



# **Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture**

## **and the Leipzig Declaration**



**adopted by the  
International  
Technical Conference on  
Plant Genetic Resources  
Leipzig, Germany  
17-23 June 1996.**



**Food  
and  
Agriculture  
Organization  
of  
the  
United  
Nations**



## List of Acronyms

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CGIAR – Consultative Group on International Agricultural Research

CSD – UN Commission on Sustainable Development

FAO – Food and Agriculture Organization of the United Nations

IFAD – International Fund for Agricultural Development

IPGRI – International Plant Genetic Resources Institute

IUCN – World Conservation Union

NARS – National Agricultural Research Services

NGO – Non-governmental Organization

PGRFA – Plant Genetic Resources for Food and Agriculture

SINGER – System-wide Information Network on Genetic Resources of the CGIAR

UNDP – United Nations Development Programme

UNDRO – Office of the United Nations Disaster Relief Coordinator

UNEP – United Nations Environment Programme

UNESCO – United Nations Educational, Scientific and Cultural Organization

UNHCR – Office of the United Nations High Commissioner for Refugees

WFP – World Food Programme

WIEWS – FAO World Information and Early Warning System on Plant Genetic Resources



# Foreword



This, the first-ever Global Plan for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture, was formally adopted by representatives of 150 countries during the Fourth International Technical Conference on Plant Genetic Resources, which was held in Leipzig,

Germany, from 17 to 23 June 1996. The Conference also adopted the Leipzig Declaration, which focuses attention on the importance of plant genetic resources for world food security, and commits countries to implementing the Plan.

The Global Plan was prepared with the active participation of 155 countries, and the public and private sectors. It contains the priority actions they identified, at local, national, regional and international levels. It provides an integrated framework for systematic, rational, balanced and equitable cooperation. Countries must now carry it out. Much work will be done with their own national resources, but some countries will need additional support: the Conference confirmed that funds should be made available to finance the implementation of the Plan by developing countries and countries with economies in transition. The Plan also acknowledged the need to realize Farmers' Rights.

Plant genetic resources – one of the most fundamental and essential of all resources on Earth – are seriously threatened. Their loss will touch each one of us and endanger future generations. The lack of capacity to conserve and optimally utilize these resources undermines the quest for food security and sustainable development. The Global Plan of Action, for the first time, provides the impetus and framework for putting conservation and utilization activities on a solid foundation. It will be a major contribution to the implementation of the Convention on Biological Diversity in the field of food and agriculture. This is an opportunity we simply must not squander.

FAO is committed to carrying out the Global Plan of Action, under the guidance of the intergovernmental Commission on Genetic Resources for Food and Agriculture, as part of the FAO Global System for the Conservation and Utilization of Plant Genetic Resources.



The Leipzig Conference stressed the importance of enlisting the widest participation in the implementation of the Plan. As it requested, I am reporting on the Conference's outcome to major international, regional and national bodies and forums dealing with food, agriculture, and biodiversity, with a request that their member constituencies identify how best they may contribute.

I appeal to all – governments and national institutions, international technical and financial organizations, non-governmental organizations, the public and the private sector and, above all, farmers and farming communities – to join together in this crucial endeavour.

Jacques Diouf  
Director-General



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# Leipzig Declaration on conservation and sustainable utilization of plant genetic resources for food and agriculture

1. In recognition of the essential importance of plant genetic resources for food and agriculture, in particular for the food security of present and future generations, the representatives of one hundred and fifty States and fifty four Organizations have gathered together in Leipzig, at the invitation of the Food and Agriculture Organization of the United Nations, at the Fourth International Technical Conference for Plant Genetic Resources. We have done so to assert and renew our commitment to the conservation and sustainable utilization of these resources and to the fair and equitable sharing of the benefits arising from the use of plant genetic resources for food and agriculture, recognizing the desirability of sharing equitably benefits arising from the use of traditional knowledge, innovations and practices relevant to the conservation of plant genetic resources for food and agriculture and their sustainable use. We are convinced that these efforts can be an essential contribution to achieving the objectives, and facilitating implementation of, the Convention on Biological Diversity and Agenda 21.
2. Recognizing that states have sovereign rights over their plant genetic resources for food and agriculture, we also confirm our common and individual responsibilities in respect of these resources.
3. 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 and agricultural production sustainably and meet the related challenges of changes in the environment, including climate change. We are 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 natural evolution and human intervention. We acknowledge the roles played by generations of men and women farmers and plant breeders, and by indigenous and local communities, in conserving and improving plant genetic resources. Through their efforts, much has been, and is still being, accomplished to collect, conserve, improve and sustainably 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 sustainably use genetic diversity should be improved. This diversity is being lost in the fields and other ecosystems of virtually all countries, even 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 are 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 conserve, characterize, evaluate, and sustainably use plant genetic resources to increase world food security and contribute to sustainable development. The crucial linkage between conservation and utilization should be improved. Existing diversity in crop species is not used to the extent possible for increased food production or for improving the sustainability of production systems. Institutional capacity, structures and programmes should be reviewed to address these deficiencies. It is necessary to strengthen national capabilities, particularly in developing countries.

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 meeting world food security and needs of the growing world population, and must be facilitated. Such access to and sharing of technologies with developing countries should be provided and/or facilitated under fair and most favourable terms, including on concessional and preferential terms, as mutually agreed to by all parties to the transaction. In the case of technology subject to patents and other intellectual property rights, access and transfer of technology should be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights. We affirm the need to promote international and regional cooperation among countries, intergovernmental organizations, non-governmental organizations, and the private sector.

8. In particular, we acknowledge the pressing need to sustain existing ex situ collections and in situ habitats of plant genetic resources. It is important that this diversity be made more useful and valuable to breeders, farmers, and indigenous and local communities, by providing better and more accessible documentation. We recognize the need for substantial and long-term support and incentives for national and international 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 enhance world food security through conserving and sustainably using plant genetic resources. This will require integrated approaches combining the best of traditional knowledge and modern technologies. Means are needed to identify, increase, and share fairly and equitably the benefits derived from the conservation and sustainable use of plant genetic resources.

10. At the Fourth International Technical Conference for Plant Genetic Resources, to help fulfil our objectives, we have adopted a Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture. This Plan





provides a coherent framework for activities in the field of *in situ* and *ex situ* conservation, in sustainable utilization of plant genetic resources, as well as in institution- and capacity-building. It will contribute to creating synergies among on-going activities, as well as more efficient use of available resources. We are convinced of the utmost importance of long-term national commitments to integrated national plans and programmes, and for indispensable national, regional and international cooperation.

11. This Global Plan of Action is an important element of the FAO Global System for Conservation and Utilization of Plant Genetic Resources. The Global System presently includes, amongst other elements, an International Undertaking on Plant Genetic Resources currently under revision. We believe it important to complete the revision of the International Undertaking on Plant Genetic Resources and to adjust the Global System, in line with the Convention on Biological Diversity.

12. We undertake to honour our commitments by taking the necessary steps to implement the Global Plan of Action in accordance with our national capacities.

13. We have gathered in Leipzig, aware of our responsibilities and the difficulties ahead, but confident that progress can and should be achieved. We stress the need for integrating the conservation and sustainable use of plant genetic resources for food and agriculture in agricultural policy as an essential element for food security. We invite attention to be paid to the Global Plan of Action at the World Food Summit, to be held in November 1996. We invite all people to join us in our common cause.

*Adopted this 23rd day of June, 1996.*

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# Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture

## Introduction

1. Plant genetic resources for food and agriculture provide the biological basis for world food security, and 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 essential for sustainable agricultural production. Properly managed, these resources need never be depleted, for there is no inherent incompatibility between conservation and utilization. The conservation, sustainable utilization, 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. In reaffirming the sovereign rights of states over their biological resources, we highlight the fact that formulating an agreed Global Plan of Action addressing plant genetic resources for food and agriculture is an appropriate manifestation of the international community's concern and responsibility in this area.

2. In 1983, the FAO Conference established the intergovernmental Commission on Plant Genetic Resources (now the Commission on Genetic Resources for Food and Agriculture), and adopted a non-binding International Undertaking on Plant Genetic Resources, which, is being revised by the Commission in harmony with the Convention on Biological Diversity. Presently, the Global System for the Conservation and Utilization of Plant Genetic Resources for Food and Agriculture includes the Commission, other international agreements, including the above-mentioned International Undertaking, technical mechanisms and global instruments at different stages of development.

3. The Global Plan of Action is part of the FAO Global System for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture, and an important element for the Commission in fulfilling its mandate, though requiring also other important elements to complete it. Agenda 21 and the Commission requested the development of a rolling Global Plan of Action on Plant Genetic Resources for Food and Agriculture, with programmes and activities aimed at filling in gaps, overcoming



constraints and facing emergency situations identified in the FAO Report on the State of the World's Plant Genetic Resources. The periodically updated Plan will permit the Commission to recommend priorities and to promote the rationalization and coordination of efforts.

