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Item 17.3 of the provisional agenda*

GLOBAL STRATEGY FOR PLANT CONSERVATION

Technical review of the targets and analysis of opportunities for their implementation: report of the meeting of technical experts on the Global Plant Conservation Strategy, Gran Canaria, 11-13 February 2002

Addendum

GLOBAL STRATEGY FOR PLANT CONSERVATION: REFINEMENT OF THE 16 TARGETS

A review of the scope, terminology, base-line information, technical and scientific rationale of the 16 draft targets included in the proposed Global Strategy For Plant Conservation, with particular reference to the quantitative elements they contain**

Draft target 1: A widely accessible working list of known plant species, as a step towards a complete world Flora

Revised Target 1: A widely accessible working list of known plant species, as a step towards a complete world Flora

1.1. Explanation

The proposed strategy addresses the Plant Kingdom with focus on vascular plants and Bryophytes (mosses and allies). The setting of measurable targets for this set of taxa is more credible than for many lower plant groups. This does not imply that these groups do not have important ecological functions, nor that they are not threatened. However, effective action will be best achieved by focusing, in an initial phase at least, on achievable outcomes for known taxa (UNEP/CBD/SBSTTA/7/10).

* UNEP/CBD/COP/6/1 and Corr.1/Rev.1.

** The "draft targets" are those proposed at the seventh meeting of the Subsidiary Body on Scientific, Technical and Technological Matters (SBSTTA) which have been revised/refined during the inter-sessional period works prior to the sixth meeting of the Conference of the Parties (COP). The "revised targets" are those hereby proposed for consideration by the Conference of the Parties at its sixth meeting.

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The provision of a working list of the accepted names of known plant species represents a key act of synthesis designed to provide the most basic of information for biodiversity management. It is an inventory of resources and a means of organising information in a logical and retrievable way. It also helps prevent duplication of effort and accidental oversight when planning conservation action. The name of a plant is the key to information about its uses, conservation status, relationships and place within ecosystems. The implementation of several of the Articles of the Convention on Biological Diversity (CBD), particularly Articles 6 (General Measures for Conservation and Sustainable Use), 7 (Identification and Monitoring), 8 (In-situ Conservation) & 10 (Sustainable Use) depend on knowing the correct names for plants and accessing the relevant information. Parties to the CBD have recognized this dependency in Decision COPIV/1: encouraging 'Governments to make available appropriate resources to enhance the availability of taxonomic information'; and requesting 'institutions, supported by Parties and international donors, to co-ordinate their efforts to establish and maintain effective mechanisms for the stable naming of biological taxa'.

It is estimated that some 270,000 - 425,000 species of vascular plant are already known (Diversitas 2000, Govaerts, in press) with perhaps a further 10- 20% still to be discovered and described (Hawksworth 1995, Diversitas 2000). Some of these species have been described twice or more, giving several names for one plant. Under the *International Code of Botanical Nomenclature* (Greuter *et al.* 2000), usually the earliest name is considered the correct name which should be accepted and used in referring to the species, the other names are known as synonyms. It is important that the correct name is established and accepted for use as the unique identifier for each species. In all there are currently about 915,000 names for the estimated 270,000 - 425 000 known vascular plant species (Index Kewensis).

Floras and Monographs are products of taxonomic research which identify the correct and accepted name of a species and which names are synonyms. They also provide descriptions of the accepted species, other information such as distribution and habitat data, uses, conservation assessment and aids to identification. A Flora is an account of all the plants of a particular area, whereas a Monograph is an account of a group of plants throughout its geographical range. The proposed list of all known species will provide a firm foundation upon which to base a future Flora of the world which could provide in-depth information to assist in the conservation and sustainable use of plant diversity.

1.2. Background and Baseline

There are around 20,000 species of mosses and allies. A good baseline for these exists in database form (Tropicos MOST). There is currently no widely accessible working list of known vascular plant species. The relevant information is scattered across many Floras, Monographs, Scientific Journals, databases and institutions. The International Plant Names Index (IPNI) is a database of the names and associated basic bibliographical details of all seed plants and as such it represents an essential first step towards a comprehensive species list. However, IPNI does not distinguish between accepted names and synonyms, so it does not fulfil the role of a checklist of accepted names. Some organisations such as Species 2000, GBIF, IOPI and The All Species Foundation, have begun to pull together existing information on accepted names to make it more accessible via the Internet. At a more fundamental level, work to establish the accepted names for the majority of the world's plant species is carried out on the basis of scattered sources in a rather piecemeal fashion at many taxonomic institutions.

A species list is basic to study and management of plant diversity and has to be made more widely available where information exists, and gaps in knowledge have to be identified and filled in cases where it does not. Parties to the CBD have recognized the importance of this in Decision COPIV/1: asking for 'taxonomic information, literature and checklists to be put into electronic form'; and in supporting the 'development of a Global Biodiversity Informatics Facility (GBIF) to allow people in all countries to share biological diversity information and to provide access to critical authority files'. Decisions COP III/10, COP IV/1 and COPV/9 support the Global Taxonomic Initiative (GTI) which seeks to address the urgency for the availability of taxonomic information to countries of origin and the need for taxonomic

input in activities aimed at the conservation and sustainable use of biological diversity. The GTI also addresses the lack of taxonomic capacity in a majority of countries, which is a considerable barrier to filling the gaps in knowledge.

Of the estimated 270,000 – 425,000 species of vascular plants, lists of accepted names are known to exist for c. 100,000 species, 24-37% of the total. However, fewer than half of these records are widely accessible in published form, the others being stored as individual or institutional databases (Bisby *et al* 2000, Govaerts, in press). For the remaining 170,000 – 325,000 plant species information is scattered across Floras, regional Checklists, monographs and scientific journals. For many groups there has been no attempt at synthesis. The baseline knowledge necessary for compiling a list of accepted names is good and fairly accessible for plant species occurring in many temperate areas, but it is poor for the rich biodiverse areas of the tropics (Diversitas 2000). There would thus seem to be two challenges involved in producing a widely accessible working list of accepted plant names. First making existing information accessible – the task undertaken by Species 2000, GBIF, IOPI and The All Species Foundation; and second creating new lists of accepted names based on taxonomic judgements from scattered sources and, often, from relatively poor baselines.

1.3. Rationale and Conclusions

The target is achievable with modest additional resources within the given time frame, and may indeed prove under-ambitious were it to become a widely accepted focus of activity.[1] . Organisations such as Species 2000 provide a framework and simple access point enabling new and existing electronic databases of accepted names to be brought together to form a comprehensive whole. The Global Strategy for Plant Conservation provides co-ordination and focus necessary for accelerating progress to achieve more quickly a working list of known plant species and thus better facilitate research into all aspects of conservation and sustainable.

However, there are two issues that require attention. First, the working list will merely be the preliminary basis for further study of plant diversity, conservation and sustainable use. Work on correcting and refining this list and adding value for conservation purposes is essential and it is here that researchers in the developing countries can make the largest impact. Further resources must be found in order to speed up completion of the list and to increase the taxonomic capacity of biodiverse countries to participate in the process. Second, increases in resources are also needed to convert existing databases to suitable electronic formats and to make them widely and freely accessible via the Internet. The annual checklist on CD-ROM published by Species 2000 provides an alternative method of presentation that may be of particular interest to those lacking Internet access.

1.4. Key References

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[1] Recent experience indicates that a single compiler can treat c. 7,000 accepted names with their synonyms per year (Govaerts, in press). Since up to 325,000 accepted names remain to be treated, funding for five further compilers would ensure that the task could be completed within eight years. Salary costs would be in the order of US $180,000 per annum

IOPI. International Organisation for Plant Information. http://iopi.csu.edu.au/iopi/
IPNI. International Plant Names Index. www.ipni.org/
Index Kewensis. Index Kewensis Universe database searched on 7 January 2002. RBG Kew.
Species 2000. Indexing the world's species. www.sp2000.org/
Tropicos MOST. Index of Mosses. www.mobot.org/MOBOT/tropicos/most/iom
UNEP/CBD/SBSTTA/7/10. Plant Conservation Strategy
http://www.biodiv.org/doc/meetings/sbstta/sbstta-07/official/sbstta-07-10-en.pdf

Draft Target 2: An assessment of the conservation status of [all] known plant species, at international, regional and national levels.

Revised Target 2: A preliminary assessment of the conservation status of all known plant species, at national, regional and international levels

2.1. Explanation

The CBD requires that each party shall, as far as possible and appropriate, identify components of biological diversity important for its conservation and sustainable use. However it recognises that this task must be prioritised, so advises on "a specific emphasis on ecosystems and habitats containing high diversity, large numbers of endemic or threatened species… and species and communities which are threatened; wild relatives of domesticated or cultivated species, of medicinal, agricultural or other economic value; or social scientific or cultural importance; or importance for research into the conservation and sustainable use of biological diversity, such as indicator species".

It is clear that to be able to determine which ecosystems or habitats contain threatened species, that these species must be assessed, hence the target of assessing ALL known plant species at international, regional and national levels.

However from experience, species conservation assessment is a long and complicated process, and to achieve this target, greater emphasis needs to be put at the national, regional and international level to achieve a global plant assessment. This paper outlines the work undertaken to date, and suggests two interim targets for the next 10 years, culminating in the first global plant assessment at the end of 10 years.

In addition, the CBD has approved a work programme on indicators of biological diversity (CBD decision IV/1 A), and a final report on indicators will be submitted to COP6. This global plant assessment work needs to work in tandem with the indicator work, with priority assessments contributing to this process, in order to aid parties in producing their national biodiversity reports.

2.2. Background and Baseline

The idea of assessing the conservation status of plant species was started by IUCN in 1950. Its purpose was "the assembling, evaluation and dissemination of information on, and the study of, all species off fauna and flora that appear to be threatened with extinction, in order to assist governments and appropriate agencies in assuring their survival" (Scott *et al.*, 1987). Although largely concerned with animals, the first IUCN Red Data Book on Angiosperms (Flowering Plants) was produced (Melville, 1970). This book only listed 118 species, although predicted that some 20,000 species could be at threat. This work was then followed by the IUCN Plant Red Data Book (Lucas & Synge, 1978) which listed 250 species as examples, estimating that this could represent 1% of the estimated 25,000 globally threatened species.

In the ensuing years IUCN, through its Conservation Monitoring Centre based at Kew, England, made a concerted effort to compile all threatened species information into a central database, working closely with the Smithsonian Latin American programme. This work continued when the CMC became the World Conservation Monitoring Centre (WCMC). The result of over 20 years compilation and networking was merged with three major datasets that had been independently compiled. The Nature Conservancy contributed information on c. 11,000 species from the USA, Canada and Latin America, Wildlife Australia contributed data on c. 5,000 species from Australia, and the National Botanical Institute, South Africa, listed 3,435 from southern Africa. This work resulted in a list of almost 34,000 threatened species of higher plants (Walter & Gillett, 1998), assessed using the "old" IUCN Red List Criteria. However this assessment was again felt to be an underestimate of the number of globally threatened plant species.

The same year a three year joint WCMC/SSC project finished assessing some 10,000 tree species, using the "new" 1994 IUCN categories, and identified 7,300 species of tree as threatened (Oldfield *et al.*, 1998). At the same time, IUCN started applying the "new" criteria to species listed in IUCN Red Lists. Today the IUCN Red List currently lists 6,266 plant species as threatened (Hilton-Taylor, 2000). However, more information is being collected all the time.

IUCN has made a further revision to the Red List Categories and Criteria (IUCN, 2001) and from now on all new species to be listed in the global IUCN Red List must follow these Criteria. The Red Listing procedure, now more rigorous than it was before, provides a more transparent and debatable process for how species get on the Red List, and is an essential tool in helping prioritise biodiversity conservation action, as well as monitor species threats and trends.

2.3. Rationale and Conclusions

Given that time is running out for many species, it could be argued that less effort should be made on assessing the conservation status of species, and more on their conservation. While more work is certainly needed on conservation and management programmes for threatened species, at the same time given the great number of known or suspected threatened species, a reliable and tested assessment system is sorely needed. Only then can countries accurately assess the priority species in need of conservation attention, and monitor the species that need immediate attention with as ever limited conservation resources.

One of the fundamental principles of the CBD is that it calls for parties to take conservation action on threatened species, but in order to know which species are threatened, it is essential that proper assessments need to take place, and that parties are trained in these assessment procedures.

However to properly assess species takes time and resources. As an indication, a project aimed at assessing all 5000 species of amphibians is taking 3 full-time staff, working with local scientists and giving training workshops in assessment procedures, over two years to achieve. While many plants are better known than some of these amphibians, at the same time many of them are much less known. However the amphibian work has shown that the less well known the species is, the quicker the assessment. Thus an assessment programme for the c. 250,000 documented vascular plant species would take about 50 times as much effort to assess, although now that the procedures and databases have been developed the process will be more efficient. In addition, a strategy for non-vascular plants also needs to be discussed. However, it should be noted that a world list of threatened bryophytes has been compiled (Hallingbäck & Hodgetts, 2000) and assessment procedures should not solely be thought about in terms of assessing vascular plant species.

While the ten-year goal must be to assess the conservation status of all known plant species, at the same time priorities must be made. The first priority should be the re-assessment of all species already known or suspected to be threatened, usually due to limited distribution or known threats. A great number of

these have already been identified in the 1997 Red List, and further work is needed to ascertain that these species are first, accepted species, and second, that they are indeed threatened, using the more rigorous 2001 IUCN criteria. Resources need to be secured now to ensure the completion on this initial task by the end of 2004.

The second priority should be to assess entire taxonomic groups of species so that these groups may serve as "indicators" of biodiversity and ecosystem health, as well as serve as a monitoring system in order to be able to follow plant population trends. Possible "indicator" groups to be assessed include the legumes, certain tribes of orchids, trees, carnivorous plants, and others. The target is to complete the assessment of the indicator groups by the end of 2007.

With the completion of these first two targets, the emphasis should be fill in the gaps, thus completing the assessment of all known plant species by the end of 2010.

It is likely that these targets could be achieved more quickly if the work can be well organized on a regional scale, and many regions could complete the full assessment of all their plant species in less than ten years. Of those species still to be evaluated, sufficient information for a full assessment is only available for a proportion. Thus, only a *preliminary* assessment will have been carried out on the remaining, "data-deficient" species. Subsequently, further fieldwork will be essential to enable more comprehensive assessments to be undertaken.

Given clear direction and resources (particularly taking into account the increasing speed of internet technology and communication), assessing the conservation status of the world's plant diversity is not an impossible task. However it needs to be logically organised and the process needs to be transparent and defendable. This will require increasing capacity-building in assessment procedures and a greater flow of information, nationally, regionally, and internationally.

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Draft Target 3: An understanding of basic conservation needs for threatened plant species and plant communities, with conservation protocols and/or techniques to assess and protect plant communities developed as necessary.

Revised Target 3: Development of models with protocols for plant conservation and sustainable use, based on research and practical experience.

3.1. Explanation

Science underpins the development of best practice principles which should form the cornerstone for effective and sustainable conservation outcomes. Conservation biology provides the methodologies and practical techniques for ensuring the conservation of plant diversity and the sustainable use of its components. These can be applied through the development and effective dissemination of relevant models and protocols for applying best practice, based on the results and synthesis of existing and new research and practical experience derived from management of systems and species. 'Protocols' in this sense, can be understood as practical guidance on how to conduct plant conservation and sustainable use activities in particular settings. Key areas where the development of models with protocols is required include: the integration of *in situ* and *ex situ* conservation; maintenance of threatened plants within ecosystems; applying the ecosystem approach; balancing sustainable use with conservation; and methodologies for setting conservation priorities and monitoring conservation and sustainable use activities. These tools will become increasingly essential as plant diversity and associated resources decline as a result of anthropogenic pressures (Tilman and Lehman, 2001). Such tools, that can be made available to practitioners and modified for specific local use, will increase the efficiency of regional capacity building and networking.

Whilst the taxonomic impediment has been recognized there is an equally urgent need to facilitate change in the "conservation management impediment" whereby regional, national and local management authorities and local stakeholders must be empowered to implement successful and cost-effective responses to retain and restore biodiversity in the context of a dynamic approach to ecosystem function. Target 3 facilitates the implementation of the Convention on Biological Diversity (CBD), notably Articles 6 (General Measures), Article 7 (Identification and Monitoring), Article 8 (*In Situ* Conservation), Article 9 (*Ex Situ* Conservation), Article 10 (Sustainable Use) and Article 12 (Research and Training) and ICSU/IUBS programmes, including Diversitas. Importantly, Target 3 depends on the application of applied scientific approaches to ensure management of biodiversity and provides for the long term sustainability of species and the ecosystems on which they depend.

3.2. Background and Baseline

Effective management is dependent upon accurate data and interpretation of data. Current data pertaining to plant extinctions are not sufficient to identify in advance those plant species requiring conservation management. A number of global initiatives have identified important areas of botanical diversity (Myers *et al.*, 2000; WWF/IUCN, 1994-97) and the Important Plant Areas (see Target 5). The practical challenges of retaining and effectively managing these "hotspots" are not resolved. IUCN Red Data Assessments are the established means for listing and assessing threatened plants (see Target 2). Currently there are few national lists accurately identifying threatened taxa along with specific management prescriptions. A key issue is that at the global scale conservation biology and management can provide working principles but not detailed prescriptions; the latter are unique to particular socio-economic, biological and cultural scales, often at the level of local communities.

National and regional capacity for conservation management varies significantly. Only 6% of the world's scientists live in the countries that house 80% of the planet's biodiversity; of the 7,000 taxonomists

globally the megadiverse countries have only about 500 in residence (Sarukhán & Dirzo, 2001). It is expected that the distribution of conservation biologists and infrastructure shows a similar pattern. In addition to restricted resources, the application of assessment and management resources needs to be effectively directed to implementing conservation management.

Plant conservation biology represents a set of working tools that has been largely developed and tested in temperate North America, Australasia and Europe. Within these areas candidate species can be identified with some confidence and resources and protocols for threatened species, though limited and highly competitive, are available. Effective application in the biodiverse regions outside of most developed countries will require modifications in both philosophy and technology. Northern models for conservation, based on a cadre of professional scientists and site managers will need to be supplemented by plant conservation protocols designed to work with and be directly supported by local communities (Maunder *et al.*, 2002). To increase efficiency it is proposed that generic guidelines for threatened species should be developed, these allowing for local conditions and species specific modifications.

In developing principles, protocols and prescriptions there is already a considerable depth of information and research available in scientific journals and reports, and summarized in the *Global Biodiversity Assessment* (Heywood and Watson 1996), which brings together the expertise of over 1200 of the world's scientists. Working linkages must develop between existing congruent programs including: Diversitas, the UNESCO Man and Biosphere Programme, the Millennium Assessment of the World's Ecosystems, the IUCN Species Survival Commission's Plants Program, the BGCI Botanic Gardens Strategy, FAO forestry and agriculture programmes, and the research and management approaches of industry agencies such as ITTO (Given 2000).

3.3. Rationale and Conclusions

Outside of the surviving major wilderness areas (*sensu* Mittermeier, *et al.*, 1998), plant conservation will need to focus on two fundamental challenges: (1) the protection and active management of habitats to maintain plant diversity, ecological processes, and plant resources; and (2) the management of individual plant species and populations to retain viable populations and prevent species loss or extinction. Fundamental to these will be dealing with the human context of plant conservation including sustainable use, cultural values and access and benefit sharing.

Once candidate taxa have been identified for conservation management the unique aspects of the ecosystem (i.e. tropical, temperate, alpine, aquatic) need to be evaluated in terms of key limiting factors (i.e. light, nutrients, water availability, disturbance and stress,). This should be reviewed on an ecosystem or regional scale e.g. protocols for threatened Proteaceae in Southern Africa. For the majority of candidate taxa, many rarely studied before, a significant investment in conservation biology research will be necessary to ensure quality scientific data underpins their conservation management. Effective plant conservation will require the integration of scientific approaches with applied practical approaches (see Falk, 1990), the integration of coarse-filter community/habitat level conservation with fine-filter single species work, the integration of professional and community efforts, the integration of academic research and practical management philosophies, the integration of *in situ* and *ex situ* approaches, and the integration of a public education component into all conservation programs. Sound conservation biology solutions should include elements of social science, resource economics and commercial practice; an "academic" awareness of the need for plant conservation alone does not necessarily change practices (Given, 1994).

