Guidance for Implementing the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP)

RESOURCE ASSESSMENT

A Guide to Implementing Principle 1: Maintaining Wild MAP Resources

Danna J. Leaman and A.B. (Tony) Cunningham
IUCN-SSC Medicinal Plant Specialist Group

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International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants

PREFACE

This guide is intended to provide a general overview of resource assessment and its central role in management planning for users of the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP). It is important that users of this guide understand that assessment and management of important wild-collected resources, such as medicinal and aromatic plants, cannot be reduced to a "cook book" set of instructions that can be applied directly to the particular conditions found in real collection projects and commercial operations. In this guide, we have described the resource assessment process in five basic steps, and have provided a summary of procedures for each of these steps. These are intended for use as a checklist of the relevant tasks, rather than as a stand-alone methods manual. In this guide, we refer to several key published methods manuals, as well as to some case studies, that provide useful examples and advice. Users of this guide must be prepared to invest time and effort into understanding and working with the specific set of conditions for each project or collection operation. Users will need to consult more thorough methods manuals and case studies and seek professional advise on field study design and analysis methods appropriate to a particular collection project or operation. We hope that this guide will enable users to ask appropriate questions and seek pragmatic means to achieve sustainable wild collection of medicinal and aromatic plants and other wild-collected plant resources.

We acknowledge our particular reliance on the published work of the following individuals in compiling this guide: A.B. Cunningham, Charles Peters, Mary Stockdale, and Tamara Ticktin. Their work consulted, and other useful references, are listed in the bibliography at the end of this document. We also acknowledge unpublished contributions of Dagmar Lange to evaluating existing approaches to resource assessment, particularly related to part used and life form. We gratefully acknowledge the support of WWF Deutchland, the German Section of the World Wide Fund for Nature (WWF) for development of this guide.

This 1st draft, and an accompanying slide presentation, are intended for review and trial application to field projects implementing the ISSC-MAP in 2007-2008. Revisions of this guidance on resource assessment relevant to the ISSC-MAP is planned for the end of 2008.

Please send comments on this Resource Assessment guide and the accompanying PowerPoint to:

Danna J Leaman
98 Russell Avenue
Ottawa, ON K1N 7X1
Canada
djl@green-world.org

Version 1.0 of the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP), and other information about the standard, can be found at the following website: http://www.floraweb.de/map-pro/.

For information about the current implementation phase of ISSC-MAP, please contact:

ISSC-MAP Secretariat
Britta Pätzold and Susanne Honnef
WWF Germany and TRAFFIC, Rebstöcker Str. 55, 60326 Frankfurt a. Main.
Tel.: +49/69/79144-122, -212
Email: MAP-Standards-Criteria@wwf.de

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OVERVIEW AND BACKGROUND

The International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP) has been developed to meet the needs industry, governments, certifiers, resource managers, and collectors to understand whether wild collection activities are sustainable, and how to improve collection and resource management operations that are detrimental to the long-term survival of these resources. The ISSC-MAP is itself a generic set of principles and criteria intended for use in a wide range of circumstances. MAP resources include many different types of plants in a wide variety of habitats. The focus of the ISSC-MAP is on the ecological sustainability of wild plant populations and species in their natural habitat, but it also addresses the social and economic context of sustainable use (Figure 1). The ISSC-MAP and this guide meeting criteria for resource assessment is relevant for other wild-collected plant resources.

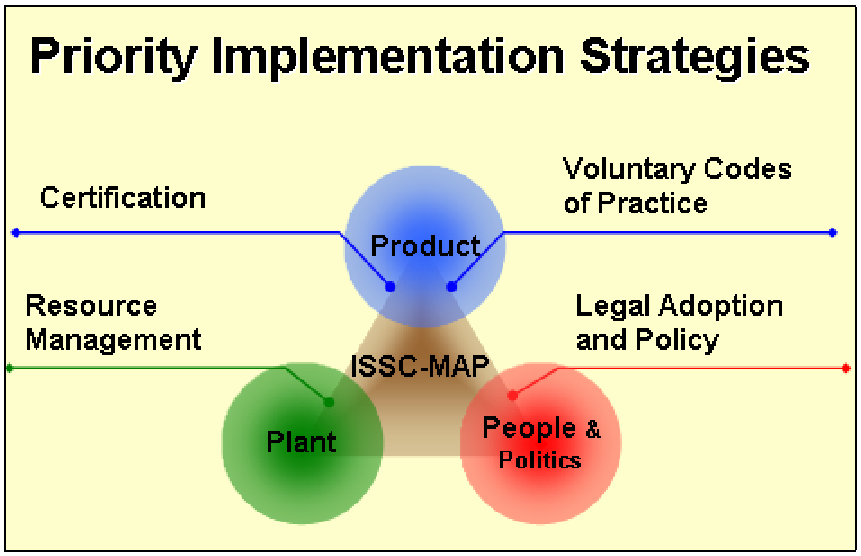

Figure 1. Priority implementation strategies for the ISSC-MAP

The objectives of this resource assessment guide are to help ISSC-MAP users:

- understand what information needs to be collected, monitored, and considered to conduct a resource assessment within the collection management process;
- determine the appropriate degree of resource assessment and monitoring accuracy and precision based on the actual project situation and target species;
- identify professional capacity, training, equipment, methods, and other information resources needed to design and implement resource assessments and management plans; and
- meet ISSC-MAP requirements for resource assessment, in particular Principle 1 and related criteria (Box 1).

Box 1. ISSC-MAP resource assessment and management requirements	
Principle 1	Maintaining Wild MAP Resources
	Wild collection of MAP resources shall be conducted at a scale and rate and in a manner that maintains populations and species over the long term
Criterion 1.1	Conservation status of target MAP species
	The conservation status of target MAP species and populations is assessed and regularly reviewed.
Criterion 1.2	Knowledge-based collection practices
	MAP collection and management practices are based on adequate identification, inventory, assessment, and monitoring of the target species and collection impacts.
Criterion 1.3	Collection intensity and species regeneration
	The rate (intensity and frequency) of MAP collection does not exceed the target species' ability to regenerate over the long term.

Resource assessment is an essential component of an adaptive management process. Resource assessments enable collectors and other resource managers to:

- estimate sustainable harvest limits for a specific resource within a particular collection area;
- observe and understand the impact of current harvest protocols (specific methods, often with agreed limits) on the recovery of the target resource; and
- make the needed adjustments in harvest protocols to maintain the target resource at sustainable levels.

These tasks therefore need to be included in the project or operation management plan. The management plan should:

- state the specific management purpose and the steps taken to achieve it (including the assessment and monitoring plan);
- clearly identify priority issues, species, and the appropriate management scale;
- incorporate and build the capacity of collectors, local communities, and other stakeholders to manage MAP resources sustainably;
- enable enforcement of management rules (such as collection limits);
- support the contributions of MAP resources to social, economic, health, and other local community goals;
- be reliable and sufficiently accurate; and
- be affordable in terms of time and other costs.

This guide gives an overview of five (5) basic steps needed to design and carry out a resource assessment and monitoring process that meets the requirements of the ISSC-MAP, and uses participatory and adaptive management approaches (Figure 2).

Step 1. Situation analysis to gather and evaluate existing knowledge about target or candidate species and the collection situation;

Step 2. Base-line inventory to understand how much of the target/selected species is present within the collection area;

Step 3. Yield and regeneration studies to understand how much of the desired raw material / plant part(s) the target species produces under natural conditions, the time required for seedlings to replace harvested individual plants and size-classes, and how productivity and regeneration vary across the collection / management area;

Step 4. Assessment of harvest impacts to determine whether current harvest levels and controls are resulting in adequate resource regeneration and productivity; and

Step 5. Periodic monitoring and harvest adjustments to revise the harvest protocol if the intensity, frequency, timing, and methods of harvest are not sustainable.

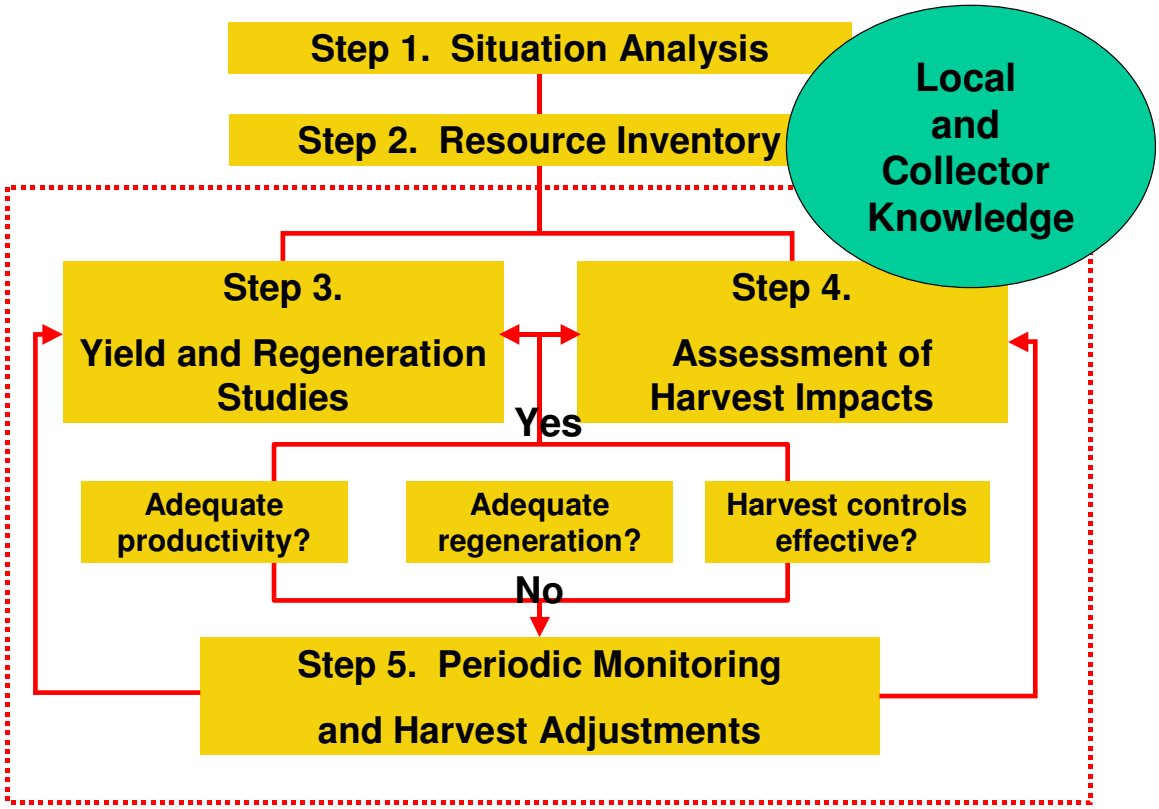

Figure 2. Resource assessment framework for ISSC-MAP within an adaptive management process

Each specific collection situation might involve a different starting point for designing a resource assessment and management plan (Box 2).

Box 2. Starting points for resource assessment

Planning a resource assessment may be considered from several distinct starting points:

A. A target species and collection area have already been identified (selected), and commercial wild-collection already exists in response to an existing market demand. The main resource assessment questions to be answered in this situation are:

- Does current demand exceed supply at sustainable levels of wild collection?
- Does the current collection operation meet resource management requirements for sustainable wild collection?
- If not, what changes are needed and possible, within limitations of time, effort, and capacity?

B. The target species identified (selected) is not yet wild-collected at commercial levels, but commercial collection is desired (a commercial level of demand exists or is likely). The main resource assessment questions to be answered in this situation are:

- Is sustainable wild-collection at commercial levels likely for the target species?
- If so, what resource management conditions are needed and possible, within limitations of time, effort, and capacity to meet requirements for sustainable wild collection?

C. A target species has not yet been identified (selected). Assuming that the relevant questions concerning market demand are also being addressed, the main resource assessment question to be answered in this situation is:

- For which species is wild collection at commercial levels most likely to be sustainable, least complex, and least costly in time and effort?

Management of wild plant resources, including medicinal and aromatic species, is complex and characterized by high levels of uncertainty about population size, growth rates, variation in yields and, not uncommonly, even the correct identity of the medicinal plants being harvested. There are great variations in the time and effort required for resource assessment depending on factors such as the terrain, species diversity, and expertise available in each situation. It is therefore very important, during the situation analysis, to carefully consider the impact of these factors on the costs and complexity of resource assessment and management (Box 3). Considering these impacts will lead to more effective design and implementation of resource assessment and monitoring as part of an adaptive management planning process, and therefore to more effective resource management outcomes. An adaptive management plan provides the foundation for developing a programme of sustainable use to reach a balance between resource demand and resource supply.

Box 3. Questions to ask yourself before you start

The costs and complexity of adaptive management plans for medicinal plants increase rapidly with increasing diversity of species and uses, larger number of harvesters or quantities harvested. Before designing a resource assessment and monitoring process within the overall management plan, you need to ask yourself several questions:

- What is the overall objective (e.g., maintaining a viable population of a target species; maintaining biodiversity values within the habitat, or maintaining ecological function, such as hydrology)?
- What resource assessment questions are you trying to answer? (See Box 2)
- What is the control? (For example, is the assessment comparing heavily harvested to unharvested sites?)
- What other factors are affecting the same resource (and how can these be distinguished from what you are monitoring)?
- At what spatial and temporal scales will you be working (i.e. what is the scale of change, how big, and where)? (See Box 4)
- How precise do you want (need) your surveys to be (e.g., precision of 5%, 10% or 20%) and what is the trade-off between cost and precision?
- Who will do the work, how participatory do you need to be, and what training needs are required before you start?
- Who will analyse the data?
- Who will act on the results (and who will translate the results into a suitable format for decision-makers)?
- How long will it be before decisions on resource management options will be made?

(Source: Cunningham, 2001)

Choices will need to be made concerning the degree of rigour needed to meet ISSC-MAP requirements (and compliance levels for ISSC-MAP) and who will do the monitoring (see Box 4). The main choices are: professional monitoring, participatory (collector / community) monitoring, or no monitoring at all. These choices imply different levels of precision, cost, and complexity. Decisions need to be carefully made, as assessment and monitoring can divert scarce resources away from conservation or other priorities while being of little management value (Sheil, 2001). On one hand, if the costs of a highly rigorous approach are unaffordable, then implementation is unlikely to happen, even at the basic survey stage, let alone relocation of a large sample size of randomly located plots. On the other hand, there is little management value in collecting anecdotal data.

Box 4. Participatory processes and "data-less management"

The results of inadequate monitoring can be both misleading and dangerous not only because of their inability to detect ecologically significant changes, but also because they create the illusion that something useful has been done. (Legg and Nagy, 2006)

There are successful cases that bridge the gap between scientific rigor and the need for local participation for resource management action. There are two common "bridges" over this gap. First, through participatory research, supported by good scientists, leading processes that retain stakeholder ownership of indicators, while improving the accuracy, reliability and sensitivity of data collection (Reed et al., 2006). Second, through expert scientists partnering with local people to develop precautionary approaches through combined knowledge – a process termed "data-less management" (Johannes, 1989). What Johannes (1989) pointed out for the complex marine systems he studied is as valid for adaptive management of medicinal and aromatic plants:

Data-less management does not mean management without information. Even in the remotest un-researched areas…it comes from two sources. The first consists of the knowledge gained from research on other, similar systems. The second source…is the knowledge possessed by fishers concerning their local marine environments and fisheries. This knowledge can be extremely useful for management purposes; in some areas it has proven to be encyclopedic.

Conventional biological training has focused our attention so single-mindedly on the rigorous quantitative description of … resources before committing ourselves to managing them, that we are liable to feel guilty if we diverge from this track – and worse still, may even criticize others who do so. But when vital resources are rapidly degrading…we often have neither the time nor the resources for such data-gathering. The choice is not between giving perfect or imperfect advice to managers. It is between giving imperfect advice or none at all.

Data-less and data-poor management are, under the circumstances, not just valid alternatives. They are an imperative. It may be argued that such activities are not science. But surely this is immaterial. Doing them well will not be easy, and success will depend heavily on good scientists helping … communities and government management agencies to plan objectives and controls.

Table 1 summarizes some of the methods used to enable the participation of local communities and collectors in resource assessment, with some notes on the contributions and advantages, as well as the challenges associated with these methods.

Table 1. Contribution of local knowledge and practices to resource assessment

Methods	Contributions / advantages	Challenges
Overall process Participation of local resource users / collectors in resource assessment and management	• Motivates and stimulates interest of local users / collectors • Reduced need for professional field staff and time in field • Local employment opportunities	• Need appropriate equipment, training, and compensation • Literacy and numeracy obstacles
Situation analysis Participatory mapping	• Mapping collection area • Mapping resource distribution	• Interface with "official" area maps
Situation analysis, assessment design Participatory Rural Appraisal	• History and general trends of resource use, collection, harvest impacts • Prediction of likely impacts of harvest levels and practices • Causes and history of other non-collection disturbances	• Participation of local communities / collectors in deciding what questions are important • Making local / collector engagement worth their time and effort
Harvest impact assessment and monitoring Local user / collector observations to collect field data	• Resource users perceptions as to why scarcity has arisen • Identify alternative harvest practices • Reassessment of local decisions on land-use options	• Setting quotas and human carrying capacities if appropriate • Development (or reassessment) of local rules which set limits on who or how many people will harvest from a set area and on harvest methods
Yield studies and monitoring	• Greater awareness of resource limits compared with demands • Change in harvest methods more readily understood and adopted.	• Use of local systems of measurement (with calibration to a more universal standard) • Development or reassessment of local rules / limits on harvest (e.g., number of harvesters per area)
Regeneration studies and monitoring	Local knowledge indicators • Change in distribution • Change in time required to collect a specific quantity	• Locate plots where a long history of collection has changed population structure, and at the resource frontier where the least collection has occurred.

Field work, record keeping
Use of field computers / palm pilots to record observations
	• GPS-linked data/records
	• Can overcome literacy and numeracy obstacles
	• Facilitates quick and easy data processing, storage, retrieval for analysis:
	  ○ Large amounts
	  ○ Over large areas
	  ○ Over long time
	• Can also be low-tech, e.g., dbh rulers using visual rating system and size-class symbols rather than a number scale.
		• High cost of equipment vs paper
		• Need strong technical support
		• Regular access to electricity, batteries, main computer to download data
		• May be most appropriate for conservation programmes and rural development projects
		• Use symbols or icons rather than numbers. E.g., icons need to illustrate rating systems, e.g., of harvest impacts

Source: Cunningham (2001)

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STEP I. SITUATION ANALYSIS

The situation analysis provides a foundation for later steps in the resource assessment process. The situation analysis should address not only the ecological factors that influence the sustainable use of a specific resource, but also social, legal, economic, and broader environmental factors[1]. The situation analysis contributes to:

- selection of target species with good potential for sustainable wild collection;
- information about the target species biology and what drives species population dynamics (see Box 5);
- correct identification of target species (even when collection is underway, local names or trade names may in fact cover several species in the same genus) (see Box 6);
- understanding and reducing the potential impact of resource assessment and monitoring methods on the target resource itself, on other species, and on the habitat;
- identification of gaps in knowledge and capacity; and
- understanding the level of effort and precision required in resource assessment methods and for ongoing resource management for the target species.

Box 5. Scale of disturbance and influence on medicinal plant resource management

Achieving sustainable harvest and effective management of medicinal plants requires us to deal with complex socio-ecological systems and in some cases, to support policy reform processes. Dealing with social, cultural and policy processes may seem complex enough – but we also have to realise that the factors driving the increase, maintenance, or decrease in plant populations may be beyond the species-population level. Dealing with factors causing habitat fragmentation is an obvious example. What is also required in many cases is to understand the disturbance requirements of species within particular habitats (fire, grazing, mowing). Forty years ago, as a last resort to save declining populations of *Orothamnus zeyheri* (Proteaceae), an endangered plant in the Cape region of South Africa, conservation staff used fire as a disturbance tool to stimulate germination from seed. In Europe, alpine pastures and meadows traditionally managed for hay have a high plant species diversity and high conservation significance (Myklestad and Sætersdal, 2004). In Switzerland, for example, viable *Arnica montana* populations are managed through maintaining grasslands by mowing, a disturbance regime that suits this species (Ellenberger, 1999). In temperate forest, the under storey medicinal shrub *Arctostaphylos uva-ursi* resprouts vigorously after the habitat is burnt or cut (Calvo et al., 2002). In forests, light demanding tree species grow best when canopy gaps form, or along forest margins, with some species geared to large-scale disturbance events (e.g.: due to hurricanes) (in "coarse-grained" forests), while others are suited to small gaps due to tree falls ("fine-grained"). This understanding is crucial for resource management plans.

At a global scale, even climate change through global warming can have serious implications for habitat-specific alpine medicinal plants. While it is not possible to deal with global warming in the short term, it is crucial to invest time in understanding what influences the population biology of medicinal plants at different spatial and time scales, so that we use appropriate tools to deal with each species.

[1]These include other environment and habitat factors (ISSC-MAP Section I), legal and ethical factors (ISSC-MAP Section II), as well as management and business factors (ISSC-MAP Section III) that influence whether the target species / resource can be collected in a sustainable manner from wild populations. (Medicinal Plant Specialist Group, 2007).

Box 6. Know your species

Knowing exactly what species you are dealing with is crucial for design of a resource assessment within an adaptive management plan. This may seem obvious, but often it is not. Trade names and local names may, in fact, cover several species in the same genus or even different genera, each with different responses to harvest, different habitat preferences, and different conservation status. The popular Chinese medicine *duhuo,* for example, refers to several *Heracleum* species. Conversely, many local names may refer to a single species. The southern African medicinal tree *Curtisia dentata*, for example, has eight different Zulu names. In addition, rising scarcity often results in substituting one herbal product for another, such as aphrodisiac bark from *Pausinystalia johimbe* being mixed with bark from *P. macroceras*, or *Ocotea bullata* bark substituted with bark from *Cryptocarya latifolia* or *C. myrtifolia*. To make sure you get the correct needed for a resource assessment, make sure you know which species you are dealing with. Good quality herbarium specimens identified at a national or international herbarium provide a good start. (See, for example, Lawrence and Hawthorne, 2006.)

The type of information that needs to be gathered, analysed, monitored, and considered within the collection management process will be different for each target species and collection operation. Procedures for carrying out a situation analysis are summarized in Table 2. The principal output based on the situation analysis should be a situation report.

Table 2. Summary of procedures for situation analysis

	Task	Notes on methods / related guidance
1.	*Planning* Select target species for ISSC-MAP application.	• In many cases, the target species has already been selected, based on existing or demonstrated potential for commercial wild collection. • In cases where target species are not yet selected, evaluation of conservation status (see Box 7 and Task 4 in this table) and the potential for sustainable wild collection (See Task 5 in this table, and Table 3) should be undertaken for candidate species, along with appropriate market studies.

2.	*Field work*
	Ensure correct identification of target species
		• Voucher specimens (with flowers, fruit, seed) from the collection / management area, authenticated by a taxonomist / botanical institution.
		• Field herbarium including identification aids (e.g. dried specimens, field guides, photographs, local knowledge of taxonomic indicators) for
		  ○ target species in each stage of the life cycle (e.g., juveniles, bark and non-reproductive structures)
		  ○ any other species that might be confused with the target species by the resource assessment team / collectors.
		• Training for resource assessment team / collectors.
		See Lawrence and Hawthorne (2006)

3.	*Desk and field work* Gather relevant information about the	• The ISSC-MAP principles, criteria, and indicators define much of the information required for the situation analysis. A

	Task	Notes on methods / related guidance

	target species and collection area.	questionnaire template based on the ISSC-MAP is provided in Annex 1. This template can be adapted for specific project situations.
		• Information sources should include:
		  ○ Published scientific sources
		  ○ Experts (ecologists, taxonomists, resource managers) familiar with the target species and the collection area
		  ○ Local community and collector knowledge and expertise (participatory processes, open-ended interviews)
		• Information about the target species should include:
		  ○ Conservation status (if known – see Box 7)
		  ○ Parts collected and related market requirements / quality preferences
		  ○ Current collection protocols (parts collected, preferred age/size-classes, methods, frequency and intensity
		  ○ Estimated volume/per area, history of collection
		  ○ Importance of the species for the company and collectors community
		  ○ Special functions in the ecosystem (e.g., ecological or cultural keystone species).
		• Information about the collection area should include:
		  ○ Ownership / resource tenure
		  ○ Ecological and social description of the area
		  ○ Identification of sensitive / protected species
		  ○ Protected or sensitive sites
		  ○ Maps
		  ○ Sites within the collection / management area not suitable for collection
		  ○ History of land use and management (e.g., wild plant collection, forestry, grazing, fire).

