March 1996

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 | Organización de las Naciones Unidas para la Agricultura y la Alimentación

COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Second Extraordinary Session*

Rome, 22-27 April 1996

DRAFT GLOBAL PLAN OF ACTION FOR THE CONSERVATION AND SUSTAINABLE UTILISATION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Explanatory Note on the Global Plan of Action for the Conservation and Sustainable Utilisation of Plant Genetic Resources for Food and Agriculture	Document CGRFA-EX2/96/3.1
Draft Global Plan of Action for the Conservation and Sustainable Utilisation of Plant Genetic Resources for Food and Agriculture	Document CGRFA-EX2/96/3.2
Financing of and Follow-up to the Global Plan of Action for the Conservation and Sustainable Utilisation of Plant Genetic Resources for Food and Agriculture	Document CGRFA-EX2/96/3.3

* By Resolution 3/95 of the Twenty-Eighth Session of the FAO Conference, the Commission on Plant Genetic Resources became the Commission on Genetic Resources for Food and Agriculture. The First Extraordinary Session was held under the Commission's previous name.

EXPLANATORY NOTE ON THE GLOBAL PLAN OF ACTION FOR THE CONSERVATION AND SUSTAINABLE UTILISATION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

BACKGROUND

1. While plant genetic resources have been sought after, collected, used, and improved for centuries, it has only been since the 1930s that concern has been voiced over the need for conservation. International efforts to promote conservation, exchange, and utilization, initiated through FAO, are somewhat more recent.

2. FAO launched a newsletter on plant genetic resources in 1957[1]. In 1963, an FAO Panel of Experts on Plant Exploration was established to advise FAO and to set international guidelines for the collection, conservation and exchange of germplasm. A similar Panel of Experts on Forest Genetic Resources was created in 1968. A series of technical meetings and conferences were convened by FAO beginning in 1961.[2] FAO acted as a catalyst for action in response to what was widely perceived to be an emergency situation. In the context of growing alarm over the rapid loss of diverse farmer landraces, the Consultative Group on International Agricultural Research (CGIAR) established in 1974 the International Board for Plant Genetic Resources (IBPGR). Then an independent Board with its secretariat supplied by FAO, IBPGR's mission was to coordinate an international plant genetic resources programme. Collecting missions were accelerated; genebanks constructed and expanded at national, regional and international levels.

3. While much was accomplished in the 1970s and 1980s, gaps persisted in the practical conservation work itself and linkages with utilization efforts, as well as in institutional relations and policy matters. Due in large part to the urgency of the work during this period, no systematic attempt was made at an intergovernmental level to develop a comprehensive, coordinated plan to conserve and sustainably utilize plant genetic resources.

4. In 1983, the FAO Conference established the intergovernmental Commission on Plant Genetic Resources and adopted a non-binding International Undertaking on Plant Genetic Resources, which is now being revised by the Commission in light of the Convention on Biological Diversity. The Commission and the Undertaking are the main institutional components

[1]This newsletter has continued to be published since 1957. Today, it is published jointly by FAO and IPGRI under the title, Plant Genetic Resources Newsletter.

[2]A series of international technical conferences and meetings on plant genetic resources have been convened by FAO, in cooperation with other Organizations, to facilitate technical discussions among scientists, and to create awareness about plant genetic resources issues among policy-makers at national and international levels. The first significant meeting took place in 1961and focused on plant exploration and introduction. The 1967 Conference formulated a number of important resolutions subsequently adopted by the 1972 UN Conference on the Human Environment, in Stockholm. A 1973 Conference, interpreted the resolutions of the Stockholm Conference in the context of plant genetic resources. The most recent international technical conference, which took place in 1981, catalyzed the development of the FAO Global System for the Conservation and Use of Plant Genetic Resources.

of the Global System for the Conservation and Utilization of Plant Genetic Resources for Food and Agriculture.[3] The Global System also includes other international agreements, technical mechanisms and global instruments at different stages of development.[4]

5. By the early 1990's it was becoming evident that an international conference was needed to assess progress, identify problems and opportunities and help give direction to future activities in the conservation and utilization of plant genetic resources for food and agriculture.

6. The convening of this International Technical Conference on Plant Genetic Resources was first proposed by the FAO Commission on Plant Genetic Resources at its Fourth Session, and was endorsed by the FAO Conference at its Twenty-sixth Session, in 1991.

7. The Commission also agreed that the implementation of Farmers' Rights, through an international fund, should be facilitated by a scientifically sound, costed Global Plan of Action and recommended that such a Plan and a first FAO Report on the State of the World's Plant Genetic Resources be developed through the preparatory process for and presented to the International Technical Conference on Plant Genetic Resources.

8. In June 1992, the importance of plant genetic resources was recognized at the UN Conference on Environment and Development (UNCED). In particular, chapter 14 of Agenda 21 includes a programme area on the "conservation and sustainable utilization of plant genetic resources for food and sustainable agriculture" (PGRFA), which contains programmes of action, at national and international levels.

9. At the international level, Agenda 21 proposes actions to strengthen the FAO Global System, and:

(a) Prepare periodic state of the world reports on PGRFA

(b) Prepare a rolling global cooperative plan of action on PGRFA and to promote the International Technical Conference, which would consider the first Report on the State of the World's Plant Genetic Resources, and Plan of Action.

---

[3]The Global System, being developed by FAO, has the objectives of promoting the conservation, the availability and sustainable utilization of plant genetic resources for present and future generations, by providing a flexible framework for sharing the benefits and burdens. One hundred forty countries are now formally part of the System.

[4]The agreements include the code of conduct for plant germplasm collecting and transfer; a draft code for plant biotechnologies, and international agreements on genebanks. To promote the conservation and exchange of germplasm, there is an international network of *ex situ* base collections under the auspices of FAO and a network of *in situ* conservation areas. The exchange of information and technology is facilitated through the world information and early warning system. Other essential components of the System are: a Report periodically updated on the State of the World's Plant Genetic Resources, to assist the Commission in carrying out its monitoring role; a rolling Global Plan of Action on Plant Genetic Resources to facilitate its coordinating role, and an International Fund on Plant Genetic Resources. The realization of Farmers' Rights, a concept which was negotiated within the Commission and unanimously adopted by the FAO Conference, in order to recognize the rights of germplasm donors, should provide for equity within the System." (Document CPGR-6/95/4, para. 2)

10. FAO established a multi-donor trust-fund project, the International Conference and Programme for Plant Genetic Resources (ICPPGR), to coordinate the preparatory process for the Fourth International Technical Conference on Plant Genetic Resources, including development of the major documents to be considered by the Conference. Under the guidance of the Commission on Plant Genetic Resources, a participatory, country-driven preparatory process was initiated.

11. The International Technical Conference on Plant Genetic Resources and its preparatory process have been organized within the context of the FAO Global System for the Conservation and Utilization of Plant Genetic Resources for Food and Agriculture.

12. At its Fifth Session in April 1993, the Commission noted that the International Technical Conference process would "transform the relevant parts of the UNCED process (including Agenda 21 and the Convention on Biological Diversity) into a costed Global Plan of Action, based on the Report on the State of the World's Plant Genetic Resources". The Commission also noted that the process would "make the Global System for the Conservation and Use of Plant Genetic Resources fully operational".

13. Later in 1993, the Twenty-seventh Session of the FAO Conference strongly emphasized the importance of the Fourth International Technical Conference and endorsed its aims and strategy.

14. The second meeting of the Conference of the Parties to the Convention on Biological Diversity in 1995 affirmed its support for the Fourth International Technical Conference and described its preparatory process as an "innovative model" and "exemplary."

DEVELOPMENT OF THE GLOBAL PLAN OF ACTION

15. The Global Plan of Action has been elaborated through a participatory, country-driven preparatory process with the active involvement of 157 countries.[5] Focal points were designated by 150 countries to coordinate national preparations and liaise with the FAO Secretariat. Country Reports based on guidelines prepared by FAO were submitted by 151 countries. In separate chapters within these reports, countries assessed their situation in regard to: indigenous plant genetic resources; national conservation activities (*ex situ* and *in situ*); in-country uses of plant genetic resources; national goals, policies, programmes and legislation; and international collaboration. In addition, countries identified national needs and opportunities, and made specific proposals for the Global Plan of Action in two additional chapters of their Country Report. Many Country Reports were provided to the Secretariat initially in draft form, giving the Secretariat an opportunity to communicate with focal points and suggest areas where elaboration could be useful. The FAO Secretariat studied the final Country Reports closely and in some cases sought further detail or clarification from governments.

16. The 151 Country Reports provided a large amount of information and a sound foundation for the critical assessment of the status of plant genetic resources and existing capacity to conserve and utilize them that is found in the FAO Report on the State of the World's Plant Genetic Resources. The Secretariat was also able to draw upon information from the FAO World

[5]This number includes countries that submitted a Country Report, or participated in one of the sub-regional meetings, or nominated a focal point for the process, or any combination of the above.

Information and Early Warning System database assembled from the responses of 89 countries to two FAO questionnaires and from information from 79 countries provided in response to a separate questionnaire dealing with forest genetic resources. In addition, a number of international agricultural research centers of the CGIAR provided information, and the Secretariat had access to the findings of the CGIAR's STRIPE review as well as to recently completed external reviews of center genebanks.

17. From the Country Reports and visits made by the Secretariat and consultants to over 100 countries, 15 sub-regional synthesis reports were prepared. These reports provided the basis for discussions at most of the 11 regional and sub-regional meetings held between July 1995 and December 1995. These meetings and the preparation of Country Reports benefited strongly from the contribution of the International Plant Genetic Resources Institute (IPGRI).

18. A total of 143 countries participated in the intergovernmental regional and sub-regional preparatory meetings. Each meeting formulated and adopted recommendations for the Global Plan of Action. The Plan represents a synthesis and elaboration of more than 1050 recommendations made through these meetings and more than 1075 recommendations made in Country Reports submitted in the course of the preparatory process. While a diversity of findings and recommendations is to be expected from such a participatory process, there was an impressive degree of commonality amongst regions.

Table 1

Preparatory Meetings for the International Technical Conference on Plant Genetic Resources

(in chronological order, 1995)

Sub-Region	Location	Countries Represented at the Meeting[1]
East Asia	China	5
Central America, Mexico & Caribbean	Costa Rica	19
South America	Brazil	11
Eastern Africa & Indian Ocean	Kenya	9
Southern Africa	Zimbabwe	11
Europe	Slovakia	35
South Asia, Southeast Asia & Pacific	Thailand	16
West & Central Asia	Islamic Republic of Iran	9
Mediterranean	Tunisia	13
Western & Central Africa	Senegal	19
North America	Canada	2

[1] The following were represented at the meetings:

East Asia (China, Democratic Peoples Rep. of Korea, Japan, Mongolia, Rep. of Korea);

Central America, Mexico and Caribbean (Antigua & Barbuda, Bahamas, Barbados, Costa Rica, Cuba, Dominica, Dominican Rep. El Salvador, Granada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, St. Kitts & Nevis, Santa Lucia, Trinidad & Tobago);

South America (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Suriname, Uruguay, Venezuela);

East Africa and Indian Ocean (Burundi, Eritrea, Ethiopia, Kenya, Madagascar, Mauritius, Seychelles, Sudan, Uganda);

Southern Africa (Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe);

Europe (Austria, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czech Rep., Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Moldova, The Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovak Rep., Slovenia, Spain, Sweden, Switzerland, Turkey, The Ukraine, United Kingdom)

South Asia, Southeast Asia and Pacific (Bangladesh, Cambodia, India, Indonesia, Malaysia, Maldives, Myanmar, Nepal, Papua New Guinea, Philippines, Solomon Islands, Sri Lanka, Thailand, Tonga, Vietnam, Western Samoa);

West and Central Asia (Azerbaijan, Iran, Iraq, Kazakhstan, Pakistan, Turkey, Turmenistan, Uzbekistan, Yemen);

Mediterranean (Cyprus, Egypt, European Community, France, Italy, Jordan, Israel, Lebanon, Morocco, Portugal, Spain, Syria, Tunisia);

Western and Central Africa (Benin, Burkina Faso, Cameroon, Central Africa Rep. Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo, Zaire);

North America (Canada, United States).

19. Three workshops concerning forest genetic resources were held: one for the forest genetic resources of Europe, another on the boreal zone, and a third on the temperate zone of North America. In addition to providing specific information on forest genetic resources activities and priorities in the regions covered, these workshops contributed useful experience and provided possible "models" for discussing issues related to forest genetic resources in other ecological regions of the world, at a future date. Governments also undertook a number of other helpful and complementary activities in support of the preparatory process.

20. A large number of specialists from international organizations and the private and public sector, including the CGIAR, have contributed to this effort through expert workshops, electronic conferences on the Internet organized by the FAO Secretariat, and other means. Over 50 non-governmental organizations, including from the private sector, have also been actively involved in the preparatory process.

21. The Commission on Plant Genetic Resources requested that the FAO Secretariat prepare the Fourth International Technical Conference in close cooperation with IPGRI. The involvement of IPGRI, its Headquarters staff and regional offices has, in fact, been extensive. In addition to helping organize a number of the sub-regional meetings and providing assistance to countries in preparing their Country Reports, IPGRI staff provided valuable inputs to the two major documents in almost daily contacts with FAO during the preparatory process.

22. The Global Plan of Action was developed in tandem with the Report on the State of the World's Plant Genetic Resources. The Report identifies problems needing international attention. The Global Plan of Actions proposes solutions to those problems.

COSTING THE GLOBAL PLAN OF ACTION

23. Two reference points can be cited in the costing of the Global Plan of Action.

24. For programme areas such as those concerning plant biodiversity in chapters 14 and 15 in Agenda 21, the UNCED Secretariat estimated the total required resources and the concessional resources needed from the international community. However, Agenda 21 covers many areas which are not a part of the Global Plan of Action. Similarly, the Global Plan includes a number of very specific activities not costed in Agenda 21. Because of the problem of comparability, it was not practical to use the UNCED Secretariat's estimates to calculate the cost for the 20 activities in the Global Plan.

25. The Secretariat also took note of estimates prepared by the Keystone International Dialogue Series on Plant Genetic Resources. The first estimate of funding needs made by Keystone at the second of three international sessions was of US$ 500 million. However, at its final session in 1991, Keystone estimated "suggested annual additional funding requirements" from international sources of $300 million per annum for the 1993-2000 period. This estimate was not broken down by category or activity. The Keystone Dialogue Series dealt principally with conservation activities, however. Again, because of the lack of comparability and the very general nature of the Keystone estimate, it was impossible to use it to calculate the costs of individual activities in the Global Plan of Action.

26. There are no similar separate estimates available for external financial concessional flow requirements needed to implement relevant sections of the Convention on Biological Diversity.

27. As in Agenda 21, the FAO Secretariat has estimated the average total annual cost over a 10 year period (in this case, 1997-2007) for implementing each priority activity. Because there are significant variables in the potential rate of implementation and because the extent of international responsibility for the activities has not yet been determined, the results of the Secretariat's costing efforts are presented in tabular form indicating three potential levels of international responsibility for each priority activity. As with Agenda 21, the Secretariat notes that these estimates are indicative and order-of-magnitude estimates only. They are not based on detailed budget line items as in a formal budget submission or project document. The total of the estimated aggregate costs for the 20 activities ranges from US$ 130.6 million to US$ 303.8 million per annum. Costing estimates provided in the Plan are not to be understood as an indirect measure of the value of plant genetic resources of the developing countries.

28. The international share of the annual cost of a given activity in the Global Plan of Action depends in large part on the level of national commitments to domestic PGRFA, the agreement on the proportion of cost of a given priority activity that should be met through international concessional financing, the relative capacity of the international community to implement a priority activity and the relative urgency and priorities given to particular priority activity tasks.

29. In costing actions, consideration must be given to current capacities to absorb the tasks. The surveying and inventorying of plant genetic resources, for example, may be constrained by scarcity of trained personnel to undertake the work, and some training functions may be limited by lack of qualified and available instuctors.

30. The costing of activities can also be influenced considerably by the extent and speed with which governments want to implement the activities. Where activities are called for in different countries, the work could, for example, be undertaken in 5 countries per year, 10 countries per year, or 20 countries per year over the course of the decade. Assisting 5 countries per year in training programmes on regeneration techniques, for example, would mean that fewer than half of the developing countries would receive a course during the decade. Holding 20 courses a year would allow for all countries to have one course and for some to have two courses during the decade. A basic training course may be completed in one or two weeks, whereas a more in-depth course might require a month or more. The number of participants per course may also differ. The cost of components of the Plan can thus vary by a large amount depending on factors of this kind. Such realities indicate that a range of cost estimates as opposed to one figure would be more transparent and useful in considering the financial implications of implementing the Global Plan of Action.

31. In light of the above, it is suggested that the International Technical Conference may wish to take note of, but not formally adopt, the Secretariat's costing estimates for the Global Plan of Action.

DRAFT GLOBAL PLAN OF ACTION FOR THE CONSERVATION AND SUSTAINABLE UTILISATION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

CONTENTS

LEIPZIG DECLARATION
ON CONSERVATION AND SUSTAINABLE UTILISATION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

A Call for [Commitment for] the Conservation and Sustainable Utilisation of Plant Genetic Resources for World Food Security

1. In recognition of the vital importance of Plant Genetic Resources for Food and Agriculture to present and future generations, the representatives of ___ States and ___ Organisations have gathered together in Leipzig, at the invitation of the Food and Agriculture Organization of the United Nations. We have done so to assert and renew our commitment to the conservation and sustainable utilisation of these resources and to the fair and equitable sharing of the benefits [arising out of the] their use.

2. While acknowledging and reaffirming states' sovereign rights over their biological resources, we also confirm our common and individual responsibilities in respect of this heritage.

3. Above all else, plant genetic resources are an essential foundation for world food security and sustainable development. These resources are the basis of natural and directed evolution in the plant species most critical to the survival and well-being of human beings. All countries require plant genetic resources if they are to increase food supplies sustainably and meet the related challenges of changes in the environment, including climate change. We are also conscious of the intrinsic value of this biological diversity and of its ecological, social, economic, scientific, educational, cultural, and aesthetic importance.