To develop models, with effective protocols, will require a continued commitment to Red Listing (*sensu* IUCN) and habitat assessments, with the development of supporting information management and research infrastructures. To fully achieve this some significant practical management issues remain as urgent challenges:

- There will need to be an expansion in a more effective means for taxonomic assessment and the development of ecological expertise for conservation management. The majority of existing recovery plans are for temperate angiosperms. With tools and protocols developed in temperate regions (e.g. CPC) should be tested and modified, where appropriate, for tropical systems

- To develop effective tools and protocols will need regional co-operation to ensure that skills and techniques appropriate to both taxonomic groups and particular habitats are developed and shared effectively. The expansion of regional capacity building groups will be essential e.g. SABONET, BOZONET, The Australian Network for Plant Conservation, and SSC/IUCN etc.

- Development of replicable tools and protocols requires an increased commitment to scientific experimentation and trials rather than ad hoc and opportunistic management. Conservation science needs to focus on more effective means for systematic and rigorous approaches to achieving management outcomes for both ex situ and in situ conservation. Equally, conservation practitioners from community to professional, require clear direction on the need to direct management activities based on timely, accurate and regionally/species relevant research. Models and guides represent a key means for informing practitioners of approaches to be used in devising and implementing science-based management of species and ecosystems.

- The development of practical and low cost techniques for biodiversity restoration should tackle priority issues such as restoring heavily degraded biodiverse habitats (e.g. post logging habitats) and predicting, preventing or ameliorating severe threats, is urgently needed. This will include techniques for restoring mutualisms and trophic linkages. Emphasis to be given to developing protocols and tools that build on knowledge innovations and practices of indigenous people, whilst also providing quantifiable social or economic services.

Tools are needed to balance species management with habitat or ecosystem management, particularly for biodiversity rich anthropogenic landscapes that provide essential ecological services and often contain diverse resources of wild collected economically and culturally valuable plants.

- Habitat conversion produces an "extinction debt", a pool of species destined for extinction unless the habitat is repaired or restored; we need to identify these species in anticipation of habitat loss and co-ordinate species conservation with habitat restoration and *ex situ* conservation.

- There will be an increased need for continuity of information between successive management regimes, communities and individuals. Professional and community networks (local, national and international), provide important conduits for ensuring the durability of management information. Currently conservation management schedules are based on short term management but biodiversity restoration will need commitment measured over many decades.

- Closing the gap between the outcomes of conservation and ecological research and its application to the practical management of threatened habitats and species by local communities, protected area managers and volunteers must be facilitated through the development of effective and easy to use (particularly by non-specialists) monitoring protocols and plant identification tools to guide the implementation of plant conservation activities (Cunningham, 2001).

- Emphasis should be given to innovative and fast-track research approaches that respond directly to emerging scenarios e.g. climate change will influence some ecological units and species more than others and research is needed to identify those systems and species most at risk from climate change.

- The increasing pace of species loss and the alteration of landscapes necessitates a more focused, cost-effective, and timely implementation of recovery plans that have local ownership. This may mean a multi-species approach or larger area considerations such as plans based, for example, on an ecoregion, important plant area or water catchment area.

The retention of wild plant diversity, as opposed to only documenting plant diversity, is largely dependent upon establishing practical and responsive tools for plant conservation that invest resources according to an accurate understanding of conservation needs and priorities while utilizing cost-effective and practical tools and protocols.

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Draft Target 4: [10 per cent] of each of the world's ecological regions effectively conserved.

Revised Target 4: At least 10 per cent of each of the world's ecological regions effectively conserved.

4.1. Explanation

Planning the use of land is desirable to achieve conservation in balance with other human aspirations (Pan-European Ecological Network 2001). The landscape can conceptually be regarded as divided into zones of differing degrees of intensity of human modification, ranging from pristine landscapes with a diversity of native species to monocultures, often of agricultural or plantation crops (Clement 1999). Conservation of plant diversity should not be confined to pockets recognised as 'hotspots' for species, though special efforts are needed at such sites (WWF and IUCN 1994-1997) (Target 5). Reasons for concerted efforts over wider areas include:

- Plant diversity can then deliver a range of benefits more widely. These benefits are cultural and economic, the support of ecologically dependent species, the provision of habitats for other species, and the delivery of ecological services.

- There will be more adequate coverage of ecological regions in which plant diversity is relatively poorly concentrated in hotspots (e.g. tundra, the African sahel).
- Loss of plant diversity through climatic and other global changes will be mitigated.

Ecological regions are extensive zones of similar ecosystem type, generally recognised at the largest scale primarily largely through their (estimated) natural vegetation (e.g. tropical forest; temperate grassland) and with some reference to climate. There is no widely accepted classification of ecological regions at the global scale. Vegetation is commonly used as a major means of classifying ecological types (natural or human-modified) at more local scales, often with physiognomic characters (structure, height, etc.) being used more to classify relatively extensive units and floristic composition at finer scales (Granger 1996). The implementation of this target will be primarily at the national level, and national schemes of classification for ecological regions or major vegetation zones will form the first point of reference in pursuing this target.

National conservation planners will need to review the representation of ecological regions and major vegetation zones within protected areas, not only in their own countries, but also in neighbouring countries sharing similar ecological regions or major vegetation zones. Planners need to be cognisant of the concepts that underpin existing classificatory schemes and review their adequacy in terms of conservation objectives (Tsouvalis 2000). The advantages of trans-national protected areas should be considered in planning networks.

Effective conservation requires that management of an area is such that features of the plant world deemed to be of special conservation value are retained or augmented. Such management is not necessarily passive nor should it necessarily exclude some human use, especially of a less intensive nature. Use and active management measures may be necessary to conserve valued aspects of botanical diversity. Restoration is frequency needed. The identification of botanical features of special conservation value should include the perspectives of stakeholders, especially local communities.

4.2. Background and Baseline

Setting a percentage for the conservation of ecological regions is useful for planning purposes. It will help to draw attention to cases where valuable ecological regions or major vegetation zones may be lost or diminished in conservation value by default.

The principal tool, available for conservation on the scale, required is the protected area. A protected area is "an area of land and/or sea especially dedicated to the protection of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means" (IUCN 1999). Six categories are recognised by IUCN, all valuable in varying circumstances. For the purposes of the practical implementation of this target, the area of land covered by ‘effectively managed protected areas’ can be regarded as equivalent to the area of land that is ‘effectively conserved’. The value of protected areas for conservation of biological diversity is integrally recognised by the Convention on Biological Diversity and is elsewhere widely recognised (WWF and IUCN 1994-1997) (Bruner, Gullison et al. 2001).

“Caring for the Earth: a Strategy for Sustainable Living” declared that “some 10% of the area of each of the main ecological regions should be safeguarded in one or other of the various categories of protected area” (IUCN 1991). The figure of “at least 10% of the world’s landmass to be set aside for conservation” was declared as a target at the IV World Congress of Protected Areas in 1992. The 10% figure is just short of 9%, which is the current total coverage of terrestrial protected areas on the planet, embracing a total of 44,000 sites (Phillips 2000). The total coverage for all *forest* protected areas (IUCN Categories I-VI) is 10.4% (WCMC 2002).

Many protected areas are small (60% are less than 1,000 ha) which can make them of limited effectiveness for conservation of species and genetic diversity (Bawa and Ashton 1991), though small reserves are very valuable in certain circumstances (Menges 1991). There is a need to review the geography of systems of protected areas to ensure that their size and disposition are adequate from the point of view of conservation of plant diversity. Many systems of protected areas lack adequate coverage of plants, e.g. (Cowling and Hilton-Taylor 1994).

Generally, the aims of protected area management have widened over recent decades to incorporate not only biodiversity objectives (necessary for them to be classified as protected areas under the IUCN definition), but also other interests, especially those of local communities. Designation of an area as protected does not necessarily mean the exclusion of indigenous and local people from living within the area or using some of its natural resources. Approaches to the management of protected areas are becoming increasingly aligned with the three major objectives of the Convention on Biological Diversity (biological conservation, sustainable use of natural resources, equitable sharing of benefits).

Today, there is widespread acceptance of the concept of protected areas, as demonstrated by their near universal adoption by countries. The most substantial criticisms of protected areas relate not so much to their value as tools in the environmental kit as to questions of management, especially about how local people should be involved in their use and decision-making processes (Tuxill and Nabhan; Wilshusen, Brechin et al. 2001). Many protected areas, or parts thereof, supply, or have the potential to supply, natural resources of great benefit to the maintenance of local livelihoods. Poorer people will often be the greatest beneficiaries, since they tend to have the greatest dependency on resources of wild plants.

4.3. Rationale and Conclusions

It is concluded that the 10% quantitative element in this target is generally realistic, but should read instead "at least 10 per cent" so as not to set an upward limit on the area covered by protected areas and to align with the target set by the IV World Congress of Protected Areas. The following actions are needed for achievement:

- If necessary, the mapping of ecological regions or major vegetation zones within countries as a basis for designing or revising national networks of protected areas.
- Assessment by countries of the locations and sizes of their existing protected areas, to ensure that ecological regions or major vegetation zones are properly covered.
- If necessary, the revision of protected area policy to ensure that the interests of communities are recognised in designing management systems for protected areas.
- Support for the training of staff of protected areas, especially so that they are capable of working with communities to achieve practical and reasonable balances between conservation and use (Target 15).
- Support by countries for the development of learning networks, especially to share information and analyses relating to the best ways of involving communities in the management of protected areas (Target 16).

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Draft Target 5: Protection of [70 per cent] of the world's most important areas for plant diversity assured

Revised Target 5: Protection of 50 per cent of the most important areas for plant diversity assured

5.1. Explanation

The plant diversity of the world's ecological regions varies greatly. Our knowledge of the whereabouts of the world's 'centres of plant diversity' or 'hotspots' for plants is relatively well-known (WWF and IUCN 1994), but knowledge of plant diversity of the less biodiversity-rich areas is less complete. This ignorance has hindered plant conservation. Within each of the world's ecological regions it is necessary to identify and protect the most important areas for plant diversity. This will help ensure efficient targeting of conservation resources to assure long-term protection of these sites.

The identification of important areas for plant diversity would help significantly to implement CBD Article 6 (national biodiversity strategies and action plans); Article 7 (identifying important biodiversity); their protection contributes to implementation of Article 8 (*in situ* conservation). By stimulating the development of networks of local experts, field-workers and volunteers, capacity for national and international co-operation and networking is increased (CBD Articles 12 and 13; GSPC targets 15 and 16). Identifying such areas will help to support, inform and underpin targets 4, 6 and 7 of the GSPC).

A useful definition of important areas for plant diversity is 'a natural or semi-natural site exhibiting exceptional botanical richness and/or supporting an outstanding assemblage of rare, threatened, and/or endemic plant species and/or vegetation of high botanic value'. This definition and guidelines for selecting such Important Plant Areas (IPAs; Palmer and Smart 2001) are based on three broad criteria that have been developed and refined since 1995 (UNEP/CBD/SBSTTA/7/INF/10):

A: The presence of globally and regionally threatened plant species (including endemic species; medicinal/other useful plant species; wild relatives of crop plants; stands of rare and local tree species);
B: Exceptional botanical richness (in relation to its ecological region or biogeographical zone)
C: Habitat types of global or regional importance (including e.g. 'microecosystems' such as hot springs; tufa formations; relict vegetation types; areas providing important ecosystem services)

Palmer and Smart propose that, to qualify, a site has to satisfy one or more of these criteria. This process will produce an objective national inventory of sites where priority species and habitats occur. Further to this the sites can then be ranked, using quantitative methods, to select the most important sites for priority conservation action.

Identification and protection of important areas for plant diversity could be undertaken through the implementation of national (or local) programmes to establish networks of individual sites suitable for *concrete conservation action.* A regional overview can help ensure consistent application of criteria. Such programmes would contribute to the worldwide effort needed to achieve the target. The ultimate aim of such programmes would be to identify, protect and manage a network of sites important for the long-term viability of naturally occurring plant populations within each ecological region. (Newton 1997, Synge & Akeroyd 1999).

5.2. Background and baseline

The identification of important areas for plant diversity is a stated global priority of the IUCN Species Survival Commission's Global Plant Conservation Programme (IUCN-SSC 2000) and a priority in IUCN's Parks for Life (1994). Such work is currently being undertaken worldwide through the adoption of Important Plant Area (IPA) Programmes, described below.

The objectives of these IPA Programmes are:

- To identify the most important sites for the conservation of plants by assessing and presenting the botanical value of each site in a standardised but also reliable way, using numerical data.
- To promote awareness of the importance and the need to conserve these sites.
- To help direct conservation activity (including appropriate management) and funding towards these sites

IPAs are being identified by teams of professional and amateur botanists representing a partnership between Government, academia and the voluntary sector. The programme complements the Important Bird Areas (IBAs) programme of BirdLife International, which launched its first inventory in 1989 (Grimmett and Jones 1989). Although birds are sensitive indicators of biological richness, it is clear that the network of important bird areas does not necessarily protect the most important sites for plants (Byfield, 1997, in Newton 1997).

The IPA programme is the appropriate framework for assessing and delivering protection of the most important areas for plant diversity. The programme is most advanced in Europe, although the methodology is designed for use anywhere in the world. A number of preliminary studies have been completed, and attempts made to identify IPAs in a range of countries, including Belarus, Czech Republic, Greece, Slovenia, Sweden Turkey and the UK. The study for Turkey is particularly well advanced and has shown that the approach is valid for very plant-rich countries as well as countries less well endowed botanically (UNEP/CBD/SBSTTA/7/INF/10). A balance has been achieved between endemic-rich mountain areas and lowland habitats such as coastal sand dunes. Other countries/regions considering the initiation of programmes include Uganda, Kenya and Australasia.

The Important Bird Areas programme includes a special category known as Endemic Bird Areas. These have concentrations of endemic species and, as might be expected, are concentrated in the tropics. IPAs

automatically encompass concentrations of endemic plant species (by fulfilling criteria A). It is interesting to note that in 'hotspots' there is a high degree of coincidence of endemism of different taxa. However, outside 'hotspots' the degree of coincidence is less.

In considering the baseline it is necessary to consider the two phases of work needed to implement the target – identification and protection.

The global IBA programme demonstrates both the benefit and feasibility of this approach. Global identification of IBAs, to be completed by the middle of this decade, will have taken two decades. Wide recognition of IBAs has been achieved at national level, and in Europe 60% of IBAs are now protected to some degree under national legislation. Just 40% have some form of international protection (Heath and Evans 2000). However rapid progress is being made towards international protection – e.g. under the Ramsar Convention (whose work programmes are now coordinated closely with those of the CBD).

Identification of IPAs: This work can proceed rapidly once funds are secured. Methodology has already been developed and peer reviewed extensively (UNEP/CBD/SBSTTA/7/INF/10). Much information about important plant areas is already available, often in unpublished form, in academic and other institutions, and could be collated easily. User-friendly databases are being developed and this should enable *standardised assessment* of sites (note: these will soon be accessible to fieldworkers through internet cafes). In European countries work has already started. The target contained in the European Plant Conservation Strategy states that by 2007 an IPA inventory should be completed for all European Countries. An important milestone is that the first draft national lists should be compiled for all European countries by 2004.

Protection of IPAs: IPAs are not intended as a legal designation, but as a way of making sure that every important plant site is effectively protected. Protection would be assured through effective conservation measures including protected areas and legislative measures. Clearly it is important to ensure appropriate management of plant species and communities both within and outside protected areas. In order to assess progress towards delivery of the global target, a number of models can be used. A crude assessment can be gained from the percentage of IPAs within nationally or internationally designated protected areas. For example, 40% of IPAs identified in Turkey are protected under national mechanisms.

5.3. Rationale and conclusions

The identification of important areas of plant diversity provides a scientific and objective basis for implementation of site-based research and action elements of the Global Strategy for Plant Conservation. However, given that delivery of this global target is a two-stage process of identification and protection of Important Plant Areas (involving two different types of activities) it is suggested that the protection of 50% of the world's most important areas for plant diversity by 2010 is a more feasible target, rather than 70% (SBSTTA VII/8). It is suggested on the basis that a Global Strategy, providing a widely accepted framework and focus, be adopted. At the same time, within this time period it would be feasible to seek to identify 85% of the world's most important plant areas, as once the infrastructure is in place to identify IPAs work can proceed rapidly.

In the longer term the protection of all important plant areas should be assured.

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Draft Target 6: At least [30 per cent] of production lands managed consistent with the conservation of plant diversity.

Revised Target 6: At least 30 per cent of production lands managed consistent with the conservation of plant diversity.

6.1. Explanation

The Convention, in Article 8, *"In situ* conservation", requires Parties to "regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use" and to "endeavour to provide the conditions needed for compatibility between present uses and the conservation of biological diversity and the sustainable use of its components".2

Further, in considering agricultural biodiversity at its third meeting in 1996, the Conference of the Parties, encouraged Parties to promote "The transformation of unsustainable agricultural practices into sustainable production practices adapted to local biotic and abiotic conditions, in conformity with the ecosystem or integrated land use approach" and "The use of farming practices that not only increase productivity, but also arrest degradation as well as reclaim, rehabilitate, restore and enhance biological diversity".3 The International Treaty on Plant Genetic Resources for Food and Agriculture, developed in harmony with the Convention includes provisions for the conservation and sustainable use of plant diversity.4 An expanded programme of work for the conservation and sustainable use of forest biological diversity is to be considered by the Conference of the Parties at its sixth meeting.

Target 6 provides a globally accepted target consistent with the aims expressed in these agreements. In focussing on production lands, this target complements targets 4 and 5.

For the purpose of this target, *Production lands* might be described as lands where the primary purpose is agriculture (including horticulture), grazing, or wood production.

Consistent with conservation of plant diversity implies that a number of objectives are integrated into the management of such production lands:

- Conservation of plant diversity which is an integral part of the production system itself (ie. crop, pasture or tree species and genetic diversity)5;

2 CBD Article 8 subparas (c), (i). See page s 7-8 of the CBD Handbook

3 COP Decision III/11, para 17 9 (a), (b). See page 393 of the CBD Handbook.

4 IT/PGRFA Articles 5.1(c); 5.2; 6.2(a),(b).

5 But note, consistent with principle 9 of the Ecosystem Approach, that this does not imply nochange in the crops and varieties grown.

- Protection of other plant species in the production landscape that are unique, threatened, or of particular socio-economic value;
- Use of management practices that avoid significant adverse impacts on plant diversity in surrounding ecosystems, for example by avoiding excessive release of agro-chemicals and preventing unsustainable soil erosion.6

6.2. Background and Baseline

To achieve this target many different activities by a range of stakeholders will be needed. Agroecosystems, for example, are highly managed and it is in the specific detail of how they are managed that determines impacts on biological diversity, and this is a result of many socio-economic factors and is influenced by the needs of the farmer, characteristics of the market, and the conditions of the environment. Fostering the development of agroecosystems that exhibit high productivity and contribute positively to plant diversity conservation will require appropriate policy support.7 Much of the appropriate policy has already been agreed under the Convention and the International Treaty and is reflected in the Convention's programme of work on agricultural biodiversity8 and the Global Plan of Action for the Conservation and Sustainable Use of PGRFA.9 For OECD countries there is much scope for the conservation of plant diversity (and other components of biodiversity) to be taken into account during agricultural policy reforms carried out in the light of the WTO Agreement on Agriculture. Developing countries face the twin challenges of ensuring that agricultural intensification is sustainable while also protecting the resource base in marginal areas, especially where this is necessary to support sustainable livelihoods (see target 14). There are a number of initiatives to promote sustainable forest management. For example, the International Tropical Timber Organizations Year 2000 Objective promotes sustainable forest management in countries that produce and consume tropical timber.

