منظمة الأغذية والزراعة للأمم المتحدة
联合国粮食及农业组织
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ORGANISATION DES NATIONS UNIES POUR L'ALIMENTATION ET L'AGRICULTURE
ORGANIZACION DE LAS NACIONES UNIDAS PARA LA AGRICULTURA Y LA ALIMENTACION

CPGR/85/5
January 1985

Item 5 of the
Provisional
Agenda

COMMISSION ON PLANT GENETIC RESOURCES

FIRST SESSION

Rome, Italy 11-15 March 1985

STATUS OF IN SITU CONSERVATION OF PLANT GENETIC RESOURCES

CONTENTS

I. INTRODUCTION [1/]

1. The wild gene pools of plant species and their relatives are an important resource. They are making a growing contribution to the improvement of agricultural and horticultural crops, to timber and forage production, to the production of biochemicals and to the control of erosion and desertification. However, loss and degradation of habitat, overexploitation and other pressures threaten wild gene pools with extinction. Conservation of wild plant genetic resources is now a matter of urgency.

2. The term "conservation" is used here in the sense defined by the "World Conservation Strategy" [2/]: "The management of human use of (genetic resources) so that (they) may yield the greatest sustainable benefit to present generations, while maintaining (their) potential to meet the needs and aspirations of future generations". The first syllable of "conservation" excludes the narrow exclusivity sometimes associated with "preservation". The saving of genetic resources can, indeed must, be combined with the other operations which are essential to their effective overall management, i.e. exploration,, collection, characterization/evaluation and utilization. At the same time conservation should not be thought of as invariably a preservation of the status quo, but rather as a dynamic process which allows fluctuations in response to changing environments.

3. The relative importance of conservation vis-á-vis the other operations of genetic resource management varies greatly according to species. For the main agricultural crops selection, utilization and (more recently) scientific breeding have long been dominant and, although very successful in increasing yield, have also narrowed the gene pools available in modern cultivars. A new phase of exploration of wild relatives has started in an attempt to increase the diversity in accessible gene pools. Forestry and forage species, in contrast, are still essentially wild. Domestication has scarcely begun and the search is for the best populations to improve through breeding, while conserving a broad range of genetic diversity as an insurance.

4. "In situ" conservation has been defined as "the continuing maintenance of a population within the community of which it forms a part, in the environment to which it is adapted". It is most frequently applied to wild populations regenerated naturally in protected areas, but can include artificial regeneration whenever planting or sowing of seed is carried out, without conscious selection, on the same area where the seed was collected. In situ conservation of land races or advanced cultivars is possible, but the present note is concerned solely with the in situ conservation of wild populations.

1/ Among the many documents on which this Secretariat Note is based, the draft FAO/IUCN background document FORGEN/MISC/84/3 "In situ Conservation of Wild Plant Genetic Resources: A Status Review and Action Plan" (copies of which are available during this Session) is particularly relevant. The other documents also available are the FAO background document "In situ Conservation of Genetic Resources of Plants: The Scientific and Technical Base" (FORGEN/MISC/84/1) and the FAO/UNEP draft report "Guide to In Situ Conservation of Genetic Resources of Tropical Woody Species" (FORGEN/MISC/84/2).

2/ A framework and guidelines prepared by the International Union for Conservation of Nature and Natural Resources (IUCN) in collaboration with the World Wildlife Fund (WWF) the United Nations Environment Programme (UNEP), FAO and Unesco (published in 1980)

5. Both in situ and ex situ methods of conservation have an essential role and are complementary. Use of in situ genetic reserves has the following main advantages:

(i) In situ conservation is an effective way of conserving species with recalcitrant seeds which cannot be dried without rapid loss of viability (and are also short-lived when moist) and hence cannot be maintained in long-term seed storage and cannot be moved safely to any distance for planting in live collections.

(ii) In situ conservation of an economic species within a natural ecosystem at the same time conserves many subsidiary species of no present economic value which form part of nature's heritage.

(iii) In situ conservation allows evolution to continue, a valuable option for conservation of disease- and pest-resistant species, which can coevolve with their parasites, providing breeders with a dynamic source of resistance.

(iv) Maintenance of wild gene pools facilitates research on species in their natural habitats.

