The CGIAR centres are 15 international food and environmental research organizations located around the world. The centres pursue a research agenda to improve the lives of the poor in partnership with national agricultural research systems, the private sector and civil society. The centres are supported by the Consultative Group on International Agricultural Research (CGIAR), a strategic alliance of countries, international and regional organizations and private foundations. The alliance mobilizes agricultural science to reduce poverty, foster human well-being, promote agricultural growth and protect the environment. The CGIAR is co-sponsored by the Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD), the United Nations Development Programme (UNDP) and the World Bank. See http://www.cgiar.org

The CGIAR System-wide Genetic Resources Programme (SGRP) joins the genetic resources activities of the CGIAR centres in a partnership whose goal is to maximize collaboration, particularly in five thematic areas. The thematic areas—policy, public awareness and representation, information, knowledge and technology, and capacity building—relate to issues or fields of work that are critical to the success of genetic resources efforts. SGRP contributes to the global effort to conserve agricultural, forestry and aquatic genetic resources and promotes their use in ways that are consistent with the Convention on Biological Diversity. The Inter-Centre Working Group on Genetic Resources (ICWG-GR), which includes representatives from the centres and FAO, is the Steering Committee. Bioversity International is the Convening Centre for SGRP and hosts its coordinating Secretariat. See http://sgrp.cgiar.org

Bioversity International (formerly known as IPGRI) is an independent international scientific organization that seeks to improve the well-being of present and future generations by enhancing conservation and the use of agricultural biodiversity on farms and in forests. Bioversity is one of 15 centres supported by the CGIAR. It has its headquarters in Maccarese, near Rome, Italy, with offices in more than 20 other countries worldwide. The institute operates through four programmes: Diversity for Livelihoods, Understanding and Managing Biodiversity, Global Partnerships, and Commodities for Livelihoods. See http://www.bioversityinternational.org

Cover photo: Nomadic herders in Niger make use of several animal species to support their livelihoods.

W. Bayer, Germany


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A number of highly significant developments in the world of agrobiodiversity over the past two years—the coming into force of the International Treaty on Plant Genetic Resources for Food and Agriculture (the Treaty), the formal establishment of the Global Crop Diversity Trust, the development of the first ‘Report on The State of the World’s Animal Genetic Resources’ to name but three—has given urgency and focus to the work of SGRP. A recognition of the pure global public goods status of the CGIAR crop diversity collections has helped to foster an understanding of the central role that the collections will be expected to play in an emerging global system governing conservation and use. This understanding led the centres to embark on an ambitious three-year project to upgrade the facilities and operations of the genebanks (see page 8). The project, which is funded by the World Bank, was externally reviewed in 2005—its second full year of implementation. The review expressed satisfaction at the substantial progress made towards meeting project goals. SINGER—the System-wide Information Network for Genetic Resources—has been ramping up to support the global system as well. With a new, cleaner and friendlier user interface and improved means for linking information systems within SINGER, the network is emerging as an enormously valuable resource for genetic resources users (see page 13). This makes SINGER increasingly attractive to partners outside, as well as inside the CGIAR as a means for reaching out to potential users. In 2005, the World Vegetable Center made information on its large collection of vegetable genetic resources available through SINGER.

Clear and consistent policies are critical to the ability of the centres to honour their roles as providers of global public goods. To this end, the centres adopted a common policy on transgenes in 2005 (see page 18). The fact that the System speaks with one voice on policy issues vastly strengthens its position in supporting and contributing to the development of international policy. By speaking with one voice, the centres were able to exert an important influence on the negotiations to develop a Standard Material Transfer Agreement (SMTA) under the Treaty (see page 19). The SMTA will govern all exchanges of plant genetic...
resources in the Multilateral System of Access and Benefit-sharing established by the Treaty.

A casual reader of SGRP reports over the years could be forgiven for assuming that the Programme is mostly concerned with crop diversity, so great has been the emphasis in recent years on the collections of plant genetic resources held in trust by the centres and their place in a global conservation and use system. But this is far from the case as can be seen from two major initiatives that kicked off recently.

SGRP, under the lead of Bioversity International (formerly known as IPGRI), is in the process of establishing a global Platform for Agrobiodiversity Research. The Platform, which covers all aspects of biodiversity—fish, livestock, crop, tree, microorganisms—will serve as a neutral space for people to consider what gaps exist in current knowledge and experience and what needs to be done to fill them (see page 5).

SGRP-convened international workshops held in 2005 helped to advance the centres’ thinking with regard to aspects of agricultural biodiversity beyond crops. The first looked at options and strategies for conserving farm animal genetic resources (see page 26) and the second at methodologies for assessing the value of crop, tree, livestock and aquatic genetic resources (see page 32).

SGRP’s progress over the past two years took place against a backdrop of considerable flux as Bioversity—the host institute for the Programme—went through a structural overhaul to allow it to better implement its new strategy. In 2005 Bioversity was newly divided into four Programmes and three Research and Support Units. Bioversity’s activities as Convening Centre of SGRP are delivered within the new structure of Bioversity.

In the period covered by this report SGRP received funding from (in alphabetical order):

- France
- Generation Challenge Programme (CIMMYT)
- Germany
- International Seed Federation
- Japan
- Netherlands¹
- Norway
- Rockefeller Foundation
- Sweden
- Switzerland
- World Bank

SGRP is grateful for all the support it receives from its donors.

¹ Part of unrestricted contribution to IPGRI from the Netherlands utilized for supporting SGRP activities in 2004 and 2005.
**Regular Programme Activities**

**Major activities are detailed elsewhere in this Annual Report. In addition to these, SGRP has continued to be involved in a number of other activities that contribute to CGIAR system collaboration on genetic resources.**

**Governance**

SGRP’s steering committee—known as the Inter-Centre Working Group on Genetic Resources (ICWG-GR)—held its annual meetings in February 2004 at WorldFish, Penang, Malaysia and in March 2005 at ICRISAT, Hyderabad, India. The 2005 meeting deliberately coincided with meetings of the Committee of Centre Deputy Director Generals and the Genetic Resources Policy Committee of the CGIAR at ICRISAT. The agenda of the ICWG-GR meeting included two special working sessions on policy and future strategic directions for SGRP. Deputy Director Generals and Policy Committee members participated in these sessions.

The second workshop considered the future of SGRP in light of the CGIAR’s new research priorities and other developments. Participants examined the perceptions of SGRP, its achievements and mode of operation, and made recommendations for operations and outputs over the next five years. Overall, participants expressed a high appreciation for SGRP, acknowledging the benefits the Programme has brought to the centres and to the System as a whole. The most impressive achievements have been in the representation of the System at major policy and technical fora, the elaboration of genetic resources policy, the development of SINGER, efforts to streamline genebank operations and the establishment of the Global Crop Diversity Trust. There was a strong affirmation of SGRP’s mode of operation, which is based on consensus and collective action. The meeting produced high expectations of SGRP in the future and resulted in concrete propositions for its strategy and outputs.