4. Plant genetic resources for food and agriculture are the product of years of natural evolution, of creative selection by farmers, and scientific plant breeding. We acknowledge the roles played by generations of farmers, including women, farming communities and indigenous populations, as well as breeders and scientists, in conserving and improving plant genetic resources. Through their efforts, much has been accomplished in past decades to collect, conserve, improve and use plant genetic resources for food and agriculture.

5. We are aware, however, of the serious threats to the security of plant genetic resources and acknowledge that efforts to conserve, develop, and use genetic diversity are inadequate. Diversity is being lost not only in the fields and forests of virtually all countries, but also in genebanks. Though the number of genebanks has increased rapidly in recent decades, many cannot meet minimum international standards. An alarmingly high number of stored accessions is in need of regeneration, indicating that much of the material collected and conserved in the past is now endangered.

6. Major gaps and weaknesses exist in national and international capacity to assess, study, monitor and use plant genetic resources to increase food production and contribute to sustainable development. Existing institutional capacity, structures and programmes are inadequate. The crucial linkage between conservation and utilisation is tenuous, particularly in many developing countries. The result is that existing diversity in crop species is not used to the extent possible for increased food production or for improving the sustainability of production systems.

7. We recognize the interdependence of countries and peoples regarding plant genetic resources for food and agriculture. Access to and the sharing of both genetic resources and technologies are essential for the meeting of food and other needs of the growing world population and must be facilitated. We affirm the need to promote international and regional cooperation among States, intergovernmental organisations and non-governmental organisations. Such cooperation must be manifested particularly when the plant genetic resources of a country are lost or threatened as a result of natural disaster, war or civil strife.

8. In particular, we acknowledge the pressing need to secure existing *ex situ* and *in situ* collections of plant genetic resources. It is important that this diversity be made more useful and valuable to breeders and farmers by providing better and more accessible documentation. We recognize the need for substantial and long term support and incentives for plant breeding programmes , including initiatives to adapt and enhance genetic materials for further development by plant breeders. We call for a new and more productive partnership between scientists and farmers to build upon the ongoing efforts of farmers to manage and improve their plant genetic resources, especially in marginal areas.

9. Our primary objective must be to safeguard the world's plant genetic resources and to use them sustainably. This will require integrated approaches combining the best of traditional knowledge and modern technologies. We believe that means are needed to increase the benefits derived from this diversity and the sharing of those benefits and that such mechanisms would be in the interest of both equity and conservation.

10. We gather together in Leipzig in a spirit of hope, and firm determination, aware of the difficulties ahead, but confident that progress can, must and will be achieved. Our pledge to common action is a key element of our commitment to promoting world food security and part of our fundamental responsibilities to the people of this world.

11. We vow to honour this commitment by taking the necessary steps to implement the Global Plan of Action. We acknowledge that [the mobilization of the necessary financial resources for these activities is of utmost importance] [particular efforts will be required to mobilise financial resources for the priority activities].

12. We commit ourselves, therefore, to this Declaration and to [this Global Plan of Action] [the development of the Global System] for the Conservation and Sustainable Utilisation of Plant Genetic Resources for Food and Agriculture. We invite all people as well as the international community to join us in our common cause.

Adopted this ____ day of ____, 1996.

INTRODUCTION

13. Plant genetic resources for food and agriculture provide the biological basis for world food security, and directly or indirectly, support the livelihoods of every person on earth. These resources serve as the plant breeder's most important raw material and the farmer's most essential input. They are therefore immensely, even incalculably valuable. Properly managed, these resources need never be depleted, for there is no inherent incompatibility between conservation and utilisation. The conservation, sustainable utilisation, and fair and equitable sharing of benefits from their use is both an international concern and imperative. These, moreover, are basic aims of the Convention on Biological Diversity. An agreed Global Plan of Action addressing plant genetic resources for food and agriculture is, therefore, an appropriate manifestation of the international community's concern and responsibility in this area.

14. The FAO Commission on Plant Genetic Resources has specified that the Global Plan of Action should cover that subset of total plant genetic resources pertaining specifically to food and agriculture. The Conference of Parties to the Convention on Biological Diversity at its Second Session in 1995 declared its support for the development of a Plan "for Food and Agriculture" through the preparatory process of the Fourth International Technical Conference on Plant Genetic Resources.

15. In its Sixth Session, the Commission agreed "that the contribution of plant genetic resources for food and agriculture to world food security should be emphasized, in the context of sustainable agriculture, and that the special nature and needs of agriculture should be stressed. In so far as the Report covered matters specifically related to forest genetic resources, it was *agreed* that it should concentrate on agroforestry and forestry for food production." The scope of the Report on the State of the World's Plant Genetic Resources and the Global Plan of Action reflect this guidance. Future refinements or elaborations of the Plan could, presumably, devote more attention to other subsets of plant genetic resources for food and agriculture.

The Rationale for a Global Plan of Action specifically for Food and Agriculture

16. A discrete Global Plan of Action for plant genetic resources for food and agriculture is warranted within the wider context of biological diversity, because of several features of this particular form of biodiversity.

(a) Many plant genetic resources for food and agriculture are the result of human intervention: that is, they have been consciously selected and improved by farmers since the origins of agriculture. In more recent times, scientific plant breeders have built on this rich inheritance with striking effects. Sustainable management of these resources requires particular strategies sensitive to their unique nature.

(b) *In situ* diversity of many plant genetic resources for food and agriculture, especially of food crops, is often concentrated in particular parts of the world distinct from areas rich in other forms of biodiversity. These so-called "centres of diversity" are, nevertheless, still largely located in developing countries.

(c) Because of the diffusion of agriculture and the association of major crops with ancient human migrations, many crop genes, genotypes, and populations spread all over the planet in ancient times. They have continued to be developed and

improved without interruption ever since by farmers both inside and far away from the historic centres of original domestication. Moreover, plant genetic resources for food and agriculture have been systematically collected and exchanged for some 500 years. More than 6 million accessions are now stored in over 1300 genebanks around the world for both conservation and utilisation purposes.

(d) The interdependence of countries is particularly high with respect to crop genetic resources. The food and agricultural production systems of all countries are heavily - even predominantly - dependent on genetic resources of plants domesticated elsewhere and subsequently developed in other countries and regions over hundreds or thousands of years. Consequently, the ways and means of "sharing the benefits" of these genetic resources for food and agriculture are fundamentally different from the approaches that might be appropriate for recently discovered "wild" or undeveloped biodiversity or medicinal plants.

(e) Plant genetic resources are under-conserved and under-utilised. The root of this paradox lies in the international "public good" nature of most conservation activities, and many utilisation activities. Such activities include most efforts associated with the assembling and management of collections as well as many endeavours associated with development and use. While these activities are essential for the public good, they are generally not profitable for individual agents to pursue. Therefore, mechanisms need to be put in place to ensure that such activities are undertaken.

(f) Activities related to *in situ* conservation, to *ex situ* conservation, and to utilisation of plant genetic resources are, to a large extent, carried out in parallel without adequate linkages and coordination. A Global Plan of Action should aim at improving this situation.

(g) There are multiple sources of funds for the conservation and development of plant genetic resources. Yet there are also multiple gaps and deficiencies in the activities financed, and national programmes show very diverse degrees of development and coverage of conservation and utilisation requirements. An agreed Global Plan of Action could help target resources to the most pressing internationally-identified priorities and increase overall effectiveness of global efforts.

Aims and Strategies of the Global Plan of Action

17. At its Sixth Session in 1995, the Commission agreed on a general outline and approach to both the Report on the State of the World's Plant Genetic Resources and the Global Plan of Action. The Commission stressed that the Global Plan of Action must be action-oriented. Since it would provide a strategy to guide international cooperation on plant genetic resources for food and agriculture in the coming years, it should be based on clear, but succinctly stated, aims and principles, and include, *inter alia*, a strategy, information on each proposed priority activity, and cost estimates. It agreed that the aims would refer to, and draw upon, as appropriate, the Convention on Biological Diversity and the International Undertaking.

18. The main aims of the Global Plan of Action are threefold:

- to ensure the conservation of plant genetic resources for food and agriculture (PGRFA) as a basis for food security;
- to promote better utilisation of PGRFA, in order to foster development and to reduce hunger and poverty particularly in developing countries;
- to promote a better sharing of the benefits derived from plant genetic resources for food and agriculture with countries, communities and farmers.

19. The conservation, utilisation, and sharing of benefits of plant genetic resources for food and agriculture are an integral part of the aims of the Convention on Biological Diversity. Indeed, the Global Plan of Action is designed to contribute to the implementation of the Convention in the field of food and agriculture and to make the Global System more fully operational.

20. The Global Plan of Action is based on the assumption that countries are fundamentally interdependent on each other with respect to plant genetic resources and that substantial international cooperation would be necessary to meet the aims of the Plan effectively and efficiently. In this context, the Global Plan of Action was developed within a broad strategic framework comprised of five basic and inter-related aspects:

(a) Securing the safety of the genetic material already collected and providing for its regeneration and safety duplication is a key strategic element of the Global Plan of Action. A large and important part of PGRFA vital to world food security is stored in these collections. Many collections, however, are stored under inadequate conditions, and as many as one million accessions are thought to be in need of regeneration.

(b) Linking conservation with utilisation and identifying and overcoming obstacles to the greater use of conserved plant genetic resources are necessary if maximum benefits are to be attained from conservation efforts.

(c) Enhancing capacity at all levels is a key strategy used in the individual activities in the Global Plan. The Plan seeks to promote the pragmatic and efficient development of institutions, programmes, human resources, cooperation, and financial mechanisms.

(d) Strengthening farmer/community level management of plant genetic resources is essential to the success of *in situ* conservation and development, and to facilitate the sharing of benefits derived from the utilisation of these resources. Farmers and their communities play a critical role in the conservation and improvement of PGRFA. Enhancing their capacity would help promote food security, particularly among the many rural people who live in agriculturally-marginal regions.

(e) Conservation and utilisation strategies at the community, national, regional and international levels need to be complementary, and as appropriate, integrated with each other during planning and implementation in order to achieve maximum effect. Conservation and use of PGRFA requires a mix of inter-related approaches, including *in situ* and *ex situ* efforts.

Structure and Organization of the Global Plan of Action

21. The Global Plan of Action has 20 priority activity areas. For pragmatic and presentational purposes, these are organized into four main groups. The first group deals with *In Situ* Conservation and Development; the second with *Ex Situ* Conservation; the third with Utilisation of Plant Genetic Resources; and the fourth with Institutions and Capacity Building. As the Global Plan of Action is a set of integrated and intertwining activities, the placement of the activities into four groups is intended simply to help order the presentation and guide the reader to areas of particular interest. Many activities will relate and be relevant to more than one group.

22. For each priority activity there is a basic set of headings or sections to aid in the presentation of the proposed priority activity. In some cases, recommendations found under one heading might as appropriately have been placed under another. While no strict section definitions are considered necessary, a few explanatory remarks might be useful:

(a) The Assessment section provides a summary of the rationale for the priority activity. It draws upon the findings of the preparatory process, and especially the Report on the State of the World's Plant Genetic Resources.

(b) The Long-term Objectives and Intermediate Objectives sections specify the ultimate and intervening objectives respectively to be accomplished by the priority activity. The explicit articulation of goals can aid the international community in judging the extent of implementation of the activity over time.

(c) The Policy / Strategy section proposes national and international policies and strategic approaches needed to implement the objectives of the priority activity. In some cases there are recommendations for new international policies; in other cases there are proposals for changes in approach, priorities, and visions.

(d) The Capacity section indicates what human and institutional capabilities need to be developed or provided.

(e) The Research and Technology section identifies those areas of scientific, methodological, or technological research or action required for the implementation of the priority activity.

(f) The Coordination and Administration section addresses how these issues might be approached as the priority activity is planned and implemented.

(g) The Section entitled This Activity is Closely Linked With lists other activities in the Global Plan of Action that are strongly associated with this one. The Global Plan of Action was designed as an integrated plan. Its successful implementation will depend on the complementarity of the activities. The success of any individual priority activity may therefore depend on implementation of another priority activity. For example, the "Securing of Existing *Ex Situ* Collections" (Activity 5) is highly dependent on actions arising from "Creating Comprehensive Information Systems for Plant Genetic Resources" (Activity 17). Because of this interdependence, not all actions needed to secure existing *ex situ* collections can be

listed under the priority activity of that name. Where interdependencies are particularly crucial, they are listed in this section.

23. On occasion, institutions or constituencies are specificially identified in the body of an Activity. This is not meant to imply their exclusion in other Activities. Such references are used to highlight a role which is particularly critical, or one which may otherwise be overlooked, or both.

MAJOR ELEMENTS AND RECOMMENDATIONS OF THE GLOBAL PLAN OF ACTION

24. The Global Plan of Action aims to promote the conservation, sustainable utilisation, and fair and equitable sharing of benefits of plant genetic resources. The Plan consists of 20 proposed activities and associated recommendations, which it employs to achieve its aims. The major thrusts and propositions of the Global Plan of Action are highlighted below.

In Situ Conservation and Development

25. To date, most attention, funds, and scientific expertise have been focused on the *ex situ* conservation of plant genetic resources for food and agriculture. The agricultural systems that generated and maintained the diversity being collected and stored - systems often found in marginal areas - were scarcely appreciated and rarely considered very important to conservation. *In-situ* conservation of the diversity found within domesticated crops, however, occurs in the cultural and environmental context of the farm. The Global Plan of Action recommends systematic surveying and inventorying of such plants in these environments. Both the on-farm management of plant genetic resources and the *in situ* conservation of wild plants should be undertaken as a valuable and complementary adjunct to *ex situ* methods.

26. The majority of the world's farmers continue to rely predominantly on their own conservation, management, and improvement of their genetic resources. While much remains to be learned about farmer management and development of genetic resources, the rich diversity that exists today offers ample testimony of what has already been achieved. The Global Plan of Action builds on this legacy recommending new initiatives to support and enhance efforts to conserve and sustainably develop plant genetic resources on-farm, including training and greater access to genetic resources. A new partnership - the first signs of which can already be seen in existing genebank and NGO ventures - is needed between genebanks and plant scientists on one hand and farmers and their organisations on the other. By supporting the on-farm development of plant genetic sources, the Global Plan of Action seeks to share some of the benefits of genetic resources directly with the farming communities that have produced them historically.

27. The Plan calls for a new initiative by the international community, including FAO and the CGIAR system, to address disaster situations during which farmers lose indigenous, adapted planting materials. The international community has a responsibility - practical and humanitarian - to assist countries that have shared those resources in the past, including by the repatriation of materials. By installing the capacity to identify, multiply, and return these materials from genebanks around the world, the international community can help countries restore a sustainable agricultural system to areas affected by natural disasters, wars and civil strife. Both human lives and aid funds can be saved. The Plan recommends that consideration be given to establishing a multi-donor contingency fund to facilitate rapid response to such situations.

Ex Situ Conservation

28. *Ex situ* collections of plant genetic resources are an essential foundation of food security and sustainable agriculture. Judging from reports received during the preparatory process, many *ex situ* collections are endangered. Action must be taken soon if the material collected in past decades is to be saved. The Global Plan of Action recommends that a major programme be launched to transform the current diverse, poorly coordinated, often inefficient, and frequently redundant efforts into a rational, effective and sustainable system.

29. The *status quo* virtually mandates that every country develop a complete, stand-alone system with a long-term genebank as well as infrastructure and capacity for the many activities associated with *ex situ* conservation. Providing the approximately 130 countries that still lack long-term storage facilities with a genebank and guaranteeing operating costs to these and existing genebanks is not fiscally imaginable for the international community. Such a genebank system is beyond the means of most countries. More importantly, it is also beyond their needs, and beyond global requirements.

30. The Global Plan of Action proposes that each country be provided the opportunity to conserve its diversity under sustainable *ex situ* conditions which meet the highest international standards. The Plan provides for support for the maintenance of collections of countries lacking long-term storage facilities and calls upon existing facilities, including those of the CGIAR, to make space available for this purpose. Countries wishing to exercise this option should be able to do so on the basis of a legal agreement, a model for which could be drafted by FAO.

31. Much diversity in *ex situ* collections is currently endangered due to poor storage conditions and inability to regenerate deteriorating accessions. As called for in Agenda 21, action is needed now to regenerate materials. Large-scale general collecting, commonplace in earlier times, is not anticipated. However, well-informed, targeted collecting is necessary to rescue materials that may soon disappear in the field and to fill gaps. Such actions, involving relatively high, one-time costs are necessary if past investments in conservation and the genetic resources themselves are to be secured.

32. By putting conservation on a more rational footing and encouraging international and regional cooperation, conservation can for the first time be virtually guaranteed while simultaneously promoting cost effectiveness. Countries will then have the opportunity and means to devote more effort to developing and using their plant genetic resources.

Utilisation of Plant Genetic Resources

33. The farms, forests and rangelands of rural people are the principal stages upon which plant genetic resources for food and agriculture perform. Both the ecological and economic justification for conserving these resources has to do with their utilisation and performance in fields, gardens and forests. Conserved plant genetic resources provide the biological material for utilisation. But it is utilisation that provides the principal utilitarian purpose for conservation. When plant genetic resources are not fully utilised, they are not fully valued. Conservation is under-appreciated as a consequence, and the benefits that could be realised from plant genetic resources are unrealised. Conservation and utilisation of plant genetic resources for food and agriculture are thus inextricably linked. Strengthening this linkage and promoting better

utilisation of plant genetic resources are important means of giving concrete recognition to farmers' rights.

34. Plant genetic resources should be made more easily available and useful to plant breeders and farmers for further improvement. Many of the priority activities in the Global Plan of Action, from surveying and inventorying PGRFA, to on-farm improvement, to strengthening documentation systems, and increasing training and educational opportunities, focus on building the capacity to utilise plant genetic resources more fully.

35. More specifically, many breeders are deterred from using collections because of a lack of information and documentation. Accessions must be well described and documented if they are to be used efficiently. The Global Plan recommends a major initiative in evaluating accessions in existing collections for useful genetic traits. Otherwise, those wishing to obtain specific characteristics are faced with the daunting prospect of searching large collections with no guarantee of success. Properly identified and documented core subsets give breeders practical access to the full range of diversity to be found in otherwise large and unwieldy collections. More value could be added to plant genetic resources by fully evaluating and documenting them than almost any other priority activity. Without such work, the funds now invested in conservation may yield low returns in the future.

