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Item 6 of the Draft Provisional Agenda

**COMMISSION ON GENETIC RESOURCES FOR FOOD AND  
AGRICULTURE**

**Tenth Regular Session**

Rome, 8-12 November 2004

**REPORTS FROM INTERNATIONAL ORGANIZATIONS ON THEIR  
POLICIES, PROGRAMMES AND ACTIVITIES ON  
AGRICULTURAL BIOLOGICAL DIVERSITY**

**PART II: INTERNATIONAL AGRICULTURAL RESEARCH  
CENTRES OF THE CONSULTATIVE GROUP ON  
INTERNATIONAL AGRICULTURAL RESEARCH (CGIAR)**

**Table of Contents**

	Paragraphs
I. Introduction	1 - 4
II. Section 1: Plant Genetic Resources For Food And Agriculture	5 - 39
III. Section 2: Farm Animal Genetic Resources	40 - 54
IV. Section 3: Aquatic Genetic Resources	55 - 60
V. Section 4: Forest Genetic Resources	61 - 64

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## I. INTRODUCTION

1. The Commission on Genetic Resources for Food and Agriculture regularly receives reports from relevant international organizations, including FAO, on their policies, programmes and activities for the conservation and sustainable use of genetic resources for food and agriculture. These reports contribute to facilitate cooperation in this area between FAO and other international organizations, and to develop appropriate mechanisms for cooperation and coordination.
2. In the case of reports from other international organizations, FAO has limited itself to compiling the reports, as submitted. Each report is fully the responsibility of the organization submitting it.
3. This report presents an overview of the genetic resources programmes of the Centres of the CGIAR<sup>1</sup> over the past two years. It has been prepared on behalf of the Centres by the CGIAR System-wide Genetic Resources Programme (SGRP) with inputs from the individual Centres. The SGRP facilitates cooperation amongst the Centres and collaboration with national and international organizations with the aim of enhancing the CGIAR's contribution to global efforts to conserve genetic resources for use in agriculture, forestry and fisheries. IPGRI is the convening Centre of SGRP and representatives of the Centres and FAO comprise its steering committee.
4. The report is presented in four sections: plant genetic resources for food and agriculture, farm animal genetic resources, aquatic genetic resources and forest genetic resources. The report contains detailed information on partnerships with national institutions, and further information on this regard is also in the information document *List of national and international partners in research programmes on farm animal genetic resources*.<sup>2</sup>

## II. SECTION 1: PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

5. The International Treaty on Plant Genetic Resources for Food and Agriculture (the Treaty) and the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (Global Plan of Action) provide the policy and practical framework for the CGIAR Centres to contribute to the conservation and sustainable use of plant genetic resources for food and agriculture. The Centres welcome the important role they have in the implementation of the Treaty, in particular with regard to the collections of plant genetic resources that they hold in trust for the world community. They are committed to working with national programmes, FAO and other organizations, to further the objectives of the Treaty and the implementation of the Global Plan of Action.
6. The Centres will continue to offer technical support, in cooperation with FAO, to assist national programmes in the ratification process and in the implementation of the Treaty. Represented by IPGRI, they stand ready to provide technical assistance and inputs to the development of the Treaty's Material Transfer Agreements.

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<sup>1</sup> Center for International Forestry Research (CIFOR); Centro Internacional de Agricultura Tropical (CIAT); Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT); Centro Internacional de la Papa (CIP); International Center for Agricultural Research in the Dry Areas (ICARDA); International Crops Research Institute for the Semi-Arid Tropics (ICRISAT); International Food Policy Research Institute (IFPRI); International Institute of Tropical Agriculture (IITA); International Livestock Research Institute (ILRI); International Plant Genetic Resources Institute (IPGRI); International Rice Research Institute (IRRI); International Water Management Institute (IWMI); The Africa Rice Center (WARDA); World Agroforestry Centre (ICRAF); WorldFish Center (WorldFish); International Network for the Improvement of Banana and Plantain INIBAP - *programme of IPGRI*; International Service for National Agricultural Research ISNAR- *programme of IFPRI*.

<sup>2</sup> CGRFA-10/04/inf.13.

