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COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

WORKING GROUP ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

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FAO's INITIATIVES FOR CAPACITY BUILDING TO SUPPORT THE UTILIZATION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE THROUGH SEED SYSTEMS AND PLANT BREEDING AND GENETIC ENHANCEMENT

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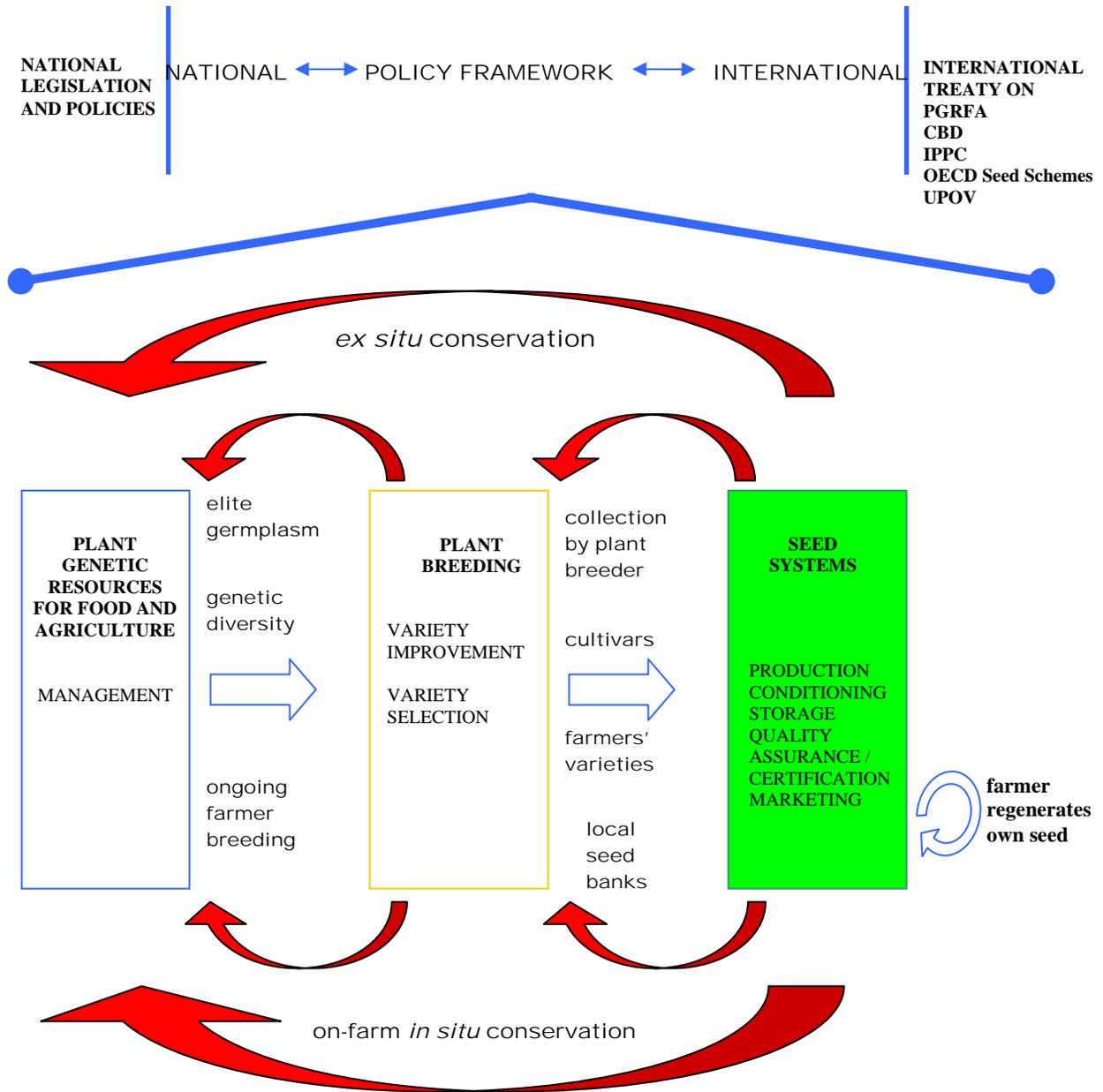
1. INTRODUCTION

