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PROGRESS REPORT ON THE WORLD INFORMATION AND EARLY WARNING SYSTEM ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

CONTENTS

	<i>Para.</i>
I. Introduction	1 -5
II. Development activities since the last Progress Report	6-21
III. Future perspectives	22-36
IV. Elements for consideration in the light of Article 17 of the International Treaty on Plant Genetic Resources for Food and Agriculture	37 - 39
V. Guidance requested from the Commission	40

PROGRESS REPORT ON THE WORLD INFORMATION AND EARLY WARNING SYSTEM ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

I. INTRODUCTION

1. The World Information and Early Warning System (WIEWS) on Plant Genetic Resources for Food and Agriculture (PGRFA), was established pursuant to Articles 7.1 (e) and (f) of the International Undertaking on Plant Genetic Resources to foster the exchange of information among member countries, to support the periodic assessment of the *State of the World's PGRFA* and to alert the international community about threats of erosion of PGRFA. Since its establishment, WIEWS has been developed under the guidance of the Commission on Genetic Resources for Food and Agriculture and has been part of the Commission's *Global System on Plant Genetic Resources*.

2. Following a recommendation of the Fourth International Technical Conference on Plant Genetic Resources,¹ reiterated by the Commission at its Seventh Session,² an external review of WIEWS was carried out in 1997. The review, and the follow-up actions undertaken by the Secretariat, were presented to the Eighth Session of the Commission.³ The review itself concluded that WIEWS was relevant both to the work of the Commission, and to FAO's collaboration with the Secretariat of the Convention on Biological Diversity (CBD) and with the International Plant Genetic Resources Institute (IPGRI). It urged the Secretariat to improve the integration of the System with other in-house PGRFA-related activities, and to enhance data-accessibility, taking advantage of Internet technology. It also stressed the need for member countries to collaborate actively, through officially-nominated correspondents, in periodically providing current data to WIEWS.

3. In response to these recommendations, a web-based application that makes WIEWS available on the Internet, was released in April 1998, through the FAO World Agricultural Information Centre (WAICENT). The application, designed as a textual and maps-based information retrieval tool, improved accessibility to the information contained in WIEWS at that time, such as on *ex situ* collections; germplasm-holding institutions and contacts; storage facilities; and quantitative information on germplasm holdings at species level. In early 1999, a trial remote update function was introduced, in order to allow users to directly manage their own information via an Internet connection to the WIEWS databases.

4. In addition, a global information network of WIEWS correspondents was initiated in 1998, to improve PGRFA information exchange, and regional meetings were held in West and Central Africa, South/South-East Asia, and West Asia and North Africa to strengthen network activities and build capacity in the use of the System.

5. This document is substantially the same as that considered as document CGRFA/WG-PGR-1/01/6 at the First Session of the Intergovernmental Technical Working Group on PGRFA in July 2001. It has, however, been updated with regard to the activities carried out since then and, following the adoption of the International Treaty on PGRFA by the Thirty-first Session of the FAO Conference. Section 4 has been added to provide information, which may be of use to the Commission, in relation to Article 17 of the Treaty, the Global Information System on

¹ *Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture*, para. 287.

² CGRFA-7/97/REP, para. 23.

³ CGRFA-8/99/6, para. 4-11.

PGRFA. Section 5 has also been modified in the light of the discussions in the Working Group, and of the new Section 4.

II. DEVELOPMENT ACTIVITIES SINCE THE LAST PROGRESS REPORT

6. WIEWS' role as an information tool within the Commission's *Global System on PGRFA* requires that it be continuously adapted to the changing needs of national PGRFA programmes and of the Commission. The main thrust since the last report to the Commission, has been to develop, test and release a new web-based interface,⁴ designed to be (i) flexible and able to be broadened without major restructuring; (ii) directly responsive to the governmental officials providing information, by giving them direct control over their own data; and (iii) integrated within on-going national and international PGRFA information and knowledge delivery and exchange processes.

7. The development of WIEWS over the past biennium has focused on improving five main issues: data content, data accessibility, data and system integration, data consistency and system sustainability,⁵ following the discussions on WIEWS at the last regular session of the Commission.⁵



World Information and Early Warning System on Plant Genetic Resources

PGR	Seed	Early Warnings	GPA	SOW's PGR	InfoSys	Links
Maps	Sources	Programme	Global Plan of Action	State of the World's PGRFA	AG Databases	AG Department
Institutes	Varieties	Thematic Papers	National Focal Points		AGPS Databases	AGP Division
Germplasm	FAO Seed Review	Assessment Formats	Monitoring GPA Implementation		WAICENT	AGPS Service
Crop Activities	FAO Networks/ Fora				ECOPORT	AGPC Service
Contacts					SINGER	CGRFA
Legal Aspects					IPGRI's DGC	CBD
Global Network Correspondents					USDA-GRIN	UNEP-WCMC
WIEWS Meetings					ZADI-GENRES	IPGRI
FAO Networks					EGID	IUCN
FAO Crop-related databases					INIBAP	ISTA
				ICRISAT-GREP	FIS/ASSINSEL	
				ECP/GR	UPOV	
				GRIN-CA	OECD	
				more...	more...	