(v) In situ genebanks can serve several sectors at once, since gene pools of value to different sectors (e.g. crop breeding, forestry, forage production) may often overlap, and so can be maintained in the same protected area,.

6. One reservation about the value of in situ reserves arises from doubts as to their security of tenure. Declarations of intent, even government legislation, are sometimes of little value in the face of overwhelming socio-economic arguments in favour of settlement programmes, irrigation, mining or other schemes, or of encroachment by farmers desperate for land. Though these problems can be overcome to some extent through careful land use planning and the involvement of local communities in conservation activities, approaches are also required that demonstrate in situ conservation as a profitable undertaking in the short term.

7. For the majority of situations it is safe to say that in situ conservation is the ideal method of conserving wild plant genetic resources, but that it is not always possible to guarantee long-term genetic integrity. Ex situ conservation is a valuable complementary method for many species and is the only hope for rescuing genetic resources threatened with inevitable loss in their natural habitat.

II. NATIONAL ACTIVITIES IN THE IN SITU CONSERVATION OF PLANT GENETIC RESOURCES

8. Conservation of nature is practised by most countries in various categories of protected areas. These may include (i) national parks, (ii) strict nature reserves, where no human intervention is permitted, and (iii) managed nature reserves where controlled intervention to favour the conservation of particular species, habitats or successional stages, which might disappear if strict natural conditions were maintained, is a possibility, or sometimes, a requirement.

9. These "national parks and equivalent reserves" as defined by IUCN cover only a small fraction of natural ecosystems. The following estimates, extracted from reports of the FAO/UNEP Tropical Forest Resources Assessment Project, relate to 76 countries and cover more than 97% of their total area which lies wholly or for the most part between the tropics, or is subject to a tropical. monsoon climate. The national parks and equivalent reserves of these 76 countries contain 41 million hectares of closed forests (mostly moist and wet types of the humid tropics) which is less than 3.5% of the total area of these

forest types; and 45 million hectares of open forests (mostly mixed forest-grassland formations of the dry tropics, such as African savanna woodlands) or about 6% of the total area of these woody vegetation types; i.e. a total of 86 million hectares or less than 4.5% of the total area of remaining tropical forest formations.

10. Maps have been prepared in many countries which show the distribution of (i) protected areas (ii) vegetation types and (iii) the presently most important species. Where plant inventories have been carried out, it should be possible to indicate not only occurrence, but also relative abundance, of a species in a given area For a number of countries, therefore, it should not be too difficult to estimate how well ecosystems and economic species are represented in protected areas.

11. However only a proportion of these protected areas can qualify as in situ genebanks. Not all of them have, as explicit objectives, the maintenance of wild genetic resources and provision of information on, and access to, those resources by researchers, breeders and ex situ genebanks. Even where management is effective and fulfills the above objectives, location and size have rarely been designed to best conserve intra-specific diversity of given species.

12. In effect, genetic diversity of the great majority of species is not known and can only be inferred from environmental diversity. Ecological zoning of a species is therefore a valuable first step towards distinguishing gene pools. Such zoning has been carried out in several countries as a basis for delimiting zones for seed collection, but is equally applicable for estimating the worth of protected areas to conserve within-species genetic diversity. The simplest systems rely on measures of climate (e.g. rainfall, altitude) and contiguity, but variations in soil and vegetation type are sometimes used in addition. However, the mapping of presumed patterns of intra-specific diversity of species has been carried out in very few countries.

13. Although a small number of countries have prepared national strategies for conserving plant genetic resources, it remains extremely difficult to identify projects where in situ conservation is actually one of the stated objectives and is being practised. Two countries - India and the USSR - have made a commitment to in situ conservation of the wild relatives of crops. India envisages preserving pockets of natural plant wealth in situ, as gene sanctuaries. Such areas exist particularly in the northeastern region where immense diversity exists of several crop plants, viz: Musa, Citrus, Oryza, Saccharum, Erianthus, Mangifera and their wild relatives. The first gene sanctuary, for Citrus, has been designated in the Caro Hills, Meghalaya; and it is anticipated that Biosphere Reserves such as the one proposed for the Nilgiri Hills in the Western Ghats (rich in wild forms of arecanut, ginger, turmeric, cardamom, black pepper, mango jackfruit, plantain, rice and millets) will have gene pool conservation as a major objective.