1. Plant genetic resources for food and agriculture (PGRFA) 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, and thus, are essential for sustainable agricultural production. As illustrated in Figure 1, conservation, management and use of plant genetic resources, along with seed systems, form a complex and dynamic continuum with inter-linkages and interdependencies. Considerable expertise, capacity, and resources, combined with supporting legislative and policy frameworks, infrastructure and information access both at the national and international levels, are necessary to optimise management of PGRFA and boost food security.

2. The importance of developing capacity for the sustainable management and use of plant genetic resources is clearly acknowledged in the *Global Plan of Action*, in a number of priority activities, in particular in Priority Activities 9, 10, 11, 12, 13, and 14. Capacity building is an integral component for undertaking the tasks highlighted within each of these activity areas, which includes characterization, evaluation, genetic enhancement, diversification of crop production, promotion of underutilized crops and strengthening seed systems through increasing production and availability of quality seeds, and developing new markets for local varieties and diversity-rich products. Priority Activity 19 of the *Plan* concentrates on expanding and improving education and training through a variety of means such as raising the awareness of decision makers, and institutional strengthening through increasing technical expertise, infrastructure and information resources for technology transfer and development.

3. Significant capacity building is essential to fully realize the objectives of the *International Treaty on Plant Genetic Resources for Food and Agriculture* and take full advantage of advanced technologies and methodologies for conservation, plant breeding and development of seed systems. Article 6 of the Treaty sets out a wide range of measures to achieve the sustainable use of plant genetic resources, including policy development, strengthening research, plant breeding, broadening the genetic base of crops, expanding use of local crops and improving regulations on variety release and seed distribution. Article 7 calls for international cooperation to strengthen the capacities of developing countries and countries with economies in transition with respect to conservation and sustainable use, and Article 8 calls for promoting technical assistance to developing countries and those with economies in transition, with the objective of facilitating the implementation of the Treaty. In addition, as a supporting component of the Treaty, the *Global Plan of Action*, provides a solid integrated framework for capacity building. Given the vital importance and need of capacity building, in particular at the national level, this activity is considered to be closely linked to all the activities enshrined in the *Plan*.

Figure 1: MANAGEMENT AND USE OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE



4. The Commission on Genetic Resources for Food and Agriculture (the Commission) and the Intergovernmental Technical Working Group on Plant Genetic Resources (Working Group) have, in past, addressed a range of issues related to capacity building, in particular those related to plant genetic resources use through strengthening germplasm conservation, plant breeding capacities and seed systems.

5. The Commission, at its Tenth Regular Session, requested that the Working Group in “considering the *Global Plan of Action*, review and provide guidance on the Organization’s initiatives for capacity-building to support the utilization of plant genetic resources for food and agriculture, through seed systems and plant breeding and genetic enhancement, including inviting information on the relevant activities of the CGIAR and other relevant stakeholders.¹”

6. Accordingly, this document presents a synthesis of recent capacity building initiatives and strategies undertaken by the Organisation towards promoting sustainable use of PGRFA through crop improvement and strong seed sector development. It highlights initiatives in the area of plant breeding, the application of advanced tools, seed production, and seed biosafety at the normative and technical levels. In relation to seed sector development, it also identifies the need to build capacity to fill the existing gaps in the availability of information in the sector, in particular at the national, sub-regional and regional levels. The various initiatives are discussed thematically, and guidance is sought from the Working Group on the way forward for accelerating capacity building with the aim of strengthening national plant breeding plans and programmes and promoting seed sector development. It is clear that a balance between conservation and sustainable use of PGRFA is implied and therefore it is imperative that country delegates are able to work with a wide scope of issues. Consequently the Working Group may wish to reflect and advise on the optimal technical composition of the representation to the Commission sessions. The Secretariat also invited information on capacity building activities from the CGIAR and other relevant stakeholders. The information received is provided in an information document².