7. The Global Crop Diversity Trust will make a major contribution to meeting the objectives of the Treaty and the Global Plan of Action, by supporting projects and programmes for the ex situ conservation of plant genetic resources over the long-term. The Trust is a joint initiative of FAO and IPGRI, on behalf of the CGIAR. Technical advice to the Trust is being provided by a joint FAO-IPGRI Technical Advisory Group. The Centres are assisting in the development of the crop and regional conservation strategies that will be used to determine which crop diversity collections will be eligible for funding by the Trust.
8. The Centres reaffirm their support to the implementation of the Global Plan of Action and are committed to contributing to the second Report on the State of the World's Plant Genetic Resources.
9. The CGIAR has renewed the mandate of its Genetic Resources Policy Committee. The Committee, an advisory body, is composed of members drawn from the CGIAR, national programmes, the private sector, and civil society organizations. Members serve in their personal capacity.
10. The next section of the report focuses on the management of the in-trust plant collections and gives examples of the Centre's research and support to national and international efforts in the conservation and use of plant genetic resources. The report on the current agreements between the Centres and FAO governing the in-trust plant collections, including the status of germplasm designated under the agreements and implementation of the material transfer agreement (MTA), is provided in CGRFA-10/04/6.

### **Management of the in-trust plant collections**

11. Eleven Centres collectively hold over half a million accessions of crop and forage genetic resources in trust under the 1994 agreements with FAO. The long-term conservation of the material in these collections, their evaluation and documentation, and the distribution of healthy germplasm and accurate, relevant information, constitute to the primary work of the Centre's genebanks. In discharging their commitments as trustees of the collections, the Centres make every effort to meet the demands of providing an international genebank service, while fulfilling the standards of management expected under the FAO agreements.
12. A major function of the SGRP is to assist the Centres to meet their trusteeship obligations. SGRP created and manages the System-wide Information Network for Genetic Resources (SINGER), which allows access through a single point of entry to information on the identity, source, characteristics and distribution of the in-trust plant collections. Over the years, SGRP has provided the mechanism for implementing common policies and legal instruments for managing the plant collections in accordance with the FAO's agreements. It has also played a focal role in instigating and supporting System-wide collaborative efforts aimed at improving the services of the genebanks. SGRP sponsored studies by IFPRI of the costs of conservation at the Centres, which will soon be published by CABI. It also conducted assessments of the requirements to bring genebank operations up to the best possible standards. This work, in part, gave rise to the initiative in 2000, to establish the Global Crop Diversity Trust. It also led in 2003, to the implementation of a major System-wide programme to rehabilitate the facilities and upgrade the operations of the CGIAR genebanks.
13. The costs of operating the genebanks and providing germplasm and related information are largely borne by core funding, which has declined for all Centres by 50% since 1994. Although this has not seriously compromised the maintenance of the collections, it has limited the ability of the Centres to operate the genebanks to best possible standards, and has given rise to backlogs in processing, multiplying and characterizing germplasm.
14. The upgrading programme is addressing constraints in equipment, staff and funding that are hampering essential work to ensure the security, viability, health and genetic integrity of the germplasm, and to make it and information on its characteristics available to users. The

programme is financed from the World Bank support to the CGIAR and will provide between US \$700,000 and \$1.5 million to each of the eleven genebanks, and \$370,000 to SINGER over a three-year period. SGRP is monitoring the implementation of the upgrading programme, which will be evaluated by the World Bank, CGIAR and FAO.

15. With much of the new equipment and additional staff provided by the upgrading programme in place, most Centres are reporting significant progress in addressing backlogs in the processing of germplasm and in raising the standards of their genebank operations. ICARDA and IITA have new seed stores nearing completion that will provide urgently needed increased storage capacity. CIMMYT, ICRISAT and IRRI have installed new equipment to increase the reliability and performance of their stores. Most Centres have either renovated or expanded their equipment for seed drying and viability and plant health testing, enabling them to accelerate preparation for storage. In 2003, CIAT, CIMMYT, ICARDA, ICRISAT and IRRI together, prepared over 40,000 accessions for storage. IITA holds the WARDA rice collection in long-term storage. The crisis in Ivory Coast has halted upgrade of the WARDA genebank. At the outbreak of the crisis, WARDA took rapid action to ensure that all germplasm and data were safely backed-up outside of the country. Now, regeneration and other essential activities are being undertaken at IITA, pending stabilization of the situation.

16. The Centre's research has contributed to the development of cryopreservation technology for vegetatively propagated crops. Reliable protocols now exist for Musa, potato and cassava, and these are being used by the Centres to improve the security and integrity of conserved germplasm. The upgrading programme is enabling IPGRI/INIBAP, CIP and CIAT to increase their capacity for routine cryopreservation of in-trust collections. The upgrading support is also facilitating the transfer of vegetative germplasm from the field to in vitro conservation. In 2003, 1500 accessions of potato, yam, cassava and Musa were transferred to in vitro.