14. The USSR has established 127 reserves for the protection of wild relatives of crops and an additional 20 protected areas have been proposed in Siberia and the Soviet Far East. The Soviet Union appears to be by far the most advanced country in identifying concentrations of wild genetic resources and establishing protected areas to conserve them. For example; expeditions to the Central Asian gene centre of the USSR have found 249 species that are wild crop relatives; the gene centre has been subdivided into regions, and those regions with the highest concentrations of wild relatives have been identified as priorities for the establishment of reserves.

15. In Zambia, two reserves for the in situ conservation of the forest tree species Baikiaea plurijuga (Zambesi redwood or Zambian teak) have been demarcated and lists of tree

shrub and climber species have been compiled. There are also proposals to conserve in situ important populations of the drought resistant shrub species Prosopis cineraria in the Balhaf area of People's Democratic Republic of Yemen.

16. In Canada, efforts have been going on for some time to conserve in situ gene pools of Jack pine (Pinus banksiana). More recently the federal institutions dealing with natural resources and environment of this country have embarked on the preparation of a cross-sectoral national inventory of wild genetic resources and an assessment of the potential of the country's national parks as in situ genebanks.

17. While little is being done by the majority of countries on the reservation and management of protected areas, the genetic erosion of many crop and other useful species, associated with the rapid destruction of natural ecosystems continues. In the early eighties, clearing of closed forests in the tropics amounts to 7.5 million hectares per year (0.62%); open tree formations are cleared at a yearly rate of 3.8 million hectares (0.52%). An additional 4.4 million hectares of closed forest are logged, i.e. altered and often degraded; and huge areas of open tree formations are subject to degradation by overexploitation for fuelwood, overgrazing and repeated fires. At a global level forest ecosystems which are under greatest pressure are all those of South-East Asia, the tropical high forests of West Africa, the open woodlands of the dry zones of South America and the pine forests of Central America.

18. The brief review made in paragraphs 8 to 16 of national efforts in the field of in situ conservation of plant genetic resources gives a broad picture of the present situation at national level. A few more examples could be added of current national initiatives. However, the fact remains that, in comparison with total needs, very few field projects are in operation which are aimed explicitly at in situ genetic conservation.

19. The main reasons for this present state of affairs can be summarized as follows:

(i) Lack of awareness at the decision-making level of the importance of genetic conservation and of the need to integrate it in land use planning and management.

(ii) Lack of cross-sectoral cooperation, e.g. between the various users, such as crop farmers and foresters, and between the users and the nature conservation sector.

(iii) Lack of progress by conservation authorities in including the conservation of genetic resources as one of their explicit objects of management.

(iv) Lack of knowledge of within-species diversity, by which to assess the effectiveness of existing protected areas and to plan the siting of new ones.

(v) Lack of appreciation of the fact that benefits from conservation may be short-term, as well as long-term. Immediate benefits include soil protection in fragile ecosystems and use of seed for breeding or planting.

III. INTERNATIONAL ACTIVITIES IN THE IN SITU CONSERVATION OF PLANT GENETIC RESOURCES

20. International efforts in the field of in situ conservation of plant genetic resources are little more advanced than those at national level. In addition to FAO, the other main governmental and non-governmental organizations in this field are: IUCN (in collaboration with WWF), the International Board for Plant Genetic Resources (IBPGR), UNEP and Unesco.

21. Most of the work of all these organizations has resulted, as described below, in studies and the formulation of recommendations and guidelines, rather than in actual implementation of in situ conservation. The sectoral. approach has also hampered effectiveness of efforts. IBPGR has concentrated on crop plants giving main priority to ex situ conservation, IUCN, UNEP and Unesco have emphasized nature conservation in general and FAO, within the framework of its forest genetic resources programme, has concentrated on trees of economic and social value. Closer inter-agency cooperation should be possible in future through the ad hoc Working Group on Plant Genetic Resources recently set up by the Ecosystems Conservation Group (comprising FAO, UNEP, Unesco and IUCN).

22. International recognition of the need for conservation of wild plant gene pools was clearly expressed at the FAO/IBP[1/] Technical Conference on the Exploration, Utilization and Conservation of Plant Genetic Resources in 1967 and in the IBP handbook on "Genetic Resources in Plants - Their Exploration and Conservation" which resulted. That Conference led to the establishment, in 1968, of FAO's two Panels of Experts on Plant Exploration and Introduction and on Forest Gene Resources.