**Representation and inputs to international fora**

SGRP coordinated CGIAR centre presence at the Seventh Meeting of the Conference of the Parties to the Convention on Biological Diversity in February 2004. For the CGIAR, the highlights of the meeting were an exhibit jointly designed by the centres, custom-designed fact sheets and a CGIAR side event on the management of agricultural biodiversity. The Parties warmly welcomed the CGIAR’s proposal to help create a facilitation unit for agricultural biodiversity research. This has led to the establishment of a Platform for Agrobiodiversity Research (see page 5).

The centres also participated in the Eleventh Meeting of the Subsidiary Body on Scientific, Technological and Technical Advice (SBSTTA) of the Convention on Biological Diversity in December 2005, with the support of SGRP. A side event concerning an integrated approach to the valuation and sustainable management of agrobiodiversity was held for SBSTTA delegates (see page 33).

Coordinated by SGRP, the centres participated in
the Tenth Regular Session of the Commission on Genetic Resources for Food and Agriculture (CGRFA) of the Food and Agriculture Organization of the United Nations (FAO) in November 2004. Centre inputs included a consolidated report on programmes, policies and activities on plant, animal, forest and aquatic genetic resources. SGRP also reported on the status of the in-trust collections under the stewardship of the centres as well as on other matters concerning the administration of the agreements with FAO that govern these collections.

In October 2005, SGRP coordinated centre involvement in a meeting of the CGRFA’s Inter-governmental Technical Working Group on Plant Genetic Resources for Food and Agriculture. This included providing a consolidated CGIAR contribution to two information documents tabled at the meeting concerning: 1) capacity-building activities to support the use of plant genetic resources for food and agriculture; and 2) monitoring the implementation of the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture and preparations for the second report on ‘The

Melinda Smale (IFPRI) and Adam Drucker (ILRI) reported at a side event at SBSTTA11 on an integrated, interdisciplinary approach to valuing agrobiodiversity including crop, livestock, tree and aquatic diversity, in order to promote the management of genetic resources for sustainable use. Photos courtesy IISD/Earth Negotiations Bulletin

Conclusions

Conceptual and theoretical literature about sources of value in genetic resources is extensive. Research documenting the economic returns to genetic resources in commercial agriculture is vast. Research aiming to solve the practical problems of managing genetic resources ex situ and in situ (on farms), with economics methods applied to empirical data in developing economies, is scant.
State of the World’s Plant Genetic Resources for Food and Agriculture’. SGRP coordinated centre representation and contributions to a number of meetings relating to the implementation of the International Treaty on Plant Genetic Resources for Food and Agriculture. These included meetings of experts on the development of the Standard Material Transfer Agreement that would govern exchanges of plant genetic resources in the Treaty’s Multilateral System of Access and Benefit-Sharing (see page 19).

Establishment of a Platform for Agrobiodiversity Research

Under the lead of Bioversity International (formerly known as IPGRI), SGRP is moving ahead to establish a global platform for agricultural biodiversity research. First proposed at an SGRP workshop on managing agricultural biodiversity for sustainable development in 2003, the Platform was welcomed by the Parties to the Convention on Biological Diversity at their seventh meeting in 2004. The major objective of the Platform is to support the creation of new research partnerships through networking to fill current knowledge gaps in understanding the magnitude, causes and consequences of losing agricultural biodiversity. Other challenges for the Platform include learning more about how to value the benefits of agrobiodiversity and the management practices that are needed to increase the contribution of agrobiodiversity to agricultural sustainability. A particular emphasis in the Platform’s activities will be given to studying ecosystem services and the interactions among components of diversity within ecosystems. In 2005, a small Secretariat was established to oversee the full establishment of the Platform.
The Secretariat comprises a coordinator seconded from the Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) and based in Montpellier, France, and an associate expert from the Netherlands located in Nairobi, Kenya. Now, work is underway to identify partners, design a web site and mobilize resources. A number of international organizations, networks and research initiatives have already expressed interest in working with the Platform. A stakeholder consultation planned for May 2006, will develop the Platform’s governance, programme of work and mode of operation.

**General collaborative activities**

SGRP facilitated a number of collaborative activities over the biennium as part of its effort to promote and share knowledge and technologies. A meeting on how genebanks might adapt to developments in molecular biology resulted in the 2004 publication of ‘The Evolving Role of Genebanks in the Fast-Developing Field of Molecular Genetics’, Issues in Genetic Resources No. 11, M.C. de Vicente (ed.). This and the proceedings of another workshop on effective genebank management (see SGRP Annual Report 2003, page 3) are intended to assist genebank curators to more efficiently manage their collections. But genebanking is not all about high technology. In 2004 an SGRP intern, based in Bioversity’s Nairobi office, spent six months surveying and documenting low cost methods for seed storage and conservation.

In 2005, SGRP embarked on a study to assess how the Programme can support the centres to implement the CGIAR’s new research priorities on underutilized and high value plant species. The so-called neglected or underutilized genetic resources present a significant opportunity to improve the incomes and welfare of the rural poor. The study, which is being conducted by a multi-disciplinary group of scientists from CIAT and Bioversity, is examining current CGIAR efforts to conserve and characterize neglected species; analysing the successes and failures of past attempts to better use such resources; and identifying ways in which CGIAR research can better help the poor benefit from their use. The study is due to be completed in 2006.
Among the many valuable public goods of the CGIAR that are put to work for the benefit of the world’s poor are the 600,000 plus accessions of crop, forage and agroforestry species held in the genebanks of eleven of the CGIAR centres. The genebanks are also a focus for the gathering, refinement and sharing of knowledge and technologies, for capacity building, and for advanced research applying cutting-edge science.

**In-trust commitment**

The public goods status of the collections was affirmed in 1994 when they were placed in trust for the world community under agreements with the Food and Agriculture Organization of the United Nations (FAO). In signing the in-trust agreements, the CGIAR made a weighty commitment, pledging to the world to secure the safety of the collections and make them accessible. The dynamic, vital nature of genetic resources is both their strength—they can be used without being used up—and their Achilles heel. Thus, they cannot simply be placed under lock and key and withdrawn when needed; rather, they need to be managed under carefully controlled conditions to maintain their health and viability. Moreover, their full value can only be realized if their traits are known and documented.

Most of the accessions in the collections can be stored as seed under specific conditions of low temperature and humidity. However, a small but significant number of accessions, particularly of root and tuber crops, can only be stored as living plants or *in vitro* plantlets. These present particular challenges in terms of maintaining their viability and stability. Across the range of accessions in the genebanks, demanding maintenance routines are applied to check viability over time, and to regenerate to ensure conservation over extended periods and generate material for use, with safety duplication of accessions at a second site to underwrite security. Thus, genebanking in the CGIAR is a complex undertaking with a significant cost, infrastructural demands and expertise requirements.