⁴ The new version of WIEWS can be accessed at <http://apps3.fao.org/wiews/>.

⁵ CGRFA-8/99/REP, para. 20.

Data Content

8. Five main, inter-related sections have been created within WIEWS (see Figure 1), covering information related to:

- *Plant Genetic Resources;*
- *Seed;*
- *Early Warning of Genetic Erosion;*
- *the Global Plan of Action for the conservation and sustainable utilization of PGRFA;* and
- *the State of the World's PGRFA.*

9. The *Plant Genetic Resources* (PGR) section contains - in addition to the information on *ex situ* germplasm collections maintained under the original WIEWS databases⁶ - information on national laws and regulations related to PGRFA,⁷ and the proceedings of the various WIEWS meetings held during the last four years.

10. The *Seed* section includes the World List of Seed Sources database, as well as a new sub-section for the periodic reporting of the activities of the FAO regional networks, and of forums on seed policies and programmes. Seed-related information is being strengthened, with the integration of the crop varieties database and the seed sector country profiles, based on data collected through the *FAO Seed Review* and a surveying mechanism being developed for farmers' cultivated varieties.

11. The *Early Warning of Genetic Erosion* section includes proceedings of a technical meeting on this subject, held in Prague in 1999, and assessment formats for reporting cases of genetic erosion in *ex situ* collections, *in situ* populations of wild crop relatives and on-farm conserved local varieties.

12. The *Global Plan of Action (GPA)* section makes available: the *Plan* in English, French and Spanish; the list of officially nominated National Focal Points for the implementation of the *Plan*; and the reporting formats and completed questionnaires for the 2000 survey on the implementation of the *Plan* in member countries.⁸

13. The *State of the World's PGRFA* (SOW's PGR) section includes the comprehensive and short versions of the report as well as all national, sub-regional and regional reports prepared for the International Technical Conference.

Data Accessibility

14. The WIEWS interface has been redesigned to provide: (i) a flexible framework for future development; (ii) a more user-friendly approach, including a multi-language function,⁹ and (iii) faster response in data-retrieval and page-downloading. A number of customisable, dynamically generated data-reporting formats have been developed, covering all the WIEWS databases. Dynamic lists of key information-providers and users, such as National Focal Points for the implementation of the *Global Plan of Action* and WIEWS Correspondents, have been implemented, within the *PGR* and *GPA* sections, respectively.

⁶ See CGRFA-8/99/6 for more details.

⁷ Information on Laws and Regulations related to PGRFA and Seed is recorded for 80 countries under the *Legal Aspects* sub-section.

⁸ CGRFA-9/02/7, *Monitoring the Implementation of the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture*, para. 8-11.

⁹ Arabic, English, French and Spanish.

Data and System Integration

15. In addition to the incorporation of the *Seed Information System* under WIEWS (see para. 10), data-integration with other in-house, crop-related databases relevant to PGRFA, such as the *Cultivars and World-wide Collections of Olive Germplasm* database,¹⁰ is underway. To foster integration with existing information systems inside and outside FAO, two auxiliary sections, *InfoSys* and *Links*, have been created under the new interface, which provide links to on-line, searchable information systems related to PGRFA, and to web sites and portals of international partners and relevant international organizations, respectively (see Figure 1). Further integration is also being pursued through direct links to national Internet-based documentation systems.¹¹

16. As part of the efforts to enhance PGRFA information exchange, activities to build capacity in information management, and establish a Latin American and the Caribbean directory including passport and characterization data of PGRFA of five main crops were initiated through a project funded under the FAO and the Netherlands Partnership Programme, and in close collaboration with national and regional stakeholders. Furthermore, a new list of multi-crop passport descriptors, which sets standards for exchanging passport data of germplasm collections and recommends the use of WIEWS based institution codes downloadable from the web, was developed by IPGRI in cooperation with FAO in 2002.

Data Consistency

17. The scientific botanical species nomenclature recorded under WIEWS has been reviewed and inconsistencies attributable to data-input mistakes have been corrected. Further controls are being carried out, through contacts with data providers. The structure of various tables has been modified, to allow full names instead of unfriendly abbreviations, and existing abbreviations have been replaced by extended names.