36. The Global Plan of Action recommends making the genetic material itself more easily usable through genetic enhancement and pre-breeding activities. Such work is necessary if diversity is actually to be incorporated into crop varieties. The Global Plan recommends focusing initially on the most pressing problems identified in certain priority crops. The tangible added benefit of these and other initiatives would be the broadening of the genetic base of our food crops, thereby furthering crop stability and world food security.

Institutions and Capacity Building

37. National programmes are the primary means for realizing each country's own goals and the objectives of the Global Plan of Action. The national programme is the link between international work and a country's constituency of rural people, farmers, foresters, and plant breeders. It is the mechanism through which much of the practical work must be done integrating more closely *in situ*, *ex situ* conservation with breeding, seed production and distribution. If national programmes are to meet the challenges of the future, their capacity will need to be strengthened. Capacity building is therefore, one of the foundations of the Global Plan of Action and a key part of each of the priority activities.

38. At the national level there is a need for countries to establish appropriate policy and institutional frameworks, including mechanisms for coordinated planning and action, and a programme strategy. Improved planning, priority setting, and management in national programmes are essential for countries to take full advantage of technical assistance, training, access to information and genetic materials, and improvements to infrastructure - elements contained in many of the individual priority activities of the Plan. The total effect of all the priority activities will be to create strong national programmes and sufficient capacity globally to meet anticipated needs into the next century.

39. Isolated, countries cannot benefit fully from plant genetic resources and related skills, capacities, technologies, and institutions. Regional and crop networks are crucial in facilitating plant genetic resources work, particularly for countries that suffer from limited capacity today. There is a need as well for a general framework of cooperation at the global level which ensures the necessary oversight, monitoring, legal and financing arrangements in support to national and regional activities. The Global Plan of Action calls for existing regional networks to be strengthened and new networks created in regions not presently served. In each region there should be an appropriate complement of crop and thematic networks. Support should be given to organize and service networks, and governments should commit themselves to active participation and support. The Global Plan of Action also provides for a series of follow up processes which will address the policy, legal, financial, and oversight/monitoring modalities of implementation.

40. The absence of integrated, fully developed and fully accessible documentation systems presents an insurmountable barrier to rationalizing conservation and to expanding and improving the use of plant genetic resources. The Global Plan of Action recommends giving high priority to constructing broad, user-friendly information systems. To this end, assistance is needed in the planning and development of documentation systems in many developing countries. Efforts by FAO and IPGRI to assess the status of plant genetic resources work globally and aid in planning and deployment of resources at all levels should be stepped up.

41. The Global Plan recommends strengthening activities to train and educate the personnel needed to implement the Plan, particularly at the national level. Support for advanced degree work as well as short courses in a number of technical, managerial and policy areas are required. The Global Plan of Action also recommends that raising public awareness should be a high priority so as to generate support for all genetic resources work at national and international levels.

42. Finally, the Global Plan of Action recommends that international cooperation as well as strengthened planning and coordination at all levels, is needed if the goals of conservation, sustainable utilisation and the fair and equitable sharing of benefits called for in the Convention on Biological Diversity are to be realised. There is a need to establish principals, criteria and obligations through an agreed policy and legal framework. Few of the priority activities described in the Plan, however, will be feasible without international cooperation and good will.

43. The Global Plan of Action presents tightly interwoven activities, because the Global System it seeks to develop further is one in which conservation, utilisation and sharing of benefits are seemlessly linked. The success of any activity inevitably depends on others. And the effectiveness of the Plan as a whole depends on the synergism created by its parts.

PRIORITY ACTIVITIES

In Situ Conservation and Development

(1) Surveying and Inventorying Plant Genetic Resources for Food and Agriculture

(2) Supporting On-Farm Management and Improvement of Plant Genetic Resources

(3) Assisting Farmers In Disaster Situations to Restore Agricultural Systems

(4) Promoting *In Situ* Conservation of Crop Wild Relatives and Wild Plants for Food and Agriculture

(1) Surveying and Inventorying Plant Genetic Resources for Food and Agriculture

44. **Assessment:** Rational conservation (both *in-situ* and *ex-situ*) ideally begins with the surveying and inventorying of existing resources. In order to elaborate policies and strategies for the conservation and utilisation of plant genetic resources for food and agriculture, national programmes need to know what resources exist in their countries. Countries that have ratified the Convention on Biological Diversity have acknowledged certain needs and responsibilities concerning this subject. Country Reports indicate that little systematic work has been done in this regard for many crops and their wild relatives.

45. **Long-term Objectives:** To identify, locate, inventory, and as feasible assess any threats to those species, ecotypes, cultivars and populations of plants relevant to food and agriculture, especially those that are of anticipated use.

46. To inform the development of complementary conservation strategies (e.g., weighing the advisability of collecting for *ex situ* conservation and/or continued conservation *in situ*) and national policies related to the conservation and use of plant genetic resources for food and agriculture.

47. **Intermediate Objectives:** To develop useful methodologies for surveying and inventorying plant genetic resources for food and agriculture.

48. **Policy/Strategy:** The surveying and inventorying of plant genetic resources should be considered as a step in the process of conservation and of reducing the rate of loss of biodiversity. Without the capacity to conserve and/or use, however, such work may have marginal utility. Thus, surveying and inventorying should ideally be linked to specific objectives and a plan, such as one for *in situ* conservation, or collecting, *ex situ* conservation, and use.

49. Ethnobotanical and indigenous knowledge should be recognized as important components of surveying and inventorying activities and should be properly considered in all such efforts.

50. **Capacity:** Countries should receive financial and technical support to survey and inventory plant genetic resources for food and agriculture.

51. Countries should be assisted in having appropriate access to existing and planned Geographic Information System facilities and information.

52. Training and capacity-building should be undertaken in areas such as taxonomy, ethnobotany, and eco-regional and agro-ecological surveying.

53. **Research/Technology:** Support should be given to developing better methodologies for the surveying and assessment of intra-specific diversity in agro-ecological systems.

54. Existing information sources should be used in research to determine to what extent wild relatives of domesticated species are already in protected areas.

55. **Coordination/Administration:** Most coordination must take place within country. Global level coordination is needed to provide linkages with existing *ex situ* and *in situ* conservation efforts.

56. Strong linkages need to be established with regional and crop networks and with the users of plant genetic resources (breeders and farmers) in order to inform, direct and prioritize the entire conservation process.

57. Coordination between relevant international organisations, *inter alia*, FAO, UNEP, UNESCO, IUCN and international agricultural research centres, should be further strengthened.

58. **This Activity Is Closely Linked With:**

Promoting *In Situ* Conservation of Crop Wild Relatives and Wild Plants for Food and Agriculture

Supporting On-farm Management and Improvement of Plant Genetic Resources

Supporting Planned and Targeted Collecting of Plant Genetic Resources for Food and Agriculture

Securing Existing *Ex Situ* Collections

Developing Monitoring and Early Warning Systems for Loss of Plant Genetic Resources

(2) **Supporting On-farm Management and Improvement of Plant Genetic Resources**

59. **Assessment:** Modern plant breeding has been remarkably successful in helping raise yields, especially in favorable environments. Still, the overwhelming majority of the world's farmers, as a matter of choice or necessity, engage in de-facto conservation and development of plant genetic resources as they select and save seed for the next planting season. These farmers typically live in "marginal" agricultural environments and practice low-input farming. Such farmers often lack access to new and diverse genetic materials which could be integrated into existing crops to improve production. Historically, farmer access to a broad range of germplasm in developed countries has contributed to yield increases and greater crop adaptability through farmer selection. It has also led in many cases to the rise of indigenous seed enterprises.

60. Without appropriate and creative intervention, prospects of markedly increasing the productivity of marginal-area and low-input farms through genetic improvements would appear gloomy. Yet, increased productivity is essential to achieve food security. Neither the private sector nor public agricultural research institutions presently have the capacity of serving this large, economically disadvantaged population adequately or completely.

61. An initiative focusing on participatory, on-farm management and improvement of plant genetic resources offers the potential to reach this large number of farmers and promote further agricultural development. It would, of necessity depend on farmers themselves and build upon and make use of their on-going efforts to improve their crops through mass selection and other breeding efforts. And, it would necessarily recognize the central role that rural women play in agricultural production in most developing countries. Programmes providing farmers greater access to appropriate genetic resources and training could assist farmers in improving various characteristics of their planting materials (such as disease or pest resistance, drought tolerance)

and in increasing food production. A number of governments, research institutes, and NGOs are now engaged in projects researching and promoting on-farm management and improvement of plant genetic resources. Significant technical and methodological questions remain. The capacity of these projects is limited, however, and the numbers of farmers they are reaching is relatively small. Thus, it would appear that the potential of on-farm improvement has yet to be realised.

62. **Long-term Objectives:** To improve the effectiveness of existing on-farm conservation, management, improvement, and use of plant genetic resources, including agroforestry systems. To provide a complement to *ex situ* conservation. To encourage recognition of farmers' rights at the international, regional, and national levels. To promote the equitable sharing of benefits from plant genetic resources as called for through the Convention on Biological Diversity. To foster the future emergence of private seed companies and cooperative enterprises as an outgrowth of successful on-farm selection and breeding. To encourage traditional seed exchange and supply systems.

63. **Intermediate Objectives:** To establish or strengthen programmes and networks for on-farm management of landraces, wild relatives of food crops, harvested food plants, rangeland and forest genetic resources. To extend the role of certain genebanks to include support for and provision of materials to on-farm improvement programmes . To build on-farm and garden programmes based on local systems of knowledge, institutions, and management, ensuring local participation in planning, management and evaluation. To gain greater knowledge about the dynamics, methodologies, effects, and potential of on-farm conservation and plant improvement. To focus greater public and scientific attention on the diverse roles that women play in production and resource management in rural households.

64. **Policy/Strategy:** On-farm activities are a means to improve existing practices in selected communities. They are complementary to and not a substitute for more formal varietal development and seed supply systems. Institutional flexibility will be needed in working with farming communities. No single plan or recipe is possible or advisable.

65. Governments should consider how production, price support and other policies, as well as agricultural extension and research services might facilitate and encourage on-farm management and improvement of plant genetic resources.

66. International Agricultural Research Centres should continue their present policies of releasing unfinished varieties to national programmes . Where appropriate, national research systems should consider strengthening local level capacity to participate in subsequent stages of breeding, including on-farm selection and adaptation.

67. Governments, donor agencies, international agricultural research centres, NGOs, and others should incorporate gender and socio-cultural factors into the design and implementation of agricultural research and plant genetic resources activities.

68. **Capacity:** Adequate support should be given to community-based institutions and user groups engaged in providing practical assistance to on-farm conservation and improvement work.

69. Considering the needs of the farmers served, genebanks and institutes such as CGIAR centres, should identify appropriate landraces for multiplication and/or develop new breeding populations incorporating specific characteristics into locally adapted materials for on-farm

improvement activities. Step-by-step incorporation and improvement should be encouraged rather than the hasty replacement of existing on-farm diversity. As a general practice, quantities of seed and planting materials distributed should encourage research and experimentation by farmers, and not be so large as to displace normal seed supply sources or on-farm seed management.

70. Interdisciplinary training programmes should be developed for extension workers, NGOs and others in facilitating and catalyzing on-farm activities, including selection and breeding techniques appropriate to supplement and improve those already used by farmers.

71. The focus of training programmes should be to help farmers better incorporate new knowledge and indeed become better "researchers," and formal sector researchers become better enablers and supporters of farmers. Training should be aimed at four different groups: scientists, technical support staff, extension agents (including NGOs), and farmers. Support for advanced degree work should include relevant work in the biological and social sciences. Training of extension agents should aim to increase their skills in crop identification, selection and breeding, and seed maintenance in order to provide the important bridge between national agricultural research staff and farmers.

72. Training of (and by) farmers should emphasize enhancing the identification of plant traits, selection/breeding, utilisation and maintenance of local crops. It is important to develop farmers' skills in selection of plants in the vegetative state and not only after harvest.

73. Training programmes should be designed in close collaboration with farmers and their organisations and be based on particular needs as they see~~m~~ them. Such programmes should not neglect the central role that women play in both influencing and directing the evolution of crops. Programmes should consider the different uses of biological resources by women and men, including women's concern for the multiple uses and processing requirements of crops.

74. **Research/Technology:** Three basic types of rigorous, multi-disciplinary scientific research are needed:

(a) ethnobotanical and socio-economic research to understand and analyse farmer knowledge, selection/breeding, utilisation, and management of plant genetic resources;

(b) population and conservation biology to understand the structure and dynamics of genetic diversity in local landraces (including population differentiation, gene flow, degree of inbreeding, and selective pressures); and

(c) crop improvement research, including research in mass selection and simple breeding as a means of increasing crop yields and reliability without significant losses of local biodiversity.

75. Scientific research should, when possible, be coupled with on-farm activities in order that the context and purpose of the work are fully appreciated. Research should assist in the monitoring, evaluation, and improvement of on-farm efforts. Research should be undertaken in a participatory and collaborative manner to foster interaction and cooperation between rural people and the staff of external institutions.

76. Methods should be developed and assistance provided for recording and linking *in situ* farm and garden management and conservation of plant genetic resources with national and regional genebanks and research institutes.

77. **Coordination/Administration:** Efforts in this area should allow for and encourage local, community-level initiatives in proposing programmes. Small, grass-roots projects should receive priority in funding and support services. Priority should be placed on areas and farmers not currently served by formal breeding programmes and unlikely to be served adequately in the near future. Subject to satisfactory progress, programmes should be sufficiently long (10 years or more) to achieve results.

78. Efforts should be coordinated closely with international agricultural research centres, including IPGRI, and with NGOs and farmers organisations. Collaborative programmes with other agencies, including UNDP, UNEP, IFAD, and the World Bank, should be undertaken, as feasible.

79. **This Activity is Closely Linked With:**

Constructing Comprehensive Information Systems for Plant Genetic Resources

Supporting Planned and Targeted Collecting of Plant Genetic Resources for Food and Agriculture

Developing New Markets for "Diversity-Rich" Products

Expanding Evaluation and Increasing the Number of Core Collections to Facilitate Use

Increasing Genetic Enhancement and Base-Broadening Efforts

Promoting Higher Levels of Diversity in Crops to Reduce Genetic Vulnerability

Promoting Under-utilised Crops and Species

Promoting Seed Production and Distribution

(3) Assisting Farmers In Disaster Situations to Restore Agricultural Systems

80. **Assessment:** In the modern world and especially in developing countries, people are threatened with and vulnerable to natural disasters, civil strife and war. Such calamities pose huge challenges to the resilience of agricultural systems. Often, adapted crop varieties are lost and cannot be recuperated locally. Food aid used as seed, combined with the importation of often poorly adapted seed varieties, can lower yields and keep them low for years. While addressing the immediate crisis, such practices can exacerbate hunger conditions, undermine food security and increase costs of donor assistance well into the future. Indigenous landraces lost during calamities can frequently be found in *ex situ* collections outside the effected country. Properly multiplied, such stocks can be returned to reconstitute locally adapted planting material, an essential component of sustainable agricultural systems.

81. **Long-Term Objectives:** To support farmers' and rural peoples' livelihoods and sustainable agriculture through the rehabilitation of agricultural systems based on locally adapted plant genetic resources. To avert adverse consequences of disaster-induced loss of plant genetic resources.

82. **Intermediate Objectives:** To establish a standing capacity to deliver seed of adapted local varieties over a period of several years to help re-establish indigenous agricultural systems in areas affected by natural disasters, war, and civil strife.

83. To establish institutional responsibilities and mechanisms for the identification, acquisition, multiplication, and re-introduction of appropriate genetic materials.

84. **Policy/Strategy:** Governments with the co-operation of relevant UN bodies and regional, intergovernmental and non-governmental organisations and taking into consideration farmers' organisations and their communities should establish necessary policies at all levels which will allow unhindered implementation of seed security activities in response to calamities.

85. For safety purposes, governments should consider duplication of plant genetic resources outside of the country, such as in genebanks of neighboring countries, and/or regional or international genebanks.

86. **Capacity:** FAO should establish agreements with appropriate agencies, especially relevant institutes of the CGIAR, for rapid acquisition and multiplication of materials. Such institutes should endeavour to ensure that their capacity is sufficient for the task.

87. Adequate information systems must be established to identify and track appropriate germplasm for reintroduction.

88. Governments should establish a multi-lateral trust fund to ensure that adequate funds are available to set in motion the multiplication of seed and to initiate other related activities in response to emergencies.

89. Governments should strengthen farmers' abilities to cope with disaster situations by supporting the re-emergence of local seed supply networks.

90. **Research/Technology:** Research should be undertaken to develop a range of options for rescue of *ex situ* collections and emergency seed collecting in the context of calamities, including war, civil strife, industrial accidents, and natural disasters.

91. **Coordination/Administration:** This programme should be coordinated administratively by FAO in close collaboration with WFP, UNHCR, UNDRO, IPGRI and the international agricultural research centres, regional plant genetic resources networks, governments of the countries affected, donor countries and NGOs.

92. Public awareness efforts are needed to sensitize the donor community and NGOs to the importance of adapted plant genetic resources in relief and rehabilitation efforts and to inform them of this programme. Such efforts should also increase awareness of the need for safety duplication of materials in other countries.

93. **This Activity Is Closely Linked With:**

Securing Existing *Ex-Situ* Collections

Constructing Comprehensive Information Systems for Plant Genetic Resources

Promoting Public Awareness of the Value of Plant Genetic Resources Conservation and Use

Developing Monitoring and Early Warning Systems for Loss of Plant Genetic Resources

Supporting On-Farm Management and Improvement of Plant Genetic Resources

(4) Promoting *In Situ* Conservation of Crop Wild Relatives and Wild Plants for Food and Agriculture

94. **Assessment:** Forests, rangelands and other ecosystems hold important plant genetic resources for food and agriculture, including endemic and threatened wild relatives of species used in agriculture, wild food plants, and other plants of importance to livelihood security. Many are not managed sustainably. Most of the world's 8500 national parks and other protected areas, moreover, were established for wildlife conservation with little concern for the conservation of wild plants and forest species of importance for food and agriculture. Management plans for protected and other areas should be broadened to conserve genetic diversity for these species to complement other conservation approaches.