2. CAPACITY BUILDING TO SUPPORT THE MANAGEMENT AND USE OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE (PGRFA)

7. FAO works with Member Countries at the national, sub-regional and international levels in a variety of areas related to capacity building to support the management and use of plant genetic resources. The main thrust of these activities can be broadly classified under four headings: a) raising awareness among policy makers; b) strengthening institutional capabilities; c) enhancing technical expertise; and d) contributing to infrastructure development.

8. Specific activities include facilitating dialogue at the national, sub-regional and regional levels in partnership with relevant stakeholders; the development and implementation of technical assistance projects at the request of countries; organisation of technical training courses, study tours and workshops; provision of training and resources to manage information related to seeds; and publication and dissemination of normative and technical materials through available channels including through networks and the Internet. All such activities are carried out either

¹ CGRFA-10/04/REP

² CGRFA/WG-PGR- 3/05/ Inf. 8: entitled “Reports from Organisations - Capacity-building Activities that Support the Utilization of Plant Genetic Resources for Food and Agriculture”.

through regular programmes, or by the mobilization of extra budgetary resources. The projects are always executed in consultation and close collaboration with stakeholders, partners and donors. An indicative list of such projects and activities is provided in Annex 1.

A. STRENGTHENING CAPACITIES IN PLANT BREEDING PROGRAMMES

9. To quantify the status and progress in investment and production of national plant breeding programmes, FAO implemented a National Plant Breeding Survey. The survey was conducted beginning in 2004 and has continued into the first part of 2005. The results of the survey will also be used as an input in the elaboration of the *Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture*. Twenty-seven countries from Africa, Asia, Latin America, the Near East and Europe have participated in the survey. Preliminary results indicate that plant breeding is in decline, and the number of adequately trained plant breeders in the countries that were surveyed is not sufficient to meet the varietal development needs of farmers. Significant capacity building would be required in developing countries to enhance plant breeding capacity, including strengthening national capacity to enable the application of available biotechnology tools.

10. A multi-stakeholder consultation was convened in 2005 to summarise and popularise the lessons learned from the ongoing global survey and to discuss the way forward. The participants noted again the decline in plant breeding capacity and stressed that without adequate numbers of suitably qualified staff, productive plant breeding will not be possible. They also noted that while biotechnology is an integral feature of modern plant breeding research and practice, it is not sufficiently embedded in practical plant breeding in many developing countries, mostly due to inadequate infrastructure and the lack of resources and trained staff. The consultation provided constructive suggestions on ways to address gaps in plant breeding capacity and requested the Commission to give urgent consideration to capacity building and technology transfer to developing countries. Participants stressed that FAO has a key role in enhancing awareness of the importance of sustainable crop improvement through creating successful opportunities for plant breeding.

11. In the past five years, FAO has initiated several activities to strengthen national plant breeding capacity and the application of biotechnology tools. These have focussed on increasing technical expertise and skills, including through participation in training courses on specific subjects, such as: base-broadening, crop diversification, multilateral environmental agreements of relevance to PGRFA, molecular techniques of plant breeding and participatory plant breeding. Training courses on plant breeding strategies and techniques have been conducted at the sub-regional level in West Africa and in East Africa, with donor support.

12. A number of these technical training courses are organised in collaboration with national agriculture research institutes, PGRFA networks and CGIAR centres. In Africa for example, IITA is a major partner. Base-broadening efforts are being promoted in Latin America with local networks. A number of technical publications were developed or are under preparation in partnership with stakeholders and partners. Ongoing work includes a book on the application of marker assisted selection (MAS) in plants, livestock, forestry and fishery, being prepared in collaboration with the FAO Interdepartmental Working Group on Biotechnology. A field guide for young scientists is also under preparation on the application and use of basic biotechnology tools like tissue culture and MAS, for the conservation of PGRFA.