4.	*Analysis* Assess the conservation status of the target species	• The relevance of assessing conservation status according to IUCN Red List categories and criteria is summarized in Box 7. The IUCN Red List categories can be found in Annex 2 of this guidance document, and the complete categories and criteria in IUCN (2001). • To determine whether the global conservation status of the target species has been evaluated according to the IUCN Red List categories and criteria (version 3.1,2001): consult the website http://www.iucnredlist.org/search/search-basic and search for the target species (typing the Latin name in the text search box). • To determine whether the conservation status of target species has been evaluated according to national or sub-national (e.g., provincial) level criteria, consult the relevant species protection authorities of your country (e.g., national / provincial threatened species lists). • Collection must comply with any existing international, national, or sub-national requirements for protection. • Target species that do not appear on any of these lists may be threatened, but have not yet been assessed. These must be evaluated, at minimum, using IUCN RapidList

	Task	Notes on methods / related guidance
		(http://www.ramas.com/RapidList.htm), and preferably according to the full IUCN Red List global categories and criteria (IUCN, 2001). • Expertise in IUCN Red List assessment will likely be required (e.g., from the IUCN/SSC Medicinal Plant Specialist Group). In some countries, the botanical expertise required to complete conservation status assessments is available from botanic gardens, herbaria, and other research institutions. • For most ongoing collection operations, the collectors and resource managers will be able to contribute much of the information required on trends in population distribution and size required for conservation status assessment.
5.	*Analysis* Estimate the potential for sustainable wild collection.	• Information gathered during the situation analysis about the target species and the collection area can be used to make a preliminary estimate of the likelihood for sustainable wild collection (see the decision matrix in Table 3). • This information can also be used to estimate the levels of accuracy and precision likely to be required to conduct an adequate resource assessment and to monitor impacts of harvest. • This information can also be used to estimate the relative cost and complexity of resource assessment, monitoring, and management for target species. • These estimates are useful for selecting target species for commercial wild collection (Task 1 in this table), as well as for designing appropriate management plans.
6.	*Evaluation and reporting* Prepare a situation report	The situation report should include: • Descriptions of the target species and the collection area • Maps defining the boundaries of the collection / management area, key populations of the target resource, conservation or other sensitive areas for protection, trails and roads, communities, overlap with other management areas. • Proposed objectives of the resource assessment • Appropriate methods for resource assessment, including monitoring plans, levels of accuracy and precision • Available knowledge and capacity, as well as gaps in knowledge and capacity • Partners needed • Bottle-necks and critical interventions needed

Box 7. Conservation status assessment and the IUCN Red List

The IUCN Red List Categories and Criteria are intended to be an objective and widely applicable system for estimating and classifying the risk of extinction to species at the global level. This system for evaluating conservation status of species can be applied consistently by different people in different situations.

A Red List assessment can answer questions relevant to sustainable use of wild-collected resources, such as:

- How threatened is a particular species relative to other species?
- What are the threats to a species?
- How important are specific populations to the overall conservation status of the species?
- How do different factors (e.g., trends in population size and distribution) affect the risk of extinction?

Extinction is a chance process. Thus, a listing in a higher extinction risk category (see Annex 2) implies a higher expectation of extinction, and over the time-frames specified more taxa listed in a higher category are expected to go extinct than those in a lower one (without effective conservation action). However, the persistence of some taxa in high-risk categories does not necessarily mean their initial assessment was inaccurate. It may mean that they are receiving the careful and informed assessment, monitoring, and management needed to enable their survival.

The pre-assessment matrix in Table 3 outlines a number of conditions / factors of plant species and populations, many of which can be learned from the situation analysis. Using this knowledge, the pre-assessment matrix can be used to:

- assist projects in selecting species appropriate for ISSC-MAP applications (i.e., to give a rough indication of the likelihood of sustainable wild collection);
- identify important information gaps for conservation status assessment and resource assessment
- assist projects in determining the amount of accuracy and precision that will be needed to adequately assess and monitor the sustainability of harvest volumes and practices in the context of the ISSC-MAP; and
- estimate the relative cost and complexity of resource assessment, monitoring, and management for the target species and the collection area.

Table 3. Pre-assessment matrix for ISSC-MAP target or candidate species

Condition/factor			
***Geographic Distribution**	Wide	Limited	Restricted
***Habitat Specificity**	Broad (more even distribution)		Very specific (patchy distribution)
***Local Population Size**	Large	Medium to large	Always small
***Growth Rate**	Fast	fairly rapid	slow
***Part of Plant Used**	leaves, flowers, fruit	exudates, sap, dead wood *	whole plant, bark, roots, bulbs, apical meristems
***Single vs Multiple Use**	single or non-competing	few, low conflict between uses	multiple-use species
Single vs multiple groups of users	One company or community of collectors	More than one company / community collects, but with clear management agreements	More than one company / community collects without management agreements
Reproductive Biology			reseeders, weak resprouters
• **pollination**	wind, abiotic, asexual	common biotic (birds, insects)	highly specific (beetles, bees, bats) Australia/So. Africa
• **dispersal**	wind, water	common generalists (birds, small mammals)	large mammals and large birds
***Ecosystem complexity**	vegetation dominated by few species (<5)	low diversity (e.g., savannah) (<10 tree spp./ha)	high diversity systems
***Conservation status and value**	Collector knowledge and other indicators suggest stable and surplus species abundance, distribution, or quality		Collector knowledge and other indicators suggest reductions in species abundance, distribution, or quality
Phylogenetic distinctiveness	Large genus (e.g., *Astragalus*)	Medium – large genus	Monotypic family or genus (e.g., *Nardostachys*)
	↓	↓	↓
Likelihood of Sustainable Wild Harvest	**HIGH**	**MEDIUM**	**LOW**
Precision, accuracy required for inventory, monitoring, and management	**LEAST**	**MEDIUM**	**GREATEST**
Costs and complexity of monitoring and management	**LOW**	**MEDIUM**	**HIGH**

Based on Cunningham (2001) and Peters (1994).

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STEP 2. RESOURCE INVENTORY

The central question for a resource inventory, in the context of the ISSC-MAP, is:

How much of the target species is present within the collection area?

An inventory provides information about the quantity (sometimes called the "standing stock") of the target resource by estimating both resource density (number per unit area) and abundance (total number in a specified area).

An inventory of the target resource provides a base line for monitoring changes in resource quantity in the collection as a result of collection management or other impacts. Resource inventory results can also be used to:

- locate the most efficient and effective collection / management areas for a target resource (combined with information from vegetation and land-use mapping);
- define appropriate management and monitoring scales (e.g., population, species, habitat)
- estimate the sustainable harvest limit of the target resource (combined with yield study and recovery time data); and
- examine the population structure and dynamics of the target species (combined with regeneration and demographic study data).

A summary of procedures used for carrying out a resource inventory is outlined in Table 4. Appropriate methods and approaches for collecting baseline inventory data must be selected case-by-case, depending on characteristics of the target species, the collection site, and the collection operation that have been examined and documented during the situation analysis (Step 1). Important things to consider include:

- collector / community participation enables community members to plan and conduct the inventory, and to compile, own, and use the inventory results. Non-community members might be involved as facilitators, advisors, or trainers.
- using local knowledge and skills, as well as existing research capacity and skills;
- location and arrangement of sampling sites for inventory and subsequent monitoring (There are many factors to consider in the location and arrangement of sampling sites for inventory and monitoring. These are summarized in Annex 3.); and
- appropriate accuracy and precision versus costs/ time and budget constraints (e.g., equipment, expertise, time and labour, combining one study with other studies, ease of access to target resource collection area / terrain – see Box 8).

Table 4. Summary of procedures for base-line inventory

	Task	Notes on methods / related guidance
1.	*Planning* Define the focus and scope of the inventory	Purpose, area, target resources/populations, other data (e.g. habitat, landscape) – see Stockdale (2005), pp 146-7.
2.	*Planning & field work* Establish / select sample populations of the target	• Selection of appropriate sites for evaluation of harvest impacts; location of control plots If target species are

	Task	Notes on methods / related guidance
	species in plots or transects.	collected from different areas / habitats under different types of environmental pressures, it is important to assess these different conditions. • See Annex 3 on location and arrangement of sampling areas (plots, transects)
3.	*Planning* Determine minimum age/ size-class of individuals to be included in the inventory.	• Less abundant species → use smaller diameter age / size-class or plant height as cut-off = greater rigor/more precise inventory • Rules of thumb: o large canopy trees: ≥ 10 cm DBH o Understory trees: 5 cm DBH o Shrubs, small palms: 50 cm age classes or • Take the interval between largest and smallest individuals, divide by the number of size-classes desired / required (e.g., 6-10) to obtain size/age class intervals. • The smaller the minimum size, the greater the time and costs involved in the inventory. • See Box 9 on age / size-classes and recovery after harvest, and Box 10 on age / size-classes for bulbs.
4.	*Field work* Count or estimate the number of individual plants in the target population(s) within the defined collection area [sample populations] and, when counting, measure size	• Some methods suitable for different plant life forms and types of resources are summarized in Annex 4 (e.g., diameter-at-breast-height (dbh) for trees, height for herbs, smaller woody species). • Care is needed to select methods suitable for patchiness of species distribution and habitat/vegetation types in collection area.
5	*Field work* Other observations	• Habitat, vegetation type • Soil type, conditions (degradation) • Impacts of other / outside harvesters can affect species and size-class selection. • Impacts of other uses (browse, fire, management for other uses) can have a larger affect on population dynamics than harvest.
6.	*Analysis* Calculate estimated resource abundance and density (and precision)	According to habitat type, age/ size-class, other relevant relationships.
7.	*Reporting* Prepare an inventory report	Data results tables, purpose and objectives of inventory, methods, results, conclusions.
8.	*Analysis* Use size and number data to determine population structure/ size-class distribution of target species	Plot data as a histogram for collection area, or different habitat types in collection area (see Figure 4). Few data are available for size-class distributions of wild populations

Box 8. Precision and costs of resource inventory

In one of the few studies of the time costs of resource inventories for management planning and monitoring, a 23% decline in a rattan population was the minimum rate that could be detected with a 95% confidence by two surveys a year apart, each with a precision of 10% (Evans and Viengkham, 2001). Given that even further declines are likely before management action may take place, it is a serious concern that the low precision in detecting major population declines are so difficult to detect. The level of effort for this level of precision is very high, however, requiring a team of 6 people 55 days for transect surveys for a single rattan species in 10 km^2 of forest. In this case, the survey time costs made surveys with greater than 20% precision unaffordable. A precision level of 5% would detect a 1% population decline, but would require an even greater level of effort – 158 days for a team of six people to undertake transects in 10 km^2 of forest. In many cases, medicinal plant harvesters use far larger areas in very rugged terrain. This extent of effort is just not practical in many countries. Careful consideration therefore needs to be given to inventory and monitoring methods.

Box 9. Plant age, rotation times, and recovery after harvest

Being able to age medicinal plants is of great value for understanding recruitment, the time taken to shift from one size class or stage to another and in developing matrix models of plant populations. Slow growing plants take much longer to make the transition from one size-class to the next and how low yields. The first size classes regenerate either from seed or through vegetatively as clones from the parent plant. Information on how a plant population is regenerating provides valuable data for resource management purposes and is widely used in management planning for sustained-use management.

Although techniques have been developed for ageing plants (see Cunningham, 2001, Chapter 4), this is unknown for most lowland or montane tropical species. Therefore, in contrast with life-tables for animal populations, which are usually based on age, studies of plant populations are generally based on size-class distributions. Measurements of stem diameter (or length) are made on the basic assumption that stem diameter (trees, bulbs or corms) or stem height (palms, tree ferns) reflects plant age. One of the reasons for making this assumption is that accurately ageing plants is difficult for most species, particularly in the tropics and sub-tropics. Tree stems, bulbs and corms get thicker as these plants grow older and diameter size classes are therefore used as the most appropriate measure for grouping them into size classes. Most palms and tree ferns have an apical meristem, growing upwards (longer) as they grow older more than they increase in diameter. For these reasons, stem length rather than stem diameter is a more accurate measure for assessing the population structure of palms, cycads, grass trees and tree ferns. Plants within a sample population are then grouped into size classes based on stem diameter (trees, bulbs) or stem length (palms, tree ferns). Indications of population structure indicate the chance of plants in one size class have in surviving into the next size class. These are used as a tool to understanding plant population dynamics, most commonly for trees.

Information on the age of harvested plants is a key to many issues in resource management. It also leads to a better understanding plant life histories. Where it is possible to age perennial plants, this provides valuable information for resource users, managers and researchers in predicting yields, understanding recovery times after harvest, and appropriate harvest rotations that reflect how long a harvested population takes to recover before it can be harvested again.

Slow growing, slow reproducing plants are known to be vulnerable to over-exploitation, yet we rarely know how old individual plants are or how long they live. This information is not only of great interest in developing resource management programmes, but also to local resource users, who often underestimate the age of slow growing (and therefore vulnerable) plant species.

Box 10. Medicinal bulbs: how old is what's sold?

Harvesting of medicinal corms, bulbs or tubers results in the whole plant being dug up. The impact of this destructive harvesting at a plant population level depends on size-class selection of the corm, bulb, or tuber and on the reproductive strategies of the species. The size-class of geophytes that are harvested and the proportion of the population removed have an important influence on recruitment of young plants (as larger, older plants produce more seed). Size also influences the ability of the species population to survive fires or drought.

Few data are available for size-class distributions of wild populations of medicinal plants harvested for bulbs or roots. This can be a very useful measure of population size-class distributions in sample populations, using bulb or lignotuber diameter, just as diameter at breast height (dbh) is applied in resource assessments and management of medicinal tree populations.

One of the few studies of medicinal bulb age for resource assessments showed that bulbs of Blue Squill (*Merwilla plumbea* (formerly *Scilla natalensis*) take at least 15 years to get to the preferred harvestable size (Williams et al., 2007). Bulbs with known ages, up to 25 years old, were examined. Some individuals probably live more than 50 years, yet in 2006, nearly 2.1 million wild-harvested *M. plumbea* bulbs were sold. This recent study showed that accurate age estimates can be derived from counting persistent bulb scales. Where land and resource tenure is weak, frequent harvest has a high impact on *M. plumbea* populations. Although this endemic southern African species is still abundant along the Drakensberg Mountain escarpment in South Africa, there are conservation concerns about this species at the margins of its range in Swaziland and in Lesotho. With increasing trade in herbal medicines, the complex interplay of harvest impacts, fire ecology and tenure need to be faced if viable wild populations are to be maintained in the long-term.

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STEP 3. YIELD AND REGERNERATION STUDIES

Yield and regeneration studies, together, estimate the sustainable harvest yield of a target resource. The central question for these studies, in the context of the ISSC-MAP, is:

> **How much of the target resource (quality and quantity) can be harvested season after season without damaging the long-term stability of the target species populations?**

Yield studies

The central question for yield studies, in the context of the ISSC-MAP, is:

> **How much of the desired raw material (quality and quantity) does the target species produce under natural conditions?**

Yield studies estimate the total harvestable yield -- the average amount of the target resource that can be collected from the collection / management area in one harvest (or one season, for plants that regenerate the harvested material).

Yield study results can also be used to:

- provide a baseline needed to balance demand with supply of the target resource (see Box 11);
- monitor the ecological impacts of collection (and other factors) on population structure and regeneration of the target species;
- delineate management zones (e.g., for rotating harvests of approximately equal yield) by providing information about different levels of the target resource yield across the collection /management area (combined with resource inventory data).

A summary of procedures for carrying out yield studies is outlined in Table 5. As for resource inventories (Step 2), appropriate methods and approaches must be selected case-by-case, depending on characteristics of the target species, the collection site, and the collection operation. Methods that promote community participation and the use of local knowledge and skills, and that allow appropriate levels of accuracy and precision, should also be considered. Advantages and disadvantages of combining yield studies with other studies and harvest activities are summarized in Annex 3.

Table 5. Summary of procedures for resource yield studies

	Task	Notes on methods / related guidance
1.	*Planning* Define the focus and scope of the yield studies.	• Resources / species to be studied • Size-classes included in the studies (e.g., only the size-classes of resources that would be harvested in a commercial operation). • Specify a standard harvesting method for the yield studies. • Define the type of "yield" to be studied: ○ Harvested yield = actual amount of resource harvested,

	Task	Notes on methods / related guidance
		or o Potential yield = amount possible to be harvested (but not actually harvested in the study)
2.	*Planning* Select sample populations to reflect variables likely to affect yield.	• Age / size-classes as defined through analysis of inventory results (Step 2) • Vegetation / habitat types (identified during the resource inventory, Step 2) • Objective system of sample selection (random or systematic) • Samples drawn from across the collection / management area • For long-lived species, mark the sample individuals (e.g., with paint) so that they can be included in the monitoring • Accuracy and precision considerations: o minimum of 3-5 individuals per size/age class and vegetation type (but same number of individuals from each) o maximum of 6 age / size-classes See Annex 3 on location and arrangement of sampling areas (plots, transects)
3.	*Field work* Measure or estimate the target resource yield of each individual included in the sample.	• Direct measurement requires actually harvesting the target resource. For resources considered too valuable to harvest during a yield study, yield may be estimated. • Local / collector participation: for species currently harvested, collectors can weigh, count, measure the actual amount collected during the harvest season, and estimate the amount of the resource left unharvested. • Measurements should be appropriate to the resource type and the primary user of the information (see Annex 4). Options include: o Counting (e.g., fruits, leaves) o Standard measurements of mass, volume, weight o Local measurements (e.g., arm-span) • Sampling may differentiate (observe or measure) relevant quality classes or resource grades (e.g., size, colour, flavour, shape)
4.	*Field work* Include observations that enable examination of relationships between yield and relevant factors, e.g., environmental.	Information about the forest type, topography, soil type and condition may already have been gathered during the resource inventory (Step 1). If not, they should be included in the yield study.
5.	*Analysis* Calculate or estimate the total harvestable yield (number of target species individuals in each age/size class x productivity)	Total target resource quantity of collection site: (i) The yield of the target MAP plant part for each plot (e.g., yield of 1 plot) = number of individuals of 1st size class x average weight of plant part of 1st size class (g or kg) + number of

	Task	Notes on methods / related guidance
		individuals of 2nd size class x average weight of plant part of 2nd size class (g or kg) + etc. (ii) (Maximum) yield of the target resource in the collection site = $\frac{\text{sum of the yield of all plots (kg or tonnes) x size of collection area } (m^2 \text{ or ha or } km^2)}{\text{size of 1 plot x number of plots } (m^2 \text{ or ha})}$ Other useful calculations using yield data: • relative yield per hectare, indicates vegetation types (or locations in the collection / management area) with the highest / lowest yields of the target resource • relative yield per age / size-class, indicates the most / least productive age/size classes in the collection / management area Stockdale (2005) describes these calculations.
6	*Ongoing field work and analysis - monitoring* Repeat yield studies over several years. Use multi-year data to construct an average yield curve.	• Yield can vary from year to year (season to season), depending on weather and other variables. • Use data collected over several years to produce a yield curve (see Figure 3). • Yield curves can predict estimated annual production of harvested products according to plant size-class or on yields on a standing biomass/area basis.

Sources: Cunningham (2001), Peters (1994, 1996), Stockdale and Corbett (1999), Stockdale (2005), Wong et al. (2001).

Box 11. Factors affecting yield

In trying to reach a balance between demand and resource supply, it is important to know how much of a resource is produced within a known area. In the long-term, yields are influenced by the regeneration rate of the medicinal plant populations, which are influenced in turn by other factors such as the effects of harvest, seed predation or animal browsing.

Methods described elsewhere (Cunningham, 2001) for measuring plant size (diameter, length), volume, age, stem or foliage biomass, bark volume or directly counting annual leaf or fruit production are useful tools in this process. The study area would usually have been mapped on the basis of information from harvesters and an inventory of selected species carried out. In even-aged stands of fast growing species with annual aboveground production, such as *Cymbopogon* grass, an estimate of annual yield can be a relatively simple task, particularly when there is just a single use or where harvest impacts do not conflict with one another. In most cases, however, yield assessment is more complex, requiring measurement of yields of products from marked plants in different size-classes and plant density and size-class data from inventories to extrapolate annual yields to an area basis (eg: tonnes/ha/yr).

Yields often vary from year to year as well as with site differences in addition to variation with plant size (or age) class. For this reason, yields need to be measured over several years. Yield curves can then be developed to predict estimated annual production of harvested products according to plant size-class or on yields on a standing biomass/area basis. This information is of great practical value in making resource management decisions. Involving local harvesters in yield assessments

can usefully lead to a greater awareness of the limits to resource yields compared to demand. This in turn can lead to development (or reassessment) of local rules which set limits who or how many people will harvest from a set area, on harvesting methods. In common with stakeholder participation in other forms of monitoring, local participation in yield studies requires motivated people back up by training and good export advice (see Pilz et al., 2006).

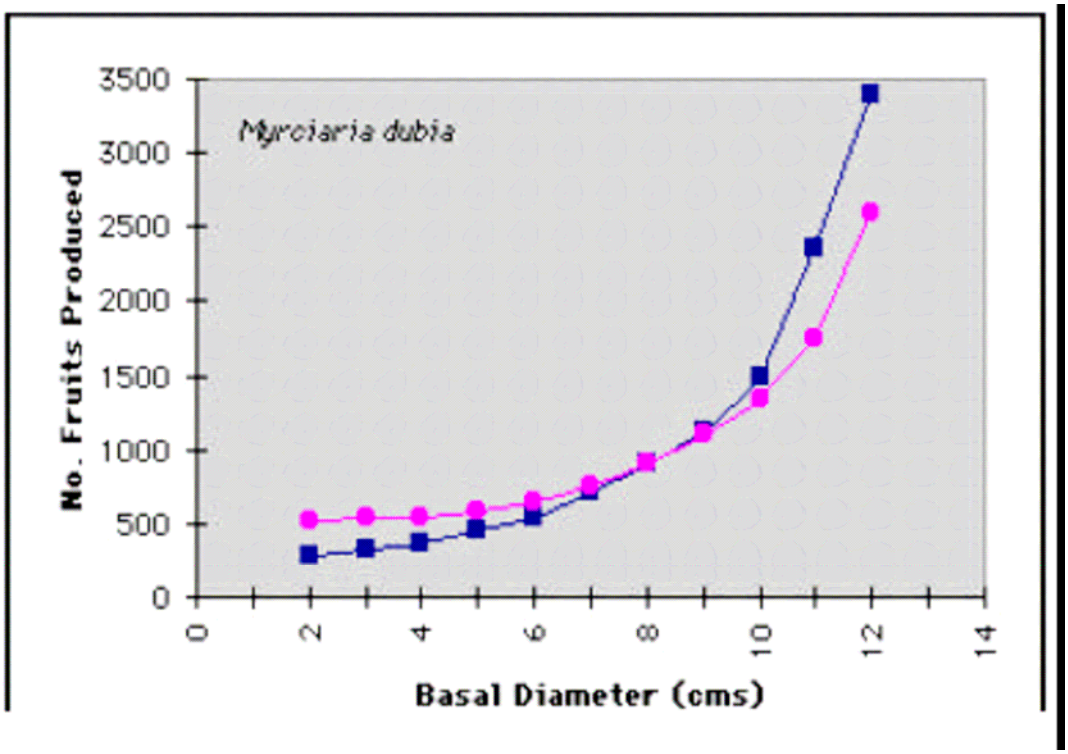

Figure 3. An example of yield curves showing annual fruit production as related to tree size for *Myrciaria dubia* plants growing in the lowlands of Peruvian Amazonia. Two years of fruit production data are shown. (Source: Peters, 1994)

Regeneration studies

The central questions for regeneration studies, in the context of the ISSC-MAP, are:

How does harvest affect recruitment of young plants into the population?

What is the regeneration rate of harvested populations / individuals?

Combined with resource inventory and yield data, regeneration studies estimate the sustainable harvest limit of the target resource. Regeneration studies can also be used to:

- compare the impact of different harvest treatments or management practices on target resource populations;
- monitor changes in population size and structure of a target resource; and
- estimate recovery time (the time taken for new plants to grow from seed to harvestable size);

Regeneration studies provide information about the impact of harvest on the long-term productivity and quality of the target resource by:

- detecting changes in the size-class distribution of the target species populations;
- monitoring the rate of establishment of new seedlings in the target population; and
- monitoring the density of seedlings and saplings in the target resource populations.

A summary of procedures for carrying out regeneration studies is outlined in Table 6. As for resource inventories and yield studies, appropriate methods and approaches must be selected case-by-case, depending on characteristics of the target species (see especially differences between "reseeders" and "resprouters", Boxes 12 and 13), the collection site, and the collection operation. Methods that promote community participation and the use of local knowledge and skills, and that allow appropriate levels of accuracy and precision should also be considered. To reduce field time and effort, regeneration studies can be undertaken together with resource inventories and harvest impact assessments.

