

*Training programmes:* This might be implemented by the organization that offers training programmes to collectors. This can either be from a community-based organization or a company/buyer.

Name of the programme	Objective	Contents	Participants	Frequency	Person/entity responsible

## Bibliography

- Alarcón-Schettini D and García-Giraldo J (2006). Propuesta de plan de manejo para la unguahua, *Oenocarpus bataua*, en las comunidades Achuar de Yutsuntsa y Makusar. Programa de Manejo de la Biodiversidad y Biocomercio (PMBB)-EcoCiencia. Informe final presentado al Programa de Facilitación del Biocomercio.
- Bailey JA (1984). Principles of wildlife management. John Wiley Sons. New York: 373.
- Becerra MT (2002). Plan de aprovechamiento y uso de los recursos naturales. Guía para empresarios de Biocomercio. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. Bogotá, Colombia: 48.
- Becerra MT (ed.) (2003). Lineamientos para el manejo de sistemas de aprovechamiento de recursos naturales in situ. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. Bogotá, Colombia: 186.
- Duque V (2006). Plan de manejo general de áreas silvestres para la producción de frutos de jagua o huito (*Genipa americana*). Comunidades Negras de Vigía del Fuerte y Bojayá, en la zona del Atrato Medio, Ecoregión del Pacífico colombiano. Informe final presentado al Programa de Facilitación del Biocomercio.
- Duerbeck K (2005). Manual de manejo de colección Silvestre orgánica. Presentación Seminario Internacional de Biocomercio. Cartagena, Colombia. Mayo de 2005.
- Dunjiæ L and Peæanac D (eds.) (2003). Manual for Collectors Based on Principles of Organic Production. Bosnia and Herzegovina.
- Elzinga C, Salzer D, Willoughby J and Gibbs J (2002). *Monitoring Plant and Animal Populations: a Handbook for Field Biologists*. Blackwell Publishg. United Kingdom: 368.
- FAO (2001). Resource assessment of non-wood forest products. Experience and biometric principles. From the series Non-Wood Forest Products No. 13. CD-ROM.
- Hamilton A (2004). Medicinal plants, conservation and livelihoods. *Biodiversity and Conservation* 13: 1477–1517.
- Instituto Alexander von Humboldt (2004). Planes de uso y aprovechamiento y protocolos para el manejo para aseguramiento de calidad e implementación de buenas prácticas para el manejo de guadua. Informe de consultaría. Consultant: Luisa Fernanda López.
- Muller S (2004). Guidance for organic collection of wild plants. Institute of Marketecology IMO.
- Peters CM (1996). The ecology and management of non-timber forest resources. World Bank Technical Paper Number 322: 157.
- Peters CM (1994). Sustainable harvest of non-timber plant resources in tropical moist forest: an ecological primer (online).
- Rainforest Alliance (1999). Generic guidelines for assessing the management of non-timber forest products. NTFP marketing and certification project. Rainforest Alliance: 24.

- Sánchez O and Aguirre Z (2006). Plan de Uso y Aprovechamiento de *Equisetum bogotense* Kunth “cola de caballo” Asociación Agro-Artesanal de Productores de Plantas Secas Medicinales del Ecuador (AAPPSME) y la Asociación de Productores de Plantas Medicinales del Chimborazo “Jambi Kiwa”. Programa de Manejo de la Biodiversidad y Biocomercio (PMBB)-EcoCiencia, Programa para la Conservación de la Biodiversidad Páramos y otros Ecosistemas Frágiles del Ecuador. Final report presented to the BioTrade Facilitation Programme/UNCTAD.
- Tituaña M (2006). Plan de uso y manejo del “palo santo” *Bursera graveolens* en la comunidad de Agua Blanca, parroquia Machalilla, provincia de Manabí. Programa de Manejo de la Biodiversidad y Biocomercio (PMBB)-EcoCiencia. Final report presented to the BioTrade Facilitation Programme/UNCTAD.
- UNCTAD/BioTrade (2007). Marco de verificación de Biocomercio para ingredientes naturales nativos. Working document.
- UNCTAD (2006). Memoria del taller técnico: Experiencias en la elaboración de planes de manejo para plantas medicinales provenientes de sistemas de recolección silvestre. 29 de Mayo–2 de Junio. Puerto López – Ecuador. Internal report.
- UNCTAD (2007). BioTrade Principles and Criteria. (UNCTAD/DITC/TED/2007/4). (<http://www.biotrade.org>).
- World Health Organization (2003). Directrices de la OMS sobre buenas prácticas agrícolas y de recolección (BPAR) de plantas medicinales. Ginebra: 79.
- Yañez P (2006). Plan de uso y manejo de la guaviduca (*Piper carpunya* Ruiz & Pav., Piperaceae) para la comunidad de Chiriboga y áreas adyacentes, Pichincha-Ecuador. Programa de Manejo de la Biodiversidad y Biocomercio (PMBB)-EcoCiencia. Final report presented to the BioTrade Facilitation Programme/UNCTAD.

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