

REPORT

*Liaison Group Meeting on
Drylands
Montreal – 27-29th September 1999*

Secretariat of the Convention on Biological Diversity

Convention on Biological Diversity
Report of the Liaison Group on Drylands
SCBD, Montreal, 27-29 September 1999

I. Introduction

1. The Liaison Group met at the Secretariat of the Convention on Biological Diversity (CBD), to assist in the preparation of pre-session documents on drylands for the 5th meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the Convention.
2. Experts from FAO, the Global Environmental Facility (GEF) Secretariat, the United Nations Environmental Programme (UNEP), the International Centre for Agricultural Research in Dry Areas (ICARDA), the International Centre for Research in the Semi-Arid Tropics (ICRISAT), the World Conservation Monitoring Centre (WCMC), and the CBD Secretariat were present. A list of participants is provided in Annex 1. Mr. Hamdallah Zedan, Executive Secretary of the CBD, welcomed the participants to Montreal and outlined the purpose of the meeting. The meeting was chaired by Mr. David Cooper of the CBD Secretariat.
3. The meeting noted that the Conference of Parties (COP) to the Convention on Biological Diversity, through decision IV/6 had decided to consider dryland, Mediterranean, arid, semi-arid, grassland and savannah ecosystems, in depth at its fifth meeting. At its fourth meeting, SBSTTA considered an assessment of the status and trends and options for the conservation and sustainable use of terrestrial biological diversity: dryland, Mediterranean, arid, semi-arid, grassland and savannah ecosystems (document: UNEP/CBD/SBSTTA/4/7), and in its recommendation IV/3 requested that the Secretariat prepare a draft work programme, in collaboration with the Convention to combat desertification (CCD) and other organizations.
4. In its work the Liaison Group drew heavily upon a background paper prepared under the auspices of UNEP by Professor Richard Odingo, as well as comments prepared by Walter Lusigi of the GEF.
5. The Liaison Group noted that SBSTTA had indicated that the proposed programme should be demand-driven and flexible. The Liaison Group underlined this point, and agreed that the proposed work programme should not be unduly prescriptive, especially, given the short period of time available to develop the draft of the programme, and the need to collaborate with existing programmes. In particular, the Liaison Group emphasised the importance of developing the programme in close collaboration with the Secretariat of the CCD. The CCD could not participate in the meeting due to conflicting meeting timetables. The Liaison Group noted the plans of the CBD Secretariat to consult fully with the CCD with a view to developing a joint approach. It was also agreed that inputs should be sought from the International Fund for Agricultural Development (IFAD), as well as the Global Mechanism for the CCD which it hosts, and relevant regional organizations such as the Permanent Inter-state committee against drought in the Sahel (CILSS), and the Intergovernmental Authority on Drought and Development (IGADD).

II. Scope, status and trends

6. The Liaison Group considered the scope of the programme and agreed that six environmental types could be included: Hyper-Arid, Arid, Semi-Arid, Mediterranean, Savannah, and Grasslands. It noted

that some of these are usually characterized by agro-climatic criteria (such as the ratio of precipitation to potential evapotranspiration), whilst others are usually characterized on the basis of major vegetation types (see Annex 2). Nonetheless, in all cases, water stress, at least during part of the year, is a defining characteristic. The environment types were described in more detail in UNEP/CBD/SBSTTA/4/7.

7. The Liaison Group considered SBSTTA's request to propose a short name for the proposed thematic area. It suggested that the name should be easy to understand to non specialists and that it need not necessarily include specific reference to all of the habitat types, since this could be spelled out in the programme itself. The Group suggested two alternatives for further consideration: drylands of "biodiversity of dry and sub-humid lands." For brevity, the term "dryland(s)" is used in the remainder of this report.
8. The Liaison Group noted the main pressures that impact on dryland biodiversity are: habitat conversion; grazing; alien species and introduced varieties/breeds; fire; water (scarcity and management, including groundwater use and irrigation); soil management (including fertiliser use, tillage, and consequences for erosion); over-harvesting (including of fuel-wood, wildlife, and wild plants); and climate change. Dryland ecosystems are often non-equilibrium systems. Management of drylands is often complex due to competing use of resources by several communities, including movements across national boundaries.
9. The Liaison Group was informed of the progress made in the LG on Indicators, and made some suggestions for indicators which could be applied to dryland biodiversity (Annex 3).
10. The Liaison Group reviewed ongoing activities of the organizations present (Annex 4 & 5), and considered potential synergies with other Conventions (Annex 6), as well as with other thematic areas under the Convention. The Liaison Group identified a number of areas where further research is needed (Annex 7).

III. Development of the proposed programme of work

11. The Liaison Group proposed that the SBSTTA document be structured as follows:
 - I. Introduction
 - II. Scope, and proposed short name
 - III. Review of the status and trends of drylands
 - IV. Guiding principles for the programme of work
 - V. Proposed Elements of the programme of Work
 - VI. Formats for reporting and monitoring.
12. The Liaison Group agreed that the work programme should be based on the following principles:
 - a) Ecosystem approach, i.e. the programme is based on ecological principles and it takes into account the political, social and economic dimensions.
 - b) The programme builds on existing knowledge and on-going activities. The programme promotes concerted response to fill knowledge gaps while supporting best management practices through partnership among countries and institutions.
 - c) The programme promotes synergies with other Conventions and with other CBD programme of work, particularly agro-biodiversity, inland waters, marine and coastal biological diversity.

- d) The programme promotes effective stakeholders' participation.
 - e) Implementation of specific activities will be demand-driven and will respond to rational priorities.
13. The Liaison Group proposed that the programme elements should be grouped in two clusters: "Assessment" and "Targeted actions in response to identified needs," which could be implemented in parallel. Knowledge gained through the assessment would help guide the responses needed, whilst lessons learnt from activities would feed back into the assessment. The Liaison Group suggested the following programme elements.

Cluster A: Assessments

Purpose: to disseminate existing knowledge and best practices, and to fill knowledge gaps, in order to define responses needed.

1. Identification of specific areas, within drylands, or particular value for biological diversity, and/or under particular threat, with reference to the criteria in Annex 1 of Article 8;
2. Further development of indicators of dryland biodiversity and its loss is needed in order to elucidate trends;
3. Building knowledge on processes that effect dryland biodiversity, especially ecosystem structure and function, (eg: grazing, fire, agricultural conversion or abandonment);
4. Identify best management practices, including viable indigenous knowledge and practices
5. Assess the socio-economic impact of biodiversity loss in drylands.

Ways and means:

- Consolidation of information from various ongoing sources, including those under the CCD and other international Conventions, the Global Observing Systems, and other programmes, through: workshops, the CHM, and partnerships between organizations
- Targeted research, including through the international agricultural research centres, and NARS,
- Case studies on management practices.

Cluster B: Targeted actions in response to identified needs

Purpose: to promote the conservation and sustainable use of biodiversity in drylands; to address biodiversity loss in drylands and its socio-economic consequences

(Note: there is a need to develop the rationale for each of the following activities)

9. promoting specific measures for the conservation (and sustainable use) of dryland biodiversity, including through, *inter alia*:
 - (a) use of protected areas and other special measures;
 - (b) restoration of degraded lands;
 - (c) management of production systems;

(x) *ex situ* conservation where necessary.
10. promoting responsible resource management, within ecological principles, at appropriate levels, through, an enabling policy environment, including, *inter alia*:

- (a) decentralization of management to the lowest appropriate level, keeping in mind the need for common resource management;
- (b) appropriate institutions for land tenure and conflict resolution;
- (c) bilateral and sub-regional cooperation to address transboundary issues (such as facilitating access to transboundary rangelands).

11. Supporting sustainable livelihoods through, *inter alia*:

- (a) diversifying sources of income,
- (b) promoting sustainable harvesting, ranching etc,
- (c) developing local markets for products derived from the sustainable use of biodiversity in drylands.

Ways and means:

- *Capacity building, particularly at national and local levels;*
- *Investments in the development of sustainable livelihoods and conservation measures;*
- *Improved consultation, coordination and information sharing within countries among respective focal points and lead institutions, relevant to implementation of the CCD, CBD and other relevant global conventions and programmes; and*
- *Partnerships between relevant international organizations and programmes.*

IV. Closing of the meeting

The Liaison Group agreed to continue to assist the Secretariat in elaborating the document for SBSTTA, including the work programme, through electronic communications and other means.

Mr Zedan thanked all participants for their important contributions to the meeting and looked forward to further collaboration in the development of the work programme.

Annex 1

List of Participants

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Annex 2

Scope

The programme of work encompasses the following six ecosystem types, all of which are characterized by water stress and soils with low fertility :

- a) Hyperarid ecosystems : areas that have P/PET ratio of less than 0.05;
- b) Arid ecosystems : areas where the P/PET is between 0.05 and 0.20;
- c) Semi-arid ecosystems : areas with P/PET between 0.20 and 0.50;
- d) Mediterranean ecosystems : no single climatic or bioclimatic definition of this ecosystem has been developed. They generally refer to areas with cool, wet winters and warm hot summers. The Mediterranean ecosystems comprise of a wide range of habitat types, including forest, woodland and grassland that are typically characterized by low, woody, fire-adapted sclerophyllous shrubland (maquis, chaparral, fynbos, mallee);
- e) Grassland ecosystems : loosely defined as areas dominated by grasses (members of the family Gramineae excluding bamboos) or grass-like plants with few woody plants. They occur mostly on drylands.
- f) Savannah ecosystems : areas dominated by a ground layer of grasses and grass-like plants. They form a continuum from treeless plains through open woodlands to closed-canopy woodland with grassy understorey.