Given the complex and multidimensional issues involved, there is no single readily available indicator to measure progress towards this target. Since countries have varying priorities and there are different conditions among farming systems and ecosystems, targets would, in any case need to be tailored to the needs of each country and region. The 12 principles and 5 points of operation guidance of the Ecosystem Approach provide useful guidance in this respect.10

Substantial progress has been made by the OECD in developing agri-environmental indicators which cover the range of issues referred to in the previous section (including for example, use of pesticides and fertilizers, and impacts on soil, water and biodiversity at genetic, species and habitat levels),11 and further development is foreseen in order to "provide information on the adoption of sustainable management practices by 2003".12 Criteria and indicators for sustainable forest management have been developed on a regional or biome-specific basis.13

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6 Consistent with principle 3 of the Ecosystem Approach.

7 See also, Wood at al (2001), at pages 10, 11.

8 COP Decision V/5, annex. See page 554ff of the CBD Handbook

9 Adopted by 150 countries at the Leipzig Conference, 1996 and subsequently endorsed by CBD COP (Decision III/11 para 19. See page 393 of the CBD Handbook).

10 CBD Decision V/6 (2000). See page 565ff of the CBD Handbook.

11 OECD (2001); OECD (2002).

12 The OECD Environmental Strategy for the first decade of the 21st Century, agreed by Environment Ministers in May 2001, noted the need to "further develop and use the core set of OECD agri-environmnental indicators, and provide information on the adoption of sustainable management practices by 2003".

13 More than 150 countries are participating nine eco-regional processes to develop and implement criteria and indicators for sustainable forest management, all of which include conservation of biodiversity. As most of these processes have begun only in the last few years, it is anticipated that much more information will be available on sustainable forest management in future. Currently there are no globally agreed criteria and indicators, but FAO is facilitating a process to harmonize the various sets.

A framework for national indicators on biodiversity is being developed under the Convention. Specifically the programme of work on agricultural biodiversity provides for "Criteria and guidelines for developing indicators to facilitate monitoring and assessment of the status and trends of biodiversity in different production systems and environments, and the impacts of various practices (…)",14 and the draft expanded programme of work on forest biodiversity provides for the advancement of criteria and indicators for sustainable forest management.15

An alternative approach to the use of comprehensive sets of indicators, as described above, it to use various proxies for "management consistent with the conservation of plant diversity". These could include use of, *inter alia*, organic farming methods, integrated pest management and other approaches to integrated production system management, and conservation agriculture.16

Information on the extent of such practices is increasingly available (for example, through registration of various schemes providing certification of organic production for agriculture, and the numerous certification schemes for the sustainable production of timber and other forest products, and information on the adoption of IPM practices etc.). Nevertheless, on the one hand, these represent only a subset of the area that might be considered to be managed sustainably, and, on the other hand, do not necessarily include criteria that are specifically related to the conservation of plant diversity. However there are examples of the use of "intermediate" standards, less stringent that those used in, for example, organic agriculture, but possibly of much wider application. For example, about 15% of commercial export-oriented banana plantations are managed according to independently verified standards that *inter alia* specify requirements for good management of pesticides and fertilizers, prohibit encroachment on surroundign areas of natural forest, and promote restoration of lands taken out of production.17 Broader approaches are also underway. FAO, for example, is considering the development of a code of practice, or framework for guidelines, on "good agricultural practices."18. In forestry, FAO has already developed the Model Code of Forest Harvesting Practices (1996) and regional codes are now being prepared.

As a first approximation, it is suggested, that the area of production lands managed consistent with the conservation of plant diversity might be estimated by summing the areas devoted to the following:

- Extensive, low-intensity-use pasture land.
- Low-input cropping systems, including many subsistence cropping systems, excepting those where soil or soil nutrients are being eroded.
- Intensive agricultural and horticultural systems practicing organic production methods or integrated production methods (i.e. a combination of integrated pest management, integrated plant nutrient management, and conservation agriculture, implying zero or low pesticide and herbicide use; controlled use of fertilizers; and soil conservation, also, where appropriate incorporating on-farm conservation of plant genetic resources).
- Forests disturbed by humans through logging, and semi-natural managed forests, modified by humans through sylviculture and assisted regeneration, that meet the criteria for sustainable forest management.

Some preliminary estimates of baseline figures are provided in Table 1.

14 CBD COP Decision V/5, Annex, activity 1.5(a). See page 557 of the CBD Handbook

15 CBD SBSTTA Recommendation VII/6, annex, Programme Element 3, Goal 2, Objective 1.

16 See also COP Decision III/11, para 15 (e), page 391-2 of the CBD Handbook.

17 The "Better Banana Project". See Courville, Sasha (2001)

18 See http://www.fao.org/prods/pract.asp

In promoting management consistent with the conservation of plant diversity it is important to bear in mind that in many agro-ecosystems, current plant diversity is dependent on management practices, including, for example, controlled grazing, the maintenance of disturbance regimes (fire, flooding/irrigation), and, of course, on farm management, and improvement, through selection, of crop and livestock genetic resources. The inherent dynamic nature of ecosystems, especially agro-ecosystems, and the need for their adaptive management must also be acknowledged.

6.3. Rationale and Conclusions

The scope of this target is multidimensional and the means of measurement of its achievement cannot be precise. However this is not a reason for non-action. As indicated above, the conservation of plant diversity in production lands is considered important in reaching the objectives of the Convention. Furthermore progress towards sustainable management has shown to be possible, for example:

- FAO's Forest Resources Assessment reports progress towards wider use of sustainable forest management practices19;
- The OECD reports improvements in some aspects of the environmental impacts of agriculture;
- There is a growing number of examples of sustainable agriculture in developing countries.20

In this decade substantial progress in measurement, and in indicator development is expected. This target, and those for subsequent periods, can be revised in the light of this emerging information. During implementation, it may also be desirable to develop sub-targets for particular subdivisions of production lands, as proposed in table 1.

Based on the foregoing, 30% would appear to be a realistic, and for some subdivisions of production lands perhaps, an unambitous figure. (The target can be considered appropriate if "production lands" is limited to farms, grazing land and production forests as suggested above.21) At the same time, it must be recognized that prodcution systems will take time to respond to incentives and other policy changes, even if such changes are introduced quickly. Therefore to be credible the target must not be over-ambitous. In the longer term, continued improvement should be expected and a higher target might be set for subsequent periods.22

Table 1: Possible sub-targets for implementation (for illustration only)

"production lands" as included in the target ?	Sub-section	Baseline Estimate (2000)		Target (2010)		Ultimate target (2050 or 2100 ?)
		certified area	total "consistent with plant diversity"	certified area	total "consistent with plant diversity"	
YES	Crop lands	2%(C)	? (E)	10%(G)	30%	to be defined
YES	Managed forest production lands (A)	2%(D)	? (F)	5 -10%	30%	to be defined
NO	"Undisturbed natural" forest	not applicable	?	not applicable	90% ?	100%

19 FAO (2001) FRA 2000, Chapter 6 page 59

20 Pretty and Hine (2001)

21 Clearly, if broader definition of production lands is used (for example, if all types of forests were included, if the whole agricultural landscape were included) then the target would be much too low. This needs to be clearly reflected in the notes accompanying the target. Alternatively, Parties may wish to reflect the necessary specification in the title of the target itself viz: "At least [30 per cent] of farming lands and production forests managed consistent with the conservation of plant diversity."

22 Note that the analysis does not deal with land-use change (eg conversion of agricultural land to urban land, or the expansion of agriculture into previously uncultivated areas, since these are expected to be relatively small over the time period to 2010 compared to the target itself, as well as compared to "errors" arising from definitional problems. However, tsuch land use change would need to be factored in to longer-term considerations.

YES	Managed pasture lands (B)	1 – 3%	25%	10%	50%	to be defined
NO	"Natural" grasslands	not applicable	?	not applicable	90% ?	100%

Notes:
(A) Managed forest production lands are estimated to be about 25% of total forests, the remainder is classified as "undisturbed"
(B) Managed pasture lands are estimated to be about 50% of total pasture lands (Batello, p.c.)
(C) About 15 to 18 million hectacres were estimated to be under certified organic production in 1998, SW Pacific, Europe and the Americas. There is very little certified organic production in Africa or Asia (Willer and Yuseffi, 2001).
(D) This ranges from near 100% (Finland), to zero for most countries. Areas certified in developing countries reach 9% in Africa (South Africa), 0.7% in Asia (Sri Lanka) and 7% in Latin America (Belize).Except for the US (12%), rates in countries with the largest forest areas are low. See FAO (2001) FRA 2000, Chapter 6
(E) Case studies of 208 sustainable agriculture initiatives cover c. 30 million hectares amounting to some 3% of developing country cropland (Pretty and Hines, 2001). This is additional to certified land. Given the relatively small sample of this project, a much larger area could be estimated to be under sustainable production, perhaps of the order of 10 – 20%.
(F) About 90% of forests in developed countries, and 6% in developing countries are managed according to a management plan. These do not necessarily ensure sustainable management, but they do provide a tool that could be applied for this purpose.. Further, six tropical countries with a combined fores tarea of over 200 million hectares appear to have established all the conditions needed to enable them to manage their forests sustainably in the near future (Poore and Thang, quoted in FAO (2001) FRA 2000 Chapter 6, page 58).
(G) The European Union has set a target of 30% organic production by 2010. Lower amounts are expected in other regions howev er.

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Draft Target 7: [50 per cent] of the world's threatened species effectively conserved in situ

Revised Target 7: 60 per cent of the world's threatened species conserved *in situ*

7.1. Explanation

The Convention on Biological Diversity is concerned, in the first instance, with the conservation of biodiversity in a broad sense, from genes to ecosystems. However, within this representation of biodiversity, species occupy a very important place as the named and recognisable biological building blocks that on the one hand make up ecosystems and on the other that allow definition of gene complexes. Therefore the conservation of species is a particularly important target of a plant strategy.

Once the conservation status of a plant species has been assessed (see target 2, on conservation assessment), the next task is to determine the degree and sources of threat, and how these threats can be addressed, taking an ecosystem approach. While *ex situ* measures can make important contributions to

conservation (see target 8), long-term conservation is only possible if viable populations are maintained *in situ*.

In situ conservation is dealt with under article 8 of the Convention on Biological Diversity (CBD). Among other measure, it calls for establishing a system of protected areas or other areas where special measures need to be taken to conserve biological diversity; developing guidelines for the selection, establishment, and management of such areas; regulating or managing biological resources both within and outside protected areas, with a view to ensuring their conservation and sustainable use; promoting the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings; promoting environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas; and providing the conditions needed for compatibility between present uses and the conservation of biological diversity and the sustainable use of its components. Therefore the CBD does not rely exclusively on protection of species within legally protected areas to ensure their effective conservation, but instead brings a wide range of measures to bear on the problem of threatened biodiversity.

A protected area is an area of land especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means (IUCN, 1994). As of the year 2000, some 30,000 protected areas have been established, covering about 13 million hectares (10% of the terrestrial surface of the earth). This is an excellent beginning, but is only part of the answer if all plant diversity is to be conserved *in situ*.

One problem of this impressive figure is representativeness: does it include samples of all ecosystems, all centres of plant diversity, and all species at risk? The answer is almost certainly not. Note that many species are only known from their type locality, thus that locality is the only place that they can be conserved *in situ*. In addition, many species of tropical trees have very large ranges with low population densities, which need comprehensive strategies across their entire range. Protected areas can only conserve these in part, although that said, they are still likely to be especially important for the *in situ* conservation of many threatened species.

It is recognised that the conservation of biological diversity depends in the first instance upon protecting and managing intact natural habitats, including successional habitats and systems affected by fire, grazing, and other perturbations (Tuxill and Nabhan, 1998). However, simply setting aside areas of landscape and representative selections of ecosystems does not of itself guarantee the protection of all component species. Given the enormous number of threatened plant species, it is important to develop comprehensive management plans so that plant populations, even when growing in protected areas, are not lost or irreversibly degraded. Such plans can also ensure that human influence, including harvesting and traditional use, on these plant populations is taken into account. However the ultimate goal must be that every species should be effectively conserved *in situ*, with conservation of threatened species as a priority. Even where a species has been reduced to such a low population size that it is unlikely to survive in the wild under current conditions, removing that species to *ex situ* conservation facilities should be seen as only a temporary measure, with the long-term objective of returning the species to its natural habitat, including if necessary the restoration of that habitat.

In many cases, *in situ* conservation might involve the establishment of a protected area, where specific measures are taken to conserve the target species. But for many other species, this approach is not necessarily the most effective, especially if protection implies that disturbance regimes are necessarily excluded. Many species of plants are dependent on appropriate intensity and scale of disturbance, for example through grazing by wild or domestic animals, periodic fires or storms, flooding, or other such processes. This means that *in situ* conservation can sometimes include protection on land used for other purposes such as agricultural production, although it cannot be assumed that human-induced disturbance is necessarily a surrogate for natural disturbance regimes. Other species can only survive in undisturbed

core habitat, and one of the roles of conservation management plans is to determine the dynamic regime most appropriate for the particular species and its associates.

In the short term, it would be reasonable to identify which threatened species are contained in which protected areas, their current population levels, and their population trends. Based on such information, each threatened species of plant within a protected area should be assigned a priority for management attention, based on both extrinsic threats and intrinsic threats which are those features of biology that predispose particular species to threat. Finally, an appropriate management plan is designed and implemented, following recognised guidelines. No threatened species of plant should be allowed to go extinct without a serious effort being made to conserve that species *in situ*.

7.2. Background and Baseline

Two baselines are needed to determine how all threatened species can be conserved *in situ*. First, knowledge of which species are threatened is needed. Many countries have developed national Red Lists, with some degree of adaptation to local requirements. Globally, some 34,000 plant species (Walter & Gillett, 1998) were assessed as globally threatened, along with a more refined assessment of some 7,300 tree species (Oldfield *et al.*, 1998). These figures are being reassessed and verified through the IUCN Red List Programme (which currently lists 6,266 plant species as threatened (Hilton-Taylor, 2000). However as more information is collected and species assessed, this number is certain to rise (a conservative global estimate is in the order of 50,000 species, roughly 15-20% of all plant species).

Second, *in situ* information on these threatened species is needed. Few protected areas can produce a reliable inventory of either all plant species within the area, or just the threatened ones, and even less often information on numbers, genetic variability, population trends, and threats posed to these species. A concerted effort on producing this information is needed if threatened species are to be conserved *in situ*. Key information includes number and size of populations, the spatial distribution of populations, identification of important associates such as pollinators and seed dispersers, critical habitat identification, and trend information that can be related to environmental changes and patterns of disturbance.

Numerous management approaches are now well known (eg. Given, 1994), and the principles of protected area planning and management are well documented (MacKinnon *et al.*, 1986; IUCN, 1999). However it is clear that the majority of protected areas have been established for reasons other than plant conservation (e.g. tourism interests, the presence of rare animals or high biodiversity, scenic beauty or unique geological features, protection of archaeological sites or timber reserves, watershed or other ecosystem management). It is important that increased plant information is made available to protected area managers as well as land-use planners in order to make decisions ensuring that every threatened plant species will be able to be conserved *in situ*. Analyses such as the Centres of Plant Diversity (WWF & IUCN, 1994-7) and projects on determining Important Plant Areas (Oldfield, 1998) should be important documents when planning for *in situ* conservation is undertaken.

7.3. Rationale and Conclusions

In a worst-case scenario, if a species does become extinct in the wild, this calamity should be duly noted and widely communicated, as a means of building stronger public support to ensure more effective conservation measures in the future. Not only conservation managers and scientists, but also the community at large can, and ought, to learn from mistakes. It is therefore important that *in situ* conservation is accompanied by a good information network.

However, loss of species should not be accepted as inevitable, as this implies acceptance of an overall reduction in global biodiversity. And experience has proven that any species can be conserved if societies are properly motivated to do so. Therefore, every threatened plant species needs to be included within an appropriate conservation programme with *in situ* conservation as a key component. Such programmes

need not be particularly expensive, and some may need to be supplemented by *ex situ* conservation measures and trade regulation in cases of heavily exploited species. In addition, it is essential to put in place a monitoring system in order to know which approaches are working. The targeted placement of financial and other resources within the research field of conservation biology, coupled with better links between research and management, could realistically ensure that no further species of plants become extinct.

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Draft Target 8: [90 per cent] of threatened plant species in accessible ex situ collections, preferably in the country of origin, and [20 per cent] of them included in recovery and restoration programmes

Revised Target 8: 60 per cent of threatened plant species in accessible *ex situ* collections, preferably in the country of origin, and 10 per cent of them included in recovery and restoration programmes

8.1. Explanation

The need for the adoption of measures for *ex situ* conservation of biological diversity is included in Article 9 of the Convention on Biological Diversity, predominantly for the purpose of complementing in situ measures. Parties shall adopt measures for the *ex situ* conservation of components of biological diversity, preferably in their country of origin, and measures for the recovery and rehabilitation of threatened species, including their reintroduction into their natural habitats. *Ex situ* collections have also been recognised as actual and potential conservation resources for many purposes, including to provide accessible material of wild and cultivated germplasm for research; to help reduce collecting pressure on wild or *in situ* stocks and promote sustainable use and to provided security for livelihoods. *Ex situ* collections can also be used for educational purposes and to raise public awareness of conservation issues. Article 8(f) of the Convention (*In situ* conservation) outlines the need for measures to be taken to rehabilitate and restore degraded ecosystems and promote the recovery of threatened species. This target therefore addresses these aspects of the Convention for plants. *Ex situ* conservation can be defined as

measures taken to safeguard the components of biodiversity outside their natural habitats. *Ex situ* conservation is generally used to safeguard populations or individuals that are presently or potentially in danger of damage or loss. These losses are brought about by habitat loss and fragmentation, invasive species, pollution and other factors. Climate change may accelerate this loss. *Ex situ* conservation involves the collection, conservation and maintenance of samples of organisms outside of their natural habitats, usually in the form of plants, seed, pollen, spores, vegetative propagules, tissue or cell cultures and other genetic material of growing or preserved individuals. Threatened species can be variously defined according to different national systems in use or by the application of the IUCN Red List categories. The definition of the quantitative elements in this target depends upon the number of threatened species so recognised (target 3). The target does not specify to what extent *ex situ* collections of a particular species should be representative of the genetic diversity of a particular species in order to be regarded as conserved *ex situ*. In practice there is little comprehensive information available on whether existing *ex situ* collections are genetically representative. An increasingly frequent use of *ex situ* collections is to provide plant material for recovery and restoration programmes, including some species that have become extinct in the wild (probably over 100 species that are extinct in the wild are presently maintained in *ex situ* collections). Recovery programmes may be defined as ones where genetically representative, self-sustaining populations of the species are established or re-established in the wild in appropriate natural habitats. In order to be successful, recovery programmes generally require the original causes of endangerment to be addressed. Recovery and restoration programmes for threatened species may adopt a single species approach, or focus on the conservation of all the components of an ecosystem, containing one or more threatened species. Such programmes represent the main methodologies used to integrate *in situ* and *ex situ* conservation as complementary but mutually supporting approaches. Integrated conservation can be defined as the combination of complementary approaches to *in situ* and *ex situ* conservation; it often involves drawing together different organisations and stakeholders to maximise a range of appropriate supporting methodologies (Wyse Jackson & Sutherland, 2000). If material from *ex situ* collections is used for recovery and restoration programmes is must be genetically appropriate for such use.

8.2. Background and Baseline

Ex situ collections

Ex situ conservation of plants is practised by a wide variety of bodies, especially genebanks (seed bank, field genebanks, in vitro collections) (FAO, 1996 & 1998) and botanic gardens and arboreta (Wyse Jackson and Sutherland, 2000). Significant *ex situ* collections are also maintained by other bodies, such as plant breeding and other experimental and research institutions, which may be of importance for plant conservation. *Ex situ* conservation collections are sometimes interpreted to include herbaria of dried or preserved specimens, when these collections contain material that supports biological or conservation research or when they contain actual or potentially functional genetic material, including seeds, spores, pollen and DNA. A sizeable proportion of the world's vascular flora is currently represented in existing *ex situ* collections, although precise figures are not yet available. According to the FAO World Information and Early Warning System (WIEWS) database, approximately six million accessions are contained in over 1,300 genebanks, with over 5.5 million of those accessions stored in regional or national genebanks and c. 600,000 maintained within the Consultative Group on International Agricultural Research (CGIAR) system (FAO, 1998). Many of these collections are included in the International Network of *Ex Situ* Collections under the auspices of FAO (including the collections of the International Agricultural Research Centres – IARCs). Seed storage accounts for about 90% of the total accessions held *ex situ* (FAO, 1996).