17. Additional staff, greenhouses, screenhouses and other equipment are enabling the Centres to improve their standards of regeneration and remove backlogs in the multiplication of material and elimination of quarantine pathogens that have in the past, hampered germplasm distribution to users. In 2003, the Centres collectively regenerated over 30,000 accessions. For CIAT, CIP, IITA and IPGRI/INIBAP, the ability to clean in vitro cultures of viruses and bacteria is crucial for the safe transfer of the vegetatively propagated crops they hold. In 2003, CIP produced 813 potato clones that were free from all known viruses. The regeneration of forage and agroforestry germplasm presents a particular problem for CIAT, ICRAF and ILRI, requiring, for most species, a long period in the field before seed can be harvested.

18. The upgrading programme is supporting the characterization of the collections, which is critical to the identification of the germplasm and its effective management. For most Centres, this means completing the characterization of the collections for basic morphological descriptors.

19. Improved genebank management and the increased quality and availability of information on the collections are also objectives of the upgrading programme. All Centres are making improvements to their genebank management systems. At some Centres, for example CIAT, IPGRI/INIBAP, ICARDA and IRRI, bar-coding is being installed to streamline accession management. CIAT, CIP, ICARDA, ICRISAT, IITA, IRRI, and WARDA have embarked on data quality improvement. The infrastructure of SINGER has been upgraded to provide users with greater speed and flexibility in accessing and searching Centre databases.

20. The upgrading is enabling the Centres to accelerate the off-site safety duplication of the collections under black box arrangements. They are making use of each other's facilities to house safety back-ups or using other genebanks when more expedient or secure. Improvements in the status of the health, documentation and quantity of germplasm will also enable the Centres to better provide a germplasm distribution service.

### **Evaluation and use of the in-trust plant collections**

21. Evaluation of the in-trust collections for specific agronomic and quality traits complements the more routine general agro-morphological characterization of the Centre's genebank operations. In addition to pest and disease resistance and tolerance to environmental stresses such as drought, nutritional characters are now also a focus of the evaluations. Evaluation is carried out with the Centre's breeding programmes, NARS and through networks such as the International Network for the Genetic Evaluation of Rice (INGER).
22. Molecular and genetic characterization of the collections continues to expand. The Centre's are using a range of marker technologies to define core collections and to assess diversity and the relationships between cultivated and wild species as a guide to breeding efforts. For example, CIP, IITA and IRRI are using microsatellite (SSR) markers to study the potato, cowpea and rice genebanks, respectively. ILRI, in a joint study with the Commonwealth Scientific and Industrial Research Organization (CSIRO) of Australia, has established a core collection of *Lablab purpureus* using amplified fragment length polymorphism (AFLP) markers. ILRI is combining genetic analysis with feeding trials and laboratory techniques to measure nutritional parameters, to identify high value forage germplasm.
23. The Centres are using wild relatives to transfer desirable traits to a variety of crops. For example, CIMMYT has used *Triticum polonicum* to increase spike size in wheat by 30-50% and has used other wild wheats as sources of resistance to Russian wheat aphid and rust diseases. ICARDA has produced homogeneous durum wheat lines with stripe and/or leaf rust resistance transferred from wild *Triticum* species and *Aegilops speltoides*. At IRRI, six traits from five species of wild rice have been incorporated and released in commercial varieties, including disease and pest resistance, acid sulphate tolerance and male sterility.
24. Genomic science and bioinformatics are expanding areas of Centre's research. In 2003, the CGIAR launched an international, multi-institute, multi-disciplinary initiative to apply genomics and bioinformatics for more effective and efficient use of genetic resources in crop improvement. Supported by the European Union, the so-called Generation Challenge Programme: Cultivating Plant Diversity for the Resource-Poor is a partnership of CGIAR Centres (CIMMYT, IRRI, IPGRI, CIAT, CIP, ICARDA, ICRISAT and IITA), specialized institutes (University of Wageningen, The Netherlands; Cornell University, USA; Agropolis, France; National Institute of Agrobiological Sciences, Japan; John Innes Institute, UK), and the national agricultural systems of China and Brazil. Drought tolerance has been chosen as the pilot characteristic for genomic analysis and crop improvement.