Annex 3

Proposed core set of biodiversity indicators

<i>Indicator</i>		Applicability to Drylands	Comments concerning application to drylands	
ECOSYSTEM QUANTITY	1.Habitat 1.1 Self-regenerating 1.2 Man-made	* * *		
	ECOSYSTEM 2.Habitat Fragmentation/Conversion 2.1 native vegetation fragmentation 2.2 wetland drainage and filling 2.3 conversion of coastal areas 2.4 erosion 2.5 irrigation 3. Species Richness	* * * * * *		
ECOSYSTEM QUALITY	SPECIES 4 Change in abundance and/or distribution of a selected core set of species	*		
	5. Threatened species 5.1 % of total species or certain taxonomic groups 5.2 % endemic species threatened threatened species in protected areas	* *		
	GENETIC 6. Crop diversity 6.1 Replacement of indigenous crops 6.2 Replacement of land races with few imported ones	* *		
PRESSURE INDICATORS	7. Population density 7.1 habitats 7.2 in/adjacent to Protected Areas	* *		
	8. Harvesting/use 8.1 production totals 8.2 export totals 8.3 imports total 8.4 local processing capacity 8.5 domestic consumption 8.6 catch/effort 8.7 changes in proportion of commercial species	* * * * * *	EG: stocking rates and frequency of transhumance (as pressure indicators)	
	9. Infrastructure 9.1 road and transportation networks 9.2 dams 9.3 rate of housing development	* * *		
	10. Pollution 10.1 Soil quality 10.2 Water quality 10.3 Air quality	* * *	EG: salinity, dust in the atmosphere	
	11. Alien/Invasive species 11.1 % habitat colonized by invasive species 11.2 % protected areas colonized by invasive species	* *		
	12 Climatic change		EG: frequency of droughts over, say, a rolling 20 yr period	
	RESPONSE	13. Habitat Management 13.1 % protected (IUCN 1 – 3) 13.2 % protected (IUCN 4 – 5) 13.3 % managed for production 13.4 no. of fires/area burned/yr	* * * *	Also: stocking rates and frequency of transhumance (as response indicators)
		14. Special habitat 14.1 % remaining 14.2 % protected	* *	

Annex 4

Activities of other organizations relevant to the conservation and sustainable use of dryland biological diversity

UNEP

1. UNEP's Division dealing with Conventions (Environmental) has an important co-ordinating role, and is immediately relevant :
 - RAMSAR, Wetlands
 - CITES, Endangered Species
 - CBD, Biological Diversity
 - CCD, Desertification
 - Diversitas
2. UNEP has important reporting links with CSD – since so many of the issues of sustainable development have an environmental component.
3. UNEP's joint sponsorship with WMO and UNFCCC, with its SBSTA, IPCC, etc. Another vital link since climate change is very central to understanding the loss of biological diversity.
4. UNEP is one of the three partners in GEF and has important influence on funding biological diversity issues.
5. UNEP collaborates closely with other agencies of WMO, FAO, UNESCO and thus provides a useful form for joint tasks or joint programming on relevant matters; also works with IUCN, WWF, IGBP, IUBS, SCOPE, ICSU, IOC, MIRCENS, WCPA, etc.
6. UNEP also cooperates closely with the CGIAR System.

FAO

FAO has a long tradition of work on drylands through activities relating to the assessment, conservation and development of national resources in these areas. The following activities are relevant to the drylands and conservation of the biological diversity they contain.

Assessment and Monitoring activities

FAO develops a number of assessment exercises regarding resources and processes directly related to biological diversity and in some applications to dryland regions.

- Activities in the framework of the Global Terrestrial observing systems define and observe variables to assess and monitor biological diversity such as regional land quality, freshwater resources. Collaboration between the Global Terrestrial Observing System and the Global Climate Observing System aims at providing indicators of global and regional relevance.
- Monitoring of land cover is a tool that helps assess the situation of resources and determine trends. The AFRICOVER programme being developed with African Countries could help assess the situation of plant resources in the continent including drylands.
- Specifically the Forest Resources Assessment exercise will help to assess the situation of world forest resources. Trends will be assessed and at the extent possible elements of biological diversity given

included protected forests. Based on the results of FAO 2000 and inputs from other institutions and FAO programmes, the State of the World Forests will be produced in 2000.

- Periodical reports on the State of plant and animal genetic resources for food and agriculture.
- Establishment of criteria and indicators for sustainable forest management Subregional activities have been developed for countries in drylands: dryland West Africa, North Africa and the Near East, Eastern and Southern Africa. All these processes include special sets of indicators for the biological diversity of dry forests.

Programmes on Genetic Resources for Food and Agriculture

FAO has a global intergovernmental forum with 161 member countries and the participation of all stakeholder groups -- the FAO Commission on Genetic Resources for Food and Agriculture (CGRFA). There is also an expert Panel on Forest Gene Resources. FAO has a set of programmes on crop, animal and forest genetic resources focused on collecting and managing information on these resources. The CGIAR collections of germplasm are mostly held in trust under the auspices of FAO.

Programmes on Food Security

Beyond the special programmes on Food Security, monitoring of food insecurity and vulnerability informs on the contribution of non classical food resources to food security. These are often produced through the use of plant and animal resources in the wild, in a way directly proportional to species richness and variety. The FAO Food Insecurity and Vulnerability Information and Monitoring System (FIVIMS) involves a number of countries including in tropical drylands of Africa, Asia and Latin America.

Overall support to the implementation of agenda 21

Through its relevant programmes, its roles of task management of the land cluster, chapters of agenda 21, the central support provided to the Intergovernmental Panel and later the Intergovernmental Forum on Forests FAO promoted the implementation of agenda 21. It specifically supports the Convention on Biological Diversity, on Desertification on climate change through the permanent work of Inter Departmental working group. Throughout these activities constant attention is devoted to drylands and their biological diversity to mountain ecosystems including in drylands.

Other specific relevant programmes

The Soil Fertility Initiative which documents and promotes the use of land and soil rehabilitation/management best practices for enhanced food production. It is relevant to the use of plant species for soil improvement and hence maintenance of biological diversity;

The Committee on Mediterranean Forestry Questions is a technical and scientific Committee promoting the knowledge and use of Mediterranean forests and other tree formations. A number of networks on key Mediterranean species promote exchange of information and experience on Mediterranean countries' experience.

FAO Supports national forest programme initiatives from the conservation and development of forest resources including natural forest resources through policy and institutional strengthening, planning and implementation of comprehensive forest programmes

A number of regionally focused activities are developed in the regions which are very relevant to the conservation of biological diversity on drylands in Africa, Asia and Latin America. Examples for

illustration are the networking on dryland and desertification in Latin America, the International Theme for the Conservation and Rehabilitation of African Lands (ISCRAL).

WCMC

While WCMC does not have a specific programme on drylands, many of its programmes are relevant:

- The Protected Areas programme, including a database of PAs;
- The GIS laboratory which is able, for example, to overlay ecological or biotic data with the location of PAs;
- The Species programme, with a database on 70,000 plant species and their conservation status;

WCMC supports scientific assessments for many of the biodiversity related Conventions.

Increasingly, WCMC involves in national capacity building for information management.

ICARDA1

Introduction

Established in 1977, ICARDA is one of the 16 international Centers supported by the Consultative Group on International Agricultural Research (CGIAR). It is based in Aleppo, Syria. In the context of the challenges posed by physical, social and economic environments of the dry areas, the Center's mission is to improve the welfare of people in the dry areas of the developing world by increasing the production and nutritional quality of food while conserving and enhancing natural resource base. ICARDA addresses its mission through research, training and dissemination of information in partnership with the national agricultural research and development systems (NARS).

ICARDA serves the entire developing world in the improvement of lentil, barley and fababean; developing countries in dry areas in the improvement of on farm water use efficiency, management and rehabilitation of rangelands, and management and nutrition of small ruminants (sheep and goats); and the Central and West Asia and North Africa (CWANA) region for the improvement of bread and durum wheat (in collaboration with CIMMYT), chickpea (in collaboration with ICRISAT), pasture and forage legumes, and farming systems; and for the protection and enhancement of the natural resource base of water land and biodiversity. ICARDA's research contributes to poverty alleviation through production improvements integrated with sustainable natural resource management, and the Center's research outputs constitute international public goods on which these are based.

Dry Areas

It is difficult to define exactly what the **dry areas** are because **dry** is a relative term. ICARDA has used an FAO aridity index which uses length of growing period (LGP) as a major parameter in identifying world agro-climatic zones, and dry areas are delimited as having an LGP of less than 180 days. Within this context, there are three major rainfed agroecologies of relevance to ICARDA:

- Lowland dry areas in subtropics and tropics, including cool, winter rainfall (Mediterranean type) and warm, summer rainfall areas,
- Highland dry areas in subtropics, including winter rainfall areas and tropical highlands on the southern periphery of winter rainfall subtropics,
- Temperate dry areas, including lowlands and highlands.

1 Presented by M Saxena, ADG, ICARDA Biodiversity Program, 27 September 1999.

The countries included in ICARDA's mandate are those developing countries having large and important subtropical and temperate dry areas, together with the following tropical countries: Sudan, Ethiopia, Eritrea, Somalia, Yemen and Oman.

Research Programs

ICARDA's research is carried out in 19 research projects, conducted by two major Research Programs, the Germplasm Enhancement Program and the Natural Resource Management Program. The Programs are backed by six research-support units: Genetic Resource Unit; Seed Unit; Communication, Documentation and Information Service; Human Resource Development Unit; Computer and Biometrics Unit; and Station Operations. In partnership with national, regional and international research organisations, many activities are implemented in seven regional programs, which provide a research continuum from the Center to its partners in the NARS. These are: North Africa Regional Program, Nile Valley and Red Sea Regional Program, Central Asia and the Caucasus Regional Program, West Asia Regional Program, Arabian Peninsula Regional Program, Highland Regional Program, and Latin America Regional Program.

Biodiversity-related Activities

The agricultural biodiversity work in CWANA is important for several reasons. The region includes three Vavilonian centers having large diversity for globally important food and fruit species and their wild relatives. Many of the species are highly adapted to harsh environments of dry areas and would be vital for combating desertification and for coping with global climatic changes. There is valuable within-species variability, which can be used in crop improvement. The dryland species are also a valuable source for commercial, industrial and pharmaceutical products. This biodiversity is threatened because of the following reasons:

- Fragile ecosystem
- Overexploitation of natural habitats
- Excessive pressure on land and water because of relative scarcity of these resources
- Deforestation and urbanisation
- Overgrazing, unsustainable agriculture in response to increasing pressure of population.

The natural vegetation in CWANA is massively eroded through the degradation of natural habitats, intensification of cultivation of arable lands, cultivation of marginal lands, rapid adoption of improved cultivars and overgrazing. ICARDA, in its medium term plan, is giving high priority to conservation and sustainable use of the agro-biodiversity in the dry areas.

ICARDA has adopted a holistic approach that incorporates aspects of conservation of plant genetic resources, utilisation of diversity in crop improvement and production systems, improved management of water, soil, livestock and natural vegetation for habitat preservation, all within the context of productive and sustainable agricultural systems. The Germplasm Program is adopting a decentralised, farmer-participatory breeding approach, combining the use of local land races and wild relatives of the crop species and making use of local knowledge. The Natural Resource Management Program is working towards this goal through better soil and water management, and through the studies of indigenous knowledge, policy and property rights. In addition to its facilities for *ex situ* conservation, which houses nearly 120,000 accessions of cultivated and wild forms of cereals, food and feed legume and pasture species, the Center is working towards the establishment of appropriate methodologies for *in situ* conservation of agro-biodiversity.