Table 6. Summary of procedures for regeneration studies

	Task	**Notes on methods / related guidance**
1.	*Planning and field work* Establish a network of permanent regeneration plots throughout the collection / management area.	• Number of plots depends on current abundance of seedlings and samplings in different parts of the collection area. • High density populations require a smaller number of plots; scattered low-density populations require a more intensive sample. • Permanently mark each plot, map its location, or describe in sufficient detail to enable re-location. Forestry or plant ecology expertise may be needed to lay out an appropriate network of plots.
2.	*Field work* Observations and measurements	• In each plot, count and record the number of seedlings/saplings that are smaller than or equal to the minimum age/size class included in the inventory (Step 2). • Correct identification of young age classes of the target species is essential, and may require assistance of a taxonomist and training for field team members. • Data collection will be easier and faster if plants can be tallied according to size-class rather than measuring every individual included in the sample (e.g., group tree seedlings and saplings into height classes 0-50 cm, 50-100 cm, 100-150 cm, 150-200 cm; diameter classes 1-10 cm, etc.) • Smaller size-classes will be needed for herbs, shrubs, smaller trees, etc.
3.	*First analysis* Prepare a size/age class structure histogram and compare with inventory (baseline) results.	• Group plot results into the different vegetation types in the collection area and average the measurements for each size-class. • Estimate density and abundance for each combination of factors, e.g., vegetation type, size-class. • Combine these results with inventory data to construct a

	Task	Notes on methods / related guidance
		size-class histogram, providing a complete picture of population structure from seedlings to large adults (see Figure 4).
4	*Analysis* Assess current regeneration status of target resource	Use histogram to evaluate whether the number of young individuals in the target population(s) = the number of adults that will need to be replaced due to collection, natural death, other impacts.
5	*Ongoing field work and analysis - monitoring* Re-inventory regeneration plots periodically and compare with previous results.	• Re-inventory regeneration plots to monitor change in the number of seedlings and saplings recruited every approx. 5 years (or more frequently for recovery time studies). • Observations should include the survival or death of individual plants, and the size of the surviving plants. • Reduced rate of seedling establishment can be an indicator of over-harvest amongst obligate reseeders (see Boxes 12, 13) • Other factors (such as lack of disturbance, for example fire) may also play a role (as for *Orothamnus* described in Box 5). • If seedling/sapling numbers are declining (below base-line regeneration rates), harvest levels/practices are not sustainable and need to be reduced (see Figure 5). • If seedling/sapling densities remain above the base-line regeneration rate, the current level of harvest is likely sustainable. (Population structure and regeneration – see Stockdale 2005, p. 67)

Box 12. Regeneration surveys

Regeneration surveys add to the knowledge required for sustainable harvest. Harvesting roots, bark, exudates or stems from adult trees can result in reduced flower and fruit production. If this occurs, then the number of young plants in the population may decline. Even the efficient collection of an excessive numbers of large seeds from trees that produce relatively few large fruits can have a long term impact. The way in which plants reproduce therefore needs to be taken into account in better understanding resilience or vulnerability. Categorising plant species in terms of where they are on the continuum from "reseeders" (which regenerate primarily from seed) to "resprouters" (which reproduce clonally through production of new shoots) (Appendix XX), gives useful insights into the potential for sustained yield harvest and for the design of regeneration studies.

An investment of time and effort in long-term regeneration surveys monitoring the fruit harvesting impacts may be very appropriate in tall tropical forest, for example, where many canopy trees regenerate from seed (Peters, 1994). Medicinal seed harvests of *Carapa guineensis* would be a good example. A similar focus on regeneration from seed would not be a priority for long-lived medicinal species that are vigorous resprouters, as relatively few seedlings may bear no relation to frequency of those species in the forest or thicket canopy.

Regeneration is generally studied through establishing a series of plots scattered throughout the harvested area. Seedlings and saplings of focal species are counted within each plot. Where the focal species are medicinal trees, these young plants are usually tallied into height classes. For medicinal bulbs and corms, diameter size classes are used. Regeneration plots are then periodically re-assessed. Depending on the time and resources available, separate samples of

young seedlings can be tagged to assess survivorship. Where possible, particularly in cases where medicinal species are not yet exploited, it is important to locate plots within unharvested areas for comparison. In many circumstances, this isn't feasible, but if it is possible, comparisons between harvested and unharvested sites are the most straightforward way to assess harvest impacts. Many factors can lead to population decline, so careful studies are needed to assess harvest impacts in relation to other factors.

Box 13. Characteristics across a continuum: long-lived reseeders vs. resprouters

Reseeders

- examples are common in the Proteaceae, Pinaceae, Ericacae and Podocarpaceae
- regenerate from seed, some maintaining canopy seed-banks ("serotiny")
- are single-stemmed, not multi-stemmed. Examine smaller shrubs closely. Some reseeders are single stemmed, but branch off close to the ground, giving the incorrect impression that they are multi-stemmed reseeders.
- don't resprout when the stem is cut
- usually are self-pollinated or have diverse pollinators
- vulnerable to extinction if dependent on specialist pollinators or seed dispersers
- seeds often germinate faster than those of reseeders
- produce abundant seedlings (a large "seedling bank")
- have higher growth rates than resprouters, as they allocate nutrient resources into growing upwards, rather than into underground storage organs. As a result, reseeder species in a particular vegetation type tend to be taller than resprouters.
- most short-lived compared to clonal resprouters
- often are habitat specialists (wetlands, moist montane sites, cool temperate forests)
- annual reproductive output is generally higher than in resprouting species

Resprouters

- maintain "bud-banks" rather than seed-banks, regenerating clonally by sprouting rather from seeds
- often multi-stemmed, some shedding stems as they get older
- produce new stems from buds which are above or below ground level (basal or upper trunk sprouting)
- cut stems show obvious signs of resprouting (but be careful here : resprouting vigour declines when trees are cut low down and with tree size or age)
- may have large underground storage organs (rhizomes, tubers, ligno-tubers) or lateral runners (eg: many forest lianas)
- recruitment from seed is infrequent and irregular
- may be pollinator limited, but can still maintain long-lived clonal populations consisting of a genetically identical clonal organism (the **genet**) which is made up of **ramets**, sprouted from buds each of which has the potential to grow and reproduce as independent, individual plants.
- few seedlings in the population, most small plants are ramets;
- grow slower than reseeders, as they have to put resources into underground storage organs and into protection and production of buds
- usually generalists, found in a wide variety of habitats, rather than habitat specialists

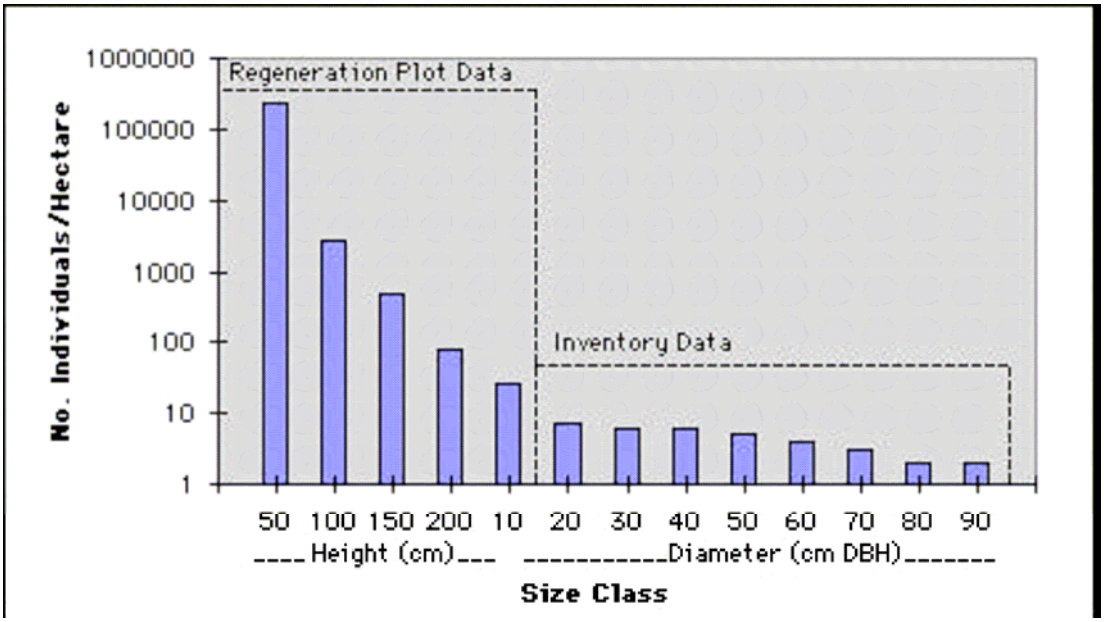

Figure 4. Size-class histogram for *Shorea atrinervosa* population illustrating the use of both height and diameter classes. Data from regeneration plots have been grouped into four 50 cm height classes and one 1.0 - 10.0 cm diameter (DBH) class. Inventory results are divided into eight 10 cm (DBH) diameter classes. Numbers shown along x-axis represent the upper size limit of each class. Note compressed, logarithmic scaling of y-axis due to the large range in values (e.g. from 3 to 250,000). (Source: Peters, 1994)

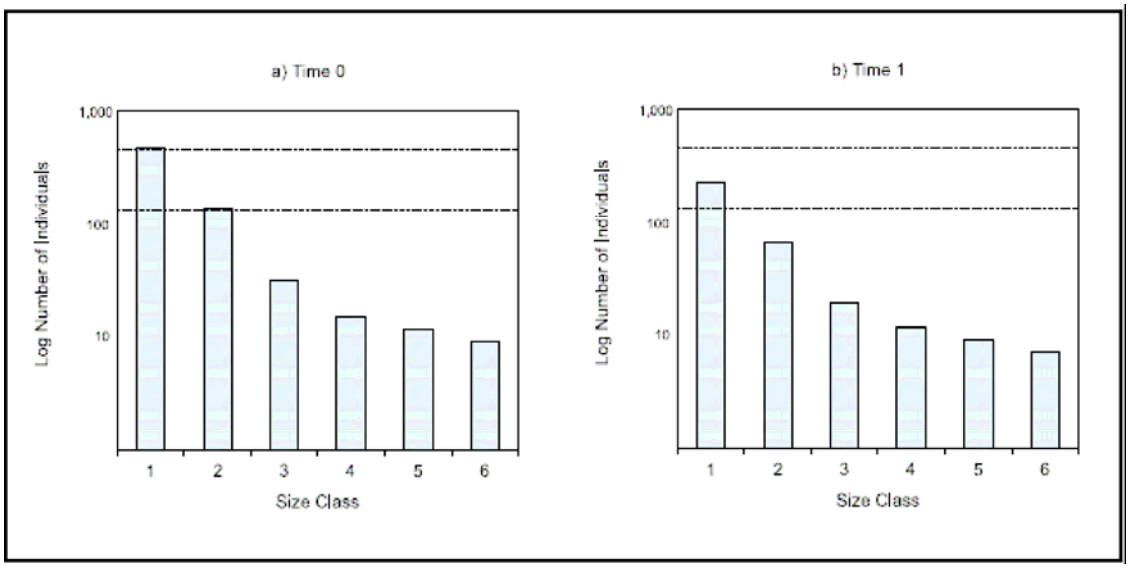

Figure 5. The regeneration size class structure at: a) the time of the first study; and b) five years later (adapted from Peters, 1996, by Stockdale, 2005). In this example, the number of young plants has dropped, indicating over harvesting.

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STEP 4. ASSESSING HARVEST IMPACTS

The central questions for assessing harvest impacts, in the context of the ISSC-MAP, are:

What is the impact of the current harvest protocol on the target population and ecosystem?

A harvest impact assessment provides information about the effect of specific harvest treatments (different intensities, frequencies, and methods) on the target resource (reproduction, growth, survival, vigor, yield, quality). This information is needed to define a sustainable harvest protocol for the target resource that takes into account site-specific variables.

Harvest impact assessments can also be used to:

- evaluate whether current harvest protocol is more or less successful in maintaining the target resource than alternative harvest treatments;
- evaluate the costs in time, money, and equipment of different harvest treatments;
- provide a visual appraisal of productivity and quality of target resource during ongoing harvest activity, enabling early detection of negative impacts, before a reduction in the rate of seedling recruitment occurs; and
- improve management practices (adaptive management).

Harvest impact assessments need to consider Important variables that influence harvest impact, including:

- nature, frequency, and intensity of harvest;
- whether harvest methods are destructive or non-destructive. (It can't be assumed that all harvest of fruit, for example, does not damage individual plants or the resource population. Often branches are removed or whole trees felled to harvest fruit.);
- recovery and regeneration time (see Step 4);
- climate and other environmental factors (e.g., temperate species may be more vulnerable to over-harvest than tropical species); and
- management practices (use of additional management techniques) and scale of management (individual, population, species, collection area, community / ecosystem).

A summary of procedures for carrying out harvest impact assessments is outlined in Table 7. Appropriate methods and approaches must be selected case-by-case, depending on the characteristics of the target species and the nature of the harvest. Local (collector) knowledge and skills can provide important insights to identify relevant harvest variables to test, and to design efficient test methods that can be carried out by harvesters during the normal harvest period.

Table 7. Summary of procedures for assessing harvest impact

	Task	**Notes on methods / related guidance**
1.	*Planning* Define the resource population to be sampled.	Some assessments may need to focus on more than one species or more than one plant part. Most assessments of harvest impact should focus on individuals in the age /size-classes considered harvestable.
2.	*Planning* Define the harvest practice or practices/treatments to be tested, and the impacts on individual plants and populations to be examined.	Individual plants: effects of seasonal timing of harvest, timing of harvest in the plant life cycle, nature / frequency / intensity of harvest, size of individuals harvested on rates of growth, survival, reproduction; vigour, yield, quality. Populations: effects of seasonal timing of harvest, timing of harvest in the plant life cycle, nature / frequency / intensity of harvest, size of individuals harvested on population structure and dynamics. Include among experimental treatments: • practices actually used by collectors • non-harvested control individuals / populations, if available, or • harvesting along an intensity / frequency/ etc. gradient, most to least.
3.	*Planning & field work* Select appropriate sampling units and design (random, systematic)	Permanently marked resources (impact on target resource individuals) • Best for testing harvest impacts on resource growth, survival, vigour, yield, quality • Only useful for resources non-destructively harvested • May be less costly in time and effort or Permanent plots in the collection area (impact on target resource populations) • Best for testing harvest impacts on population structure, regeneration • Can be used for destructively or non-destructively harvested resources • May be more costly in time and effort (however, plots established for yield studies can be used for harvest assessments, because they include a representative sample of different size-classes and vegetation types in the collection area). High density populations require smaller number of plots; lower density, scattered populations require a larger number of plots For species that require more rigor and precision, caution, etc.,

	Task	Notes on methods / related guidance
		an experienced ecologist should be engaged to assist in laying out the plot network.
4.	*Training* Pilot assessments, trials to ensure consistency and accuracy of observations.	Hold field-based workshops to ensure that collectors and other members of the monitoring team understand and properly record the specified observations.

5.	*Field work*
	Record harvest impact observations for individuals or plots selected.
		Observations of harvest impact can be made during the regular harvest period. Visual rating systems for some types of harvest impact (e.g., crown health, bark removal, and root damage) facilitate involvement of collectors in making and recording these observations (see Box 14 and Figures 6-8).
		
		<u>Individual plants</u>
		• Survival and vigour
		  o Signs of mortality / sickness
		  o Evidence of harvest (cut stumps or leaves, bark or root removal) (See Figures 6-8)
		• Reproduction (number of seeds, fruits produced per individual; aborted flowers, fallen young fruits)
		• Yield of target resource (e.g., fruit production) by long-lived individuals (periodic monitoring)
		• Growth rates / growth increments (diameter, length, height, number of stems per clump, percentage ground cover, etc.)
		• Retrospective observations (Cunningham, 2001, p. 133)
		• Simulated harvest (control vs increasing, successive levels of harvest, e.g., 25, 50, 75, 100% / 30, 60, 100%)
		
		<u>Populations</u> of the target species
		  • Demographic changes in the sample populations.
		  • Shifts in regeneration.
		  • Shifts in yield curves.
		
		Plant <u>communities</u> / <u>habitat</u>
		• Trampling of seedlings, damage to other plants
		• Changes in species composition, relative abundance and density.
		• Observed population level changes for:
		  o Pollinators, frugivores, granivores who rely on the target species
		  o Alien and invasive species.

6.	*Field work* Other observations potentially relevant to harvest impact response of target species	Use of additional management techniques vs individual and population growth rates: • Sparing of individuals • Size restrictions • Overstory light management • Thinning • Transplanting • Coppicing

	Task	Notes on methods / related guidance
		• Replanting plant parts (seeds or vegetative) Kinds and levels of anthropogenic pressure: • Forest cutting (creation of secondary forest) • Frequency, intensity, time since burning • Types of timber extraction practiced in conjunction with harvest of target species Other pressures: • Fungal / pathogen infestation • Insect attack • Browsing Management of habitat: • Agroforestry • Enrichment planting Impacts on communities • Effects of fruit, seed, and flower harvest / enrichment planting on composition and diversity of frugivores, granivores, pollinators • Creation of habitat for invasive species and other changes in species composition Impacts on ecosystems • Biomass removal and soil nutrient levels • Plant harvest (esp. roots) and soil erosion Costs of different treatments in time, effort, money.
7.	Estimate sustainability of current level of harvest	Data from harvest records (± level of precision), compared with sustainable harvest limit (Step xx). These data can be broken down into different quality classes, different users, different uses, if these data have been recorded. These data can be helpful in distributing the resource harvest equitably among different harvesters.
8.	Monitor harvest impact	Compare data from harvest records with previously collected data. • Destructively harvested resources: yield per unit area a good indicator of resource quantity in the study area. • Non-destructively harvested resources: yield in combination with resource quality, reproduction, growth, survival, vigour indicates harvest impact.
9.	Carry out long-term studies	Some species reallocate stored reserves to growth and reproduction after defoliation and other harvest stress. Short-term studies will therefore not adequately assess harvest impacts over the longer term.

Box 14. Harvest impact assessment methods

Ideally, the effects of harvesting need to be studied on the same sample population over time in established permanent plots, which are periodically resurveyed. In many cases there have been no previous field studies of focal medicinal species and consequently no permanent plots for comparative work. It is useful to establish permanent plots, but harvest protocols can also be developed through assessing harvest impacts along a gradient from places where harvesting impacts are high to where they are low (or absent).

It is often useful to combine quantitative botanical or forestry methods with methods that incorporate the insights of local people, but this can influence your choice of sampling method. If local resource users are involved in resource inventories or monitoring impacts, then it can be worthwhile using systematic sample plots along transects rather than randomly located plots, which local resource users often feel "waste time" (due to the time required to set up the plots). The limitation that this places on statistical analysis due to lack of random plots is often repaid by the insights of local resource users during joint fieldwork. Issues such as size-class selection can be linked to the practical field assessments of stem and leaf harvesting, root removal, bark damage or tree crown condition.

Crown conditions reflect tree health generally (Cunningham, 2001). Trees or shrubs can show die-back of the canopy as a result of age, bark or root removal, or fungal infection as a result of bark or root damage. The crown health rating system, developed by Dawkins (1958), can be used together with the rating systems for bark or root damage, described in Boxes C.3 and C.4, respectively, for a fuller understanding of plant health and its causes. The ratings are defined as follows (see Figure C.1):

0 = Perfect: excellent size and development, wide, symmetrical and generally circular.
1 = Good: slightly asymmetrical with some dead branch tips.
2 = Tolerable: marked asymmetry, some dieback.
3 = Poor: extensive dieback, leaves form less than half the original crown size.
4 = Very poor: badly damaged, unlikely to survive.
5 = Dead.

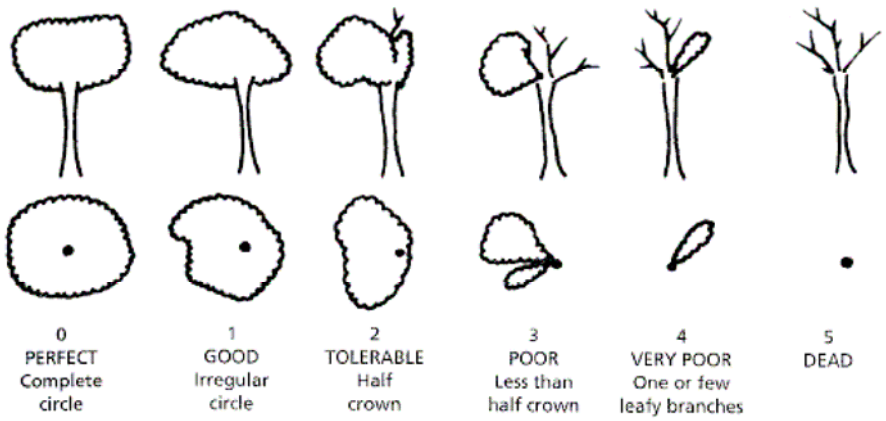

Figure 6. A visual rating system for tree crown health. (Source: Stockdale, 2005, from Cunningham, 2001, based on Dawkins, 1958).

Cunningham (2001) has developed a rating system for assessing the level of damage due to bark removal. The ratings are defined as follows (see Figure C.2):

0 = No damage.

1 = Small patches removed (<10% of trunk bark).

2 = Larger patches removed (10-25% trunk bark).

3 = Large strips removed (26-50% trunk bark).

4 = Extensive bark removed (51-75% of trunk bark).

5 = Ring-barking or girdling, where bark is completely removed around the trunk. This leads to death in many tree species.

6 = Complete girdling, all bark removed. At this stage, trees or large branches may have been felled or trees climbed to maximize bark removal.

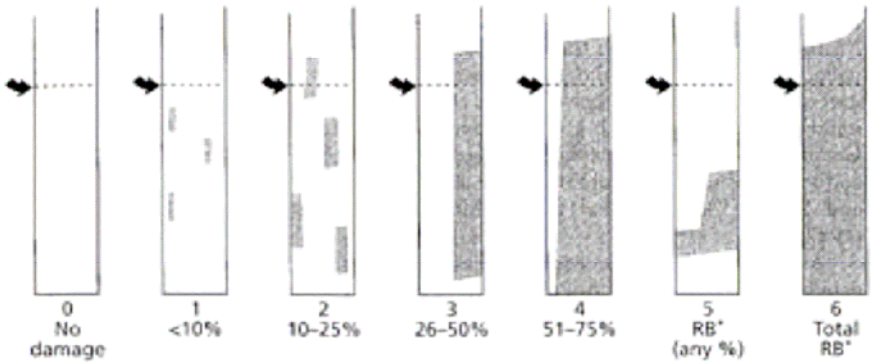

Figure 7. A visual rating system for bark damage (Source: Stockdale, 2005, from Cunningham, 2001).

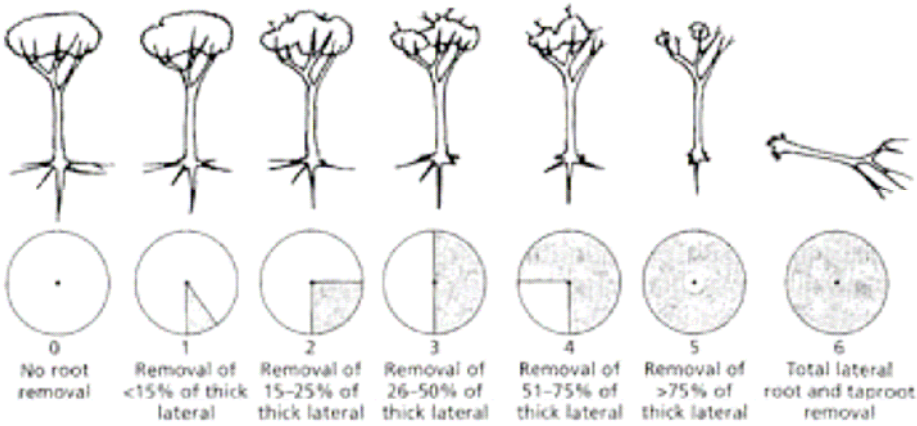

Figure 8. A visual rating system for root damage. (Source: Stockdale, 2005, from Cunningham, 2001).

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STEP 5. PERIODIC MONITORING AND HARVEST ADJUSTMENTS

The central questions for monitoring and harvest adjustments, in the context of the ISSC-MAP, are:

Is the management action (harvest protocol) successful in sustaining harvest quality and quantity?

Is the target resource maintaining base-line yields and population regeneration?

What adjustments can / should be made to allowed harvest protocols to maintain resource quality and quantity for future collection cycles, and to avoid undesired impacts on the target resource and the environment?

Monitoring provides periodic qualitative and quantitative information about:

- yield, growth, and vigor of harvested (long-lived, non-destructively harvested) individuals in response to harvest and other impacts;
- yield and regeneration of the target resource population in response to harvest and other impacts; and
- sustainability of the collection operation using the current harvest protocols.

Caution: if conservation status assessment of the target species (see Step 1) indicates that the species is threatened (small or declining populations, increasing fragmentation and habitat degradation, etc.), the base-line inventory, yield, and regeneration data cannot be treated as those of stable and self-sustaining populations. Adjustments of harvest protocols and other management interventions must have reducing harvest impacts and increasing yields / regeneration to sustainable levels as their principal objectives.

A summary of procedures for periodic monitoring and making harvest adjustments is outlined in Table 8. Important things to consider include:

- the purpose of monitoring;
- participatory monitoring by the harvester community (see Box 15); and
- third-party monitoring for certification / consumer assurance.