B. CAPACITY BUILDING FOR THE DEVELOPMENT OF EFFECTIVE SEED SYSTEMS

13. Seeds and planting material are the physical embodiment of plant genetic resources. Seeds hold new and valuable genetic information for increased agricultural productivity. As shown in Figure 1, the seed system is a key segment of agricultural production. It is comprised of a series of activities that include seed production and conditioning, storage, seed quality control, distribution and marketing. Policy and legal frameworks underpin seed systems and assist in ensuring delivery of quality seeds to farmers and stakeholders, as illustrated.

14. Capacity building activities provide a major component in most technical assistance projects for seed sector development that are undertaken by FAO. In the past 10 years or so, some 18 national projects³ have been executed in support of seed sector development. Core activities include facilitating the access of farmers to high yielding varieties suitable for their agro-ecological conditions; seed sector reviews; seed policy assistance; formulation of seed legislation, seed production and multiplication; management of information related to seeds; infrastructure development; and assistance for developing local seed enterprises or community based seed security projects operating in Afghanistan, Ethiopia, Malawi and Myanmar, for example. Capacity building in member countries in relation to seed sector development is taking place in close collaboration with international organisations, including the International Seed Testing Association (ISTA), the global standard-setting organisation on procedures for seed testing, the OECD seed schemes, the Union for the Protection of New Varieties of Plants, (UPOV), the International Seed Federation (ISF), Centres of the CGIAR, and in partnership with local, national and regional organizations, including UEMOA and South African Development Community (SADC).

15. In order to obtain stakeholders' views on gaps and needs in the seed sector, FAO convened expert workshops on Seed Policy (2004) and Quality Declared Seed (2003)⁴. The seed policy workshop generated several recommendations to assist seed policy development, including: promoting participatory processes in the development of seed regulatory frameworks, gathering information on existing seed regulatory models, assisting in collecting and sharing accumulated experiences in developing countries, and providing a forum to discuss compatibility of seed regulatory issues to facilitate the movement of seeds among countries. The experts recommended identifying opportunities to build partnerships between public and private sector in seed systems, as their role is perceived as complementary. Several recommendations also resulted from the Quality Declared Seed workshop, including: finalization of the revised edition of its Quality Declared Seed document, incorporating new crops as well as the revised seed standards into the document, promoting the implementation of Quality Declared Seed at the global level, and organizing another expert consultation to produce a manual aimed at issues related to a quality control scheme for clonal (asexually propagated) crops.

16. As a contribution to the gaps analysis on seed systems requested by the Commission⁵, a study is being conducted by FAO to assess the state of information on seeds and planting material in Member Countries. The objective of the study is to review the information needs of countries for producing and accessing seed and for seed supply in rehabilitating farming systems after disasters, as well as to analyse gaps in the availability of and accessibility to this information.

³ In Albania, Afghanistan, Angola, Argentina, Belize, Burkina Faso, Democratic Republic of Congo, East Timor, Jamaica, Iran, Libya, Myanmar, North Korea, Sierra Leone, Syria, Sri Lanka, Tajikistan and Uzbekistan.

⁴ CGRFA/WG-PGR-2/03/3

⁵ CGRFA-10/04/REP para. 32

Preliminary results suggest that capacity building to fill gaps in the accessibility to and management of information on seed systems in developing countries would strengthen seed systems and enhance opportunities for seed production and distribution at the national and regional levels. FAO will continue to provide technical assistance to developing countries on request, and seek extra budgetary funding opportunities to further enable support.

17. Complementary to capacity building activities in the seed sector, seed security assessment methodologies are being developed to improve the response to emergency situations. FAO has implemented more than 400 emergency seed relief and rehabilitation projects during the period 2001-2003.

18. As a result of accumulated experience through project implementation, in 2003, FAO organized a global Expert Workshop on Seed Emergency and Relief. Participants recommended that FAO broaden the scope of the Global Information and Early Warning System on Food and Agriculture (GIEWS) and the Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS) to include needs assessments relevant to seed security and other aspects of agricultural productivity, pay more attention to the management of information relevant to emergency relief operations, review its administrative procedures to facilitate emergency operations and allow for innovative approaches, promote greater attention to preparedness among its partners and strengthen partnerships with other organizations.