Biodiversity conservation at ICARDA responds to the Leipzig Global *Plan of Action for the Conservation and Sustainable use of Plant Genetic Resources of NARS*. The Center has recently shifted its emphasis from collection and *ex situ* conservation of plant genetic resources to the characterisation, evaluation,

documentation, and use of the biodiversity held in collection, supported by the use of molecular markers and other advanced biotechnological techniques. Efforts to promote *in situ* conservation of naturally occurring and evolving populations of agriculturally important species through improved habitat management are being strengthened. *In situ* and on-farm conservation of agro-biodiversity is a rather new departure and its implementation requires innovative approaches and close collaboration with national programs and participation of local communities. This approach is supported by the Center's activities in agroecological characterization through the use of remote sensing and GIS; participatory research approaches to developing strategies for resource management and conservation that are compatible with farmers' production objectives; and research on policy and property rights and how these affect resource use and technology adoption.

ICARDA pursues its goals of biodiversity conservation through established partnerships with NARS, international research organisations in the region, and advanced research institutes in the developed world. An example of that partnership is the recently started project on *Conservation and Sustainable Use of Dryland Agro-biodiversity in Jordan, Lebanon, Syria and the Palestinian Authority* funded by GEF. The project will promote the conservation and preservation of important wild relatives and landraces of agricultural species in the participating countries by introducing and testing *in situ* and on-farm mechanisms and techniques to conserve and sustainably use agro-biodiversity. ICARDA, in collaboration with IPGRI and ACSAD is providing technical assistance to the project through:

- Integration of nationally executed project components through co-ordination, networking and raising awareness,
- Technical backstopping, capacity building and training in *in situ* and on farm conservation and sustainable use of agro-biodiversity, and
- Monitoring of project activities and their impact for lessons learned and adaptive project planning.

The project is concerned with biological resources of actual or potential agricultural value, and the diversity of these species within agro-ecosystems. Given that the drylands of the Near East represent the resource base for productive agriculture and given developing countries' food security priorities, the project is concerned with the conservation and sustainable use of biodiversity within agricultural systems. The project is being conducted in two sites in each of the four countries and will deal with sixteen target species and their wild relatives including cereals, food legumes, forages, fruit trees and *Allium* spp. Eight target areas where *in situ* and on-farm conservation activities will be carried out through this project have been selected based on the following criteria:

- Wild progenitors of globally important crops
- Wild relatives of globally important crops
- Populations of high genetic diversity
- Presence of more target species
- Endangered populations
- Species which are difficult to conserve *ex situ*
- Traditional agricultural systems
- Traditional germplasm (landraces, breeds)
- Linkage with agricultural development projects.

ICARDA is supporting the project through its existing research program as documented in its Medium Term Plan 1998-2000, particularly through the following projects:

Natural Resource Management:

- Agrobiodiversity Collection and Conservation

- Agroecological Characterization
- Water Resource Conservation and Management
- Land management and Soil Conservation

Germplasm Enhancement: Projects on the improvement of barley, bread wheat, durum wheat, lentil, chickpea, and forage legumes.

Production System Management:

- Improvement of sown pastures and forage production for livestock feed
- Rehabilitation and improvement of native pastures and rangelands.

Socioeconomics and Policy:

- Socioeconomics of natural resource management
- Socioeconomics of agricultural production systems
- Policy, tenure system, and public management research.

It is hoped that the project would: serve as a model for regional partnership in the important area of agro-biodiversity conservation and sustainable utilisation; benefit immediately the communities in target sites whose livelihood depends on the sustainable use of genetic resources of the target species in agricultural production, and in the longer term, through extension of the project experiences, other rural communities; and benefit national programs of the participating countries through institution strengthening and training of staff working in biodiversity conservation. The methodologies developed and lessons learned would benefit other biodiversity conservation and sustainable use activities in the dry areas.

ICARDA is also giving attention to the genetic resources of sheep in CEWANA. This is being done in collaboration with FAO, ILRI and IPGRI. Genetic characterisation and evaluation for different productivity traits are important component of this work. In the rangelands of Central Asia, West Asia and North Africa, collection, characterization and conservation of forage shrubs and other native vegetation are an important component of ICARDA's collaboration with the NARS of these countries. Rangelands are important sink of carbon. A collaborative research project in Central Asia is investigating the effect of rangeland degradation on carbon sequestration. The information generated would help in developing future programs for rangeland biodiversity conservation.

ICRISAT2

BACKGROUND AND OVERVIEW OF THE PROBLEMS

1. Areas of transition (ecotones) between more or less arid regions harbor globally significant biodiversity, and are also increasingly being recognized as important areas of specialization and genetic variability. The contribution of drylands to carbon sequestration is little understood, and most likely under-estimated. Desertification and land degradation lead to biodiversity loss, reduction in carbon stocks, and erosion of agriculturally productive landscapes. Desertification is a major worldwide problem, but it is most extensive and severe in the arid and semi-arid areas in Sub-Saharan Africa, where one third of the entire world area of dryland soil degradation is to be found. Over 330 million ha of African drylands are subject to soil degradation. Areas of high degradation are extensive in Sub-Saharan Africa in the regions bordering the Sahara and Kalahari deserts.
2. The gradient of aridity from the core of the Sahara and Kalahari deserts to the neighboring arid and semi-arid lands for example acts as a natural screener of genetic adaptation to aridity. Although the total number of species is lower in these areas than other biomes, the percentage of endemism is very high. The spatial heterogeneity based on the pattern of soil texture, rainfall distribution and re-distribution of surface water by run-off enhances the biodiversity of these ecotones in spite of extreme ecological condition for plant and animal lives. However, because of large rainfall variations between years, the survival of these animals and plants requires that large areas of land be kept under low human pressure. Land fragmentation that results from the expansion of crop agriculture, associated with deforestation and sedentary overgrazing, threaten the biodiversity of these ecosystems.
3. There is a strong correspondence between the areas of land degradation and the arid (100-400 mm rainfall per year) and semi-arid zones (400-600 mm rainfall per year). The aridity (index 0.05-0.65) emphasizes the close relationship between land degradation and drought. The majority of the people living in the arid and semi-arid regions of Africa for example depend on rainfed agriculture and natural rangelands, which are particularly vulnerable to climate change. Cereal production per unit area of land has been decreasing in the last few decades because of the impacts of land degradation and increasing aridity, thus obliging farmers to clear more and more virgin land.
4. Land degradation is recognized by the United Nations Convention to Combat Desertification (UNCCD) as a loss of both economic and environmental potential. In addition to the domestic costs of declining food productivity and increasing poverty, dryland soil degradation results in a significant reduction in carbon storage, loss of globally significant biodiversity, and genetic resources, and increased sedimentation of rivers and lakes, thereby contributing to the degradation of international water systems.
5. Degradation of drylands occurs as a subtle, dispersed, and continuous process, mainly in semi-arid areas far away from the desert fringes. However, the arid ecotone between deserts and semi-arid areas is also increasingly affected by degradation, either as a result of human-induced pressure spreading out from degraded semi-arid areas, or as a result of less understood ecological and atmospheric inter-linkages between the two ecotones.

² Contribution to the Draft Programme of Work on the Biological Diversity of Dryland, Mediterranean, Arid, Semi-Arid, Grassland, and Savannah Ecosystems of the Convention on Biological Diversity. A paper presented at "Liaison Group Meeting on Drylands". 26-29 September 1999, Montreal, Canada. By S. Koala, Coordinator, Desert Margins Program (DMP) ICRISAT-Niger

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6. The true extent of permanent land degradation is not known; nor are the relative contributions of the various human and climatic factors understood well enough to prescribe sustainable long-term counter measures. We know however that both human and climatic factors contribute to dryland degradation in a number of complex, interactive ways. First, direct anthropogenic pressures, such as overgrazing, over-cultivation, mismanagement of irrigated land, and deforestation can cause a decrease in vegetation cover, exposing vulnerable soils to erosion and affecting hydrological regimes. Semi-arid soils (loams and clays) appear to be more vulnerable than arid sandy soils. These pressures also lead to a simplification of the plant community, decreased diversity (inter-specific and genetic), and loss of habitat integrity for globally significant fauna.
7. A second mechanism triggered by the loss of vegetation is the propagation of further land-degradation via the land surface – atmosphere feedback. This mechanism however, is little understood at present.
8. Natural climatic variability over geological time is a third mechanism whose effects are hard to separate from the fourth factor, recent climatic change. External influences from anomalies in sea surface temperature, deforestation in the humid tropics, and CO₂ – induced climate change are thought to be associated with desiccation and drought in arid zones.

II. *ICRISAT contribution to the Programme of work for the consideration of SBSTTA*

9. This contribution relies on the assumption that SBSTTA wishes to adopt methodologies that focus on developing holistic and participatory solutions to land degradation and biodiversity loss problems. It also assumes the adoption of an ecosystems approach. Ecosystem management allows the integration of scientific knowledge of ecological relationships with that of sociopolitical conditions and values to achieve biodiversity protection and sustainable management. The ecosystem approach also permits the management of biodiversity by taking into account the interrelationships among its components, including species and gene pools. Protection and sustainable management of ecosystems require a long-term commitment and a range of coordinated policy program and project interventions at the national level, the regional level, or both, as well as successful integration into the wider economic, social, and cultural contexts.
10. In that context and in line with the background given earlier, we propose that the following be included in the operational programme:
 - Assessments of the biological and genetic diversity losses that may result from the expansion of cropped land, the fragmentation of rangelands associated with increasing grazing pressure and wood harvesting. The potential offered by marginal lands, fallows and ecotones at field edges, along drainage lines and roadsides to maintain some plant diversity should also be evaluated. These assessments will be used to develop appropriate technologies for the conservation and sustainable use of biodiversity which will be disseminated to farmers.
 - Demonstration experiments be conducted on semi-arid rangelands at different stages of degradation to show the effect of grazing management on diversity of flora, range productivity, soil physical and chemical properties and animal production. The demonstration experiments will build upon the considerable experience gained so far by the current actors working in the field (NARs , NGOs, CBOs, Government bodies and CGIARs), to capture the dynamics of vegetation and account for interaction effects of rainfall conditions and climate change. Modeling the effect of rotational grazing on herbaceous growth during the wet season

and on standing hay and litter disappearance during the dry season will permit the application of the findings to a wider range of situations. The impact of these demonstrations on increasing biodiversity and carbon sinks will be monitored.