95. Many protected areas are under threat of degradation and destruction. Moreover, they cannot now provide comprehensive geographical and biological coverage of the diversity of many species. It is thus necessary to complement the conservation in protected areas with measures aimed at conserving genetic diversity which lies outside such areas. *In situ* conservation implies comprehensive planning in which protection, production and genetic conservation aspects are considered and made complementary.

96. **Long-term Objectives:** To promote conservation of wild crop relatives, other food plants, and forest genetic resources in protected areas and on other lands not explicitly listed as protected areas.

97. **Intermediate Objectives:** To initiate planning and management practices which take into account wild relatives of crops and other wild species of current or potential value to food and agriculture. To gain knowledge of the uses, in particular by women, of wild foods and forest products, as sources of income and food.

98. To create a better understanding of the contributions of plant genetic resources to local economies, national food security, and environmental health. To improve management and planning and promote complementarity between conservation and sustainable use in parks and protected areas by *inter alia* broadening the participation of local communities in these processes.

99. To establish better communication and coordination between various institutes and organisations engaged in *in situ* conservation and land use management, nationally and regionally.

100. **Policy/Strategy:** Governments with the cooperation of the relevant UN bodies and regional, intergovernmental and non-governmental organisations and taking into the views of farmers and communities living near protected areas should:

(a) include among the purposes and priorities of national parks and protected areas, the conservation of plant genetic resources for food and agriculture, including appropriate forest and forage species, wild relatives of crop plants and species gathered wild for food;

(b) consider integrating conservation and management of plant genetic resources for food and agriculture in national land use plans;

(c) establish national and local objectives for protected area management through broad based participation, involving in particular, groups most dependent on wild plant genetic resources for food and agriculture;

(d) create advisory panels at the appropriate levels that involve farmers, indigenous people, plant genetic resources scientists, local government officials, and community leaders, to guide management of protected areas;

(e) recognize the ancestral domain of tribal and indigenous people and their rights to resources in protected areas, and recognize that women are a valuable source of information on the feasibility of *in situ* conservation and management practices;

(f) support indigenous peoples' efforts to manage living resources in protected areas, either through traditional practices and/or by developing new forms of community-state partnerships based on negotiated agreements;

(g) review existing environmental impact statement requirements to ensure an assessment of the likely effect of the proposed activity on local biodiversity for food and agriculture, particularly on wild crop relatives;

(h) integrate genetic conservation objectives in the sustainable management of plant species used as wild populations, in forests and other managed resource areas.

101. As appropriate and feasible, protected area policies should promote and sustain rather than restrict those human activities that maintain and enhance genetic diversity within and among plant species. Participatory approaches to protected and related area management should also be encouraged to reconcile the sometimes conflicting goals of conservation and local livelihood security.

102. **Capacity:** Governments should:

(a) develop a prioritized plan particularly for those ecosystems in which high levels of diversity related to plant genetic resources for food and agriculture are found, and conduct national reviews to identify those management practices needed to protect the desired level of genetic diversity for wild crop relatives and plants of importance for food and agriculture, including forest, forage, and aquatic plant species;

(b) inform/train local communities, as appropriate, in the identification, appreciation, and management of wild crop relatives and wild foods;

(c) catalog holdings of botanical gardens, private crop holdings, university collections, and other relevant collections and ensure that data and information from *in situ* conservation programmes are integrated into or linked with that of *ex situ* programmes .

103. **Coordination/Administration:** Governments should:

(a) establish inter-sectoral and interagency task forces to facilitate protected area planning and action that covers the full scope of biodiversity conservation. These task forces should help link formal *in situ* initiatives with related efforts such as habitat protection, ecosystem management, pollution prevention programmes and various mapping programmes , as well as with botanic gardens, genebanks, and other institutions responsible for *ex situ* conservation. In addition, institutions within countries and regions involved in *in situ* conservation should communicate regularly and collaborate in order to promote efficient and effective planning, priority setting and rational conservation activities.

(b) designate national focal points to catalyze national coordination of *in situ* protection programmes and liaise with other countries in the region;

(c) establish mechanisms for periodically reviewing and modifying conservation plans.

104. **This Activity Is Closely Linked With:**

Surveying and Inventorying Plant Genetic Resources for Food and Agriculture
Building Strong National Programmes
Constructing Comprehensive Information Systems for Plant Genetic Resources
Promoting On-farm Management and Improvement of Plant Genetic Resources

PRIORITY ACTIVITIES

Ex Situ Conservation

(5) Securing Existing *Ex Situ* Collections

(6) Regenerating Threatened *Ex Situ* Accessions

(7) Supporting Planned and Targeted Collecting of Plant Genetic Resources for Food and Agriculture

(8) Expanding *Ex Situ* Conservation through Botanic Gardens and Use of New Technologies

(5) Securing Existing *Ex Situ* Collections

105. **Assessment:** The number of genebanks in the world and the size of *ex situ* collections grew tremendously during the 1970 and 1980s in response to increasing awareness of threats to plant genetic resources. While most countries still lack long-term storage facilities, excess storage space as well as over-duplications of some material are thought to exist today in many individual genebanks and globally.

106. Inadequate provisions have been made by governments and donor agencies for the significant on-going maintenance costs of such facilities. The result has been a steady deterioration of many facilities and their ability to perform even basic conservation functions adequately. The severity of the threat to *ex situ* collections can be seen in the high percentage of accessions presently in need of regeneration and in reports by many countries of significant technical and administrative problems in genebanks. In addition, many genebanks house far more species than national breeding programmes are developing. While plant genetic resources may be valued for many different purposes, *ex situ* conservation costs - especially for non-unique, non-indigenous materials - may seem excessive and unwarranted if no breeding programmes are using them and options exist for less costly conservation.

107. With a more rational system based on better planning and more coordination and cooperation, costs could be reduced and conservation work placed on a scientifically sound and financially sustainable foundation. This would lay the groundwork for expanded utilisation of plant genetic resources, in the context of more effective conservation. To realise such a system, conservation options must be made available, particularly to the many countries presently lacking sufficient capacity to ensure the on-going *ex situ* conservation of plant genetic resources at the highest international standards.

108. **Long-term Objectives:** To safeguard existing unique and valuable diversity in *ex situ* plant genetic resources collections. To create an efficient, goal-oriented, cost-effective and sustainable system. To minimise conservation costs as a means to increase development/utilisation efforts and maximise benefits.

109. **Intermediate Objectives:** To develop and strengthen the existing FAO *ex situ* network within the FAO Global System and in accordance with policies and strategies set out by the Commission on Genetic Resources for Food and Agriculture. To assemble therein sufficient capacity to provide options to countries for the voluntary storage - preferably within each region - of appropriate genetic materials and their duplicates. To provide for the transfer and on-going conservation of this material under internationally-sanctioned legal agreements and with appropriate technical and financial support.

110. To reduce unnecessary and unplanned redundancy in current programmes , and promote access to and exchange of information about plant genetic resources in line with the Convention on Biological Diversity. To provide for the duplication and safe storage of materials not currently duplicated.

111. **Policy/Strategy:** The international community is considered to have certain interests in and responsibilities for the *ex situ* conservation of plant genetic resources collected prior to the coming into force of the Convention on Biological Diversity. It is this understanding which provides the basis for an effective, integrated and rational global plan to secure existing collections.

112. In addition to any conservation efforts made by the source country, all appropriately determined materials should be duplicated and stored in two long-term facilities meeting international standards. Full use should be made of appropriate existing facilities, including those of the CGIAR. Unintended and unnecessary duplications between collections within the network should be reduced to promote cost efficiency and effectiveness in global conservation efforts. Countries should be assisted in identifying which genetic resources are already stored and duplicated in long-term facilities.

113. FAO in co-operation with countries and with relevant institutions should facilitate the formalizing of arrangements to safeguard diversity in *ex situ* collections through, *inter alia*, a model legal agreement allowing those countries so desiring to place collections voluntarily in secure facilities outside their boundaries. Such an agreement, as appropriate, should *inter alia*:

(a) acknowledge ownership of the material;

(b) guarantee quick access to the material by the providing countries;

(c) spell out the conditions, if any, for granting others (including the institution housing the material) access to the materials or information about them;

(d) detail the conditions under which the material would be stored and provisions, if any, for its characterisation, regeneration, and evaluation;

(e) allow for the facilities to be inspected and the material examined by the providing countries and/or the FAO at any time upon reasonable notice;

(f) fix the term of the agreement, with provisions for immediate termination by the providing country or termination by the host institution upon reasonable notice and,

(g) provide for the restitution or other arrangements for the safeguarding of material at the end of the agreement.

114. **Capacity:** Appropriate personnel for implementing and monitoring the above policies and agreements should be supported, provided, or trained, as appropriate. National programmes should evaluate current genebank management practices in light of the need to create more rational, efficient, and user-oriented *ex situ* conservation systems.

115. On-going conservation of collections of crops housed in CGIAR centres and part of the FAO network should be ensured. Sustainable funding should also be secured for other base collections in the network.

116. Support should be given to defray expenses incurred by institutions providing designated storage and related conservation and research/documentation services for other countries. This support should be sufficient to allow for all unique material to be identified, suitably duplicated, stored safely, and characterized, regenerated, evaluated, and documented as agreed, appropriate, and feasible. This would include the identification of materials both inadequately and excessively duplicated. Inadequately duplicated materials should be multiplied and placed appropriately in secure storage. Excess *ex situ* duplications of accessions would be maintained at the discretion and expense of countries. Expansion of some existing storage facilities and in rare cases the creation of new facilities may be required to meet the policies and objectives outlined above.

117. **Research/Technology:** Research should be aimed at the development of robust, low-cost techniques appropriate to local operating conditions. Technologies and procedures transferred from temperate climates may not be appropriate for conditions in tropical countries.

118. Research based on the improved documentation and information foreseen under this Plan, should be undertaken to inform decisions upon which a rational, effective system must be based. This might include, *inter alia*, research on identifying priority germplasm and duplications, on methods of testing viability of accessions, procedures for the rational conservation and duplication of vegetatively-propagated species, and on the modalities and technologies of conserving genes, genotypes and gene complexes.

119. **Coordination/Administration:** Technical coordination and oversight of the implementation of this activity should be under the policy guidance of the FAO Commission on Genetic Resources for Food and Agriculture. Implementation will require considerable planning and coordination. Active consultation is foreseen with national programmes , regional networks and crop networks.

120. Periodic administrative and technical reviews should be performed to assess the effectiveness of the actions taken. Subject to these reviews as well as the specific provisions of relevant legal agreements, financial support should foster long-term security and allow for efficient planning.

121. **This Activity Is Closely Linked With:**

Regenerating Threatened *Ex Situ* Collections
Assisting Farmers in Disaster Situations to Restore Agricultural Systems
Constructing Comprehensive Information Systems for Plant Genetic Resources
Expanding Evaluation and Core Collections to Facilitate Use
Building Strong National Programmes
Promoting Networks for Plant Genetic Resources

(6) Regenerating Threatened *Ex Situ* Accessions

122. **Assessment:** As accessions in *ex situ* storage decline in viability, both genes and genotypes are lost. Even under optimal *ex situ* storage conditions, all accessions eventually require regeneration in response to declining viability. Capacity for regenerating was often not considered when assembling collections and disseminating accessions, with the unintended consequence that much material collected in the past cannot now be properly maintained. Consequently, a large backlog of materials requiring regeneration exists today. An average of 50% of current national collections are in need of regenerating, according to substantial but incomplete data provided in Country Reports. Good planning and coordination will minimize the amount of material to be regenerated. But, without prompt and significant intervention, much of the stored genetic diversity of food and agricultural crops in the world - as well as the large public investment made in assembling the collections - will be lost forever.

123. Low initial sample size and viability as well as frequent demand for samples from long-term facilities can shorten the regeneration cycle. But, because proper long-term storage conditions should obviate the need for regeneration for decades and even centuries, one might expect average, routine, on-going annual regeneration requirements (as opposed to multiplication needs) to amount to fewer than 10% of accessions so conserved. However, some 95% of countries responding with specific information on regeneration report a far higher level of need, and most countries, both developed and developing, report technical, financial or other constraints to regenerating their material. Perhaps one million accessions may need to be regenerated to conserve the material in *ex situ* programmes. No global coordinating mechanism exists. Lack of information on accessions constitutes an additional constraint impeding rational regeneration. Most developing and many developed countries cite lack of long-term storage facilities, lack of facilities for handling cross-pollinated species, and inadequate funds and manpower, as major problems to overcome.

124. **Long-term Objectives:** To complete the first safe world-wide regeneration of accessions in *ex situ* storage, under conditions designed to preserve the genetic integrity of material. To create in the process the institutional linkages and experience to regenerate materials as it becomes necessary in the future.

125. **Intermediate Objectives:** To formulate a strategy, establish coordinating mechanisms, identify locations for regeneration, complete agreements needed to formalize cooperation among institutions, improve capacity and infrastructure as needed, and initiate action to regenerate targeted accessions.

126. **Policy/Strategy:** Priority should be given to:

(a) regeneration needs of samples currently in long-term storage or intended for placement in long-term conditions and experiencing a loss of viability as opposed to those in need of multiplication for other reasons. (Proper management will assure that accessions in long-term conditions will be generated mainly due to loss of viability and those in active collections multiplied due to loss of numbers - loss of viability in active collections indicates that the accession should be move to long-term storage);

(b) samples which meet the criteria of being globally unique, threatened, and having the potential of maintaining the diversity of the original sample;

(c) collections in the International Network of *Ex Situ* Collections under FAO auspices.

127. Input from crop and regional networks should be sought in the refining of priorities and identification of appropriate germplasm for regeneration.

128. Identification of specific samples should be made in cooperation with national programme breeders and curators, who often have intimate and detailed knowledge of collections and of the possible availability of similar materials from *in situ* locations.

129. As appropriate and feasible, regeneration efforts should strive to maintain the allelic and genotypic diversity and adapted complexes of the original sample.

130. Efforts should take into account the need to reduce unneeded redundancies within and between collections as a means of improving efficiency and minimizing on-going conservation costs. Regeneration should not be viewed as a means of maintaining collections in sub-standard conditions on a long-term basis. In this regard, it is noted that minimizing the frequency of regeneration is an important goal and consequence of other activities under the Global Plan of Action.

131. Governments, institutions, including in particular the CGIAR, and NGOs should:

(a) cooperate to make efficient use of existing capacity and to ensure that regeneration can take place, if scientifically, technically and administratively feasible, at sites closely approximating the origin of the original sample; and,

(b) promote and facilitate access to plant genetic resources for food and agriculture stored *ex situ* to minimise the need for storing identical samples in several locations, and the consequent need to regenerate each of them.

132. Characterisation activities should be undertaken in conjunction with regeneration, as feasible, without compromising the effectiveness or scientific goals of the regeneration exercise.

133. **Capacity:** As appropriate and cost efficient, proper facilities, human resources and equipment should be made available to national programmes and international institutions involved in regeneration activities undertaken as part of the Global Plan. Particular attention should be given to establishing or strengthening capacity for the regeneration of cross-pollinated species. Consideration should be given to offering international tenders for regeneration services and to the use of the private sector, farmers, and NGOs in this activity.

134. Genebanks should have the capacity for determining the status of their accessions and identifying and prioritizing those in need of regeneration.

135. Training programmes should take into consideration the need for personnel trained in the unique regeneration requirements of specific species.

136. **Research/Technology:** General guidelines for regeneration, and as appropriate, standards for regeneration for different species or groups of species, should be developed. Guidelines should, *inter alia*, provide guidance on how accessions are chosen for regeneration. They should take planning and management into account as well as applicability to different institutional situations and collection purposes.

137. Scientific methodologies for identifying and prioritizing choices of accessions to be regenerated through national as well as global efforts should be further developed.

138. Research should be undertaken to increase the effectiveness and efficiency of regeneration efforts broadly defined, including the identification of markers associated with seed longevity to assist in devising regeneration strategies, the causes of mutations in conserved germplasm, the negative effects of seed borne pests on genetic diversity in storage and the reduction of such, and various questions regarding breeding systems and technical problems associated with regeneration practices.

139. Data on existing accessions in *ex situ* collections should be assembled and analysed in order to assist in planning and implementation.

140. **Coordination/Administration:** An operational plan for a coordinated, global regeneration effort must be developed, coordinated, administered and implemented by the appropriate agency or agencies. It should include identification of institutions and locations for regeneration, be based on sound scientific practices, and consider the need for cost efficiency. The active involvement of crop and regional networks is important to the success of regeneration efforts, particularly in the identification and prioritization of germplasm to be regenerated. Similarly, national plans for regeneration should be formulated particularly in regard to plant genetic resources of purely national importance.

141. There should be on-going monitoring of the need for regeneration, including consideration of the prevalence of adequate duplication, storage behaviour of the species, storage conditions, and individual accession viability.

142. **This Activity is Closely Co-ordinated with:**

Securing Existing *Ex-Situ* Collections
Constructing Comprehensive Information Systems for Plant Genetic Resources
Expanding Evaluation and Core Collections to Facilitate Use
Building Strong National Programmes
Promoting Networks for Plant Genetic Resources

(7) Supporting Planned and Targeted Collecting of Plant Genetic Resources for Food and Agriculture

143. **Assessment:** The perception of threat and the potential for use are the prime motivating forces behind most collecting. The materials currently being conserved do not represent the total variation in plants. Global needs for collecting are not, however, as high now as 20 years ago due to progress made in the past two decades. CGIAR centres report that major crops have generally been well collected though gaps exist in some collections. Collecting of certain regional, minor, and subsistence crops is much less complete.

144. Past collecting missions conducted with inadequate methodologies may not have successfully sampled diversity. Conditions in genebanks may also have led to the loss of collected materials, leading to a need for re-collection. In some cases, collecting is needed to rescue materials under imminent threat *in-situ*. In others, clear utilitarian needs - for disease or pest resistance or other adaptive characteristics - make further collection warranted.

145. **Long-term Objectives:** To collect those species, ecotypes, landraces, or other cultivars, and associated information, that are under threat or are of anticipated use.