**Genebanks prominent in SGRP priorities**

For over a decade, meeting their in-trust commitments has been a central concern for the CGIAR genebanks. Accordingly, from the time of its creation in 1994, SGRP has addressed three critical needs regarding the collections: (i) transparent and ready availability to users, (ii) the achievement of high standards of conservation, and (iii) the related issue of sustainability of funding in the long term. The first of these needs led to the creation of SINGER—the System-wide Information Network for Genetic Resources—in 1997. SINGER has assisted the centres to standardize and document information...
on their collections, and apply web technologies to network their genebank data. Through SINGER, users have a single entry point for interrogating information on the collections and finding the diversity that they need to meet their breeding needs and other objectives (see page 13).

On the issue of standards of conservation, a review conducted in 1995 revealed that, while the CGIAR collections were generally being maintained to high standards, there were concerns in terms of the quality of some genebank facilities, and there were backlogs in processing material through routine maintenance procedures and into storage and safety duplication. This meant that the CGIAR genebanks’ aspirations to set and adhere to best practices and to minimize risk to the collections were compromised.

A strategic plan was needed to address the challenge of bringing the genebanks up to standard and eliminating backlogs, and the longer-term question of how to cover recurrent costs. An SGRP-commissioned costing study carried out by IFPRI with the centre genebank managers provided a detailed quantification of both current costs of maintaining the genebank collections and projected costs into the long term (see also SGRP Annual Report 2002, page 14). In addition to providing direction to the centres in terms of their long-term funding needs, the study has informed the financial planning of the Global Crop Diversity Trust (see page 22 and http://www.croptrust.org), which is mobilizing an endowment fund to finance into perpetuity important international collections in the CGIAR and elsewhere.

Timely support from the World Bank

To meet the urgent need to bring the CGIAR genebanks up to standard, an approach was made to the World Bank for support from its Global Public Goods initiative. The approach was successful and the first phase of the ‘Global Public Goods Rehabilitation Project’ to upgrade the genebanks was initiated in mid-2003; it is scheduled to draw to a close in 2006.

One of the challenges to implementing and monitoring a project of this complexity and size is the need for common reporting standards. At the start of the project, each centre and SINGER developed a plan for monitoring and reporting progress in implementing its...
upgrading activities. Dr Henry Shands of the US Department of Agriculture, expert advisor to the project, helped to create a common format for all centres to use so that the reports would be broadly comparable. This took time but the results are impressive and will make future reporting more efficient.

**External review salutes progress**

The upgrading project underwent a mid-term review by a panel of external experts, supported by a representative of FAO, the CGIAR’s Internal Auditing Unit and Dr Shands. The review panel, chaired by Dr Cal Qualset of the University of California, Davis, USA, presented its very positive report in December 2005. The review revealed substantial progress in meeting the upgrading project’s goals. The improvements to the physical facilities of the genebanks were complete; equipment had been purchased and installed, and the planned improvements had been made to SINGER. In parallel, most of the activities to upgrade critical genebank functions relating to conservation *per se* as well as health, characterization, information management and supply to users were on track to meet 2006 completion targets. In a massive effort, over 275,000 accessions had been processed for storage, regenerated, placed in safety back-up, characterized, and/or health tested. Further details of the project’s achievements are given in the box on page 11.

Against a general pattern of good progress by the centres towards upgrading targets, WARDA faced difficulties in conducting its programme of activities due to civil strife in Côte d’Ivoire during 2004. This necessitated the transfer of WARDA’s headquarters to Benin and a major revision of the upgrading plan. However, the rehabilitation of storage facilities is once more under way and processing tasks are now making good progress with support from IITA.

**Preparing for Phase 2**

The upgrading project’s external review made 16 recommendations relating to the importance of sustaining its achievements. Accordingly it was planned
that the centres, coordinated by SGRP, prepare a proposal for a follow-up Phase 2 project. Taking into consideration the recommendations and the priorities identified by the review panel for future work, the proposal will address a wider range of issues than Phase 1. The issues relate to the centres’ effective stewardship of the public goods that they hold, and the leadership role that SGRP and the genebanks should

## AN OVERVIEW OF SUCCESSFUL UPGRADING ACTIVITIES

### Improved storage facilities
- New genebank at ICARDA
- Upgraded storage facilities at CIMMYT, ICRISAT and IITA
- Expanded and improved cryopreservation facilities at Bioversity, CIAT and CIP

### Increased safety back-ups
- Discussions among centres and between centres and external genebanks to secure duplicate collections
- 152,000 accessions deposited off-site by Bioversity, CIAT, CIMMYT, CIP, ICARDA, ICRISAT, IITA, ILRI, IRRI and World Agroforestry Centre

### Reduced backlogs in processing
- Upgraded seed drying and processing facilities at CIAT, CIMMYT and IRRI
- 119,000 accessions processed and stored by Bioversity, CIAT, CIMMYT, CIP, ICARDA, ICRISAT, IITA, ILRI, IRRI and World Agroforestry Centre
- 190,000 accessions viability tested at CIAT, CIP, ICARDA, ICRISAT, ILRI and IRRI

### Reduced backlog in regeneration
- Greenhouses, screenhouses, pollination cages etc. expanded and renovated at CIAT, CIMMYT, ICARDA, ICRISAT, IITA, ILRI and IRRI
- 190,000 seed or in vitro accessions regenerated at Bioversity, CIAT, CIMMYT, CIP, ICARDA, ICRISAT, IITA, ILRI, IRRI, WARD and World Agroforestry Centre
- CIAT established 11,000 forages in field genebanks

### Reduced backlog in plant health testing
- New and expanded equipment at CIAT, CIP, ICRISAT and IITA
- 65,000 accessions cleaned by Bioversity, CIP, ICARDA and IITA
- 128,000 accessions tested at Bioversity, CIAT, CIMMYT, ICARDA, ICRISAT, IITA and ILRI

### Improved identification and characterization
- New equipment for molecular identification at CIP and IRRI
- Identity of 3700 accessions verified at CIP and IRRI
- 84,000 accessions characterized at CIMMYT, CIP, ICARDA, ICRISAT, IITA and IRRI

### Improved information management and availability
- Hardware and software upgrades at all centres
- Bar-coding equipment installed at Bioversity, CIP, CIAT and ICARDA
- Data quality improved at CIAT, CIMMYT, CIP, ICARDA, ICRISAT, IITA, IRRI and WARD
- SINGER Help Desk operational and training provided to Bioversity and WARD
continue to play in global activities on the conservation and use of crop genetic resources. Phase 2 priorities include the accomplishment of the following:

• Effective collective action by the CGIAR genebanks with regard to the in-trust collections and on issues of common interest within and outside the CGIAR;
• Security of conservation through risk management and safety duplication;
• The setting and application of best practices in collection management, including quality of storage, viability testing, health, regeneration, genetic integrity and accessibility;
• Transparent and effective access to the collections via a one-stop entry point for germplasm information and ordering;
• Enhanced knowledge about the diversity held in the collections to optimize use and facilitate gap-filling;
• Exploration of the scope for involvement of the CGIAR genebanks in the storage of genetic and genomic stocks, associated biodiversity, and underutilized species;
• Contribution to the development of a global plant genetic resources conservation system;
• Capacity building for continuity of expertise within the CGIAR genebanks and to enhance the capacity of national partners to contribute to a global system.