The composition of these collections is not fully known and information on the types of collections held are only available for approximately one third of the accessions listed in the WIEWS database. However, it has been estimated that 48% of all accessions are advanced cultivars or breeders' lines, while over one third are landraces or old cultivars and about 15% are wild or weedy plants or crop relatives (FAO, 1996). BGCI estimates that in excess of 80,000 plant species are in cultivation in botanic gardens worldwide,

represented by some 6,130,900 living plant accessions in 2,178 botanic gardens (Wyse Jackson et al., 2001). A recent preliminary electronic analysis of accession information from 445 botanic gardens (undertaken by BGCI in 2002) indicated that between them they cultivate 80,070 taxa, of which 8,823 are species included in the 1997 IUCN Red List of Threatened Plants (Walter & Gillett, 1998). There is clearly very considerable capacity amongst the botanic gardens of the world for the maintenance of ex situ collections. In addition, Laliberté (1997) reports that 152 botanic gardens have seed/genebanks containing at least 255,832 accessions and an additional 17,069 germplasm accessions in botanic garden field genebanks. Of the long-term botanic garden seed banks surveyed by Laliberté, approximately 77% of their accessions are of germplasm collected directly from the wild. These same seed banks estimated that approximately 27% of their accessions are of rare and endangered species. An example to note is the Millennium Seed Bank (MSB) of the Royal Botanic Gardens Kew. It aims to collect and conserve 10% of the world's seed-bearing flora (some 24,000 species), principally from the drylands by 2010 (Roger Smith, pers. comm. 2002). The MSB has already collected c.97% of the UK Flora (229 spp. of which are on the national Red list).

Herbaria

The world's vascular flora is already very well represented in herbaria. As most described taxa are represented by one or more preserved type specimens, it is fair to suggest that almost all the known plant species are represented in *ex situ* collections.

Threatened plant species

IUCN currently estimates that there are 5,611 plant species which have been assessed and found to be threatened (according to IUCN's 1994 Red List categories) (Hilton-Taylor, 2000). This is a very small number, relative to the total number of plant species known worldwide. However, it reflects the small number that has yet been assessed according to these 1994 IUCN categories. Oldfield et al. (1998) document over 7,300 globally threatened tree species, which they suggest represents nearly 9% of the world's trees (or which 1,665 are known in botanic garden cultivation - BGCI figures, 2002). If a similar percentage can be applied to the complete world flora, then a total of 30,000 or more plant species may be threatened. However, in some regions the total is considerably higher than this, for example, Master et al. (2000) suggest that 33% of the flowering plant species in the USA. are threatened with extinction. The earlier 1997 IUCN Red List of Threatened Plants (Walter & Gillett, 1998) documented nearly 34,000 species (or 12.5%) of the world's flora facing extinction, using the pre-1994 IUCN Red List Categories. However, they acknowledge that this is just 'the tip of the iceberg' as much information is lacking from a number of biodiversity rich countries. However, it is reasonable to give a conservative estimate -that the actual world threatened plant flora lies somewhere between 30,000 and 60,000 species at the present time, although this total may climb significantly over the coming decades

Accessibility

Providing access to their collections through exchange of plant material is a standard practice for the majority of *ex situ* collections. An informal exchange system between botanic gardens has operated for decades by means of an *Index Seminum* that is sent regularly to other botanic gardens and a variety of research institutions worldwide. These seed lists contain information on material available within collections for exchange (mainly seeds, and sometimes information on provenances). Such material is generally only available to support scientific research, collections development and for conservation purposes. The exchange of such material between botanic gardens is increasingly regulated by means of voluntary codes of conduct and material transfer agreements (to bring such access in line with CBD provisions). Few botanic gardens provide access to their collections for commercial purposes. Concerning botanic garden seed banks, 82.6% of long-term botanic garden seed banks surveyed by Laliberté (1997) have a distribution policy.

Information and data on the living plant accessions in *ex situ* collections is increasing becoming available in electronic formats. Some institutions are providing access to such information through their web sites and contribute to electronic data compilation projects (such as a current project by BGCI to compile a

preliminary checklist of taxa in cultivation in the world's botanic gardens (due for publication in early 2003).

Material stored in the world's herbaria has also been widely accessible

Country of Origin
Twelve countries have 45% of the germplasm accessions held in national collections (FAO, 1998) and c.57% of the world's botanic gardens are situated in Europe (including the countries of the former Soviet Union) and North America (Wyse Jackson, et al., 2001), indicating that there is a very uneven spread of facilities available for *ex situ* conservation. Nevertheless many new institutions, such as botanic gardens, have been established in many countries in recent years and this uneven distribution is beginning to be addressed (Wyse Jackson, et al., 2001). However, no studies have yet been undertaken to determine the level of *ex situ* conservation resources needed in order to deliver the *ex situ* conservation of plants in each country. At the present time no figures are available of the proportion of *ex situ* collections that containing accessible collection of the flora of their own countries. Increasingly, access laws and best practice require that primary accessions of *ex situ* collections to be lodged in their country of origin.

8.3. Rationale and Conclusions

To summarise the points above:
Ex situ is an essential complement to *in situ* and should be seen as part of an integrative package.
To achieve the target given it will be necessary to have a measure of the number of threatened plant species available. Using these ball-park figures, it can be suggested that in order to achieve the target of 60%, between 27,000 and 54,000 threatened plant species will need to be included in *ex situ* collections. Similarly, if 10% of threatened plant species are to be included in recovery and restoration programmes then between 6,000 and 12,000 species must be targeted.

The development of a sub target should be considered, as a priority, to include 90% of critically endangered species in accessible *ex situ* collections during the target period.

Although *ex situ* collections contain very considerable collections currently, it will be necessary to increase the rate of accessioning of new material, of priority rare and endangered species, if the target figure is to be reached. This may involve accessioning between 2,000 and 3,000 additional threatened species into *ex situ* collections each year to meet the target.

There many gaps in the baseline data. We still have limited information on the composition of *ex situ* collections in many countries and the proportion that are threatened. We know insufficient details on the extent to which *ex situ* collections are situated in their countries of origin. The extent to which *ex situ* collections have been used in recovery programmes is also inadequately known.

It is concluded that the inclusion of 60% the world's threatened flora in accessible *ex situ* collections is achievable by 2010, considering the widespread availability of existing well established *ex situ* conservation facilities and the extent to which the world's flora is already represented in such collections. However, very considerable changes in institutional priorities, policies and practices will be required in many *ex situ* facilities if this target is to be reached. An important component in achieving this target will be in building and applying new capacity for *ex situ* conservation in countries in several priority regions, including Africa, Asia, Latin America and the Middle East, to ensure that *ex situ* conservation can be carried out increasingly and effectively in the country of origin. Ensuring that 10% of the threatened flora can be included in recovery and restoration programmes is a much more challenging target, but one which can be reached with careful planning and co-ordination, inter-institutional, national and international co-operation and with determined implementation of well focused national or regional plant conservation strategies.

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Draft Target 9: [70 per cent] of the genetic diversity of crops and other major socio-economically valuable plant species conserved, and associated local and indigenous knowledge maintained

Revised Target 9: 70 per cent of the genetic diversity of crops and other major socio-economically valuable plant species conserved, and associated local and indigenous knowledge maintained

9.1. Explanation

The genetic diversity present in crops and other useful plant species provides the essential basis for improving sustainable crop production and productivity, and for ensuring that useful plant species have sufficient genetic variation, or genetic diversity, to be able to adapt to and meet humanity's growing and changing needs. The conservation of useful plant diversity (or plant genetic resources) has been recognized as an objective of international importance through the adoption, in 1996, by over 150 countries of the Global Plan of Action on the Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture. In November 2001, negotiations were completed on an International Treaty on Plant Genetic Resources. This will provide an agreed international framework for conservation and exchange of plant germplasm and allow for the development of appropriate benefit sharing procedures.

Substantial conservation efforts have already been undertaken by many countries and by a number of international organizations. There are about 6 million accessions of plant genetic resources of over 7,000 useful plant species conserved *ex situ* world-wide in over 1,300 collections (FAO, 1998). However, the effectiveness of conservation efforts cannot be adequately assessed simply in terms of numbers of samples conserved *ex situ*. In order to develop effective conservation programmes that meet identified global needs, it is necessary to consider what proportion of diversity should be conserved, what useful plant species should be the focus of national and international efforts and what methods of conservation

are most appropriate. At the same time, it is essential to recognize the importance of maintaining associated local and indigenous knowledge of useful plant species and to determine in what ways this can be achieved. A realistic target of the diversity to be conserved will allow an improved allocation of resources, identification of gaps, avoidance of duplication, and a more complete and effective global conservation effort that can be expected to provide users with a greater range of useful variation.

9.2. Background and Baseline

What species?
Estimates differ widely as to the number of useful plant species. Heywood (1991) estimated that about 100,000 species are useful to humans in some way or other (e.g. as food, forage, fuel, building materials, medicines, or as wild relatives with potentially useful genes). FAO (1998) suggested that 30,000 plant species are edible, and that about 7,000 have been cultivated by humans for food at one time or another. In contrast, it is currently estimated that only 103 crops provide 90% of per caput plant based food supplies.

While the number of crops and other major socio-economically plant species throughout the world may be a few thousand, a much smaller number (of the order of a few hundreds) will be important in any one country. Countries supporting the implementation of the FAO Global Plan of Action will have identified which species should have priority in their conservation efforts depending on national distribution, production and use, and ethnobotanical significance. In the context of the Global Strategy, it is suggested that this set should include all crop plants and selected species of major socio-economic importance. In implementing this target, it is important that specific local needs and uses are recognized, that locally important crops and other species are included in country conservation activities, and that associated local and indigenous knowledge is maintained.

How much diversity?
The objective of conservation efforts for plant genetic resources should be to conserve as much of the genetic diversity of a species as possible with an emphasis on useful diversity. This diversity, which can be seen as heritable differences in e.g. morphological characteristics, physiological traits, disease resistance, and stress tolerance, reflects differences in genes and gene sequence at the DNA level.

Sampling procedures have been developed which can be used to select sets of material that contain substantial proportions of the total diversity of the populations (Brown, 1995). Experimental work on the development of core collections (Hintum et al., 2000) has shown that, using stratified sampling procedures that take account of species characteristics such as breeding system and the ways in which taxonomic, geographic and ecological factors affect the distribution of genetic diversity, sets of material can be identified which contain some 70% of the total diversity of the populations sampled (e.g. Grenier et al., 2000). The size of these samples has varied greatly but the evidence suggests that the numbers of accessions conserved would not need to exceed 2000 (Brown, 1995) and could be as low as a few hundred (Lawrence et al., 1995).

Although for crop plants, the emphasis to date has been on *ex situ* conservation, the value of maintaining crop genetic diversity *in situ* in production systems is being increasingly recognized. The use of protected areas to maintain diversity of useful plant species such as crop wild relatives is also increasing. By combining ex situ and *in situ* methods in complementary ways which take account of uneven gene distribution and focus on centres of diversity, it is expected that 70% of the diversity of the chosen species will be effectively conserved.

Current status
As noted above, there are about 6 million accessions conserved throughout the world of many thousand species. For some 50 crops there are over 10,000 accessions already conserved *ex situ* and for a further 350 crops there are 1,000 – 10,000 accessions. While many of these will be duplicates and the real

numbers of unique accessions maintained are much lower the existing conservation effort is substantial and it is likely that the target has been achieved for a number of important crop plants. However, for many crops this is not yet the case, and recent studies have indicated that as many as 5,000 useful species conserved *ex situ* may be represented by less than 10 accessions each (Padulosi, et al. 2001). A number of these are crops or other species that will be regarded as socio-economically important by individual countries and therefore deserving of further conservation effort.

Work on *in situ* conservation of crops and other useful plant species is relatively undeveloped. However, the importance of ensuring that communities can maintain crop diversity as part of their livelihood strategies is now recognized and a number of ways in which *in situ* conservation of this type can be supported have been identified (UNEP/CBD/SBSTTA/7/INF/7). Several countries have included *in situ* conservation programmes of crop plants in their national conservation programmes.

Where *ex situ* conservation is undertaken, specific actions that support knowledge maintenance are required. Procedures to ensure that this occurs have been developed (e.g. Eyzaguirre 1995) and the importance of ethnobotanic work is now widely appreciated. On farm maintenance of diversity must also include specific actions to ensure that local and indigenous knowledge is maintained. These can include Community Biodiversity Registers and Ethnofloras.

9.3. Rationale and Conclusions

Ex situ and *in situ* conservation actions should be combined in a complementary manner to ensure the target is achieved. Individual countries will want to give priority to specific species important for their own national needs. Achieving the global target will also be helped by collaboration between countries for crops that are widely distributed. A number of existing regional and crop networks can be mobilized to support implementation of this target which builds on the work plan to implement the FAO Global Plan of Action. Important elements in ensuring that the target is reached will be the continuing collaboration, capacity building, research and public awareness programmes planned under the GPA. The implementation of the Genetic Resources Treaty will provide further support to achievement of the target.

It is expected that for many of the 120 most important crops identified by FAO, the 70% goal may already have been reached and that for a further few hundred much of the work has already been done. For these, an analysis of the diversity conserved will be needed together with an adjustment of conservation actions to deal with any identified gaps and to strengthen the contribution of *in situ* conservation. It is important to recognize that for these crops large collections will continue to be needed, not only to ensure that all the useful diversity is conserved, but also to provide plant breeders and other uses with the necessary combinations of characteristics required for increasing productivity and performance, at rates required by human population growth and development objectives.

For 1,000 – 2,000 crops and socio-economically important species, that have been neglected by conservation efforts, *ex situ* collections (of about 500 – 2,000 accessions) will need to be developed together with a relatively small number of *in situ* efforts (e.g. 5 – 10 separate populations) in centres of crop diversity. All the actions required can be achieved within the timescale proposed for the target provided that sufficient resources can be mobilized to support the work proposed.

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Draft Target 10: Management plans in place for [90 per cent] of major alien species that threaten plants, plant communities and associated habitats and ecosystems

Revised Target 10: Management plans in place for at least 100 major alien species that threaten plants, plant communities and associated habitats and ecosystems

10.1. Explanation

Invasions by alien (and non-alien) species are recognised as the second most important threat to biological diversity (after habitat destruction and decline). This is equally true of species, populations and communities of plants and their habitats which are threatened by invasive species of fauna, flora and micro-organisms in terrestrial, freshwater and marine situations in many parts of the world. Mammals, birds, fish and invertebrates are all known to have species capable of invasions in pristine and disturbed ecosystems that can have devastating effects on plant diversity through grazing, browsing, trampling, altering of light regimes, general disturbance and alteration of habitats. Classic examples are the alien mammals intentionally introduced into Australia and New Zealand (Clout and Lowe, 2000); the effect of introduced plants on islands such as Mauritius, Tahiti, the Galapagos and many others; the effects of invasive birds on crops and wild vegetation; and the impacts of introduced fish, crustaceans and molluscs introduced to waterways and lakes in many countries. More subtle are the disturbances wrought by invading animals on susceptible forest, woodland, thicket, heath and grassland plant communities as agriculture proceeds and alien pollinators displace local species. Invasive plants can cause competition for nutrients, light and space, can overwhelm or alter plant populations and communities in terrestrial and freshwater ecosystems, and can hybridise with native and/or endemic species. Most weeds are invasive – the majority being alien but local species can have the same effect when they are faced with altered ecosystems and disturbed habitats. Famous examples include the invasive alien waterweeds that affect tropical freshwater systems and the many weeds now known to affect managed and unmanaged plant communities. Countless species of trees, shrubs, forbes and herbs are potentially invasive and can have serious deleterious effects on native plant biodiversity – whether introduced intentionally or otherwise. Plant pathogens and parasites are equally capable of being invasive and seriously impacting individual species, populations and communities of plants.

At present it is not possible to say precisely how many species of invasive species are affecting plant biodiversity around the world – but there are few ecosystems or landscapes that have not been altered by man's introduction of alien species or by the unintentional spread of invasive species without human intervention. Escapes from forestry, farming, livestock rearing, zoos, aquarium, botanic gardens and others together with increasing world trade and human movements have all contributed to this expansion of invasions and the subsequent impacts on plant ecosystems. Sometimes the effects of invasions are obvious in a short time span of several months or years, others may take decades or even centuries to become noticed. Some species of innocuous alien animals and plants can become invasive through natural (or contrived) genetic changes that give rise to "invasive generations" that spread to pristine areas.

Others may become invasive with subtle changes in weather or with disturbances of their habitats after man-induced changes nearby such as irrigation development, dam construction, urbanisation and industrial expansion. Thus there is need to be vigilant concerning existing invasions, potential new invasions and changes in innocuous species that can lead to invasions.

Recognising these threats to plant diversity, the target is to acknowledge the threats from invasions, identify and recognise the agents actually or potentially responsible and develop mechanisms to prevent, eradicate or control the invasions so that the plants and their associated ecosystems can be restored to their original status.

10.2. Background and Baseline

Invasive alien species are one of the most significant drivers of environmental change worldwide. The globalization of trade, travel, and transport, is greatly increasing the number and diversity of harmful organisms being moved around the world, as well as the rate at which they are moving. At the same time, human-driven changes in land use and climate are rendering some habitats more susceptible to invasion. Invasive alien species are thus a growing problem, and one that we will have to manage in perpetuity.

Recognition of invasive alien (and non-alien) species as major threats to plant diversity has been present for decades but has grown in the past few years as biologists saw beyond weeds and "feral" animals to subtle and unintentional introductions of many species. There has also been recent acknowledgement of the devastating impacts of invasive alien aquatic plants, appearance of alien species in the marine environment and invasions of previously pristine forests and other precious plant communities by various species. Williamson (1996), Sandlund *et al.* (1999), Mooney & Hobbs (2000) Perrings *et al.* (2000) and McNeely (2001) are among some of the recent authors to have highlighted the range, extent, impacts and costs of invasive alien species on biodiversity, economics, and human welfare. The CBD has now addressed this issue through the recent SBSTTA6 deliberations (March 2001) which will be discussed in general at COP6 in April 2002. A particular recognition of the importance of invasive species on plants conservation was noted in UNEP/CBD/SBSTTA/7/10 which is the origin of this target for the Plant Conservation Strategy of the CBD.

There are several agencies and organisations that have developed databases of invasive alien species and species that could become invasive – many of which are listed in the GISP Toolkit of Best Prevention and Management Practices on Invasive Alien Species (Wittenburg & Cock, 2001). GISP (the Global Invasive Species Programme) has also released the Global Strategy on Invasive Alien Species (McNeely *et al.*, 2001) which outlines the need for understanding the identity, impacts, pathways and general ecology of invasions and the range of policies and methods necessary for their prevention and management. Nevertheless no inventory of the major species of invasives that are the greatest threats to plant diversity exists, nor specific methods for management or prevention.

Options and needs for prevention or control first need to be evaluated through a process of risk assessment (e.g. Groves *et al.*, 2001) whereupon there are then many methods that can be used (e.g. Preston *et al.*, 2000; Wittenburg & Cock, 2001). The best strategy is prevention of invasions, but if that is not feasible, there are possibilities for eradication, or if that fails, for control by many methods (Preston *et al.*, 2000) of which biological control is often the most sustainable as well as available for many known invasives (e.g. Julien & Griffiths, 1998). However, where the biocontrol agent is itself an alien species, it too must be subjected to rigorous risk assessment each time it is proposed for "deployment" in an area where it is not native, to avoid undesirable effects on non-target species.