146. **Intermediate Objectives:** To begin to fill gaps in existing collections with well targeted and prioritized collecting.

147. **Policy/Strategy:** Collecting should be made in accordance with the Convention on Biological Diversity, in particular its provisions for Prior Informed Consent (Article 15), and with respect for the knowledge of indigenous and local communities (Article 8j). The FAO Code of Conduct on Plant Collecting provides useful, detailed guidelines. Where collecting missions are initiated by foreign agencies, they should be ideally undertaken jointly with national bodies.

148. Before collecting is initiated, full consideration should be given to the ability to conserve the material collected effectively and sustainably. The capacity to conserve should be a prime determinant in the launching of future collecting missions.

149. **Capacity:** Targeted collecting expeditions for well identified and pressing regional and global needs should be supported. Materials so collected should not be deposited in facilities where the result would be to over-burden the capacity of the facilities and thus threaten the sustainable conservation of existing accessions.

150. Training (including for extension workers, farmers and others) should be undertaken in scientific collecting methods for plant genetic resources for food and agriculture.

151. **Coordination/Administration:** Most coordination must take place within country. Global level coordination is needed to provide linkages with *ex situ* collections and gap-filling and regeneration efforts. Such coordination might concern the identification of global needs or specific needs of one country that could be met by plant genetic resources in another.

152. Strong linkages need to be established with regional and crop networks and with the users of plant genetic resources (breeders and farmers) in order to inform, direct and prioritize the entire conservation process, including surveying, inventorying and collecting.

153. Mechanisms need to be developed at all levels to support emergency collection of plant genetic resources.

154. As part of national plant genetic resources programmes, governments should designate a focal point for administering requests for collecting.

155. **This Activity Is Closely Linked With:**

Surveying and Inventorying Plant Genetic Resources for Food and Agriculture

Securing Existing *Ex Situ* Collections

Promoting *In Situ* Conservation of Crop Wild Relatives and Wild Plants for Food and Agriculture

(8) Expanding *Ex Situ* Conservation through Botanic Gardens and Use of New Technologies

156. **Assessment:** The diversity of many species of plants cannot be conserved conveniently or effectively as seed in traditional genebanks. Some species are vegetatively propagated. Others have seed which is called "recalcitrant," because it cannot be dried and/or kept in the low temperatures of a genebank. A number of major staple crops, tropical fruits, export crops, and forest species fall into these categories, including: cassava, yam, potato, sweet potato, plantain, sugarcane, oil palm, rubber, coconut, cacao, and tea. Due to technical difficulties, the conservation of genetic resources of such plants is often slighted.

157. Ornamental and amenity plant species as well as some food plants of local importance have been almost totally neglected by traditional genebanks. Collections are *ad hoc* and no coordinated efforts have been made to ensure that adequate germplasm samples are maintained for conservation and further development.

158. Botanic gardens, field genebanks, and the use of new technologies, including *in vitro* methods, could be developed more fully to complement and expand conservation of plant genetic resources for food and agriculture.

159. **Long-term Objectives:** To conserve and make available for improvement and use the full range of plant genetic resources for food and agriculture.

160. **Intermediate Objectives:** To develop management strategies for conservation of vegetatively propagated and non-orthodox seeded plants, as well as for species neglected in current conservation activities.

161. To promote the development and transfer of appropriate technologies for the conservation of such plants.

162. To encourage and strengthen the involvement of botanic gardens in the conservation of plant genetic resources for food and agriculture, particularly for those species for which they already have a comparative advantage.

163. **Policy/Strategy:** Governments, international agricultural research centres, NGOs, and funding agencies, should provide adequate, appropriate, and balanced support for the conservation of vegetatively propagated and non-orthodox seeded plants, as well as for ornamental and amenity, forest, and medicinal species.

164. **Capacity:** Botanic gardens and field genebanks should be strengthened, particularly in relation to their capacity to conserve species neglected by more agriculturally-related facilities. In this regard, capacity building is especially needed in developing countries. As appropriate, genebank facilities of botanic gardens might be strengthened.

165. Simple, low-cost botanic gardens, arboreta and field genebanks associated with universities, schools and other institutions should, as appropriate, be strengthened and encouraged to promote education and public awareness.

166. Support should be given to training in *in vitro* techniques and to other new and appropriate technologies. In accordance with regional needs and priorities, support should be given to establishing the capacity to use such technologies.

167. **Research/Technology:** Protocols should be developed for *in vitro* conservation and other conservation technologies for important vegetatively propagated and non-orthodox seeded plants.

168. An assessment should be made of the conservation needs of medicinal, ornamental, amenity, and other species for food and agriculture, including a survey of activities and collections as a prerequisite for further planning, coordination, and action. Such an assessment would also identify any pressing research needs regarding the *ex situ* conservation of such species.

169. **Administration/Coordination:** Crop and regional networks as well as relevant international botanic garden organizations, with the support of international agricultural research centres and national agricultural research systems, should regularly assess the state of conservation of vegetatively propagated and non-orthodox seeded plants, and make recommendations and take action as appropriate.

170. Links between international botanic garden organisations (such as the International Association of Botanic Gardens and Botanic Gardens Conservation International) and those responsible for and engaged in conservation of food and agriculture species (*inter alia*, FAO, IPGRI and other international agriculture research centres) should be strengthened. Similar links should be made between institutions, including the private sector (such as the nursery trade), at the national level. Practical cooperation should be encouraged as a matter of high priority.

171. **This Activity is Closely Linked With:**

Securing Existing *Ex Situ* Collections

Promoting *In Situ* Conservation of Crop Wild Relatives and Wild Plants for Food and Agriculture

PRIORITY ACTIVITIES

Utilisation of Plant Genetic Resources

(9) Expanding Evaluation and Increasing the Number of Core Collections to Facilitate Use

(10) Increasing Genetic Enhancement and Base-Broadening Efforts

(11) Promoting Higher Levels of Diversity in Crops to Reduce Genetic Vulnerability

(12) Promoting Under-utilised Crops and Species

(13) Supporting Seed Production and Distribution

(14) Developing New Markets for Local Varieties and "Diversity-Rich" Products

(9) Expanding Evaluation and Increasing the Number of Core Collections to Facilitate Use

172. **Assessment:** Genebank collections should enable users to respond to new challenges and opportunities. Typically, most genebank accessions have not been well evaluated, a situation that leads to the under-use of collections and failure to realise their full value, resulting in high conservation costs in relation to derived benefits. In Country Reports, lack of evaluation is cited as a major constraint to use of plant genetic resources in breeding programmes .

173. In practice, plant breeders (and most other users) are interested in having fairly small numbers of genotypes that possess, or are likely to possess, the characters needed in their breeding programmes . Identification of those characters through evaluation, and their subsequent placement in a core collection (a subset selected to contain the maximum available variation in a small number of accessions), are measures that can encourage greater and more efficient use of collections. Evaluation can also aid identification of germplasm of potential for more direct use by farmers.

174. In addition, evaluation (and characterisation) data as well as the wise use of core subsets are important in the overall efficient and effective management of collections.

175. **Long-term Objectives:** To increase and improve the ease of use of conserved plant genetic resources. To facilitate innovative progress in plant breeding through promoting the identification of useful accessions or their component genes for introduction into genetic enhancement and plant breeding programmes. To promote plant breeding that results in higher levels of genetic diversity in crops and agricultural systems. To identify germplasm of potential value for direct use by farmers in on-farm programmes.

176. To improve the efficiency of genebank operations in targeting collecting expeditions, optimising sampling strategies, optimising regeneration methodologies, identifying gaps in collections, rationalizing collections, establishing priorities for conservation, forming core collections, and quantifying the relative effectiveness of *ex situ* and *in situ* conservation.

177. **Intermediate Objectives:** To develop crop specific evaluation programmes to identify genes that allay those biotic and abiotic stresses which are limiting production of those crops.

178. To improve the efficacy of the evaluation process by developing and adopting new technologies for reliably detecting genes that have been identified as valuable.

179. To establish international core collections for approximately 10 crops of global significance and promote establishment of genebank-based core collections for key national crop collections in national facilities.

180. **Policy/Strategy:** Governments with the co-operation of the relevant UN bodies and regional, intergovernmental and non-governmental organisations, including the private sector, and taking into consideration views of the scientific community and farmers' organisations and their communities should:

(a) define priorities and periodically assess progress in evaluation in relation to the different needs of the various users of plant genetic resources, with emphasis on identifying traits limiting production in local staple crops and of crops of national economic importance;

(b) promote collaboration and complementarity between breeders, researchers, farmers and genebanks;

(c) encourage exchange of characterisation and evaluation information;

(d) develop effective means to encourage users of plant genetic resources for food and agriculture receiving materials from a national system to return any evaluation data to the source institute. Due regard should be given to the special needs of commercial users for a certain amount of confidentiality of their evaluation data; and

(e) financially support evaluation programmes for crop species of primary or exclusive importance to food security in their countries.

181. Genebanks should proceed carefully to develop core collections of crops of major interest to breeders. Genebanks should not use the existence of a core collection to function as an excuse for allowing conservation conditions for other accessions in the collection to deteriorate.

182. **Capacity:** Support should be given to begin a step-by-step, targeted evaluation programme for selected priority germplasm. The evaluation process would begin with an assessment of current information and an effort to assemble, collate, computerize, and make available existing information contained in notes, reports, punched cards, etc. Much evaluation work will need to be done in a use-oriented, site-specific manner.

183. Governments and appropriate organisations should identify institutions and individuals who may have the capacity and expertise to carry out germplasm evaluation for specific stresses and should develop a national portfolio of such expertise, including farmers in high stress areas who may perform preliminary evaluation to identify subsets of accessions that hold promise for further evaluation under more stringent scientific conditions. The cost efficiency of sub-contracting evaluation work should also be investigated as well as cooperative programmes between national programmes and the private sector, such as the LAMP project.

184. National programme staff should receive training in germplasm evaluation techniques on a crop-specific basis. Such training should begin with crops deemed important nationally, and for which there are current or planned breeding programmes .

185. In conjunction with on-farm improvement programmes , farmers should be trained as para-evaluators of plant genetic resources for food and agriculture. Women may be particularly useful in this role. As their responsibilities often extend from the propagation, production and harvesting of crops to the processing, storage and preparation of foods, women's knowledge of the uses and usefulness of plants is often extensive.

186. Support should be given for multiplication of core collection germplasm.

187. **Research/Technology:** Various kinds of research must be undertaken if the cost-effective use of current collections is to be encouraged. This could include support for scientific research to improve evaluation techniques, including those to facilitate the identification of genes directly rather than through observation in the field.

188. Research priorities concerning core collections include developing:

(a) improved methods of germplasm characterisation using biochemical and molecular methods;

(b) improved diversity stratification procedures;

(c) methods for validating core collection selections;

(d) methods for linking core collection to the main collection (sampling strategies); and

(e) improved methods of using plant genetic resources, including targeted trait detection.

189. In addition, an international symposium of germplasm experts should be convened to discuss the many technical issues involved in developing and using core collections and to stimulate activity in this area and complementarity with other aspects of the Global Plan of Action.

190. **Coordination/Administration:** Characterisation and evaluation efforts should be planned and implemented with the active participation of national programmes, and crop and regional networks. As appropriate, farmers' organisations, private companies and their associations, and others might also be involved.

191. Core collections should be developed with the active participation of breeders and crop networks for major crops. Work on core collections must be considered within and integrated firmly in the context of the entire effort to improve utilisation.

192. Cooperation and exchange of information are needed, especially by developing country genebanks that manage collections of wide species diversity without corresponding specialization among staff in all species.

193. There should be a periodic global assessment of the state of evaluation and the use of core collections to guide future work and assist in setting priorities. Such an assessment should be made in conjunction with plant breeders and in consultation with appropriate international agencies, institutions, and NGOs.

194. **This Activity Is Closely Linked With:**

Securing Existing *Ex Situ* Collections

Supporting On-farm Management and Improvement of Plant Genetic Resources

Regenerating Threatened *Ex Situ* Accessions

Supporting Planned and Targeted Collecting of Plant Genetic Resources for Food and Agriculture

Increasing Genetic Enhancement and Base-Broadening Efforts

Constructing Comprehensive Information Systems for Plant Genetic Resources

(10) Increasing Genetic Enhancement and Base-Broadening Efforts

195. **Assessment:** Broadening the genetic base of crops can contribute to increasing stability and performance in crops. However, from the perspective of any individual breeder, company or institute, the costs of incorporating new and diverse germplasm into already adapted material may outweigh the benefits they could realise. Such benefits are often realised only in the long-term and accrue to society in general as well as to other plant breeders. Due to the nature of many genetic enhancement and general pre-breeding activities, international collaboration and public support are warranted.

196. Two approaches to genetic enhancement are needed: (1) introgression of useful agronomic traits identified through evaluation into locally adapted or elite material for further use in breeding programmes ; and (2) base-broadening of breeders' material through incorporation of wide genetic diversity.

197. **Long-term Objectives:** To increase food security and improve farmers' livelihoods through the development of better plant varieties. To improve the utilisation of genetic resources and thereby provide incentives for their conservation. To reduce genetic uniformity in crop varieties. To increase sustainability and the capacity for adaptation to unexpected environmental changes.

198. **Intermediate Objectives:** To increase the genetic diversity available in breeders' populations through appropriate strategies of introgression and incorporation (base-broadening).

199. **Policy/Strategy:** Governments, international organisations, non-government organisations and funding sources should recognize the importance of providing long-term funding and logistical support to pre-breeding, genetic enhancement and base-broadening activities.

200. **Capacity:** Support should be given to International Agricultural Research Centres, national agricultural research systems, non-government organisations and other relevant organisations to carry out pre-breeding and genetic enhancement projects. Priority should be given to addressing problems identified by crop and regional networks, other competent scientific bodies and institutions, and farmers' organisations. Initial efforts should focus on the most pressing problems identified in 15 crops of international and regional significance.

201. **Research/Technology:** Relevant institutions, including the International Agricultural Research Centres, should further develop methodologies for genetic enhancement.

202. **Coordination/Administration:** Activities should be planned and undertaken in close collaboration with crop and regional networks, other competent scientific bodies and institutions, and farmers' organisations. Close communication with plant breeders in both the public and private sector should be encouraged.

203. **This Activity is Closely Linked With:**

Constructing Comprehensive Information Systems for Plant Genetic Resources
Expanding Evaluation and Core Collections to Facilitate Use
Supporting On-Farm Management and Improvement of Plant Genetic Resources

(11) Promoting Higher Levels of Diversity in Crops to Reduce Genetic Vulnerability

204. **Assessment:** Many major crops are, to quote an early National Academy of Sciences assessment of the US situation, "impressively uniform genetically and impressively vulnerable." Uniformity does not equate with nor necessarily lead to vulnerability. And the lack of perfect assessment and forecasting tools and methodologies means that the degree of vulnerability cannot be precisely identified. Nevertheless, it is important to monitor this situation in order to take remedial or precautionary actions when warranted.

205. As a precaution, some actions are warranted now to encourage and facilitate the use of more diversity in breeding programmes and in the varieties and species used on farms. The promotion of higher levels of diversity in crops and on farms is recognized as a means for adding stability in agricultural systems and promoting agricultural production and food security.

206. **Long-term Objectives:** To reduce genetic erosion and possible genetic vulnerability, and to promote sustainable productivity by facilitating use of genetic diversity in crops.

207. **Intermediate objectives:** To monitor genetic vulnerability in crops and take mitigating action nationally and internationally.

208. To develop and implement plant breeding and biotechnological strategies which result in higher levels of intra and interspecific genetic diversity being maintained within and between farming systems. To minimise regulatory and legislative obstacles to these objectives.

209. **Policy/Strategy:** Governments and relevant intergovernmental organisations in cooperation with crop networks, research institutions, the private sector, farmers' organisations and NGOs, should:

(a) Regularly monitor genetic uniformity and assess vulnerability in crops;

(b) review legislation and regulations which may have effects on genetic resources, the level of diversity in agricultural systems, and specifically the degree of genetic uniformity and vulnerability of major crops. With due regard for the need for commercial confidentiality, the disclosure of cultivar pedigrees should be encouraged to facilitate assessment and monitoring of genetic uniformity and vulnerability at national and international levels.

210. Funding agencies should provide support to international agricultural centres, national agricultural research systems, and other relevant research bodies and NGOs, for work aimed at enhancing levels of genetic diversity in agricultural systems. The release by the international centres of unfinished varieties to national programmes for further development, including on-farm improvement, is one measure which could bring higher levels of diversity, adaptation and stability to crops.

211. **Capacity:** Governments, and their national agricultural research systems, supported by the International Agricultural Research Centres, and other research organisations should:

(a) increase their capacity to develop and use multilines, mixtures and synthetic varieties, as appropriate;

(b) increase their capacity to use integrated pest management strategies, including the use of race-non-specific resistances, and the pyramiding of race-specific resistances;

(c) explore and, in appropriate circumstances, make use of decentralized and "participatory" plant breeding strategies to develop plant varieties specifically adapted to local environments;

d) make use of modern biotechnological techniques as feasible, to facilitate broadening of the genetic base of crops.

212. **Research/Technology:** Support should be given to research to identify appropriate technological strategies (plant breeding or biotechnologies) as well as farming systems and practices which maintain and maximise on-farm diversity. Such research might include a review of non-homogenous farming systems such as those based on intercropping, polycropping, integrated pest management, and integrated nutrient management, for their possible wider applicability, as well as research to develop decentralized, participatory and other appropriate plant breeding methodologies.

213. Support should be given for developing better tools and methodologies for assessing genetic vulnerability and identifying, if possible, the ideal equilibria in crops between genetic uniformity and diversity consistent with practical, technical and economic considerations.

214. **Administration/Coordination:** The Commission on Genetic Resources for Food and Agriculture, or an appropriate subsidiary body designated by the Commission, should be regularly informed of the state of diversity in collections and breeding populations of major crops of significance to world food security. The Commission should make such information available to other relevant intergovernmental bodies such as the Conference of the Parties to the Convention

on Biological Diversity, the International Plant Protection Convention, and the Commission for Sustainable Development.