Looking back on the history and achievements of the project in the context of developments in the genetic resources arena over time (see page 22) reveals the timeliness of the genebank upgrading initiative and the important role that SGRP and the centres have to play as partners in these global developments.
SINGER is dedicated to the idea that access to information about genetic resources is every bit as important as access to the genetic resources themselves. Indeed, the trust agreements with FAO make it clear that information about the centre collections must be freely available along with the resources. In pursuit of this objective, SINGER has developed a new way of presenting data about the collections on the Internet. The resulting user interface is easier to use and at the same time more powerful, allowing people to obtain botanical and geographical information about the resources they are interested in and to download the data to their own computer for further analysis. The website is at http://www.singer.cgiar.org.

Developing the new Internet interface was possible with support from the World Bank-sponsored project to upgrade CGIAR genebanks (see page 8). The project allowed SINGER to test and install special software (known as Web Services) at most centres. The new technology enables users to directly search the databases maintained by the centres themselves, eliminating the need for the replication of centre data into a central SINGER database. This is a much more efficient system that gives people the power to examine all the centre databases, which are the most up-to-date sources of information, at the same time.

These developments were anticipated and endorsed by a meeting that took place at ICARDA in Syria in February 2005. An international group of information specialists from the CGIAR centres took stock of SINGER’s achievements to date and discussed its future plans in light of other important developments within the CGIAR, such as the informatics activities of the CGIAR Generation Challenge Program. Participants agreed that SINGER had made considerable progress as a gateway to information on the collections held by centres. Efforts to implement Web Services, outlined above, have made a crucial contribution to this progress. Equally fundamental, meeting participants agreed, was the work that SINGER had put into promoting standards and the importance of high-quality data.

Continuing these efforts, the meeting urged SINGER to broaden its scope to include characterization and evaluation data about the material in the
collections. To that end, work began in 2005 to establish a database that will store crop descriptors for the CGIAR’s mandate crops and protocols for the exchange of characterization and evaluation data based on the descriptors and other measures. When this work is complete, it will be used to publish the centres’ characterization data through SINGER, thus adding to its usefulness.

SINGER is also exploring an entirely new form of characterization data—genomic information—which is emerging from the Generation Challenge Program and other efforts. Complex issues, such as the data standards that will allow genomic data to be associated with phenotypic characterization, will be invisible to most users of the Challenge Program’s outputs, but without them those outputs would be much less useful. SINGER’s contribution to the establishment of the informatics network for the Challenge Program has been crucial. It has deployed Web Services for all partners and manages the central data repositories and the virtual workspace.

With genomic information, as with other sorts of characterization data, it is absolutely essential to ensure that the information in each of the databases is compatible. SINGER’s emphasis on database standards has helped the centres to achieve this compatibility and has enabled the free exchange of information. A CGIAR project on Information and Communications Technology and Knowledge Management (ICT-KM), funded by the World Bank, is helping to take this forward. The work on the use of Web Services includes initiatives that aim to improve data standards and protocols for the exchange of data.

In 2005, SINGER assessed the data exchange protocols of three projects: GBIF (the Global Biodiversity Information Facility), BIOCASE (The Biological Collection Access Service for Europe) and BIOMOBY (a system for interoperability between biological data sources). SINGER organized a workshop to examine the three projects, during which more than 40 scientists were trained in their use. After considerable discussion and hands-on experience, workshop participants decided that GBIF/BIOCASE was the most appropriate solution for the needs of CGIAR centres. This package was then rolled out to participating centres. The meeting further brought together scientists from outside the CGIAR, who are developing the Web Services, with potential partners in the CGIAR and meaningful collaborations are beginning to emerge.

SINGER’s own collaborations have increasingly been with scientists outside the CGIAR,
who bring their expertise to bear on problems of joint interest. In 2005 SINGER hosted an expert from the Nordic Gene Bank, who helped to develop the Web Services tool to link with GBIF. The tool includes a user-friendly front end, and the expert traveled to centres to help train staff in its use. Another external expert worked with SINGER staff on geographical information systems. This has resulted in a Web-based platform that makes it easy for centres to map their accessions and to share geographical information.

SINGER, having implemented the Web Services and data exchange protocols that enable “remote real time” searching, is thus poised to play a focal role in the creation of a global clearing house for information on plant genetic resources collections.

SINGER has established strong partnerships with other players, such as the Nordic Gene Bank and the US Department of Agriculture, and SGRP is continuing to facilitate the collaborations necessary to bring the vision of a clearing house mechanism to fruition. Combining disparate sets of data—evaluation, characterization, including molecular characterization, geographic, pedigree and so on—for individual accessions, the clearing house mechanism will be an important contribution to the global information system foreseen under the International Treaty on Plant Genetic Resources for Food and Agriculture.

In 2005, information on the collections of the World Vegetable Center (AVRDC) came on line through SINGER (see box next page).
The International Seed Federation (ISF) provided financial support to enable information on the collections of vegetable genetic resources held by the World Vegetable Center (AVRDC) to be made available on the Internet through SINGER. AVRDC holds more than 50,000 accessions of over 300 vegetable species. For more about AVRDC see http://www.avrdc.org.

### Number of accessions

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<td>Allium</td>
<td>1,011</td>
</tr>
<tr>
<td>Brassica</td>
<td>1,386</td>
</tr>
<tr>
<td>Capsicum</td>
<td>7,514</td>
</tr>
<tr>
<td>Glycine</td>
<td>15,312</td>
</tr>
<tr>
<td>Lycopersicon</td>
<td>7,213</td>
</tr>
<tr>
<td>Solanum</td>
<td>2,942</td>
</tr>
<tr>
<td>Vigna</td>
<td>10,821</td>
</tr>
<tr>
<td>Other</td>
<td>6,646</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>52,845</strong></td>
</tr>
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</table>

Characterization data for Capsicum, Glycine, Lycopersicon and Vigna radiata are now available through SINGER.

The ISF is a non-governmental and non-profit organization representing the seed trade and world plant breeding community (http://www.worldseed.org). Like AVRDC, it realizes the importance of information to furthering the use and conservation of genetic resources by scientists and plant breeders in public and private organizations. Thanks to ISF support to SINGER, information related to vegetable crop diversity conserved at AVRDC is now freely available to all and can be accessed through SINGER at http://www.singer.cgiar.org.