Table 8. Summary of procedures for periodic monitoring and harvest adjustments

	Task	**Notes on methods / related guidance**
1.	*Planning* Design a monitoring plan	• Define monitoring objectives • Select monitoring indicators • Decide on methods for measuring and monitoring indicators • Develop a plan for monitoring and evaluation activities
2.	*Field work* Monitor target resource individuals and	• Focus on target resources (individuals) included in normal harvest activities

	Task	Notes on methods / related guidance
	populations	• Include any additional target resource populations selected for monitoring
3.	*Field work* Monitor and record relevant environmental conditions	Keep site-specific records of: • Temperature and rainfall • Fire, grazing, and other disturbances
4.	*Paper work* Keep harvest records	Harvest records should include: • Amount of targeted resource harvested (% of yield) • Quality of target resource • Harvesting practices used • Observations of harvest impacts <u>Destructively harvested resources</u>: • Yield per unit effort: quantity harvested vs time spent looking for harvestable individuals or distance walked between harvestable individuals <u>Non-destructively harvested resources</u>: • Permanently marked resources, monitored for harvesting practices, yield, quality, reproduction, growth, regeneration / survival, vigour.
5.	*Analysis* Estimate current harvest level	Relevant information includes: • Quantity requested by buyer • Quantity harvested (different sites, age & size-classes, etc.) • Quality of material harvested (size, colour, flavour, shape, etc.) (different sites, age & size-classes, etc.) • Quantity/quality sold • End use(s)
6.	*Adaptive management* Make adjustments to the harvest protocol if required	Given the following conditions, current harvest levels and protocols can be considered sustainable: • The global and local populations of the target resource are not threatened (See Step 1, IUCN categories and criteria) • Regeneration studies and monitoring indicate that seedling / sapling densities remain equal to or above baseline levels • Yield studies indicate that availability of the target resource is not decreasing • Harvest assessments indicate that vigour, productivity, and other factors are not a concern If any of the above conditions are negative (loss of vigour, decreased productivity, reduced regeneration or yield), adjustments must be made in the frequency, intensity, and/or manner of harvest. Possible adjustments include: • Reduce the number or alter the size-class of harvested individuals; • Reduce the proportion of the collection area harvested in a given season;

	Task	Notes on methods / related guidance
		• Adjust harvest methods to make them less damaging to individual plants or the surrounding habitat.
7.	*Monitoring, field work* Carry out long-term studies	• Some species reallocate stored reserves to growth and reproduction after defoliation and other harvest stress. Short-term studies will therefore not adequately assess harvest impacts over the longer term. • Changes in other factors (settlement, land-use changes chance events such as fire, annual climate variations and climate change, etc.) can also affect yield and regeneration.

Box 15. What ecological, economic conditions favour participatory monitoring?

There are many cases where a long history of medicinal plant harvest is reflected in traditional / local collector knowledge of the resource (an example involving *Nardostachys grandiflora* and *Neopicrorhiza scrophulariiflora* is described by Ghimire et al., 2004). This knowledge represents a useful resource for participatory monitoring as well as the option of "data-less management" (Johannes, 1989). These may provide cost-effective alternatives to professional monitoring, but will require expert evaluation for verification that the ISSC-MAP criteria are being met. To help with decision-making on the effectiveness of participatory monitoring programs compared with options such as harvest closure or unmonitored exploitation, Hockley et al (2005) developed a framework for determining when stakeholders could be expected to adopt monitoring programs and how much they may be expected to contribute. In doing so, they asked several key questions, which are equally relevant to medicinal plant monitoring and management:

- Under what ecological and economic conditions will local communities want to manage and monitor their resources?
- If these conditions are met, are local communities are able to establish institutions to undertake monitoring and management?
- When is it desirable that local stakeholders should monitor (i.e., not just when people will have the incentive to monitor)?

The main factors influencing stakeholder "Willingness to Contribute (WTC)" were: **resource values** (cultural values and the lost opportunity costs of sustainable harvests (or not harvesting) compared to over-exploitation), **security of resource tenure**, **vulnerability to overexploitation**, **ease of monitoring** and finally, whether monitoring and management did improve yields (i.e.: **what benefits were there**?). Resilient resources benefited little from monitoring and management. Nor was there WTC to monitoring and management of highly vulnerable resources with low sustainable yields that required intensive monitoring and management. In testing their decision framework on a high value (freshwater crayfish) resource harvested by local people in Madagascar, Hockley et al (2005) found that a monitoring programme with sufficient statistical power to detect declines would be extremely costly in terms of local people's effort. As a result, they concluded that stakeholders WTC was unlikely to be high enough to make direct monitoring crayfish populations a viable option. Catch Per Unit Effort (CPUE) methods, on the other hand, could yield useful results, but were poor at detecting declines and could be misleading. Similar conclusions are likely for medicinal plants: what is most likely to succeed is participatory monitoring of high value, less vulnerable species that are relatively easy to monitor. (See Table 3)

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CONCLUSION: RESOURCE ASSESSMENT AND MANAGEMENT PLANNING

Resource assessment is an essential part of managing a sustainable wild-collection project or commercial operation. Resource assessment supports the development of collection protocols that do not deplete harvested populations of the target resource or damage their long-term survival.

Some wild-collection operations may need to develop stand-alone management plans. In many cases, however, a management plan for a target resource will need to connect with a larger management framework, such as an existing multi-species area management plan. Within any scale of management framework, however, the resource assessment should:

- document and define sustainable yield, regeneration, and harvest levels
- describe the methods used to determine these values, as well as their accuracy and precision;
- specify sustainable collection protocols, including collection limits, frequency, intensity, and methods;
- describe how specified protocols will be adopted, encouraged, or enforced;
- set out a schedule of monitoring and review of collection protocols;
- document harvest adjustments made over time, and why; and
- assign responsibilities, including those of local communities and collectors, for each part of the resource assessment process
- estimate the associated costs and provide a financial mechanism to cover them.

A management plan that fulfills these expectations will need to be written down. For most organized commercial operations, this will be essential. Commercial wild-collection that relies on a large number of small-scale collector groups or individual collectors will find a written management plan to be a larger challenge. Local harvesters rarely make formal written management plans. However, there can be advantages for them to do so. Developing a management plan enables stakeholders to communicate their planned management approach to people not as actively involved in the decision-making process (a third-party certifier, for example). However, recording a plan in a written document may challenge traditional ways of transmitting knowledge and alter power relations in favour of those with a formal education. Moreover, developing a management plan may prove too challenging for the existing resources or capacities in the community. Developing and implementing a management plan that meets requirements for sustainable wild collection under these circumstances will require participatory methods, financial support, and long-term commitment from all involved.

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GLOSSARY

Bark (stem / twig)	overlaying wood as the outer layer of stems, branches and roots of woody plants, namely trees. It usually consists of three layers: cork, phloem and vascular cambium
Collection area	= management area
Cryptic species	a cryptic species complex is a group of species which satisfy the biological definition of species, that is, they are reproductively isolated from each other, but they are not morphologically distinguishable (or at least are not readily or reliably distinguishable on a morphological basis)
Dioecious species	Male and female flowers on separate plants
Exudates	include gums, rubber, resin, balsam, and plant sap; exudates extracted from plant parts after harvest are treated as the respective plant part or plant part group
Geophyte	Plants with underground storage organs
Herb	refers to the aerial plant part of herbaceous MAP, and to (annual) vegetative, green or soft shoots of woody MAP
Leaf	above-ground plant part used for photosynthesis; plant organs of respiration and transpiration
Method	A means or manner of procedure, especially a regular and systematic way of accomplishing something. Orderly arrangement of parts and steps to accomplish an end.
Monocarpic species	Plant species that flowers and sets seed only once during its life cycle.
Monoecious species	Male and female flowers on different parts of the same plant
Population structure	Size-class distribution of a population
Procedure	A method or manner of proceeding; a way of performing or effecting something.
Protocol	A plan, as for a scientific experiment; or a code of conduct.
Recovery time	The time required for plants to grow from seed to a specified (e.g., harvestable) size.
Recruitment	Addition of new individuals to a population (for plants, by growth and reproduction)
Regeneration	Replacement or repair of tissues or organs lost through damage (e.g., harvest); used commonly to refer to vegetative propagation in plants.
Reproductive parts	include all organs and parts of inflorescences and flowers at all different stages from flowering to fruiting; e.g., calyx, petal, stamen, pistil, fruit, and seeds
Resource abundance	The total number of resources in a specified area.
Resource density	The number of resources per unit area.
Resource inventory	An estimate of the quantity of a resource population in a specified area.
Size-class	A division or group within a sample population defined by a size range (e.g., diameter, height)
Strategy	A plan of action intended to accomplish a specific goal.
Stratagem	A clever, often underhanded scheme for achieving an objective.
Underground parts	depending on harvesting methods, it is further divided into two groups: (1) partial harvest possible (e.g. rhizomes), and (2) partial harvest impossible (e.g. often in the case of bulbs)
Whole plant	includes the aerial and the underground part of a plant
Wood (stem / twig)	solid material derived from the stems, branches, and roots of woody plants, namely trees and shrubs; wood is mostly secondary xylem and consists of cellulose, hemi-cellulose and lignin

ANNEX 1.
SITUATION ANALYSIS QUESTIONNAIRE FOR ISSC-MAP IMPLEMENTATION

The following sets of questions are related to each section, principle, and criterion of the ISSC-MAP (MPSG, 2007).

- These questions indicate the scope of the situation analysis needed to prepare for management planning, including the elements of management planning that address conservation status assessment and resource assessment.
- Each project may adapt this approach to the specific project situation.
- Some of these questions may be answered through literature reviews. Others will likely require interviews with resource management authorities / government officials, traders, collectors, and affected communities.
- Participatory processes are encouraged.
- These questions provide a useful framework for a situation analysis report for implementation projects.

SECTION 1: WILD COLLECTION AND CONSERVATION REQUIREMENTS

Principle 1. Maintaining Wild MAP Resources

Wild collection of MAP resources shall be conducted at a scale and rate and in a manner that maintains populations and species over the long term.

1.1 Conservation status of target MAP species

The conservation status of target MAP species and populations is assessed and regularly reviewed.

- What is the conservation status of this species (national, regional or global)?
- How recent is this assessment?
- Have any population assessments been conducted (collection area, national, regional or global)?

1.2 Knowledge-based collection practices

MAP collection and management practices are based on adequate identification, inventory, assessment, and monitoring of the target species and collection impacts.

- What collection and management practices are in place for this species (this must capture any formal and community based management systems whether functional or defunct)?
- How is this species identified (need to find out if there is any taxonomic confusion)?
- Have any inventories or assessments of this species been conducted (e.g. is the collection area well defined)?
- Is there any ongoing monitoring of this species?

1.3 Collection intensity and species regeneration

The rate (intensity and frequency) of MAP collection does not exceed the target species' ability to regenerate over the long term.

- Is the harvest volume known and monitored (e.g. trade studies, harvest monitoring results)?
- Is there any known illegal/unmonitored trade
- Have any species regeneration assessments been conducted?
- Have any assessments into the long-term sustainability been conducted?

Principle 2. Preventing Negative Environmental Impacts

Negative impacts caused by MAP collection activities on other wild species, the collection area, and neighbouring areas shall be prevented.

2.1 Sensitive taxa and habitats

Rare, threatened, and endangered species and habitats that are likely to be affected by MAP collection and management are identified and protected.

- Are current collection practices known to negatively impact on other species or habitats?
- Does the collection area contain or overlap with any protected species (i.t.o. national, regional or international laws)?
- Does the collection area contain or overlap with IUCN Red List species?

2.2 Habitat (landscape level) management

Management activities supporting wild MAP collection do not adversely affect ecosystem diversity, processes, and functions.

- Are current collection practices known to negatively impact on the functioning of the MAP eco-system?

SECTION II: LEGAL AND ETHICAL REQUIREMENTS

Principle 3. Complying with Laws, Regulations, and Agreements

MAP collection and management activities shall be carried out under legitimate tenure arrangements, and comply with relevant laws, regulations, and agreements.

3.1 Tenure, management authority, and use rights

Collectors and managers have a clear and recognized right and authority to use and manage the target MAP resources.

- What is the land tenure regime in the areas where this species is being harvested (e.g. communal land, private land, etc)?
- Who is carrying out the harvesting (e.g. local people in the communal areas, employees of landowners, external traders etc.)?
- Who has the authority to authorise and manage collection?

3.2 Laws, regulations, and administrative requirements

Collection and management of MAP resources complies with all international agreements and with national, and local laws, regulations, and administrative requirements, including those related to protected species and areas.

- What is the permit system used for the harvesting of and trade in this species?
- Are there any problems with the current permit system?
- Are there any ways in which the permit system could be improved?
- Is there any unmonitored, unregulated or illegal harvest and trade?

Principle 4. Respecting Customary Rights

Local communities' and indigenous peoples' customary rights to use and manage collection areas and wild collected MAP resources shall be recognized and respected.

4.1 Traditional use, access rights, and cultural heritage

Local communities and indigenous people with legal or customary tenure or use rights maintain control, to the extent necessary to protect their rights or resources, over MAP collection operations.

- Are there any customary rights of access to the species (what are they)?
- If so, are these protected or honoured in the existing management or harvest regime (describe)?
- Are there any conflicts in relation to these customary rights (describe)?

4.2 Benefit sharing

Agreements with local communities and indigenous people are based on appropriate and adequate knowledge of MAP resource tenure, management requirements, and resource value.

- Are there any use (e.g. harvest, commercial, research or traditional) agreements in place with local communities?
- If so, what is the legal basis for these agreements (e.g. national, provincial, municipal or traditional)?

SECTION III: MANAGEMENT AND BUSINESS REQUIREMENTS

Principle 5. Applying Responsible Management Practices

Wild collection of MAP species shall be based on adaptive, practical, participatory, and transparent management practices.

5.1 Species / area management plan

A species / area management plan defines adaptive, practical management processes and good collection practices.

If answer to Q.1.2 confirms that there is a management plan then:

- Describe the management plan? (make sure answer includes reference to adaptive, practical and GCP's!)

5.2 Inventory, assessment, and monitoring

Management of MAP wild collection is supported by adequate and practical resource inventory, assessment, and monitoring of collection impacts.

- Describe the resource inventory and monitoring systems in place for this species?

5.3 Transparency and participation

MAP collection activities are carried out in a transparent manner with respect to management planning and implementation, recording and sharing information, and involving stakeholders.

- Who is involved in the management planning process and its implementation?
- Describe how these management plans are reviewed and revised?
- How do stakeholders participate in the day-to-day implementation of the management plan (need to find out specifically how affected communities, collectors, middlemen are involved)?

5.4 Documentation

Procedures for collecting, managing, and sharing information required for effective collection management are established and carried out.

- What are the procedures for collecting and sharing information required for implementing the management plan.

Principle 6. Applying Responsible Business Practices

Wild collection of wild MAP resources shall be undertaken to support quality, financial, and labour requirements of the market without sacrificing sustainability of the resource.

6.1 Market / buyer specifications

The sustainable collection and handling of MAP resources is managed and planned according to market requirements in order to prevent or minimise the collection of products unlikely to be sold.

- Is the collection of the species following specific volume and quality instructions from the buyer?
- If not, how do collectors decide how much and what quality of material required
- Further questions you could ask:
    - How is processing carried out by the harvesters before the material is sold?
    - What is the quality sold by the collectors?
    - Are there any problems with quality (e.g., insufficiently dried, dirty, includes taproots, confusion with other species during collection)?
    - How are these problems currently dealt with?

6.2 Traceability

Storage and handling of MAP resources is managed to support traceability to collection area.

- Are the main stages in the commodity chain from harvesting to export or sale known and documented (e.g. harvesters in the communal areas sell to buyers, who export directly, or sell to exporters)?
- Identify the main actors in the commodity chain (e.g. harvesters in North West Province, harvesters sell to company X or company Y.)
- Can the processed medicinal product in the market place be traced back to its point of collection?

6.3 Financial viability

Mechanisms are encouraged to ensure the financial viability of systems of sustainable wild collection of MAP resources.

- What are the current arrangements for purchasing the target resource from harvesters?
- What are the prices received by collectors / middle traders / wholesalers/exporters?
- Is it possible for collectors to ask higher prices for better managed and higher quality material in the current market situation? (e.g, are there very few sources of the material for the buyers, or do the collectors have to compete with many other collection sources?
- How is the price determined?

6.4 Training and capacity building

Resource managers and collectors have adequate skills (training, supervision, experience) to implement the provisions of the management plan, and to comply with the requirements of this standard.

- What are the strengths and weaknesses / gaps in the current knowledge and skills of resource managers (resource management authority, collection operation) in:
    - Resource assessment and monitoring?
    - Adaptive management process?
    - Participatory processes (working with collectors to assess and monitor harvest impacts)?

6.5 Worker safety and compensation

MAP collection management provides adequate work-related health, safety, and financial compensation to collectors and other workers

- What are the working conditions of the collectors?
- Are there health, safety, and economic risks associated with collection of this resource? What are they?
- How are illness, injury, financial losses related to collection of this resource handled, and by whom?

ANNEX 2. IUCN RED LIST CATEGORIES

EXTINCT (EX)
A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

EXTINCT IN THE WILD (EW)

A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.

ENDANGERED (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.

VULNERABLE (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.

NEAR THREATENED (NT)

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

LEAST CONCERN (LC)

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

DATA DEFICIENT (DD)

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available.

In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

NOT EVALUATED (NE)

A taxon is Not Evaluated when it is has not yet been evaluated against the criteria.

Source: IUCN (2001)

ANNEX 3. LOCATION AND ARRANGEMENT OF SAMPLING SITES FOR RESOURCE ASSESSMENT AND MONITORING

Sampling option	Relevant tools & methods	Advantages	Disadvantages (cautions)	Supporting guidance and information sources
Type of sampling area	Plots: square, rectangular, or circle	More efficient in capturing / characterizing diverse vegetation types or varied vegetation Easier to create larger sample sizes	Frustrating to local resource users / collectors participating in inventory and monitoring – individuals of the target species left out of sample plots Plots on sloping ground – location and measurements need to corrected for slope – the distance along a slope is greater than the corresponding horizontal distance)	Campbell 1989 Durr et al., 1988 In: Cunningham, 2001, pp. 163-64
	Square / rectangular		More plot perimeter (edge) effects per unit area sampled Greater chance of bias / error in deciding which individual plants on the border are “in” or “out” Measurements need to be taken more carefully	Peters 1996
	Circle plots	Least edge effects		

Sampling option	Relevant tools & methods	Advantages	Disadvantages (cautions)	Supporting guidance and information sources
	Transects • Belt transects allow sampling of vegetation at equal distances on both sides of a transect line	More habitats covered Inventory more representative of study area – cover a wider spectrum of microhabitats, allowing detection of subtle changes density or structure of sample populations Widely used method Accessibility: Narrow transects at right angles to a forest path Apparently preferred by local resource users	Edge effects Less efficient: sample size = 1 Need more short transects rather than a few long ones to enable statistical analysis	Cunningham, 2001, p. 161
	Point-centred quarter (PCQ) – determines patterns of species distribution from analysis of associated plants within patches = near-neighbour analysis	Enables sampling of micro-habitats Efficient in characterizing vegetation Minimizes damage to forest understory	No permanent plots or transects, therefore does not cover an exact area each time. Species richness is not related to area sampled Only 4 trees/sampling interval Labour intensive if large sample sizes are needed for statistical analysis	Cunningham, 2001, p. 162 / fig. 5.7a Campbell 1989
Arrangement of sample plots / transects Size of plots / length of transects	Random – selected by drawing numbers from a hat, using a random number table	Avoids bias Better for statistical analysis	Time consuming to locate, esp. in rough, forested terrain	Cunningham, 2001, p. 162

Sampling option	Relevant tools & methods	Advantages	Disadvantages (cautions)	Supporting guidance and information sources
	Systematic – arranged at regular intervals following a set pattern	Quicker and easier to locate for resampling	Acceptable for statistical analysis in situations where the individual plants are randomly distributed, but this rarely occurs in nature. Statistical assessment of precision or sampling error is not possible.	Peters 1996
	Stratified random			
	Depends on size and abundance of species and individuals in the target populations			
	Larger number of small plots / transects (more replicate plots)	Better for sampling target species in which small size-classes are preferred / collected Small plants with low populations density Better for statistical analysis	Labour intensive Greater chance of error in estimates of plant density If plots are too small, may get many plots without any individuals of the target species	
	Fewer but larger plots / transects	Better for target species in which the minimum cut-off size-class for sampling is relatively large (larger dbh) e.g., large trees Less time consuming Less error	Less statistical accuracy If plots are too large, too much time is required to sample all individuals of the target species in the relevant size-classes.	

Sampling option	Relevant tools & methods	Advantages	Disadvantages (cautions)	Supporting guidance and information sources
	Tiered plots (combine larger plots with smaller sub-samples within each plot)	Smaller diameter size classes can be more readily included Allows for equal amount of time spent sampling each of the relevant size classes.		Alder and Synott 1992
Sampling intensity – number of sampling units	Less intense (e.g., forest surveys, 5-10 % common)	Less precise	May not achieve appropriate level of precision	
	More intense	More precise	May not be required to achieve appropriate level of precision Require a random sampling design	Philip 1994 Peters 1996
Combining different types of studies requiring sampling	Inventory + yield studies • All relevant resources of harvestable size included in yield study • Systematic sub-sample included in yield study	Can save time, effort, and other costs if well planned	Yield study samples may not be: • objectively drawn from the sample resource population (systematic or random) enumerated in the inventory • evenly distributed across the management area • drawn in equal numbers from the relevant age / size-classes, vetation types, etc.. Additional sampling for yield study may be needed after the inventory is completed	Stockdale (2005)

Sampling option	Relevant tools & methods	Advantages	Disadvantages (cautions)	Supporting guidance and information sources
	Yield studies + on-going harvest of target resource	• Harvested resources are not wasted • Real-life harvesting practices are used	• Too many resources may be sampled from locations, age / size-classes, etc., and not enough from others. • Sampling may not be evenly distributed across the management area; • Additional sampling may be needed.	Stockdale (2005)
Statistical analysis		•		Sokal and Rohlf (1987); Zar (1998)

Source: Cunningham (2001) chapters 2 & 6

ANNEX 4. MEASUREMENTS USED FOR DIFFERENT RESOURCE TYPES AND PLANT FORMS

Resource type / plant part	Age	Size-class	Yield	Impacts of harvesting	"Typical" harvest protocols
Leaves	Time to die-off of marked / tagged new leaves	Length Petiole width		Experimental defoliation: effects of defoliation levels (eg., control, 30, 60, 100 percent) on growth rates (e.g., leaf size and production rate) of different size-classes. (Cunningham, 2001)	Specified % of the average annual biomass production of the individuals of each size class every xth year..
Fruits, flowers, seeds				Population level - of most concern for commercial harvest of reseeder plants that are dioecious or monocarpic Population level if whole plant is removed (of most concern for tall, difficult to reach) Individual level effects if branches are pruned. Philips (1993)	Monocarpics: seeds, fruit, flowers are allowed to be harvested from specified % of all flowering individuals every year; or specified % of seed, fruit, flowers produced in 1 year can be harvested
Exudates (gums, resins, latexes)				• Few studies • Bark and root tapping: Individual level, damage to bark layer, growth rates under different tapping frequencies and intensities, reproduction • Fruit: population level	
Bark	See woody trees	See woody trees	Thickness	• Point-scale rating of visible bark damage vs dbh.	Specified % of the average annual biomass production of

Resource type / plant part	Age	Size-class	Yield	Impacts of harvesting	"Typical" harvest protocols
				(Cunningham, 2001)	the individuals of each size class each xth year.
Stems / branches				Regeneration rates from seed, resprouting	Specified %of the average annual biomass production of the individuals of each size class each xth year.
Whole plant / apical meristem					Target plant parts of individuals ≥ minimum age class are allowed to be harvested Target plant parts of specified % of each size class are allowed to be harvested, every x years; x = time to reach minimum age class
Roots, bulbs, tubers, corms	Annual rings in perennial corms Leaf-base counts from longitudinal sections of bulbs Spent remains of annual corns and stem tubers	Diameter (growth is outward with age)		Few studies Field rating scale for root damage (recent harvest) vs dbh.	Specified % of the average annual biomass production of the individuals of each size class each xth year.
Woody trees	Annual rings in wood cores	Diameter at breast height (dbh) = 1.3 m from ground (but see Cunningham,		Rating scale for crown die-back (effect of bark or root damange) Non-destructive sampling methods in woody trees (Swart, 1980).	

Resource type / plant part	Age	Size-class	Yield	Impacts of harvesting	"Typical" harvest protocols
		2001, on tough customers) Canopy diameter			
Palms, cycads, grass trees, tree ferns, grasses	Leaf scars + known leaf production rate Stem height, length indicate plant age, but also growing conditions	Height, length (apical meristem grows upwards)		Palms well studied Retrospective counts of harvested leaves (Cunningham, 2001)	
Climbing palms, grasses		Length (rather than height, as much of the growth may be horizontal) Bamboo: diameter at a specific internode (e.g., 5th internode from the base) and height	Rattan: estimate of total length, converted to total wet weight using size-class specific conversion factors (Stockdale et al., 2003)		
Lianas / vines		Length and diameter			
Shrubs		Height and dbh			
Herbs		Height (most common)			Annuals: Target plant parts are allowed to be harvested from specified % of the total

Resource type / plant part	Age	Size-class	Yield	Impacts of harvesting	"Typical" harvest protocols
					harvestable yield every year. Biennials: Target plant parts are allowed to be harvested from specified % of the total harvestable yield every second year.
Special cases: clonal species, monocarpics, Fungi, etc.		Clonal species: clumps, stems, outer diameter, etc (Sutherland, 1996) in Stockdale 2005			Monocarpics: seeds, fruit, flowers are allowed to be harvested from specified % of all flowering individuals every year; or specified % of seed, fruit, flowers produced in 1 year can be harvested.