215. **This Activity Is Closely Linked With:**

Developing Monitoring and Early Warning Systems for Loss of Plant Genetic Resources
Promoting On-farm Management and Improvement of Plant Genetic Resources
Expanding Genetic Enhancement and Base-broadening Efforts
Developing New Markets for Local Varieties and "Diversity-rich' Products

(12) Promoting Under-utilised Crops and Species

216. **Assessment:** While a small number of species provides a large proportion of global food needs, hundreds of other species are utilised at a local level, either through cultivation or harvesting. These under-utilised species contribute substantially to household food and livelihood security; they are often managed or harvested by women. Knowledge concerning the uses and management of these species is likewise often localized and specialized. Many under-utilised plants have potential for more widespread use, and their promotion could contribute to food security, agricultural diversification, and income generation, particularly in areas where the cultivation of major crops is economically marginal. However, current programmes for conservation, research and development tend to neglect these species.

217. **Long-term Objectives:** To contribute to agricultural diversification, increased food security, and improved farmers' livelihoods. To promote the conservation and sustainable management of under-utilised species and their genetic resources.

218. **Intermediate objectives:** To develop appropriate conservation strategies and sustainable management practices for under-utilised species; to improve selected species; to improve the marketing of under-utilised crops.

219. **Policy/Strategy:** Governments and their national agricultural research systems, with the support of the international agricultural research centres, and non-governmental organisations, and taking into account the views of farmers' organisations and their communities, should:

(a) consider providing more support to the development of those under-utilised species identified as having a potential to make significant contributions to local economies and food security;

(b) review legislation and regulations which may unduly inhibit the use of under-utilised species, and make changes or take mitigating action as appropriate;

(c) review land-tenure policies which have a negative impact on the sustainable management of under-utilised species, and consider changes or take mitigating action as appropriate.

220. **Capacity:** Training and capacity building for scientists and for farmers and local communities, with particular emphasis on women, should be provided in:

(a) identifying under-utilised species with potential for increased sustainable use;

(b) developing and implementing sustainable management practices for wild and semi-wild underutilised species;

(c) developing post-harvest processing methods;

(d) developing marketing methods.

221. **Research/Technology:** Research should be undertaken to:

(a) develop sustainable management practices for wild and semi-wild underutilised species and their genetic resources;

(b) develop post-harvest processing methods to improve marketing possibilities.

222. **Coordination/Administration:** Regional networks together with national programmes and in cooperation with international agricultural research centres, NGOs and other relevant organisations, should regularly review the status of under-utilised species in their region, to:

(a) identify possibilities for greater sustainable use;

(b) identify common research and development needs;

(c) facilitate, and as appropriate, coordinate requests for financial and technical assistance.

223. **This Activity is Closely Linked With:**

Supporting On-farm Management and Improvement of Plant Genetic Resources

Promoting *In situ* Conservation of Crop Wild Relatives and Wild Plants for Food and Agriculture

Developing New Markets for Local Varieties and "Diversity-Rich" Products

Promoting Public Awareness of the Value of Plant Genetic Resources Conservation and Use

(13) Supporting Seed Production and Distribution

224. **Assessment:** Farmers benefit from having a wide range of seed varieties and other planting materials. Availability can be constrained by: (a) poor harvests, inadequate on-farm storage facilities, insufficient means to multiply quality seed, and (b) poor seed distribution systems. These problems can apply to seed of both local and commercially-bred varieties. Parastatal and commercial seed companies sometimes have difficulty supplying seed of varieties specifically adapted to unique and local conditions. Often they cannot offer the range of varieties, or seed of so-called "minor" crops, on which many farmers rely, because of high transaction costs and low purchasing power of farmers. There is thus a need to strengthen local capacity to produce and distribute seed of many crop varieties, including some landraces, that are useful for diverse and evolving farming systems.

225. **Long term objectives:** To increase the availability of good quality seed of a wider range of plant varieties.

226. To contribute to the maximization of both agro-biodiversity and productivity.

227. **Intermediate objectives:** To improve the complementarity between governmental (or parastatal), commercial, and small scale enterprises in plant breeding, seed production, and seed distribution.

228. To develop and expand viable local-level seed production and distribution mechanisms for varieties and crops important to small-scale farmers;

229. To help make available to farmers new crop varieties, as well as suitable material stored *ex situ.*

230. **Policy/Strategy:** Governments and their national agricultural research systems, with support from international agricultural research centres and NGOs, and taking into account the views of the private sector, farmers' organisations and their communities, should:

(a) develop appropriate policies concerning governmental, commercial and informal enterprises in plant breeding, seed production, and seed distribution, to help focus efforts of government supported plant breeding initiatives on the varietal needs of resource-poor farmers in particular, with attention, where necessary, on the needs of women farmers. Such an approach should be complemented by encouraging the private sector to meet the needs of larger-scale, commercial farmers. Government involvement with those minor crops that are inadequately covered by the private sector should not be precluded;

(b) provide an enabling environment for the development of small-scale seed enterprises, including through appropriate incentives;

(c) strengthen linkages between genebanks, plant breeding organisations, seed producers, and small-scale seed production and distribution enterprises;

(d) consider seed quality control schemes appropriate to small scale enterprises.

231. **Capacity:** Governments, in conjunction with international aid agencies, NGOs and existing seed enterprises should:

(a) encourage existing seed enterprises to improve the range and quality of planting materials they offer;

(b) provide appropriate incentives, credit schemes, etc., to facilitate the emergence of small-scale seed enterprises, paying particular attention to the needs of women and of vulnerable or marginalized groups;

(c) provide support to and strengthen farmers' organisations in order that they can more effectively express demand for their seed requirements, paying particular attention to the needs of women and of vulnerable or marginalized groups;

(d) provide training and infrastructural support to farmers in seed technology, in order to improve the physical and genetic quality of farmer-saved seed.

232. **Research/Technology:** Governments should:

(a) assess current incentives and disincentives as well as needs for support to seed production and distribution enterprises, including small-scale, farmer-level efforts;

(b) develop approaches to support small-scale, farmer-level seed distribution, learning from the experiences of community and small-scale seed enterprises already underway in some countries.

233. **Coordination/Administration:** National capacity to provide farmers with appropriate seed should be regularly monitored by governments.

234. The potential for integrating this activity into agricultural development projects should be explored in collaboration *inter alia* with FAO, UNDP, the World Bank, and IFAD.

(14) Developing New Markets for Local Varieties and "Diversity-Rich" Products

235. **Assessment:** Increasingly, diversity is being replaced by uniformity in the agricultural market place. Changes in traditional cultures and in consumer preferences are one explanation. Concentration on productivity, the effects of advertising and the rise of global consumer markets offer additional explanations. Farmers worldwide are losing once-strong incentives to provide an array of varieties. Both in developed and developing countries, economic and social incentives could be offered to encourage farmers who continue to grow distinct, local varieties and produce "diversity-rich" agricultural products.

236. A programme to assist in the creation of specialized niche markets for biodiverse food crops could act as a positive stimulus to farmers to grow landraces, traditional varieties, and other under-utilized food crops.

237. **Long-term Objectives:** To establish stronger demand and more robust market mechanisms for landraces (farmer varieties) and related agricultural products.

238. **Intermediate Objectives:** To encourage farm suppliers, food processors, food distributors, and retail outlets to support the creation of niche markets for diverse foods, varieties and products.

239. **Policy/Strategy:** Governments should consider and as appropriate, adopt policies in extension, training, pricing, input distribution, infrastructure development, credit and taxation which serve as incentives for crop diversification and the creation of markets for biodiverse food crops, including standards for labeling of foods which allow the highlighting of use of non-standard crop varieties, by means of an approved logo.

240. As feasible and appropriate, governments should consider providing incentives or rewards to institutions that purchase "diversity-rich" foods for internal use, including staff cafeterias, or commercial purposes.

241. **Capacity:** Processes and activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biodiversity should be identified and their effects on crop diversification monitored.

242. Appropriate bodies, including NGOs, should promote public awareness in various media and through appropriate mechanisms, such as street fairs, initiatives in schools, etc.

243. **Coordination/Administration:** National and local level coordination and administration should be most effective.

244. **This Activity is Closely Linked With:**

Supporting On-Farm Management and Improvement of Plant Genetic Resources

Promoting Public Awareness of the Value of Plant Genetic Resources Conservation and Use

PRIORITY ACTIVITIES

Institutions and Capacity Building

(15) Building Strong National Programmes

(16) Promoting Networks for Plant Genetic Resources

(17) Constructing Comprehensive Information Systems for Plant Genetic Resources

(18) Developing Monitoring and Early Warning Systems for Loss of Plant Genetic Resources

(19) Expanding and Improving Education and Training

(20) Promoting Public Awareness of the Value of Plant Genetic Resources Conservation and Use

(15) Building Strong National Programmes

245. **Assessment:** National programmes are the foundation of regional and global genetic resources efforts; they are also a means to promote international cooperation on access to genetic resources and the fair and equitable sharing of the benefits arising from their use. Effective national programmes provide a link between in-country activities and those at the regional and global level. Many existing national programmes suffer from poor planning and management exacerbated by lack of resources and isolation from related activities.

246. Genetic resources activities involve government and private institutions and companies, non-governmental organisations, communities and individuals from the agriculture, environment and development sectors. The integration of existing genetic resources activities in the framework of a unified national programme provides the opportunity to enhance such diverse efforts within a country.

247. The integration of conservation and use is necessary to realise the full value of plant genetic resources. The traditional emphasis on centralised genebank facilities, however, tends to distract attention from use and focus it on *ex-situ* conservation activities which, if isolated, provide few benefits to the country. While conservation and plant breeding in developing countries are generally undertaken by government institutions, practical and institutional linkages between the two are often poor. Clearly articulated goals are frequently absent. The lack of holistic, goal-oriented planning mitigates the rational use of existing resources and results in inefficiencies, reduced benefits and lost opportunities.

248. **Long-term Objectives:** To identify and meet national needs though instituting rational, sustainable, effective, and equitable approaches to the conservation and use of plant genetic resources for the benefit of present and future generations.

249. To ensure adequate national capacity to participate in global efforts to conserve and use plant genetic resources and to share in the benefits arising from their use.

250. **Intermediate Objectives:** To help countries establish the essential elements of an integrated national programme: a recognized national status, appropriate policy and institutional frameworks, including mechanisms for coordinated planning and action, and a programme strategy.

251. To improve institutional and sectoral linkages and strengthen integration of institutional and community efforts.

252. To develop national capacities in the technical, managerial and policy areas.

253. **Policy/Strategy:** National programmes should have a formally recognized status. The ecological, economic, social and aesthetic values of plant genetic resources should be recognized in national planning and policies and in the prioritization and deployment of financial and other resources. Specific funding allocations should be made to plant genetic resources programmes in the budget process of national governments.

254. International assistance does not remove the need for domestic funding. National commitment to provide sustainable funding for national programmes and projects is essential.

255. National programmes should develop the capability to assess and determine the plant genetic resources required to meet national conservation and development needs and related international obligations and should have complementary policies on conservation, access, and use of plant genetic resources. In addition, governments should establish quarantine and other regulations regarding the import-and export of genetic materials which offer adequate protection without unduly restricting appropriate transfers of materials.

256. As appropriate to the level of development and complexity of existing institutional efforts, a national programme should provide for coordination amongst all relevant institutions and organisations in the country and link national work to regional and international activities. Integrated, holistic national strategies address more than genebank operations. They should effectively encompass conservation, development, and utilisation of plant genetic resources and the linkages between these areas. Establishment of broadly-comprised national committees will be an important means of organizing and coordinating efforts in most countries.

257. The actual structure and organisation of the national programme will depend on the infrastructure and capacities available in the country; policy decisions will determine programme strategy and mode of operation, in particular regarding international collaboration. In countries where capacities are limited, the strategy may include use of the physical facilities and technical expertise of other national programmes or of international institutions.

258. Existing programmes should consider establishing stronger partnerships with private enterprises, non-government organisations, rural communities and indigenous people. Cross-sectoral links should be forged with agencies engaged in national planning and other programmes concerning agriculture, land reform, and environment protection.

259. **Capacity:** Where appropriate, assistance upon request should be given to facilitate regular national planning and priority setting. High priority should be placed on the assessment and improvement of management practices in facilities such as genebanks and research stations.

260. Other measures needed to develop effective national programmes are contained in the recommendations associated with other activities.

261. **Research/Technology:** Research is needed on certain policy and institutional questions confronting national programmes , *inter alia* material transfer agreements, intellectual property rights, biodiversity, and trade laws and agreements pertaining to plants and plant parts, and the effect of these on the conservation, availability and use of genetic resources. Capacity to undertake such policy analysis on an on-going basis should be developed.

262. **Coordination/Administration:** International collaboration is necessary in a world where countries are interdependent and where they wish to establish practical, rational and economical means to conserve plant genetic resources, enhance their use, encourage access, and share benefits.

263. Plant genetic resources networks and international fora (*inter alia*, the FAO Commission on Plant Genetic Resources for Food and Agriculture, the Conference of the Parties to the Convention on Biological Diversity, UNEP, UNDP, UNESCO, and CSD) provide useful mechanisms through which countries can coordinate activities and agree on common policies, as appropriate.

264. **This Activity Is Closely Linked With:**

All other activities

(16) Promoting Networks for Plant Genetic Resources

265. **Assessment:** Networks are important platforms for scientific exchange, information sharing, technology transfer, research collaboration, and for the determination and sharing of responsibilities for such activities as collecting, conservation, evaluation, and genetic enhancement. By establishing links between those involved in the conservation, management, development and utilisation of plant genetic resources, networks can promote exchange of materials on the basis of mutually agreed terms and enhance the utilisation of germplasm. In addition, they can serve to help set priorities for action, develop policy, and provide means whereby crop-specific and regional views can be conveyed to various organisations and institutions.

266. Currently, a number of regional and crop-based networks are operating. Some networks, especially certain crop networks, are not fully functional. These are in need of strengthening. A number of new networks need to be organized in order to ensure that all regions benefit from the existence of active networks covering the crops / plants of importance to the region. The participation of countries with limited national capacity in plant genetic resources (*inter alia* many of the least developed countries and small island states) is particularly important, as it gives them access to information, technology and materials.

267. **Long-term Objectives:** To ensure that all countries are served by an active regional network and an appropriate complement of crop-based, thematic and *in situ* oriented networks.

268. To promote scientific exchange and cooperation, and to promote coordination, planning, and priority setting at the regional level, as a means to avoid duplication, and to strengthen and make more efficient existing work in plant genetic resources.

269. To facilitate the setting of regional goals and priorities and the implementation of these through existing national and regional institutions.

270. To facilitate consideration of integrated, eco-regional approaches to conservation of plant genetic resources.

271. **Intermediate Objectives:** To strengthen existing regional, crop and thematic networks.

272. To establish active regional networks in areas not currently covered by such, and within the context of these and existing networks establish or strengthen 5-15 crop and possibly theme-oriented networks, including *in-situ* networks, as appropriate and feasible for each particular region.

273. To facilitate and promote the participation of countries in these networks.

274. **Policy/Strategy:** Governments should as a matter of policy commit to active participation and support of regional, crop and thematic networks. Costs of such networks should, in part, be met by governments according to their ability. Such participation should be seen as benefiting the country and as a means for promoting the sharing of benefits with other countries. Both cash and in-kind contributions by governments to the networks should be considered as meeting these obligations and contributing to the implementation of the Global Plan of Action. Countries should have appropriate oversight over the activities carried out under the aegis of the networks.

275. Regional networks should play an active role in providing guidance for international agricultural research centres and regional institutions and efforts in order to ensure higher levels of communication, accountability, and synergy.

276. **Capacity:** The building of networks requires not only technical expertise, but substantial communication and organisation skills. It is first and foremost a problem of organizing, coordinating and facilitating. Resources should be provided for such activities as: planning; communication, including travel; meetings; network publications such as newsletters and reports of meetings; servicing and strengthening of the network.

277. For regional networks, priority should be given to strengthening existing networks or integrating countries not presently served into them, and to establishing new networks in the following regions:

(a) Pacific

(b) Caribbean

(c) CIS states of Central Asia

(d) West and Central Africa

(e) East Africa

(f) Indian Ocean Islands

278. **Research /Technology:** Networks provide a vehicle for implementing collaborative research in mutually agreed priority areas. As appropriate and feasible, research, training and technology transfer should be planned and/or implemented in collaboration with the networks.

279. **Coordination/Administration:** Resources should be made available to continue to service existing networks as appropriate and to organize and facilitate the development of new regional and crop-based networks.

280. **This Activity Is Closely Linked With:**

All Other Activities

(17) Constructing Comprehensive Information Systems for Plant Genetic Resources

281. **Assessment:** Many of the world's plant genetic resources are insufficiently and/or poorly documented relative to what should be known about them for optimal conservation, access and use. Documentation of wild relatives of cultivated crops located *in situ* is particularly poor. In *ex situ* collections, basic identification such as accession number and taxonomic name; where and how material originated; descriptions of basic morphological and agronomic characters; current viability test results; regeneration cycles; where the material has been distributed; and pertinent ethno-botanical information, farmer and indigenous knowledge, should ideally be maintained on all material conserved. A genebank or *in situ* programme lacking sufficiently trained personnel, proper infrastructure or sustainable resources to manage genetic resources data cannot reliably or fully conserve or promote the full use of its plant genetic resources. This situation is exacerbated due to the fact that at the national and institutional level, data management and documentation activities are typically given an inappropriately low priority in the allocation of funding. In the proper format, data can be used not only to assist conservation efforts, but to "add value" to plant genetic resources.

282. Historically, development in agriculture has not included a strong linkage to development in communication infrastructure, information use and information management. With rapid changes in information technology, development could proceed more quickly by providing sustainable communication and information access. Lack of access isolates individuals and institutes and prevents their being part of a visible framework in which their work can be seen as an integral component.

283. **Long-term Objectives:** To facilitate increased access to and better management and utilisation of plant genetic resources through the assembly, exchange, and provision of useful information.

284. To establish a reliable and accurate plant genetic resources data exchange network through the development of expertise and infrastructure at the global, regional, national, and facility levels.

285. To help countries assemble and better manage their existing information and to facilitate their access to globally and regionally held information.

286. **Intermediate Objectives:** To assemble available data and information in a usable form using accepted methodologies, databases and protocols.