23. The need for conservation of wild plant genetic resources was confirmed in 1972 by the United Nations Conference on the Human Environment, which recommended both static (= ex situ) and dynamic (= in situ) ways of maintaining, genetic resources, and in particular called for the conservation of "gene pools of wild plant species within their natural communities". Meanwhile Unesco was studying the subject as part of its Man and Biosphere (MAB) programme, with particular reference to the conservation of natural areas and of the genetic material they contain.

24. In 1974, IBPGR was founded and eventually took over the functions of the FAO Panel on Plant Exploitation and Introduction. As already noted, most of its efforts over the past decade has been devoted to the exploration and ex situ conservation of seeds of wild relatives or landraces of the major food crops. It commissioned IUCN to prepare a position paper on in situ conservation of crop genetic resources. It subsequently cosponsored with FAO and IUCN the International Conference on Crop Genetic Resources in 1981 which involved the collection of information on the status of in situ conservation of crop species and their relatives and made some recommendations relevant to in situ conservation.

25. In 1974, the FAO Panel of Experts on Forest Gene Resources approved Proposals for a Global Programme for Improved Use of Forest Genetic Resources. They included priority ratings by species, for various operations including in situ conservation, which have been regularly updated. Cooperation between FAO and UNEP led to the publication of a report on the Methodology of Conservation of Forest Genetic Resources and to the establishment of two in situ genetic reserves in Zambia (see para. 15). In 1980, FAO with UNEP organized an Expert Consultation on In Situ Conservation of Forest Gene Resources to advise on guidelines for the selection and management of in situ genetic conservation areas.

26. This meeting has been the only international one concerned exclusively with in situ conservation of plant genetic resources. It recommended inter alia the preparation of a practical manual on in situ conservation of forest genetic resources for international use and the identification of potential pilot projects on in situ conservation through a survey covering a range of species in selected developing countries. These two recommendations

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1/ International Biological Programme.

were acted on during 1983-84 within the framework of the FAO/UNEP projects on in situ conservation of tropical wood species (see draft FAO/UNEP report "A Guide to In Situ Conservation of Genetic Resources of Tropical Woody Species").

27. IUCN, whose aim is to promote and carry out scientifically-based action for conservation was, until recently, like FAO, UNEP and Unesco, mostly concerned with the maintenance of biological diversity at the levels of species and ecosystems rather than gene pools. Its Commission on National Parks and Protected Areas is now drawing attention to the need to conserve diversity within species and to set up in situ genebanks.

28. IUCN's work related to in situ conservation of plant genetic resources is diverse. It has published several editions of the "United Nations List of National Parks and Equivalent Reserves" and has prepared a list of biotic provinces with an indication as to how well they are represented in protected areas. The preservation of genetic diversity is identified as one of the three main objectives of the "World Conservation Strategy". IUCN has been commissioned by IBPGR to investigate the feasibility of establishing an in situ genebank in Indonesia to conserve wild mango (Mangifera) species. It is preparing an inventory of wild genetic resources in the Andean countries, including wild relatives of crops, woody species, forage species and other wild plant species. It is also formulating guidelines for protected area managers on how to include the conservation of wild genetic resources as an explicit objective of national protected area systems.

29. Conserving plant genetic resources is one of the six themes of the Plants Programme specially designed by IUCN/Conservation Monitoring Centre within the framework of the 1984-85 WWF/IUCN Plants Conservation Campaign. Basic outlines for pilot projects aimed at conserving the gene pools of wild resource plant species (such as forest food tree species and medicinal plants) in situ are currently being developed as part of this programme.

30. The efforts of Unesco in the field of genetic conservation were initiated in the context of MAB Project 8, "Conservation of Natural Areas and of the Genetic Material They Contain". A major element of this project was the development of the Biosphere Reserve concept. One of the basic purposes of these reserves is to conserve for present and future use the diversity and integrity of biotic communities of plants and animals within natural ecosystems, and to safeguard the genetic diversity of species on which their continuing evolution depends. Establishment of a world-wide network of Biosphere Reserves has been pursued and most recently an Action Plan for Biosphere Reserves was adopted at the Eighth Session of the International Co-ordinating Council of the MAB Programme, Paris, December, 1984. The third of the nine objectives of this plan is entitled "In Situ Conservation: To Promote the Conservation of Key Species and Ecosystems in Biosphere Reserves".