C. CAPACITY BUILDING FOR BIOSAFETY AS IT RELATES TO SEEDS AND PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

19. A number of projects have been undertaken in the context of the implementation of the *Cartagena Protocol on Biosafety*. These have focused on enhancing technical capacity, strengthening infrastructure, providing policy and legal assistance and raising awareness within national agencies and institutions to support biotechnology and biosafety functions for handling genetically modified (GM) seeds and crop products, in line with international agreements.

20. Biosafety related capacity building projects have been completed in Argentina, Bolivia, Bangladesh, Malaysia and Paraguay, and are ongoing in Grenada, Kenya and Swaziland. Regional and sub-regional projects are under development for the Caribbean region and Central and Eastern European countries. In addition, since 2003, technical training in GM seed testing and variety verification for staff of national seed agencies and public and private sector institutions has also been undertaken. FAO has worked with ISTA to conduct training courses at the regional and sub-regional levels. Seven such courses have been held and additional sub-regional courses are being planned to meet Member Country requests.

21. FAO's Interdepartmental Working Groups on Biotechnology and on Biodiversity organised two multidisciplinary Expert Consultations on '*Environmental Effects of GM Crops*'⁶ and '*GMOs in crop production and their effects on the environment: Methodologies for Monitoring and the way ahead*'⁷. The experts recommended that the environmental effects of GM crops need to be assessed on a case-by-case basis, within an ecosystem context. Effects should be monitored on a medium- to long-term basis, through well-planned transparent strategies that provide for stakeholder engagement, and that assist policy makers in taking effective biosafety decisions and

⁶ FAO Expert Consultations on 'GMOs in crop production and their effects on the environment: Methodologies for Monitoring and the way ahead' 18 -20 Jan, 2005 (<ftp://ftp.fao.org/docrep/fao/008/ae738e/ae738e00.pdf>)

⁷ FAO Expert Consultation on 'Environmental Effects of GM Crops', 16-18 June, 2003, (<ftp://ftp.fao.org/docrep/fao/field/006/ad690e/ad690e00.pdf>)

actions. They also recommended that FAO lead the way in assisting developing Member Countries in shaping practical measures and guidelines towards this end. Capacity building at the national level and mobilization of resources for achieving these objectives were emphasised.

22. Along with the International Federation for Organic Agriculture Movements and the International Seed Federation, FAO organized the First World Conference on Organic Seed⁸. The event provided an opportunity to exchange views on a wide range of issues and participants agreed on the need for future discussions. The conference agreed on the principle of freedom of choice of agricultural production systems and stressed that producers have the right to choose their production system. FAO was requested to continue to facilitate stakeholder-led dialogue on co-existence measures and responses to develop and elaborate guidelines for management practices for co-existence between organic and convention agriculture production, with and without the deployment of GM crops.

3. CONCLUSIONS

23. The National Plant Breeding Survey, expert consultations and workshops on PGRFA and seed sector issues related to policies and seed security, have revealed a number of important issues in relation to the sustainable use of plant genetic resources that the Working Group may wish to consider in their deliberations. There appears to be a trend toward reduced funding by the public sector and overall decreased capacity to produce new, adapted varieties of essential crops. Adequate operational and human resources over several years are required to permit such varieties to be released on a continuous basis. This suggests that there may be a lack of awareness among some policy makers of the positive impacts of plant breeding on national agriculture development. In many instances, investments in national seed programmes are also currently not adequate to meet the needs of small-scale farmers in most developing countries.

24. The survey indicated that there is also a need for enhanced interaction among the public and the private sector interests in the utilization of plant genetic resources. Though there is an increase in the number of private sector companies investing in agricultural research, the results from much of this research are not immediately available to everyone, and thus cannot always be used by national programmes to improve the situation of small-scale farmers in developing countries. Also, the private sector tends to concentrate its interests on a small number of crops of global importance, which are not necessarily the most important crops for small-scale farmers.