287. To establish regional data management and exchange networks between genebanks to assist with provision of documentation systems and training of personnel.

288. To develop data and documentation system strategies with and for genebanks and breeding programmes and establish, as feasible, genebank database management systems at appropriate genebanks.

289. To support access to the global electronic communication infrastructure by genebanks and breeding programmes.

290. **Policy/Strategy:** High priority should be given at all levels to developing, staffing, and maintaining useful and user-friendly documentation and information systems.

291. The rights and concerns of farmers and indigenous people should be fully considered and respected in the acquisition and dissemination of information in accordance with the Convention on Biological Diversity, particularly Article 8(j).

292. **Capacity:** Planning assistance should be provided to national programmes to encourage the development of rational and compatible strategies for information management. Such strategies need not be electronic or computer-based, but computerization and linkages to other institutions and programmes through Internet should be an ultimate goal for many facilities.

293. Existing data and information should be assembled and put in a usable and easily accessible form and verified. Such material is often found in genebanks and research stations in scientists' notebooks and reports or contained in antiquated, inaccessible systems.

294. Access by national programmes to basic scientific, research, and bibliographic information should be facilitated.

295. Every genebank should have sufficient personnel to manage information and make it easily and widely accessible to users according to national goals. Education and training in data management and electronic communications should be provided at the genebank level, with emphasis on data management and analysis, connectivity, and data exchange. Such activities (including training of staff) should be supported as appropriate and feasible while considering the need to rationalize genetic resources efforts at the global and regional level.

296. Appropriate self-teaching manuals should be developed as needed. Technical support should be provided on a continuing basis to improve management of data and information and to allow for adoption of new, appropriate technologies.

297. **Research/Technology:** Research should be supported to:

(a) develop appropriate and low-cost methodologies and technologies for compilation and exchange of data;

(b) develop methods for adapting these technologies at the local level as appropriate;

(c) develop means to facilitate easy access and use of data by electronic means and through Internet;

(d) develop means and methodologies to make useful information easily available to non-specialists, including NGOs, farmers' and indigenous peoples' organisations.

298. **Coordination/Administration:** Coordination and collaboration should be further developed in the context of the World Information and Early Warning System being developed by FAO, and building upon the SINGER initiative within the CGIAR, the documentation work being done regionally by IPGRI, UNEP's Geographical Information System, UNESCO's Biosphere Information System, and national efforts. Such coordination should also seek to involve regional and crop networks and other users and conservers of plant genetic resources, including the private sector and other NGOs, as active participants and partners.

299. Global and regional assessment, oversight, planning, and coordination is needed to promote cost efficiency and effectiveness.

300. **This Activity Is Closely Linked With:**

All Other Activities

(18) Developing Monitoring and Early Warning Systems for Loss of Plant Genetic Resources

301. **Assessment:** Erosion of plant genetic resources can occur at two different levels: in genebanks or *ex situ* collections and in the natural environment. The former depends on the quality of the original material stored, and on the conditions under which the material is

maintained and multiplied. The loss of wild relatives can occur through loss or disturbance of habitat or natural disasters. Loss of genetic resources in cultivated crops occurs mainly through adoption of new crops or new uniform varieties of crops with the consequent abandonment of traditional ones.

302. Various factors, both natural phenomena and the results of human behavior, including urban expansion, agricultural modernization, civil strife and war, can put plant genetic resources at risk. Several countries were unable to submit Country Reports or participate in the preparatory process for the International Technical Conference due to these factors. Despite the implications of this, no formal mechanisms exist to monitor such situations, assemble information and initiate appropriate actions.

303. **Long-term Objectives:** To minimise genetic erosion and its impact on sustainable agriculture by monitoring key elements of genetic resources conservation and the various factors causing genetic erosion, and assembling information to enable remedial or preventive action to be taken.

304. **Intermediate Objectives:** To encourage monitoring at the national, regional, and global levels. To establish mechanisms to ensure that information is transferred to appropriate points designated as responsible for analysis, coordination and action.

305. **Policy/Strategy:** In accordance with Agenda 21, governments should periodically review and report on the situation of plant genetic resources for food and agriculture. Governments should designate / re-confirm a focal point to convey this information to FAO, the Conference of the Parties to the Convention on Biological Diversity, and other appropriate bodies.

306. Information from appraisals and environmental impact assessments of major development projects which may have a significant impact on plant genetic resources for food and agriculture should be made available to relevant national authorities.

307. **Capacity:** National programme personnel and allied workers at more local levels should receive short training in methods of gathering and interpreting information on plant genetic resources and the various threats to these resources.

308. FAO should maintain and expand its existing World Information and Early Warning System (WIEWS), including its coverage of matters concerning utilisation. The WIEWS should develop the capacity to acquire and analyse information in a timely fashion and to recommend remedial or preventive action.

309. **Research/Technology:** Research applicable to improving methods for surveying of plant genetic resources will also be useful to early warning systems.

310. Technical experts, representatives of national programmes, UNEP, UNDRO, the CGIAR, IUCN, NGOs, and the private sector, should be assembled or otherwise requested by FAO to develop further the mechanisms and modalities of an early warning system.

311. The utility of using remote sensing technologies should be investigated.

312. **Coordination/Administration:** The FAO WIEWS should collaborate closely with national focal points, national coordinators, regional and crop networks, the international agricultural research centres, UNEP, UNDRO, and other relevant organisations, to assemble and disseminate information, and to initiate action to rectify any significant threats identified.

313. Governments and aid agencies should ensure communication and cooperation between plant genetic resources programmes , development programmes , and organisations and agencies such as the World Bank, FAO, UNDP, UNEP, UNESCO, IFAD and the CGIAR.

314. **This Activity Is Closely Linked With:**

Surveying and Inventorying Plant Genetic Resources for Food and Agriculture

Supporting Planned and Targeted Collecting of Plant Genetic Resources for Food and Agriculture

Constructing Comprehensive Information Systems for Plant Genetic Resources

(19) Expanding and Improving Education and Training

315. **Assessment:** The importance of training in achieving sustainable improvements in plant genetic resources conservation and use is widely accepted. At a time when financial support to many programmes is threatened, funding for training has become particularly tenuous.

316. The dearth of well-trained personnel is evident at virtually all levels and in all scientific and technical specialties in many developing countries. Every sub-regional meeting in the preparatory process called attention to this. Both university programmes and short specialized courses offered by a variety of institutions, are typically oversubscribed. There is a great disparity in the educational and training opportunities available in the various regions. Moreover, programmes which combine technical training with exposure to the increasingly complex legal and policy issues associated with plant genetic resources, appear not to exist.

317. **Long-term Objectives:** To make available to every country according to their needs and priorities, training in all the relevant functions of conservation and utilisation, as well as management and policy.

318. **Intermediate Objectives:** To develop regional capacity for advanced training and to establish effective collaborative arrangements between relevant institutions in developed and developing countries.

319. To develop appropriate short courses and educational modules in subjects identified as priorities regionally.

320. To foster access to external training for those countries lacking national capacity.

321. To encourage institutions to include plant genetic resources aspects in related courses and programmes in biological sciences.

322. **Policy/Strategy:** Governments should recognize the appropriateness and importance of education concerning plant genetic resources at all levels.

323. Governments and institutions should commit themselves to providing training and advanced educational opportunities for existing staff.

324. **Capacity:** As feasible, support should be given to the development of institutions in each region, capable of providing advanced education in plant genetic resources. Support should also be given to students to complete degree programmes at these institutions. Collaboration between developed and developing country academic institutions, as well as relevant internships, should be encouraged. Educational programmes should have access to and should use the Internet for professional communication and data and information acquisition.

325. As regional institutions are being strengthened, existing capacity in developed countries should be used and supported, particularly if it is specifically tailored to the needs of developing countries.

326. In addition to current efforts, specialized training courses should be developed and regularly held for each region in a number of technical topics as well as in management, policy and public awareness.

327. Consideration should be given to developing the courses in a module form so as to be widely applicable and usable in different regions, while maintaining a distinctive regional focus. As feasible, courses should be offered in the language most appropriate for the region.

328. Special consideration should be given to on-site training for rural women, as they play a significant but sometimes unrecognized role in maintaining and developing plant genetic resources and associated knowledge and traditions.

329. At the global level, capacity to develop training materials and offer or coordinate training courses should be enhanced.

330. **Research/Technology:** Institutions should endeavor to link training with on-going research.

331. **Coordination/Administration:** Training courses should be developed and offered in close collaboration with regional networks and national programmes. In addition, advanced programmes should be developed in cooperation with relevant regional academic consortia or associations.

332. **This Activity Is Closely Linked With:**

All other activities

(20) Promoting Public Awareness of the Value of Plant Genetic Resources Conservation and Use

333. **Assessment:** Public awareness is the key to mobilising popular opinion and to generating and sustaining appropriate political action within countries and globally. The capacity to communicate the impact of genetic resources activities to key target audiences is critical to the success of any conservation programme.

334. A targeted public awareness programme can promote the development of international linkages and collaborative mechanisms such as networks. Within countries, public awareness can facilitate efforts to involve communities and local and non-governmental organisations in national genetic resources activities, thus ensuring a broader base for conservation. Strong linkages between public awareness work done by international organisations and national programmes and organisations can increase effectiveness and reduce costs.

335. **Final Objectives:** To integrate fully public awareness into all local, national, regional and international programme activities.

336. **Intermediate Objectives:** To support mechanisms, particularly in developing countries, for coordinated public awareness activities at all levels.

337. **Policy/Strategy:** National policies and planning should recognize the role that public awareness can play in establishing a firm basis for sustainable genetic resources conservation and use. Public awareness should not be considered as a separate function but should be a fully integrated part of all national programme activities. The public awareness potential of every project and activity should be considered at all stages of its formulation and implementation; this will have implications for the deployment of financial and other resources.

338. National strategies should identify objectives and strategies for public awareness, defining target audiences, partners and tools for public outreach. Governments should recognize and encourage the work of NGOs in raising public awareness.

339. Adequate consideration should be give to production of public awareness materials in appropriate languages to facilitate broad use within countries.

340. **Capacity:** Every genetic resources programme should have a focal point for public awareness. All genetic resources workers, however, should develop the capacity to articulate the importance of programme goals and activities in the broader context of sustainable agriculture and development. They should be able to communicate this to all stakeholders using tools provided by public awareness specialists.

341. At all levels, plant genetic resources programmes should consider enlisting the help of well-known and influential people to increase access to the media and attract added attention.

342. National genetic resources programmes should draw on public awareness tools and technologies generated at the regional and international level for use in their own information efforts. These tools -- and the messages they convey -- may have to be adapted to reflect national priorities and circumstances. However, it is likely that many of the regional and global messages will prove useful in supporting national public awareness strategies and activities. This will substantially reduce costs to the national programme.

343. Awareness of the value of plant genetic resources for food and agriculture, and of the role of scientists, plant breeders, farmers and communities in maintaining and improving them, should be promoted in schools at all levels, as well as in specialized agricultural research institutions.

344. **Research/Technology:** Research into or consideration of the information needs of targeted audiences should be made before launching major public awareness initiatives. At the global level, research into the use of the new information technologies to meet public awareness needs should be undertaken.

345. **Coordination/Administration:** A certain degree of coordination and facilitation is needed at the global level to rationalize and bring cost efficiencies to public awareness work. National programmes and others can take advantage of materials developed at the global level, for example through public awareness officers in FAO, UNEP, the CGIAR system, and NGOs, including the private sector. Linkages between international organisations and NGOs will facilitate the sharing of messages and the identification of opportunities for collaborative activities.

346. **This Activity Is Closely Linked With:**

All other activities

COSTING OF THE GLOBAL PLAN OF ACTION[1]

Table 1

Preliminary Cost Estimates Organized by Category and Tallied

(in US$ millions, annually, averaged over ten years)

Priority Activities	Option A	Option B	Option C
***In Situ* Conservation and Development**	17.0	24.2	39.2
***Ex Situ* Conservation**	33.7	51.7	79.5
Utilisation of PGRFA	45.1	60.7	108.5
Institutions and Capacity Building	34.8	51.6	76.6
Total	130.6	188.2	303.8

[1] Information on how the Secretariat costed the Global Plan, as well as some of the limitations of the to implement the activities, as well as their capacity to absorb certain actions. It points out that precise estimates are not possible for certain recommendations given current gaps in information, thus indicating exercise, is given in the Explanatory Note accompanying the Plan. The Explanatory Note observes that the costing of activities can be influenced considerably by the extent and speed with which governments want that a range of possible funding requirements might be appropriately offered. It also stresses that the costings are the Secretariat's indicative, order-of-magnitude estimates only.Three options providing three different levels of costing are given for each priority activity and each group of activities. Option A represents a basic or rudimentary approach to implementation of the activities and recommendations found in the Global Plan of Action. In situations where costs cannot be precisely determined (e.g., because the exact number of accessions to be regenerated is not known), it assumes the least costly of reasonable possibilities. The rate of implementation is slower and the number of countries or institutes covered (e.g., in training programmes) is lower than in other options. Option B represents a moderate approach to the costing exercise, based on intermediate assumptions regarding needs. Its rate of execution and general coverage is greater than Option A, but is consistent with known and documented needs and realistic absorbtion and implementation capacity of countries. Option C represents a more ideal, comprehensive and urgent approach to implementation of the Global Plan. Its coverage of countries and the speed with which certain activites are implemented are generally higher and less fiscally constrained than other options. Where precise costs cannot be determined, its assumptions provide for a greater degree of safety, while still falling within a reasonable range of expectations.

Table 2

Preliminary Cost Estimates Organized by Priority Activity[2]

(in US$ millions, annually, averaged over ten years)

Priority Activities	Option A	Option B	Option C	Partially Costed in Project Activity (ies)
***In Situ* Conservation and Development**				
1. Surveying and Inventorying Plant Genetic Resources for Food and Agriculture	2.1	3.0	7.3	
2. Supporting On-Farm Management and Improvement of Plant Genetic Resources	6.3	10.5	16.7	10
3. Assisting Farmers In Disaster Situations to Restore Agricultural Systems	4.7	5.1	5.3	5, 17, 16, 20
4. Promoting *In situ* Conservation of Crop Wild Relatives and Wild Plants for Food and Agriculture	3.9	5.6	9.9	17
Subtotal:	17.0	24.2	39.2	
***Ex Situ* Conservation**				
5. Securing Existing *Ex Situ* Collections	25.2	38.6	55.0	1
6. Regenerating Threatened *Ex Situ* Accessions	4.4	6.0	9.2	
7. Supporting Planned and Targeted Collecting of PGRFA	1.1	2.1	3.0	17, 3, 18
8. Expanding *Ex Situ* Conservation through Botanic Gardens and Use of New Technologies	3.0	5.0	12.3	
Subtotal:	33.7	51.7	79.5	

[2] See footnote 1 on previous page for an explanation of Options A, B, and C. The column entitled, "Partially Costed in Project Activity (ies)," indicates that a component of one activity has been costed under a separate activity. For example, information and documentation needs of Activity 3 (Assisting Farmers in Disaster Situations to Restore Agricultural Systems) have been costed under Activity 17 (Constructing Comprehensive Information Systems for Plant Genetic Resources). In this way, inter-relationships are noted and double-costing of certain actions is avoided.

Preliminary Cost Estimates Organized by Priority Activity (cont.)

Utilisation of PGRFA				
9. Expanding Evaluation and Core Collections to Facilitate Use	9.0	14.4	25.0	10
10. Increasing Genetic Enhancement and Base-Broadening Efforts	25.7	26.3	42.3	17
11. Promoting Higher Levels of Diversity in Crops to Reduce Genetic Vulnerability	3.7	7.9	16.7	10, 17
12. Promoting Under-utilised Crops and Species	1.7	4.1	8.2	
13. Promoting Seed Production and Distribution	3.2	5.5	10.3	
14. Developing New Markets for Local Varieties and "Diversity-Rich" Products	1.8	2.5	6.0	
Subtotal:	45.1	60.7	108.5	
Institutions & Capacity Building				
15. Building Strong National Programmes	3.6	5.3	10.5	all
16. Promoting Networks for Plant Genetic Resources	6.7	10.4	12.9	
17. Constructing Comprehensive Information Systems for Plant Genetic Resources	9.1	12.6	17.3	
18. Developing Monitoring and Early Warning Systems for Loss of Plant Genetic Resources	1.5	2.4	4.3	
19. Expanding and Improving Education and Training	9.8	14.0	22.0	all
20. Promoting Public Awareness of the Value of Plant Genetic Resources Conservation and Use	4.1	6.9	9.5	
Subtotal:	34.8	51.6	76.6	
Total	130.6	188.2	303.8	

FINANCING OF AND FOLLOW-UP TO THE GLOBAL PLAN OF ACTION FOR THE CONSERVATION AND SUSTAINABLE UTILISATION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

1. In order to implement the Global Plan of Action fully, Governments will need to take a number of steps, individually and collectively. These steps concern matters of oversight (both technical and policy), monitoring, coordination, and financing. This document outlines some of the issues involved and suggests a basic process for their resolution. It suggests that those issues be resolved principally through the Commission on Genetic Resources for Food and Agriculture rather than by the International Technical Conference. In accordance with guidance from the Commission on Plant Genetic Resources in its Sixth Session, it also provides a listing of (a) existing sources of funding for plant genetic resources for food and agriculture (PGRFA) activities; (b) options of financing mechanisms for the Global Plan of Action; (c) possible criteria for funding.

EXISTING SOURCES OF FINANCING

2. Two categories of possible funding for the Global Plan of Action can be identified: existing funds and new funds (through existing or new funding mechanisms).

3. Among existing sources of funding which may be applicable to the Global Plan of Action are, *inter alia*:

(a) bilateral official development assistance (including the European Union and a portion of the Consultative Group on International Agricultural Research (CGIAR) system)

(b) World Bank (including IDA and a portion of the CGIAR system)

(c) Global Environment Facility (including those funds administered in conjunction with the Convention on Biological Diversity)

(d) FAO (including the regular programme budget and FAO administered trust funds)

(e) United Nations Development Programme

(f) United Nations Environment Programme

(g) Other specialized UN trust funds

(h) International Fund for Agricultural Development

(i) regional development banks

(j) Non-Governmental Organisations (e.g. Worldwide Fund for Nature - WWF)

(k) Foundations

(l) Universities and research institutes

4. In addition there are non-concessional flows to plant genetic resources for food and agriculture from the private sector as investments or loans, from governments and the World Bank group as non-concessional loans, and from governments and institutes in non-ODA technical assistance (i.e., scholarships, fellowships, and non-ODA advisory missions).