4. The Global Plan of Action will cover the subset of 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.

5. 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." The Second Extraordinary Session of the Commission "agreed that forestry would not be included in the Global Plan of Action to be discussed for adoption at the Leipzig Conference, on the understanding that this matter could be considered in future, in the light of the work of the Inter-governmental Panel on Forestry established by the Commission on Sustainable Development on this issue." Future refinements or elaborations of the Plan could include other subsets of plant genetic resources for food and agriculture.

6. A global plan of action will make significant and increasingly important contributions to the efforts to promote world food security.

## **The rationale for a Global Plan of Action specifically for food and agriculture**

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7. A discrete Global Plan of Action for Plant Genetic Resources for Food and Agriculture is warranted because of their great importance to world food security and, 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, plant breeders have built on this rich diversity with striking effect. Sustainable management of these resources requires particular strategies sensitive to their unique nature. Unlike most natural biodiversity, these resources require continuous active human management.
- (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 human migrations, many crop genes, genotypes, and populations have spread all over the planet since 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. Millions of accessions are now stored in hundreds of genebanks around the world for both conservation and utilization 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 medicinal plants.
- (e) Plant genetic resources for food and agriculture are under-conserved and under-utilized.
- (f) Activities related to *in situ* conservation, to *ex situ* conservation, and to utilization of plant genetic resources for food and agriculture 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) Despite the existence of a variety of sources of financing for the conservation and sustainable use of plant genetic resources for food and agriculture, there are still gaps, overlaps, inefficiencies and unnecessary redundancies in the activities financed. In addition, national programmes are at very different stages of development, in their coverage of conservation and use of plant genetic resources for food and agriculture. An agreed Global Plan of Action could help to focus resources on the priorities which have been identified at various levels, and increase the overall effectiveness of global efforts.

## Aims and strategies of the Global Plan of Action

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8. 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 and information on each proposed priority activity. It agreed that the aims would refer to, and draw upon, as appropriate, applicable international agreements.

9. The main aims of the Global Plan of Action are:

- to ensure the conservation of plant genetic resources for food and agriculture (PGRFA) as a basis for food security;
- to promote sustainable utilization of plant genetic resources for food and agriculture, in order to foster development and to reduce hunger and poverty particularly in developing countries;
- to promote a fair and equitable sharing of the benefits arising from the use of plant genetic resources for food and agriculture, recognizing the desirability of sharing equitably benefits arising from the use of traditional knowledge, innovations and practices relevant to the conservation of PGRFA and their sustainable use.



- Confirming the needs and individual rights of farmers and, collectively, where recognized by national law, to have non-discriminatory access to germplasm, information, technologies, financial resources and research and marketing systems necessary for them to continue to manage and improve genetic resources.
- Developing and/or strengthening policies and legislative measures, as appropriate, to promote fair and equitable sharing of benefits arising from the utilization of PGRFA in their exchange between communities and within the international community.
- to assist countries and institutions responsible for conserving and using PGRFA to identify priorities for action.
- to strengthen, in particular, national programmes, as well as regional and international programmes, including education and training, for the conservation and utilization of PGRFA and to enhance institutional capacity.

10. The Global Plan of Action is based on the assumption that countries are fundamentally interdependent with respect to plant genetic resources for food and agriculture 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 six basic and inter-related aspects:

- (a) A large and important amount of PGRFA, vital to world food security, is stored *ex situ*. These collections need to be developed effectively in coming years. 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. Many collections, however, are stored under inadequate conditions, and as many as one million accessions may be in need of regeneration.
- (b) Linking conservation with utilization and identifying and overcoming obstacles to the greater use of conserved plant genetic resources for food and agriculture 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 use and development of institutions, programmed human resources, cooperation, and financial mechanisms.
- (d) Strengthening the selection efforts of public and private breeders, which are essential to the continued improvement of PGRFA.
- (e) *In situ* conservation and development of PGRFA occurs in two contexts: on-farm and in nature. Farmers and their communities play a crucial role. It is important to better understand and improve the effectiveness of on-farm management of PGRFA. Improving the effectiveness of farmer/community level conservation, management, development and use of PGRFA is essential to facilitate the sharing of benefits arising from the utilization of these resources. Enhancing the capacity of farmers and their communities through linkages to extension agencies, the private sector, NGOs and farmer-owned cooperatives would help promote food security, particularly among the many rural people who live in areas of low agricultural potential. Wild relatives of crop plants also require better protection through improved land-use practices.
- (f) Conservation and utilization strategies at the community, national, regional and international levels are most effective when they are 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 interrelated approaches, including *in situ* and *ex situ* efforts.

## Structure and organization of the Global Plan of Action

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11. 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 Utilization 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.

12. 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 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 should be developed or provided.
- (e) The Research/Technology section, including technology development and transfer, identifies areas of scientific, methodological, or technological research or action relevant to 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 "Sustaining Existing *Ex Situ* Collections" (Activity 5) is highly dependent on actions



arising from “Creating Comprehensive Information Systems for Plant Genetic Resources for Food and Agriculture” (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.

13. On occasion, institutions or constituencies are specifically 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.





# In Situ Conservation and Development

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1. **Surveying and inventorying plant genetic resources for food and agriculture**
2. **Supporting on-farm management and improvement of plant genetic resources for food and agriculture**
3. **Assisting farmers in disaster situations to restore agricultural systems**
4. **Promoting *in situ* conservation of wild crop relatives and wild plants for food production**

## 1. Surveying and inventorying plant genetic resources for food and agriculture

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14. **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 utilization 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.

15. **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.

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

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

18. **Policy/strategy:** The surveying and inventorying of plant genetic resources for food and agriculture 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.

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

20. **Capacity:** Countries should provide and may need financial and technical support to survey and inventory plant genetic resources for food and agriculture.



21. Countries should provide and may need assistance in having appropriate access to existing and planned Geographic Information System facilities and information.
22. Training and capacity-building should be undertaken in areas such as taxonomy, population biology, ethnobotany, and eco-regional and agro-ecological surveying.
23. **Research/technology:** Adequate support should be given to developing better methodologies for the surveying and assessment of intra- and infra-specific diversity in agroecological systems.
24. Existing information sources should be used in research to determine to what extent wild relatives of domesticated species are already in protected areas.
25. **Coordination/administration:** Most coordination must take place within country. Regional and global level coordination is needed to provide linkages with existing *ex situ* and *in situ* conservation efforts.
26. Strong linkages need to be established with national, regional and crop networks and with the users of plant genetic resources for food and agriculture (breeders and farmers) in order to inform, direct and prioritize the entire conservation process. Countries should collaborate in surveying and inventorying activities in order to build in-country capacity.
27. Coordination between relevant international organizations, *inter alia*, FAO, UNEP, UNESCO, IUCN and international agricultural research centres, should be further strengthened.
28. **This activity is closely linked with:**
- Promoting *in situ* conservation of wild crop relatives and wild plants for food production
  - Supporting on-farm management and improvement of plant genetic resources for food and agriculture
  - Supporting planned and targeted collecting of plant genetic resources for food and agriculture
  - Sustaining existing *ex situ* collections
  - Developing monitoring and early warning systems for loss of plant genetic resources for food and agriculture

## 2. Supporting on-farm management and improvement of plant genetic resources for food and agriculture

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29. **Assessment:** Modern plant breeding has been remarkably successful in helping raise yields, and to improve resistance to pests and diseases and quality of food products, especially in favorable environments. Farmers choose to grow new cultivars for many reasons including market conditions, family food security and environmental sustainability. Unfortunately, these choices often result in significant on-farm genetic erosion. Still, in some countries, the overwhelming majority of farmers, as a matter of choice or necessity, engage in *de facto* conservation and development of plant genetic resources for food and agriculture as they select and save seed for the next planting season. These farmers typically 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 local seed enterprises.

30. Without appropriate and creative approaches, prospects of markedly increasing the productivity of low-potential and low-input farms through genetic improvements alone also would appear limited. Yet, increased productivity is important for food security and to reduce pressure on fragile environments. Neither the private sector nor public agricultural research institutions presently have the capacity of serving this large, economically disadvantaged population completely. Many governments are seeking to realize farmers' rights through national legislation, as appropriate.

31. Initiatives focusing on participatory, on-farm management and improvement of plant genetic resources for food and agriculture may offer the potential to reach large numbers of farmers and promote further agricultural development. It would, of necessity, depend on farmers themselves and their decisions 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. Efforts to provide 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), 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 for food and agriculture. 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 the full potential of on-farm improvement may not yet be realized.

32. **Long-term objectives:** To better understand and improve the effectiveness of existing on-farm conservation, management, improvement, and use of plant genetic resources for food and agriculture. To achieve a better balance between *ex situ* and *in situ* conservation. To realize Farmers' Rights as defined in FAO Resolution 5/89 at the international, regional, and national levels. To promote the equitable sharing of benefits from plant genetic resources for food and agriculture as called for in the Convention on Biological Diversity. To foster the future emergence of public or private seed companies and cooperative enterprises as an outgrowth of successful on-farm selection and breeding. To encourage traditional seed exchange and supply systems.