- Native forage species adapted to grazing, drought stress and climatic change be identified. Populations of these species should be sampled along the climatic gradient and in areas of different grazing history in order to characterize the genotypes using specialized molecular analysis such as isozyme and DNA profiles, to establish the best provenances adapted to arid and semi-arid lands under anthropic and climatic stress. In addition, plant genotypes best adapted to grazing and drought stress should be tested to demonstrate their usefulness in the enrichment of biodiversity, reclamation of degraded areas, and production of good quality forage in semi-arid zone. Recommendations should be formulated on developing incentives for the adoption of these technologies.
- Assessments be carried out of the ecological and economic impacts of traditional production systems, especially grazing systems and herd mobility in arid lands, as well as traditional and improved agroforestry systems. The results will be used in environmental awareness campaigns at the local level, and in shaping appropriate national policies in support of bio-friendly production systems.
- Assessments be carried out on how to improve community-based participatory approaches to enhancing the return on natural resource assets. The results will be used in building capacity of NGOs, NARs and other government institutions for effective extension of development packages.
- Farm surveys and field experiments be conducted to identify economic policies and institutional arrangements that would facilitate the adoption of improved management systems.
- Assessments be carried out on genetic diversity losses of plants and animals that may result from land use changes. These include assessments on crop and animal genetic losses that may result from habitat disturbance, market-driven forces leading to species/varietal uniformity and replacement of traditional varieties, and catastrophic climatic events. Subsequently, strategies will be formulated on how to conserve and distribute the maximum biodiversity of Semi-Arid Tropics (SAT) food crops and how to diversify SAT cropping systems through a broader choice of crop and livestock options.
- Jointly with farmers, carry out on-farm experiments and monitoring to analyse, measure and compare resource management methods and technologies, and seek improvements.
- The impact and replication of promising technologies will be accelerated by scaling up using new informatics tools. Annex 1 provides more details on the suggested programme of work.

III. *Building partnerships; a case study: The Desert Margins Programme (DMP)*

11. The imperative for more effective utilization of resources to address common problems has brought together nine countries of sub-Saharan Africa: Kenya, Botswana, Burkina Faso, Mali, Namibia, Senegal, Niger, South Africa, and Zimbabwe into the Desert Margins programme (DMP) with a basic premise to develop an integrated national, sub-regional, and international action programme for developing sustainable natural-resource management options to combat land degradation and loss of biodiversity.

12. The immediate objectives of the overall DMP are to:
- i. develop a better understanding of the causes, extent, severity and physical processes of land degradation in traditional crop, tree, and livestock production systems in the desert margins; the impact, relative importance, and relationship between natural and human factors, with their links to biodiversity loss and reduction in carbon sinks;
 - ii. document and evaluate, with the participation of farmers, NGO's, and NARS, current indigenous soil, water, nutrient, vegetation, and livestock management practices for both conserving natural resources and arresting land degradation, and identify socioeconomic constraints to the adoption of improved management practices;
 - iii. develop and foster improved and integrated soil, water, nutrient, vegetation, and livestock management technologies and policies to enhance local incentives for biodiversity conservation and achieve greater productivity of crops, trees, and animals to enhance food security, income generation, sustainable use of biodiversity and ecosystem resilience in the desert margins;
 - iv. evaluate the impact and assist in designing policies, programs, and institutional options that influence the incentives for farmers and communities to adopt improved resource management practices, including efficient drought-management policies and strategies;
 - v. enhance the institutional capacity of countries participating in the DMP to undertake land degradation research and the extension of improved technologies, with particular regard to multidisciplinary and participative approaches;
 - vi. facilitate the exchange of technologies and information among farmers, communities, scientists, development practitioners, and policymakers.
13. The overall strategy for the DMP is to follow a participatory and multidisciplinary approach, with an emphasis on on-farm research and demonstrations, taking into account social issues, local needs, and institutional options.
14. The DMP specifically addresses issues of global environmental importance, primarily in the area of biodiversity but with secondary impacts in the areas of climate change (carbon sequestration) and international waters (reduced sedimentation). Examples of these include:
- Full inclusion of biodiversity and above and below ground biomass (carbon storage) issues in analytical and monitoring activities.
 - Understanding impact of different management regimes on biological diversity (plants and animals).
 - Inclusion of studies on sedimentation (siltation) of trans-boundary rivers and lakes. Study of fugitive dust and impacts.
 - Large-scale carbon (carbon sequestration) and nutrient (biodiversity) balance models in arid lands.
 - Understanding and developing strategies for enhancing ecosystem resilience through sustainable use of biodiversity.
 - Development of participatory approaches to vegetation management and biodiversity conservation.
 - Identification of livestock management practices that preserve biodiversity and resilience of natural vegetation in the arid zone and minimize land degradation in the semi-arid zone.

15. The expected outputs include:

- review and analysis of the extent and nature of land degradation and its socio-economic and biophysical causes in globally significant ecotones;
- identification and testing of available solutions (indigenous, new technologies, and policy and institutional changes) together with farmers, NGOs, and NARS and identification of those proven to increase the sustainable use of biodiversity (plants, animals and trees), arrest soil erosion and sedimentation;
- development of improved solutions (technologies, policies, institutions) through participatory testing and demonstrations;
- communication of policy and technical recommendations to government decision makers, extension workers, NGOs, farmers' and local organizations on: land use and grazing management practices; arid zone forage species best adapted to grazing and drought, agroforestry technologies (living hedges, fodder banks and fruit trees) best suited to the semi arid zones; successful case studies of diversified systems in each of the three sub-regions; multi-scale technology; systems simulation capacity for solving farmers' problems; appropriate methodologies for the collection of germplasm of endangered crop, tree and livestock species; regeneration and storage methods that reduce the risk of genetic erosion in *ex situ* collection; policy and institutional arrangements that promote the adoption of recommended technical packages (eg. Policy guidelines for integrated nutrient management), and drought management strategies.
- establishment and functioning of regional information exchange networks among the affected countries, and national networks, for increased collaboration with researchers, farmers, communities, NGOs, policymakers, and donors in implementing and monitoring the findings and recommendations of the programme.
- assessment of the likely impact of solutions in solving degradation problems and designing and implementing improved monitoring systems for measuring impact. The programme will undertake monitoring activities to understand the functioning of dryland ecosystems in order to recognize and distinguish between changes resulting from : a) natural climate variability (drought), b) human activity (over – cultivation, overgrazing), and c) climatic change induced “internally” by large-scale land degradation, or d) “externally” by sea surface – temperature anomalies, tropical deforestation, or enhanced ambient CO₂ concentration.

16. The DMP program will also monitor simultaneously dryland degradation at three distinct scales: local, national and sub-regional. On a local scale, it will develop a common methodology and gather reliable information on the rate of land degradation, biodiversity loss and reduction in carbon sink, not only to support process-oriented demonstrations into the mechanisms of degradation, but also to identify and demonstrate conservation and remedial action. These activities will increase our understanding of the physical, biological, and socio-economic processes associated with land degradation, and produce and test effective solutions through improved natural resource management.

17. At national and sub-regional levels, assessments will be made of the global significance of arid and semi-arid lands, and of the extent of degradation, for purposes of national planning, to indicate the economic implications of continued resource degradation, and to indicate thematic

areas where policy changes would be advisable.

18. The three levels will be integrated through both analytical modeling and identification of best practices and/or innovative solutions demonstrated to local level land users.

IV. *Country level support for the DMP*

19. All the countries participating in the programme have ratified the Biodiversity Convention, as well as the Climate Change Convention and the Convention to Combat Desertification. The consortium focuses on arid and semi-arid ecosystems. Specifically, it meets the guidance provided by “The Follow-up Action to the STAP workshop on Land Degradation”, and by COP3 on Agro-biodiversity (Decision III/II), and is consistent with the provisions of article 12 of the CBD. It also gives priority to ecosystems identified by the COP of CBD as needing priority action, i.e., arid and semi-arid lands.

V. *Global benefits*

20. Global environmental benefits that will result from the successful implementation of this programme can be assessed in terms of:
 - the contribution to the conservation of biodiversity by the provision of land-use options that maintain high levels of species diversity;
 - assessing the extent of arid and semi-arid land degradation, and means of restoration;
 - helping developing countries rescue their endangered agricultural biodiversity;
 - improved carbon C sequestration and reduced greenhouse gas (GHG) emissions in the productive landscape
 - shared technologies and information through networks and other partnerships;
 - improved community-based participatory approaches to enhancing the return on natural resource assets.
21. From a sustainable development perspective, and pursuant to the three fold objectives of the Convention on Biological Diversity, biodiversity conservation at agricultural margins should not occur at the expense of farmers livelihoods. Similarly, it is recognized that agricultural practices aimed at reducing biodiversity loss must also be economically and socially beneficial in order to be sustainable. DMP would also benefit its member countries in their contribution to the work of Committee on Science and Technology of the Desertification Convention (CST/CCD). More specifically it relates to the articles 17, 18 and 19 of CCD on institution building, training and development of national capacities. We believe that the DMP would also make a contribution to the work of the STAP of the CBD, and the SBSTTA of the UNFCC through its innovative modeling and monitoring efforts.
22. The benefits of more sustainable agricultural practices are evidently local and national. However, they are also global since the sustainable use of the resource base of agriculture promotes the conservation of the unique above - and below - ground plant and animal biodiversity of the dry tropics. The benefits of biodiversity conservation, carbon sequestration and decreased GHG emissions are largely global. A basic premise of the programme is that these global environmental benefits can be achieved only through a combination of appropriate land-use practices and supportive national and regional policies.
23. Selected and recommended practices will have measurable short term costs (e.g. of labour) associated with carbon and biodiversity management but only those will be chosen that also

generate local agricultural benefits (e.g. more stable production). Technological alternatives will be developed that will ensure that local benefits become sufficiently attractive in the short run for farmers to adopt the recommended practices. These recommendations will be widely disseminated so as to benefit other countries with similar ecological and socio-economic conditions.

VI. Conclusion

This contribution to the draft programme of work of SBSTTA has emphasized the drylands (arid, semi-arid and dry sub-humid) with no prejudice to the other ecosystems to be covered. This is just where lies ICRISAT mandate.

24. Pursuant to the main objectives of the convention on Biological Diversity (CBD), we propose a program strategy that should proceed from review and analyses of the threats and root causes of biodiversity loss and reduction of carbon stocks, both of which are linked to analyses of the extent and nature of land degradation; to the identification and participatory demonstration of solutions (indigenous, new technologies, and policy and institutional changes); and to the design and implementation of monitoring systems for measuring impact.
25. Furthermore, the program strategy should follow the ecosystems approach in the formulation of solutions and sustainable use of biodiversity in the drylands.
26. It should be built on partnerships (NGOs, farmers, donors, researchers and government agencies. The Desert Margins Program has been given to give an example of a partnership formed to tackle the twin problems of land degradation and desertification in one hand and its consequence in loss of biodiversity.