31. Some progress has recently been made in synthesizing data at the global level on species and genera which are economically important or endangered. Such information has been compiled for wild relatives of crops and other useful plant species, mainly by IUCN (see Annex I) and IBPGR (see Annex II); and, for forest tree species, by the FAO Panel of Experts on Forest Gene Resources (see Annex Hi).

32. This brief review of international efforts in the field of in situ conservation of plant genetic resources shows that effective action has only started recently and on a very modest scale. Most of the recommendations made at the few international meetings

in which this subject was touched upon have not been implemented. This is especially true for entire categories of useful plants, such as forage species, despite the wild and semi-wild nature of many of them and for the wild relatives of practically all crop species amenable to ex situ conservation, although the related gene pools may be threatened with extinction.

IV. SUGGESTIONS FOR ACTION

33. The two previous sections of this document demonstrate that in situ genetic conservation activities are presently minimal in comparison with global needs. Attempts at defining priorities for action by species and genera at global level have already been made and various lists have been compiled as mentioned in paragraph 30. General geographic priorities worldwide can be inferred by identifying subregions which exhibit a high concentration of wild plant species of actual socio-economic value and, at the same time, strong pressure on existing natural resources.

34. The draft FAO/IUCN background document "In Situ Conservation of Wild Plant Genetic Resources: A Status Review and Action Plan" summarizes the present situation and indicates the major gaps in the conservation of wild plant genetic resources by (i) plant categories (wild relatives of crops, woody species, browse and forage species, wild resource species) and (ii) by biogeographical regions. List no. 2 of Annex I of species of high priority for in situ conservation by regions/subregions has been extracted from this document.

35. Certain types of action can be taken at all levels - local, national and international - simultaneously such as:

(i) raising of awareness as to the importance of in situ genetic conservation: the need for informed interest is equally great, whether among rural communities as to their local reserve, national land use planners concerned to integrate genetic conservation with land management, or the international community which should facilitate the flow of information, reproductive material and aid between countries;

(ii) dissemination of information: information on genetic resources must first be acquired locally and should always be available locally, but plants are no respecters of political boundaries, so information needs to be compiled and disseminated at national, regional and international levels also. The case for efficient computerized data storage and retrieval systems for in situ genetic resources is already strong and will become stronger as information accumulates;

(iii) training: management of genetic resources is still a new subject. Training courses, including on the job training, which are devoted specifically to genetic resources, will be of prime importance at all levels. In addition, genetic resource management should be injected as an essential component of of more general training courses, both for scientists (agronomists, foresters) and for top administrators (land use planners, economists etc.);

(iv) research: most research needs to be undertaken within natural populations, and will therefore be predominantly local or national. Certain specialized research, however, may rely on facilities in institutes of international scope, e.g. taxonomy of both plants and associated animals, medicinal or chemical properties of plants. Because of the lack of knowledge on genetic diversity within so many species, especially in the tropics, research should receive high priority in most genetic conservation projects.

36. Priority field action at national level should be directed towards the two objectives of: (i) evaluating and mapping intra-specific genetic diversity or (where this is unknown) ecological diversity of economic species, in order to assess the value of existing protected areas and, where necessary, to select sites for new ones and (ii) ensuring that the management of protected areas is compatible with the conservation of genetic resources.

37. Field projects to achieve both objectives would aim to establish an in situ genetic resource unit to explore and map the distribution, vulnerability, and relationship to protected areas, of the main populations of economic plants, and at the same time to assess how appropriate the current management of protected areas is to the conservation of genetic resources.

38. For projects in many developing countries, multilateral or bilateral aid will be required to finance international specialists to work alongside national counterparts and the necessary equipment, travel costs etc. As the phase of exploration and selection of new genetic reserves was completed and activities concentrated more on reserve management, international inputs could be reduced.

39. The location of a unit would depend on the circumstances of each country. It should be closely linked to any existing national centre for ex situ conservation, and should have good communications with services responsible for managing protected areas. In addition to its own field operations, the unit should devote a substantial part of its time to (i) public relations, both at government and at local level (ii) training and (iii) initiation of genetic research and monitoring within protected areas.