The SINGER team provided onsite training to AVRDC staff on genetic resources documentation and data standards, including the use of international passport and characterization descriptors developed by Bioversity International (formerly known as IPGRI). The team also assisted in the development of a new genebank database system and the migration of data from the old system.

Characterization data for Capsicum, Glycine, Lycopersicon and Vigna radiata are now available through SINGER.

<table>
<thead>
<tr>
<th>Species</th>
<th>Accessions</th>
</tr>
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<tbody>
<tr>
<td>Capsicum</td>
<td>4,201</td>
</tr>
<tr>
<td>Glycine</td>
<td>2,676</td>
</tr>
<tr>
<td>Lycopersicon</td>
<td>3,468</td>
</tr>
<tr>
<td>Vigna radiata</td>
<td>70</td>
</tr>
</tbody>
</table>

Users can search for characterization data based on standard descriptors, view summaries based on the descriptors and refine their search by reviewing a graphical representation of the data. The user-friendly query interface makes it easy to pinpoint the exact accessions needed.

The overall objectives of this project have already been met: the scientific and plant breeding communities are now able to make use of available germplasm information to improve the quality of vegetable crops and enhance the well-being of millions of people who depend on these crops for their lives and livelihoods.
In recent years, SGRP has developed a portfolio of policy activities to address issues relating to both the CGIAR centres' genetic resources work and the broader international genetic resources arena where the CGIAR System is a respected presence. Major emphasis was placed by SGRP in 2004-2005 on the capacity of the CGIAR centres to support the implementation of the International Treaty on Plant Genetic Resources for Food and Agriculture (the Treaty). SGRP represented the centres at international negotiations concerning the development of the Standard Material Transfer Agreement (SMTA) to be used under the Treaty. In very closely related activities, SGRP provided representation and prepared technical inputs to meetings organized under the aegis of the Convention on Biological Diversity on access and benefit-sharing, encouraging the development of policies that preserved as much as possible the public goods aspects of genetic resources for food and agriculture.

After many years of focusing principally on scientific and technical issues, genetic resources practitioners are now confronting a more complex working environment where policy and legal issues demand attention. Indeed, these have become critical factors in determining whether and how agricultural biodiversity achieves its full potential as a tool for development. Recognition of the present and future value of genetic resources has led to heated international debate revolving around the issues of access and benefit-sharing in particular. The CGIAR System has been both a subject of the debate, as a holder of significant collections of plant genetic resources, as well as an expert contributor to the development of policies and laws governing exchange.

SGRP has worked in consultation with FAO and under the guidance of the CGIAR Genetic Resources Policy Committee (GRPC) to develop policy instruments to use in acquiring, managing and distributing genetic resources with emphasis on the in-trust collections. Starting in 2002, SGRP began working to develop agreements governing the relationship between the centres and the Treaty. These agreements—to be signed with FAO in 2006—will eventually supersede the 1994 agreements recognizing the centres' role as trustees, rather than as owners, of the plant genetic resources collections they hold. SGRP monitors the implementation of all such agreements for System-wide consistency and conformity. The establishment of common policies as well as a coordinated presence and contribution in global policy fora have raised the credibility, profile and impact of the CGIAR System nationally and internationally.

The following two sections focus on SGRP's contributions to the

Nepali farmers worked with plant breeders to select improved versions of traditional varieties that have now been released in Nepal for other farmers' benefit. B. Sthapit/Bioversity
development of System-wide policy instruments in compliance with international law as well as the development of international policies and laws themselves.

**Development of System-wide policies**

Article 15 of the Treaty “calls upon the IARCs of the CGIAR to sign agreements with the Governing Body [of the International Treaty] with regard to [their] *ex situ* collections” of plant genetic resources for food and agriculture. In November 2004, a draft agreement went before the FAO Commission on Genetic Resources for Food and Agriculture (CGRFA), acting as the Interim Committee for the Treaty, which proposed a number of modifications. Thereafter, SGRP, GRPC and the Centre Directors facilitated discussions on the draft agreement by the Boards of Trustees of the eleven CGIAR centres with crop diversity collections, preparing the way for the centres to sign the agreements bringing the in-trust collections into the Treaty’s Multilateral System of Access and Benefit-sharing (Multilateral System) in 2006.

As reported in the SGRP Annual Report for 2003, a new ‘interim’ Material Transfer Agreement (MTA), reflecting the benefit-sharing provisions of the new Treaty and interim pending finalization of the Treaty’s Standard Material Transfer Agreement (SMTA) has been implemented by the centres since May 2003. Since 2003, SGRP has worked to ensure that the centres are consistent in their use of the MTA that governs the transfer of materials from the in-trust collections. And over the past two years, SGRP has been instrumental in informing centres of the significance of the developments in the international negotiations to prepare the SMTA to be used for the transfer of all Annex 1 materials in the Multilateral System created by the Treaty. SGRP has also been the conduit for addressing questions and suggestions about the implications of the SMTA for the centres.

As well as distributing germplasm from the genebank collections, the centres distribute other materials, including products of their own research. Out of concern that those materials may not be subject to the benefit-sharing provisions of the Treaty, SGRP stimulated a discussion of the issue by centres, the GRPC, Centre Directors and Board Chairs. This led to the development of a System-wide policy that those materials should be subject to the benefit-sharing provisions of the Treaty.

**Development of a policy on transgenes**

Amid the intense public debate on genetic manipulation, SGRP has taken a responsible and cautious position to addressing concerns about the possibility of unintended contamination of accessions with transgenic material. After surveying centres’ current procedures concerning the maintenance of the genetic integrity of genebank accessions, a joint meeting in
September 2004 of the GRPC and the CGIAR Science Council considered the technical issues associated with the development of a System-wide policy on dealing with the possibility of unintended presence of transgenes in the in-trust collections.

The workshop led to the development of ‘Guiding Principles for the Development of Future Harvest Centres' Policies to Address the Possibility of Unintentional Presence of Transgenes in Ex Situ Collections’, that were adopted by the centres in 2005. These Guiding Principles went before the CGRFA’s Inter-governmental Technical Working Group on Plant Genetic Resources for Food and Agriculture in October 2005, where they were recommended for further consideration at the next meeting of the CGRFA in 2007. The task of translating the principles into crop-specific guidelines will now be done by SGRP.

Contributions to international policy-making

International fora and agreements

SGRP’s policy work has moved forward on several fronts relating to policy instruments, research and capacity-building. Under the lead of Bioversity International (formerly known as IPGRI), SGRP played an important role over the past two years in ensuring centre contribution to the development of the Treaty’s SMTA. Most visibly perhaps, SGRP supported centre representation at the Expert Working Group on the terms of the SMTA in September 2004 and the first meeting of the Contact Group to develop the SMTA in July 2005. The centre representatives made numerous interventions, addressing, among other things, the potential capacity of SINGER and other existing information systems to serve as a starting point for the global information system that will be needed to support the implementation of the Treaty. SGRP also facilitated the representation of the centres at informal meetings of key delegates convened to address difficult issues in the SMTA negotiations.