### **Research and support for ex situ conservation**

25. Advances in the technologies and procedures for ex situ conservation arise from the Centre's work to improve the management of the in-trust collections and from collaborative research with national programmes and other institutions. The results of the research are disseminated through scientific and technical publications, workshops and training programmes. For example, over the past two-years, IPGRI has produced technical manuals on collection management, in vitro collecting and the management of in vitro and field collections (the latter on behalf of the SGRP). A workshop in November 2002 explored the implications of developments in molecular genetics for the future of genebanking. The workshop was co-sponsored by SGRP; the Fundación Española para la Ciencia y la Tecnología and Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria, Spain; FAO; and USAID, with the participation of scientists from CGIAR and national institutes.
26. IITA assisted in collecting yam and cassava germplasm in Sierra Leone, Guinea and the Democratic Republic of Congo. ICARDA and IPGRI have supported collecting efforts in Afghanistan for germplasm of staple crops and high value nut trees (pistachio, almond), respectively. ICARDA also assisted with the planning of the new national genebank and in the establishment of seed health laboratories. The countries of Central Asia and the Caucasus have

also received assistance from CIMMYT, ICARDA and IPGRI. This has included collaboration in collecting as well as support for their national conservation activities.

27. CIMMYT has continued to support the cooperative project on the regeneration of maize landraces that involve national programmes in Argentina, Bolivia, Brazil, Ecuador, Guatemala, Mexico, Peru and Venezuela. CIP is assisting and participating with the Programa de Investigación de la Papa, Bolivia, Instituto Nacional de Investigación Agrária e das Pescas, Ecuador and Instituto Nacional de Investigación Agraria and the University of Cajamarca, Peru, in a collaborative effort to identify homologies among the collections of potato and Andean root and tuber crops they hold. IRRI has continued to help build conservation capacity in the Lao PDR through the National Agriculture and Forestry Research Institute and National Agriculture Research Council.

#### **Research and support for in situ and on-farm conservation and sustainable use**

28. In situ conservation and the management and improvement of plant genetic resources on-farm are expanding areas in the programmes of most of the Centres. SGRP sponsored a workshop in 2003, on Managing Agricultural Biodiversity for Sustainable Development. Organized by IPGRI and hosted by ICRAF, the workshop brought together representatives of the Centres, FAO, national institutes and NGOs. Participants recognized that while there are an increasing number of programmes and projects actively working on the maintenance and use of different components of agricultural biodiversity, there is a need to enhance information flow and collaboration among them, and to engage a wider community of national research programmes, NGOs, farmers and communities in the development of a strengthened research endeavour. It was agreed that establishing a facilitation unit could make a significant contribution to improving information flows, linking groups and stimulating additional research. The proposal to establish such a unit was presented at a seminar at the 7th meeting of the Conference of the Parties to the Convention on Biological Diversity (COP VII), in 2004. There was strong endorsement from the COP for the proposal, formally reflected in Decision VII/3.

29. A number of Centres are involved in projects that investigate farmer practices in maintaining and managing and improving crop diversity. For example, CIP is studying farmer practices in managing native potato cultivars and Oxalis landraces with communities in the Peruvian Andes. The efficiency of the management practices has been substantiated by genetic studies. CIP is also supporting Andean farming communities with the provision of virus-free landraces of potatoes. CIMMYT and the Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias are collaborating on monitoring and evaluating diversity within the Mexican maize race Zapalote Chico, which is grown by communities in the Oaxaca region. IRRI is working with the National Agriculture Research Council of Lao PDR to study farmer practices in managing traditional rice varieties and integrating this knowledge into participatory breeding and conservation, to achieve sustainable improvement through on-farm diversity.

30. ICARDA coordinates a project that is investigating and supporting community-based management of farmer varieties and wild species of crops and fruit trees of the Fertile Crescent centre of diversity. It is funded by the Global Environment Facility (GEF), and jointly executed by the National Centre for Agricultural Research and Technology Transfer of Jordan, the Lebanese Agricultural Research Institute, the General Council for Agricultural Scientific Research of Syria and the Ministry of Agriculture and UNDP of the Palestine Authority. IPGRI and The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) are also involved. The activities include, generating knowledge about local agricultural diversity and its status, developing technologies and actions to maintain and use the diversity, methods to add value and derive alternative sources of income, capacity building, public awareness and policy reform to create a supportive environment for the conservation and sustainable use of the diversity.