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Appendix 1. Indicative Programme Objectives, Expected Outcomes, and Activities - Example from the DMP

Land degradation and desertification	Biodiversity and climate change
1- Understanding land degradation	
1.1 Improved knowledge of the relative contributions of climatic and human factors to dryland degradation	Inclusion of the effects of climate change on large-scale land degradation and their efforts on biodiversity
1.1.1 Databases will be created containing inventories of existing information, including "gray" literature, on the biophysical resources in dryland areas (e.g., soils, soil mycorrhizas, vegetation, lost or endangered species) which will allow gaps in key information to be identified.	Full inclusion of biodiversity and biomass (carbon storage) issues.
1.1.2 Identification and assessment of physical and biological factors contributing to land degradation (e.g., climate; physical, chemical, and biotic properties of soils; vegetation characteristics; and livestock). These include the long-term effects of different forms of land management on soil fertility and plant growth and the interactions of different climates with the degree and duration of anthropogenic pressures.	Understanding of impact of different management regimes on biological diversity and soil carbon stocks.
1.1.3 Studies of the processes of soil erosion, including the effects of different types and intensity of land use on the water balance, the sensitivity of different soils to erosion, factors that affect soil infiltration and runoff (e.g., soil type, surface crust, topographical position, vegetation cover, livestock grazing, faunal activity) and hence the siltation of rivers and lakes. Studies of the amount of and processes controlling wind erosion of dryland soils.	Inclusion of studies on sedimentation (siltation) of transboundary rivers and lakes between neighboring countries. Study of fugitive dust and impacts, and loss vegetative cover and species.
1.1.4 Development of models and use of remote-sensing techniques to extrapolate results to national and regional scales. These include hydrological models for predicting runoff and sediment transport, large-scale carbon and nutrient balance models of dryland areas, and general circulation modeling of the effects of land-use change on rainfall.	Effects of land-use change to large-scale carbon (carbon sequestration) and nutrient balance models and their effects on arid land biodiversity and to climate change. Interrelationships of above 113. Climate change modelling from regional perspective
1.2. Improved understanding of the temporal and spatial variability of dryland climates and improved methods for weather monitoring and forecasting of seasonal rainfall	
1.2.1 Studies of rainfall variability, rainfall-generating systems, and the implementation of improved weather monitoring systems at selected benchmark locations in western, southern, and eastern Africa.	
1.3 A set of consistent and objective criteria to evaluate and monitor the present status and severity of land degradation in dryland areas	Development of indicators to assess status of current biological diversity and its monitoring
1.3.1 The development of quantitative indicators of land degradation and the monitoring of land degradation (including sand dune dynamics) over long periods using field observations, aerial photography, satellite imagery, and geographical information systems (GIS).	Activities to include development of quantitative indicators of biological degradation including observations of species composition and the identification of "resilience" indicators.
Specific Objective 2 - Assessing dryland management practices	

2.1 Inventory of soil and water conservation and nutrient management practices in traditional systems, including integration of trees and livestock with crops.	
2.1.1 Compilation of an inventory of indigenous farming and agroforestry techniques currently used to improve productivity (crop, tree, and animal) and conserve soil, water, nutrients,	Quantification of agroforestry contribution to carbon sequestration and above and below biological diversity
2.1.2 Documentation of indigenous knowledge (IK) about traditional dryland production systems (crops, agroforestry, livestock).	Evaluation of IK contribution to biodiversity conservation and sustainable use.
2.1.3 Inventory of previous soil, water, and nutrient management research results, including "gray" literature, and the identification of gaps in knowledge.	
2.1.4 Collection of information on spatial variations and temporal changes in soil fertility in relation to land use, and evaluation of their role in land degradation management.	Full inclusion of the effects of soil fertility changes on biodiversity
2.2. Information on traditional and modern practices for natural resource management and their effectiveness in arresting land degradation, as well as their impact on the resilience of dryland ecosystems	Inclusion of comparative studies across different ecozones to identify best traditional or modern practices that enhance species diversity and resilience in dryland ecosystems.
2.2.1 Assessment of traditional cropping systems, parklands, fallows, and other communal lands (e.g., type, extent, state of degradation) and identification of biophysical and socioeconomic factors that determine their natural-resource balance and degree of degradation.	
2.2.2 Assessment of agroforestry techniques using indigenous and exotic species, including their introduction in parklands under different management systems to assess their effectiveness for preventing degradation and to support cropping.	
2.3 An understanding and inventory of the constraints to adoption of existing technologies	In comparing cross country studies, fine tune our understanding of the constraints to adoption of existing technologies promoting sustainable use of biodiversity in dryland ecosystems (and accumulation of soil-C).
2.3.1 Identification and analysis of the constraints to the adoption of alternative technologies to control land degradation.	Emphasize identification of alternative technologies focused on biodiversity and carbon sequestration
2.3.2 Understanding the spatial suitability of land for different farming and land-use practices.	
Specific Objective 3 – Improving natural-resource management	
3.1 Improving the role of livestock in the rangeland/arable land continuum	
	3.1.1 identification of livestock management practices that preserve biodiversity and resilience of natural vegetation in the arid zone and minimize land degradation in the

	semi-arid zone (contribution to GHGs)
3.1.2 technologies, policies, and local institutional innovations directed at sustaining livestock-derived income in arid-zone production systems and improving the effectiveness of indigenous coping mechanisms to production and capital shortfalls	
3.1.3 assessing the potential for improving the beneficial inter-zonal interactions to enhance regional livestock and crop productivity	
3.2 Improved methods for restoring and sustaining long-term fertility in dryland areas, to effectively combat land degradation	Inclusion of improved methods for restoring globally significant biological diversity. SOM as an indicator of both soil fertility and soil biodiversity
3.2.1 Development of improved nutrient cycling methods by efficient exploitation of the interactions between organic and inorganic nutrient sources and the relationships between system inputs, soil organic-matter characteristics, soil properties, and crop productivity.	Case studies / assessments of effects of P-fertilization on SOM or soil-C on long, medium and short term.
3.2.2 Studies of organic matter, including manure and slurries, and phosphate rock combinations and analysis of conditions favoring investments in the use of phosphate rock.	Ditto see above
3.2.3 Use of multipurpose trees for the development of agroforestry technologies that can maintain or enhance soil fertility through biological nitrogen fixation or nutrient pumping.	Inclusion of cross region identification of suitable multipurpose trees for the development of agroforestry technologies aimed at increasing or enhancing biological diversity through N ₂ fixation or nutrient pumping
3.2.4 Efficient utilization of stover and other vegetable matter from food crops and tree species as compost, mulch, and animal feed.	In terms of biodiversity improvement in the soil
3.3 Improved soil and water management techniques for increasing plant water-use efficiency and arresting land degradation	Full inclusion of improved water and soil management techniques on the siltation or sedimentation of rivers and lakes
3.3.1 development and evaluation of appropriate technologies for soil and water conservation (e.g., surface tillage, animal traction, mulching, contour hedgerows, grass strips)	Include similar evaluations of native species for biodiversity conservation and their sustainable use.
3.3.2 development and evaluation of improved technologies for sustained productivity in the seasonally waterlogged lands in the arid regions	Waterlogged lands in arid regions host unique plant and animal species forming unique habitats that requires a better understanding to ensure their sustainable use.
3.3.3 development and evaluation of water harvesting techniques.	
3.4 Sustainable crop production technologies that conserve the environment, are socially and economically acceptable, and meet the food, fodder and medicinal needs of local populations in the dryland areas	
3.4.1 introduction of improved cropping systems and crop/fallow rotations and conditions for acceptable and rapid diffusion of improved technologies	
3.4.2 development of integrated pest management (IPM)	IPM effects on saving useful insects and

strategies by optimizing crop-management technologies: e.g., crop residue management, crop rotation and intercropping, including catch and trap crops for parasitic weed (Striga) management	non-harmful endemic plant and animal species both in and above soil
3.4.3 evaluation of simulation models relevant to dryland management for use in decision-support systems to target research, identify areas for spillover, and predict benefits	
3.4.4 implementation of pilot schemes with alternative crop technologies that have proved to be successful in several regions for sustainable utilization of existing inputs and enhancing productivity.	
3.5 Availability of tree species and agroforestry systems that use limited water more efficiently and sequester carbon below ground	Quantification of above and below carbon sequestration at national and regional levels
3.5.1 screening and identification of appropriate species (fruit, timber, fodder) with economic value for agroforestry systems, including species, provenance, and clonal trials, in a range of different environments and cropping systems	Increase biological diversity by promoting agroforestry systems.
3.5.2 regeneration and management of parklands by incorporation of selected multipurpose trees for fodder, fruits, and living fences (hedges)	Quantification of carbon sequestration by parklands
3.5.3 role of parkland trees and agroforestry systems in nutrient cycling/pumping, for enhancing water-use efficiency and control of wind and water erosion, including the assessment of the distribution of tree roots, soil moisture, organic matter, carbon, and nitrate from the surface layers down to the water table	Identification of appropriate agroforestry systems to control siltation of trans-boundary rivers and lakes and enhance carbon sequestration.
3.5.3 quantification of the competition between trees and crops for light, water, nutrients, and modeling of the hydrological and nutrient limitations to forestry and agroforestry in semi-arid lands.	Beneficial for global understanding of the issues
3.6 Strategies for enhancing ecosystem resilience through optimization of biodiversity	
	3.6.1 conservation of trees, shrubs, and other plant species and their microsymbionts threatened by over-utilization and habitat degradation, through germplasm collection, indigenous knowledge selection, vegetative propagation, and clonal selection
	3.6.2 promotion of strategies for enhancing biodiversity and ecosystem resilience; e.g., introduction of alternative crop and tree species
3.6.3 promotion of range management practices that improve the carrying capacities of the rangeland	Include those practices that maintain plant species diversity
	3.6.4 development of participatory approaches to vegetation management and biodiversity conservation
	3.6.5 evaluation and development of integrated mixed-farming systems; e.g., game and domestic livestock.
Specific Objective 4 - Designing policies, programs, and	