33. **Intermediate objectives:** To gain greater knowledge about the dynamics, methodologies, effects, and potential of on-farm conservation and plant improvement. To establish or strengthen programmes and networks for on-farm management of farmer's varieties, wild relatives of food crops, harvested food plants and rangeland genetic resources. To extend the role of national, regional and international 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 focus greater public and scientific attention on the diverse roles that women play in production and resource management in rural households.



34. **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. Working examples must be identified of conservation and sustainable use of plant genetic resources for food and agriculture that support and maintain the social, economic and cultural values of local and indigenous communities and improve the quality of life.

35. Governments should consider how production, economic incentive, and other policies, as well as agricultural extension and research services might facilitate and encourage on-farm management and improvement of plant genetic resources for food and agriculture.

36. Where appropriate, national research systems should consider strengthening local level capacity to participate in all stages of breeding, including on-farm selection and adaptation.

37. 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 for food and agriculture activities.

38. **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.

39. Considering the needs of and numbers of the farmers served, genebanks and national/international institutes should consider identifying appropriate landraces/farmers' varieties for multiplication and/or developing 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.

40. 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.

41. The focus of training programmes should be to help farmers better incorporate new knowledge and technologies and indeed become better technicians, and 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.

42. Training of (and by) farmers should emphasize enhancing the identification of plant traits, selection/breeding, utilization 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.

43. Training programmes should be designed in close collaboration with NARS and farmers and their organizations and be based on particular needs as they see 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.

44. **Research/technology:** Four basic types of rigorous, multi-disciplinary scientific research are needed:

- (a) ethnobotanical and socio-economic research to understand and analyze farmer knowledge, selection/breeding, utilization, and management of plant genetic resources for food and agriculture, consistent with the approval of the farmers involved and with applicable requirements for protection of their knowledge and technologies;
- (b) population and conservation biology to understand the structure and dynamics of genetic diversity in local landraces/farmers' varieties (including population differentiation, gene flow, degree of inbreeding, and selective pressures);
- (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.
- (d) research and extension studies for little known crops will be promoted, including seed production, marketing and distribution.

45. 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 national institutions. Other institutions must be involved appropriately whenever necessary.

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



47. **Coordination/administration:** National and international coordination 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 farmers with a technical project promoting the maintenance of pre-existing diversity and to collaboration between communities and research institutions. Subject to satisfactory progress, programmes should be sufficiently long (10 years or more) to achieve results.

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

49. **This activity is closely linked with:**

- Constructing comprehensive information systems for plant genetic resources for food and agriculture
- Supporting planned and targeted collecting of plant genetic resources for food and agriculture
- Developing new markets for local varieties and “diversity-rich” products
- Expanding characterization and evaluation and number of core collections to facilitate use
- Increasing genetic enhancement and base-broadening efforts
- Promoting sustainable agriculture through diversification of crop production and broader diversity of crops
- Promoting development and commercialization of under-utilized crops and species
- Supporting seed production and distribution

### 3. Assisting farmers in disaster situations to restore agricultural systems

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50. **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, 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/farmers’ varieties 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. Partnerships are important in such efforts and can include government and non-governmental organizations.

51. **Long-term objectives:** To support farmers’ and rural peoples’ livelihoods and sustainable agriculture options through the rehabilitation of agricultural systems based on locally adapted plant genetic resources, including the restoration of pre-existing germplasm in cases of disaster-induced loss of plant genetic resources for food and agriculture.



52. **Intermediate objectives:** To establish capacity to deliver seed of adapted local varieties as needed to help re-establish indigenous agricultural systems in areas affected by natural disasters, war, and civil strife.
53. To establish institutional responsibilities and mechanisms for the identification, acquisition, multiplication, and re-introduction of appropriate genetic materials.
54. **Policy/strategy:** Governments with the co-operation of relevant farmers' organizations and communities and UN bodies and regional, intergovernmental and non-governmental organizations should establish necessary policies at all levels which will allow unhindered implementation of seed security activities in response to calamities.
55. To minimize genetic loss, governments should ensure duplication of plant genetic resources for food and agriculture outside of the country, such as in genebanks of neighboring countries, and/or regional or international genebanks and crop genebank networks. Where such *ex situ* collections do not exist outside the affected country, support should be given to undertake emergency collections of local varieties as soon as possible within the country, so that they may be multiplied for immediate use and also may be conserved in national and international *ex situ* collections for future use.
56. **Capacity:** FAO should establish agreements with appropriate agencies, especially national and international agricultural research institutions, for rapid acquisition and multiplication, restoration and provision of materials to countries in need. Such institutes should endeavour to ensure that their capacity is sufficient for the task. Cooperation with non-governmental and private organizations can be an important component of efforts to distribute suitably adapted germplasm into regions that are recovering from disasters.
57. Adequate information systems must be established to identify and track appropriate germplasm for reintroduction.
58. Governments should consider making available adequate funds to set in motion the multiplication of seed and to initiate other related activities in response to emergencies, after approaching existing international emergency funds to determine if they could effectively plan ahead to cover action related to the restoration of plant genetic resources for food and agriculture after disaster situations.
59. Governments should strengthen farmers' abilities to cope with disasters by supporting the re-emergence of local seed supply networks.
60. **Research/technology:** Previous experience should be reviewed and options developed to enhance preparedness for rescue of *ex situ* collections and emergency seed collecting in the context of calamities, including war, civil strife, industrial accidents, and natural disasters. These efforts could benefit from close collaboration among governments of countries affected, donor governments, non-governmental and private organizations, the national, regional and international agricultural research centres, regional plant genetic resource networks as well as relevant inter-governmental agencies such as FAO, WFP, UNHCR and UNDRO.





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

62. Public awareness efforts are needed to sensitize the donor community and NGOs to the importance of adapted plant genetic resources for food and agriculture 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.

63. **This activity is closely linked with:**

- Sustaining existing *ex situ* collections
- Constructing comprehensive information systems for plant genetic resources for food and agriculture
- Promoting public awareness of the value of plant genetic resources for food and agriculture conservation and use
- Developing monitoring and early warning systems for loss of plant genetic resources for food and agriculture
- Supporting on-farm management and improvement of plant genetic resources for food and agriculture

## 4. Promoting *in situ* conservation of wild crop relatives and wild plants for food production

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64. **Assessment:** Natural ecosystems hold important plant genetic resources for food and agriculture, including endemic and threatened wild crop relatives and wild plants for food production. Many are not managed sustainably. This genetic diversity, because of interactions which generate new biodiversity, is potentially an economically important component of natural ecosystems and cannot be maintained *ex situ*. Unique and particularly diverse populations of these genetic resources must be protected *in situ* when they are under threat. Most of the world's 8500 national parks and other protected areas, however, were established with little specific concern for the conservation of wild crop relatives and wild plants for food production. Management plans for protected and other areas are not usually broad enough to conserve genetic diversity for these species to complement other conservation approaches.

65. 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.

66. **Long-term objectives:** To promote conservation of genetic resources of wild crop relatives and wild plants for food production in protected areas and on other lands not explicitly listed as protected areas.





67. **Intermediate objectives:** To initiate planning and management practices which take into account wild crop relatives and wild plants for food production. To clearly identify which wild crop relatives and wild plants for food production need to be protected *in situ*. To gain knowledge of the uses, in particular by women, of wild plants for food production as sources of income and food.
68. To create a better understanding of the contributions of plant genetic resources for food and agriculture to local economies, 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.
69. To establish better communication and coordination between various institutes and organizations engaged in *in situ* conservation and land use management, nationally and regionally. To conserve genetic diversity for these species to complement other conservation approaches.
70. **Policy/strategy:** Governments, subject to national legislation, with the cooperation of the relevant UN bodies and regional, intergovernmental and non-governmental organizations and taking into account the views of farmers and communities living near protected areas should:
- (a) include as appropriate, among the purposes and priorities of national parks and protected areas, the conservation of plant genetic resources for food and agriculture, including appropriate 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) support the establishment of national and local objectives for protected area management through broad based participation, involving in particular, where they are present, groups most dependent on wild plants for food production;
  - (d) support the creation of advisory panels at the appropriate levels, that where appropriate, involve farmers, indigenous communities, plant genetic resources scientists, local government officials, and community leaders, to guide management of protected areas, according to national rules and regulations;
  - (e) recognize the rights of indigenous communities to PGRFA in protected areas;
  - (f) recognize that women are a valuable source of information on the feasibility of *in situ* conservation and management practices;
  - (g) support indigenous and local communities efforts to manage wild crop relatives and wild plants for food production in protected areas, or where existing aboriginal or treaty rights are recognized;
  - (h) review existing environmental impact statement requirement to incorporate an assessment of the likely effect of the proposed activity on local biodiversity for food and agriculture, particularly on wild crop relatives;
  - (i) integrate genetic conservation objectives in the sustainable management of wild crop relatives and wild plants for food production in protected areas and other managed resource areas.