40. The genecological exploration involved should lead to the establishment of new in situ conservation areas. However, if valuable populations are found to be under imminent threat and there is no possibility of in situ conservation, seed should be collected for ex situ conservation. Within protected areas the unit should emphasize that genetic resources must be used as well as conserved, and ensure that provision is made for supervised collection of seeds.

41. For wide-ranging species information gained in a given country should be supplemented by parallel information on the same species in adjacent countries. These national activities related to given species could be coordinated within the framework of regional and global networks.

42. In addition to the coordination of national field activities, development of a data management system is a high priority at the international level. Valuable data will be generated as inventories and assessments are prepared at country level - and as in situ genebanks are established and documented in a manner analogous to the documentation of ex situ genebanks. Early provision should be made to store these data (in easily retrievable form) in some central location. The likelihood that in situ genebanks will be cross-sectoral and scattered makes this provision particularly important. Without a central data bank it will

be very difficult for the potential users of genetic resources to know what is being maintained where, or how to obtain it.

43. Other actions at international level will be of an ad hoc nature and to some extent dependent on progress in the field. International training courses or seminars should be organized but will be most effective if sited in countries where in situ progress has already convincing achievements to demonstrate. As far as FAO, IUCN, UNEP and Unesco are concerned, overall coordination of their activities should be effected through the established ad hoc Working Group on Plant Genetic Resources by the Ecosystems Conservation Group.

V. CONCLUSION

44. The areas of natural ecosystems will continue to shrink and those of man-made ecosystems to expand, in order to satisfy the basic, short-term needs of increasing human populations. However, to be sustainable in the long term, agricultural development is dependent on the sound management of genetic resources of crop and other useful plant species, and in particular on the conservation of natural resources and their genetic wealth in in situ reserves. Thus, the kind of conservation for development action suggested above is needed to meet the long-term agricultural needs of present and future generations.

Annex I

IUCN List of Species and Genera
Of High Priority for In Situ Conservation[1/]
(excluding forest tree species[2/])

1. Classification by plant categories

Category	Species	Wild relatives of
Oil Crops	Helianthus spp.	sunflower
	Arachis spp.	peanut
	Glycine spp.	soybean
	Olea lapperinei	olive
	Elaeis guineensis	oil palm
	Elaeis oleifera	oil palm
Pulse crops	Cicer spp.	chickpea
Tree fruit and nut crops	Mangifera spp.	mango
	Durio spp.	durian
	Artocarpus spp.	breadfruit/jackfruit
	Citrus spp.	citrus
	Clymenia spp.	citrus
	Eremocitrus spp.	citrus
	Fortunella spp.	citrus
	Microcitrus spp.	citrus
	Poncirus spp.	citrus
	Lansium spp.	lanson
	Dimocarpus spp.	longan
	Litchi spp.	litchi
	Nephelium spp.	rambutan
	Pyrus spp.	pear
	Malus spp.	apple
	Prunus spp.	peach (and other fruits)
	Punica spp.	pomegranate
	Pistacia spp.	pistachio
	Carica spp.	papaya
	Passiflora spp.	passion fruit
	Lucuma spp., Pouteria spp.	eggfruit/canistel
	Manilkara spp.	sapodilla
Other Fruit Crops	Vitis spp.	grape
	Fragaria chiloenis	strawberry
	Musa spp.	banana
Fibre crops	Gossypium raimondii	cotton
Commidity and industrial crops	Coffee spp.	coffee
	Theobroma spp.	cocoa
	Hevea spp.	rubber

1/ Based on draft FAO/IUCN background document "In Situ Conservation of Wild Plant Genetic Resources. A Status Review and Action Plan".

2/ For forest tree species, see Annex III.

Annex I (Cont.)