Thus there is a need to develop management plans for existing, potential and likely invasions of plant communities, populations and habitats so that the threats to plant survival can be assessed and then acted upon – based on sound, scientifically-based methods and experience. Management plants against

invasive alien species may be species specific, or site-specific, depending on what the management aim is, and most countries will require a mixture of both types (Owen, 1998).

10.3. Rationale and Conclusions

Invasive alien species can impact plant diversity in any ecosystem in any part of the world. There is thus a need to accumulate the information referring to invasive species and their propensity to invade and impact negatively upon plants, plant communities and associated habitats and ecosystems. This will require a collaborative, integrated meta-database that can access those existing and developing databases of invasive species and identify the species that are known to have major impacts on plants.

There will then be need to prioritise those species likely to become seriously invasive in a range of special, important and agreed plant situations – such as areas of high plant diversity, areas of high endemism, areas of special floras and of cultural and medical importance, areas of importance for plant genetic diversity and so on.

Once an assessment of key species that impact plant conservation has been established, collaborative research, data collection and sharing of information combined with field experience and policy development is needed to establish management plans for those key invasive species. This may include field experimentation combined with assessments of past experiences and the development of necessary tools for the implementation of management plans and building of capacity to manage.

The rationale is that when pilot management plans for the prevention, eradication and/or control of invasive alien species that affect plants have been established and proved effective, it will be possible to begin a steady process to add more plans as time, knowledge and resources become available.

The target is to have management plans developed and in place for the major invasive alien species so that the rate of plant diversity loss is reduced. These management plans will be directed at the best-option process (prevention, eradication or control) and will aim at restoring ecosystem integrity to plant associations and habitats. A management plan, especially in the case where the invasive alien species may have been established for some time, needs to be developed in an ecosystem context, to avoid unexpected and undesirable secondary effects from the management e.g. the eradication of one invasive alien releasing another invasive alien species with even worse ecological effects (Zavaleta *et al.*, 2001).

The target is achievable provided that there is general awareness of the seriousness of the impact of biological invasions on plants and their habitats and if countries (signatories to the CBD) are prepared to share experience and exchange information and assist to build each other's capacity to implement the management plans. It will be necessary to build international cooperation to address the introduction, establishment and spread of known or potentially invasive species from one country to another, and to establish an early-warning system in the event that an introduction of invasive species is imminent or likely.

10.4. Some Key References

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Draft Target 11: No species of wild flora subject to unsustainable exploitation because of international trade

Revised Target 11: No species of wild flora endangered by international trade

11.1. Explanation

The proposed formulation of the target is more precise since it focuses on those species that are actually threatened by international trade. So formulated, the target is attainable and is complementary to target 12. *Species of wild flora endangered by international trade* include but are not limited to species listed on CITES Appendix I. The target is consistent with the main purpose of the CITES Strategic Plan (to 2005): "No species of wild flora subject to unsustainable exploitation because of international trade".

The Governing Council of UNEP, at its 20th session (Nairobi 1999), noted the importance of promoting interlinkages among multilateral environmental conventions and international processes in an effort to achieve a better focus on international policy-making. It calls upon Parties to give due consideration to ways and means to strengthen coherent interlinkages among relevant conventions. The missions of CBD and CITES are closely related, thus necessitating a high degree of co-operation and synergy. The CITES Strategic Plan includes itself the need of a high degree of co-operation and synergy with CBD. So, this target offers an excellent opportunity to work both conventions in a co-ordinated way.

CBD Articles and CoP Decisions: Article 10.
Key CBD Programmes and Cross-Cutting Initiatives: Sustainable Use; Thematic programmes.
Key International Initiatives: CITES (Parties, Plants Committee, Standing Committee); WCMC-UNEP; TRAFFIC network; IUCN, WWF, etc.

11.2. Background and Baseline

At national level 157 CITES Parties are working in a co-ordinated way with tools for implementation under the umbrella of the CITES. The systems and data for monitoring of the international trade are centralised in WCMC-UNEP and the activities from international NGOs such us TRAFFIC-network, IUCN, WWF and other relevant networks on this specific issues constitutes the background and baseline for this target.

The purpose of the CITES Strategic Plan is to improve in order to the international trade in wild flora is increasingly and consistently conducted at sustainable levels. The Strategic Plan confirms that sustainable trade in wild flora can make a major contribution to securing the broader and not incompatible objectives of sustainable development and biodiversity conservation. It also recognizes that the CITES must continue to ensure that proper trade mechanisms are put in place. These depend upon the availability of and access to reliable scientific data and to information generated by effective monitoring systems to counter over-exploitation. But information by itself is not enough and such trade mechanisms also require strong national capacity backed by good co-operation at national, regional and global levels. In order to achieve this purpose, 7 goals, 38 objectives have been identified with an Action plan with specific Action points directed to Parties; Standing Committee, Plants Committee; Scientific and Management Authorities; Conference of the Parties and CITES Secretariat.

11. 3 Rationale and Conclusions

To get that "No species of wild flora endangered by international trade" it will be necessary the following:

- **Enhance the ability of each Party**
  - ⇒ To assist in the development of appropriate domestic legislation and policies that encourage the adoption and implementation of social and economic incentives allied to legal instruments that:
    – promote and regulate sustainable management of wild flora
    – promote and regulate responsible trade in wild flora
  - ⇒ To strengthen the administrative, management and scientific capacity of Parties by improving the co-ordination with other national agencies responsible for wild plants.
  - ⇒ To encourage organizations capable of supporting the Parties in building national information management capacities through training and other activities, and to facilitate improved access to and management of databases.
  - ⇒ To encourage Parties to develop and implement effective management programmes for the conservation and recovery of species, so that the species will no longer satisfy the criteria for inclusion in the CITES Appendices.
  - ⇒ To use fully the potential of regional co-ordination and collaboration in capacity-building efforts.

- *Strengthen the scientific basis of the decision-making processes*
  - ⇒ To improve the scientific basis on which the Parties make non-detriment findings.

- **Contribute to the reduction and ultimate elimination of illegal trade in wild flora**

  The illegal trade in wild plants is a major factor in the depletion of the world's natural resources in exchange for commercial gain. It undermines the conservation efforts of developing countries, affects the income of rural populations and has driven several species to the brink of extinction.
  All countries, whether they are consumers or producers of wild plants, share responsibility to reduce and eventually eliminate illegal trade in wildlife. Successful achievement of this responsibility entails co-ordination and co-operation at all levels – local, national, regional and global. Heightened local awareness of and involvement in wildlife protection activities can further national efforts in combating illegal trade. Also, heightened awareness of and understanding by the judiciary of their potential role in deterring illegal activities relating to wild flora would further strengthen a Party's effort to stem illegal trade.

  - ⇒ To promote a high degree of co-operation, co-ordination and collaboration between national and international law enforcement agencies.
  - ⇒ To stimulate and participate in bilateral, regional and global efforts to combat illegal trade in wild flora.

⇒ To develop appropriate management strategies and incentives for promoting a change from illegal to legal use of wild flora, for example: certification systems for timbers.
⇒ To strengthen communication and collaboration with national and international NGOs.
⇒ To strengthen alliances with relevant local communities, consumer groups and traders.
⇒ To promote awareness and a greater understanding by the judiciary of the social and economic significance of conservation threats posed by illegal trade in wild flora.
⇒ To promote greater awareness among and co-operation with the scientific community.
⇒ To produce and disseminate informative materials to a broad public at a local, national and regional levels.

It is recommended to link the proposed Target XI with CITES.

11.4. Key references

Decision 11.1 CITES Conference of the Parties (Nairobi, 2000). http://www.cites.org

Draft Target 12: [30 per cent] of plant-based products derived from sources that are sustainably managed.

Revised Target 12: 30 per cent of plant-based products derived from sources that are sustainably managed.

12.1. Explanation

The sustainable use of the components of biological diversity is one of the three objectives of the Convention. Article 10 requires each Party, as far as possible and as appropriate, to "adopt measures relating to the use of biological resources to avoid or minimize adverse impacts on biological diversity."23 Practical principles, operational guidelines and associated instruments for sustainable use, as well guidance specific to sectors and biomes, are currently under development.24 More specifically, one of the activities in the draft expanded programme of work on forest biological diversity is to "Develop, support and promote programs and initiatives which address the sustainable use of timber and non-timber forest products"25

Plant-based products include food products, timber, paper and other wood-based products, other fibre products, and ornamental, medicinal and other plants for direct use. Such plants or plant products may be harvested from wild or semi-natural conditions, or cultivated. In the case of plant material collected from wild or semi-natural ecosystems, harvesting, to be sustainable, must be below replacement rates and the process of harvesting should not cause significant damage to other parts of the ecosystem. For some unique or fragile ecosystems, it may be judged that no exploitation can be considered sustainable, beyond that carried out traditionally by indigenous and local communities, where such local use is sustainable. In the case of cultivated material, i.e.: agriculture and plantation forestry, to be considered sustainable, the management practices used should avoid significant adverse impacts on plant diversity in the production system and in surrounding ecosystems, for example by avoiding excessive release of agro-chemicals and preventing unsustainable soil erosion.26

23 CBD Article 10 subpara (b). See page 9 of the CBD Handbook

24 COP Decision V/24, para 3. See page 642 of the CBD Handbook.

25 CBD SBSTTA Recommendation VII/6, annex, Programme Element 2, Goal 4, Objective 1, Activity (b).

26 See discussion under target 6.

Sources that are sustainably managed would thus include:

- Natural or semi-natural ecosystems that are sustainably managed (by avoiding over-harvesting of products, or damage to other components of the ecosystem), excepting that commercial extraction of resources from some primary forests and near-pristine ecosystems of important conservation value might be excluded.
- Sustainably managed, plantation forests and agricultural lands (see discussion under target 6).

In both cases, sustainable management should be understood to integrate social and environmental considerations, such as the fair and equitable sharing of benefits and the participation of indigenous and local communities.

12.2. Background and Baseline

A number of certification schemes designed to guarantee the sustainability of production exist. Those relevant to plant-based products include:

- Standards for organic food production. Many schemes are in operation, most are certified by private agencies, though some countries and regional groups have minimum core standards. The FAO/WHO Codex Alimentarius Commission has recently agreed guidelines for organic foods.
- Other standards for food products that include criteria relevant to sustainable production. These include "fair trade" standards for example, as well as "intermediate" standards for commercial export-oriented plantation crops such as bananas and coffee [27].
- Standards for certified timber sources such as those of the Forest Stewardship Council. [28]

Currently, plant-based products that meet the stringent standards for organic production, and verified as doing so, account for a small percentage of output (globally, of the order of one to three percent) Certified timber reaches a similar proportion[29]. However, much greater proportions are reached for products meeting what might be considered as "intermediate standards". For example, 15% of commercial export-oriented banana plantations are certified under the "Better Banana Project". Additionally, it might be expected that a much greater share of output may be considered as from sustainable – or near-sustainable – sources. Such sustainable sources might include:

- Low-input systems, including many subsistence cropping systems, excepting those where soil or soil nutrients are being eroded.
- Intensive agricultural and horticultural systems practicing integrated production methods (i.e. a combination of integrated pest management, integrated plant nutrient management, and conservation agriculture, implying zero or low pesticide and herbicide use; controlled use of fertilizers; and soil conservation).
- Forests managed according to internationally or regionally agreed criteria and indicators of sustainable management.[30]

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[27] . For example, under the "Better Banana Project", about 15% of commercial export-oriented banana plantations are managed according to independently verified standards that *inter alia* specify requirements for good management of pesticides and fertilizers, prohibit encroachment on surrounding areas of natural forest, and promote restoration of lands taken out of production. "Shade-Coffee" provides another example.

[28] FAO (2001b) SOFO pages 18-19.

[29] About 15 to 18 million hectares of cropland were estimated to be under certified organic production in 1998, SW Pacific, Europe and the Americas. Highest percentage areas are Lichenstein (17%) and Austrai and Switzerland (8%). There is very little certified organic production in Africa or Asia (Willer and Yuseffi, 2001). Forest certification covers some 80 million hectares. The proportion of forest area certified ranges from near 100% (Finland), to zero for most countries. Areas certified in developing countries reach 9% in Africa (South Africa), 0.7% in Asia (Sri Lanka) and 7% in Latin America (Belize).Except for the US (12%), rates in countries with the largest forest areas are low. See FAO (2001a) FRA 2000, Chapter 6

[30] More than 150 countries are participating nine eco-regional processes to develop and implement criteria and indicators for sustainable forest management, all of which include conservation of biodiversity. As most of these processes have begun only in the last few years, it is anticipated that much more information will be available on sustainable forest management in future. Currently there are no globally agreed criteria and indicators, but FAO is facilitating a process to harmonize the various sets.

Information on the extent of such practices may be estimated. For example, information on the adoption of IPM practices is increasingly available. Criteria for sustainability could also be incorporated into codes of practice or guidelines on "good agricultural practices", as currently being considered by FAO. Additionally, the development of agri-environmental indicators may assist in determining the extent of adoption of such sustainable practices.

Substantial progress has been made by the OECD in developing agri-environmental indicators which cover the range of issues referred to in the previous section (including for example, use of pesticides and fertilizers, and impacts on soil, water and biodiversity at genetic, species and habitat levels),31 and further development is foreseen.32 Criteria and indicators for sustainable forest management have been developed on a regional or biome-specific basis.33

A framework for national indicators on biodiversity is being developed under the Convention. ,34 and the draft expanded programme of work on forest biodiversity provides for the advancement of criteria and indicators for sustainable forest management.35 (For further information, please refer to Target 6).

12.3. Rationale and Conclusions

Ultimately, the global community must reach a target of 100% of sustainable production for all products. This will need to be achieved within the course of this century. Certified organic foods and timber currently account for about 2% of production globally. For several product categories, examples exist of 10–20% of products meeting "intermediate standards". Against this baseline, the target is considered to be attainable. It would be applied to each category of plant-based products, understanding that for some categories (such as non-wood forest products) it will be more difficult to reach and more difficult to monitor progress. Implementation would require a combination of product-specific and sector-wide approaches, involving initiatives by governments, industry, and civil society, consistent with the Convention's programme of work on agricultural biodiversity.

Progress towards the target may be monitored through:

- Direct measures e.g.: products meeting relevant verified standards (such as for organic food, certified timber, and intermediate standards that codify good practices for sustainable agriculture and forestry);
- Indirect measures e.g.: products from sources considered to be sustainable, or near-sustainable, on the basis of farming system analyses, taking into account the adoption of integrated production methods. Assessment of progress will be assisted by the development of criteria and indicators of sustainable agricultural and forest management

12.4. Key references

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31 OECD (2001); OECD (2002).

32 The OECD Environmental Strategy for the first decade of the 21st Century, agreed by Environment Ministers in May 2001, noted the need to "further develop and use the core set of OECD agri-environmnental indicators, and provide information on the adoption of sustainable management practices by 2003".

33 See http://www.fao.org/forestry/FODA/en/T-crit-e.stm

34 CBD COP Decision V/5, Annex, activity 1.5(a). See page 557 of the CBD Handbook

35 CBD SBSTTA Recommendation VII/6, annex, Programme Element 3, Goal 2, Objective 1.

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Draft Target 13: The decline of plant resources, and associated local and indigenous knowledge, that support sustainable livelihoods, local food security and health care, reversed.

Revised Target 13: The decline of plant resources, and associated local and indigenous knowledge innovations and practices, that support sustainable livelihoods, local food security and health care, halted.

13.1. Explanation

This is a complicated target with several major elements and assumptions about their relationships.

Plant resources (as elements of 'biological resources') "includes genetic resources, plants or parts thereof, populations, or any other botanical component of ecosystems with actual or potential use or value for humanity" (CBD definition). The inclusion of the phrase 'local and indigenous knowledge' in the target shows that the plant resources of interest here are those available from local sources to rural people. Plants provide many products of value to rural communities, whether used directly or sold, as well as ecological services. Plant products may be derived from domesticated or wild plants, in the latter case managed or otherwise. Wild plants provide people in rural communities in developing countries with many materials - used for construction and the manufacture of furniture and crafts, providing food, firewood, charcoal and fodder, and being used for medicinal and many other purposes (Campbell and Luckert, 2002). Trade in wild-collected plant products can form a significant part of the income of rural people. The sale of wild-harvested medicinal plants provides 15-35% of the income of poorer households in parts of Gorkha District, Nepal (Olsen 1998).

Associated local and indigenous knowledge refers to the knowledge held by rural people about their plant resources, including about their uses and methods of management. All people have some knowledge of plants, but this is most concentrated among those whose lives are most closely bound to plants, such as farmers, traditional healers and gatherers of wild products. More traditional, geographically-based, societies typically have close dependency on local plant resources and are rich in botanical knowledge. Working with local knowledge-holders is a vital part of practical conservation in developing countries (Cunningham, 2001).

"A *livelihood* comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future,

while not undermining the natural resource base." (Definition adapted by DFID from (Chambers and Conway, 1992))

The term *sustainable livelihoods* in the present context refers to the benefits which plants provide for maintaining or improving qualities of living. To continue to provide such benefits, plant resources must continue to be available, for example (most directly) through their rates of regeneration at least equalling their rates of depletion through harvest or other processes. They must also be accessible, for example through individuals continuing to have rights of access to the resources. Further, people must have knowledge of the uses of plants. Sustainability is a complex concept with ecological, political and cultural dimensions.

Food security refers to an aspect of sustainable living. Security in the supply of food is typically a major concern of people in developing countries. It has been defined as the "access by all people at all times to enough food for an active and healthy life" (World Bank 1986). Farmers following more traditional practices commonly conserve and grow many varieties of crops, the diverse properties of which reduce the risk of total crop-failure as through the vagaries of climate or the ravages of diseases. Wild plants provide valuable food supplements to rural communities and can become important for supplying food at times of crisis.

Health care in the present context refers to the roles of plants in sustaining physical, mental and spiritual well-being.

13.2. Background and Baselines

The target is proposed in recognition that: (1) the management of the environment for conservation of plant diversity is intricately related at the local level to its use as a provider of products and other benefits from plants; and (2) there is frequently a need to improve ways of managing plant resources, such that local needs are met without depleting natural capital.

Communities closely dependent on local plant resources are rich in knowledge of plants, the continuing utilisation of which will be of great value for sustaining their livelihoods (as well as often potentially to other people). Despite the rise in the plant sciences, there is no doubt that there has been a great decline over the centuries in the sum total of human knowledge about plants. A proxy indicator of knowledge of plants is global decline in the number of languages (NG 2001). There are numerous reports referring to local rural societies of inter-generational decay in knowledge of plants, (e.g. Luoga, Wikowski et al. 2000), but there are no global indicators of this phenomenon.

Having access to, and being able to effectively use, local plant resources will certainly remain a central element contributing to the quality of life in rural communities in the developing world. Local plants are so important to the achievement of sustainable rural living in developing countries that indicators of the quality of life will be virtually identical to indicators of the quality of life generally. Existing indicators of the quality of life include the Human Development Index (HDI) of the United Nations Development Programme (UNDP) and the Human Wellbeing Index (HWI) proposed by a consortium including the Food and Agricultural Organisation of the United Nations (FAO) (Prescott-Allen 2001). These indices build on the idea that development is a process of enlarging choice. They include many variables, consistent with the multiple dimensions of human lives, including three factors regarded as essential - a long healthy life, education and an adequate income. The International Development Targets (IDT), set by the Organisation for Economic Co-operation and Development (OECD) in 1996 include measures of improved economic well-being (e.g. "A reduction by one-half in the proportion of people living in extreme poverty by 2015"), social and human development (e.g. "A reduction by two-thirds in the mortality rates for infants and children under five") and environmental sustainability and regeneration (e.g. "The existence of effective processes for sustainable development in all countries by 2005, so as to ensure that current trends in the loss of environmental resources are effectively reversed at both global

and national levels by 2015") (DFID 2001). The more recent Millennium Development Goals (MDG) of the United Nations adds additional poverty concerns, consistent with a current emphasis among organisations concerned with development.