71. Governments with the cooperation of the relevant UN bodies and regional, intergovernmental and non-governmental organizations and the farming, indigenous and local communities living in non-protected areas, should seek, where possible and appropriate, to:

- (a) Establish conservation of wild crop-relatives and wild plants for food production as an integral component of land-use planning;
- (b) Encourage local communities to conserve and manage wild crop relatives and wild plants for food production, and provide for their participation in decisions relating to such local conservation and management.

72. 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.

73. **Capacity:** Governments should, whenever possible, and as appropriate:

- (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 wild plants for food production
- (b) Assist local communities in their efforts to identify, catalogue and manage wild crop relatives and wild foods
- (c) Monitor the holdings, the distribution and diversity of wild crop relatives and wild plants for food production, integrate and link data and information from *in situ* conservation programmes with that of *ex situ* programmes and encourage private and non-governmental organizations to do likewise

74. **Coordination/administration:** Governments should, as appropriate:

- (a) Link protected area planning and management with institutions responsible for the conservation and sustainable use of wild relatives of crop plants and wild plants for food production, such as centres for crop genetic resources, national crop genetic resources coordinators, and botanical gardens
- (b) Designate focal points, as appropriate, to catalyze coordination of *in situ* protection programmes and liaise with other countries in the region
- (c) Establish mechanisms for periodically reviewing and modifying conservation plans

75. **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 for food and agriculture
- Supporting on-farm management and improvement of plant genetic resources for food and agriculture
- Promoting development and commercialization of under-utilized crops and species
- Supporting planned and targeted collections of plant genetic resources for food and agriculture
- Promoting public awareness of the value of plant genetic resources for food and agriculture conservation and use



# Ex Situ Conservation

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## 5. Sustaining 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 activities

## 5. Sustaining existing *ex situ* collections

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76. **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 for food and agriculture. While most countries still lack long-term storage facilities, storage space is thought to be available today in many individual genebanks and globally, and could be expanded through elimination of unnecessary duplication in the collections.

77. Globally, governments and donor agencies have made insufficient provisions for on-going maintenance costs of conservation infrastructure. The result has been a steady deterioration of many facilities and their ability to perform even basic conservation functions. 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, and options exist for less costly conservation.

78. 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 utilization of plant genetic resources for food and agriculture, in the context of more effective conservation. To realize 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 for food and agriculture at the international standards.

79. **Long-term objectives:** To give high priority to safeguarding as much existing unique and valuable diversity as possible in *ex situ* collections of plant genetic resources for food and agriculture. To develop an efficient goal-oriented, economically efficient and sustainable system of *ex situ* conservation. To develop and strengthen cooperation among national programmes and international institutions to sustain *ex situ* collections, recognizing that states have sovereign rights over their own plant genetic resources for food and agriculture.



80. **Intermediate objectives:** To develop and strengthen national, regional and international networks, including 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 applicable international legal agreements, which ensure the sovereign rights of the countries of origin, and with appropriate technical and financial support.

81. To reduce unnecessary and unplanned redundancy in current programmes, and promote access to and exchange of information about plant genetic resources for food and agriculture in line with applicable international agreements, including the Convention on Biological Diversity. To provide for the planned replication and safe storage of materials not currently duplicated.

82. **Policy/strategy:** The international community has interests in and responsibilities for the *ex situ* conservation of plant genetic resources for food and agriculture. It is this understanding which provides the basis for an effective, integrated and rational global plan to secure existing collections. Countries have national sovereignty over, and responsibility for, their own plant genetic resources for food and agriculture.

83. Full use should be made of appropriate existing facilities, including national, regional and international centres. Conserved materials should be, as appropriate, replicated and stored in long-term facilities meeting international standards, in accordance with applicable international agreements. Unintended and unnecessary duplications between collections within the networks should be reduced to promote cost efficiency and effectiveness in global conservation efforts. Countries could be assisted in identifying which genetic resources are already stored and duplicated in long-term facilities.

84. FAO in co-operation with countries and with relevant institutions should facilitate the formalizing of agreements to safeguard diversity in *ex situ* collections in conformity with applicable international agreements. This would allow those countries so desiring to place collections voluntarily in secure facilities outside their boundaries.

85. **Capacity:** Appropriate personnel, at all levels, for implementing and monitoring the above policies and agreements should be recruited and trained, as appropriate. National institutions should evaluate current genebank management practices in light of the need to create more rational, efficient, and user-oriented *ex situ* conservation systems. As appropriate, proper facilities, human resources and equipment should be made available to national programmes.

86. Ongoing conservation of collections of plant genetic resources for food and agriculture should be secured. Particular care must be taken to safeguard the original accessions of threatened collections.



87. Support should be given where appropriate to defray expenses incurred by institutions providing designated storage and related conservation and research/documentation services for other countries. This support could help to allow for all unique material to be identified, suitably duplicated, stored safely, and characterized, regenerated, evaluated, and documented. This would include the identification of materials both inadequately and excessively duplicated. Materials not yet duplicated should be suitably multiplied and placed appropriately in secure storage, with the full observance of applicable international agreements and national legislation. Additional *ex situ* duplications of accessions would be maintained at the discretion of countries. Expansion of some existing storage facilities and the creation of new facilities may be desirable.

88. **Research/technology:** Research should be aimed at the development of improved conservation methods including as appropriate *in vitro* and cryopreservation and in particular reliable low-cost techniques appropriate to local operating conditions. Technologies and procedures transferred from temperate climates may not be appropriate for conditions in tropical countries and *vice versa*.

89. 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 identifying duplicates as well as 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.

90. **Coordination/administration:** Coordination should take place within the country, between the national *ex situ* genebank, national crop working groups, and all users of PGRFA (breeders, farmers and NGOs). Strong links need to be established with regional networks and international centres

91. Oversight of the implementation of this activity should be supported by guidance of the FAO Commission on Genetic Resources for Food and Agriculture.

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

93. **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 for food and agriculture
- Expanding the characterization, evaluation and number of core collections to facilitate use
- Building strong national programmes
- Promoting networks for plant genetic resources for food and agriculture



## 6. Regenerating threatened *ex situ* accessions

94. **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. 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 percent 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.

95. Low initial sample size and low 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, one might expect average, routine, on-going annual regeneration requirements (as opposed to multiplication needs) to amount to fewer than 10 percent of accessions so conserved. However, some 95 percent 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.

96. **Long-term objectives:** To establish the infrastructure needed for periodic regeneration.

97. **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. To complete the first world-wide regeneration of accessions in *ex situ* storage, under conditions designed to preserve the genetic integrity of material.

98. **Policy/strategy:** Priority should be given to:

- 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 regenerated mainly due to loss of viability and those in active collections multiplied due to loss of numbers.)
- samples which meet the criteria of being globally unique, threatened, and having the potential of maintaining the diversity of the original sample.



99. Input from crop and regional networks should be sought in the refining of priorities and identification of appropriate germplasm for regeneration.
100. 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.
101. As appropriate and feasible, regeneration efforts should strive to maintain the allelic and genotypic diversity and adapted complexes of the original sample.
102. Efforts should be encouraged 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.
103. Governments, the private sector, institutions, including in particular the CGIAR, and NGOs should:
- 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,
  - 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.
104. Characterization activities should be undertaken in conjunction with regeneration, as feasible, without compromising the effectiveness or scientific goals of the regeneration exercise.
105. **Capacity:** As appropriate and cost efficient, proper facilities, human resources, appropriate technology, 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 involving the private sector, farmers, and NGOs in this activity.
106. Genebanks should ensure monitoring and have the capacity for determining the status of their accessions and prioritizing those in need of regeneration.
107. Training programmes should take into consideration the need for personnel trained in the execution of the procedures of germplasm regeneration and in the unique regeneration requirements of specific species.
108. **Research/technology:** Guidelines for regeneration, and as appropriate, standards and specific technologies should continue to 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.





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

110. There is a need to reinforce research to improve conservation technologies in various fields: lengthening of the interval between two regeneration cycles (orthodox seeds), physiological mechanisms linked to low temperature tolerance and dehydration (recalcitrant seeds), and *in vitro* conservation technologies.

111. Research should be undertaken to increase the effectiveness and efficiency of regeneration efforts, including methodologies for minimizing genetic drifts, the identification of markers associated with seed longevity to assist in devising regeneration strategies, to develop an understanding of the causes of mutations in conserved germplasm, to eliminate seed borne pests, and to answer various questions regarding breeding systems, reproductive biology, and dormancy mechanisms and technical problems associated with regeneration practices.

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

113. **Coordination/administration:** An operational plan for a coordinated, global regeneration effort should be developed, 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 for food and agriculture of purely national importance.