Category	Species	Wild relatives of
Forage species	To be identified. High priority regions: a) Greece, Turkey, Morocco b) Italy, Spain, Yugoslavia	
Wild resources species	Chidoscolus spp.	chilte
	Euphorbia antisyphilitica	candelilla
	Schinopsis spp.	quebracho
	Manikara spp.	chicle
	Calamus spp.	rattan
	Dyera spp.	jelutong
	Palaquium spp.	gutta
	Couma spp.	gum sorva
	Acacia Senegal	gum arabic
	Astragalus spp.	gum tragacanth
	Sterculia urens	gum karaya
	Bertholletia excelsa	Brazil nut

ANNEX I

2. Classification by regions/sub-regions

Regions and sub-regions	Species	Wild relatives of
America (North, Central, and South)	Eleais oleifera	oil palm
	Fragaria chiloensis	strawberry
North America	helianthus spp.	sunflower
	Vitis spp.	grape
Central America (and/or Caribbean and/or Mexico)	Chidoscolus spp.	chilte
	Euphorbia antisyphilitica	candelilla
	Manilkara zapota	chicle
Central America, Mexico and South America	Theobroma spp.	cocoa
	Lucuma spp., Pouteria spp.	eggfruit, canistel
	Manilkara spp.	sapodilla
South America	Arachis spp.	peanut
	Bertholletia excelsa	Brazil nut
	Carica spp.	papaya
	Couma spp.	gum sorva
	Gossypium raimondii	cotton
	Hevea spp.	rubber
	Passiflora spp.	passion fruit
	Schinopsis spp.	quebracho (vegetable tannin)
Mediterranean region [1/]	Various forage species	
	Cicer spp.	chickpea
	Malus spp.	apple
	Pistacia spp.	pistachio
	Prunus spp.	peach (and other fruits)
North Africa	Olea laperrinei	olive
North Africa/West Asia	Pyrus spp.	pear
West Asia	Astragalus spp.	gum tragacanth
	Punica spp.	pomegranate
Africa south of the Sahara	Coffea spp.	coffee
	Elaeis guineensis	oil palm
Soudano-Sahelian zone	Acacia Senegal	gum arabic
	Olea laperrinei	olive
Asia		
Indian sub-continent	Cicer microphyllum	chickpea
	Dimocarpus gardneri	longan
	Musa spp.	banana
	Pistacia spp.	pistachio
	Sterculia urens	gum karaya
South-East Asia	Artocarpus spp.	breadfruit/jackfruit
	Calamus spp.	rattan

1/ Including North Africa, West Asia and Southern USSR.

ANNEX I (cont.)

Category	Species	Wild relatives of
South-East Asia (cont.)	Citrus halimii [2/]	citrus
	Dimocarpus spp.	longan
	Durio spp.	durian
	Dyera spp.	jelutong
	Glycine spp.	soybean
	Lansium spp.	lanson
	Litchi spp.	litchi
	Mangifera spp.	mango
	Musa spp.	banana
	Nephelium spp.	rambutan
	Palaquium spp.	gutta
East Asia	Glycine soya	soybean
	Pyrus spp.	pear
Oceania	Dimocarpus australiensis	longan
	Glycine spp.	soybean
	Microcitrus spp.	citrus

ANNEX II

IBPGR Global Crop Priorities [1/] [2/]

Crop Category	Global Priority 1	Global Priority 2[3/]	High Regional Priority[4/]
Cereals	Wheat (*Triticom* spp. & *Aegilops* spp.)	*Sorghum (*Sorghum* spp.) *Finger millet (*Pennisetum* spp.) *Barley (*Hordeum* spp.) *Pearl millet (*Pennisetum americanum*) *Foxtail millet (*Setaria italica*) *Rice (*Oryza* spp.)	Maize (*Zea* spp.) Quinoa (*Chernopodium quinoa*)
Food legumes	Beans (*Phaseolus* spp.)	*Groundnut (*Arachis* spp.) *Soyabean (*Glycine* spp.) *Yard long bean and cowpea(*Vigna unguiculata*) *Winged bean (*Psophocarpus* spp.) *Chickpea (*Cicer* spp.) *Mung bean (*Vigna radiate*) *Black gram (*V. mungo*) Moth bean (*V. aconifolia*) Red bean (*V. umbellate*)	Broad bean (*Vicia Faba*) Lentil (*Lens* spp.) Lupin (*Lupinus* spp.)
Roots and tubers	Cassava (*Manihot* spp.) Sweet Potato (*Ipomoea* spp.)	Potato (*Solanum* spp.)	Yam (*Dioscorea* spp.) Taro (*Colocasia* spp., *Alocasia* spp., *Xanthosoma* spp.) Minor S.American tubers (*Dioscorea* spp., *Xanthosoma* spp.)
Oil Crops		Oil Palm (*Elaeis melanococca*) *Coconut (*Cocos* spp.) *Oilseed brassica (Brassica spp.)	
Fibres		Cotton (*Gossypium* spp.)	
Starchy fruits		*Starchy banana and plantain (*Musa* spp.)	Breadfruit and Jackfruit (*Artocarpus* spp.)
Sugar crops		*Beet (*Beta* spp.) *Sugarcane (*Saccharum* spp.)	
Beverages	Coffeee (*Coffea* spp.)	Cocoa (*Criollo varieties) (*Theobroma* spp.)	