Decline in the availability of plant resources to particular communities can be measured or estimated. Such research, undertaken on a case-by-case basis in participation with communities, is an essential step in practical conservation in the developing world (Cunningham 2001). However, the identification of *global* indicators of the availability of such resources is complicated by:

- The great diversity of plant resources used.
- A shortage of reliable statistics (wild plants, used for subsistence or traded, are largely unrecorded in official economic statistics).
- The varying and often massive impacts of commercial harvesters operating within the territories of communities but outside their control.
- The increasingly monetary nature of many rural economies.
- The adoption of substitutes.

The commercial harvesting of wild plant resources by outsiders, or by members of communities acting on their own account, can have major impacts on the availability of plant resources available to communities. Such harvest can be predicted to grow, especially to meet the needs of growing urban centres. Much commercial harvesting of wild plant products is unsustainable. Less than 1% of tropical timber is believed to originate from sustainable operations. Quantities of wood harvested for fuelwood and charcoal in Africa are greater than is the case with timber (FAO 1992); very little of this in Africa or elsewhere is harvested sustainably. Urban centres in developing countries are often surrounded by widening zones depleted of trees that have been harvested for fuel. Resources of vulnerable species of medicinal plants growing in the Himalayas are being diminished through demand generated by the vast markets of India and China, not substantially because of local use (Olsen 1998).

Four indicators of health adopted by the United Nations Statistical Commission are: (1) healthy life expectancy at birth; (2) infant mortality rate; (3) child mortality rate; and (3) maternal mortality rate (Prescott-Allen, 2001). There are no global indicators of the decline in availability of medicinal plants, a proxy measure of quality of health. Such a decline for more vulnerable species of medicinal plants is however reported from many parts of the world, for example Europe (Lange 1998). Unsustainable collection for the commercial market is the predominant cause. Problems in the supply of medicinal plants and other plant resources for local use can be a by-product of commercial activities and can also result from loss of access to resources through changes in land tenure or resource-rights (Cunningham 1996).

The ability to meet this target depends on many factors both internal and external to communities. Local communities are embedded in wider economic, political and cultural systems. Among the numerous factors which must be considered in deciding on whether this target can be achieved are:

- There will be a major increase in the global demand for plant resources, including wild plant resources, related to the growing human population and aspirations for higher material standards of living.
- The effect of these increased demands on the natural resource base will not be linear. Rather, critical fresholds will be reached when major adjustments are needed in socio-economic systems (many environmental responses to change are non-linear).
- There will a major rise in demands for plant resources by urban populations with a predicted massive growth in cities. Currently about 150,000 people worldwide drift from rural to urban areas every day (DFID 2001).

- Access to plant resources by communities, or marginalised sections of communities, are likely to become increasingly restricted through a general trend towards greater privatisation of land, favourable especially to already more privileged members of society.
- There will be increased globalisation of cultures and economies.
- In some cases, alternatives to current resources will become available.

13.3. Rationale and Conclusions

Achievement of the target will depend on the evolution of policies towards rural livelihoods. From the positive perspective, attainment of the target will be assisted by current trends in the policies of development agencies towards rural livelihoods. However, much more attention needs to be paid to plant resources within these policies than is currently the case.

There is an intimate relationship between cultural and biological diversity. Related to this, much greater stress needs to be placed on recording local knowledge of plants through ethnobotanical studies, and returning this knowledge to communities in forms in which it can be utilised. Effective use of local and indigenous knowledge will contribute significantly to the achievement of Targets 2 and 3.

This is a complex target for which a number of indicators will need to be defined. It is recommended that the quantitative element of the target be changed from 'reversed' to 'halted' in recognition of the magnitude of the task at hand. Achievement of the target will depend on the feeding of case-studies specific to particular communities and their plant worlds into policy processes.

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Draft Target 14. The importance of plant diversity and the need for its conservation incorporated into educational programmes.

Revised Target 14. The importance of plant diversity and the need for its conservation incorporated into communication, educational and public awareness programmes.

14.1. Explanation

The Convention on Biological Diversity states that the Parties *shall* undertake Public Education in Article 13 – so incorporating plant conservation into awareness and education programmes forms a component of Article 13 responsibilities under the Convention.

Terminology
Awareness brings the issues relating to plant diversity to the attention of key groups who have the power to influence outcomes. Awareness is an agenda setting and marketing exercise helping people to know what and why this is an important issue, the aspirations for the targets, and what is and can be done to achieve these. The tools to develop awareness range from a personal phone call, a sign, brochure, seminar, in-flight magazine article, reports in the press, or testimonials by popular figures. The tools used depend on who is to be reached, why, and with what key issues. Awareness programmes may also be oriented to explaining the legal and financial instruments associated with implementing plant diversity conservation.

Education is a set of processes that can inform, motivate and empower people to support plant conservation, not only by making lifestyle changes, but also through promoting change in the way that institutions, business, and governments operate.

In the *formal* sense, education tends to take place in schools and other formal settings. It aims at a more profound, long-term understanding of the issues, uncertainty, possible solutions and the clarification of and development of values that can motivate decisions and practice. Education tools include workshops, interactive online resources, texts, videos, CD-ROMS, research projects, as well as presentations by experts and discussions. Though relatively expensive and long-term, its benefit is that educated people have a more deep-seated appreciation for the issue and have the ability to incorporate the principles into their way of working and living, or follow a career in the field.

Education – meaning learning - can also take place in *informal* settings, by dialogue, use of internet, through art and media, short courses, in-service education programmes associated with work or leisure, seminars, training, reading, travel and ecotourism, as well as visits to museums and botanical gardens. It is in this context that the greatest value can be gained for the plant diversity outcomes.

Scope
While a necessary first step, *awareness* alone is not enough. It only leads to conservation if people who can do something about it gain interest and follow through with an appropriate action. Without that level of co-operation the Strategy outcome targets will not be met. Awareness needs to be an initial learning stage in an instructive process towards adopting certain practices.

Therefore the scope of this target goes further in incorporating the issues into "educational programmes". If the Strategy is focused on incorporating plant diversity in formal education alone (in school studies, university and technical education, meaning that the curricula of these institutions should be reviewed and changed), then a huge effort is proposed. In addition, this effort will not either effectively or efficiently lead to the plant strategy targets to be achieved by 2010. This is because the educational effort will not be directed to those who can make changes in the next 10 years. Secondly it is difficult, costly, and long-term to change school curricula, and there is great resistance from educational systems to do this.

At a less formal level, incorporating plant diversity issues into visitor educational programmes of protected areas, museums, and botanical gardens can contribute to building a constituency for the issues and support for conservation measures.

However to achieve the proposed outcomes of the Global Strategy for Plant Conservation Strategy outcomes, the development of indicators to measure the achievement of the target will be required. Such

indicators can be linked specifically to the achievement of each of the other targets so that the educational target is supportive of these, which is discussed further in this paper.

14.2. Background and Baseline

The Convention recognises the importance of social instruments in Article 13 on Public Education by directing the Parties to use them. In practice, the approach to biodiversity conservation is mostly focussed on research and technical measures. The benefits of using education and communication as a management and policy tool, as well as to streamline the complex processes involved in multi-stakeholder situations in biodiversity conservation, are yet to be fully recognised by the Convention Parties and implementers.

As yet no framework for reporting on Article 13 has been developed, so it is not possible to assess the incorporation of biodiversity information into education. Therefore a baseline is difficult to provide.

The important point to recognise is that almost all of the Global Strategy for Plant Conservation targets will only be achieved if communication and education instruments are used to support these targets. Communication and education are an essential means to gain co-operation of groups in society.

Through interactive communication, key stakeholders can contribute to preparing policy and plans which are related to the other targets. This results in reducing conflicts over policy, rather than engaging in processes that first decide with consultation in limited circles, and then announce and have to defend the policy. So a measure of the use of communication as an integrated tool could be the level of conflict associated with the work.

In addition, each specific target must be analysed in the national context to clarify who can make a difference in achieving it, i.e. the target groups. Communication and education are used to mobilise target groups towards action related to each outcome. Therefore, communication or education objectives have to be specified for each target. These communication objectives are therefore cross-cutting across the different target groups, and must be oriented to support each target.

A communication or educational programme is designed to meet the communication objectives, which are measured in terms of actions, solutions proposed, knowledge, understanding, skills and attitudes developed.

Finally the extent to which the plant diversity conservation outcomes are reached will provide a useful measure of the success of the target on awareness and education, since without the integral use of communication and education, these targets will probably not be achieved.

The work on plant conservation could be supported to some degree by the proposed work programme on Communication, Education and Public Awareness (CEPA), prepared by the Consultative Working Group of Experts convened according to decision COP V/17. This will be presented to the Parties at COP6 in April 2002.

This CEPA Work Programme recognises that education and communication, as social instruments, work best when undertaken together with other instruments (legal, financial) which are designed to formulate, implement and manage biodiversity objectives. One of the main result areas for the CEPA Work Program is a global capacity-building program to support National Biodiversity Strategy Focal Points in effective communication.

The CEPA Programme should be extended to assist plant diversity experts to more effectively communicate their findings to policy makers and to sectors that are instrumental in influencing the plant conservation targets.

14.3. Rationale and Conclusions

The existing "education" outcome can be interpreted as either limited to formal education systems, or to incorporating plant education into protected area, museum, or botanical garden outreach programmes. In addition it fails to link communication and educational actions with each specific conservation targets. Its particular focus may therefore be directed professionally informed communications, education and public awareness (CEPA) strategies developed specifically for each of the global targets.

This target-specific approach aimed at key target groups means that not everyone in the world has to understand the importance of plant diversity. A general attempt to introduce plant diversity conservation into education is an impractical aim for the Strategy, as it is beyond available resources and the time frame of the Strategy to be able to deliver results.

What matters is that key people co-operate towards achieving the targets. By focusing communication to those who can make a difference to plant diversity conservation and sustainable use issues, the communication and education target will support the outcomes of the Strategy. The following examples illustrate how communication and education may contribute to the broad strategic targets.

1. Conserving plant diversity. Governments – national, state and local - are directly responsible for land use planning and land management, which affects the conservation of centres of plant diversity. Key decision-makers in all relevant sectors therefore need to be identified, and encouraged to incorporate the most important plant diversity issues into their work so that, for example, mining exploration, transport networks and forest management do not negatively impact plant diversity. This requires communication between sectors to develop consistent policies and management practices as well as internal communication within government agencies. The approaches are oriented to listening to understand how to fit into the institutional practices, exploring for win-win opportunities, benefits to partners, building relationships, information, and negotiation. These approaches are included in a communication tool box. Indicators for the communication objectives in each case will have to be set for each component of the outcome at the national or local level.

2. Using plant diversity sustainably. By analysing the chain of people involved in e.g. plant trade, appropriate communication and other instruments can be put in place according to the degree to which the target groups are willing to comply voluntarily.

To measure the success of the integration of targets 1and 2, a sample of the communication plans and their evaluation for each outcome should be reviewed.

3. Building capacity for the conservation of plant diversity. The third area relates to building the skills of those involved in plant issues to communicate more effectively, and sharing knowledge between countries and groups on how to undertake CEPA work. Part and parcel of providing such support is the allocation of funding to communication capacity-building and CEPA. These actions are consistent with those proposed in the CEPA Work Programme under the Convention. The adoption of this Work Programme and provision of funding are clearly crucial to support the Global Plant Conservation Strategy.

Success may be measured by counting the numbers trained, the financial allocation to CEPA for plant diversity, the provision of information by Parties to the clearing house mechanism on CEPA, and the achievement of specific objectives related to the outcomes.

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Draft Target 15: The number of trained people working with adequate facilities in plant conservation and related activities [doubled]/[increased], according to national needs.

Revised Target 15: The number of trained people working with appropriate facilities in plant conservation increased, according to national needs, to achieve the targets of this strategy.

15.1. Explanation

At its eighth meeting, SBSTTA in Decision VII/8 on the Global Strategy for Plant Conservation emphasized the need for capacity building, particularly in developing countries, small island states and countries with economies in transition, in order to enable them implement the Strategy. Further, they noted the importance of national actions, in accordance with national priorities, to the achievement of plant conservation, and the urgent need to strengthen national capacities.

There are two major issues within this target on which the effective implementation of the proposed strategy hinges. First is the need for a critical mass of conservation practitioners in the priority areas based on national needs as well as the physical infrastructure and appropriate facilities. Parallel to this is the need for an enabling environment supported by appropriate institutional and policy frameworkwhich is essential for the effective conservation and sustainable use of plant resources at national level.

Plant conservation, like conservation biology, is a synthetic discipline that is cross-cutting, involving a variety of skills and technologies. These can be acquired through various capacity building initiatives including courses at most tertiary institutions but more often than not, supplemented by specialized training in priority areas according to national, regional and international needs. . This is because plant conservation practitioners working at the field level need to be able to work across disciplines corresponding to the reality of the ways that plants and plant resources are managed and used thus requiring interdisciplinary skills. However, curriculum development for broad based courses at tertiary levels is often challenged by a compromise of depth for breadth.

While few documented analyses of capacity building initiatives and needs in plant conservation are available Oteng-Yeboah 1998, identified the critical skills needed for plant conservationists in Africa as those for inventories, curatorial work, monitoring, restoration, ethnobotany and education. For field based plant conservation practitioners, as is required of any conservationists, skills in communication and team building were noted as essential by Touval and Dietz (1994). Saberwal and Kothari, (1996) further highlighted the need for a clear understanding of social and policy issues together with management skills (). Hence, whilst a good grasp of the technical background in essential for problem solving in plant conservation, cross-disciplinary skills are indispensable.

While there may be available expertise in several disciplines in plant sciences, the much needed broad based capacity is limited especially in developing countries, small island states and countries with economies in transition. Unfortunately, this situation is further compounded by the lack of adequate physical and financial resources, which pose a constraint on the few available practitioners.

15.2. Background and Baseline

The achievement of the targets included in this strategy will require a considerable targeted effort in capacity building in priority areas based on national and regional needs. For example, in developing the Tanzania Botanical Training Programme it was noted that with over 10,000 species of which 11% are endemic, the flora was poorly known (Mziray, 1993). A small number of qualified botanists, severe shortage of technical support, inadequate facilities and budgetary constraints further compromised the situation. There was an urgent need for careful and appropriate training; efforts to ensure stable employment for trainees and mechanisms to strengthen collaboration. These needs are similar for most developing countries. In addressing the infrastructural and institutional needs, Mossmer and Willis (2000) carried out a survey on botanical expertise for Southern Africa (Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe). Of the 202 respondents, 52% were from South Africa, 33 % from Europe, and only 4% from the rest of the region (Malawi 2%, Zimbabwe 2%). Only 8% were involved in plant conservation. This highlighted the critical need for building expertise, which in some instances may have a baseline of zero. A parallel need for adequate infrastructure had been highlighted by a needs assessment based mainly on herbaria, which is summarised in Smith *et al.* 1999.

Whilst most countries have tertiary institutions offering courses in biology, botany, forestry, agriculture and horticulture, there is a lack of synthetic training opportunities that are broad based and problem centered. However, as a stop gap measure, various international and regional training programmes have been developed to focus on specific needs, skills and techniques especially in response to CBD article 12 on capacity building and technology transfer. A list of examples of such relevant courses is presented in Annex III. There is a wide range of courses offered by specialized institutions trying to meet the varying needs of plant conservationists internationally (Maunder and Clubbe, 1998). The benefits from such courses is compromised by a lack of appropriate facilities and secure employment leading to high staff turnover. Inability to retain these trained plant conservation practitioners further creates a perpetual need for capacity building.
A critical factor in the context of the proposed strategy is the need to build the capacity based on the integration of the principles of the ecosystem approach, access and benefit sharing; and built upon the knowledge, innovations and practices of indigenous and local communities (CBD Article 8j) with their approval and involvement.. A robust and dynamic model for capacity building in plant conservation is thus needed to continually internalize emerging principles and innovations into plant conservation practise at national and community levels is imperative..

However, it is unlikely that short courses will adequately deal with these issues due to time and resource limitations. Hence, there is an urgent need to integrate these principles as foundational components especially in forestry, agriculture, horticulture, resource management and conservation biology faculties in tertiary institutions. This obviously has implications for curriculum development in the long term, but in the short term as a remedial action, training modules could be incorporated into available courses. There is an urgent need to ensure that this type of training is sustained by follow-up activity that evaluates application and impact in the field. Further, there is need to establish appropriate and adequate technological, institutional and financial resources to back up these efforts at national and regional levels.

15.3. Rationale and Conclusions

A critical mass of plant conservation expertise is essential for the achievement of all the proposed targets of this strategy. However, while in general it is clear that there is a lack of adequate facilities and expertise in developing countries, small island states and countries with economies in transition, the baseline data are limited. Effective implementation of these targets at the national level and based on national needs and priorities requires capacity building commensurate with the priorities identified. For example, species-rich countries with threatened and heavily utilized taxa will urgently need to boost their capacity if they are to achieve their national targets and do so in a greater percentage compared to those with less taxa and/or facing lesser threats.

Hence, it is important to clearly define this target to offer maximum effective benefit for all parties. Thus there is need to consider the use of the terms "increased" and "doubled" critically. Whilst doubling capacity is measurable, it is of little value if it does not result in strategic targets being met. On the other hand, an "increase" in capacity according to national needs and priorities is appealing and effective but not measurable.

In order to make a justifiable target, it is necessary to establish the baseline, which unfortunately is not currently available for most parties. It is therefore suggested that the process component of this target should include a national needs assessment as a precursor to the definition of this target at national level. In this respect, the use of the term "increase' is more appropriate as it allows for flexibility of setting targets at national level. As such, the overall objective must be to increase capacity according to national needs and priorities. However, there should be a minimum measurable element defined within the target for this to be a SMART target. . Hence, as a minimum requirement within the framework of the strategy, the number of trained people working with adequate facilities in plant conservation and related activities should at least be doubled world wide by 2010. worldwide. Given the current geographical disparity between the biodiversity and expertise, this is likely to involve considerably more than a doubling of capacity in many developing countries, small island states and countries with economies in transition. Increased capacity will include not only in service training but also the training of additional staff and other stakeholders, particularly at community level. In this context, it is likely that the increase will be as high asten-fold in some countries given their national needs and priorities, given that effective implementation of the strategy will depend on the achievement of this target,

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Draft Target 16. Networks for plant conservation activities established or strengthened at national, regional and international levels.

Revised Target 16. Networks for plant conservation activities established or strengthened at international, regional, and national levels.

16.1. Explanation

Effective conservation of species depends on all the legitimate stakeholders being supportive of, and committed to, an agreed conservation approach. People need to have a common interest and a shared vision and priorities, which is why networks at many different levels are essential. Networks may be multi-disciplinary, cross-cutting or thematic. They may involve organisations, institutions and individuals

or a combination of all three. Networks may also be, in part, defined by their means of operation (e.g. electronic internet based networks, and ones that operate through regular meetings and publications). This target in the plant conservation strategy aims at strengthening existing networks and developing others in order to support the other global plant conservation targets.

A key point about networks is that they are of use only when the collective knowledge of many people results in a stronger product than any one person could accomplish alone. At an international level, global syntheses are a classic example of where networks are essential, as no one person has a global knowledge of plant diversity, but many people have either a very good regional or taxonomic knowledge. By bringing together this expertise, broader trends can be determined, and the network can be mutually self-supporting in helping members not to "reinvent the wheel", and to share experience and discovery. Effective networks may also provide a means to help develop common approaches to plant conservation problems, shared policies and priorities and to help disseminate the implementation of all such policies at all levels. Networks provide an essential link between 'on the ground' plant conservation action and international level coordination, monitoring or policy development.

Regional and national networks are also of great importance for the same reasons so that stakeholders can share information and knowledge within a country or smaller geographical area (where conservation action happens) as well as beyond international borders. The CBD in Article 17 aims to promote and facilitate the exchange of information. The creation, further development and support of networks can greatly enhance the implementation of this article, and of the Convention as a whole. Networks must also include strategic alliances and partnerships among plant conservation groups, to ensure that the work is accomplished and that costly duplication does not occur. The main purposes for networks involved in plant conservation are as follows (Wyse Jackson, 1998) to:

- Provide a forum for policy development.
- Plan, organize, facilitate or implement projects involving several institutional partners.
- Raise funds centrally or cooperatively to support those involved in the network and any coordinating organisation or secretariat from a variety of donors.
- Prepare, circulate and disseminate guidelines, manuals and other technical materials to guide participants' policies, procedures and practices.
- Prepare agreed Codes of Conduct and policies on matters of mutual concern.
- Act as central clearing houses for linkages between participants, as well as with other relevant bodies and individuals.
- Organize events, meetings and training opportunities.
- Disseminate information about the priorities, concerns and activities of the network or of its participants to others, including other networks and the general public.