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

115. **This activity is closely linked with:**

- Sustaining existing *ex situ* collections
- Constructing comprehensive information systems for plant genetic resources for food and agriculture
- Expanding the characterization, evaluation and number of core collections to facilitate use
- Building strong national programmes
- Promoting networks for plant genetic resources for food and agriculture

## 7. Supporting planned and targeted collecting of plant genetic resources for food and agriculture

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116. **Assessment:** Potential for loss and the opportunities 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. However, in the absence of comprehensive analysis of the genetic diversity represented in the world's genebanks, these conclusions can only be deemed tentative.

117. 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.

118. **Long-term objectives:** To collect those species, ecotypes, landraces/farmers' varieties, or other cultivars, and associated information, that are under threat or are of anticipated use.

119. **Intermediate objectives:** To begin to fill gaps in the genetic diversity of existing collections with well targeted and prioritized collecting.

120. **Policy/strategy:** Collecting practices should be developed with regard to the objectives and obligations set forth in the Convention on Biological Diversity, for example the right of Contracting Parties to require prior informed consent before providing access to genetic resources and the obligations of Contracting Parties, subject to their national legislation, to respect the knowledge of indigenous communities regarding the conservation and sustainable use of biological diversity.

121. **Capacity:** Material so collected should be deposited in facilities which have the capacity to manage them in the country of origin, and possibly elsewhere, as agreed by the country of origin prior to collection. Where such facilities do not exist in the country of origin, they should be developed, where desired, and in the meantime, the materials could be managed in other countries as agreed in the country of origin prior to collection.

122. Before collecting is initiated, full consideration should be given to the ability to conserve the material collected effectively and sustainably.

123. Training should be undertaken in scientific collecting methods for plant genetic resources for food and agriculture.

124. **Coordination/administration:** Coordination, as appropriate, should take place within a country. International level coordination, as appropriate, 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 for food and agriculture in another.

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



126. Mechanisms need to be developed at all levels for emergency collection of plant genetic resources for food and agriculture. These mechanisms should make full use of and therefore should be closely linked with information and early warning systems at all levels.

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

128. ***This activity is closely linked with:***

- Surveying and inventorying plant genetic resources for food and agriculture
- Sustaining existing *ex situ* collections
- Promoting *in situ* conservation of wild crop relatives and wild plants for food production

## 8. Expanding *ex situ* conservation activities

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129. ***Assessment:*** The diversity of many species of plants cannot be conserved conveniently or effectively as seed. Some species are vegetatively propagated and others have “recalcitrant” seed. A number of major staple food crops, tropical fruits, and export crops, fall into these categories. Due to technical difficulties, the conservation of genetic resources of such plants is often not given appropriate attention.

130. Many plants of local importance for food and agriculture have been virtually 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.

131. 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.

132. ***Long-term objectives:*** To conserve plant genetic resources for food and agriculture so that they will be available for use.

133. ***Intermediate objectives:*** To develop management strategies for *ex situ* conservation of vegetatively propagated and recalcitrant seeded plants, as well as for species neglected in current conservation activities.

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

135. 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.

136. ***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 recalcitrant seeded plants.



137. **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.
138. 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.
139. Support should be given to training in *in vitro* techniques and to other new and appropriate technologies. In accordance with national, sub-regional and regional needs and priorities, support should be given to establishing the capacity to use such technologies.
140. **Research/technology:** Protocols should be developed for *in vitro* conservation and other conservation technologies for important vegetatively propagated and non-orthodox seed plants.
141. An assessment should be made of the conservation needs of other species for food and agriculture which are not adequately conserved, including a survey of activities as a prerequisite for further planning and coordination of collecting and conservation.
142. **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.
143. Botanic Gardens should be encouraged to participate actively in the activities of international botanic gardens associations. Links between international botanic garden organizations (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 priority.
144. **This Activity is Closely Linked With:**
- Sustaining Existing *Ex Situ* Collections
  - Promoting *In Situ* Conservation of Wild Crop Relatives and Wild Plants for Food Production
  - Building Strong National Programmes



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# Utilization of Plant Genetic Resources

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9. Expanding the Characterization, Evaluation and Number of Core Collections to Facilitate Use
10. Increasing Genetic Enhancement and Base-Broadening Efforts
11. Promoting Sustainable Agriculture through Diversification of Crop Production and Broader Diversity in Crops
12. Promoting Development and Commercialization of Under-utilized Crops and Species
13. Supporting Seed Production and Distribution
14. Developing New Markets for Local Varieties and “Diversity-Rich” Products

## 9. Expanding the characterization, evaluation and number of core collections to facilitate use

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145. **Assessment:** Genebank collections should enable users to respond to new challenges and opportunities. Typically, most genebank accessions have not been well characterized and 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 characterization and evaluation is cited as a major constraint to use of plant genetic resources in breeding programmes .

146. Plant breeders and most other users are interested in having a manageable number of genotypes that possess or are likely to possess the traits needed in their breeding programmes. Identification of those traits through characterization, and the establishment of core collections (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.

147. In addition, characterization and evaluation data as well as the wise use of core collections are important in the overall efficient and effective management of collections.

148. **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.



149. To promote the coordination of conservation, exploration and improvement activities by 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.

150. **Intermediate objectives:** To give high priority to the development of crop specific characterization and evaluation programmes to identify accessions and genes that counter those biotic and abiotic stresses which are limiting production of those crops.

151. To improve the efficacy of the evaluation process by developing and adapting new technologies for reliably identifying valuable accessions and detecting valuable genes that have been identified as valuable.

152. To establish international core collections for crops of global importance and promote establishment of genebank-based core collections for key national crop collections in national facilities. To promote, improve and test methodologies and technologies for important core collections.

153. **Policy/strategy:** Governments with the co-operation of the relevant UN bodies and regional, intergovernmental and non-governmental organizations, international agricultural research centres, and including the private sector, and taking into consideration views of the scientific community and farmers' organizations 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 for food and agriculture, with emphasis on identifying traits that counter limits to production in staple crops and of crops of national economic importance;
- (b) promote collaboration and complementarity between breeders, researchers, farmers and genebanks;
- (c) encourage exchange of characterization and evaluation information;
- (d) note that access to plant genetic resources for food and agriculture is subject to applicable international agreements. In compliance with such agreements, users of plant genetic resources for food and agriculture should be encouraged to agree to provisions for sharing relevant evaluation data with source institutes, giving also due regard to the special needs of commercial users for appropriate confidentiality;
- (e) give appropriate financial support for characterization and evaluation programmes for crop species of primary or exclusive importance to food security in their countries, given the importance of medium and long-term financing.

154. Crop networks and genebanks should proceed carefully to develop core collections of crops of major interest to the national systems. While core collections provide guidance on the constitution of genebank collections, they do not replace them. Genebanks should not use the existence of a core collection as an excuse for allowing conservation conditions for other accessions in the collection to deteriorate.

155. **Capacity:** Support should be given to begin a step-by-step, targeted characterization and evaluation programme for selected priority germplasm. The characterization and 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 needs to be done in a use-oriented, site-specific manner.

156. Governments and appropriate organizations should identify institutions and individuals who may have the capacity and expertise to carry out germplasm characterization and 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 (Latin American Maize Project) project.

157. National programme staff should receive training in germplasm characterization and 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.

158. Support training of farmers, including women farmers, participating in on-farm evaluation programmes, in the necessary relevant skills. 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.

159. Appropriate technical and financial support should be given for multiplication of core collection germplasm.

160. **Research/technology:** Various kinds of research must be undertaken if the cost-effective use of current collections is to be encouraged. This could include access to the latest technology and support for scientific research to improve characterization and evaluation techniques.

161. Research priorities relating to core collections include developing:

- (a) improved methods of germplasm characterization using, *inter alia*, biochemical and molecular biological 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);
- (e) improved methods of using plant genetic resources for food and agriculture, including targeted trait detection.

162. Promote regional and international symposia of germplasm experts 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.

163. **Coordination/administration:** Characterization and evaluation efforts should be planned and implemented with the active participation of national programmes, and



crop and regional networks. As appropriate, farmers' organizations, private companies and their associations, and others might also be involved.

164. 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 utilization.

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

166. There should be periodic assessments of the use of core collections to guide future work and assist in setting priorities. Such assessments should be made in conjunction with plant breeders and in consultation with appropriate international agencies, institutions, and NGOs.

167. ***This activity is closely linked with:***

- Sustaining existing *ex situ* collections
- Supporting on-farm management and improvement of plant genetic resources for food and agriculture
- 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 for food and agriculture

## 10. Increasing genetic enhancement and base-broadening efforts

168. **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.

169. Approaches to genetic enhancement include:

- (a) introgression of useful agronomic traits identified through characterization or evaluation into locally adapted or elite material for further use in breeding programmes
- (b) base-broadening of breeders' material through incorporation of wide genetic diversity.