Sources: Cunningham (2001), Stockdale (2005), Lange (unpublished)

ANNEX 5. EQUIPMENT AND CAPACITY NEEDED FOR RESOURCE ASSSESSMENTS

Main skills required (Cunningham, 2001):

- Understanding what you see in the field
- Understanding what you hear from local resource users/harvesters
- Knowing key measurements needed to predict supply and monitor impact

(Source: Stockdale 2005)

Equipment and skills	Situation analysis	Base-line inventory	Yield studies	Regeneration studies	Harvest assessments	Monitoring
To establish and mark permanent plots and plants						
Scale map of the collection / management area	X	X		X	X	X
GPS recorder	Opt	Opt		Opt	Opt	Opt
Compass		X		X	X	X
Clinometer (to correct for slope)	Opt	Opt		Opt	Opt	
Surveyor's chain or nylon rope (30-50 m, marked in decimeters and meters)		X		X	X	
Compass staff and survey sticks		X		X	X	X
Bush knife	X	X		X	X	X
Durable wooden posts with metal tags (or metal stakes, PVC plastic pipes, or concrete beacons)		X		X	X	
Exterior grade emulsion (water-base) paint and/or metal alloy tags attached with metal wire (copper) or corrosion-resistant alloy nails		X		X	X	X
To measure plants						
Exterior grade emulsion (water-base) paint to mark the point of measurement		X			X	X
3 meter diameter at breast height (dbh) tape		X			X	X
Calipers (to measure the diameter of small stems)		X		X	X	X
Telescopic height stick (or long pole, marked in decimeters and meters)		X		X	X	X
Meter tape (10-30 m long)		X		X	X	X
Ruler (to estimate height)		X			X	X
Clinometer (to estimate height)		Opt			Opt	
Weighing scales		X			X	X
Binoculars		X			X	X
To record data						
Pencils and notebooks (or clipboards with data sheets)	X	X		X	X	X
To analyze data						
Calculator		X		X	X	X
Computer with spreadsheet software		Opt		Opt	Opt	Opt
Skills						
Planning and designing plots and tests		X		X	X	X
Statistical survey design and analysis		X	X	X	X	X
Taxonomy	X	X		X		
Plant ecology	X	X	X	X	X	X
Participatory research methods	X	X	X	X	X	X

Guidance Manual for Implementing the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP)

FRAMEWORK FOR DEVELOPING AN ADAPTIVE

MANAGEMENT PLAN

FOR SUSTAINABLE COLLECTION OF WILD PLANTS

SYLVIA WINKLER

REVISED BY WOLFGANG KATHE AND CHRISTINE LIPPAI

VERSION 01-2010

International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants

MEDICINAL
PLANT
SPECIALIST
GROUP

Preface

This guidance manual on ISSC-MAP Management Planning is intended to provide users of the ISSC-MAP (companies, collectors associations, resource managers, certifiers, etc.) with detailed, easy to understand information on contents and modes of creation of a Management Plan that aids compliance with the requirements of the Standard.

Structure

This guidance manual consists of three parts:

Part A includes an introduction, definitions and the basic principles and approach of resource management.

Part B deals with the preparation of an adaptive Management Plan, its implementation and monitoring. This part of the guidance manual is structured as a sample Management Plan, a matrix containing all chapters and contents required in the ISSC-MAP Standard. It also includes a chapter listing the required documents to be annexed to the Management Plan.

Part C comprises **Annexes** that provide formats or examples of required or suggested documents mentioned in Part B.

Each chapter of Part B of this guidance manual contains the following information:

1) ISSC-MAP criteria relevant to the corresponding chapter of the Management Plan are highlighted

These are the criteria set in the ISSC-MAP Standard for achieving a sustainable management system; i.e., in principle they must be implemented for ISSC-MAP certification or compliance.

Several procedures or actions might be necessary to fulfil one single criterion. Thus, some of the criteria will be relevant and, therefore, appear in more than one chapter or component of the Management Plan.

2) Management Plan content and supporting documents

Descriptions of the information that should be provided by the resource managers for each chapter.

Describes a separate document, which should be prepared and kept by the collection operation / resource manager, and includes procedures or steps to be followed to develop certain aspects of the Management Plan

Describes a formal document, which is issued by a third party such as relevant authorities, external experts etc.

Comments and Suggestions

These may include examples of procedures that have already proven to work well or explanations regarding the background of a certain requirement.

Table of contents

Part A: Introduction

What is a Management Plan?

A Management Plan is a written document in which the resource management sets out its goals and the approaches it will use to accomplish those goals in a given period of time. The ISSC-MAP Management Plan sets forth standards and procedures, responsibilities and work practices required to fulfil the principles of the ISSC-MAP Standard.

Why is a Management Plan needed?

The management of natural resources with the aim of ensuring their long term survival cannot be improvised. A Management Plan that has been carefully worked out is essential to guarantee the sustainability of wild collection and to ensure that activities are undertaken to protect the resource(s) and habitat(s) and that systems are in place to monitor the resource(s), habitat(s) and impacts of resource use.
A Management Plan also contains rules and responsibilities for all actors involved.

Who is responsible for the development of a Management Plan and who has to be involved?

The Management Plan should be developed by the responsible resource authority or resource management entity. The Resource Management is the person or organization that has the right to use and manage the area and its resources, and is responsible for protecting it from unauthorized or illegal activities (see box below).

In some cases, a collection operation may be developing and implementing the Management Plan, even if another organization (e.g. Forest Department or other authority) is formally responsible for resource management. It may be beneficial if the collection operation promotes the involvement of the formal resource management in order to get its long term approval of resource use and management.

Collectors' organizations and local communities affected by collection activities need to be actively involved in the development and implementation of the resource Management Plan. Care needs to be taken that participatory structures are developed to involve these stakeholders, Intellectual Property Rights are considered, and that Access and Benefit Sharing (ABS) provisions are observed if applicable (see ISSC-MAP policy on ABS). Local authorities, collection companies and other local stakeholders need to be involved at all planning steps so that they get a sense of "ownership" of and responsibility for the final plan.

Who is responsible for resource management?

In the case of public land, the Forest Department or similar authority is formally responsible for resource management. It is important that the responsible authority integrates all stakeholders, who use the resource and / or habitats, such as collection organizations or companies, into the decision making process, for example through establishing a Management Committee.
If the collection area is under the responsibility of one or more local communities, a collection company or collectors' group, the resource management will be carried out by these groups or a person or organization mandated with resource or area management. This is the predominant management structure on communal or private land or in the case of long-term lease agreements of state land.

If several collection companies work in the same area without an effective central management from the Forest Department or a similar institution, a **Management Committee** should be formed by the different companies, involving all relevant stakeholders. If possible, the responsible authority should be involved in all steps and informed of all planned activities. The Management Committee will be responsible for the development, implementation and monitoring of the Management Plan.

It is essential that the Management Plan works within the framework of existing national, supranational and / or regional legislation and other Management Plans which are in place in the area. These can be e.g. Protected Area Management Plans, land or forest Management Plans, communal development plans and others. Integration of Management Plans should be formalized and discussed with the relevant authorities and / or organizations at an early stage to avoid or sort out in time potential conflicts resulting from different interests.

When should the Management Plan be prepared?

Since the Management Plan must be adapted to the local situation and to the collected species, it can only be prepared once the overall situation of the operation has been defined and analysed. The following chapter provides suggestions on preparatory steps of Management Plan development (questions 1 - 3) and monitoring (question 4).

Leading questions: How to develop a Management Plan?

Question 1: What is the status quo? - Situation Analysis

All steps related to the situation analysis are covered in more detail in chapters 2 to 6 of the Management Plan Matrix (Part B of this document).

Step A. Defining the operation

The first step for the preparation of an adaptive Management Plan is the definition of the management and collection operation:

- Identification of the borders of the collection areas. A comprehensive description of the area (including habitat characterization) is important in order to identify sensitive species and habitats as well as potential sources of contamination.
- The target species must be accurately identified and their biological characteristics, extraction methods and effects on other species known and described.
- Definition of the collection operation: Is it a commercial company, a collectors' group or cooperative, local community collection and management? Is it a single collection operation or are there several companies / organizations / communities active in the area? Is a single species or a single part of the species extracted or are various species being collected and / or multiple parts of the same species used?

Step B. Review of stakeholders and existing management systems / collection practices

All activities that affect the collection area and the collected species should be identified. All management objectives should be considered (conservation areas, regeneration areas, etc.), all stakeholders involved identified (land owners and resource management, responsible authorities, traditional users, collection companies active in the area, collector groups etc.) and collection methods (traditional; scientific; etc.) reviewed.

Question 2: What is the objective of Management Planning?

Step C. Needs assessment

With information on the local situation in hand, the Resource Management is in a good position to assess what needs to be changed, adapted or improved in order to achieve compliance with the ISSC-MAP requirements.

- What aspects of the ISSC-MAP standard does the operation comply with already?
- What are the most critical and the most difficult requirements to comply with and what are the reasons for these difficulties?
- What needs to be changed, adapted or improved to achieve compliance with the ISSC-MAP?
- What steps will have to be taken or structures / mechanisms to be established to ensure continuous compliance with the ISSC-MAP?

Needs can be grouped into three categories, although some may fall into more than one category:

Biological needs

Needs related to the resource. Examples are:

- Increase of species and age diversity to provide long-term habitat stability;
- Adaptation of collection practices to reduce damage to the habitat(s) or collected plant(s);
- Research into optimum sustainable yield data.

Management needs

Needs of those involved in the short- and long-term management of the area and target resources:

- Adequate training and education of collectors to ensure sustainability of collection and to minimize waste caused by poor collection practices;
- Coordination of activities of different actors (e.g. collection operation; forest department);
- Improvement of documentation and record keeping to ensure traceability;
- Improvement of quality control to ensure that market / buyer requirements are met.

Community needs

Needs relating to how the local stakeholders and users perceive and interact with the natural resources / habitats and the Management Planning process, e.g.:

- Increasing awareness of the benefits associated with sustainable collection methods;
- Promotion of good collection practices through better understanding of the biological needs of the species;
- Foster community support for the Management Planning process.

Step D. Management objectives

Once the present situation and needs are known, the goals of the Management Plan can be set to address identified needs and to guide the development of the management strategy (see also chapter 1 in Part B of this document).

Question 3: How to achieve the aims of the operation?

The steps related to this question are addressed in chapters 7 to 9 of the Management Plan Matrix (Part B of this document).

Step E. Development of Management Procedures

The objective of this step is to develop management procedures that address the goals of the operation:

- What procedures need to be applied so that compliance with the ISSC-MAP can be ensured?
- Description of all management procedures, including their potential impacts (see chapter 9).
- The resulting management practices and internal collection and handling rules should be summarized in simple words.

Feasibility, practicality, legality, and economic viability should be considered in selecting appropriate management tools. The responsibilities of each party should be clearly outlined and include funding needs, training requirements, organization of the collectors and marketing.

- Exploration of funding opportunities;
- All key stakeholders should take part in the development process and take on clear roles and responsibilities;
- All involved parties must receive appropriate training and understand their commitments;
- The Management Plan should include all aspects required to meet ISSC-MAP criteria.

Minimal contents and considerations that need to be included in the Management Plan are outlined in Table 1 of this guidance manual.

Step F. Implementation of the Management Plan

Although a plan may appear ideal on paper, it cannot achieve anything unless implemented. This requires the commitment of financial and personnel resources to coordinate stakeholder meetings, organize training and capacity building and carry out other components of the management strategy.
It may take some time to implement the management strategy fully and reach ISSC-MAP compliance. Therefore, it is useful to map out an implementation schedule. As sourcing parameters and external factors affecting these are constantly changing, the Management Plan must be continuously adapted.

Question 4: Does the Management Plan achieve what it set out to achieve?

Step G. Monitoring, evaluation and revision of the Management Plan

The implementation of the Management Plan should be monitored regularly to identify its impacts and to ensure that its objectives are met. Evaluation provides the feedback necessary to determine whether the Management Plan is working. Regular monitoring as part of the management process allows timely identification of negative impacts and adaptation needs.
This step is being addressed in chapters 10 and 11 of the Management Plan Matrix (Part B of this guidance document).

Part B: Management Plan Matrix

- ***A species / area Management Plan defines adaptive, practical management processes and good collection practices [ISSC-MAP criterion 5.1]***

Part B of this guidance document is structured as a Management Plan. All chapters listed in the following table should be included in a Management Plan. In the following pages each chapter will be discussed and suggestions given on how to obtain the necessary information and develop the required procedures. The Resource Management Team is free to include additional requirements.

Table 1: Suggested **Contents of an ISSC-MAP Management Plan**

	Chapter	Type of Information/ subchapters
1.	Background	• Text outlining the main information about the area, structure of the wild collection operation, species targeted for collection, etc. • Goals and objectives of the Management Plan
2.	The collection area	• Description of the area • Identification of sensitive species and habitats • Protected areas or sensitive sites within or next to collection areas • Indication of populations of target species on maps • Maps of the entire area covered by the Management Plan (overview map; smaller scale detailed maps), including collection areas, type of vegetation, settlements, road or similar infrastructure, farming zones etc., as available • Sites not suitable for and / or excluded from collection
3.	Social and institutional situation	• Ownership of the collection area / tenure rights • Traditional uses and customary rights in the collection area • Identification of all stakeholders (organizations and individuals) • Other management objectives
4.	The target species	• Conservation status assessment • Description of the species, associated habitats and collection methods • Uses of the collected plant(s) / plant part(s) • Importance of the species for the operation, collectors' communities and other stakeholders • Specific functions in the ecosystem • Quality and market requirements
5.	Resource assessment information	• Resource assessment planning and methods • Resource assessment data (including brief analyses) • Resource mapping (marking of growing locations in collection plots)
6.	The collection operation	• Description and structure of the operator and the collection operation, including the national and international legislative context • Collectors (list of collectors, collector contracts, socio-economic context, responsibilities, accountability, collector payment, levies / taxes etc.) • Description of the responsibilities of the supervision body
7.	Working plan	• Management procedures and responsibility matrix • Management Planning steps and implementation time frame
8.	Internal instructions and procedures of the collection operation	• Internal Quality Standard • Instructions for collection and handling by collectors • Purchase procedures • Storage, processing and handling procedures • Training and capacity building • Product demand and market requirements
9.	Risk assessment and potential negative impacts: identification and strategies for prevention	• Risk assessment • Identification of negative impacts of management activities • Measures to prevent identified risks and negative impacts
10.	Monitoring and evaluation	• Monitoring objectives, indicators, procedures and responsibilities • Monitoring and evaluation intervals • Evaluation methods • Methods to be used to communicate monitoring and evaluation results
11.	Approval and revision of the Management Plan	• Approval procedure • Schedule outlining responsibilities for reviewing the Management Plan
12.	Annexes	• Documents / records that need to be annexed to the Management Plan

1. Background

1.1 Introduction

The introduction should include, *inter alia*, a brief description of the species in question and give an overview of the collection process, the need for and benefits of the Management Plan, any stakeholder consultations that took or should take place, and how the plan follows the ISSC-MAP's recommended structure.

1.2 Goals and objectives of the Management Plan

The provisions of the Management Plan should address clearly the stated goals and objectives. The context of the goals in terms of national legislation could be included here, as well as the anticipated outcome of the Management Plan.

Comments and Suggestions

- Goals and objectives should be apparent after the current situation has been described and analysed (chapters 2 to 6).
- To establish realistic goals, it is important to consider limitations posed by the level of stakeholder support, economic realities, and environmental constraints. Because of limited resources, the Resource Management may be unable to address immediately all identified needs. If this is the case, prioritisation will be necessary. Goals that require a long-term approach should not be neglected in favour of those that can be achieved quickly.
- Compliance with ISSC-MAP requirements should be integrated into the management objectives. For example, achievement of the 6 ISSC-MAP principles can be included in the objectives.

2. The collection area

- ***Rare, threatened, and endangered species and habitats that are likely to be affected by plant collection and management are identified and protected. [ISSC-MAP criterion 2.1]***
- ***Management activities supporting wild collection do not adversely affect ecosystem diversity, processes, and functions. [ISSC-MAP criterion 2.2]***

2.1 Description of the area

The area where wild collection is carried out needs to be clearly defined and its boundaries established. In order to fulfil this, this chapter should include information on:

a) Geographic location (e.g. GPS coordinates), altitude and topography
b) Size of the total area in ha or km^2
c) Exact identification of zones / sites of target plant occurrence and collection
d) Average temperatures and climate
e) Description of soil structure and characteristics
f) Description of prevailing habitats and plant communities

Collection zones:
These are the zones inside the collection area that are currently harvested by collectors; they do not necessarily correspond to the total range of the target species in the collection area. If optimum collection quantities are calculated based on the total size of the area, this may lead to over-harvesting in the portions (sub set of the total harvestable area) where collection is actually taking place.

2.2 Identification of sensitive species

All rare, endangered or threatened species (plants and animals) that can be found in the collection area need to be listed here (indicating their scientific, trade, international, national and local names).

The valid up-to-date national red list(s) of rare, endangered or threatened species should be available and consulted to find out, which species occur in or next to the defined collection area.

A list of sensitive species that are known from or likely to occur in the collection area should be developed, maintained and regularly updated.

If there is no up-to-date national list of threatened species, information on the occurrence of sensitive taxa in or near the collection area may be obtained from sub-national (e.g. provincial) environmental and conservation authorities, local nature conservation organizations, collectors, or researchers in universities.

The on-line global IUCN Red List of threatened species (www.iucnredlist.org) should be consulted for listed species that occur in the collection area.

When drafting the management plan, authors should keep in mind that many potentially threatened species have not yet been assessed according to national and / or global criteria.

Once a national list of rare, endangered or threatened species in the country is available, the Resource Management should check if some of these species grow in the collection area. Collectors and other stakeholders may be asked for information about the species' occurrence within or next to the collection area.

2.3 Identification of protected or sensitive habitats

Information on protected or sensitive habitats and ecosystems should be provided in this chapter with reference to any pertinent legislation that precludes off-take of the target species within these areas.

Comments and Suggestions

- To identify protected areas, follow the steps indicated in chapter 3 of this manual.
- Protected or sensitive habitats and ecosystems and related areas that need to be excluded from collection or that require extra precautions must be marked on the collection area maps (see 2.4 below).
- If there are issues surrounding look-alike species, these could be included in this section of the chapter.

2.4 Maps

Maps need to be available to indicate the location of all trails or roads, conservation areas and main infrastructure, settlements, farming areas, industrial zones, and collection areas at a scale that is useful for supervision of management activities and to facilitate onsite monitoring. All major sources of potential contamination must be indicated on the map and excluded from collection.

A set of maps should be available at each purchase station. Collection areas boundaries should be clearly marked, as well as obvious landmarks such as rivers, ouadis, large trees, hills, houses or huts etc. Maps must be detailed enough to allow rapid identification of:

- All purchase centres and processing facilities
- All collection zones / sites
- All conservation areas (protected areas, areas with special management objectives or sites of cultural or religious significance to local people)
- All trails, roads and settlements
- All potential sources of contamination such as industrial zones, quarries, farming areas and waste deposits.

2.5 Sites not suitable for collection

Sources of known or potential contamination need to be identified and excluded from collection. A corresponding list must be available at each purchase station.
No prohibited inputs (according to relevant organic standards) may be used in the collection area.

Confirmation:
A confirmation by the relevant authority, land owner or trustworthy expert statement that the collection area was not treated with prohibited inputs (as listed in the relevant organic regulation) during the previous three years should be available. Confirmations issued by the collection operation or related groups or individuals will not be accepted.

Comments and Suggestions

- If more than one company or organization is collecting in the area, the collection sites of the different companies need to be clearly indicated (e.g. in different colours). Potential overlaps should be highlighted.
- A suitable distance of the collection area from major contamination sources needs to be defined, e.g. next to roads, rubbish dumps, home consumption fields, etc. Intensity and nature of contamination, main wind direction and topography should be taken into consideration. In case of doubt, analysis of soil or plant samples can be necessary and required by the ISSC-MAP consultant or certifier.
- Collectors should be trained to avoid collecting in prohibited collection sites, and consideration should be given to creating a list of unsuitable collection sites; this could be included in the Internal Collection Rules annexed to the collector contracts.

3. Social and institutional situation

- ***Collectors and managers have a clear and recognized right and authority to use and manage the target resources [ISSC-MAP criterion 3.1]***
- ***Traditional use, access rights, and cultural heritage: Local communities and indigenous people with legal or customary tenure or use rights maintain control, to the extent necessary to protect their rights or resources, over collection operations [ISSC-MAP criterion 4.1]***
- ***Benefit sharing: Agreements with local communities and indigenous people are based on appropriate and adequate knowledge of resource tenure, management requirements, and resource value [ISSC-MAP criterion 4.2]***
- ***Transparency and participation: Collection activities are carried out in a transparent manner with respect to Management Planning and implementation, recording and sharing information, and involving stakeholders [ISSC-MAP criterion 5.3]***

3.1 Ownership of the area and regulatory system

The ownership, tenure, and / or use rights of the collection area need to be known and should be fixed over a timescale that is long enough to fulfil the resource management objectives.

- **Ownership of the area**: Land can be under different forms of ownership, e.g. state (mostly public land; sometimes land owned by state or sub-state rulers), community, or private ownership. In some cases, land can be owned by families rather than communities or individuals. Some indigenous peoples do not acknowledge the concept of land ownership but have customary resource use rights. Land owners may delegate land and / or resource management responsibility to other persons, groups or agencies.
- **Identification of the Resource Management body:** Up-to-date documents identifying the responsible management body need to be consulted. This could be for example the land titles, a lease agreement, a resource management agreement, a collection permit or land registry records.
- **Regulatory system:** Description of the mechanisms that are being used to control the effective functioning of the regulatory system. A summary of the methods used to ensure protection of the collection area from illegal collection, human settlement and other unauthorized activities.

3.2 Stakeholders and socio-economic context of collection

All stakeholders (e.g. collector groups, organizations, enterprises, individuals, state agencies, universities etc.), with an interest in using the target resource(s) or the collection area, or are likely to be affected by potential impacts of the collection operation, need to be identified and involved in the development and implementation of the Management Plan.

The socio-economic context of collectors and their families should be analysed and described. The analysis should include an overview of the sources of income, a description of collection practice and status of equity issues (gender; different religious or political affiliations; minority groups; etc.) and an overview of all forms of child labour in communities and collector families (including proposed remedial action or strategies where prohibited forms of child labour occur).

Comments and Suggestions

- If no collection permit system is in place, care must be taken to find out if more than one company collects the target species in the same area. In this case, all companies should be integrated into the collection operation and participate in the development, implementation and monitoring of management practices (e.g. through establishing a joint Management Committee or a species-specific working group that should work towards establishing a Code of Good Management and Collection Practice).

3.3 Traditional uses and customary rights in the collection area

Description of the traditional collection and use practices of the target species in the collection area. Identification of local communities and / or indigenous peoples with legal or customary tenure or use rights. In case where records exist of traditional use or access rights as well as concessions for using resources or sites inside the collection area, these records need to be made available to and respected by the Resource Management. The customary rights of local communities and indigenous peoples to manage collection areas and use the resources have to be recognized and respected.

Documentation of agreements and meetings with communities and traditional resource users.

Records of compensation payments and the development and implementation of access and benefit sharing mechanisms (ABS agreements or similar) need to be kept.

If applicable: An adapted guideline document on access and benefit sharing should be developed and annexed to the Management Plan.

Comments and Suggestions

To find out more about customary practices and rights, it may be useful to:

- Ask collectors about the activities of local or indigenous peoples in the collection area.
- Consult local resource authorities about traditional rights or concessions related to the collection area or target species.
- If the target species has been traditionally collected for local use in the area, the collection management should take this into account when developing collection guidelines. In order to determine the optimum sustainable yield and to assist with collection planning, the material collected for home use or local markets must be considered.
- A sufficient number of good quality plants must be made available to local communities. How this can be achieved should be described and included in the management activities.

If negative impacts on the rights of traditional users or local communities are identified (see chapter 9), measures need to be taken to mitigate or avoid these impacts. A process of fair compensation for the damage caused needs to be incorporated into the Management Plan, which should include participatory negotiation and consensus by the affected communities.

- ABS agreements must fulfil the following requirements:
    - comply with national / local legislation
    - be based on prior informed consent and mutually agreed terms
    - be based on adequate information regarding resource value
    - be adaptable in case of new knowledge and changing conditions

- The communities having the traditional knowledge related to the collected species have to be correctly and fully informed about the collection operation and the Management Plan and give their consent to the planned activities.

3.4 Other existing management systems and practices

The Management Plan needs to be synchronized with any existing management plan that refers to the collection area, such as protected area, forestry or other land or water management plans, local area development and management plans, or communal land user group management plans.

Comments and Suggestions

- The ISSC-MAP resource Management Plan should not override any existing rights and responsibilities of local people or any other management objectives but should strive to incorporate these into the Management Plan.
- In order to identify all traditional rights, responsibilities, protected areas and areas with special management systems, it can be useful to organize a workshop with collectors and other involved stakeholders (authorities, collection companies, etc.). Together, the main products from the collection area that are used can be identified (e.g. timber, firewood, grazing, fodder, wild collected plants), the main "services" of the area (e.g. water, biodiversity, wildlife, soil conservation, sites of cultural or religious significance, protected ecosystems) and the patterns of use rights can be described and documented.
- The Management Plan needs to be accessible on request.

4. The target species

For each species, the information required in this chapter should be available. If several species are collected, this chapter can be copied as many times as necessary. Alternatively, the form "Plant specifications" should be completed *(annex I)* for each plant / plant part and annexed to the Management Plan.