16.2. Background and Baseline

Networks that have a direct relevance to, effect or impact on plant conservation are too numerous to cite here, and it is clear that many networks (e.g. those concerned with protected areas, education, law, economics, agriculture, forestry, horticulture, invasive species, social policy, and decision-making bodies) all have a more or less significant impact on plant conservation too. IUCN—the World Conservation Union members (bringing together 79 states, 112 government agencies, 760 NGOs, 37 affiliates, and some 10,000 scientists and experts from 141 countries) is an example of a global network with conservation (including plant conservation) as its mandate. However this paper will focus on networks that have plant conservation as a specific mandate, and examine how these may be strengthened and what are the needs for further development of networks.

Global plant networks

The IUCN Species Survival Commission (SSC) currently maintains a network of some 33 plant Specialist Groups with over 1,000 members with expertise on some particular plant taxon or region. This network is managed through a system of Specialist Group Chairs, with each group working on particular Action Plans or other projects for the species under their purview. Communication and sharing of information is achieved via newsletters, email, the Internet, and meetings. While this network is an important one, many more botanists exist that could contribute their knowledge and expertise for conservation.

Botanic Gardens Conservation International (BGCI) is a major network including over 500 botanic gardens in 111 countries, and among other things produces training manuals, policy guidelines and national or regional Action Plans for botanic gardens to improve plant conservation. The International Association of Botanic Gardens is another significant networking body for botanic gardens. National or regional network organisations now exist for botanic gardens in all parts of the world (eg. the Caribbean Botanic Gardens for Conservation network and the BGCI/IABG European Botanic Gardens Consortium, both of which have prepared action plans (Burbidge & Wyse Jackson, 1999 and Cheney et al., 2000). Although most are derived from different origins and have different modes of operation, nevertheless most share similar objectives in botanic garden development and management, plant conservation and environmental education. In addition networks for herbaria and museums also exist. All of these form essential networks for the success of several of the targets included in the strategy.

Close cooperation and effective networking also occurs for the conservation of agricultural biodiversity through the activities, for example, of FAO and The International Plant Genetic Resources Institute, which link a large network of scientists and institutions concerned with genetic resource conservation and use. The People and Plants initiative of WWF/UNESCO/RBG Kew forms an international network of conservation practitioners involved in conservation and sustainable use of plant diversity, with a particular focus on the conservation of knowledge about plants and their uses. Scientific and academic networks of importance for plant conservation also operate globally, such as the membership of such societies as the Linnean Society of London and the Society for Restoration Ecology.

Regional and national plant networks

While too numerous to list all regional and national plant networks, a number should be taken account of and serve as examples for other regions and countries, as well as be strengthened in order to take on the many tasks associated with the targets of this plant strategy. In addition, many of these regional and national networks are connected to contribute to the international plant networks. Examples of successful regional and national networks are SABONET (including all southern African countries), the Australian Network for Plant Conservation, the Canadian Botanical Conservation Network, and the Indonesian Network for Plant Conservation. In the USA there are a number of plant networks including the North American Plant Conservation Alliance, the US Center for Plant Conservation, and the newly formed NatureServe. This organisation works with a network of natural heritage programs and conservation data centers across the United States, Canada and Latin America to supply conservation information for both plants and animals. In Europe there are a number of regional plant (mostly taxonomic) networks, and the developing Planta Europa network has the potential to bring all major stakeholders concerned with plant conservation in Europe together to achieve European conservation priorities. Elsewhere in most regions there are important scientific or academic networks operating that are of considerable significance for plant conservation (and especially for plant taxonomy), for example, AETFAT, the Association for Taxonomic Study of the Flora of Tropical Africa, the Association Latinoaméricanos de Botánica, the Red de Herbarios de Mesoaméricos and plant scientists associated with national academies of science in countries such as China, Russia, Ukraine and the U.S.A.

It should be noted however that the largest and best resources networks are mostly developed-country based, and more effort needs to be made to developing and strengthening similar networks in areas where the major centres of plant diversity are found. There is an urgent need to strengthen or develop plant conservation networks in most parts of the world, and connect these to other stakeholder and decision-

making networks. At local levels important networks also support the implementation of plant conservation actions through practical projects, public awareness and fund raising. Many plant conservation bodies benefit from having a network of individuals involved in support groups such as 'Friends' associations.

16.3. Rationale and Conclusions

Strengthening networks will be essential if the plant conservation targets are to be achieved. There is a need to develop a series of indicators, which may be used to measure the implementation of this target. Such indicators could include the number of individuals and organisations/institutions involved in the networks, the geographical spread of such networks, their operational budgets and the range and number of plant conservation projects which they initiate, coordinate, support or help to facilitate. There is a need to undertake a comprehensive review of existing networks worldwide of relevance to plant conservation, and a needs assessment, so that baseline information for the achievement of this target can be elaborated. Baseline information on the number of scientists and other plant conservation practitioners involved in existing networks needs to be determined. The increasing number of such plant professions involved, particularly from regions of high plant diversiy, may provide a convenient measure of the achievement of this target. While plant conservation networks are already making very positive contributions to plant conservation, it is clear that much more needs to be accomplished, particularly in areas of high plant diversity

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ANNEX I

Recommendation VII/8 of SBSTTA on the Global Strategy for Plant Conservation

The Subsidiary Body for Scientific, Technical and Technological Advice,

Recalling decision V/10 of the Conference of the Parties,

Noting the call from the XVIth International Botanical Congress, in August 1999, for plant conservation to be recognized as an outstanding global priority in biodiversity conservation,

Further noting that the Gran Canaria Declaration of April 2000 called for the development of a Global Strategy for Plant Conservation, within the framework of the Convention on Biological Diversity, and the support for such a strategy by the second IUCN World Conservation Congress, in September 2000,

Recognizing ongoing international initiatives that contribute to plant conservation, such as the Global Plan of Action for Plant Genetic Resources for Food and Agriculture and the International Treaty on Plant Genetic Resources for Food and Agriculture of the Food and Agriculture Organization of the United Nations, the Strategic Plan and work of the Plants Committee of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Man and Biosphere programme of the United Nations Educational, Scientific and Cultural Organization, the International Agenda for Botanical Gardens in Conservation, the IUCN Species Survival Commission's Plant Conservation Programme, the International Plant Protection Convention, the Global Invasive Species Programme, activities of the International Association of Botanic Gardens; and the people and plants initiative of the World Wide Fund for Nature and the United Nations Educational, Scientific and Cultural Organization,

Recognizing also that the thematic and cross-cutting programmes of work of the Convention contain elements aimed at plant conservation,

Noting the importance of national actions, in accordance with national priorities, to the achievement of plant conservation, and the urgent need to strengthen national capacities,

Recognizing regional initiatives such as the European Plant Conservation Strategy developed by the Council of Europe and Planta Europa as valuable contributions to global plant conservation,

1. *Recommends* that the Conference of the Parties, at its sixth meeting:

(a) *Considers* for adoption a global strategy for plant conservation, which should include outcome-oriented global targets for 2010, developed on the basis of the proposals in the annex to the present recommendation and taking into account the results of the inter-sessional work described in paragraphs 2, 3 and 4 below;

(b) *Invites* relevant international organizations to adopt these targets, in order to promote a common effort towards halting the loss of plant diversity;

(c) *Notes* that the targets provide a flexible framework within which national and/or regional targets may be developed, according to national priorities and capacities taking into account differences in plant diversity between countries;

(d) *Invites* Parties and Governments to develop national and/or regional targets, and, as appropriate, to incorporate them into relevant plans, programmes and initiatives, including national biodiversity strategies and action plans;

(e) *Emphasizes* the need for capacity building, particularly in developing countries, small island states, and countries with economies in transition, in order to enable them to implement the strategy;

(f) *Considers* the need to ensure financial support, for country driven activities and capacity building for the implementation of the strategy;

(g) *Reviews*, at its eighth and tenth meetings, the progress made in reaching the global targets, and provide additional guidance in light of those Reviews;

(h) *Considers* the global strategy for plant conservation as a pilot approach for the use of outcome targets under the Convention within the context of the Strategic Plan and, also consider the wider application of this approach to other areas under the Convention, including other taxonomic groups;

(i) *Requests* The Subsidiary Body on Scientific, Technical and Technological Advice:

(i) To take the targets into consideration in its periodic *Reviews* of the thematic and cross-cutting programmes of work of the Convention;

(ii) To develop ways and means, within the Convention's thematic and cross-cutting programmes of work, for promoting implementation of the global strategy for plant conservation, and for monitoring and assessing progress; and to report to the Conference of the Parties at its seventh meeting;

(j) *Welcomes* the contribution of the "Gran Canaria Group" in developing this strategy, and invite the organizations involved, and other relevant organizations, in collaboration with the Executive Secretary, to contribute to the further development, implementation and monitoring of strategy;

[Inter-sessional work]

In preparation for consideration of the draft strategy by the Conference of the Parties at its sixth meeting,

1. *Requests* the Executive Secretary, with the support of technical experts, in consultation with participants of the ongoing international initiatives referred to in the fourth paragraph of the preamble to the present recommendation and on the basis of advice from Parties, to refine the quantitative elements of the targets in the draft strategy providing a scientific and technical rationale in each case, and clarifying terms as necessary;

2. *Requests* the Executive Secretary to prepare an analysis of the opportunities for implementation of the strategy through the thematic and cross-cutting programmes of work of the Convention, including in particular the Ecosystem Approach and the Global Taxonomy Initiative, as well as through existing relevant international, regional and national initiatives, and of any gaps in these programmes and initiatives;

3. *Invites* Parties, Governments and relevant organizations to provide information to the Executive Secretary on relevant international, regional and national initiatives.

Annex to SBSTTA Recommendation VII/8

GLOBAL STRATEGY FOR PLANT CONSERVATION

A. Objectives

The ultimate and long-term objective of the strategy is to halt the current and continuing loss of plant diversity.

The strategy will provide a framework to facilitate harmony between existing initiatives aimed at plant conservation, to identify gaps where new initiatives are required, and to promote mobilization of the necessary resources.

3. The strategy will be a tool to enhance the ecosystem approach to the conservation and sustainable use of biodiversity and focus on the vital role of plants in the structure and functioning of ecological systems and assure provision of the goods and services such systems provide.

4. The strategy will also:

(a) Provide a pilot exercise under the Convention for the setting of targets that relate to ultimate objectives of the Convention;

(b) Act as a means to develop and implement the thematic programmes of work of the Convention.

5. Within the ultimate and long-term objective, a number of sub-objectives can be identified as follows:

(a) Understanding and documenting plant diversity:

(i) Document the plant diversity of the world, including its use and its distribution in the wild, in protected areas and in *ex situ* collections;

(ii) Monitor the status and trends in global plant diversity and its conservation, and threats to plant diversity, and identify plant species, plant communities, and associated habitats and ecosystems, at risk, including consideration of "red lists";

(iii) Develop an integrated, distributed, interactive information system to manage and make accessible information on plant diversity;

(iv) Promote research on the genetic diversity, systematics, taxonomy, ecology and conservation biology of plants and plant communities, and associated habitats and ecosystems, and on social, cultural and economic factors that impact biodiversity, so that plant diversity, both in the wild and in the context of human activities, can be well understood and utilized to support conservation action;

(b) Conserving plant diversity. Improve long-term conservation, management and restoration of plant diversity, plant communities, and the associated habitats and ecosystems, *in situ* (both in more natural and in more managed environments), and, where necessary to complement *in situ* measures, *ex situ*, preferably in the country of origin. The strategy will pay special attention to the conservation of the world's important areas of plant diversity, and to the conservation of plant species of direct importance to human societies;

(c) Using plant diversity sustainably:

(i) Strengthen measures to control unsustainable utilization of plant resources;

(ii) Support the development of livelihoods based on sustainable use of plants, and promote the fair and equitable sharing of benefits arising from the use of plant diversity;

(d) Promoting education and awareness about plant diversity: Articulate and emphasize the importance of plant diversity, the goods and services that it provides, and the need for its conservation and sustainable use, in order to mobilize necessary popular and political support for its conservation and sustainable use;

(e) Building capacity for the conservation of plant diversity:

(i) Enhance the human resources, physical and technological infrastructure necessary, and necessary financial support for plant conservation;

(ii) Link and integrate actors to maximize action and potential synergies in support of plant conservation.

B. Rationale, scope and general principles

6. Plants are universally recognized as a vital part of the world's biological diversity and an essential resource for the planet. In addition to the small number of crop plants used for basic food and fibres, many thousands of wild plants have great economic and cultural importance and potential, providing food, medicine, fuel, clothing and shelter for vast numbers of people throughout the world. Plants play a key role in maintaining the planet's basic environmental balance and ecosystem stability and provide an important component of the habitats for the world's animal life. At present, a complete inventory of the plants of the world has not been assembled, but it is estimated that the total number of vascular plant species may be of the order of 300,000. Of particular concern is the fact that many are in danger of extinction, threatened by habitat transformation, over-exploitation, alien invasive species, pollution and climate change. The disappearance of such vital and large amounts of biodiversity sets one of the greatest challenges for the world community: to halt the destruction of the plant diversity that is so essential to meet the present and future needs of humankind. The global strategy for plant conservation is proposed to address this challenge. While the entry point for the strategy is conservation, aspects of sustainable use and benefit-sharing are also included.

7. The rationale for a strategy focusing on plants has two aspects:

(a) Plants are primary producers and provide habitat infrastructure for many ecosystems;

(b) Setting meaningful targets is feasible since scientific understanding of at least higher plants, though incomplete, is better than for most other groups.

Accordingly, the proposed strategy addresses the Plant Kingdom with focus on higher plants, and other well-described groups such as Bryophytes and Pteridophytes. The setting of measurable targets for this set of taxa is more credible than for many lower plant groups. This does not imply that these groups do not have important ecological functions, nor that they are not threatened. However, effective action will be best achieved by focusing, in an initial phase at least, on achievable outcomes for known taxa. Parties may choose on a national basis to include lower taxa.

The strategy applies to plant genetic diversity, plant species and communities and their associated habitats and ecosystems.

10. The strategy would provide a framework for actions at global, regional, national and local levels. A global dimension to the strategy is important because it can:

(a) Facilitate the development of a global consensus of key objectives, targets and actions;

(b) Strengthen possibility of implementing necessary transnational actions (such as some recovery programmes);

(c) Optimize availability and usefulness of information;

(d) Be used to focus research on key generic issues (such as conservation methods);

(e) Allow the identification of appropriate standards for plant conservation;

(f) Mobilize support for globally significant actions (globally threatened species; "centres of plant diversity" and "hot spots"); and

(g) Allow for collaboration between national, regional and international entities.

11. The global strategy for plant conservation will:

(a) Apply the Convention provisions on access and benefit sharing, drawing as appropriate on the Bonn Guidelines for access and benefit sharing, with a view to ensuring a fair and equitable sharing of benefits arising from the use of genetic resources, and consistent with the International Treaty on Plant Genetic Resources for Food and Agriculture;

(b) Build upon the knowledge, innovations and practices of indigenous and local communities, with the approval and involvement of the holders of such knowledge, innovations and practices, and contribute to the implementation of Article 8(j) of the Convention;

(c) Apply the ecosystem approach adopted under the Convention, Recognizing the interaction of plants and plant communities, with other components of ecosystems, at all scales, and their role in ecosystem functions and processes. The ecosystem approach also implies, inter alia, intersectoral cooperation, decentralization of management to the lowest level appropriate, equitable distribution of benefits, and the use of adaptive management policies that can deal with uncertainties and are modified in the light of experience and changing conditions;

(d) Adopt a multidisciplinary approach that takes into account scientific, social and economic issues;

Strengthen initiatives on national inventories

C. Targets

12. Proposed global targets for the year 2010 are as follows:

(a) Understanding and documenting plant diversity:

(i) A widely accessible working list of known plant species, as a step towards a complete world flora;

(ii) An assessment of the conservation status of [all] known plant species, at international, regional and national levels;

(iii) An understanding of basic conservation needs for threatened plant species and plant communities, with conservation protocols and/or techniques to assess and protect plant communities developed as necessary;

(b) Conserving plant diversity:

(i) [10 per cent] of each of the world's ecological regions effectively conserved;

(ii) Protection of [70 per cent] of the world's most important areas for plant diversity assured;

(iii) At least [30 per cent] of production lands managed consistent with the conservation of plant diversity;

(iv) [50 per cent] of the world's threatened species effectively conserved *in situ*;

(v) [90 per cent] of threatened plant species in accessible *ex situ* collections, preferably in the country of origin, and [20 per cent] of them included in recovery and restoration programmes;

(vi) [70 per cent] of the genetic diversity of crops and other major socio-economically valuable plant species conserved, and associated local and indigenous knowledge maintained;

(vii) Management plans in place for [90 per cent] of major alien species that threaten plants, plant communities and associated habitats and ecosystems;

(c) Using plant diversity sustainably:

(i) No species of wild flora subject to unsustainable exploitation because of international trade;

(ii) [30 per cent] of plant-based products derived from sources that are sustainably managed;

(iii) The decline of plant resources, and associated local and indigenous knowledge, that support sustainable livelihoods, local food security and health care, reversed;

(d) Promoting education and awareness about plant diversity:

(i) The importance of plant diversity and the need for its conservation incorporated into educational programmes;

(e) Building capacity for the conservation of plant diversity:

(i) The number of trained people working with adequate facilities in plant conservation and related activities [doubled]/[increased], according to national needs;

(ii) Networks for plant conservation activities established or strengthened at international, regional, and national levels.

These targets provide a framework for policy formulation and a basis for monitoring. National targets developed within this framework may vary from country to country, according to national priorities and capacities taking into account differences in plant diversity.

D. The strategy as a framework

14. The strategy is not intended to be a "programme of work" analogous to existing thematic and cross-cutting programmes of work under the Convention. It does not, therefore, contain detailed activities, expected outputs etc. Rather, the strategy provides a framework by means of setting outcome-orientated targets (these differ from the "process" targets used so far under the Convention). It is envisaged that the

activities necessary to reach those targets could be developed within this framework. In many cases, activities are already under way, or envisaged in existing initiatives. These include:

(a) Activities aimed at plant conservation within national biodiversity strategies and action plans and relevant sectoral and cross-sectoral plans, programmes and policies. In this respect, Parties and Governments may wish to report on the incorporation of the strategy in their national plans, programmes and policies;

(b) Relevant activities under existing relevant initiatives, in particular: the Strategic Plan and work of the Plants Committee of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the International Plant Protection Convention (IPPC); the International Treaty on Plant Genetic Resources of the Food and Agriculture Organization; the FAO Global Plan of Action for Plant Genetic Resources for Food and Agriculture; the Man and the Biosphere programme of the United Nations Educational, Scientific Cultural Organization (UNESCO); the Global Strategy on Invasive Alien Species of the Global Invasive Species Programme (GISP); the plant conservation programme of the IUCN Species Survival Commission; the International Agenda for Botanic Gardens in Conservation; activities of the International Association of Botanic Gardens; and the WWF-UNESCO people and plant programme; and

(c) Relevant activities under the programmes of work of the Convention on Biological Diversity, including those relating to agricultural biodiversity, forest biological diversity, inland water biological diversity, marine and coastal biological diversity, and dry and sub-humid lands, as well as activities involving cross-cutting issues such as access and benefit-sharing, sustainable use, indicators, alien species, the Global Taxonomy Initiative, and issues related to Article 8(j).