31. IPGRI works in partnership with rural communities, researchers and extension agents in nine countries (Burkina Faso, Ethiopia, Hungary, Mexico, Morocco, Nepal, Peru, Turkey and Vietnam) in a programme of research and capacity-development on the management of crop

diversity on-farm. IFPRI has been involved in research on the costs and benefits to farmers of maintaining diversity. National programmes have been provided with the skills and tools needed to implement on-farm projects. Over the past two- years, the emphasis has been on bringing together the results of the in-country research to develop best practices that can be adopted in a range of situations. Further study on the role of intra-specific diversity in the management of crop diseases and pests will be pursued through a UNEP/GEF supported project with the Institut Agronomique et Vétérinaire Hassan II, Morocco; the National Agricultural Research Organisation of Uganda; Yunnan Agricultural University, China; and the Estación Experimental Santa Catalina and Instituto Nacional Autónomo de Investigaciones Agropecuarias of Ecuador.

32. ILRI has expanded its work on promoting the adoption of fodder crop diversity in crop-livestock production systems through a new project located in Nigeria and India, and supported by DFID, UK. The project seeks to enhance the livelihoods of poor livestock keepers by increasing the productivity of their livestock and the sustainability of their farming systems, through the adoption of new ways of using fodder. In Nigeria, work has started to develop approaches to participatory food-feed crop and forage testing in three agro-ecological zones. The research is being conducted in collaboration with IITA, CIAT, the Institute for Agricultural Research, National Animal Production Research Institute, Kano Agricultural and Rural Development Authority, Kaduna Agricultural Development Project and the NGO Justice, Development and Peace Commission. In India, parallel work in collaboration with ICRISAT, the Andhra Pradesh Rural Livelihoods Project, Indian Grassland and Fodder Research Institute, National Research Centre for Sorghum and the National Dairy Development Board, as well as NGOs (Deccan Development NGO Network, Accion Fraternal, Weaker Communities Upliftment Services Society) is focusing on the participatory testing of fodder options in eleven villages across three livestock production systems. ICRAF is involved in participatory tree domestication using indigenous species in 15 countries in Latin America, Southeast Asia and Africa.

33. A substantial initiative on neglected and underutilized crop species (NUS) is now in progress in seven countries (Bolivia, Ecuador, Peru, Syria, Yemen, India, Nepal). The project, coordinated by IPGRI and supported by the International Fund for Agricultural Development (IFAD), focuses on Andean grains, millets and medicinal and aromatic species and is designed to support and promote the diversity of the selected species so as to ensure improved food security and livelihoods of the rural poor. IPGRI hosts the Bundesministerium für Wirtschaftliche Zusammenarbeit und Entwicklung (BMZ)-funded Global Forum for Agricultural Research (GFAR) Global Facilitation Unit, which provides a focal point for NUS research around the world. IPGRI projects and programmes on leafy African vegetables, coconut, Musa and date palm have a specific goal to improve livelihoods by seeking new markets and means for promoting greater appreciation and use of the diversity of these crops.

34. A collaborative project involving CIAT and the University of Costa Rica, supported by BMZ, Germany, has mapped the populations of wild relatives of rice and beans in Central Costa Rica, and has estimated the direction of gene flow and its consequences for the maintenance of wild populations in situ and for the management of traditional landraces by farmers. IPGRI has embarked on a project, supported by the United Nations Environment Programme/Global Environment Facility (UNEP/GEF) and BMZ, Germany, to conserve the wild relatives of crops in Armenia, Bolivia, Madagascar, Sri Lanka and Uzbekistan. A major component will be the creation of an information resource and exchange network to facilitate decisions on how to best conserve the genetic resources and the identification of germplasm with potentially valuable traits.

#### **Strengthening national capacity and international cooperation in plant genetic resources conservation and use**

35. Strengthening institutional capacity at the community as well as the national levels is an integral part of Centre's activity. Over the past two-years, the Centres have organized a number of workshops, regional and international courses, and in-country training events on collecting, *ex situ* conservation, on-farm management, and germplasm evaluation and documentation.

36. In 2003, SGRP, IPGRI and ISNAR jointly produced a learning module on law and policy of relevance to the management of plant genetic resources. Available on CD-Rom, the module covers the Treaty, the Convention on Biological Diversity and other significant and relevant policy and legal agreements; and the impact of these on genebanks and breeding programmes. At a workshop in July 2004, new regional components of the module were tested and regional trainers were trained. The workshop was organized by IPGRI and co-sponsored by Capacity Building International (InWent), Germany; ISNAR; SGRP, FAO and IRRI. In 2003, CIP held a regional seminar on access to plant genetic resources and the Treaty, the Convention on Biological Diversity, and Decision-391 of the Andean countries. Genebank managers and regulatory officials from the five Andean countries and representatives from CIP, CIAT and the Secretariat of the FAO Commission on Genetic Resources for Food and Agriculture participated.