- ***The conservation status of target species and populations is assessed and regularly reviewed [ISSC-MAP criterion 1.1]***
- ***Knowledge-based collection practices: Collection and management practices are based on adequate identification, inventory, assessment, and monitoring of the target species and collection impacts [ISSC-MAP criterion 1.2]***
- ***Market / buyer specifications: The sustainable collection and handling of plant resources is managed and planned according to market requirements in order to prevent or minimise the collection of products unlikely to be sold [ISSC-MAP criterion 6.3]***

4.1 Conservation status assessment

The conservation status of each species and its populations targeted for wild collection according to the ISSC-MAP requirements should be evaluated.

- Endangered (E) and critically endangered (CR) species must not be commercially collected.

- Target species evaluated and determined to be vulnerable (VU) or near threatened (NT) may be collected under the following conditions:
    - Threats affecting the species are accurately identified in chapter 9 and management strategies are defined and implemented to reduce threats
    - The species is not considered as E or CR using national-level criteria
    - The requirements of the ISSC-MAP for assessing and monitoring sustainable harvest levels are fully met (see chapters 5 and 10).

Comments and Suggestions

- For information on how to determine whether the conservation status of the target species has been evaluated according to the IUCN Red List categories and criteria or according to national or sub-national level criteria, please consult the ISSC-MAP Resource Assessment Guide.
- Collection should comply with all relevant regulations. Even if a plant is not on the IUCN Red List, protected species in the target country or region must not be collected or might only be collected if all local, national or international requirements for protection are fulfilled.
- Target species that do not appear on any of these lists may be threatened, but have not yet been assessed. Please consult the ISSC-MAP Resource Assessment Guide for information on how to perform an assessment to determine the local conservation of the resource.

4.2 Description of the species and collection methods

Knowledge of biological characteristics of the target species as well as appropriate sources of information should be available.

Information about each collected plant:

- Botanical (scientific) name
- Common local, national, international and trade names
- Distribution within the collection area and collection sites
- Habitat(s) of the plant
- Part(s) of the plant collected
- Collection period and frequency
- Collection method: For each plant / plant part a detailed description of the harvest methods should be available.

Comments and Suggestions

- If not the whole plant is collected, the Management Plan should indicate which percentage of the collected parts is harvested per plant (e.g. “30% of the flowers of each tree”) or another type of estimate (e.g. “the lowest limb of a 100 ft tall tree is pruned off”).
- A good way to provide all basic information about the plants to the collectors is the development of “**Plant Monographs**” for each collected plant. An example may be found in the Wild Collection Manual developed by GTZ, IMO and SIPPO (an example is provided in annex II). However, a Plant Monograph does not replace the Plant Specification Form, as conservation status and resource assessment information is missing, but complements it: the aim of Plant Monographs is to provide a tool for correct identification, collection and handling of the species and should be kept simple.

4.3 Uses of the collected plant / plant part

The uses of the collected plant part (including local use) should be described. This includes uses for all purposes (such as alimentary, medicinal, ritual, cosmetics, decorative etc.) and all markets (home consumption; local; provincial; national; international; global markets). If figures for the annual demand of each of the use types and markets are known, they should be provided.

4.4 Importance of the species for the collection operation and collector communities

The aim of this point is to assess how dependent the operation or the collector communities are on a single species. If collectors or communities depend on a single species to make their living, they are commercially vulnerable and fully dependent on market dynamics, which may enhance the risk of over-harvesting of the species. An evaluation of the economic importance of each collected species to the collection operation, the collectors and their families should be presented in this section.

4.5 Specific functions in the ecosystem

If the target species has a specific function in the ecosystem, it needs to be indicated here. Examples of such functions are:

- Symbiotic relation with other species
- Erosion control
- Flood control or influence on water balance in the area
- Influence on light regime (e.g. shadow plants) within the ecosystem
- Shelter, nesting ground or material or food for animals

Information on specific functions can be found by researching botanical studies of the species, or researched through communications with plant experts and from discussions with collectors and other local experts or environmental organizations.

4.6 Quality and market requirements for the collected products

If applicable (e.g. if the target species is / are collected for commercial purposes), the collection operation needs to identify market needs. The characteristics and qualities required on the market might depend on the end use of the product (e.g. a product intended for pharmaceutical use has different requirements than the same product used for the food industry). Conducting a market study or include regular market surveys into the Management Plan can be beneficial for the operation. The industry should submit and market survey reports to the organization responsible for the Management Plan.

Collection managers should request written product quality specifications from interested buyers. These should also include requirements for the fulfilment of specific standards and / or respective certifications (e.g. DIN, ISO, Pharmacopoeias, USP, organic standards or the buyer's own standard).

5. Resource Assessment Information

- ***Collection and management practices are based on adequate identification, inventory, assessment, and monitoring of the target species and collection impacts [ISSC-MAP indicator 1.2]***

- ***The rate (intensity and frequency) of collection does not exceed the target species' ability to regenerate over the long term [ISSC-MAP indicator 1.3]***

In order to fulfil these ISSC-MAP requirements, baseline information needs to be available on target species' population size, distribution, and structure (age classes) in the collection area.

5.1 Assessment planning and methodology

Resource assessments vary in complexity depending on the size and complexity of the collection operation and on the assessment of the sustainability risk related to the collected species. They can be made by public (state) institutions, consultants, or trained company staff. However, it is important to ensure that the data collected is valid and reliable, since this information provides a basis for decisions made during later steps in the process. For information on resource assessment techniques, please refer to the ISSC-MAP Resource Assessment Guide.

5.2 Resource assessment data

Obtaining the following data should be included in the Management Plan (all required data can be taken from the resource assessment):

- Information on population size, distribution and structure
- Yield per ha in each area and periodicity of production (e.g. annual cycles)
- Availability, viability and quality of the target plant / plant part in the collection area
- Regeneration analysis of the target species
- Proportion and distribution of mature, reproducing plants that need to be left untouched
- Regional / site specific yield variations: climate, yield alternations
- Determination of safe removal rates (based on research trials and / or knowledge among local stakeholders, in combination with relevant, research-based literature if available).

5.3 Resource mapping (marking of growing locations in collection plots)

For many wild collected species that have a patchy distribution in the collection area, it is necessary to mark their distribution on a reasonably small-scale map.

Resource mapping:

1. Marking on a large-scale map the location of the collection area(s).

2. Marking on a / several small-scale map(s) the locations where the target species is / are found within each collection area.

3. The Resource Assessment should provide all basic data. However, if there is any uncertainty with regard to exact locations, habitats should be revisited with the map at hand and all target species populations should be sketched in the map as accurately as possible.

4. The use of GPS can be beneficial. For each location, collectors or other local stakeholders should be asked if there is a local name of the site.

5. Each location should be discussed with the collectors and / or other local stakeholders. Comments from them can be documented in the **Resource Map Recording Format** (see

below). These comments could include the quantities harvested in previous years, changes in the availability of the plant / plant part, and problems noticed inside the collection area.

6. If possible, it is useful to indicate on the map those areas where the species is not found, but where it could potentially grow.

Adapted from: COMMUNITY FORESTRY MANUAL FOR BHUTAN, Part II Community Forest Management Planning. 2004. Developed with the support of Wang Watershed Management Project (European Union), GTZ and SDC/Helvetas

Resource Map Recording Format for *Species A* (indicate scientific and local names)			
Collection Area	Name / description of species' populations location (collection sites)	Approximate size of the species' population at this site (ha) / GPS or related coordinates if available	Comments

6. The collection operation

- ***Laws, regulations, and administrative requirements: Collection and management of resources complies with all international agreements and with national and local laws, regulations, and administrative requirements, including those related to protected species and areas [ISSC-MAP criterion 3.2]***
- ***Collection activities are carried out in a transparent manner with respect to Management Planning and implementation, recording and sharing information, and involving stakeholders [ISSC-MAP criterion 5.3]***

6.1 Description

In the introduction, the name(s) of the collection operation(s), the history and background of the collection operation(s) and collection activities of the target species in the area should be given. If there are several collection operations in the area, each of them needs to be described, including the species they collect. The collection locations of each operator need to be marked in a map.

6.2 Structure

Description of the structure of the collection operation(s): number of collectors in each area, number and location of purchase centres. Description of all processing (including storage) and trade steps and respective locations.

6.3 Legal status

The Management Plan and all collection activities need to work within the framework of existing regional, national, and / or supranational legislation.

If collection permits or other documents (e.g. export permits) are legally required for the use and management of the area or the species, they need to be available for each collection operation.

Confirmation of use: If there is no permit system, a confirmation from the relevant authority indicating that the collection area is legally free and available for wild collection management may be required.

6.4 Collectors

Collectors List

- Complete collector registers need to be available in order to ensure that all collectors are known, well-trained and aware of the collection rules.
- All collectors have a valid contract with the collection operation.
- Collector training is documented; collectors sign their participation in the training. Only fully registered and trained collectors are allowed to collect.

1. **Approved Collectors List**: At each purchase centre a complete list of all contracted collectors (including name, code number, and address) must be available for the respective collection area. Purchase is only allowed from the listed collectors.
2. A responsible person should be assigned for each collection area.

Comments and Suggestions

- For entire families who are active collectors, the registration and contracting of one family member who organizes family collection may be sufficient under two conditions: 1) the total number of family members collecting is known and indicated on the collectors list; 2) all collecting family members have participated in adequate collection training. The registered member of the family is responsible that all other family members collect in compliance with the Internal Collection Rules. The collection operation should develop a catalogue of sanctions in case of non-compliance of collectors or their families with these Rules. The catalogue of sanctions must be annexed to the collector contracts and made known to the collectors and their families.
- All collectors should have a unique code number to guarantee individual identification. To avoid confusion, if a collection contract is cancelled, the code should not be given to another collector.
- It is suggested that for all trained and contracted collectors a Collector's Card is introduced. This is a simple identification card with the name and photo of the collector, which proves that she / he was trained and is obliged to follow the Internal Collection Rules.

6.5 Responsibilities

Responsibilities within the collection operation must be clearly defined.
An organizational chart of the collection operation should be developed and included in the Management Plan, providing information on the person(s) and departments responsible for:

- the collection operation in each collection area
- each purchase centre
- handling, storage and processing unit(s)

- monitoring impacts on the collection area
- resource assessments, quality assurance and others as appropriate.

Supervision body: The collection operation should define who supervises the general management of the collection operation and the implementation of the procedures as defined by the Management Plan. If more than one company or collectors organization is involved in the collection operation, the role of the supervision body is particularly important. It may be useful to elect a supervision committee. For big and complex collection operations the certification body or ISSC-MAP consultant may request formal assignment to an external expert to supervise the wild collection operation.

7. Working plan

- ***Collection activities are carried out in a transparent manner with respect to Management Planning and implementation, recording and sharing information, and involving stakeholders [ISSC-MAP criterion 5.3]***

7.1 Management procedures and responsibility matrix

The management procedures (including timelines and responsibilities) need to be agreed upon by all stakeholders who participate in the resource management process, and must be documented.

Management Procedures and Responsibilities Matrix:

1. Composition of a list of all Management Plan objectives (see example below).
2. Listing and detailed description of all activities required to achieve the objectives.
3. For each activity, priority indicators should be given, e.g. high (H), medium (M) or low (L).
4. Procedures and responsibilities should be listed for each activity. 'Procedure' means details about **how** an activity will be carried out (as detailed as necessary). Responsibility means **who** is supposed to carry it out and who is to ensure that procedures are followed.

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Example of Management Procedures Matrix

Objectives	Activities	Priority	Procedures	Responsibilities	Timeline
1. Ensuring a stable plant population	Definition of collection methods and quantities	H	1. Review of literature 2. Getting information from experienced collectors 3. Resource assessment	1. &2. Collection operation manager in collaboration with collector's representative 3. Resource manager	01.01.201x
	Implemen-ting new collection procedures	H	1. Defining Internal Collection Instructions 2. Training of collectors 3. Applying new collection methods	1. Collection operation manager and collectors representative. To be approved by resource manager 2. Collection operation manager 3. All collection companies / collectors	01.06.201x
	Monitoring of collection activities	H	1. Defining monitoring procedures and indicators 2. Regular surveys of collection area 3. Monitoring collectors (correct implementation of collection	1. & 2. Collection operation manager is responsible for establishing a monitoring procedure and for doing regular surveys in the area 3. Collection operation manager	15.12.201x

			procedures) 4. Reporting collection impacts	4. All collectors for monitoring and reporting collection impacts	
	Enrichment planting	L	1. Reproducing plants 2. Selection of planting sites 3. Planting	1, 2 & 3:To be carried out by collection companies under the supervision of the resource manager	30.02.201x 30.02.201x 31.08.201x
	Etc.	Etc.	Etc.	Etc.	Etc.

7.2 Management Planning and implementation schedule

Full planning and implementation of the management strategy can take some time, depending on the size and complexity of the operation and the availability of financial and personnel resources. A time / action schedule shows the steps involved and the time frame for completing tasks (see table above).

A long-term **working plan** should be established (in this chapter or as a separate document annexed to the Management Plan). All planning and implementation steps (including workshops, meetings, development of work procedures) and management activities (training, collection periods, rotation plan, monitoring schedule, revisions of the Management Plan) need to be included in the working plan. The required activities can be taken from the Management Procedure Matrix (chapter 7.1). The working plan must be revised at the end of each season and modified according to monitoring results and new information obtained.

Please note that it is not possible in all cases to fix a date for the achievement of all steps and procedures of the Management Plan at the beginning. Activities can be kept flexible and fixed later during one of the annual revisions.

Comments and Suggestions

If the collection operation management decides that the first steps to be taken are the resource assessment and the definition of sustainable collection methods and quantities, these should be set for year 1. There may not be enough resources in place to begin monitoring already during the first year; monitoring procedures will therefore be planned in year 1 but fully implemented only in year 2.
Some activities will be performed annually on a recurring basis, while others may be carried out continuously during the whole season, while others will have e.g. 3 years' intervals.

Progress checks should be included in the Management Planning schedule to ensure that delays or problems are detected and dealt with in time. The collection operation management can write an annual progress report, which should be sent to the ISSC-MAP consultant or supervisor. Additionally, external (third party) annual audits performed by an ISSC-MAP consultant or a certifier should be carried out.

7.3 Financial Planning

- ***Mechanisms are encouraged to ensure the financial viability of systems of sustainable wild collection [ISSC-MAP criterion 6.3]***

The sustainability of an ISSC-MAP managed project depends to a great extent on its financial viability. The revenues received from wild collection often have to cover the costs of the operation's management activities over the long term, including conservation investments required to meet the

ISSC-MAP Standard. For this reason, the operation's management needs careful financial planning, which is usually part of the business planning process. In some cases, especially when there is substantial involvement of state agencies, additional funds may be provided through this source.
Personnel responsible for the financial planning must be identified. In case the project consists of a resource management institution (e.g. Forest Department) and one or several collection operations, the both the resource management, and the collection operation(s), should prepare a financial plan considering their own costs and revenues. For details about financial planning, expert knowledge is required. Detailed guidance on financial planning is outside the scope of this Management Plan Guide.

8. Internal instructions and procedures of the collection and marketing operation

The responsibility of developing internal instructions and procedures (e.g. Internal Collection Rules or Standard Operational Procedures) lies with the collection management body. However, the resource management (if different) is responsible for supervising the procedures and guaranteeing that these are based on reliable data (resource assessment, optimum sustainable yield and other parameters).

- ***Procedures for collecting, managing, and sharing information required for effective collection management are established and carried out [ISSC-MAP criterion 5.4]***
- ***Collection and management practices are based on adequate identification, inventory, assessment, and monitoring of the target species and collection impacts [ISSC-MAP criterion 1.2]***
- ***The rate (intensity and frequency) of collection does not exceed the target species' ability to regenerate over the long term [ISSC-MAP criterion 1.3]***
- ***The sustainable collection and handling of resources is managed and planned according to market requirements in order to prevent or minimize the collection of products unlikely to be sold [ISSC-MAP criterion 6.1]***
- ***Storage and handling of resources is managed to support traceability to the collection area [ISSC-MAP criterion 6.2]***
- ***Training and capacity building: Resource managers and collectors have adequate skills (training, supervision, experience) to implement the provisions of the Management Plan, and to comply with the requirements of the ISSC-MAP Standard [ISSC-MAP criterion 6.4]***
- ***Worker safety and compensation: Collection management provides adequate work-related health, safety, and financial compensation to collectors and other workers [ISSC-MAP criterion 6.5]***

8.1 Internal Quality Standard

An internal quality standard should define, for each collected product, the minimum quality requirements. It needs to be based on the market and buyer requirements identified in chapter 4.
If several different species are collected, the Quality Standard can be written as a separate document and annexed to the Management Plan.

8.2 Collection instructions and collector training

The collection instructions have to guarantee that:

- Wild collection is conducted at a scale and rate and in a manner that maintains populations and species over the long term (sustainability of wild collection).
- The collection does not damage other plants or habitats (e.g. through weakening natural erosion control).

Therefore written collection instructions need to include the following information:

1. Determination of target species and target plant part(s). Drawings and / or photographs of target species and potential look-alike species.
2. Determination of collection and harvesting rules in terms of:
    - Optimum collection quantities: Volume to be collected in total or from a single plant.
    - Periods to avoid and concentrate collection activities: When can the plant / plant part be collected (in which season, month, time of day, weather conditions)?
    - Target product quality: what types of plants/part of plants can be collected e.g. size, age, ripeness?
    - Collection methods: Which collection method can be used e.g. picking, cutting, breaking, uprooting? Techniques should be described and illustrated in a simple way.
    - Who collects (e.g. how many people per household, which households)? Reference to collectors list and contracts / written agreements.
    - Replanting or restocking. If required: description of the techniques to be used; supply of seedlings; times of re-planting.
3. Collection sites: locations (maps; local names), and their opening and closing times.
4. Collection plan: collection frequency, rotation plan, production per collection site.
5. Conservation sites (sites to be left untouched because they are protected or have special management objectives) that serve as control sites for monitoring activities.
6. Sites not suitable for collection: description and indication on maps of all areas excluded from collection, such as roadsides, rubbish dumps, fields where conventional farming is practiced; within and in the direct vicinity of settlements, at or near operational industrial production sites or known contamination areas of old, derelict industrial production sites, and others.
7. Observation of collection impacts:
    - What is the population development of the target species (increase; decrease; why)?
    - How much time does it take on average to collect amount x of produce y?
    - What changes in product quality / size can be observed?
    - What other changes have occurred in the area, e.g. are other species getting rare or more frequent (including animals), accumulation of waste, erosion, etc.
8. Further activities specific to the collection operation.

The internal collection rules should be written or at least summarized in simple words so that they can be easily understood by all relevant stakeholders. It is useful to work also with simple illustrations and pictures.
The internal collection rules are the basis for all internal procedures on the level of the collection and handling. They need to be available in each purchase centre and each collector must receive a copy and detailed explanations during the first training.

<u>Comments and Suggestions</u>

- The percentage of plants / plant parts left untouched should be based on the results of the resource assessment and / or market demand and determined through research trials and / or knowledge among stakeholders, in combination with research-based literature if available.

- Collection quotas should be calculated based on sustainable harvest yields, population density in a collection area and market demand. Agreements should be made with the collectors on how much of which plant / plant part needs to be collected to avoid unsustainable harvesting practice.
- Only collected material that meets the Internal Quality Standard should be accepted by the collection operation. Plants which do not meet the quality requirements are left untouched or, if already collected, rejected at the purchase centres.

Collector training should include the following aspects:

- The collectors need to be trained in the internal collection instructions regularly before collection starts. The collection instructions should be available for all collectors at any time at least in the purchase stations. The same applies for the maps of the collection areas.
- Collectors' registers should be available in order to make sure that all collectors are well-trained and know the rules for collection.
- All purchase and company staff should be trained in the internal collection instructions and purchase, storage and processing procedures when beginning to work with the operation.
- Collectors and staff responsible for resource surveys and monitoring should be additionally trained in monitoring procedures (the resource management should supervise the training).
- Date and content of the training should be documented for each collector and staff member.
- The operation should ensure compliance with internal procedures and needs to have a system of sanctions for collectors and staff who do not comply.
- For all new plant species the collectors need to be informed and re-trained.

8.3 Handling by collectors

In cases where collectors dry and store products at their homes, handling instructions need to be included in the Internal Collection Rules (Internal Collection and Handling / Processing Rules). These should describe how the products should be handled post harvesting (nature of transport containers; drying conditions and locations etc.) in order to prevent quality loss or product contamination.

Comments and Suggestions

- It is recommended that the collection operation provides the collectors with the needed post-harvest equipment in order to achieve the intended quality and to minimize the risk of contamination (e.g. contamination during drying on chemically-treated wooden trays).
- The collection operation should distribute clean bags to the collectors to make sure that they do not use contaminated materials (e.g. old fertilizer bags; bags for non-organic products; etc.)
- If drying and storage takes place at the collectors' homes, the relevant locations should be accessible for spot inspections by the collection supervisor, the ISSC-MAP consultant and/or certification body.

8.4 Purchase procedures

- The purchase records need to provide proof of compliance with the ISSC-MAP requirements:
  - Only registered and trained collectors are allowed to collect. It has to be checked if the delivering collector is listed on the Approved Collectors List. Quantities delivered must correspond to the quantities the collector and family members registered under the

collector's name can collect within a given period. Collectors must know that they are not allowed to purchase material from other collectors and sell it to the collection operation.
  - Records and proper identification allow each batch of goods to be traced back to the area where it was collected.
  - Payment of collectors must be at least equal to the current local price, must be equitable for men and women and must be registered at the purchase centre. Receipts are issued.
  - Collection quantities, periods and frequency of collection are recorded and confirm compliance with collection instructions.
  - Consolidated data on collected quantities are available (species / area / year) and confirm compliance with collection instructions.

- The purchased quantities allow evaluation of the amount of material being harvested from a defined collection area. These figures must be sent to the supervisor and to the certification body (if the operation is certified) automatically at the end of the season.
- During purchase, the quality of incoming goods is controlled; material that does not fulfil the quality requirements is rejected.

1. At every purchase centre a **purchase register** has to be kept. Date, quantity, collector, payment (price), collection area, product, processing state (fresh, dried) need to be documented for each purchase (see example in annex IV).

2. The purchase centre issues a receipt to the collectors**,** which indicates the purchased product, quantity, payment and name of the collector; collectors must retain these receipts.

3. If incoming goods are not in compliance with the quality requirements or if it is suspected that the collector does not comply with the Internal Collection Rules, the products must be refused. This should be documented (reason of complaint, concerned collector, date etc).

4. From the purchase onwards all bags and containers must be labelled at all times (collection area, harvest year, product and lot number (if applicable) – if certified: certified quality).

5. If the purchase centre is independent, it must be contracted by the collection operation.

6. At the end of the year each purchase station should send the consolidated purchase quantities for each product to the supervisor and, if applicable, to the certification body.

7. Purchase procedures should be written down and known to all personnel. They should be placed in the purchase centre for everyone to see.

8.5 Storage, processing and handling procedures

The following storage, processing and handling requirements should be ensured and included in the Management Plan:

a. All processing steps should be described and illustrated in the Management Plan in a flow chart, including processing ratios.

b. Processing instructions reflecting client requirements and good handling procedures.

c. Identification (labelling) of the product during all stages of product flow with product name, lot number, and certified quality, if applicable. Collection operations are advised to install a system of traceability by lot-numbers, which enables the product to be traced back to its origin. Whenever smaller lots are consolidated into bigger processing lots, this should be carefully documented.

d. Strict separation (physical and in documentation) of different certified qualities (ISSC-MAP, non-ISSC-MAP) and if products from other sources (not ISSC-MAP managed) are purchased.

e. Internal handling instructions that describe the procedures for correct handling after purchase from the collectors and during transport in order to minimize contamination / deterioration of quality. The processing and handling instructions should be accessible to and visible for all staff.

Additionally, the following records should be kept by the operation:

Transport records and / or transport documents from the collection area or purchase centre to the processing and trading / export unit.

Processing records: All processing steps should be documented and allow a follow-up of the product flow from incoming raw ingredients to final products (see example in annex V).

Stock records: Stock records should include following information: Product type / name, certified quality, lot number, weight or quantity.

Facility pest management:
Synthetic products may only be used when the storage facility is empty and must be documented. The waiting period until the storage facility is used again has to be adequate.

8.6 Contracts

Each collector should confirm by written contract or agreement with the collection operation that her / his activities comply with the internal collection and handling instructions. The contract or agreement has to include at least the following points:

1. **Collection instructions**: The collector has to agree to comply with the collection instructions defined by the operation. A summary of the collection instructions should be included in or annexed to the contract.

2. **Access:** The collector agrees to grant access to all his / her facilities used for collected products (drying, storage, etc) and to provide information about the collection areas to the ISSC-MAP supervisor and / or certification body.

3. **Sanctions:** The collector agrees to accept the sanctions set by the purchasing company in case the collector breaches the agreement.

If collectors do not understand all the written provisions of the contract, the operation must explain them to the collector. Thumbprints instead of signatures are acceptable.

Employed workers and company staff must also sign a contract confirming that they will comply with internal instructions and procedures. Additionally, these contracts should provide proof that standard working rights and conditions with regard to benefits such as health, retirement, worker's compensation, food and housing are implemented.

If workers and employees of the collection company do not want to sign contracts, and if this is not legally obligatory, they and the collection operation must sign **terms of employment or an agreement,** in which the internal instructions and procedures and compliance obligations are described and working rights and conditions mentioned. Payment records must be kept for employed workers as described for individual collectors (see section 8.4).