The strategy and its 16 targets are intended to provide a framework for policy makers and public opinion and catalyse the reforms necessary to achieve plant conservation. Clear, stable, long-term targets that are adopted by the international community can help shape expectations and create the conditions in which all actors, whether Governments, the private sector, or civil society, have the confidence to develop solutions to address threats to plant diversity. For the targets to be widely understood, and appealing to public opinion, they need to be kept fairly simple and straightforward. They should be understood in a commonsensical rather than a literal way. In order that the number of targets be kept manageable, they need to focus on a set of activities that are strategic, rather than aiming to be comprehensive. Targets may be reviewed, and appropriate revised, as major new scientific evidence becomes available on important areas for plant diversity, threats to diversity, and major alien species that threaten plants, plant communities and associated habitats and ecosystems.

E. Further work required to develop and implement the strategy

16. Measures to implement the strategy will need to be put in place at international, national, and subnational levels. This will include development of national targets and their incorporation into relevant plans, programmes and initiatives, including national biodiversity strategies and action plans. National targets will vary from country to country according to differences in levels of plant diversity and national priorities. Multilateral and bilateral funding agencies should consider putting in place policies and procedures to ensure that their funding activities are supportive of and do not run counter to the strategy and its targets.

17. For each target, the scope of activities may need to be clarified and sub-targets, or milestones, developed. In order to monitor progress towards achieving the targets, baseline data and a series of indicators may need to be developed. This would draw upon relevant national and international data sets (such as national "red lists"), and make full use of the clearing-house mechanism.

18. Regional components of the strategy might be developed, perhaps using a bio-geographical approach.

19. In addition to the Parties to the Convention, the design, development and implementation of the strategy should involve a range of actors, including:

(a) International initiatives (e.g., intergovernmental organizations, United Nations agencies, multilateral aid agencies);

(b) Conservation and research organizations (including protected-area management boards, botanic gardens, gene banks, universities, research institutes, non-governmental organizations and networks of non-governmental organizations);

(c) Communities and major groups (including local and indigenous communities, farmers, women, youth);

(d) Governments (central, regional, local authorities);

(e) The private sector.

20. In order to promote implementation of the strategy and facilitate cooperation between these initiatives, the Executive Secretary will collaborate with relevant stakeholders. To ensure full participation, the actors mentioned in paragraph 19 above should reflect not only United Nations geographical regions but also biogeographical regions. This collaboration will aim to avoid duplication of effort, promote collaboration and synergies among existing initiatives, and facilitate analysis of the status, trends, and effectiveness of different measures on the conservation and sustainable use of plant diversity. Consideration might also be given to the establishment of a flexible coordination mechanism.

ANNEX II

Target 11. The relevant CITES Actions Points regarding Plants from CITES:

Action points		Action by CITES bodies
Objective 1.1 To assist in the development of appropriate domestic legislation and policies that encourage the adoption and implementation of social and economic incentives allied to legal instruments that: – promote and regulate sustainable management of wild flora – promote and regulate responsible trade in wild flora – promote the effective enforcement of the CITES.		
1.1.1	Develop templates of best practice policy and legislative provisions, including several forms recognizing differences in language/culture/legal system.	Secretariat
1.1.2	Develop a planning guide to policy and legislation provisions, including a scientific basis for decision making which is woven into the legislation (to enhance capacity building).	Secretariat
1.1.3	Exchange experience on provisions that work well or not well.	Parties, Secretariat
1.1.5	Enhance compliance with implementation of recommendations and Decisions of the Conference of the Parties.	Parties, Secretariat
Objective 1.2 To strengthen the administrative, management and scientific capacity of Parties by improving the coordination between Management and Scientific Authorities and other national agencies responsible for wild plants.		
1.2.1	Convene regional and within-Party workshops to identify functional roles and train all levels of administration and related agencies.	Parties, Secretariat
1.2.2	Develop a national directory of government officials responsible for CITES issues.	Parties
1.2.3	Improve coordination between Scientific Authorities and other agencies (e.g. universities, museums) to maximize transfer of knowledge and skills.	Scientific Authorities, Secretariat
1.2.4	Collate and make accessible lists of specialists (national and regional).	Scientific and Management Authorities
Objective 1.3 To strengthen the enforcement capacity of the Parties and to improve coordination among Management Authorities and other agencies (e.g. Police, Customs and phytosanitary services).		
1.3.1	Convene regional and within-Party workshops to identify functional roles and train all levels of administration and related agencies responsible for CITES enforcement.	Parties, Secretariat
1.3.2	Produce modular procedural manuals pertaining to enforcement that can be customized for national and regional differences.	Parties, Secretariat
1.3.3	Develop a national directory of government officials responsible for CITES enforcement issues.	Parties
1.3.4	Collate and make accessible lists of taxonomic, forensic and identification experts.	Scientific and Management Authorities
1.3.5	Identify focal points in agencies (e.g. Police, Customs, veterinary and phytosanitary services) responsible for assisting CITES enforcement.	Parties

1.3.6	Provide training for staffs of enforcement agencies, and improve the distribution of existing public awareness tools for enforcement purposes.	Parties
Objective 1.4 To facilitate development and use of appropriate technologies and information management systems that enhance and expedite the collection, submission and exchange of accurate information.		
1.4.1	On the basis of information from Parties, evaluate needs, capabilities and opportunities related to information technologies and management.	Secretariat, with Plants Committee
1.4.2	Encourage use of technology such as the Internet and CD-ROM for data and information exchange and training.	Secretariat, Parties
1.4.3	Develop and implement an information management strategy and training programmes based on 1.4.1 and 1.4.2.	Secretariat, Parties
1.4.4	Develop a simple guide to the Review of Significant Trade.	Secretariat, Plants Committee
1.4.5	Develop and enhance databases that include information related to species in trade, CITES Decisions and procedures.	Secretariat, Plants Committee
Objective 1.5 To encourage organizations capable of supporting the CITES to assist the Secretariat and Parties in building national information management capacities through training and other activities, and to facilitate improved access to and management of databases.		
1.5.1	On the basis of information from Parties, evaluate national capacity and training needs.	Secretariat
1.5.2	Identify organizations with potential for assisting in training and capacity building.	Secretariat
1.5.3	Develop a list of available databases and information sources consistent with Objective 1.4.	Secretariat
1.5.4	Make relevant databases user-friendly.	Secretariat
1.5.5	Enhance compliance with implementation of recommendations and Decisions of the Conference of the Parties.	Parties, Secretariat
Objective 1.6 To ensure that all Parties have at least one designated Scientific Authority with experts in wild flora.		
1.6.1	Advise and assist Parties in exploring options and models for establishing Scientific Authorities.	Secretariat
1.6.2	Pursue on a regular basis progress toward the designation of Scientific Authorities by all Parties.	Secretariat
Objective 1.7 To improve the coordination between CITES Management and Scientific Authorities, and increase the effectiveness of the latter.		
1.7.1	Develop a manual specifying the obligations and procedures of the Scientific Authorities in order to encourage the development of specific training courses for them.	Secretariat with Plants Committee
1.7.2	Develop regional directories that list the botanists in each region who are experts in CITES-listed species.	Plants Committee.
1.7.3	Communicate to the Parties the importance and advisability of including plants experts within the structure of the Scientific Authorities.	Plants Committee
1.7.4	Facilitate workshops and training programmes in issuance of non-detriment findings.	Secretariat

1.7.5	Ensure that Management Authorities consult with Scientific Authorities on all permits to be issued that require Scientific Authority findings, and that those findings are independent and cannot be overridden.	Parties
Objective 1.8 To encourage Parties to develop and implement effective management programmes for the conservation and recovery of species, so that the species will no longer satisfy the criteria for inclusion in the Appendices.		
1.8.1	Share experience gained by different countries in conservation, management and the recovery of species with other countries.	Parties, Secretariat
1.8.2	Promote establishment of effective programmes for species conservation, management and recovery.	Parties, Secretariat
1.8.3	Establish national and regional networked rescue centres for plants.	Parties
1.8.4	Develop and incorporate scientific baselines in management plans for traded Appendix-II species, designed to ensure that any trade is sustainable.	Parties
1.8.5	Report biennially on progress related to this objective.	Parties, Secretariat
Objective 1.9 To encourage the proper funding of CITES implementation and enforcement by Parties, and the adoption of national mechanisms that have resource users make a greater contribution to such funding.		
1.9.1	On the basis of information from Parties, evaluate existing mechanisms for obtaining funds from resource users for conservation benefit, and share this information to encourage other Parties to adopt such mechanisms.	Parties, Secretariat
1.9.2	Ensure adequate funding for necessary research and investigation on CITES species.	Parties
Objective 1.10 To use fully the potential of regional coordination and collaboration in capacity-building efforts.		
1.10.1	Identify and make available information on existing regional entities that could be used to assist with information sharing, capacity building and funding.	Secretariat, Standing Committee
1.10.2	Interact with existing regional networks, organizations and focal points.	Secretariat, Standing Committee, Parties
1.10.3	Ensure that representatives of the Plants Committee are enabled by their Governments to carry out their responsibilities.	Secretariat, Parties
Objective 1.11 To review and simplify, where possible, existing measures, procedures, mechanisms, and recommendations for the implementation of the CITES.		
1.11.1	On the basis of information from Parties, identify those measures, procedures and mechanisms that would benefit from review and simplification.	Parties, Secretariat
1.11.2	Make recommendations on possible review, modification and consolidation.	Secretariat
1.11.3	Continue consolidation process of Resolutions and recommendations as appropriate.	Secretariat
1.11.4	Produce modular procedural manuals for CITES implementation that can be customized for national and regional differences.	Parties, Secretariat
Objective 2.1 To ensure that the CITES's Appendices correctly reflect the conservation and management needs of		

species.		
2.1.1	Ensure periodic review and refinement of the listing criteria to ensure their applicability to broad taxonomic groups, scientific validity and utility.	Parties
2.1.2	Regularly review the Appendices to ensure that listed taxa satisfy the relevant criteria.	Plants Committee
2.1.3	Continue the Review of Significant Trade as initiated by the Parties in Resolution Conf. 8.9 (Rev.).	Plants Committee
2.1.4	Evaluate trade and biological information on currently unlisted species subject to significant international trade to determine whether they would qualify for and benefit from CITES listing.	Plants Committee
Objective 2.2 To ensure that decisions to amend the CITES's Appendices are founded on sound and relevant scientific information and meet agreed biological and trade criteria for such amendments.		
2.2.1	All proposals to amend the Appendices should conform to the relevant criteria.	Parties
2.2.2	Encourage Parties to consult with the Plants Committee appropriate to assist in the preparation of proposals to amend the Appendices.	Secretariat, Plants Committee
2.2.3	For identified commodities, develop standardized units of measure for permits, trade analysis and reporting.	Secretariat, Plants Committee
2.2.4	Encourage the analysis of annual report information in the development of proposals to amend the Appendices.	Parties, Secretariat
Objective 2.3 To improve the scientific basis on which Scientific Authorities make non-detriment findings.		
2.3.1	Develop practical guidance for making non-detriment findings, including a manual and checklist, and samples of non-detriment findings and case studies.	Secretariat with Plants Committee
2.3.2	Facilitate national and regional training for Scientific Authorities in the issuance of scientifically based non-detriment findings; include the use of the aforementioned guidance on non-detriment findings.	Secretariat with Plants Committee
2.3.3	Ensure that the necessary scientific information is taken into consideration when making non-detriment findings (e.g. life history, ecological adaptability, distribution, abundance, population trends and management programme).	Parties
2.3.4	Ensure that management plans involve periodic research, monitoring, testing, evaluation and opportunities for improvement (including adaptive management).	Parties
2.3.5	Provide opportunities for Scientific Authorities to exchange information and data (e.g. sharing of non-detriment findings; sharing of data, management plans and case studies; postings to a website; and communication through a listserver).	Parties, Secretariat, Plants Committee
Objective 2.4 To develop innovative technologies and encourage relevant research, including research into CITES implementation and enforcement, and to pursue these objectives, where appropriate, at the regional level.		
2.4.1	In collaboration with enforcement agencies, identify the needs for and potential benefits of innovative technologies.	Secretariat, Plants Committees, Parties
2.4.2	In collaboration with Parties, international agencies, and	Secretariat, Plants

	relevant research entities, identify the available technologies (e.g. digital technology, microchips, barcodes, holograms, DNA tests) relevant to assisting the better implementation of the CITES.	Committee
2.4.3	Encourage the adoption and use of such technologies in CITES processes and procedures (e.g. licensing, verification, enforcement, communication).	Secretariat, Parties
2.4.4	Develop with relevant institutions collaborative research projects for testing the appropriateness of new and forthcoming technologies.	Secretariat, Plants Committee
2.4.5	Assess progress on a regional basis.	Standing, Plants Committee
Objective 3.1 To promote a high degree of cooperation, coordination and collaboration between national and international law enforcement agencies.		
3.1.1	Establish, communicate and agree on international priorities for enforcement.	Parties, Secretariat
3.1.2	Encourage each enforcement agency to identify suitable contacts for WCO, Interpol, and other relevant international enforcement entities.	Parties
3.1.3	Share information on illegal trade, seizures and ongoing investigations with other relevant Parties.	Parties
3.1.4	Liaise with Interpol and WCO working groups on environmental crime.	Parties, Secretariat
Objective 3.2 To stimulate and participate in bilateral, regional and global efforts to combat illegal trade in wild flora.		
3.2.1	Develop and expand effective regional cooperative efforts, particularly among countries with common borders.	Parties, Secretariat
3.2.2	Initiate and expand regional enforcement contact networks.	Parties
3.2.3	Convene regional enforcement training workshops.	Parties, Secretariat
3.2.4	Facilitate exchange of intelligence information.	Parties, Secretariat
3.2.5	Formally recognize and award exemplary enforcement actions.	Parties, Secretariat
Objective 3.3 To encourage mutual technical assistance, including the exchange of information, in enforcement matters.		
3.3.1	Encourage enforcement agencies to share technology (e.g. forensic).	Parties
3.3.2	Collaborate in the production of pertinent identification materials.	Parties, Secretariat
3.3.3	Promote development of new technologies for the identification of specimens in trade.	Parties, Secretariat
Objective 3.4 To develop appropriate management strategies and incentives for promoting a change from illegal to legal use of wild flora.		
3.4.1	Develop and implement appropriate economic, education, and awareness programmes that lead to greater local involvement in wildlife management, and stimulate participation in combating illegal trade within and from producer countries.	Parties
3.4.2	Develop and implement targeted awareness programmes that promote voluntary compliance with wildlife trade	Parties

	regulations by user groups in consumer countries.	
3.4.3	On the basis of information from Parties, develop templates of best practice in regard to the strategies and incentives concerned, and encourage Parties to adopt them.	Secretariat
Objective 3.5 To promote awareness of CITES issues and a greater understanding by the judiciary of the social and economic significance of conservation threats posed by illegal trade in wild flora.		
3.5.1	Contribute papers and articles to law journals and other publications.	Parties, Secretariat
3.5.2	Attend and contribute to legal conferences.	Parties, Secretariat
3.5.3	Provide training to raise awareness of judges and prosecutors.	Parties, Secretariat
3.5.4	Encourage the judiciary to apply more appropriate penalties when dealing with wildlife crime.	Parties, Secretariat
Objective 4.1 To strengthen communication and collaboration with national and international NGOs.		
4.1.1	Recognize the significant contributions of NGOs to CITES process and encourage greater NGO participation in CITES outreach.	Parties, Secretariat
4.1.2	Encourage Parties to enhance communication and collaboration with local and national NGOs.	Secretariat
4.1.3	Improve availability of CITES information to a broad spectrum of NGOs.	Parties, Secretariat
4.1.4	Collaborate with NGOs in public education and outreach campaigns.	Parties, Secretariat
4.1.5	Meet regularly with local and national NGOs.	Parties
4.1.6	Meet regularly with international NGOs.	Secretariat
Objective 4.2 To strengthen alliances with relevant local communities, consumer groups and traders.		
4.2.1	Identify audiences to be targeted and their needs.	Parties, Secretariat
4.2.2	Develop campaigns and materials for the distribution of information to targeted groups, with a specific focus on Appendix II.	Parties, Secretariat
4.2.3	Promote awareness of the impacts of consumption patterns and demands on species conservation.	Parties, Secretariat
4.2.4	Meet regularly with targeted groups and encourage their active participation.	Parties, Secretariat
Objective 4.3 To promote greater awareness among and cooperation with the scientific community.		
4.3.1	Identify audiences to be targeted within the scientific community (e.g. specialist groups, universities, scientific societies, museums, academic institutions).	Parties, Secretariat
4.3.2	Participate actively at scientific meetings and conferences, and encourage participation in CITES issues by the scientific community.	Secretariat, Scientific Authorities, Plants Committee
4.3.3	Encourage the scientific community to focus their efforts on national CITES priorities.	Parties
Objective 4.4 To produce and disseminate informative materials to a broad public at a local, national and regional levels.		
4.4.1	Develop information that is culturally and locally relevant, as well as technically accurate.	Parties, Secretariat

Objective 4.5 To improve communication and collaboration with the media.		
4.5.1	Inform media about CITES-related activities and its regional and global achievements.	Parties, Secretariat
4.5.2	Identify national media outlets and contacts for dissemination of CITES information.	Parties, Secretariat
4.5.3	Develop factual media packets on relevant CITES issues (e.g. fact sheets, CD-ROMs, videos).	Parties, Secretariat
Objective 4.6 To strengthen knowledge, promote awareness and facilitate enforcement of flora issues in CITES.		
4.6.1	Ensure that adequate attention is given to plant conservation in all activities related to the implementation of this Plan.	Parties, Secretariat
Objective 5.1 To secure at least 20 more Parties to the Convention by 2005 with a special focus on range countries of species subject to significant trade and important consumer countries of wild plants and animals, as well as countries located in regions with relatively low representation.		
5.1.1	Identify priority non-Party countries and pursue their accession.	Secretariat
5.1.2	Engage in bilateral discussions with non-Parties to encourage their accession and adoption of appropriate implementing legislation.	Parties, Secretariat

ANNEX III

Target 15. A sample of capacity building initiatives relevant to target 15

Hosts	Course title	Type	Comments
SABONET	Herbarium management Red List training Database management Specialist identification	Regional/Certificate	Nine courses held since 1996, 110 individuals from the southern Africa region trained Www.sabonet.org/activities/index.html
Smithsonian Institution	Conservation genetics Biodiversity assessment Environmental leadership Conservation GIS	International/certificate	Approx. 30 courses over 10 yr. 400 students; 40 countries. www.si.edu/simab/training.html
National Museums of Kenya/RBG Kew	Plant conservation techniques Herbarium techniques	Regional/Certificate	4 courses; 42 students; 4 countries; 21 Institutions www.museums.or.ke/restherb.html
Royal Botanic Gardens Kew	Plant conservation techniques Botanic garden management Botanic garden education (jointly with BGCI) Herbarium techniques	International/Diploma	27 courses since 1986; 279 students; 96 countries www.rbgkew.org.uk/education/high ered.html
RECOFTC, Thailand	Community based tourism for conservation and development Managing conflict in forest resource management	International/Certificate	Www.recoftc.org/
Australian Network for Plant Conservation	Plant Conservation Techniques	Regional/Certificate	3 courses since 1998. Run annually. www.anbg.gov.au/anpc/course1.html
WWF/UNESCO/RBG Kew – People and Plants	Applied ethnobotany	Regional/Certificate	(Kenya, Malaysia, Nepal, Pakistan, South Pacific Tanzania, Uganda and Zimbabwe) www.rbgkew.org.uk/peopleplants/
Darwin initiative, UK, West Africa	Plant Conservation and sustainable use	Regional short courses	Benin, Cote D'Ivore, Cameroon www.nbu.ac.uk/darwin/projects.htm
Botanic Gardens Conservation International/in-country institutions	Plant conservation, information management, botanic garden development, strategic planning, fund-raising	Regional and national short courses	Courses held in such countries as China, Colombia, Ghana, India, Indonesia, Kazakhstan, Poland, Russia, South Africa, Ukraine.
Tanzania/Missouri Botanical Gardens	National botanical training	National/certificate	Technical level http:/www.ru.ac.za/affiliates/herbarium/tbtp/tbtp.htm

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