As a continuing responsibility, SGRP ensures centre representation in meetings relating to the Treaty and the period covered by this report was a particularly active one in that context, with SGRP seeking to aid the Treaty’s timely and efficient implementation through constructive
contributions to the preparatory process. For example, in December 2005, on the request of the Swiss government, Bioversity provided resource persons for a meeting of the Open-ended Working Group on Rules of Procedure to examine the future plan of work of the Governing Body of the Treaty with regard to Article 6, which addresses sustainable use. That same month, Bioversity represented the centres at the First Meeting of the Open-Ended Working Group on the Rules of Procedure and the Financial Rules of the Governing Body, Compliance, and the Funding Strategy, held at FAO in Rome.

SGRP contributed to a study by the CGIAR Central Advisory Service on Intellectual Property (CAS) concerning the contribution the centres are making to promote Farmers’ Rights and to non-monetary benefit-sharing in the form of technology transfers as called for in the Treaty. The centres also provided a comprehensive, response, coordinated through SGRP, to a survey, and subsequently, a publication by the Fridtjof Nansen Institute in Norway on Farmers' Rights. The Institute, which is an independent foundation engaged in research on international environmental, energy, and resource management politics, used the results in the development of a report on ‘The History of Farmers’ Rights: A Guide to Central Documents and Literature’.

In November 2004, SGRP reported on the status of new designations by centres to the tenth regular session of the FAO CGRFA as well as reporting on other matters concerning the administration of the CGIAR-FAO in-trust agreements. SGRP facilitated representation of the centres at international conferences held under the aegis of the Convention on Biological Diversity (CBD) to address issues relating to access and benefit-sharing. Subsequently, SGRP supported participation by the centres in the Fourth Meeting of the CBD’s Ad Hoc Open-ended Working Group on Access and Benefit-sharing in early 2006. Here, SGRP distributed a brief linking data on germplasm flows to access and benefit-sharing policies, and an annotated bibliography of literature addressing international pedigrees of crops and germplasm flows.

Capacity building
In the area of capacity building, SGRP undertook to expand and improve the training module ‘Law and Policy of Relevance to the Management of Plant Genetic Resources’, first produced in 2003 by SGRP, Bioversity and the ISNAR (the International Service for National Agricultural Research, since April 2004 a programme of IFPRI). A workshop was held in Germany in July 2004, where the module was tested by international technical experts and representatives of national programmes. Following the workshop, the module was subject to a final revision.
The training module was introduced at a side event organized by Bioversity at the third meeting of the CBD Ad Hoc Open-ended Working Group on Access and Benefit-Sharing in February 2005. The final module, which includes a review of regional policy instruments, developments and trends, was released in December 2005. The module was used in a number of national and regional training courses around the globe in 2005. Supplementary training materials developed by the facilitators of the courses have been collected and will be made publicly available.

**Additional research**

SGRP has been studying germplasm flows to better understand the dynamics of germplasm movement into and out of the CGIAR genebanks. A paper entitled ‘Germplasm flows in and out of Kenya and Uganda through the CGIAR: a case study of patterns of exchange and use to consider in developing national policies’, written by M Halewood (Bioversity), S Gaiji (Bioversity) and HD Upadhyaya (ICRISAT), was presented at the Frati Meeting on Genetic Resources Policies in East and Central Africa held in September 2004. The meeting endorsed the strategy of undertaking more studies on germplasm flows on a country-by-country and regional basis. It is expected that, through Bioversity, SGRP will be involved in such studies.

Also in 2005, SGRP and GRPC supported research on a paper documenting reduced rates of acquisition of new materials by centre genebanks, linking that phenomenon to political and legal developments since the mid 1990s. The paper–‘Genebanks and public goods: political and legal challenges to building collections for the international community’–will be published in 2006.
The early years of the 21st century will be remembered as the time when the world finally took important measures to ensure that agricultural biodiversity will continue to benefit people far into the future. The dawning revolution has been long in coming but it is worth the wait. It gives us our best chance to defeat hunger and poverty forever.

The first shot was fired fourteen years ago at the Rio Earth Summit when delegates put the issue of biodiversity on the short list of challenges that governments must attend to together. The result was the Convention on Biological Diversity, adopted by world leaders at the 1992 Summit. Ironically, the growing recognition of the importance of biodiversity for the world’s future was accompanied by a growing reluctance of countries to make that biodiversity available to others. This was a reversal of the spirit that had characterized the relationships between national genetic resources programmes for decades. Considered the ‘common heritage’ of humanity, crop diversity was for the most part exchanged easily, and with few, if any, restrictions. The Convention changed all that with its assertion of national sovereignty over biodiversity. Newly aware of the value of their biodiversity and often not well informed about the special nature of agricultural biodiversity, some countries began to put restrictive regimes into place to limit access.

At the same time, the renegotiation of the 1983 International Undertaking on Plant Genetic Resources was getting underway at FAO. The goal was to bring the Undertaking in line with the Convention since the Undertaking was adopted at a time when common heritage was the accepted paradigm and when technologies and policies regarding crop diversity were less sophisticated. Another major issue prompting a fresh look at the International Undertaking concerned the disposition of the collections held in the genebanks of the CGIAR centres. These collections, generally accepted to be the world’s most important, fell outside of the Convention insofar as the centres could not be a signatory. Although the centres had signed agreements with FAO in 1994 to place the collections in trust for the world community, it was understood that these agreements were temporary. The permanent status of the collections would have to be determined within the context of the International Treaty on Plant Genetic Resources for Food and Agriculture (the Treaty) that was to be the successor instrument to the Undertaking.

Seven years of difficult and sometimes acrimonious negotiations later, the new Treaty was adopted in November 2001. A centre-piece of the Treaty is the so-called Multilateral System, which will facilitate access by parties to plant diversity for food and agriculture, and allow the fair sharing of benefits arising from the use of that diversity. The Multilateral System covers over 64 crops and forages; according to FAO these include the plants providing 80% of the calories consumed by humans. The Governing Body of the Treaty, composed of the countries that have ratified,
will set out the conditions for access and benefit-sharing under the Multilateral System in a contract that is binding on all parties, which is known as a ‘Standard Material Transfer Agreement’ (SMTA). New, permanent agreements confirming the in-trust status of the collections held by the CGIAR centres—to replace the 1994 FAO-centre agreements—will be signed in 2006.