37. IPGRI works extensively with all regional plant genetic resources networks. It provides the coordinating secretariat for several networks such as the European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR) and the Genetic Resources Network for West and Central Africa (GRENWECA). Other Centres also participate in regional plant genetic resources networks, for example, IITA in GRENWECA and ICARDA in the network for Central Asia and Caucasus regions. However, the focus for most Centres is crop-specific networks such as the International Network for Genetic Evaluation of Rice (INGER), in which IRRI and WARDA are involved. IPGRI coordinates the International Coconut Genetic Resources Network (COGENT).

38. In 2003, CIMMYT organized a workshop for the Latin American network on maize landrace conservation, with participation of representatives from member countries of the region. In April 2004, IITA hosted the "Plant Genetic Resources Conference for West and Central Africa" on behalf of GRENEWCA. The conference brought together scientists working on the genetic resources from the region.

39. In 2003 EURISCO, a searchable catalogue of the ex situ collections in Europe was launched on the Internet by ECP/GR. EURISCO is modeled on SINGER and was developed with the tools and expertise of SINGER. EURISCO is based on 26 national inventories, and provides access to passport information on more than 900,000 accessions.

### **III. SECTION 2: FARM ANIMAL GENETIC RESOURCES**

40. ILRI and ICARDA have research programmes on farm animal genetic resources in partnership with a range of national and international organizations.<sup>3</sup> The work complements and supports the development of the FAO Global Strategy for the Management of Farm Animal Genetic Resources. The Centres and SGRP have provided assistance and inputs to the development of the Global Strategy and the process for preparing the first Report on the State of the World's Animal Genetic Resources, and will continue to provide their support in coordination with FAO.

#### **Characterization and documentation**

41. The characterization and documentation of the status of farm animal genetic resources is a major component of the programmes of both ILRI and ICARDA. The results of this work inform the setting of priorities and development of improved strategies for the conservation and sustainable use of livestock genetic resources.

42. ILRI has continued with molecular diversity analyses of African cattle, sheep and goats, the Asian yak, camels from Kenya, China and Mongolia; and has analyzed the mitochondrial DNA diversity of domestic chicken in Asia and Africa. ILRI is a member of the committee overseeing MoDAD. In collaboration with FAO, ILRI has developed guidelines on the design,

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<sup>3</sup> See CGRFA-10/04/info. 13

execution and analysis of on-farm breed surveys through pilot studies conducted in Zimbabwe in the context of the UNDP/FAO/Southern African Development Community project on animal genetic resources.

43. The Domestic Animal Genetic Resources Information System (DAGRIS), includes a comprehensive bibliography and technical information primarily on Sub-Saharan African livestock with plans to extend it to Asia. ILRI and FAO have agreed on the complementary functions and development of DAGRIS and FAO DAD-IS (Domestic Animal Diversity Information System), including their linkage to serve the intergovernmental, policy and research needs of the global community.

44. ILRI is conducting economic and policy analyses to quantify market opportunities for indigenous livestock and to identify institutional constraints to their commercialization and marketing in several sub-Saharan African countries. It is developing and testing a range of economic valuation methods and decision-support tools.

45. ICARDA is working with the national programmes of West Asia and North Africa (WANA) and Central Asia and the Caucasus (CAC) on the characterization of small ruminants. The work includes, cataloguing past on-station characterization records and conducting on-farm characterization of breeds under current production conditions. Information gathered from sheep and goat breeds in eleven WANA and eight CAC countries has been synthesized and compiled with SGRP support into a book, that is now in its final stages of editing and translation. The book covers the relevance and status of the genetic resources, the phenotypic features and performance of the breeds and the breeding programmes in each country.

46. Through projects supported by USDA, CGIAR System-wide Livestock Programme, International Fund for Agricultural Development (IFAD) and Japan, indigenous breeds have been monitored on-farm through at least two production seasons, primarily in the CAC region. In Syria, a project aimed at improving sheep milk production systems has involved the monitoring of Awassi sheep on-farm. In Turkey, a study is underway with the University of Cukurova to characterize the goat breeds in Antakia Province. This year, ICARDA and the University of Natural Resources and Applied Life Sciences, Vienna, Austria initiated work in Syria on the on-farm characterization of Jabali and Baladi goats. Work has started to assess the genetic relationships among breeds of sheep using microsatellite (SSR) markers.

### **Conservation and use**

47. In situ conservation through use, is widely accepted as the best way to ensure the sustainable conservation of indigenous farm animal genetic resources. ICARDA and ILRI are developing programmes on community-based management of livestock genetic resources to investigate mechanisms to support in situ conservation and to demonstrate the sustainability of the approach in developing world settings.