institutional options	
4.1 Improved understanding of the social, economic, and policy factors that affect land degradation	Include macro economic and policy factors that affect sustainable use of biological diversity
4.1.1 examination of the dynamics of household and community responses to resource degradation under fragile land conditions, and identification of successful patterns of resource investment through technical, policy, and institutional innovation	
4.1.2 study of the socioeconomic linkages of land use in the upper and lower slopes along a top sequence to design appropriate policy interventions to promote sustainable land-management practices in the drier areas	
4.1.3 examination of the dynamics of population migration that can cause land degradation and deforestation of communal areas	Evaluate impact of migration on biodiversity loss
4.1.4 comparative studies of regional land-use policy to identify and analyze points of synergy/conflict, with a view to adopting a synergistic regional approach	
4.1.5 evaluation of the role of women in natural-resource management and development of policies to enhance their role in sustainable natural-resource management strategies	Identification of traditional practices by women for conservation of biodiversity
4.2 Guidelines for policy and institutional changes to improve incentives for the adoption of sustainable technologies and natural-resource management practices	Include the study of incentives developed and/or used by externally funded initiatives having an impact on the sustainable use of biodiversity
4.2.1 analysis of the role and impact of local and national policies on the incentives for sustainable resource use in arable cropping, agroforestry, and livestock husbandry; including the effects of sectional, public investment, credit, trade and exchange rate policies;	
4.2.2 analysis of the role and impact of institutional options on the incentives for households and communities to manage crop, tree, and animal resources in sustainable ways; including the impact of property rights, tenure systems, land-use regulation and legislation, and the role and effectiveness of local government and community management initiatives	
4.2.3 analysis of contractual relationships affecting livestock mobility and of factors that lead to conflicts of natural resources	
4.2.4 creating an environment conducive to adoption of improved plant-nutrient technologies through programs that promote a more efficient procurement, distribution, and marketing of inputs and programs that enhance effective utilization of farm outputs through the development of microenterprises	
4.2.5 cost/benefit analyses for natural-resource auditing and impact assessment.	Include regional biodiversity auditing and impact assessment
4.3 Methodologies and models for assessing the impact of policies on natural-resource management	
	4.3.1 development of combined hydrological and socioeconomic models to study the feedback mechanisms between climate, agricultural

	development, and land degradation
4.3.2 development of new methodologies and models to enhance the ability of policymakers and local communities to monitor and evaluate the effects of policies and programs on food security, human welfare, economic activity, and natural-resource conditions.	
	4.4 Priorities for a long-term growth strategy for the drylands, including improved market opportunities for the products of drylands
4.4.1 analysis of the impact of improved technologies and resource-management practices on farm households, including direct impacts on their own farm productivity and indirect impacts arising through changes in off-farm employment, non-farm earnings, and food prices	
4.4.2 increasing the local awareness and use of the indigenous dryland products, processing, and enhanced marketing strategies	Include use of plants species used as medicinal herbs or other uses of global benefits
4.4.3 developing markets for non-timber forest products and other dryland products	Recognition / price-tagging of the biodiversity values of forests and other dryland non-timber products
4.4.4 examining ways to add value to the outputs from the farm in order to increase the farmers' income (fattening livestock, dairy, etc.)	
Specific Objective 5 - Formulating drought-management strategies	
5.1 Knowledge of historical response to agricultural drought and policies, to plan and prepare for future droughts	
5.1.1 identification of strategies adopted by farmers and rural communities for coping with drought, such as herd mobility, livestock sales/loans, and slaughter, and the implications for crop and animal productivity, capital losses, and biodiversity	Include biodiversity conservation strategies adopted by farmers and rural communities in drylands to cope with droughts
5.1.2 development of policies and institutional arrangements to promote technologies and resource-management practices that help rural households to better cope with droughts, including the implementation of pilot schemes to verify their effectiveness	
5.1.3 development of policies to encourage efficient production and use of available food resources (e.g., reduction of food losses) and diversification of the food base through popularization of other foods, using improved processing and packaging.	
5.2 Availability of crop and tree varieties tolerant of drought, with acceptable functional and food properties	
5.2.1 evaluation of traditional and nontraditional genotypes of crops, fodder, and fuel wood species to identify cultivars with high yield and tolerant of moisture stress and salinity, and testing their performance under communal farmer management	
5.2.2 development of drought-resistance tests for selected multipurpose trees for integration into different agroforestry technologies, including assessment for improved water use with	

and without mycorrhizas	
5.2.3 determination of the biochemical and physiological characters that influence drought resistance at different stages of plant growth	
	5.2.4 evaluation of existing germplasm for identification of sources tolerant of drought and grazing
5.2.5 evaluation and development and demonstration of alternative crop management strategies, such as farming response to minimize the effects of drought	
5.3 Availability of modern and traditional early-warning systems and biophysical models relevant to climate in the areas susceptible to drought	
5.3.1 strengthening of drought monitoring and information systems to facilitate decision-making	
5.3.2 development of dryland catchment models for use in decision support systems under different climatic conditions	
5.3.3 development of early-warning systems for local populations	
5.3.4 coordinated drought and pest management at the regional level (e.g., armyworm, locusts)	
5.3.5 development of infrastructure, resources, and procedures to manage drought disasters and linkage to the existing knowledge base.	
Specific Objective 6 – Enhancing institutional capacities	
6.1 Availability of opportunities for institutional and human-resource capacity building	Include regional human capacity issues
6.1.1 reinforcement of national capacities, including equipment, communication, human resources, infrastructure	
6.1.2 evaluation of and incentives to attract and retain qualified research and development staff.	
6.2 Availability of training opportunities and training manuals on improved land-management practices for farmers, technicians, and scientists	
6.2.1 undertaking an analysis of existing training programs, qualifications, and requirements of field personnel and managers in the region. Developing appropriate inter- and intra-regional training programs that are designed to address any identified areas	Include training manuals and programs with relevance to biodiversity
6.2.2 long-term, degree-oriented training (M.Sc. and Ph.D.) and short-term courses in agriculture, agroforestry, and natural-resource management	Training on biodiversity issues
6.2.3 short-term training on natural-resource management issues for the staff of the national agricultural research and extension systems (NARES) and policymakers	
6.2.4 training of technicians and producers in natural-resource management, including NGO personnel.	Training of and learning from each other on issues pertaining to biodiversity
6.3 Effective partnership of national, regional, and international institutions to create a continuum from strategic, applied, and adaptive research to extension and adoption of technologies for arresting land degradation	Interactive planning and implementation of production and conservation activities so as to demonstrate and learn from each other

6.3.1 developing partnerships through the reinforcement of producer capacities and organization of regional technical committees and research partner forums	Development of a global partnership to promote the sustainable use of biodiversity
6.3.2 promoting global partnerships through inter- and intra-regional workshops, seminars, and conferences	
6.3.3 developing participatory approaches to improve the extension delivery system	
6.3.4 reinforcing national and regional centers of excellence in land degradation research	
	6.3.5 developing linkages with regional electronic networks.
	6.4 Harmonization and rationalization of the land degradation programs of relevant national, regional, and international institutions to ensure complementary and optimal use of the available capacity
6.4.1 development of consultation, conflict resolution, and information structures at the national, regional, and sub-regional levels	
6.4.2 implementation of arbitration councils for conflict resolution at the grassroots level	
6.4.3 strengthening governmental and nongovernmental agencies for effective mediation between researchers and farmers to facilitate the exchange and adoption of technologies	
6.4.4 promotion of demonstration strategies managed by NGOs and producers, showing the restoration, conservation, and protection of lands against soil degradation.	Include biodiversity considerations
Specific Objective 7 – Exchanging technologies and information	
7.1 Community-based groups involving local farmers, pastoralists, and extension officers, focused on improving land-management practices	
7.1.1 evaluation of the existing interface between experts and rural communities and development of effective mechanisms	
7.1.2 constitution of working groups, especially women, and promotion of effective linkages between researchers and agencies within the region	
7.1.3 identification and coordination of pilot activities with community-based groups.	
7.1.4 formulation of strategies for protecting indigenous technology and systems to facilitate free exchange of information.	Include activities to facilitate free inter regional exchange of information.
7.2 Availability of information, including training manuals, workshops, conferences, and symposia aimed at various audiences (policymakers, scientists, development practitioners, farmers, NGOs) which contribute to a better understanding of the processes of land degradation and the means of arresting it	Local language manuals and other information materials promote global cause of sustainable use and conservation of biodiversity and will give an value added to the globally important project results.
7.2.1 development of didactic manuals in local and official languages	
7.2.2 editing and production of scientific publications, multimedia	

outputs, and organization of local, national, and sub-regional workshops and international meetings	
7.2.3 developing tools for community self-evaluation of national resource management (NRM) problems, progress, and policy effects for use by communities in planning local action	Tools for regional bodies self evaluation
	7.2.4 establishment and maintenance of a regional data base network for natural-resource management information (soil, climate, plants, production systems, methods) and policy analysis to exchange results and methodologies
7.2.5 participatory rural appraisal procedures to get local issues onto the prioritized research agenda	
	7.2.6 exchange of technologies among different regions; i.e., western Africa, southern Africa, eastern Africa, and Asia.
7.3 Natural resource councils at national and regional levels, involving representatives from ministries and other relevant government agencies, and officials from implementing agencies, including the private sector, to create an enabling policy environment for the generation, exchange, and adoption of technologies for arresting land degradation	Transboundary concerns
7.3.1 Establishment of national and sub-regional technical committees which are properly coordinated with existing national and regional natural-resource management committee structures.	Better enlightened institutional structures from biodiversity and climate change perspective

Annex 5

OPERATIONAL PROGRAM NUMBER 1 ARID AND SEMI-ARID ZONE ECOSYSTEMS June 1997

1.1 Arid and semi-arid lands include the tropical grassland and savannah/woodland savannah, the warm desert and semi-desert, temperate grasslands, tundra communities, and cold deserts biomes.³ These lands cover over one third of the earth's land surface and are home to over 900 million people. Many important food crops originate from drylands. Indigenous crops and fruits from drylands are known for their resistance to disease, stress, and adaptability and are valuable sources for plant breeding. Arid and semi-arid lands are notable for their within-species genetic diversity, rather than between-species variation or species richness. Yet they contain a significant endowment of plants and animal species, including micro-organisms. Arid land species exhibit notably a restrictive geographical distribution (endemism) and a wide range of morphological, physical, and chemical adaptation to their harsh environment. These ecosystems provide critical habitats for wildlife and ecosystem diversity, including wetlands for migratory species, but are under severe threat.

GUIDANCE

1.2 This Operational Program responds to the three sets of guidance provided by the Conference of the Parties (COP) of the Convention on Biological Diversity (CBD) to the GEF as the institutional structure operating the financial mechanism on an interim basis. The first set of guidance is from the first COP⁴ and includes policy, strategy, and eligibility criteria, as well as program priorities among which are the following related to arid and semi-arid zone ecosystems:

- (a) Projects that promote the conservation and sustainable use of biological diversity ... in other environmentally vulnerable areas such as arid and semi-arid; and⁵
- (b) Projects that promote the conservation and/or sustainable use of endemic species.⁶

1.3 At its second meeting, the COP approved the second set of guidance,⁷ concerning *inter alia* finance for measures for conservation and sustainable use and for in-situ conservation,⁸ and preliminary consideration of components of biodiversity under threat.⁹

³ Classification of Biogeographical Provinces of the World (Udvardy, 1975).

⁴ Document UNEP/CBD/COP/I/17, Policy, Strategy, Programme Priorities and Eligibility Criteria for access to and utilization of financial resources of the Convention on Biological Diversity. Annex 1, pages: 33-34.