Things hardly stood still during the seven-year process to negotiate the Treaty. In 1996, 150 countries adopted the first Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (Global Plan). The Global Plan consists of 20 priority activities that countries agreed to undertake to protect their agricultural future. The Global Plan confirmed the value of ex situ conservation to complement in situ approaches, including on-farm conservation. Significantly, it called for a rational global conservation and use system based on the principles of effectiveness, efficiency and transparency. The Global Plan recognized the immense inefficiency of the ‘system’ existing at the time, an inefficiency that was exacerbated by a growing tendency of countries after the adoption of the Convention to enact national policies supportive of bilateral exchange arrangements. Such arrangements, although expensive, time-consuming and nearly impossible to police, were felt to afford greater protection with regard to national sovereignty over genetic resources. In contrast, the Global Plan urged countries to consider the benefits of multilateral cooperation and of sharing roles and responsibilities in the conservation and use of crop diversity.

Discussions around benefit-sharing, both within the context of the Convention and the Treaty, have most often centred on monetary benefits, largely ignoring the significant non-monetary benefits that can arise from the exchange and use of crop diversity. These include access to more genetic resources and improved material than can be found in any one country, as well as access to training opportunities, new technologies and information arising from the use of exchanged material. International collaboration brings increased opportunities for developing joint strategies.
and activities for conserving and using genetic resources and for sharing responsibilities and costs. In general, the more parties that are involved in a collaborative relationship, the more widely the costs and benefits are shared, reducing the burden and increasing the advantage to all partners. In the end, arguments concerning the non-monetary benefits of multilateralism were helpful in trying to unstick the Treaty negotiations at difficult moments.

While the Global Plan of Action provided a useful framework to guide the development of national strategies and plans for conservation and use, the rational system it envisaged was still many years away. Fulfilling that aspiration would have to await the adoption of the Treaty, and specifically, the loosening of the tension between national sovereignty and multilateralism.

Another important development during these years was the decision to establish a permanent funding mechanism for ex situ conservation—the Global Crop Diversity Trust (the Trust). The spectre of genetic erosion loomed large in the 1970s and 1980s, leading to an atmosphere of crisis and prompting a massive effort to collect and conserve crop diversity before it was too late. Tragically, a large number of national genebanks established during the crisis years did not make sufficient provision for ongoing financial support. Some of these genebanks have now closed and others are in an advanced state of deterioration. The CGIAR was also faced with the challenge of how to meet its perpetual responsibility as trustee of the world’s largest public domain collections on the basis of annual funding alone.

In the past, genebank crises had been dealt with in an ad hoc manner, if at all, often with dire consequences for the collections. It is not going too far to say that the inability to provide a stable funding base for ex situ conservation was putting at grave risk the ability of the world to feed itself into the future. Enter the Global Crop Diversity Trust—an endowment whose proceeds will be used to fund the operations, forever, of the world’s most important crop diversity collections. Established by Bioversity International (formerly known as IPGRI)—on behalf of the CGIAR centres—and by FAO, today the Trust is an independent international organization based in Rome, close to its parent institutions.

The goal of the Trust is to promote and support the development of a global conservation and use system and to provide financial backing for the operations of key elements of that system. The Trust is closely tied to the Treaty; indeed, it has been recognized by the Treaty’s Governing Body as an essential element of the funding strategy for the Treaty. For its part, the Global Plan of Action provides the technical blueprint to guide the Trust’s funding decisions: the Trust would be unlikely to fund an ex situ activity that has not been identified as a priority in the Global Plan. In particular, the Global Plan’s call for a rational global system very much underpins the Trust’s funding philosophy.

The Trust has been preoccupied with helping
to create the space for stakeholders to come together and consider what the global system will do, and how it will function, since the early days of its existence. Literally hundreds of people have already been involved in processes to develop collaborative approaches to conservation and use, taking both regional and crop perspectives into consideration. Most often, these conversations have taken place within the context of existing regional and crop networks. These networks, which include the CGIAR centres, could collectively provide the agency for the implementation as well as for the development of the rational global system. Monitoring the effectiveness and impact of the global system, and reporting on its progress to the various international bodies that are concerned with its mission—the Convention, the Treaty, the FAO Commission and the Trust chief among them—will be important to ensuring the sustainability of the system. Taking responsibility for such activities could be another important initiative to be shouldered by the networks.

Building a rational global system for crop diversity conservation and use is still an uphill battle. How it will function, be monitored, and its impact measured still has to be determined. Convincing the people whose good will is necessary to ensure that the system can be implemented—policy-makers, genebank managers, breeders to name but a few—that participation in the global system is in their best interest will not be easy, particularly if it does not provide immediate and visible rewards. But the promise of a more equitable and food-secure world is there. The Global Plan of Action established a mandate for the development of the global system; the Treaty established the legal basis for its operations, at least with regard to the crops covered by the multilateral system. The Global Crop Diversity Trust offers a funding mechanism to support key elements of the rational system. The CGIAR and its centres have made a strong commitment to support its development and implementation. Achieving a rational and efficient conservation and use system, based on principles of collaboration and cost effectiveness is within our grasp. If we succeed, we will make a monumental contribution to improving the lives of people all over the world. We must not fail.
Farm animals provide a crucial component of food and agriculture for communities all over the world. Beyond providing food and clothing, animals are important for income generation, wealth accumulation, traction and nutrient recycling. Of special importance is the contribution that farm animals make to the livelihoods and well-being of the most vulnerable groups—small-holders in marginal environments, especially women and children.

The diversity of cattle, sheep, goat, pig, poultry and breeds of other farm animal species represent an irreplaceable source of traits for livestock development in response to changing environmental and human needs. However, these genetic resources are being eroded as a result of changing agricultural practices, economic, environmental and other factors. Of particular concern are the high rates of loss of indigenous breeds in developing countries, which, coupled with inadequate programmes for the use and management of the genetic resources, is seriously reducing the livelihood options of the poor.

The need to arrest the degradation of farm animal genetic resources (FAnGR) and establish programmes for their conservation and sustainable use is well recognized. It is embodied in the objectives of the Convention on Biological Diversity and in the Global Strategy for the Management of Farm Animal Genetic Resources of the FAO. Noting the need for a greater understanding of the status of farm animal genetic resources and the measures necessary for their conservation and sustainable use worldwide, in 1999 the FAO Commission on Genetic Resources for Food and Agriculture initiated a country-driven process to develop the first ‘Report on the State of the World’s Animal Genetic Resources’. The Report will be finalized at the First International Technical Conference on Animal Genetic Resources in September 2007, hosted by the Government of Switzerland.
The workshop

The workshop, held in Montpellier, France from 7 to 10 November 2005, brought together 63 scientists, conservation programme managers and other FAnGR experts from 28 countries, and from the CGIAR centres (ICARDA, ILRI, Bioversity International [formerly known as IPGRI]), the French scientific community (including CIRAD¹ and INRA²), FAO and GTZ. Participants focused on the needs of developing countries as they aimed at assisting the international community to develop a global framework for FAnGR conservation and identify priorities for action.