170. **Long-term objectives:** To increase food security and improve farmers' livelihoods through the development of better plant varieties. To increase the utilization of genetic resources and thereby provide incentives for their conservation. To reduce genetic uniformity in crop varieties through the utilization of wild relatives, local materials and/or modern varieties. To increase sustainability of agricultural systems and the capacity for adaptation to unexpected environmental changes





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

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

173. **Capacity:** Support should be given to national systems, regional networks, International Agricultural Research Centres, non-government organizations, universities and other relevant organizations 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' organizations. Initial efforts should focus on the most pressing problems identified in 15 crops of international and regional significance.

174. **Research/technology:** Institutions, should further develop methodologies for genetic enhancement including pre-breeding, and broadly disseminate these methodologies.

175. **Coordination/administration:** Activities should be planned and undertaken in close collaboration with national programmes with the collaboration of crop and regional networks, other scientific bodies and institutions, and farmers' organizations. Close communication with plant breeders and other scientists in both the public and private sector should be encouraged.

176. **This activity is closely linked with:**

- Constructing comprehensive information systems for plant genetic resources for food and agriculture
- Expanding the characterization, evaluation and number of core collections to facilitate use
- Supporting on-farm management and improvement of plant genetic resources for food and agriculture

## 11. Promoting sustainable agriculture through diversification of crop production and broader diversity in crops

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177. **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.

178. In the future agricultural systems will need to incorporate a broader range of crops including *inter alia* crops which produce raw material or are sources of energy. 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. Innovative approaches in plant breeding for the purposes of domesticating new crops, the development of new plant varieties and the promotion of higher levels of genetic diversity in crops and on farms, such as planting mixtures of adapted varieties, are recognized as means for adding stability in agricultural systems and promoting agricultural production and food security.

179. **Long-term objectives:** To promote sustainable agriculture and reduce genetic erosion and possible genetic vulnerability by diversifying crop production and increasing genetic diversity in crops.

180. **Intermediate objectives:** To review periodically genetic vulnerability in crops and encourage breeders and appropriate groups, to take mitigating action nationally and internationally, as appropriate.

181. To promote the goal of higher levels of genetic diversity consistent with productivity increase and agronomic needs, including in crop production, plant breeding and biotechnological research and development settings.

182. **Policy/strategy:** Governments and relevant intergovernmental organizations in cooperation with crop networks, research institutions, extension agencies, the private sector, farmers' organizations and NGOs, should:

- (a) Regularly monitor genetic uniformity and assess vulnerability in crops;
- (b) review policies which may affect the level of diversity in agricultural systems, and specifically the degree of genetic uniformity and vulnerability of major crops.
- (c) increase heterogeneity by planting mixtures of adapted varieties and species as appropriate.

183. Funding agencies should be encouraged to continue to 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, and in accordance with an appropriate strategy, is one measure which could bring higher levels of diversity, adaptation and stability to crops. The selection of high yielding landraces/farmers' varieties is another measure.

184. **Capacity:** Governments, and their national agricultural research systems, supported by the International Agricultural Research Centres, and other research and extension organizations 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 (or horizontal) resistances, the pyramiding of race-specific resistances, and the strategic deployment of resistance genes;
- (c) facilitate the strategic use of a range of varieties;



- (d) explore and, in appropriate circumstances, make use of decentralized and “participatory” plant breeding strategies to develop plant varieties specifically adapted to local environments;
- (e) make use of modern biotechnological techniques as feasible, to facilitate broadening of the genetic base of crops.

185. **Research/technology:** Support efforts to identify those activities used in plant breeding, plant research and farming systems that foster 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 appropriate plant breeding methodologies.

186. Support should be encouraged for developing improved 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 that sustain ecosystems.

187. **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.

188. ***This activity is closely linked with:***

- Developing monitoring and early warning systems for loss of plant genetic resources for food and agriculture
- Supporting on-farm management and improvement of plant genetic resources for food and agriculture
- Increasing genetic enhancement and base-broadening efforts
- Developing new markets for local varieties and “diversity-rich” products

## 12. Promoting development and commercialization of under-utilized crops and species

189. **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.



190. **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.

191. **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.

192. **Policy/strategy:** Governments and their national agricultural research systems, with the support of the international agricultural research centres, and non-governmental organizations, and taking into account the views of farmers' organizations and their communities, are encouraged to promote policies consistent with the sustainable use, management and development of under-utilized species, including land use policies, as appropriate, identified as having a potential to make significant contributions to local economies and food security.

193. **Capacity:** Training and capacity building for scientists and extension specialists 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 under-utilized species of importance to food and agriculture;
- (c) developing post-harvest processing methods;
- (d) developing marketing methods.

194. **Research/technology:** Research should be undertaken to:

- (a) develop sustainable management practices for under-utilized species of importance to food and agriculture and their genetic resources;
- (b) develop post-harvest processing and other methods to improve marketing possibilities.

195. **Coordination/administration:** Regional networks together with national programmes and in cooperation with international agricultural research centres, NGOs and other relevant organizations, 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 relevant financial and technical assistance.

196. **This activity is closely linked with:**

- Supporting on-farm management and improvement of plant genetic resources for food and agriculture
- Promoting *in situ* conservation of wild crop relatives and wild plants for food production
- Developing new markets for local varieties and "diversity-rich" products
- Promoting public awareness of the value of plant genetic resources for food and agriculture conservation and use



### 13. Supporting seed production and distribution

197. **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/farmers’ varieties, that are useful for diverse and evolving farming systems.

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

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

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

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

202. To help make new crop varieties available to farmers. To make suitable materials that are stored *ex situ* available for multiplication and distribution to farmers.

203. **Policy/strategy:** Governments and their national agricultural research systems, subject to national laws and regulations as appropriate, with support from international agricultural research centres, regional cooperation programmes and NGOs, and taking into account the views of the private sector, farmers’ organizations and their communities, should:

- (a) develop appropriate policies concerning governmental, commercial and informal enterprises in, seed production, and seed distribution, to help focus efforts of government supported 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 major or minor crops that are inadequately covered by the private sector should not be precluded;
- (b) provide, and promote as appropriate, an enabling environment, where such an environment does not already exist, for the development of small-scale seed enterprises, including through appropriate incentives;
- (c) strengthen linkages between genebanks, plant breeding organizations, seed producers, and small-scale seed production and distribution enterprises;



- (d) consider seed quality control schemes particularly those appropriate to small scale enterprises.
- (e) Consider legislative measures which allow distribution and commercialization of landraces/farmers' varieties and obsolete varieties, if they meet the same distribution and commercialization criteria for disease, pests, health and the environment, as conventional or registered varieties. These measures should meet quality standards of seed distribution and commercialization, in accordance with national legislation or applicable regional agreements, as appropriate.

204. **Capacity:** Governments, subject to national laws, regulations and policies as appropriate, and 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 seed enterprises, paying attention as appropriate in each country, to the needs of the small farming sector, of women and of vulnerable or marginalized groups;
- (c) provide support to and strengthen farmers' organizations 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.

205. **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.

206. **Coordination/administration:** National capacity for farmers to acquire appropriate seed should be regularly monitored by governments.

207. 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

208. **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 leading to stringent requirements being imposed on farmers and the inadvertent disincentives arising from legislation, policies, programmes and other institutional activities 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.

209. 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/farmers’ varieties, obsolete varieties, and other under-utilized food crops. Such a program should include the identification and removal of systemic institutional barriers and disincentives to biodiversity conservation and production/marketing

210. **Long-term objectives:** Stimulate stronger demand and more reliable market mechanisms for landraces/farmers’ varieties and related agricultural products.

211. **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.

212. **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. Consideration should be given to developing appropriate niche variety registration systems to permit and promote the perpetuation, trial, evaluation and commercial distribution of local, obsolete varieties and to monitoring regulations enacted for other purposes to ensure that they do not inadvertently lead to the extinction of varieties.

213. As feasible and appropriate, institutions should be encouraged to purchase “diversity-rich” foods for internal use.

214. **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.

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

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

217. **This activity is closely linked with:**

- Supporting on-farm management and improvement of plant genetic resources for food and agriculture
- Promoting public awareness of the value of plant genetic resources for food and agriculture conservation and use



# Institutions and Capacity Building

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## 15. Building Strong National Programmes;

## 16. Promoting Networks for Plant Genetic Resources for Food and Agriculture;

## 17. Constructing Comprehensive Information Systems for Plant Genetic Resources for Food and Agriculture;

## 18. Developing Monitoring and Early Warning Systems for Loss of Plant Genetic Resources for Food and Agriculture;

## 19. Expanding and Improving Education and Training;

## 20. Promoting Public Awareness of the Value of Plant Genetic Resources for Food and Agriculture Conservation and Use.

## 15. Building strong national programmes

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218. **Assessment:** National programmes are the foundation of regional and global plant genetic resources efforts; they are also a means to promote international cooperation on access to plant 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 levels. Many existing national programmes suffer from poor planning and management exacerbated by lack of resources and isolation from related activities.