25. FAO and several other organizations are assisting developing countries and countries with economies in transition to strengthen their national plant breeding and seed systems, including through the development of appropriate and harmonized policy frameworks. However, further investments are essential. FAO has confirmed, in its Medium Term Plan for 2004-2009, a renewed commitment to developing capacity to enhance the sustainable use of plant genetic resources and to advance seed systems. The main expected outputs include:

- a. Support to on-farm management, exchange and improvement of plant genetic resources and national seed systems ensuring complementarity between private and public systems;
- b. Improved and harmonized regulatory frameworks for plant genetic resources, seed production and trade and variety release;

⁸ First World Conference on Organic Seed: Challenges and Opportunities for Organic Agriculture and the Seed Industry, Rome, 5-7 July 2004. <ftp://ftp.fao.org/paia/organicag/organic-seed-conf.pdf>

- c. Due attention given to seeds and plant genetic resources in disaster preparedness, relief and rehabilitation;
- d. Improved access to and transfer of plant genetic resources, and seed related technologies, including biotechnology;
- e. Capacity building for enhanced use of PGRFA, including through plant breeding strategies and biotechnology; and
- f. Decision support system on plant breeding and biotechnology to strengthen National Agriculture Research Systems (NARS).

26. Capacity building activities are possible as a result of a combination of regular programme funding and the mobilization of extra budgetary financial resources. Donor support provided has proven essential to carry out activities in the seed sector⁹. A number of projects are also unilaterally funded by concerned developing countries (e.g. Nigeria and Libya). FAO will continue to rely on extra budgetary support to undertake capacity building projects and activities in plant breeding and seed systems development. A coordinated, long-term response from donors and international organizations and investments from within countries will be necessary.

4. GUIDANCE SOUGHT FROM THE WORKING GROUP

For Plant Breeding

27. The Working Group may wish to recommend that the Commission request FAO to prepare an *options paper* aimed at strengthening plant breeding including, *inter alia*, all issues related to capacity building. The following consultative process is proposed for preparing the *options paper*:

- a. Expand coverage of the National Plant Breeding Survey to additional countries, including regional consultations, to further assess the capacity of national plant breeding programmes and to determine constraints and opportunities.
- b. Further assess opportunities for partnerships with relevant organisations and institutions in strengthening plant breeding, with special attention to capacity building.
- c. Based on the results of the February 2005 expert consultation, and further analysis of the existing survey data and any additional survey inputs, elaborate a draft of the *options paper* taking into consideration linkages to the *Global Plan of Action* and the *International Treaty*; which will then be reviewed by a technical task force.
- d. Convene a workshop, including experts and representatives of relevant organizations and donors, to review and finalize the draft *options paper* to gain support for implementing priority actions. A separate donors meeting may also be considered.
- e. Present the *options paper* to a future session of the Commission for consideration.

⁹ Past and current donors in the seed sector include European Commission, France, Germany, Norway, Japan, Sweden, and the United States of America

28. The Working Group may wish to provide advice on the proposed process for preparing the *options paper* that will emphasize capacity building and encourage additional countries to participate in the National Plant Breeding Survey.

29. The Working Group may wish to recommend to the Commission that it endorse the consultative process and request donors to provide support, and most importantly to contribute to strengthening plant breeding programmes in developing countries and countries in transition.

For Seed Systems Development

30. The Working group may wish to provide comments and suggestions to FAO on the Organisation's capacity building activities aimed at strengthening use of PGRFA through seed systems, keeping in mind paragraph 15 and the indicative list provided in Annex 1 to this document.

31. The Working Group may wish to recommend to the Commission to consider the need for and modality of a code of conduct that focuses on emergency seed relief and rehabilitation during and after a disaster situation (see paragraph 18).

32. The Working Group may wish to recommend that the Commission requests FAO to develop a draft plan to formulate appropriate seed policy and regulatory regimes to advance the growth of the seed systems of Member Countries, including to identify sources of funding for technical assistance, bearing in mind the progress of the gap analysis on seed systems requested by the Commission as described in paragraph 16.