48. ILRI is developing optimized breeding schemes for indigenous cattle breeds based on the demands and opportunities of poor livestock keepers in eastern Africa. Recently, it embarked on a project on community-based management of indigenous farm animal genetic resources in Ethiopia, Kenya and Benin in collaboration with the national programmes.

49. A project on the in situ conservation of endemic ruminant livestock in West Africa is expected to start in the near future in Mali, Senegal, The Gambia and Guinea, with support from GEF. This project is aimed at removing barriers to the in situ conservation of these livestock genetic resources and their habitats. The project will address communal land tenure, pastoral movement, community-based natural resource management, harmonization of relevant policies between the four countries and the coordination of interventions. Incentive programmes to motivate farmers and herders to maintain endemic, pure breeds in their herds will include, improvement of marketing channels and public-private sector partnerships.

50. Advances in technology, reductions in costs and the changing pressures on livestock genetic resources suggest that it is timely for a reassessment of in vitro technology as a means of conservation. Discussions are underway between FAO and SGRP, with ILRI, ICARDA and IPGRI, on furthering the investigation of in vivo and in vitro approaches to conservation, complementary to in situ management on-farm. An expert consultation on this topic is being planned in 2005, in the context of furthering the Global Strategy.

51. The development of sustainable use and improvement programmes for livestock genetic resources and the understanding of host resistance to disease, are major thrusts in ILRI's research programme. Molecular and genomic methods are being used to map the regions of the genome controlling resistance and to identify the gene pathways, and ultimately the causative genes underlying resistance to trypanosomosis in cattle and gastrointestinal nematodes in sheep. These are the largest disease constraints on cattle production in Africa, and on sheep globally. An important output is the development of capacity in Africa to undertake advanced bioscience and genomics research, and this role will be further enhanced by the ongoing development of the Canadian-funded Biosciences Facility for Eastern and Central Africa, that will be largely based on the ILRI Nairobi campus.

52. The development of sustainable use and improvement programmes focuses on how to effect genetic improvement and sustainable use of cattle in low-input production systems of poor farmers in eastern Africa. Investigation of the socio-economics of farmer needs and opportunities coupled to the genetics of alternative improvement and dissemination strategies, including for trypanotolerance, is used to define sustainable use and improvement strategies. The work includes confirmation under natural field conditions of laboratory findings on trypanotolerance, in collaboration with Kenya Trypanosomosis Research Institute and a Maasai group ranch.

#### **Training and capacity development**

53. Training and capacity-building components are embedded in nearly all activities mentioned previously, and achieved through the training of visiting scientists, studentships, internships and graduate fellowships, as well as through the organisation of training workshops and tailor-made courses addressing specific needs.

54. Since 2000, ILRI has collaborated with the Swedish University of Agricultural Sciences (SLU) in a project to strengthen university teaching in animal production, breeding and genetics in developing countries through improving motivation, knowledge, teaching and research supervisory skills, curriculum review and stimulating regional contact and networks. So far, a total of 56 university teachers and researchers from 20 countries in Sub-Saharan Africa and nine in Southeast Asia have attended the regional training courses. A CD version of the training resource has been developed. Following a very positive review in 2003, the project is now being further extended to the South Asia region.

### **IV. SECTION 3: AQUATIC GENETIC RESOURCES**

55. WorldFish carries out research and training on aquatic genetic resources, primarily through its programmes on Biodiversity and Genetics Resources Research and Coastal Marine Resources Research. The main purpose of the work on genetic resources is to ensure that research institutions, management agencies and NGOs use appropriate scientific tools and methods for understanding, conserving and sustainably using aquatic biological diversity. The programme also ensures that the national breeding programmes supported by the Centres, maintain and continuously improve strains for distribution to farmers, and take measures to promote the genetic diversity of aquaculture species.

56. FishBase, WorldFish's comprehensive fish biodiversity database covering over 98% of the world's estimated fish species, with local names in 413 languages, was updated with the production of a 2004 edition on DVD and CD-ROM, a Chinese language edition of the print version of FishBase, and access to the web site provided in nine languages. It is now the most

frequently used Internet resource in the CGIAR, with over 11 million user sessions per month. A major new version of ReefBase, the global information system on coral reefs, has been produced, including a Web-based Reef Advisory System to present and interpret all Reef Check coral status information.