219. Many of the countries which do not have strong national programmes, or appropriate long-term storage facilities, are those which have the most urgent food security problems. They are also often countries with rich and variable plant genetic resources in farmers' fields and in the wild. Also, the often limited capacity of national programmes, particularly those located in developing countries, in assessing, utilizing and updating technologies for the conservation, characterization and sustainable utilization of plant genetic resources for food and agriculture is an important cause of inefficient management of collections and a limiting factor for their further utilization.

220. Plant genetic resources for food and agriculture activities involve public and private institutions and companies, non-governmental organizations, communities and individuals from the agriculture, environment and development sectors. The integration of existing plant genetic resources for food and agriculture activities in the framework of a unified national programme provides the opportunity to enhance such diverse efforts within a country.

221. National *ex situ* collections are an integral part of national plant genetic resources programmes for food and agriculture. Genebanks should not be viewed as closed repositories, but as dynamic centres. The integration of conservation, characterization, evaluation information and use will facilitate the valorization of plant genetic resources for food and





agriculture. Too strong an emphasis on centralized genebank conservation facilities, however, can distract attention away from utilization and lead to isolation, preventing genebanks from providing optimal benefits to the country. While conservation and plant breeding in developing countries are generally undertaken by public 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.

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

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

224. **Intermediate objectives:** To give high priority to establishing the essential elements of integrated national programmes: a recognized national status; appropriate policy and institutional frameworks including mechanisms for coordinated planning and action; and a programme strategy; benefiting from help to do so. Where appropriate, to upgrade conservation facilities at the national or regional level.

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

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

227. **Policy/strategy:** National programmes should have a formally recognized status. The ecological, economic, social and aesthetic values of plant genetic resources for food and agriculture should be recognized in national planning and policies and in the prioritization and deployment of financial and other resources including financial incentives for the retention of qualified staff. Specific funding allocations should be made to plant genetic resources for food and agriculture programmes in the budget process of national governments.

228. National commitment to provide sustainable funding for national programmes and projects is essential; however regional or international support is a complement to domestic efforts.

229. National programmes should develop the capability to assess and determine the plant genetic resources for food and agriculture required to meet national conservation and development needs and related international obligations and should have supporting policies on conservation, access and use of plant genetic resources for food and agriculture. National programmes should make available, as appropriate, the widest possible representative collection of plant genetic resources for food and agriculture to meet farmers' needs, and for the improvement of local varieties. Governments, in cooperation with national, regional and international institutions should monitor the development of new technologies relevant to the



conservation, characterization and sustainable utilization of plant genetic resources for food and agriculture. In addition, governments should establish quarantine and other regulations regarding the import and export of plant genetic materials which offer adequate protection without unduly restricting appropriate transfers of materials.

230. As appropriate to the level of development and complexity of existing institutional efforts, a national programme should encourage or provide for coordination amongst all relevant institutions and organizations 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 utilization of plant genetic resources for food and agriculture 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.

231. The actual structure and organization 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.

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

233. Institutional links should be promoted, as appropriate, among national institutions and entities specialized in technology transfer, in order to assist national institutions in the negotiation for the acquisition of technologies for the conservation, characterization and sustainable utilization of plant genetic resources for food and agriculture and associated data processing, under fair and most favourable terms, including on concessional and preferential terms, as mutually agreed to by all parties to the transaction. In the case of technology subject to patents and other intellectual property rights, access and transfer of technology should be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights.

234. **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.

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



236. Research activities in national programmes focus mainly on scientific and technical research described within the other activity areas. Research is also needed on missions and management of national PGRFA programmes including testing of institutional frameworks; and evaluating use needs and the efficiency of alternative responses; data base management; and the economic efficiency of different approaches to conservation.

237. Certain policy, legal and institutional issues, *inter alia*, those related to ownership, intellectual property rights, exchange, transfer and trade in plant genetic resources, are confronting national programmes increasingly. Coordination is needed to provide national programmes with information on these issues and to assess the impact of international developments in these fields on the conservation and exchange of plant genetic resources, and to incorporate new research developments, as appropriate, into national systems and practices.

238. **Coordination/Administration:** Implement coordination mechanisms within countries to ensure the most effective prioritization in the deployment of financial and other resources. Governments should periodically review their policies to evaluate their effectiveness. Coordinated and prioritized action at the national level should be complemented by an international system that is likewise coordinated and prioritized. 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 for food and agriculture, enhance their use, encourage access, and share benefits.

239. Plant genetic resources for food and agriculture networks and international fora (*inter alia*, the FAO Commission on 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.

240. **This activity is closely linked with:**

- All other activities

## 16. Promoting networks for plant genetic resources for food and agriculture

241. **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, distribution, evaluation, and genetic enhancement. By establishing links between those involved in the conservation, management, development and utilization of plant genetic resources for food and agriculture, networks can promote exchange of materials on the basis of mutually agreed terms and enhance the utilization 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 organizations and institutions.

242. 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 for food and agriculture (*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.

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

244. As a matter of high priority, promote scientific exchange and cooperation, and to promote coordination, planning, and priority setting at the regional level, as a means to avoid duplication, to strengthen and make more efficient existing work in plant genetic resources for food and agriculture, and to minimize costs of conservation and utilization.

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

246. To facilitate consideration of integrated, eco-regional approaches to conservation of plant genetic resources for food and agriculture, including wild relatives of crops.

247. **Intermediate objectives:** To strengthen existing regional, crop and thematic networks.

248. To establish active regional networks in areas not currently covered by such. To establish and strengthen 5 to 15 international crop and thematically-oriented networks, including *in situ* conservation networks, with broad participation, open to any country.

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

250. **Policy/strategy:** Governments should as a matter of policy support the active participation of public and private institutions in regional, crop and thematic networks. Cost of such networks should be met by participants in the networks according to their ability, complemented, as appropriate, by support from governments and other sources. Participation should be seen as benefiting the country and as a means for pooling efforts among countries faced with similar challenges and 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.

251. Governments, national research institutions, international agricultural research centres, in particular IPGRI, and/or crop-specific scientific organizations, may convene existing and/or new crop or thematically oriented networks and/or facilitate their work. Networks may cooperate closely with, offering guidance as appropriate, to international agricultural research centres and regional institutions and efforts in order to ensure higher levels of communication, accountability, and synergy.



252. Networks should identify the opportunities for working with non-governmental organizations, and develop concrete actions, particularly in the areas of training, access to reproductive material, coordination of local initiatives, information, and public awareness.

253. **Capacity:** The building of networks requires not only technical expertise, but substantial communication and organization 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.

254. 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
- (g) Black Sea, or Caucasus and other regions, when necessary.

255. **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.

256. **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.

257. **This activity is closely linked with:**

- All other activities

## 17. Constructing comprehensive information systems for plant genetic resources for food and agriculture

258. **Assessment:** Many of the world's plant genetic resources for food and agriculture 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 crops and on-farm genetic resources 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, has been maintained on material conserved. A genebank or *in situ* programme lacking sufficiently trained personnel, proper infrastructure



or sustainable resources to manage genetic resources data cannot fully conserve or promote the full use of its plant genetic resources for food and agriculture. This situation is exacerbated due to the fact that at the national and institutional level, data management and documentation activities are often 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 for food and agriculture.

259. 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.

260. **Long-term objectives:** To facilitate increased access to and better management and utilization of plant genetic resources for food and agriculture through the assembly, exchange, and provision of useful information.

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

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

263. **Intermediate objectives:** To assemble available data and information in a usable form using effective methodologies, databases and protocols.

264. To establish regional and crop based data management and exchange networks between genebanks and other partners in PGR programmes to assist with provision of documentation systems and training of personnel.

265. To develop data and documentation system strategies with and for genebanks and other partners in PGR programmes and breeding programmes and establish, as feasible, genebank database management systems at appropriate genebanks.

266. To support access to the international electronic communication infrastructure by genebanks and other partners in PGR programmes and breeding programmes.

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

268. Documentation, information and dissemination systems which are cost effective and easy to access, should also be developed in order to facilitate technology transfer.

269. Information on plant genetic resources for food and agriculture will be acquired and disseminated in accordance with Article 8(j) of the Convention on Biological Diversity.



270. **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.
271. 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.
272. Access by national programmes to basic scientific, research, and bibliographic information should be facilitated.
273. Genebanks 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 levels.
274. 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.
275. **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' organizations.
276. **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 available expertise in national programmes as well as the SINGER initiative within the CGIAR, the documentation work being done regionally by IPGRI, UNEP's Geographical Information System, UNESCO's Biosphere Information System, work being undertaken through the Convention on Biological Diversity. Such coordination should also seek to involve regional and crop networks and other users and conservers of plant genetic resources for food and agriculture, including the private sector and other NGOs, as active participants and partners.
277. Global and regional assessment, oversight, planning, and coordination is needed to promote cost efficiency and effectiveness.