Accident and sickness records need to be kept, as well as any other relevant record providing proof that social benefit requirements are met.

8.7 Marketing: product demand and marketing records

The collection operation should agree in writing with the buyers on quantities of collected resources (e.g. how much of which plant / plant part) before the collection season starts. Only the requested quantities are collected and; no plants are collected without a chance of being sold. This is especially important for plants which cannot be stored for a long period of time.

1. **Sales records:** All sales must be recorded. The entire product flow (incoming and outgoing goods) needs to be transparent and traceable.

2. The **original invoices** / **receipts** must be kept. The certification status and quality of the products need to be mentioned on all sales documents.

3. If **export permits** or other documents are required for marketing the collected species (e.g. CITES Appendix II species) or are legally necessary in the source or import country, they need to be available for each lot.

4. **Agreements with buyers** on quantities and product quality should be documented.

Comments and Suggestions

- For species with a high or constant demand on the market (i.e. all collected quantities in previous years have been sold without problems), or that can be stored for a long period of time without quality loss, the demand for the next season may be estimated on previous experiences and collected before having a definitive agreement on quantities.
- For non-abundant species with low or irregular demand, agreements with buyers must be established before collection.

9. Risk / Impact assessment and prevention strategies

This step of the Management Planning process is relevant for achieving a large number of the ISSC-MAP criteria.

An important aspect in the Management Planning process is the identification of all potential risks. Each project will face potentially relevant impacts that could threaten the sustainability of collection, the quality of the product, or the successful implementation of the Management Plan. In particular, all negative environmental and social impacts of management activities should be thoroughly identified and monitored. A first risk assessment should be carried out at the beginning of the Management Planning process, so that all identified risks can be considered when establishing management and collection protocols. This procedure should be repeated regularly each year. Once the risks have been recognized, appropriate management strategies can be formulated to prevent or minimize them.

9.1 Risk assessment

Risks can be grouped into 4 categories. Each of these categories should be analysed in separate subchapters of the Management Plan:

Sustainability risks

The risk level depends on several factors, such as:

a) Factors related to the species

- Part of plant collected (e.g. roots or fruits)
- Frequency and intensity of collection
- Reproductive and regeneration capacity of the plant after collection
- Species distribution and population structure
- Habitat specifics
- Demand on the market / price level for produce
- Conservation status of the species

b) Project and site-specific factors

- Size and complexity of the collection
- Existence of other sources of income for collectors
- Level of collectors' knowledge in sustainable collection methods
- Regulatory system in place controlling the use of the collection area versus open, uncontrolled collection. Efficacy of the regulatory system.

Risk for the habitats

- Potential damage to the habitats or to other species due to collection or management activities or due to other activities in the collection area(s). Examples: risk of erosion in case of collection of roots or whole plants, damage to trees, risk of forest fires or waste deposits in cases where collectors camp on the area during the collection season.
- Assessment if the plant collected is important for the survival of other species or has specific ecosystem functions (such as food or shelter for animals, land stabilization, erosion control).

Social / institutional risks

- Level of stakeholder participation and interest to participate in the Management Planning. Potential conflicts between stakeholders (e.g. ethnic tensions; gender issues; economic differences between collector groups; dominance of certain collector groups; different interests between collector groups, etc.).
- Traditional use or use rights in the area; potential or already effective Intellectual Property Right claims, Access and Benefit Sharing agreements. Analysis of potential impact of commercial collection on traditional use and access rights of local communities. Level of participation and / or ownership of the collection operation among local and / or indigenous communities.

Contamination / quality risks

- Intensive / conventional farming or timber extraction areas, villages, industries, mines, dump sites, roads or governmental / private spraying or other pest-fighting activities in the region.
- Appropriateness of current / traditional collection and handling methods to ensure product quality according to market requirements.
- Quality control performed during purchase procedure.

Risk assessment

Thorough assessment and completion of the Risk Assessment Form (annex VI) is recommended for each species; the risk assessment should always be kept up to date as an annex to the Management Plan. Revisions of the risk assessment should be performed regularly; the intervals between risk assessments should be defined in the Management Plan.

Main results of each section of the risk assessment should be commented and analysed in the Management Plan.

Comments and Suggestions

- The above listed aspects are some examples of potential common risks, but they are not exhaustive; each operation (maybe in cooperation with the responsible state agency) will have to identify individually the potential risks relevant to its own situation. This can be done by completing the Risk Assessment Form in annex VI or developing and completing a comparable document. Risk assessment documentation should always be adapted to the situation found in each collection area.
- Even experienced operations or management agencies need to **update the risk assessment regularly** to find out if parameters or situations have changed.
- Any problem encountered during previous years should be considered and included in the risk assessment as a potential risk unless there is proof that it has been eliminated permanently.

9.2 Identification of management impacts

All possible effects (positive or negative) of management activities on the sustainability of the collected species, on other species, on the habitat of the area or on traditional use, access rights and cultural heritage in the collection area need to be identified.

Where sensitive species or areas have been identified in the Management Plan, the impact of collection and management activities should be evaluated with special attention.

This step should be carried out at the end of the Management Planning process, but before the plan is finalized so that all proposed activities can be included and assessed.

Identification of impacts

1. Preparation of an Impact Assessment Chart (see below). This should be prepared in advance of a meeting with all stakeholders or members of a resource management committee. The chart should be adapted to the situation of the collection operation and the Management Plan.
2. The assessment can begin by listing the activities proposed for the Management Plan down the left hand side of the chart. The information on activities should be copied from the Procedures and Responsibilities Matrix.
3. For each of the activities, the potential environmental and socio-economic factors are listed along the top row. For each of these, all stakeholders should determine if the proposed activity will have a positive, negative, or no impact. Positive impacts are indicated by '+', negative impacts by '-', and no impacts by '0'. The number of plusses or minuses should give an idea how strong the potential effect is.
4. If there are sensitive species or protected areas inside the management area, the effects of management and collection activities on each of them needs to be evaluated with special attention and detail. Rating grades may be useful.
5. The Impact Assessment Chart should be included in or annexed to the Management Plan.

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Example of a completed Impact Assessment Chart		
	Potential environmental impacts	Potential impacts on local communities

Activity proposed in the Management Plan	Target species	Other plant species	Wild animals	Soil, water, sensitive areas	Traditional use of target species	Trad.itional access rights	Cultural values	Local employment
Commercial collection of liquorice roots	-	+	0	--	0 (no trad. Users)	0	0	++
Enrichment planting	++	-	0	+	0	0	0	+
Processing activities (using local wood for drying facility)	0	-	--	--	0	0	0	+
Etc.								

Positive effect shown by + / ++; Negative effect shown by - / --; No effect (or not relevant) shown by 0

For more detailed guidance on how to assess collection impacts on the target species, please refer to the ISSC-MAP Resource Assessment Guide.

9.3 Strategies and measures to prevent or minimize risks and negative impacts

- The Management Plan needs to include strategies to prevent or reduce negative impacts on other species and the collection area.
- Measures should be taken to avoid loss or damage of traditional rights, resources, health security or livelihoods of collectors and their families, local communities and / or indigenous peoples.

Strategies to prevent or minimize identified risks

For each section of the risk assessment in annex VI, the procedures that will be taken to avoid or reduce the identified risks should be described. These procedures should become part of the Management Plan and the collection operations' internal work procedures.

Strategies to prevent or minimize negative management impacts

Each management activity which has one or two minus ratings in the Impact Assessment Chart should be listed and analysed.

For each activity, procedures that will be taken to avoid or reduce the impact during implementation should be defined and elaborated. These procedures should then become part of the Management Plan.

Example of procedures to address potential negative impacts	
Activities	**Strategies and measures**
Commercial collection of liquorice roots	- Only 20% of the adult plant population (at least 3 years old) according to the resource assessment will be collected. - A plot rotation system will be implemented; each plot will be visited by collectors once every 3 years. - No collection on areas with steep slopes in order to avoid erosion.
Enrichment planting	- Very restricted enrichment planting to minimize impact on other local plant species - Monitoring of plant diversity will be especially rigorous in areas with enrichment planting. Conservation sites will be established; each year the plant diversity at the collection plots will be monitored against conservation sites.

10. Monitoring and Evaluation

- ***Inventory, assessment, and monitoring: Management of wild collection is supported by adequate and practical resource inventory, assessment, and monitoring of collection impacts [ISSC-MAP criterion 5.2]***

This chapter should include all procedures necessary to achieve the above mentioned ISSC-MAP criterion by fulfilling the following indicators:

- Assessment and regular monitoring of the target resources and habitats, as well as of social / cultural and economic issues related to plant collection should be performed, documented, and incorporated into the Management Plan [ISSC-MAP indicator 5.2.1]
- Collection instructions specify observations required to monitor collection impacts [ISSC-MAP indicator 5.2.2]
- Periodic regeneration surveys need to be conducted within the management area using repeatable, comparable survey methods [ISSC-MAP indicator 5.2.3]
- Monitoring and regeneration surveys confirm that
    - Plant population size, distribution and structure remain stable or improve and reflect a healthy population [ISSC-MAP indicator 5.2.4]
    - Availability, viability and quality of the target resource / part of plant remain stable or increase [ISSC-MAP indicator 5.2.5]

Monitoring is used to verify if objectives and targets of the Management Plan are being achieved, to survey changes in sensitive aspects (as identified in chapter 9), to identify new issues and potential impacts, and - as a feedback mechanism - to modify and improve management practices (e.g. through changes in operational activities and procedures).

Monitoring should be carried out on a regular basis. A monitoring system needs to identify what will be monitored in the area, how it will be done and who is responsible for monitoring. Some key aspects for designing and implementing efficient monitoring procedures include:

- Clearly defined monitoring objectives and indicators
- Actions that address long- and short-term concerns
- Specific statements about how data will be used
- A clearly defined monitoring plan
- Definition of responsibilities

The Management Plan should define the rigour needed to meet ISSC-MAP monitoring requirements and responsibilities. The main options are: professional external monitoring, or participatory (collector / community) monitoring. These options imply different levels of precision, cost, and complexity. If the costs of a highly rigorous approach are unaffordable, implementation is unlikely to happen. On the other hand, there is little management value in collecting anecdotal data (for details see ISSC-MAP Resource Assessment Guide, Leaman and Cunningham, 2008).

10.1 Monitoring objectives and indicators

Definitions:

- **Indicator**: used to measure if resource, social and other management conditions are changing because of collection procedures or other management activities (see annex VII).
- **Monitoring**: systematic observation of indicators to assess changes and evaluate if desired conditions are being attained.

How to define monitoring objectives and indicators:

1. To define monitoring objectives, a list of all the management objectives that have been included in the Management Plan and of all potentially negative impacts that have been identified in chapter 9 (sensitive environmental and social issues) should be created.
2. Two or three indicators should be identified for each monitoring objective. For example: If the management objective is "To conserve biodiversity", indicators may include the population or density of certain plant or animal species in the collection area. If a sensitive issue identified was the availability of products for local users, indicators may include the availability, quality and prices of the target products on the local market.
3. A short list of indicators should be developed, which will be monitored throughout the entire duration of the Management Plan's validity.
4. The list of monitoring objectives and indicators should be included in this chapter of the Management Plan.

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Examples of possible indicators

- Regeneration status of perennial species
- Numbers and diameters or age/size classes of different species (including sensitive / protected species even if not collected)
- Degree of soil erosion
- Structure and density of populations of plant or animal species that may be sensitive to environmental disturbance (if sensitive / dependent species have been identified)
- Frequency of fires
- Evidence of illicit collection activities

10.2 Management Plan monitoring procedures and responsibilities

To ensure that changes detected by monitoring are actually occurring in practice and not simply a result of measurement inaccuracies or discrepancies (e.g. taken by different people or in slightly different ways), detailed and exact monitoring protocols should be developed and implemented. Monitoring protocols are specific instructions on how to measure each indicator.

Establishing monitoring procedures

1. The procedures for measuring and recording each indicator should be discussed with the management committee, with collectors and / or the monitoring staff.
   a. **Where** will information on the indicator be collected?
   b. **How** will the information be collected?
   c. **How often** will the indicator be monitored?
   d. **Who will be responsible** for the monitoring of this indicator?
   e. **How will** the people who collect the information be trained?

f. **How will** collected information be recorded for comparability and easy access?

2. Detailed monitoring procedures need to be described in this chapter or annexed to the Management Plan.

3. For each agreed monitoring indicator, the approach including the responsibilities and timelines should be documented and included in the Management Plan.

4. A table summarizing the monitoring objectives, indicators, procedures and responsibilities as shown below should provide an overview of monitoring activities.

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Monitoring records need to be maintained indicating the date of monitoring, indicator monitored, location, responsible person who has performed the monitoring, monitoring results (measure or result of the target indicator) and comments.

Monitoring report: An inventory or a monitoring form can be designed that is used in the field to collect data. This form can be filled in by the monitoring staff, including all relevant information about the monitoring activity (see monitoring record), revision date and signature of the responsible manager or supervisor confirming that notice has been taken of the report.

Comments and Suggestions:

Monitoring locations:

- Some of the monitoring indicators involve collecting information from the entire collection area, such as evidence of illicit collection activities, frequency of fires, etc. Other indicators are measured through the review of records (e.g. total collected quantities) or interviews (e.g. availability of products on the local market).
- In many cases it may not be practical to collect information from the entire collection area by, for example, performing a complete census of a plant population. Nevertheless, it is still possible to obtain reliable information on the overall population by collecting data from a representative sample or monitoring plot. Selecting monitoring plots is a way to choose representative plots or locations and extrapolate the results to the collection area. There are two approaches to select monitoring plots depending on the monitoring objectives:
    - Monitoring of areas where collection activities tend to concentrate (more accessible zones e.g. near villages or roads or other intensive collection locations). The objective of choosing these sites is the early detection of over-harvesting or other impacts of collection activities on the habitat. It is also useful to monitor specific management efforts such as reduction of waste disposal by collectors.
    - Random sampling across the entire collection area. The goal is to characterize the overall condition of the collection area and to determine the general extent of management impacts in order to detect more widespread changes.
- The monitoring plots for measuring indicators on species population and habitat changes caused by collection activities should be selected inside areas where collection is normally performed.

Monitoring methods**:**

- In order to establish consistent monitoring methods, clear procedures need to be defined on how each of the indicators will be measured. The monitoring methods should be written in the form of instructions, with step-by-step procedures.
- **Regeneration surveys** should be performed on a regular basis. These surveys monitor changes in population size and structure. They also provide information about the impact of harvesting on

the long-term productivity and quality of the target resource (see ISSC-MAP Resource Assessment Guide for more information on performing regeneration surveys).

- For most indicators, monitoring refers back to the **baseline level** determined by the resource assessment.
- Some indicators may fluctuate from year to year according to changing local conditions (e.g. climatic variations), and a comparison with a control site may be necessary. **Conservation sites** should be established, which need to have conditions (species diversity and population, availability of target species, overall geographic conditions) similar to the collection sites and therefore serve as a control against which change can be measured. It is important that conservation sites are marked on the maps and left untouched by collectors (this has to be part of collectors training and also needs to be monitored).
- A monitoring schedule should be fixed summarizing at what time and in which years the different monitoring activities will be performed. This schedule should be part of the working plan for the implementers of the Management Plan (see chapter 7).
- Responsibilities: The persons in charge of monitoring measurements and of taking action in case of negative or unexpected monitoring results must be named and their roles and responsibilities must be clearly defined to make sure their responsibility is understood.
- Collector instructions: Collectors are also responsible for monitoring changes related to their collection areas or collected species. Instructions on the responsibilities, methods and frequency of monitoring and reporting must be included in the Internal Collection Instructions (chapter 8.2 of this manual).
- Equipment / training needs: Assessment of equipment or capacities necessary for monitoring. Depending on the complexity of the monitoring (which will depend on factors like size of the operation, target species, etc.) it can be necessary to assign monitoring to an external expert or specifically train one person within the collection operation in order to be able to perform sufficiently detailed regeneration surveys and resource assessments. For more information concerning the degree of rigour needed to meet ISSC-MAP requirements (and compliance levels for ISSC-MAP), please refer to the ISSC-MAP Resource Assessment Guide. Appropriate courses, manuals, and other training materials should be developed.
- Monitoring records and report: If the monitoring reports filled in by the monitoring staff on the field allow a full overview of all monitoring activities, no additional monitoring records are needed.

Example of Monitoring Summary

Objective	**Indicator**	**How it will be monitored**	**Responsibility**	**Comments**
To guarantee the maintenance of the target species population size, distribution and structure	Regeneration status	Number of seedlings will be counted each year in a fixed area (monitoring plot)	Management committee will organize	Forest Department staff will give support
	Population surveys	Number and age classes of individuals in monitoring plots will be recorded every second year and compared with baseline level.	Management committee will organize	Forest Department will give support
	Resource assessments	A resource assessment will be repeated every 10 years	Forest Department	
To collect the target species according to sustainable collection quantities	Collected quantities of each collection company	From company records	Collection companies	A monitoring team will be formed and trained by the resource manager.
	Evidence of illicit collection activities	Annual reports from collectors and monitoring staff	Collection companies and monitoring team	All collectors will be trained
To involve all stakeholders in decision making structure	Attendance and regularity of meetings; decision making pattern	Records and minutes of stakeholder meetings	Management committee	

10.3 Targets and management actions

Targets are measurable objectives which describe the conditions managers feel can be achieved over a reasonable time period (e.g. 5 years). Targets describe the maximum amount of change (measured against baseline levels or conservation sites) that is considered acceptable for the selected indicators. The aim of setting targets is to ensure that information collected on an indicator leads to management action and is used in decision-making.
If monitoring finds conditions to be below the target, corrective management actions will need to be identified and included in the Management Plan (see chapter 11).

11. Approval and Revision of the Management Plan

11.1 Approval procedure

In order to ensure that everyone involved in the Management Planning process understands and accepts the final plan, an approval procedure should be established. A meeting with all stakeholders and members of the management committee should be organized, in which a representative of each organization or group (authorities, resource management, collection operations, local users, etc.) officially accepts the Management Plan as well as the roles and responsibilities assigned, by signing an approval sheet. This approval sheet should be annexed to the Management Plan.

11.2 Regular revisions and further development of the Management Plan

Regular revisions of the Management Plan are an essential component of an adaptive management process. These revisions have to take place in order to evaluate if the management objectives were reached and if the internal procedures and management activities are adequate and effective. If monitoring indicates that performance is not in line with the management objectives, corrective management action needs to be taken and integrated into the Management Plan, for example modifying internal procedures, adapting collection quantities, enhancing stakeholder support, or organizing awareness-building workshops.

It is important to assess the success of the corrective management actions and indicators put in place. A feedback loop should be established between the information collected via monitoring, and the success of actions put in place to improve performance where targets are not being met (see figure below).

12. Annexes to the Management Plan

Minimum annexes to the Management Plan:
Maps showing collection area and main infrastructure, roads, conservation areas, settlements, farming areas, purchase centres etc.
Documents identifying tenure rights and resource management agreements (e.g. land titles, lease agreements, resource management agreement or land registry records).
Official confirmation from regional forest office or similar (land owner, responsible manger) of no-use of prohibited inputs on the area.
Documented regulatory system of the area / policy from the responsible manager or authority / owner
Collection permits or confirmations of use
National / provincial / local lists of protected species known from or likely to be found in the collection area
Complete list of collectors (including number of helping family members, if any)
Contracts / agreements with collectors, workers, buyers etc.
Internal Collection Instructions
Conservation status assessment of the target species
Plant specification forms / plant monographs
National legislation / regulations related to collection of wild species and use of natural resources
Resource assessment compilation sheets and other resource assessment documentation
Instructions / product specifications from buyers (quantity and quality specifications)
Market survey(s)
Internal Quality Standard (if not already included in the Management Plan)
Table identifying Traditional Rights, Responsibilities & Management Systems (if not already included in the Management Plan)
Consultation agenda with local stakeholders
ABS agreements, if applicable
Records of meetings with contracting parties and other stakeholders
Risk assessment / analysis
Impact Assessment Chart (if not already included in the Management Plan)
Procedures chart to address potential negative impacts (if not already included in the Management Plan)
Working Plan (if not already included in the Management Plan)
Monitoring procedures (if not already included in the Management Plan)
Monitoring report form
Templates for annual record keeping (purchase, transport, processing, stock and sales records training records and records on quality control)

Additional annexes if applicable:
Approval sheet
National local lists or maps of protected areas within, overlapping with or adjacent to the collection area
Reports on other activities in the area
Export permits (e.g. CITES Appendix II species)
Documentation on traditional uses of the species and the collection area as well as on cultural and religious significance
Documented agreements with source community / local peoples on the use of the area, collection of species and/or use of traditional knowledge: • Financial arrangements • Conflict resolution • Benefit sharing procedures (equity)
Records, reports or other evidence reflecting the resource value (in case of agreements with source community/ local peoples)
Evidence of communication with and involvement of traditional users and local stakeholders, for example: • Early notification / opportunity for involvement • Definition of roles and responsibilities • Facilitation of participation • Records, plans, schedules of meetings with contracting parties and other stakeholders • Records of decisions taken as a result of such consultations
Records of compensation payments
Any other legally required permit or document
Other records, reports or documents according to each operation.

Part D: Annexes

Annex I: Plant Specification Form

(This form must be filled in for each plant. Alternatively the company may include this information in the Management Plan (e.g. in cases where a small number of species is being collected) or present similar internal documents in which the requested information is available for each plant. For information on how to fill in this form, please refer to the ISSC-MAP Management Plan Guidance Manual, chapter 4.)

Company:	**Scientific name:**
1. Plant (local / national / international / trade) name(s)	
Please describe the reproduction system of the species (vegetative propagation or by seeds; pollination by wind, by insects or others; means of dispersal (wind, water, birds, other animals), etc.).	
Current conservation status of target MAP species according to the IUCN Red List categories and criteria	
2. Description of the habitat (Where exactly inside the collection area is this plant collected?)	
In which of the collection areas can this plant be collected?	
Habitat	
Altitude:	
3. Collected plant parts	
Collected parts: PART A) PART B) PART C)	Preferred age or size-classes for each collected part: PART A) PART B) PART C)
4. Uses of the plant and market/buyer specifications	
What are the uses of the collected plant / part of plant? For which uses is it being collected?	PART A) PART B) PART C)
Does the buyer have written quality specification requirements for this plant? If so, what quality standard for this plant/part of plant is specified (e.g. DIN, ISO, PhEur, USP, or buyers' own standard)?	PART A) PART B) PART C)
5. Resource assessment and sustainability of collection	
Yield in this area per ha (if necessary different estimations for different areas) according to the resource assessment	PART A) PART B) PART C)
% of total plant population which is harvested / from which parts are being harvested in the collection area	
How can regeneration of this plant be ensured? Are plant populations stable?	

Rate of replacement of adult individuals or plant part collected[1] (1 year (annual plants), 2 years, etc.):	PART A) PART B) PART C)
6. How is the harvesting done and which tools are being used?	
PLANT PART A)	
PLANT PART B)	
PLANT PART C)	
If not the whole plant is collected, which % (or other type of measurement) of collected parts is harvested per plant?[2]	
7. Collection period	
PART A) PART B) PART C)	
8.Typical frequency of collection at one location (e.g. once a year, every second year)	
PART A) PART B) PART C)	
9. Average quantity collected per day per collector. Is collection daily during collection period?	
PART A) PART B) PART C)	
10. Importance of the species for the collection operation and collectors' community	
To what extent do collectors depend on the collection of the species (for both local use and as source of income)? What other sources of income do the collectors have?	
How important is the collected species for the collection operation? (approximate % of total turnover of the collection operation)	
11. Special functions in the ecosystem	
Does the collected plant or part of plant have any special functions in the ecosystem? For example, symbiotic relations with other species, erosion control, shelter or food for animals, etc.	
12. Specific problems or remarks regarding this plant	

Date, Signature_____

[1] *Example : Roots of adult plants collected (10 year old): Rate of replacement = 10 years.*

[2] *Example: "app. 30% of all flowers of the tree" or "The lowest limb of a 100 ft tall tree is pruned off"*

Annex II: Plant Monograph (example)

Botanical name: *Juniperus communis L.*

Local names Klekinja, kleka, plava kleka, fenja, smreka, smrekovina, borovica, brinja

Plant description

Juniper tree belongs to the family Cupressineae. It grows up in mountain regions as evergreen bush 1m high, or as a small tree, 10m high, in the region of lower altitude.

Single tree has pyramid shaped treetop, but if several trees are growing in the same place, the treetop is irregular.

Leaves are thin, needle-shaped, 10 - 20 mm long.

Flowers are small, yellow-green placed in the angle of leaf.

Juniper tree is bicameral plant-one plant has male, and the other one has female flowers.

The fruit is a berry maturing the next year. At the same time the plant has green and ripe fruits. The fruit, if green at the beginning, later rust, and as ripe fruit has ashen blue-black colour.

Other varieties as sources for adulteration:

- Juniperus oxycedrus L. (Crvena kleka)

We can find Red Juniperus diffused in southern parts of BH. The berries are bigger than the berries of Juniperus communis; 12 mm in diameter, dark red coloured.

- Juniperus macrocarpa (Pukinja)

The berries of Juniperus macrocarpa are bigger than the berries of Juniperus communis. The difference is the bluish coating. The berry doesn't have commercial value.