System Sustainability

18. The information available in WIEWS relies on:
- i. direct contributions from member countries;
 - ii. routine data collecting activities (such as the *FAO World Seed Review* and surveys for monitoring *GPA* implementation); and
 - iii. event-related data-collecting activities (such as country reports for the Fourth International Technical Conference on PGR; WIEWS regional meetings; seed networks and *forum* meetings).

The network of national WIEWS correspondents, initiated in 1998, now includes 86 officially appointed members. In line with the recommendations of the Working Group on PGRFA and as part of the activities aimed at strengthening network activities at the regional level and build national capacity, a meeting for Latin America and the Caribbean was held in Costa Rica in November 2001. Activities for the development of an improved version of a genebank information management system are being carried out jointly with IPGRI, USDA, INTA-Argentina and FAO.

19. Data-gathering is increasingly being decentralized, including through the introduction of remote data-access and update functions, and the adoption of electronic formats for country reporting during surveys. The number of persons and institutions providing information for WIEWS is progressively increasing, with positive implications for the overall sustainability of

¹⁰ The database, which has been updated in 2002, contains information on over 1,250 olive cultivars, compiled from about 1,150 published sources: list of olive cultivars with a short description of their characteristics and information on their geographical distribution, and a world-wide list of olive collections.

¹¹ There are currently more than 412 direct links to national Internet-based documentation systems.

the System, and the amount and quality of the information available. Since the 2000 release of WIEWS, 141 users out of 598, who have been granted writing privileges, have provided new information to the System.

20. Summary data on CGIAR genebanks holdings is being periodically updated from the System-wide Information Network for Genetic Resources (SINGER). Following the recommendation of the Working Group on PGRFA, automatic procedures have been developed under WIEWS for maintaining updated information on germplasm holdings of genebanks, which publish these data through the Internet, such as the National Genetic Resources Program of the United States Department of Agriculture (NGRP-USDA), the Centre for Genetic Resources (CGN) of the Netherlands, and the Braunschweig's Plant Genetic Resources Collection, Federal Centre for Breeding Research on Cultivated Plants (BGRC) in Germany.

21. In line with priority activity area 17 of the Global Plan of Action for the conservation and sustainable use of PGRFA, and with Article 17 of the recently adopted International Treaty on PGRFA, and as part of the preparation for the Second Report on the State of the World's PGRFA, a global survey for updating the information on germplasm holdings has been initiated with the collaboration of IPGRI in March 2002. About 1,500 institutions from 145 countries are being surveyed either directly or through the network of National WIEWS Correspondents. To date, information on about 28% of the existing germplasm collections has been updated. The Commission may wish to encourage member countries, which have not already done so, to nominate national correspondents to participate in the information network and to collaborate in updating the information within WIEWS.

III. FUTURE PERSPECTIVES

WIEWS' Role in Updating the State of the World's PGRFA and in Monitoring the Implementation of the Global Plan of Action

22. One of the main, original objectives of WIEWS was to periodically provide detailed information on which to base the report on the *State of the World's PGRFA*.¹² WIEWS contributed extensive information for the preparation of the first *State of the World's PGRFA*¹³ for the Fourth International Technical Conference on PGR (Leipzig, 1996) and it will be a key resource in the preparation of future reports.¹⁴

23. Following the Commission's request, at its Seventh Regular Session,¹⁵ that FAO play a proactive and creative role in facilitating and monitoring the implementation of the *Global Plan of Action*, a standardized monitoring approach was successfully adopted during the 2000 survey on the implementation of the *Plan* in member countries.¹⁶ Within the framework of a continuing monitoring process,¹⁷ this approach will be comprehensively developed, in order to gather detailed quantitative information (comparable both spatially and temporally), regarding the 20 priority activity areas of the *Plan*. This will establish an efficient data-collecting, analysis and delivery mechanism, and set the basis for the utilization of a web-based information system for monitoring the implementation of the *Plan*, with built-in remote updating, searching and reporting functions.

¹² CPGR/93/REP, para. 21.

¹³ ITCPR/96/REP, para. 14.

¹⁴ CGRFA -9/02/8, *Updating the Report on the State of the World's Plant Genetic Resources for Food and Agriculture*, para. 11 and 14.

¹⁵ CGRFA-7/97/REP, para. 19.

¹⁶ CGRFA -9/02/7, *Monitoring the Implementation of the Global Plan of Action*, para. 11.

¹⁷ CGRFA-9/02/7 para. 21.