⁵ Ibid. 4(k).

⁶ Ibid. 4(l).

⁷ A Call to Action: Decisions and ministerial statement from the Second Meeting of the Conference of the Parties to the Convention on Biological Diversity. Jakarta, Indonesia, 6-17 November, 1995.

⁸ Ibid. Decision II/6 11, referring to decision II/7 on Articles 6 and 8 of the Convention.

⁹ Ibid. Decision II/6 11, referring to decision II/8, para 2.

1.4 Although not specifically directed to the GEF, the second COP also reaffirmed that “the ecosystem approach should be the primary framework of action to be taken under the Convention”¹⁰ and stressed the need “to identify the driving forces determining the status and trends of components of biological diversity.”¹¹ The ecosystem approach is followed in the Operational Programs and identification of driving forces is stressed.

1.5 At its third meeting, the Conference of the Parties (COP) of the Convention on Biological Diversity (CBD) approved additional guidance for the GEF. The guidance is directly relevant to, and can be fulfilled through Enabling Activities, long-term Operational Programs, and/or Short-term Response Measures. In addition, the operational response to the guidance on agrobiodiversity will be consolidated in an operational policy note on the treatment of agrobiodiversity in the context of the four current Operational Programs in biological diversity. Pertinent references have been included in the Operational Criteria for Enabling activities and the operational policy work of the Secretariat.

1.6 The Conference of the Parties:¹²

- (a) urged Implementing Agencies to enhance cooperation to increase efforts to improve processing and delivery systems;
- (b) asked GEF to “...provide financial resources to developing countries for country-driven activities and programmes, consistent with national priorities and objectives...”¹³ on the following topics: capacity building in biosafety, including implementation by developing countries of the UNEP International Technical Guidelines on Safety in Biotechnology; capacity building for initial assessment and monitoring programs, including taxonomy; supporting efforts for the conservation and sustainable use of biological diversity important to agriculture; and capacity building and country driven pilot projects on the Clearing-house Mechanism (CHM);
- (c) reconfirmed the importance and requested support for incentive measures;
- (d) urged capacity building efforts to implement measures and guidance on access to genetic resources;
- (e) requested GEF to examine the support of capacity building for indigenous and local communities embodying traditional lifestyles;
- (f) requested GEF to incorporate targeted research and promotion of awareness activities when relevant to project objectives and consistent with national priorities; and
- (g) requested GEF to collaborate with the CBD Secretariat in preparing a proposal on the means to address the fair and equitable sharing of the benefits arising out of genetic resources including assistance to developing country Parties.

¹⁰ Ibid. Decision II/8 , para1.

¹¹ Ibid. Decision II/8, para 3.

¹² UNEP/CBD/COP/3/38, annex II, Decision III/5.

¹³ Idem, para 2.

1.7 The Conference of the Parties¹⁴ requested GEF to make financial resources available to developing country Parties for urgent implementation of relevant aspects of Articles 6 and 8 concerning general measures for conservation and sustainable use and for in-situ conservation.

1.8 The present Operational Program responds to the above decisions.

PROGRAM OBJECTIVE

1.9 The objective of this Operational Program is the conservation and sustainable use of the biological resources in arid and semi-arid zone ecosystems.

- (a) **Conservation¹⁵**, or in-situ protection, will be sought through protection of systems of conservation areas, focusing primarily on countries in Africa and in the Mediterranean type climatic zone threatened by increased pressure from intensified use, drought, and desertification, which lead to land degradation; and
- (b) **Sustainable use¹⁶** management will be sought by combining production, socio-economic, and biodiversity goals. The Operational Strategy calls for a range of uses from strict protection on reserves through various forms of multiple use with conservation easements to full scale use.

1.10 The key assumptions are as follows:

- (a) **Scope.** Conservation and sustainable use will be achieved in specific ecosystems that are identified as priorities within National Biodiversity Strategies or other national plans such as UNCED reports, National Environment Action Plans, etc. It is assumed that protecting a number of dryland ecosystems that are national priorities will, overall, result in a sufficiently representative coverage of habitat types to fulfill the objective of the Operational Program; and
- (b) **Replication.** Successful outcomes will be replicated elsewhere on the basis of the experience and learning gained.

EXPECTED OUTCOMES

1.11 A successful outcome is one where globally important biodiversity has been conserved or sustainably used in a specific arid or semi-arid ecosystem.

Monitoring outcomes

1.12 Outcomes would be monitored and evaluated by measuring key indicators of ecosystem structure and function, and of sustainable use. Examples of monitoring and evaluation methodologies and tools include:

¹⁴ Idem, Decision III/9, paras 2, 3, and 4.

¹⁵ GEF Operational Strategy, Chapter 2, pages 17-18.

¹⁶ Idem, pages: 18-19.

- (a) surveys of dryland vegetation cover and composition; measures of the plant vigor, age, diversity, species density, and age class; other measures of the population of native species, showing these to be high enough to be viable in-situ;
- (b) surveys of fauna performance -- population change, wildlife calving, and weight gains etc.;
- (c) indicators of ambient threats such as air and water pollution and induced or excessive divergence, soil erosion and its underlying causes, or landslides, showing these to be below critical thresholds;
- (d) measures of the population of key alien, invasive species;
- (e) ecological surveys within dryland conservation areas, showing the maintenance of species diversity and endemism and the presence and abundance of indicator or keystone species;
- (f) appropriate indicators for monitoring of the process of rehabilitation efforts; and
- (g) surveys of impacts on the livelihoods and participation of indigenous and local communities and surveys of impacts on biodiversity from these communities.

Assumptions and risks to achieving the outcomes

1.13 A key assumption is that Implementing Agencies, in their regular work programs, will assist countries to analyze the causes¹⁷ of biodiversity loss at the ecosystem level, which could include demographic and economic factors, and to identify and implement national plans that address such root causes. Supplementing this baseline course of action, GEF can assist with additional actions to address driving forces or proximate causes of biodiversity loss and unsustainable use.

1.14 There are some risks to achieving successful outcomes at the ecosystem level through conservation and sustainable use activities and these risks will be addressed through emphasis on good project design. The following important risk-reducing steps will need to be confirmed in project proposal documents:

- (a) **Complementarity.** The necessary complementary activities, such as expected policy changes and the availability of bilateral and other sources of finance, will take place;
- (b) **Size.** Large protected areas which are less isolated from other natural areas are expected to be richer in terms of species and more stable in terms of retaining the species they contain. Any protected dryland area should be large enough, and the practice of sustainable use of resources in the surrounding productive landscape should be widespread enough, to ensure that the most threatened and endangered components of arid or semi-arid zone biodiversity will be protected; and

¹⁷ World Resources Institute, 1992. Global Biodiversity Strategy, pages: 12-18.

- (c) **Absorptive capacity.** The absorptive capacity of agencies and NGOs to implement the GEF activity and all the other activities necessary for protecting the ecosystem and use available funds effectively.

PROJECT OUTPUTS

1.15 Outputs of individual GEF activities in arid or semi-arid ecosystems would be monitorable. Examples include:

- (a) **Protected areas.** Well established systems of conservation units with effective management plans;
- (b) **Threat removal.** Removal of the causes of biodiversity loss and the specific threats to the ecosystem arising in the surrounding productive landscape, e.g., through reduced fragmentation;
- (c) **Sectoral integration.** Incorporation of biodiversity protection into the main productive sectors of the economy and integrated community development addressing livelihood issues of local and indigenous communities living in the buffer zone and areas of influence of protected areas;
- (d) **Sustainable use.** Sustainable livestock grazing, hunting, and tourism as well as sustainable use of commercial and industrial products of drylands, e.g. gums, resins, plant-based waxes, oils, and biocides; and
- (e) **Institutional strengthening.** Stronger institutions and well-trained staff to address these issues.

GEF ACTIVITIES

1.16 GEF can support¹⁸ investment, technical assistance, capacity building (institutional strengthening, human resource development, and information exchange, including participation in the Clearing-house Mechanism), policy, public education, and targeted research. Through these means, GEF will help to finance the conservation of biodiversity and sustainable use.

1.17 Typical conservation activities are:

- (a) demarcating, gazetting, strengthening, expanding, and consolidating conservation areas;
- (b) assessing the impact of natural disturbances and the compound effect of anthropogenic stress;

¹⁸ GEF Operational Strategy, Chapter 2, Biodiversity, pages: 17-21.

- (c) control of alien, invasive species;
- (d) capacity building for biosafety activities formulated on a case-by-case basis in the context of a specific project responding to country-driven national priorities;
- (e) identifying components of biological diversity important for its conservation with regard to the indicative list of Annex I of the CBD;
- (f) identifying processes and categories of activities which have or are likely to have significant adverse impacts on the conservation of biodiversity;
- (g) piloting selected activities that are country-driven national priorities and which develop and/or test methods and tools, such as rapid biological/ecological/social assessment, geographic information systems, and data analysis systems of importance for the conservation of biodiversity;
- (h) demonstrating and applying techniques to conserve biodiversity important to agriculture, such as wild relatives of domesticated plants and animals;
- (i) supporting capacity building efforts that promote the preservation and maintenance of indigenous and local communities' knowledge, innovation, and practices relevant to conservation of biological diversity with their prior informed consent and participation;
- (j) incorporating components for targeted research important for biological diversity conservation when relevant to project objectives and consistent with national priorities; and
- (k) including sustainable use awareness components when relevant to project objectives and consistent with national priorities.

1.18 To maintain biodiversity and the diversity of biological resources, GEF sustainable use activities will be supported in arid and semi-arid ecosystems. Sustainable development activities that integrate biodiversity and biological resource concerns are central to and a necessary foundation for national sustainable development goals. Typical GEF sustainable development activities would be in areas surrounding critical habitats that require integration of biodiversity protection and sustainable development into sectoral plans. In addition, consistent with the incremental cost approach, GEF could pay for modification of activities so they incorporate and add protection to biodiversity or biological resources. Typical examples are of the first approach are:

- (a) integrating biodiversity conservation and sustainable use objectives in land use and natural resource use management plans;
- (b) piloting projects providing alternative livelihoods for local and indigenous communities residing in buffer zones of globally important biological areas;
- (c) strengthening capacity building for biosafety activities which will be formulated on a case-by-case basis in the context of a specific project responding to country-driven national priorities;

- (d) identifying components of biological diversity important for its sustainable use, with regard to the indicative list of Annex I of the CBD;
- (e) identifying processes and categories of activities which have or are likely to have significant adverse impacts on the sustainable use of biodiversity;
- (f) piloting selected activities that are country-driven national priorities and which develop and/or test methods and tools, such as rapid biological/ecological/social assessment, geographic information systems, and data analysis systems of importance for the sustainable use of biodiversity;
- (g) demonstrating and applying techniques to sustainably manage biodiversity important to agriculture, such as wild relatives of domesticated plants and animals;
- (h) supporting capacity building efforts that promote the preservation and maintenance of indigenous and local communities' knowledge, innovation, and practices relevant to the sustainable use of biological diversity, with their prior informed consent and participation;
- (i) incorporating components for targeted research important for the sustainable use of biological resources when relevant to project objectives and consistent with national priorities; and
- (j) including sustainable use awareness components when relevant to project objectives and consistent with national priorities.