1/ From Annual Report 1982 – International Board of Plant Genetic Resources – CGIAR/IBPGR 1983

2/ Although work has been concentrated on some of the species listed for almost a decade, main emphasis has generally been on improved varieties and land races; and on conservation *ex situ*.

3/ *= a first priority in at least on region

4/ Although having a lower global priority , these crops all have a first priority in at least one region.

ANNEX II (Cont.)

Crop Category	Global Priority 1	Global Priority 2[3/]	High Regional Priority[4/]
Subtropical and tropical fruits		*Dessert banana (Musa spp.) *Citrus (Citrus spp.) *Mango (Mangifera spp.)	Avocado (Persea spp.) Lanson(Lansium spp.) Sop, Custard or Sugar apple (Annona spp.) Passion fruit, Water-lemon and Sweet calabash (Passiflora spp.) Peach palm (Bactris pupunha) Durian (Durio spp.) Rambutan (Nephelium spp.)
Temperate fruits		*Apple (Malus spp.) *Pear a Quince (Pyrus spp.) Peach and Nectarine (Prunus persica)	
Vegetables	Tomato (Lycopersicon spp.)	*Amaranth (Amaranthus spp.) *Brassica (Brassica spp.) *Cucurbits (Cucurbita spp.) *Eggplant (Solanum spp.) *Okra (Abelmoschus spp.) *Onion (Allium spp.) *Chili (Capsicum spp.) *Radish (Raphanus spp.)	Bitter gourd (Cucurbita spp.) Globe artichoke (Helianthus spp.) Melon and Cucumber (Cucumis spp.) Chocho (Sechium spp.) Kangkong (Ipomoea spp.) Spinach (Spinacia spp.)
Trees		Trees for fuelwood and environmental stabilization (Acacia spp., Atriplex spp., Prosopis spp., Cercidium spp., Chilopsis spp., Balanites spp.)	

ANNEX III

Forest Tree Species: Conservation Priorities by Regions

At its 5th Session in December 1981, the FAO Panel of Experts on, Forest Gene Resources drew up a list of woody species and genera which are considered in need of attention in any one of the field operations (exploration, collection, evaluation, conservation, utilization). These priority species, arranged by region, are based not only on the information of the Panel Member himself and his alternate, but also on information gained through consultation with institutes, organizations and professionals in the regions and individual countries, unidentified for their knowledge in the genetic resources field.

The full list of species, with priority ratings from 1 (urgent attention needed), through 3 (medium priority), to 4 (action already started and activity adequately covered by existing schemes), can be found in Appendix 8 of the Report of the Panel (FAO 1984).

The table below summarizes some of the information contained in the list, showing number of priority species by region and the number of species rated priority 1 in conservation, 81 of these species are considered endangered with extinction in all, or part of, their national ranges.

It should be recognized that any list will reflect present-day knowledge: exact information on the status and on the potential value of a species will become available only in the course of exploration and evaluation, Additional species to those now listed are therefore, expected to be added as our knowledge of presently lesser-known species increases.

Country/Region	No. of species rated Priority 1 for conservation activities [1/]	Total number of species identified [2/]
1) Africa	36	55
2) South/SE Asia	30	45
3) Mexico	31	54
4) Brazil	30	56
5) Caribbean, Central/South America (excl.	28	44
6) South Europe, Mediterranean, Near East	16	33
7) North/NE/Central Asia	13	192
8) Australia	5	159
9) U.S.A. and Canada	2	65
10) North/Central Europe	-	15
	191	718

1/ Conservation in situ; collection for conservation; conservation ex situ in (i) live collections/ex situ conservation stands; and (ii) as seed.

2/ Priorities 1-3 in exploration, collection, evaluation, conservation and utilization.