57. Scientists from 13 member countries of the International Network for Genetics and Aquaculture (INGA)<sup>4</sup> have participated in advanced courses on quantitative genetics and breeding. WorldFish is the Member Coordinator of INGA. Through INGA, the Centres facilitates germplasm transfers of improved tilapia and carp species within Asia. Genetic enhancement research is focused on developing selective breeding methods and faster growing strains for tilapia and carp species. Improved tilapia stocks are maintained in a facility at WorldFish as an insurance policy, and further germplasm improvement is carried out through collaboration with the Malaysian Fisheries Research Institute.

58. Selective breeding of the Centre's Genetically Improved Farm Tiliapia (GIFT) in Malaysia has led to a 10% increase in harvest weight in one generation, indicating good prospects for further improvements. The GIFT technology has been transferred to Africa, and active genetic improvement programmes for Nile tilapia are ongoing in Côte d'Ivoire (Centre National de Recherche Agronomique), Egypt (Central Laboratory for Aquaculture Research) and Ghana (Water Research Institute); and for indigenous tilapia (*Oreochromis shiranus*) in Malawi (National Aquaculture Center and University of Malawi).

59. Based on earlier work on carp genetic improvement, a second phase of the programme was launched in six Asian countries<sup>5</sup> in 2004, with a focus on disseminating improved strains to farmers. At the WorldFish Abbassa Centre in Egypt, selection for faster growing strains under low input conditions is underway.

60. An Expert Consultation on 'Ecological Risk Assessment of Genetically Improved Breeds' was organized in Dhaka, Bangladesh, 2003. It made recommendations for environmentally safe dissemination of improved fish strains, which have been published and widely disseminated. The economic feasibility of village enterprises based on the capture and culture of post-larval coral reef fish and invertebrates for the marine aquarium trade has been demonstrated, and a manual for small-scale operators has been developed to facilitate transfer of this technology for alternative income generation.

## V. SECTION 4: FOREST GENETIC RESOURCES

61. Three Centres (CIFOR, ICRAF and IPGRI), carry out research related to forest genetic resources. CIFOR's programme is directed to the sustainable use and management of forests and forest lands. ICRAF is concerned with agroforestry systems and the use and domestication of agroforestry species. IPGRI's activities emphasize the conservation and sustainable use of the genetic diversity of forest species. The Centres provide assistance to FAO, for example in contributing to the report on the State of the World's Forests, and by participating in its Panel of Experts on forest genetic resources.

62. The Centres are developing a new shared strategy to guide their collaboration and cooperation with other stakeholders in forest biodiversity research for development. Networks are

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<sup>4</sup> INGA member countries: China, Vietnam, Thailand, Bangladesh, India, Malaysia, Indonesia, Philippines, Fiji, Egypt, Cote d'Ivoire, Malawi, Ghana.

<sup>5</sup> Carp genetic improvement partner institutions and countries: Freshwater Fisheries Research Centre and Chinese Academy of Fisheries Science - China; Ministry of Fisheries (Research Institute for Aquaculture No. 1) - Vietnam; Department of Fisheries (Aquatic Animal Genetics Research and Development Institute and Fisheries Economics Division) - Thailand; Bangladesh Fisheries Research Institute and Bureau of Socioeconomic Research and Training - Bangladesh; Indian Council of Agricultural Research (Central Institute for Freshwater Aquaculture and Central Inland Fisheries Research Institute) - India; and Agency for Marine and Fisheries Research - Indonesia.

an important mechanism for IPGRI's collaboration with national partners. In 2003, the Asia Pacific Forest Genetic Resources Network (APFORGEN) was established. IPGRI also coordinates the European (EUFORGEN) and Sub-Saharan African (SAFORGEN) networks. ICRAF is a participant in SAFORGEN.

63. The conservation and sustainable use of forest genetic resources is the focus of IPGRI's work with partners in Argentina and Brazil. These projects have assessed the impact of forest use by local communities on forest genetic resources of selected species and defined criteria and indicators for sustainable forest management. In Asia, the focus of research is the sustainable management of non-timber forest products, such as bamboo and rattan. This work is conducted in partnership with the Institute of Ecology and Biological Resources of Vietnam, the University of Malaysia, the Indonesian Institute of Sciences and in India with the University of Bangalore and the NGO Ashoka Trust for Research in Ecology and the Environment (ATREE).

64. Collaborative research involving laboratories in 15 countries in Africa, America and Asia, supported by IPGRI and the Danish Forestry Seed Centre, has led to the development of improved procedures for the handling and storage of 52 tropical trees species that have recalcitrant or intermediate storage behaviour. The results of this research will be published as a technical manual.