24. Document CGRFA-9/02/7, *Monitoring the Implementation of the Global Plan of Action for the Conservation and Sustainable Utilization of PGRFA*, reports on the monitoring methodologies tested to date, and makes a proposal for the use of WIEWS in systematic further monitoring.

25. As a dynamic information tool, WIEWS provides a natural framework for hosting the proposed web-based information system of the *Plan's* monitoring mechanism. This is evident from the role that WIEWS can play in the preparation of the *State of the World's PGRFA* (see para. 22), and the complementarity between the periodic updating of the *State of the World's PGRFA*, and the monitoring of the *Plan's* implementation.¹⁸ The integration of the monitoring system and WIEWS would reduce the costs of implementation, through the sharing of the physical and logical resources already in WIEWS.

26. With the implementation of a *Global Plan of Action* monitoring system, WIEWS might therefore become a common repository among member countries for exchanging experiences, tracking achievements, and highlighting constraints and needs, in the context of the *Plan's* implementation process. It could serve as a virtual bridge between the Commission and national PGRFA programmes.

27. Support to National Focal Points in the establishment of national clearing-house mechanisms for monitoring the *Plan's* implementation, either by hosting such mechanisms or providing linkages among them, as well as by participating in the capacity-building process through its network of correspondents, would consolidate WIEWS' further contribution to both the implementation and monitoring processes of the *Global Plan of Action*.

28. In order to strengthen the link between conservation and utilization, specific information on national capacities in plant breeding, including in relation to traditional and modern plant breeding technologies, is required. Partnerships for the monitoring at molecular level of genetic diversity and erosion could involve, among others, National Plant Genetic Resources for Food and Agriculture Programmes, the World Conservation and Monitoring Centre (WCMC) of the United Nations Environment Programme (UNEP), Cornell University, the Institute for Genomics Research, the International Plant Genetic Resources Institute (IPGRI) and other Centres of the CGIAR system. The results could be made public through WIEWS. It is therefore proposed that WIEWS create a database on national financial and human resources committed to plant breeding in the public and private sector. In doing so, links with national breeders will be strengthened and synergy with conservation promoted. This information will also allow the identification of country needs and priorities, and development opportunities, in the updating of the *State of the World for Plant Genetic Resources for Food and Agriculture*.

Early Warning System on Plant Genetic Erosion

29. The development of the Early Warning System on Plant Genetic Erosion was discussed during a technical meeting, in Prague, in June 1999.¹⁹ Further research on general models of genetic erosion, to define key indicators applicable by field-workers, is required. In addition, national PGR programmes could build linkages to community-level conservation efforts, so as to develop a network of community-based early warning indicators of genetic erosion, and to provide regular inputs to WIEWS.

30. Molecular approaches are becoming increasingly valuable and cost-effective in understanding the diversity of crops. Single nucleotide polymorphisms (SNPs), coupled with high throughput screening, made possible through micro-array analyses and bioinformatics, are

¹⁸ CGRFA-7/97/REP para. 22.

¹⁹ *Proceedings of the Technical Meeting on the Methodology of WIEWS*, Research Institute of Crop Production, Prague, Czech Republic, 21 - 23 June 1999, FAO, 89 pp.
Internet address: <http://apps3.fao.org/wiews/Prague/tabcont.htm>

powerful new tool. These technologies can be applied not only for crop molecular diversity monitoring, but also for crop gene discovery and marker-assisted selection, useful for crop improvement. Very precise information for the management of crop diversity will increasingly become available, and it is proposed to add crop-specific information derived from these technologies to WIEWS.

31. The potential of Geographical Information Systems (GIS) technology for early warning of genetic erosion should be explored further, particularly as a tool for the identification and mapping, on a crop species basis, at national level, of zones where highest diversity of PGRFA occurs, in order to concentrate monitoring efforts in the most vulnerable zones, to promptly alert national programmes and the international community to genetic erosion threats, and to take the necessary action.

32. Data on the collection sites of accessions stored in national gene-banks could be used to map geographic distributions of national germplasm holdings on a per species basis. Existing tools for the management and spatial analysis of genetic resources data²⁰ could be more systematically used by National Programmes for the identification of areas of high diversity, as well as for the selection and design of *in situ* conservation sites. Ultimately, by correlating meteorological and pedological information with available geographical coordinates of collected samples, it could be possible to identify new potentially diversity-rich areas, which might deserve attention in future germplasm exploring and collecting missions, and in monitoring genetic erosion.

33. In addition, remote sensing technology could play a role complementary to GIS in providing information on macroscopic events of natural or human causality, with either direct or potential impacts on identified diversity-rich areas, and provide a basis for better ground-level monitoring of genetic erosion. This would enhance monitoring capacity at local and national levels.