5. Countries also use considerable internal funding to support their own PGRFA programmes.

6. Data made available to the Secretariat from countries, international organisations, and other sources, unfortunately did not permit a sound, comprehensive accounting of total international concessional flows or current total expenditures.

POSSIBLE NEW SOURCES OF FINANCING

7. In 1991, the FAO Conference[6] agreed :

(a) "that Farmers' Rights will be implemented through an international fund on plant genetic resources which will support plant genetic conservation and utilisation programmes, particularly, but not exclusively, in the developing countries;

(b) that the effective conservation and sustainable utilisation of plant genetic resources is a pressing and permanent need, and, therefore, the resources for the international fund as well as for other funding mechanisms should be substantial, sustainable and based on the principles of equity and transparency;

(c) that through the Commission on Plant Genetic Resources, the donors of genetic resources, funds and technology will determine and oversee the policies, programmes and priorities of the fund and other funding mechanisms, with the advice of the appropriate bodies."

[6] Resolution 3/91, annex 3 to the International Undertaking.

8. The FAO Conference did not, however, determine the size, nature, or priorities of this fund or the "other funding mechanisms" referred to in the Resolution. To facilitate agreement on these matters, the Commission recommended that the preparatory process for the Fourth International Technical Conference be used to assess what was needed to ensure the conservation and sustainable utilisation of PGRFA both in technical and financial terms.

9. The institutional location of the fund and the organization(s) that should be responsible for its administration have been given preliminary consideration by the Commission on Genetic Resources for Food and Agriculture. Some of the options are presented below. These options are not necessarily mutually exclusive.

10. The need for the Global Plan of Action to have a secure financial basis has been noted. However, the lack of comprehensive data on current levels of international concessional flows, as well as an agreed budget and estimate of possible savings, makes its difficult to determine the level of incremental external concessional financial flows that will be needed to implement the Plan.

11. The multitude of existing independent channels for financing PGRFA also means that there is almost certainly duplication of efforts and loss of effective development financing through fragmentation of project planning and supervision. A significant increase in effectiveness would result from more coordinated decision-making and priority setting.

12. Some savings would result from full implementation of the recommendations and initiatives of the Global Plan of Action. These savings are difficult to estimate, because they would depend on the manner and degree to which the Plan was implemented, and would be associated with different activities and might be experienced at different levels among different institutions. Tracking such savings would be difficult. Were these savings applied to other aspects of the Plan, however, the need for net additional resources would be correspondingly reduced.

13. Supplemental resources for PGRFA could be obtained from a re-prioritization of existing bilateral and multilateral financing from such fields as agricultural and rural development, and from reallocation of domestic agricultural expenditures. Some of the proposed activities, such as securing existing *ex situ* collections and restoring agricultural systems following disasters, might be reasonably financed through such reallocations.

14. A number of possible new and potentially complementary options for funding for the Global Plan of Action have been identified. Without prejudice to negotiations of the revision of the International Undertaking, or further elaboration of the Convention on Biological Diversity, a list of options for consideration could include:

(a) a new fund managed by the Global Environmental Facility in a similar manner to GEF's current arrangements for management of funds to implement the Montreal Protocol. Under such an arrangement, governments would make special allocations to a new GEF fund for plant genetic resources for food and agriculture.

(b) an arrangement with the Global Environmental Facility to draw upon their existing resources on biodiversity and any additional resources for biodiversity that may evolve from a joint agreement between GEF, the Conference of Parties to the Convention on Biological Diversity, and FAO.

(c) a special trust fund, either voluntary or mandatory, managed by FAO to implement the Global Plan of Action. Under this arrangement, governments would make special allocations that could be used to implement specific programme needs of the agreed Plan. Consideration might be given to opening such a fund to contributions by the private sector.

15. Other resources might be accessed on an *ad hoc* basis. In addition, the Global Plan of Action could be initiated without a fund, though only partially and with reduced effectiveness, through yet-to-be-determined mechanisms of coordination, priority setting, and allocating of existing resources.

CRITERIA FOR FUNDING

16. The following criteria are largely derived from the criteria and priorities for funding as agreed by the first Conference of the Parties to the Convention on Biological Diversity[7] .

17. All projects and programmes should either:

(a) have an integrated approach (including institutional and human capacity building, promotion of national strategies, policies and plans for priority action, socio-dimensions such as those related to poverty alleviation) addressing both conservation and utilisation; or,

(b) address clearly identified factors which limit the conservation and sustainable use of PGRFA, or address emergency situations.

18. Additionally, where appropriate, projects should:

(a) promote the conservation and/or sustainable use of indigenous species in the centres of origin and other areas of high diversity in PGRFA;

(b) promote the conservation of and sustainable use of PGRFA in environmentally vulnerable areas such as islands, arid and semi-arid and mountainous areas;

(c) identify PGRFA of actual or potential socio-economic importance under threat and processes which threaten such PGRFA;

(d) strengthen the conservation, management and/or sustainable use of PGRFA under threat;

(e) promote the sustainability of project benefits;

[7] Policy, strategy, programme priorities and eligibility criteria for access to and utilization of financial resources, UNEP/CBD/COP/1/17, Annex I.

(f) include innovative measures, such as economical incentives, aiming at conservation and/or sustainable use of PGRFA (including measures which assist developing countries to address situations where opportunity costs are incurred by local communities and measures to identify ways and means by which these can be compensated);

(g) strengthen the involvement of local and indigenous people in the conservation and sustainable use of PGRFA (including, where appropriate through the involvement of local non-governmental organisations and community organisations, and with particular attention to the role of women in PGRFA conservation and use);

(h) have national priority status and contribute to fulfilling the obligations of the Convention on Biological Diversity and the revised International Undertaking;

(i) offer a potential contribution to experience in the conservation of and sustainable use of PGRFA which may have application elsewhere;

(j) contribute to building cooperation at the sub-regional, regional and international levels;

(k) promote utilisation of local and regional expertise;

(l) promote cooperation for joint development of, access to, and transfer of technology;

(m) encourage scientific excellence;

(n) provide access to other international, national and/or private sector funds and scientific and technical cooperation.

19. Priorities might also be set for species and for areas of diversity.

PROPOSALS FOR CONSIDERATION BY THE INTERNATIONAL TECHNICAL CONFERENCE FOR FOLLOW-UP TO THE GLOBAL PLAN OF ACTION

General considerations

20. The Global Plan of Action was developed on the basis of a worldwide survey of the state of plant genetic resources for food and agriculture (PGRFA) and an analysis of the requirements as they emerged from a process of regional and subregional consultations. Input was received from many other sources, including the CGIAR (in particular, IPGRI), NGOs (including the private sector), and individual scientists. The preparatory process benefited from the guidance given by the Commission on Plant Genetic Resources. Once reviewed by the International Technical Conference, in particular as regards the overall priorities, the Global Plan of Action with the cost estimates, will constitute the best collective judgment on, and assessment of the "demand side," namely of what is considered from a scientific and technical point of view as necessary to conserve and utilise PGRFA sustainably on a global scale. The follow-up processes, within the overall context of the FAO Global System for the Conservation and Utilisation of

Plant Genetic Resources, should then address the "supply side," namely the political, legal, and financial commitments which will condition the actual implementation of the Plan, including related oversight and monitoring.

21. Having given its best assessment of what is required, the International Technical Conference will be invited to map out the processes and actions that will be needed to ensure concerted national action and international cooperation within the framework of the Global Plan of Action. It should also agree, not on the financing mechanism and level of funding for the Global Plan, but rather on the steps by which the funding mechanism(s) will be determined and the resources mobilised in its support. In this process, the demand and the supply sides will have to be mutually adjusted over time to ensure that the Global Plan of Action is a "rolling" plan as requested by UNCED.

Principles in Implementing the Global Plan of Action

22. It is understood that the Global Plan of Action will be implemented, as feasible, through activities at the national level with a view to meeting the requirements of individual governments and their people, both men and women of present and future generations, in a sustainable way. It should support and facilitate the effective realization of present international agreements on biodiversity and on PGRFA, including in particular the revised International Undertaking on Plant Genetic Resources, as well as the future development of other agreements.

23. In considering institutional implications of the follow-up processes at the international level, the International Technical Conference may wish to take into account the following suggested general principles:

(a) The Plan should not be thought of as individual activities implemented in isolation from one another. There will be need for a coherent, holistic overview not just on policy matters, but from the practical level of implementation. Moreover, adjustments will need to be made to the Plan as it is implemented in order to take advantage of new possibilities and address unforeseen problems. These adjustments must be made on a scientifically sound basis and in light of the total situation, including the interactions of the different components of the Plan.

(b) The Global Plan should be implemented through processes and structures which ensure intergovernmental accountability, primarily through the Commission on Plant Genetic Resources for Food and Agriculture (CGRFA). Full use should be made of existing technical and scientific competence. In this regard, provision should be made, as appropriate, for the full participation of institutions such as IPGRI.

(c) International cooperation in the implementation of the Plan should achieve economies of scale in meeting certain requirements at the regional and/or global level, promote efficiency and the rational use of resources through planning, coordination, and priority setting, and enable an equitable sharing of costs and benefits among the parties concerned.

The further development of the framework for the implementation of the Global Plan of Action

24. In order to implement the Declaration, the Global Plan of Action, and the other relevant international agreements, existing or in the making, individual governments may have to develop or adjust their policies, their legislation, rules and regulations on PGRFA. They may wish to enter into new bilateral, regional and multilateral agreements.

25. The process concerning the revision of the International Undertaking in harmony with the Convention on Biological Diversity, should be facilitated by the implementation of the Global Plan of Action. In this context, specific international instruments may be required for follow up activities of the Global Plan, such as on exchange of genetic material.

26. As far as PGRFA are concerned, the Commission on Genetic Resources for Food and Agriculture (CGRFA) should continue to serve as the forum for the negotiation of such instruments and for the monitoring of their implementation. The FAO Conference, the Conference of Parties to the Convention on Biological Diversity and the Commission on Sustainable Development should be kept informed of the progress of these negotiations and facilitate their conclusion. As appropriate, these bodies should be called upon to approve or endorse relevant international instruments.

27. In developing their national policies and legislation and in negotiating bilateral or regional agreements related to the Global Plan of Action, some governments may request specialized legal advisory services from external sources of assistance. FAO should give high priority to and continue to respond to these requests along with other multilateral and bilateral agencies and NGOs, and develop guidelines, manuals and comparative legal studies to support these activities.

The follow-up process for the funding of the Global Plan of Action

28. Many sources of funding could be expected to be involved in providing funds for the implementation of the Plan. First and foremost are the national and local government budgets, complemented, as feasible and appropriate, by voluntary contributions from the private sector, local NGOs and communities since the largest part of the Plan is to be implemented at national and local levels. In particular, individual governments and other national institutions are likely to wish to review their structures, their programmes, and budgets, after the International Technical Conference in order to step up their efforts for PGRFA conservation and utilisation.

29. At the international level, two types of funding requirements will emerge: those related to increased demands for assistance in building national capacities and those related to the further development of international activities.

30. As regards the former, a country-driven process should be carried out by which requests for international support to national activities and capacity building will be formulated as technical assistance projects and demands for investment support loans and grants. Each government and national institution may direct these requests and demands to diverse appropriate funding sources, multilateral or bilateral, governmental or non-governmental. In order to meet these requests, funding institutions may decide through their respective governing bodies to

establish specific criteria, and review procedures as well as specific budget lines or "windows". Coordination of these initiatives, under the aegis of the CGRFA, should be pursued, *inter alia*, through informal consultative donor meetings and through formal meetings of established funding bodies such as the GEF or in conjunction with such meetings. The developments in this field should be similar to the process which took place before and after UNCED as regards the mobilization of funds for capacity building.

31. The latter comprises in particular those activities which are international such as the development of genebanks serving international needs, the regeneration of their accessions, the development of international information systems, regional networks, and the support to the negotiation of international agreements. In addition to some of the funding sources mentioned above, the funding requirements of these activities should be met from the regular budgets of international institutions concerned (IGOs and NGOs), as well as other funding mechanisms such as the CGIAR, the WWF, and the fund to be established as part of the Global System for PGRFA in conjunction with the revision of the International Undertaking and the realization of Farmers' Rights. In order to ensure an adequate coordination of these diverse sources of funding, each of them should undertake a review of their programmes and budget in the light of the Global Plan of Action and determine which activities they could finance. Consultative meetings may then be called to assist in the coordination of the funding sources.

32. In view of the multiplicity of the funding sources, existing and potential, there is a need for monitoring of the financial flows contributing to the Global Plan with a view to avoiding duplication, competition, imbalances, and gaps. Systematic surveys of these flows should be undertaken periodically by FAO, enlarging the scope and focusing on specific segments of the Plan as part of a multi-year programme of the CGRFA for monitoring the implementation of the Plan as described further below. In so doing, the CGRFA may examine the need for special fundraising initiatives by existing bodies and the desirability of innovative financing mechanisms for some elements of the Global Plan of Action.

Oversight and monitoring of the implementation of the Global Plan of Action

33. In many instances, the implementation of the Global Plan of Action at the national level will require the development of new, or the reinforcement of existing mechanisms to guide and coordinate national activities and inputs in international activities. Such mechanisms will depend on the particular conditions and policies of the country and may include, for example, some sort of inter-ministerial committee assisted by one or more scientific/technical/legal advisory bodies as well as a "multi-stakeholder" consultative body involving representatives of the diverse public and private contributing parties to the implementation of the Plan.

34. This machinery should prepare the necessary policies, legal, institutional and budgetary measures to enable the formulation and execution of a coordinated national plan for PGRFA conservation and utilisation and be charged with the responsibility of its oversight and monitoring. It should also determine the position and participation of the country in international fora and related activities.

35. The secretariat of the above-mentioned national mechanism should be placed normally with the appropriate ministry in charge of food and agriculture, but act in close cooperation with others dealing with broader aspects of biodiversity and *in situ* conservation, with research and technology, with international cooperation and foreign affairs, and with trade. It should ensure the day-to-day liaison with the secretariats of the international institutions concerned as indicated below. It should also promote the coordination of the external sources of funding for the national capacity building and other activities related to the Global Plan of Action.

36. Oversight and monitoring requirements at the international level will need to be determined by governments as part of the commitments taken in approving the Declaration and the Global Plan of Action and as part of their obligations under existing and new international instruments. Several aspects will have to be considered. There are already a number of oversight, coordination and cooperation mechanisms addressing specific aspects of the Global Plan of Action, crop-wise, activity-wise and region-wise. Under the auspices of the appropriate international organisations and the overall policy guidance and monitoring of the CGRFA, these mechanisms, or at least some of them, may have to be gradually streamlined, filling gaps and reducing duplication, while avoiding the proliferation of overhead structures. As much as possible, the modern telecommunication technologies should facilitate information exchange, dialogue and monitoring and replace the use of formally constituted working groups, ad-hoc committees and specialized networks for these tasks.

37. The CGRFA may need to establish monitoring and oversight arrangements in order to ensure that all the scientific and technical aspects of the Global Plan will be adequately guided and monitored. As regards the scientific and technical aspects of oversight and monitoring of the activities, several international institutions may, under the guidance of the CGRFA, contribute as part of their respective mandates. IPGRI acts as a focal point within the CGIAR system and has cooperative agreements with FAO and other institutions. By virtue of this and its technical capacity, IPGRI would have the major role in areas falling within its competence.

38. Overall progress in the implementation of the Global Plan of Action and of the related follow-up processes should be centrally monitored and guided by the governments, through the CGRFA which guided the preparation of the International Technical Conference and serves as the forum for other parallel negotiations. In order to discharge this function the CGRFA could develop, as the CSD did for UNCED follow-up, a multi-year programme of review of the Global Plan by tranches. Such review should deal with the progress made at national, regional and international levels and with the further elaboration of the Plan, thus making it a "rolling" plan as recommended in Agenda 21.

39. To this end, the CGRFA should set the formats for receiving progress reports from all the parties concerned and establish criteria and indicators to assess progress. In the light of its findings, the CGRFA may address recommendations to governments and international institutions to fill gaps, rectify imbalances or lack of coordination in certain areas, and to launch new initiatives or activities. Those recommendations of the CGRFA which have major policy implications should be referred to the FAO Council and Conference as was already the case with its predecessor body, the Commission on Plant Genetic Resources (CPGR), and as appropriate to the Conference of Parties to the Convention on Biological Diversity and/or to the Commission on Sustainable Development for action, endorsement or information.

40. The secretariats and inter-institution coordinating mechanisms which should service and support the above-described machinery already exist for the greatest part. The FAO secretariat services the CGRFA and has close cooperative arrangements with IPGRI, which in turn has cooperative agreements with the CGIAR centres and other institutions. The IACSD of which FAO and other CGIAR co-sponsors are members can address any broader interagency coordination issue and more specifically FAO, as Task Manager for Chapter 14 of Agenda 21 (which includes the section on PGRFA) is entrusted with the task of promoting interagency cooperation in this particular field.

41. It is likely, however that the requirements for secretariat support services and interagency cooperation will increase to some extent together with the volume of international cooperation activities. These requirements and the adequacy of existing arrangements may best be examined in the context of the multi-year programme of review of specific tranches of the Global Plan by the CGRFA and of its discussions and negotiations of new or modified international instruments. The CGRFA may on this opportunity address the necessary recommendations to the international institutions concerned.

42. Finally, it may be anticipated that at some point in time there will be a common felt need for a comprehensive assessment of the impact of the Global Plan of Action. It may also be necessary to re-launch international action and cooperation on the basis of a review of new requirements and problems as well as taking into account possible failures in the implementation of the Global Plan in some areas. This may require the convening of a 5th International Technical Conference on PGRFA to pursue and further develop the international cooperation which started under the auspices of FAO four decades ago, and give further impetus to the Convention on Biological Diversity, Agenda 21 and other international instruments in this field.