- Juniperus sabina L. (Somina, Glušac, Gluha smreka)

Juniperus sabina is present in BH near the Adriatic Coast. The berries are blue-black or black, 5-8 cm in diameter, poisonous.

- Juniperus phoenicea L. (Gluhaè) We can find Juniperus phoenicea in coastal region. The berries are much bigger than the berries of Juniperus communis, yellow or red-yellow, poisonous.

Characteristics of the collection areas

We can find Juniper tree growing in sparse pine and birch forest, in mountain-cleared land, in uncultivated, neglected, dry, bare, rocky places.

Plant parts harvested

- Ripe fruit (Juniperi fructus)

Time period of collection

The berries are ripe and ready for the collection when blue-black. In our region this happens from the end of August till October, depending on the altitude.

Harvesting tools

Jute linen 2 x 2 m, gloves, metal or wooden hook, umbrella.

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Collection method

Berries can be picked by hand or shaken from the shrub on previously prepared linen or similar cloth (umbrella). Shaking should be done carefully in order not to shake the green berries. It is important to

collect ripe berries 20% of the fruits need to be left for regeneration. No cutting of juniperus!

Important to know that forest fire represents special danger for this plant since it doesn't have the possibility to regenerate.

Post collection treatment

The juniper fruit should dry in a windy place and should be turned from time to time. A thin layer allows easier turning of the berries and uniform drying. After drying the berries should be clean from eventual dirt, needles, green berries etc. To pack in jute bags.

The dried fruit is fleshy and 5-9mm in diameter, dark-violet. The pulp is dark-green, soft, and after longer time it becomes spongy. The fruit of juniper has agreeable smell and sweet bitter flavour.

Source: GTZ/SIPPO/IMO Manual 2003

Annex III: Record on traditional rights, responsibilities and management systems

Traditional Rights, Responsibilities & Management Systems Format			
Product/Service	**Rights** Who has use rights?	**Responsibilities** Who has responsibilities?	**Traditional management systems** Describe any traditional ecosystem management or ecosystem use systems

Record of Traditional Rights and Responsibilities in Lobneykha Community Forest

Product/ Service	Rights Who has the right? What are they?	Responsibilities Who has Responsibilities? What are they?	Traditional management systems Describe any traditional forest management or forest use systems
Timber	*Everyone including outsiders has rights provided that the individual holds a valid permit*	*Government controlled, Forestry Department issues permits*	*Before 1969 no outsiders were allowed to collect timber, the Mangmi and Chipon were controlling the quantities collected by Lobneps*
Fodder	*Lobneykha community*	*Free access for Lobneykha community*	
Grazing	*Only Lobneykha community members are allowed to graze their cattle on Lobneykha pastures and forest areas*	*Free access for Lobneykha community*	*Before 1969, pasture taxes were collected, grazing times fixed and every 3 years the pastures were burned*

Source: COMMUNITY FORESTRY MANUAL FOR BHUTAN, Part II Community Forest Management Planning. 2004. Developed with the support of Wang Watershed Management Project (European Union), Bhutan-German Sustainable Renewable Natural Resources Development Project (GTZ) and Participatory Forest Management Project (SDC/Helvetas)

Annex IV: Purchase Records for Wild Collection

Company:……. Purchase station:……..……..

Plant and part of plant:… ……..

Date	Collector /code	Quantity	Price paid to collector	State (fresh, dried, etc)	Origin (collection area/code)	Lot number*

J. Lot number example: month / year-collector's code-collection area code

Date, Signature of the responsible person:…….

Source: SIPPO/IMO Guidance Manual for Organic Collection of Wild Plants, 2005

Annex V: Processing Records

Date	Plant, part of plant	Lot Number*	Quantity in (fresh)	Processing step	Processing ratio	Quantity out	Waste	Packing
18.08.03	*Juniperus communis*	*0508-23-5*	*100kg*	*Cleaning, drying*	*10:1*	*9kg*	*1kg*	*89x 100g bags*

*Must correspond with the purchase diary: e.g. year-collector's code-code of collection area

Date, Purchaser's signature:……..

Source: SIPPO/IMO Guidance Manual for Organic Collection of Wild Plants, 2005

Annex VI: Risk assessment

Company / project name:	
Plant (Scientific name):	
Region and Country:	
Date of risk assessment:	

Summary of risks

	Low Risk	Medium risk	High risk
Sustainability risk of target species			
Sustainability: local/project factors			
Risks for the habitat			
Social/institutional issues			
Contamination/Quality			
TOTAL			

Instructions:

Choose for each criterion in the table below the risk category and mark it with a 1 in the blue text box. Sum up the number of low, medium and high risks of each section and fill in the summary table above. For each section, all identified risks (medium and high) should be addressed in the Management Plan (chapter 9 of the Management Plan Matrix in the guidance manual). Strategies should be developed for reducing or preventing the identified risks.

1a Sustainability risk of target species

	Low Risk	Medium risk	High risk	Remarks
Survival of the individual plant after collection possible	Yes, always without problem (e.g. berries, flowers)	Only if collected using accurate methods (specific knowledge required)	no (roots are collected, no recovery of the single plant possible)	
Biotic reproduction capacity of the single plant after collection (if not relevant to be left empty)	hardly or not affected by collection (collection after reproduction season, collection of leaves etc)	affected but still possible (collection of berries, seeds flowers but a part of these are left for reproduction)	not possible (whole plants, roots, flower in case there is only one single flower etc)	
Reproductive Biology	easy	normal	difficult, weak resprouters	
· **pollination**	wind, abiotic, asexual	common biotic (birds, insects)	highly specific (beetles, bees, bats)	
· **dispersal**	wind, water	common generalists (birds, small mammals)	large mammals and large birds, complicated mechanism	

	Low Risk	Medium risk	High risk	Remarks
Geographic Distribution	wide (abundant in many different regions of the world)	medium (abundant in a larger area/climatic zone, e.g. southern Europe)	restricted (abundant only in few countries/regions)	
Habitat Specificity	broad (not habitat specific, no special needs)	medium (specific needs but of common conditions e.g. edge of a forest, freshwater plants, alkaline soil etc..)	very specific (e.g deserts, high altitude, symbiotic etc)	
Local Population Size	large (very common plant, dense population, found almost everywhere in the whole area)	medium to large (medium density, but still common; patch wise distribution etc)	small, (rare plant, rare individuals or only few isolated populations, hard to be found)	
Population development	growing	stable	decreasing	
Growth	fast	medium	slow	
Part of Plant Used	leaves, flowers, fruit, dead wood	exudates, sap (flowers*), bark**	whole plant, roots, bulbs, apical meristems (bark)	
Single vs Multiple Use	single or non-competing	few, low conflict between users	multiple-use species	
Single vs multiple groups of users	One company or community of collectors	More than one company / community collects, but with clear management agreements	More than one company / community collects without management agreements	
Conservation status and value	Collector knowledge and other indicators suggest stable and surplus species abundance, distribution, or quality		Collector knowledge and other indicators suggest reductions in species abundance, distribution, or quality	
Demand on the market	low	medium	high	
Price of Product	Low value product	Medium	High value product	
TOTAL	**0**	**0**	**0**	

Adapted from Cunningham (2001) and Peters (1994).

*if a plant has a single or very few flowers (arnica, primula etc)
** if the bark is not used from the stem but from smaller branches.

1b Sustainability Risk: Project / Area Specific Factors

	Low Risk	Medium risk	High risk	Remarks
Collecting Place	Well defined and assigned to each collector/collection company	Several collectors/collection companies in one place active	Open, uncontrolled collection by anybody	
Regulatory System	Effective protection from unauthorized collection and other illegal activities	Partially functioning regulatory system	No effective regulatory system protecting the area	
Situation of Collection Area	Remote, inaccessible	Accessible but far off	Well accessible by car	
Collectors Habitation	In or adjacent to collection area	Traditional collectors coming each year	Migrating labour	
Collectors Knowledge	Traditional and trained in sustainable practices	Traditional	No knowledge of wildlife and ecology	
Social Self-control	Strong self-control by the village society	Weak self-control	No control existing	
Roamers / collection monitoring in place	Yes	Partially	No	
Importance of Collection	Minor additional income to the collectors	Additional income to the families	Only source of income in this area	
Buyer Availability in or near the area	Only one buyer available	Few traditional buyers	Many buyers, near open market place	
High demand for collectors	No	Partially	Yes	
Contracted Harvest (between collectors-collection company)	Collection only for what is contracted	Free collection for contracted buyer	Free collection on own initiative and risk	
High price for products (for collectors)	No	Partially	Yes	
Contract with collectors signed	Yes	Partially	No	
Buyer Agreements on Quantities Defined (Between Collection Company-Buyer or Importer)	Yes	Partially	No	

	Low Risk	Medium risk	High risk	Remarks
Size of collection operation	Small company, collected quantities clearly far below available yield according to resource assessment	Small company, quantities estimated to be far below available resources (overall assessment but no accurate resource assessment performed)	Intensive collection company, high collection quantities (near available yield, with or without resource assessment)	
Skills and capacities (knowledge, financial, tools, etc.) to implement sustainable collection and monitoring	All actors have the required means to carry out their tasks	Partially	Clearly not sufficient skills and capacities to carry out the required tasks	
TOTAL	**0**	**0**	**0**	

2 Risks for the habitat

	Low Risk	Medium risk	High risk	Remarks
Special Interdependency between Collected Plant and Other Plant Species	None	Low	High interdependency (symbiotic relation, etc.)	
Importance of Collected Plant/Part of Plant for Animals	None	Low (not main feed/shelter source for animals)	High (animals depend to an important extent on the collected species/part of plant for survival)	
Other special functions of the collected plant/part of plant in the ecosystem (land stabilisation, ersosion control)	Not relevant/function in ecosystem not affected at all by collection	Impact on species function in the ecosystem not relevant in case of correct collection method	Important species to ensure stability of the ecosystem + whole plant collected or function otherwise affected by collection	
Research being done by the project	Elaborate research programme exists	Some done	None	
Use of Other Species During Collection or Processing	No other species used by collectors	Some use of other common species	Intensive use of specific species	
Collectors influence on the habitat	None	Some influence (e.g. fireplaces, some hunting, etc.)	High impact, collectors camp on the area, high use of firewood, dumpsites, hunting, etc.	
Cultivation Measures or Measures Promoting the Collected Species	None	Some supportive measures done	High impacts into natural habitat	
Monitoring	Close monitoring of biodiversity and ecosystem done	Some monitoring done	No monitoring	
Ground water control (especially considering processing)	Well done	None	Water exploitation/ pollution	
TOTAL	**0**	**0**	**0**	

3 Social/ Institutional Issues

	Low Risk	Medium risk	High risk	Remarks
Collection Area	Well defined boundaries	Semi-controlled	Open, uncontrolled, boundaries unknown	
Tenure Rights	Clear land ownership, collection permits needed	Several collectors in one area active	Open, uncontrolled collection by anybody	
Collectors Groups	Well defined, traditional groups	Defined, individual	Undefined, individual	
Several companies in the area	No	Partially	Yes	
Stakeholder involvement	All involved stakeholders benefit from the project and collaborate	Low collaboration	No collaboration/ different interests and goals	
Competences and means	All actors have the required means (knowledge, finance, infrastructure, transport, etc.) to carry out their tasks	Partially	Clearly not sufficient skills and capacities to carry out the required tasks	
Responsibilities and fulfilment of tasks	Responsibilities clearly defined and understood by all actors. Tasks fulfilled accordingly.	Actors aware of responsibilities, some aspects need to be improved	No clear definition of responsibilities/ no fulfilment of tasks	
Communication	Good information flow between stakeholders and regular meetings held	Irregular information flow, only sporadic meetings	No exchange of information, important stakeholders do not assist to meetings/no meetings organised	
Traditional users of the species	No traditional users of the species in or near the area / species not used by local people	Some traditional users collect in small quantities	Species has an important cultural/ religious significance for local people	
Customary rights on the area	No traditional users in or near the area / no customary rights on the area	Small use of the area/ of other species in the area by local people (other than collectors of the company)	The area has been traditionally used and managed by local communities and/or has an important significance for local peoples, who are not the collectors of the ISSC-MAP managed operation	
Ethnic / Religious Problems	No problems existing	Different groups of collectors and users	High tension between different groups	
Documentation	Comprehensive records available	Some records available	No records available	
TOTAL	**0**	**0**	**0**	

4 Sources of contamination and quality/ traceability Issues

	Low Risk	Medium risk	High risk	Remarks
Power Station, Heavy Industry, Mines, Airport, Highways, etc.	None	In far distance	In or adjacent to collection area	
Intensive Agriculture, Govt. Spraying	None	In far distance	In or adjacent to collection area	
Cultivation in habitat	None	In far distance	In or adjacent to collection area	
Dump Sites, Towns	None	In far distance	In or adjacent to collection area	
Other Environmental Contamination	No source of contamination existing	Low risk of contamination	Pollutant in the vicinity	
Quality requirements defined	Yes, clearly	Partially	No	
Collection methods	Traditional collection methods according to quality requirements	Partially appropriate collection methods	Traditional collection methods not at all controlled to ensure quality, intensive training and monitoring needed to change practices	
Handling by collectors	Adequate and controlled handling by collectors	Normally appropriate handling, no regular supervision	Product commonly dried/processed on the ground (not on mats) or treated wood layers, no supervision by company	
Contamination in collectors homes	No risk/no storage or processing at collector's homes	Low risk of contamination	Very poor sanitation situation in the houses, common use or storage of synthetic products (e.g. agrochemicals, rodenticides)	
Quality Control during purchase	Quality control for harvest products implemented	Traditional interaction with collecting station	Sales at any price and conditions	
Quality Control during processing, storage and handling	Appropriate processing, handling & storage methods and quality control	Acceptable processing & storage and quality control	No adequate processing / no control of quality issues during processing, handling or storage	
Pest Management and Hygienic measures in purchase, processing and storage units	No chemical pest management, cleaning only with water	Documented use of synthetic products, only when store is empty and waiting period respected	Uncontrolled/undocumented use of synthetic products, waiting period not always respected	

	Low Risk	Medium risk	High risk	Remarks
Knowledge of collectors and staff	All collectors, purchase and handling staff well trained on quality and contamination issues	Partially	No training, collectors and employees not aware of quality and contamination risks	
Traceability well possible	Yes	Partially	No	
Collectors books well kept	Yes /not relevant	Partially	No	
Books at collecting station well kept	Yes	Partially	No	
Pre-processing well defined, documented	Yes /not relevant	Partially	No	
Harvest estimations available and checked	Yes	Partially	No	
Good maps and site descriptions at hand	Yes	Partially	No	
Lot number system in place and meaningful	Yes	Partially	No	
TOTAL	**0**	**0**	**0**	

Annex VII: Glossary

Term	Definition	Source
Adaptive management	An integrated, multidisciplinary approach for confronting uncertainty in natural resources issues. It is adaptive because it acknowledges that managed resources will always change as a result of human intervention, surprises are inevitable, and that new uncertainties will emerge. Active learning is the way in which the uncertainty is winnowed. Adaptive management acknowledges that policies must satisfy social objectives, but also must be continually modified and flexible for adaptation to these surprises. Adaptive management therefore views policy as hypotheses- that is, most policies are really questions masquerading as answers…and management actions become treatments in an experimental sense.	HOLLING 1978; WALTERS 1986
Benefit sharing	Participation in the economic, environmental, scientific, social or cultural benefits resulting or arising from access to genetic resources and associated traditional knowledge under mutually-agreed terms.	SECO 2005
Bill of lading	A document that establishes the terms of a contract between a shipper and a transportation company. It serves as a document of title, a contract of carriage, and a receipt for goods.	J. BRINCKMANN (personal communication)
Biological diversity	The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.	UNEP 2001
Botanicals	A subset of NTFPs that includes herbal medicines, personal care products, and functional foods.	PIERCE and LAIRD 2003
Chain of custody	The path taken by raw materials and products, from the forest to the consumer, including all successive stages of processing, transformation, manufacturing, and distribution.	FSC 2006
	A tracking system that enables certifiers to trace each forest product from its origin through harvesting, processing, storage and sale.	SHANLEY et al. 2002
Collectable yield / harvestable yield	Maximum available quantity for collection.	See PETERS 1996

Term	Definition	Source
Collection operation	Structured operation organizing wild collection activities. For commercial companies such operations usually consist of three major parties: The collectors, local purchasers/purchase centres and the main processor/trader, which usually is the actual collection operator or collection manager.	
Consensus	General agreement, characterized by the absence of sustained opposition to substantial issues by any important part of the concerned interests and by a process seeking to take into account the views of interested parties, particularly those directly affected, and to reconcile any conflicting arguments. Need not imply unanimity.	ISEAL 2004
Criterion	A state or aspect … which should be in place as a result of adherence to a principle. The way criteria are formulated should give rise to a verdict on the degree of compliance in an actual situation.	LAMMERTS VAN BUEREN and BLOM 1997.
	A standard on which judgement or decision may be based; a characterizing mark or trait.	ENCYCLOPÆDIA BRITANNICA 2006
	A means of judging whether or not a principle has been fulfilled. A criterion adds meaning and operationality to a principle without itself being a direct yardstick of performance.	SHANLEY et al. 2002.
	Indicates what a standard measures.	ISEAL 2004
	A means of judging whether or not a Principle (of forest stewardship) has been fulfilled.	FSC 2000
Customary rights	Rights that result from a long series of habitual or customary actions, constantly repeated, which have, by such repetition and by uninterrupted acquiescence, acquired the force of a law within a geographical or sociological unit.	FSC 2000
Ecosystem	A community of all plants and animals and their physical environment, functioning together as an interdependent unit.	FSC 2000
Endangered species	Any species that is in danger of extinction throughout all or a significant portion of its range.	FSC 2000
Ethical	Conforming to accepted professional standards of conduct.	ENCYCLOPAEDIA BRITANNICA 2006
Ex-situ conservation	The conservation of components of biological diversity outside their natural habitats.	UNEP 2001
Extent of collection	Extent: the range over which something extends: scope.	ENCYCLOPOEDIA BRITANNICA

Term	Definition	Source
	Scope: extent of treatment, activity, or influence: range of operation Scale: a distinctive relative size, extent, or degree < projects done on a large scale. Rate: a fixed ratio between two things; a reckoned value; a quantity, amount, or degree of something measured per unit of something else Intensity: the magnitude of a quantity (as force or energy) per unit (as of area, charge, mass, or time). Frequency: the number of repetitions of a periodic process in a unit of time Volume: the amount of space occupied by a three-dimensional object as measured in cubic units; the amount of a substance occupying a particular volume. Quantity: a determinate or estimated amount Level: the magnitude of a quantity considered in relation to an arbitrary reference value; broadly = magnitude, intensity. Yield (sustainable annual): to bear or bring forth as a natural product, esp. as a result of cultivation; product, esp. the amount or quantity produced or returned.	2006
Guideline	An indication or outline of policy or conduct.	ENCYCLOPÆDIA BRITANNICA 2006
Habitat	The place or type of site where an organism or population naturally occurs.	UNEP 2001
Harmonization	Harmonization is the process by which the content of two or more standards is brought into increasing conformity. Activities that support harmonization include, but are not limited to the use of common criteria and indicators, statements of common objectives, adoption of common structures for presentation of standards, and development and adoption of a single international standard.	ISEAL 2004
Indicator	A quantitative or qualitative parameter which can be assessed in relation to a criterion.	LAMMERTS VAN BUEREN and BLOM 1997.
	Qualitative or quantitative parameter that can be assessed in relation to a criterion. It describes in an objectively verifiable way the features of the ecosystem or a related social system. Minimum or maximum allowable value of an in indicator is known as threshold value (i.e., a way of quantifying	SHANLEY et al. 2002

Term	Definition	Source
	or qualifying or measuring performance)…. An indicator is assumed to include a performance value and is therefore called a performance indicator.	
	How criteria are measured.	ISEAL 2004
In-situ conservation	The conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.	UNEP 2001
Management Plan	A Management Plan is a written document in which the resource manager or management committee sets out its goals and the approaches it will use to accomplish those goals in a given period of time. The ISSC-MAP Management Plan sets forth standards and procedures, responsibilities and work practices required to fulfil the principles of the ISSC-MAP Standard.	
Medicinal and aromatic plants	"Medicinal" and "aromatic" are terms describing properties of chemistry and use that can be ascribed to plants. Medicinal plants prevent, alleviating, or curing disease. This group can be defined narrowly, to include only those plants already known to be used in this way in some system of medicine, traditional or modern, or it can be defined broadly to include potential, as yet undiscovered uses of this nature. Aromatic plants contain fragrant, essential oils valued as perfumes, herbs, spices, and as medicines. Many "medicinal" plants are thus also "aromatic" (and vice versa), just as medicinal and aromatic uses overlap within particular taxa with other important categories of plant use, such as foods and beverages. The coincidence of highly desirable qualities within particular taxa makes these groups all the more important as plant genetic resources. The degree of overlap between medicinal and aromatic properties and uses has supported the treatment of medicinal and aromatic plants as a single category, particularly from the point of view of commercial harvest, trade, and agriculture.	LEAMAN et al, 1999
Monitoring	Systematic observation of indicators to assess changes or whether desired conditions are being	

Term	Definition	Source
	attained.	
Mutually-agreed terms	Conditions and provisions of access and benefit sharing, among others, negotiated between the user and the provider and involving other relevant stakeholders.	SECO 2005
Non-timber forest products	All forest products except timber, including other materials obtained from trees such as resins and leaves, as well as any other plant and animal products.	FSC 2000
	All biotic products other than timber that can be harvested for subsistence and/or for trade. NTFPs may come from primary and natural forests, secondary forests, and forest plantations, as defined by FSC regional Working Groups.	FSC 2000
Organic agriculture = biological agriculture = ecological agriculture	A whole system approach based upon a set of processes resulting in a sustainable ecosystem, safe food, good nutrition, animal welfare and social justice. Organic production therefore is more than a system of production that includes or excludes certain inputs.	IFOAM 2004
Precautionary principle; precautionary approach	An approach to uncertainty that provides for action to avoid serious or irreversible environmental harm in advance of scientific certainty of such harm.	COONEY 2004
Principle	A fundamental law or rule, serving as a basis for reasoning and action. Principles are explicit elements of a goal.	LAMMERTS VAN BUEREN and BLOM 1997.
	A comprehensive and fundamental law, doctrine, or assumption.	ENCYCLOPÆDIA BRITANNICA 2006
	A fundamental truth or law as the basis of reasoning or action; an essential rule or element.	SHANLEY et al. 2002
	An essential rule or element.	BROWN *et al.* 2000
Prior informed consent	Consent obtained by the user from the State and other providers, as the case may be, after fully disclosing all the required information, that allows access to their genetic resources and associated traditional knowledge under mutually-agreed terms.	SECO 2005
Protected area	A geographically defined area that is designated or regulated and managed to achieve specific conservation objectives.	UNEP 2001
Resource manager	Person, group of persons, organization or authority	

Term	Definition	Source
	responsible for the use and management of the natural resources in a defined area.	
Standard	A definite rule, principle, or measure established by authority.	ENCYCLOPÆDIA BRITANNICA 2006
	Principles + criteria = standard.	FSC 2000
	Practice standard = core commitment (fixed requirements / the outcome or condition to be achieved in all applicable circumstances, applicable to all) + guidance (flexible, to be respected in intent and are available to be adopted according to the specific circumstances, levels, and sectors), documentation and reporting (to bring transparency to the application of the commitments and guidance).	SECO 2005
	Document that provides, for common and repeated use, rules, guidelines or characteristics for products or related processes and production methods, with which compliance is not mandatory. It may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method.	ISEAL 2004
Sustainable use	The use of components of biological diversity in such a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.	UNEP 2001
Sustainable yield	Harvest at a rate equal to the annual growth rate.	ZABEL et al. 2003
Tenure	Socially defined agreements held by individuals or groups, recognized by legal statutes or customary practice, regarding the "bundle of rights and duties" of ownership, holding, access and/or usage of a particular land unit or the associated resources there within (such as individual trees, plant species, water, minerals, etc).	FSC 2000
Threatened species	Any species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.	FSC 2000
Traceability	The completeness of the information about every step in a process chain.	WIKIPEDIA 2006

Term	Definition	Source
Traditional knowledge, innovations and practices	Knowledge and practices of an individual or collective nature, of indigenous peoples and local communities associated with genetic resources and related to the conservation and sustainable use of biological resources.	SECO 2005
Use rights	Rights for the use of forest resources that can be defined by local custom, mutual agreements, or prescribed by other entities holding access rights. These rights may restrict the use of particular resources to specific levels of consumption or particular harvesting techniques.	FSC 2000
Verifier	Describes the way an indicator is measured in the field (i.e., data points or information that enhance the specificity or the ease of assessment of an indicator). The intention in this process in not to prescribe a minimum set of verifiers, but to allow room for verifiers that are specific to region, product, class, operation size, etc. Verifiers add meaning, precision and usually also site-specificity to an indicator. Numerical parameters might be assigned to a verifier on a case-and-site-specific basis.	SHANLEY et al. 2002
Viable population	A population that is capable of maintaining itself over a given period of time.	
Wild collection	Practice of gathering a non-cultivated native or naturalized resource from its natural habitat (which may be forest, meadow, pasture, agricultural field, desert, or any other environment in which non-cultivated species are present.	
Zones of influence	Zones inside the collection area that are in fact being harvested by collectors. The zones of influence do not necessarily correspond to the total area of distribution of target species in the collection area.	