34. In this regard, the Commission may wish to recommend strengthening capacity in the use of GIS technology for the development of the monitoring of genetic erosion through collaboration among National PGRFA Programmes, WIEWS, the World Conservation and Monitoring Centre (WCMC) of the United Nations Environment Programme (UNEP), the International Plant Genetic Resources Institute (IPGRI), and other Centres of the CGIAR system.

35. As highlighted in the *Global Plan of Action*, there is a close relationship among priority activity area 18, *Developing monitoring and early warning system for loss of PGRFA*, priority activity area 1, *Surveying and inventorying PGRFA*, and priority activity area 3, *Assisting farmers in disasters situations to restore agricultural systems*.²¹ Farmers and local communities in many regions depend on particular local crop varieties for achieving food security. The geographical distribution and conservation status of such local varieties may fluctuate across years. Related information is scarce and fragmentary and there are concerns that local varieties may be unavailable to farmers in some years and may even face extinction in disaster situations. A coordinated effort to collect and divulge relevant information about on-farm local varieties conservation, use and geographical distribution would contribute to preventing genetic erosion, and to improving the effectiveness of emergency relief operations in restoring agricultural systems, when disasters occur.

36. In this respect, the Commission may wish to recommend that FAO initiate pilot activities to assist countries in selected disaster-prone areas to build capacity for establishing mechanisms

²⁰ *WorldMap version 4.20.05*, developed by the Natural History Museum, UK;
DIVA version 2.0, developed by the International Potato Centre (CIP), IPGRI, SINGER and FAO;
FloraMap version 1.01, developed by the International Centre for Tropical Agriculture (CIAT).

²¹ Global Plan of Action, para. 28, 51, 63 and 292.

to integrate efforts on these priority activity areas, including monitoring geographical distributions areas of local varieties, their conservation and use.

IV. ELEMENTS FOR CONSIDERATION IN THE LIGHT OF ARTICLE 17 OF THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

37. In recognising the importance of access to and exchange of information for the conservation and sustainable use of PGRFA and the implementation of the Global Plan of Action, and to optimise the effectiveness and value of WIEWS as one of the partners, particularly for the development of a feasible and effective early warning system on plant genetic erosion both *in situ* and *ex situ*, the Secretariat attaches high priority to working towards the development and strengthening of a Global Information System as foreseen by Article 17 of the International Treaty on PGRFA.

38. Preparatory activities for paving the way towards the development of a Global Information System will include identifying the full range of existing information systems and partners, end-user needs, information gaps and new resources needed to satisfy needs and fill gaps. Towards this end, the Secretariat proposes to initiate systematic consultations involving stakeholders and governments to address issues pertinent to advancing the harmonious and synergistic development of a Global Information System on PGRFA, under the guidance of the Governing Body of the International Treaty on PGRFA, and in the *interim*, the Commission on Genetic Resources for Food and Agriculture, acting as Interim Committee for the Treaty.

39. The report on the outcome of a preliminary informal consultation is expected to be available by the time of the Commission meeting.

V. GUIDANCE REQUESTED FROM THE COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

40. The Commission may wish to provide guidance on actions to be taken by the Secretariat, in relation, *inter alia*, to:

- a. the participation of countries in the WIEWS information network and their collaboration in updating information (para. 22), as well as the role of WIEWS in:
 - i. the forthcoming assessment of the *State of the World's PGRFA*, and the establishment of a web-based information system for monitoring the implementation of the *Global Plan of Action* (para. 22-26); and
 - ii. providing support to National PGRFA Programmes for the establishment of a national mechanism to exchange information on the implementation of the *Global Plan of Action* (para. 27);
- b. the possible further development of the Early Warning System on Plant Genetic Erosion and the initiation of pilot activities to assist countries in selected disaster-prone areas to build capacity for establishing mechanisms to integrate efforts on the Plan's priority activity areas 1, *Surveying and inventorying PGRFA*, 3, *Assisting farmers in disasters situations to restore agricultural systems* and 18, *Developing monitoring and early warning system for loss of PGRFA*, including monitoring geographical distributions areas of local varieties, their conservation and use (para. 29-36);

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- c. the proposed consultation process towards the implementation of a Global Information System on PGRFA as foreseen in Article 17 of the International Treaty on PGRFA (para. 37-39); and
 - d. the integration in WIEWS of information resulting from molecular techniques for monitoring genetic diversity and erosion (para. 30), and of information to support national capacity-development in breeding (*i.e.*, DNA markers such as SNPs, high throughput screening with micro-array analyses and bioinformatics in plant molecular diversity characterization) (para. 28).