1.19 Typical examples of activities that could be modified specifically to protect biodiversity:

- (a) integrated rural development on a sustainable basis, e.g. range management may need to involve not only livestock, but also agriculture, infrastructure, marketing, wildlife, and tourism;
- (b) soil conservation and restoration of degraded areas to conserve biodiversity;
- (c) natural resources management activities which emphasize integrated resource use with conservation and development, such as use of water resources and its distribution in order to spread out grazing pressure and prevent vegetation deterioration;
- (d) energy conservation projects that emphasize conservation of trees and alternative energy sources to conserve the natural vegetation; and
- (e) establishment of long-term cost recovery mechanisms and financial incentives for sustainable use.

Project risks

1.20 Project proposals would also address the main risks to being able to reach the desired outputs by:

- (a) **Best practice.** Using and adapting best practice for GEF activities, and best available knowledge to establish the necessary baseline and indicators to monitor impacts; and
- (b) **Local communities.** Ensuring that programs are culturally sound, that they fit local customs and gain strength from community dynamics, and that the people recognize and receive benefits; ensuring local participation in natural resources management from the start; and ensuring that local communities respect the limits on biological resource extraction.

Inter-Agency Coordination

1.21 The activities would be coordinated with the past, ongoing, and prospective work of the Implementing Agencies and others. These will include experience gained, lessons learned, and dissemination of experience from the Pilot Phase activities, and the experience of multilateral, bilateral, and private institutions, the international and national NGO community, and international, regional, and national research centers and academic institutions.

Land Degradation

1.22 Increased incidences of drought, intensive pressure of people on the land, and improper land use practices are leading to a deterioration of these lands and their biodiversity. Land degradation in developing countries is usually marked by poverty and human suffering, making it difficult to conserve biodiversity without alleviating human suffering. Despite the basic resilience of these ecosystems, once key thresholds are passed, recovery becomes almost impossible.

1.23 Arid and semi arid lands have suffered some of the worst forms of degradation, due to their fragility and increased pressure from growing and partially sedentarized populations. Projects in the conservation of ecosystems and integrated land use will also naturally alleviate the problems of land degradation. However, there will be areas which have been degraded to the extent that they will need special measures within the projects to address the issues of rehabilitation and their future rational management. Components addressing these specific issues will be developed within both types of GEF activity: conservation and sustainable use.

PUBLIC INVOLVEMENT

1.24 It is one of ten basic operational principles for the GEF that its projects will provide for consultation with, and participation as appropriate of, the beneficiaries and affected groups of people. The GEF Council approved a paper on *Public Involvement in GEF-financed Projects* that defines the procedures for information dissemination, consultation, and stakeholder participation, including the following:

- (a) that there should be emphasis on local participation and local stakeholders; and
- (b) that specific conditions in-country should be taken into consideration.

1.25 These principles respond to the guidance of the COP.19 Strategic partnerships will be sought, where possible, between all relevant stakeholders (e.g., government, NGOs, academia, the private sector, local communities, and indigenous groups), each group collaborating based on comparative advantage. Projects to implement the Operational Program will clarify the conditions of cooperation and contain transparent mechanisms to ensure the active participation of relevant stakeholders in the planning, implementation, and monitoring of project activities. Partnerships will be appropriate to local conditions and build on local expertise.

RESOURCES

1.26 GEF resources will be used to meet the incremental costs of activities in this Operational Program. The financial resources required over the period of the first three years are estimated to be approximately US \$160 million. Arid and semi-arid lands occur in frontier areas and are vast. Communication tends to be difficult and raises the costs of project implementation in these areas. The first two years will see a build up of projects to a level of \$135 million after which the last years of this planning period will see reduced activity to the \$25 million level. The above projections take into account the uncertainty of droughts in this environment which might call for some short term measures to save certain critical biodiversity, especially in wetlands.

¹⁹ Decision II/6, para 10, page 22 and Idem Decision III/5.

Annex 6

Linkages to Other Biodiversity-Related Conventions

1. RAMSAR Shared interest in wetlands and water management. Possible actions :
 - Identify those Ramsar sites that are located in dryland and sub-humid ecosystems
 - Inform national focal points for Ramsar and CBD of need for inter-linkages and coordinated planning for conservation and sustainable use
2. Migratory Species (CMS) Shared interest on migratory species of animals that inhabit drylands and contribute significantly to their productivity and ecological diversity. Possible actions :
 - Review CMS appendices to highlight dryland migratory species;
 - Identify key migratory areas / sites in drylands;
 - Inform national focal points for CMS and CBD of need for inter-linkages.
3. World Heritage (WH) Shared interest in protected and natural areas of global status. Possible actions :
 - Identify WH national sites in dryland and sub-humid zones;
 - Assess coverage of these ecological zones by WH sites within the framework of the on-going gap analysis by the WHC Secretariat;
 - Identify possible new WH sites within target ecosystems;
 - Inform national focal points for WH and CBD of need for inter-linkages.
4. CITES Shared interest in trade and sustainable use of species of dryland and sub-humid ecosystems. Possible actions :
 - Assess Appendices I and II of CITES Convention for dryland and sub-humid species (e.g. cactaceae)
 - Link this information to programmes of livelihood development and species conservation
 - Inform national focal points for CITES and CBD of need for inter-linkages
5. General suggestions Build into the drylands PoW a consultation or workshop involving representatives of the biodiversity-related convention, CCD and CCC together with CBD, to identify shared objectives / synergies and opportunities for joint programming. The meeting should be well supported by scientific analyses as outlined above. Support whenever possible shared reporting and

programming between convention focal points at the national level.

Areas of Possible and Desirable Cooperation with CCD

Article 16 : Information collection, analyze and exchange

Integrate and coordinate the collection, analysis and exchange of relevant short-term and long-term data and information to ensure systematic observation of land degradation (including loss of biological diversity) and understand better and assess the processes and effects of drought and desertification (including loss of biological diversity).

Article 17 : Research and Development

Support research activities that :

- a) Contribute to increased knowledge of the processes leading to desertification (including loss of biological diversity);
- b) Protect, integrate, enhance and validate traditional and local knowledge, know-how and practices.

Article 18 : Transfer. Acquisition, adaptation and development of technology

- a) Make inventories of local technologies, knowledge, know-how and practices and their potential use
- b) Ensure that they are adequately protected
- c) Disseminate

Article 19 : Capacity-building, education and public awareness

Promote capacity-building on National Action Programs (NAPs)

NAPs include measures to conserve natural resources :

- i) Ensuring integrated and sustainable management of natural resources, including :
 - Agricultural land and pastoral land
 - Vegetation cover and wildlife
 - Forests
 - Water resources
 - Biological diversity

Support activities that promote alternative livelihoods

Linkages and synergy with the FCCC

The UN Convention on Climate Change gives full consideration to all ecosystems. It has specifically singled out, and further recognized « that low-lying and other small island countries, countries with low-lying coastal, arid and semi-arid areas or areas liable to flood, drought, and desertification, and developing countries with fragile mountainous ecosystems are particularly vulnerable to the adverse effects of climate change ». In consequence, the Convention has specified particular measures for the benefit of these countries, and including the conservation of their biological diversity in arid and semi-arid parts.

Principles

« The specific needs and special circumstances of developing country Parties, especially those that, are particularly, vulnerable to the adverse effects of climate change (including drylands) should be given full consideration » article 3-2.

Commitments

Commitment 4-e calls for cooperation « in preparing for adaptation to the impact of climate change » and to the development and elaboration of « appropriate and integrated plans for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification as well as floods ».

Cooperation and Capacity-Building :

The Convention also supports the development of endogenous capacities of developing countries. Commitment 4.5 calls for the promotion ... transfer and « access to environmentally sound technologies » and the « development and enhancement of endogenous capacities and technologies of developing country Parties » with support of developed country Parties. In the transfer of technologies and overall implementation of commitments, Country Parties are called to give full consideration to what actions are necessary to meet the specific needs and concerns of countries with areas liable to drought and desertification (art. 4.8.e). There are evident linkages between the two Conventions for the management and conservation of natural resources of areas liable to drought and desertification. In consequence :

- The programmes defined under both Conventions for the Conservation of biological diversity and other resources in areas prone to drought and desertification should be eligible to both funding mechanisms;
- Both SBSTTA and SBSTA should operate in defining and promoting the implementation of such programmes;
- National implementing mechanisms should cooperate in the implementation of respective programmes addressing conservation and sustainable use of land-resources.

Annex 7

Areas where further research is needed

- 1- Improved knowledge of the relative contributions of climatic and human factors to dryland degradation and their effects on biodiversity, The true extent of permanent land degradation is not known: nor are the relative contributions of the various human and climatic factors understood well enough to prescribe sustainable long-term counter measures.
- 2- Development of indicators to assess status of current biological diversity and its monitoring. Activities to include development of quantitative indicators of biological degradation including observations of species composition and the identification of “resilience” indicators.
- 3- Evaluation of indigenous knowledge (IK) contribution to biodiversity conservation and sustainable use.
- 4- Comparative studies across different ecozones to identify best traditional or modern practices that enhance species diversity and resilience. In particular, identification of traditional practices by women for conservation of biodiversity.
- 5- Strategies enhancing ecosystem resilience through optimization of biodiversity.
- 6- Development of participatory approaches to vegetation management and biodiversity conservation.
- 7- Improve understanding of the social, economic and policy factors that affect land degradation and loss of biological diversity. This should include analysis of the role and input of institutional options on the incentives for households and communities to manage natural reserves in sustainable ways; including the impact of property rights, tenure systems, land-use regulation and legislation, and the role and effectiveness of local government and community management initiatives.
- 8- Evaluation of existing germplasm for identification of sources tolerant of drought and grazing on capacity building.
- 9- Effective partnership of national, regional and international institutions to create a continuum from strategic, applied and adaptive research to extension and adoption of technologies for arresting loss of biological diversity.

On exchanging technologies and information

- 10- Development of local language manuals and other information materials that promote global cause of sustainable use and conservation of biodiversity and will give a value added to globally important project results.
- 11- Participatory rural appraisal procedures to get local issues onto the prioritized research agenda.