ANNEX 1

INDICATIVE LIST OF CAPACITY-BUILDING PROJECTS SUPPORTED OR CARRIED OUT BY FAO

- FAO and the International Atomic Energy Agency (IAEA), Vienna, Austria have supported capacity building in member countries for the use of nuclear techniques and relevant biotechnologies for crop germplasm enhancement and crop improvement for the past 40 years, through their Joint FAO/IAEA Division for Nuclear Techniques in Food and Agriculture. This has been implemented through the coordination and provision of technical input into research and development activities; training; provision of services; and the adaptation of technologies to suit the circumstances and needs of Member Countries.
- The EcoCrop data base, which gives users lists of possible crops to consider for production, has characterised over 2000 species. Users may choose among kinds of crops (e.g. cereal, root crop, living fence, etc) then enter information on general environmental conditions and length of the growing season, and the data base selects crops for consideration. EcoCrop is linked with EcoPort (developed initially within FAO but now managed as an independent foundation), where users can get detailed information on crops (e.g. their pests and diseases). EcoPort species information is maintained by international experts who are empowered as gatekeepers to keep the system up-to-date. The content of the related Hortivar database has more than doubled during the last two years. Varietal performance data within many horticultural crops, helps point to the best suited growing ecologies (or *vice versa*, identify cultivars for given ecologies) and the searchable data base is linked to growers' guides on sustainable husbandry practices. The grassland species profiles (more than 600) and country-specific grasslands use profiles that have been brought up to date and are available on CD and the web.
- The Secretariat of the International Rice Commission has been supporting capacity building activities on breeding and seed production. The main areas are on use of hybrid rice in Asia, in collaboration with IRRI; NERICA rice in Africa, in collaboration with WARDA under the framework of the African Rice Initiative; and population improvement in Latin America and the Caribbean, in collaboration with CIAT.
- REDBIO, the FAO-sponsored Latin American Biotechnology Network, has been working in the region supporting the application of biotechnology tools to enhance plant breeding and the sustainable conservation of plant genetic resources. The network has promoted *in vitro* germplasm exchange, training courses and workshops regarding molecular markers and genomics.
- Projects at the country and sub-regional levels on harmonization of seed rules and regulations are being implemented to increase seed trade and access to improved varieties in West Africa and in Southern Africa. They are provided in cooperation with various stakeholders, including UEMOA and the South African Development Community. A regional approach on the same theme has been initiated for the countries of Central Asia and the Caucuses. These harmonization initiatives include the development of sub-regional information systems to improve exchange of varieties.
- National projects aimed at developing a seed policy and arrangements to coordinate their execution have been implemented in Afghanistan, Angola, Democratic Republic of Congo,

Iran, and Burkina Faso. These projects facilitate the development of the seed industry and access of farmers to quality seed varieties.

- National or sub-national seed programme development for seed production of high yielding varieties have been carried out or are underway in Afghanistan, Albania, Belize, Cameroon, East Timor, Libya, Myanmar, North Korea, Sierra Leone, Sri Lanka, Tajikistan and Venezuela.
- In Nigeria, a seed programme is being implemented within the context of the Special Programme for Food Security (SPFS); and other projects are under development in Angola, Iraq, Lesotho and Sudan.
- Community seed security projects supported by FAO are operating in Afghanistan, Ethiopia, Honduras, Malawi and Myanmar to facilitate the production of high yielding varieties of local staple food crops at the community level to meet the food security needs of communities.
- The LinKS project on gender, biodiversity and local knowledge systems for food security in Tanzania, Swaziland and Mozambique has provided revealing information about gender roles and responsibilities and the effect of HIV/AIDS on traditional seed systems and linkages among different types of seed systems. This project will help FAO and Member Countries to design strategies for helping farmers access the crop diversity that they need.
- FAO conducted a study in Ethiopia on the role of local of markets in the access to crop diversity by local farmers. An assessment tool is being developed with International Agriculture Research Centres (IARCs) to determine the role of markets in the exchange of crop diversity and will soon be tested in selected countries.
- Case studies were carried out to assess the impact of the natural disasters on agro-biodiversity in Mozambique.
- Studies on Understanding Access to Seeds and Plant Genetic Resources: What a Livelihoods Perspective Can Offer and the relevance of an EcoSystem Approach to Seed Systems.