278. ***This activity is closely linked with:***

- All other activities

## 18. Developing monitoring and early warning systems for loss of plant genetic resources for food and agriculture

279. **Assessment:** Erosion of plant genetic resources for food and agriculture can occur in *ex situ* collections, in farmers' fields and in nature. 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 crops occurs mainly through adoption of new crops or new varieties of crops with the consequent abandonment of traditional ones without appropriate conservation measures.

280. 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 for food and agriculture 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.

281. **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.

282. **Intermediate objectives:** To determine the underlying causes of genetic erosion. 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.

283. **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.

284. 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.

285. **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 for food and agriculture and the various threats to these resources.

286. Realizing the importance of global monitoring and early warning of loss of plant genetic resources for food and agriculture, the efficiency, purpose and value of the FAO World Information and Early Warning System (WIEWS) should be evaluated. In the light of





the results of that review, WIEWS should be improved.

287. **Research/technology:** Research to determine the underlying causes and dynamics of genetic erosion. Research applicable to improving methods for surveying of plant genetic resources for food and agriculture will also be useful to early warning systems.

288. Technical experts, representatives of national programmes, UNEP, UNDRO, the CGIAR, IUCN, NGOs, and the private sector, should be invited by FAO to participate in and contribute to discussions on developing an early warning system.

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

290. **Coordination/administration:** WIEWS should collaborate closely with national focal points, national coordinators, regional and crop networks, the international agricultural research centres, UNEP, UNDRO, and other relevant organizations.

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

292. ***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 for food and agriculture

## 19. Expanding and improving education and training

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293. **Assessment:** The importance of training in achieving sustainable improvements in plant genetic resources for food and agriculture conservation and use is widely accepted. At a time when financial support to many programmes is threatened, funding for training has become particularly tenuous. Governments do not always ensure that individuals receiving such training are appropriately utilized and remunerated.

294. The dearth of well-trained personnel is evident at virtually all levels and in all scientific and technical specialities 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 many disciplines, including management, policy and legal fields, associated with plant genetic resources for food and agriculture, appear not to exist very often.

295. **Long-term objectives:** To make available to every country according to their



needs and priorities, training in all the relevant functions of conservation and utilization, as well as management and policy.

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

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

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

299. To encourage institutions to include plant genetic resources for food and agriculture aspects in related courses and programmes in biological sciences.

300. **Policy/strategy:** Governments should recognize the appropriateness and importance of education concerning plant genetic resources for food and agriculture at all levels.

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

302. **Capacity:** As feasible, support should be given to the development of institutions and/or programmes in each region, capable of providing advanced education in plant genetic resources and plant breeding. Support should also be given to students to complete degree programmes at these institutions and/or programmes. 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.

303. 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.

304. 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.

305. Technology transfer expertise related to the conservation, characterization and sustainable utilization of plant genetic resources for food and agriculture should be enhanced, particularly in developing countries. National institutions from both developing and developed countries and international organizations all have a very important role to play in facilitating this process.

306. 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.

307. 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 for food and agriculture and associated knowledge and traditions.

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

309. **Research/technology:** Institutions should endeavour to link training with on-going research.

310. **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.

311. **This activity is closely linked with:**

- All other activities

## 20. Promoting public awareness of the value of plant genetic resources for food and agriculture conservation and use

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

313. 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 organizations in national genetic resources activities, thus ensuring a broader base for conservation. Strong linkages between public awareness work done by international organizations and national programmes and organizations can increase effectiveness and reduce costs.

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

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

316. **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 be considered in the development of all national programme activities.

317. 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.



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

319. **Capacity:** Genetic resources programmes should have as appropriate a focal point for public awareness. 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.

320. 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.

321. 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.

322. 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.

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

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

325. ***This activity is closely linked with:***

- All other activities



# Implementation and Financing of the Global Plan of Action<sup>1</sup>

1. The Conference recognized that the Global Plan of Action was an important element of the Global System on Plant Genetic Resources for Food and Agriculture and could be an essential contribution to facilitating the implementation of Agenda 21 and of the Convention on Biological Diversity.
2. The follow-up processes call for action at local, national, regional and international levels and should involve all parties which were associated with the preparation of the International Technical Conference: the national governments, local and regional authorities, regional and international organizations, both inter-governmental and non-governmental, the scientific community, the private sector, local communities and farmers and other agricultural producers and their associations. The implementation of the Global Plan of Action should take place as an integral part of the Global System for the Conservation and Utilization of Plant Genetic Resources for Food and Agriculture and in harmony with the Convention on Biological Diversity.
3. In order to enlist the widest participation and support for the implementation of the Global Plan of Action, the outcome of the Leipzig Conference should be reported to the major international, regional and national bodies and fora dealing with food and agriculture and biodiversity, including, in particular, the FAO Conference, the Conference of the Parties to the Convention on Biological Diversity, the Commission on Sustainable Development of the United Nations, and the governing bodies of the United Nations Environment Programme, the Global Environment Facility, the United Nations Development Programme, the International Fund for Agricultural Development, the World Bank, the Common Fund for Commodities, Regional Development Banks and the Consultative Group on International Agricultural Research, inviting their member constituencies to promote and take part as appropriate in the implementation of the Global Plan of Action. It should also be reported to the World Food Summit which meets in Rome in November 1996.

<sup>1</sup> Extract of the Report of the International Technical Conference on Plant Genetic Resources, paragraphs 18 to 28. Additionally, the Conference took note of the FAO Secretariat's estimate of the cost of implementing the Global Plan of Action and of its identification of existing sources of financing and of possible new sources of financing. Given the changes introduced by the Conference in many of the priority activities, it requested the Secretariat to refine its cost estimates. (Extracted from para. 17 of the Report).



4. Overall progress in the implementation of the Global Plan of Action and of the related follow-up processes would be monitored and guided by the national governments and other Members of FAO, through the Commission on Genetic Resources for Food and Agriculture. In order to discharge this function, the Commission could develop a phased programme with appropriate cost estimates, and a procedure for the review of the Global Plan. Such review should deal with the progress made at national, regional and international levels in implementation, elaboration, and adjustment as appropriate, of the Plan, thus making it a “rolling” plan as recommended in Agenda 21. A first review should be undertaken within four years.
5. To this end, the Commission on Genetic Resources for Food and Agriculture 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 conclusions of the Commission should be brought to the attention of concerned governments and international institutions to fill gaps, rectify imbalances or lack of coordination, and to consider new initiatives or activities. Those conclusions of the Commission which have major policy implications should also be brought to the attention of the FAO Council and Conference as was already the case with its predecessor body, the Commission on Plant Genetic Resources, and to the Conference of Parties to the Convention on Biological Diversity and/or to the Commission on Sustainable Development for action, endorsement or information, as appropriate.
6. The Conference recognized the need for financial resources for the implementation of the Global Plan of Action and that its full implementation would involve a significant increase in the activities currently taking place. The Conference recognized that the Global Plan of Action would have to be implemented progressively, and adequate financial resources commensurate with the scope of the Global Plan of Action should therefore be mobilized. Each country should determine its own priorities in the light of those agreed in the Global Plan of Action and in the framework of its food and agriculture development needs.
7. The Conference recognized that significant, but indeterminate, funding for plant genetic resources for food and agriculture is currently provided by national governments and other domestic sources of funds, multilateral organizations and from bilateral and regional sources.
8. Recognizing the importance of the contribution of domestic sources, including both public and private sectors, the Conference strongly recommended that each country make every possible effort to provide, in accordance with its capacities, financial support and incentives with respect to its national activities which are intended to achieve the objectives of the Global Plan of Action, in accordance with its national plans, priorities and programmes.
9. The Conference reaffirmed that international cooperation for conservation and sustainable utilization of plant genetic resources for food and agriculture should be strengthened, in particular to support and complement the efforts of developing countries and countries with economies in transition.
10. The Conference reaffirmed the commitments for the new and additional funds made



under Agenda 21 of the United Nations Conference on Environment and Development and by the Parties to the Convention on Biological Diversity. Under those commitments, funds should be made available to finance the implementation, by developing countries and countries with economies in transition, of the Global Plan of Action. Such funding should come from developed countries and/or other sources, and should, where possible, seek to facilitate the leveraging of other funding sources and mechanisms, and assist countries to implement the Global Plan of Action. Every effort should also be made to seek new, additional and innovative sources of funding within the process of the implementation of the Global Plan of Action.

11. The analysis of information on activities on plant genetic resources for food and agriculture world wide and through all funding sources should be extended under the auspices of the Commission on Genetic Resources for Food and Agriculture. This work should help to utilize the funds more efficiently and assist national, multilateral, regional and bilateral organizations to develop effective programmes. It should be a continuing process of monitoring and should not be construed as a pre-condition to funding. The major multilateral and bilateral funding and development institutions should also be invited to examine ways and means of supporting the implementation of the Global Plan of Action. In this process, close cooperation should be maintained with the Convention on Biological Diversity.