The workshop focused on the following questions:

- Why is the conservation of FAnGR needed?
- What is the nature and status of threats to FAnGR?
- What types of conservation will be required?
- What are the key knowledge and information gaps?
- What are the priorities for action?

Some of the most commonly agreed reasons for conserving FAnGR included the need to prevent the erosion of genetic diversity needed to provide options for adapting to changing environmental conditions and production systems and to provide support for livestock improvement and sustainable production. Other motives include the need to provide options to meet the demands

¹ Centre de coopération internationale en recherche agronomique pour le développement, France.
² Institut national de la recherche agronomique, France.

Maasai goats may carry traits of interest to others who make use of this species. S. Mann/ILRI
of new markets for livestock products and to preserve and pass on the cultural and historical value of livestock and its diversity.

The workshop identified a framework to guide decision-making on the conservation strategy for a given farm animal genetic resource, based on the severity and speed of the threats to which it is exposed, the nature of the value of the resource, and the capacity to take action to conserve it. A coherent strategy will include an appropriate combination of in situ, ex situ in vivo and in vitro conservation methods. In determining the precise combination of conservation methods to use, the following factors should be considered:

- **In situ** (community-based, management and conservation) approaches should be the preferred method of conservation where maintenance of the FAnGR is the best available livelihood option for the livestock keepers involved.
- **Ex situ in vivo** conservation in institutional or communally owned herds or flocks can be used successfully to support conservation of FAnGR that have current value.
- **In vitro** conservation is needed to provide a secure back-up for the developing world’s FAnGR in the face of natural and human disasters that could drive the FAnGR to extinction faster than in situ or in vivo approaches can respond.

**Next steps**

The outputs of the workshop are expected to contribute to the preparation of the first ‘Report on the State of the World’s Animal Genetic Resources’ and the advancement of the Global Strategy for the Management of Farm Animal Genetic Resources.

The findings of the workshop will be presented at a side event to be organized by FAO in association with SGRP during the Eighth Meeting of the Conference of the Parties to the Convention on Biological Diversity (COP8), in Curitiba, Brazil, 20-31 March 2006.
Priorities for Action

General priorities

**Action 1:** Develop policy that promotes use of appropriate FAnGR and supports the conservation of FAnGR.
**Action 2:** Show the benefits and costs of conservation and raise awareness of the issues.
**Action 3:** Establish international funding mechanisms, legal frameworks and advocacy to support the actions of developing countries to conserve FAnGR.
**Action 4:** Develop policy and guidelines for biosecurity, exchange, ownership, access and benefit-sharing of FAnGR.

Research and information priorities

**Action 9:** Capture all existing information on FAnGR in an internationally accessible information system and couple this with tools for analysis and interpretation of information and for decision-making.
**Action 10:** Improve the level of knowledge about how to prioritize, design and operate conservation and use programmes that will be sustainable in the medium to long term.
**Action 11:** Complete global surveys of the molecular genetic diversity of the major livestock species.
**Action 12:** Undertake critical analyses of the economies of scale for various conservation actions and interventions.
**Action 13:** Improve the technologies and reduce costs of cryopreservation of gametes, embryos and somatic cells of most species of FAnGR.

Conservation priorities

**Action 5:** Develop capacity for cryopreservation, including the development of human and technical resources.
**Action 6:** Determine the most appropriate system for regional and international cryopreservation programmes as a back-up for *in situ* and *ex situ* *in vivo* methods.
**Action 7:** Identify hotspots of diversity and identify the most threatened FAnGR within those hotspots and take action to conserve them now.
**Action 8:** Establish early warning and response systems for emergency threats to FAnGR.

The priorities for action can only be satisfied if four broad knowledge gaps are clearly identified and filled. The first gap relates to the lack of information and documentation of the status, characteristics, current and future values of most FAnGR. The second deals with the deficiency of inventory, analysis and design of policy and regulatory frameworks, and information on how they impact FAnGR and conservation. The specifications of a system to prioritize, design and operate conservation and use programmes was also recognized as an area that needed research. The final knowledge gap concerns the void in appropriate evaluation methods applicable to the developing world in order to determine priorities for conservation, breeding objectives, and the sustainability of different conservation options.
VALUES AND INCENTIVES—THE ECONOMICS OF AGRICULTURAL BIODIVERSITY CONSERVATION

The body of work on valuation and incentives that is being developed under the aegis of SGRP builds on a long-term interest of the Programme to integrate the different components of agricultural biodiversity. It responds positively to calls from the Conference of the Parties to the Convention on Biological Diversity to develop mechanisms to give communities incentives to prioritize the conservation of diversity, and to remove or mitigate perverse incentives that work against conservation objectives and thereby threaten the long-term well-being of communities.

The challenge of understanding and optimizing the use of the various components of agricultural biodiversity has been an implicit concern for SGRP from the outset. The very fact that the CGIAR works not only on crop plant diversity but also on fish, livestock and forest genetic resources has provided the CGIAR centres with an awareness of, on the one hand, the complex interactions between different sectors and, on the other, common themes and patterns that facilitate cross-fertilization of ideas and learning.

The SGRP Annual Report for 2003 described a workshop on agricultural biodiversity, which took place in that year. This event, which was organized by Bioversity International (formerly known as IPGRI) for SGRP, brought together stakeholders from the centres, NGOs, national programmes and donors to identify ways forward to enhance communication and synergy between practitioners working with plant and animal diversity and those concerned with soil fertility, pollinators, and pests and diseases.

Focus on valuation

The workshop requested SGRP to address the valuation of agricultural biodiversity as a pivotal factor affecting sustainable conservation and use. By understanding the values that farmers assign to biodiversity, we can gain a greater appreciation of the incentives favouring the maintenance of that biodiversity, and thereby seek to create an environment favourable to conservation and sustainable use. The request to SGRP identified three particular initiatives needing support: (i) the preparation of a status report on valuation methodology, (ii) the preparation of a bibliography on crop and livestock valuation, and (iii) the organization of an expert workshop on valuation tools.

All three initiatives have been taken forward, building on work by IFPRI and ILRI. The status report was published in 2005 as ‘Valuation and sustainable management of crop and livestock biodiversity—a review of applied economics literature’, edited by Adam Drucker, Melinda Smale and Patricia Zambrano. Accompanying the report is an annotated bibliography on CD-ROM ‘ECOGENLIT—Economics Literature on Crop and Livestock Genetic Resources’. The status report examines the hypothesis that research on agricultural biodiversity would be advanced by taking a holistic approach to valuing its components.

In support of a holistic approach is the reality that many small-scale farmers, especially in subsistence agriculture, integrate their management of crops and livestock. These represent interdependent livelihood assets that are used for production on the same lands and that provide mutual inputs, such as livestock feeding on crops
and crops benefiting from animal manure. The same policies and development interventions impact on crops and livestock, and are often implemented by the same agents, especially at the local level. In addition, the forces such as mechanization and intensification that drive change are the same for both crop and livestock components.

**More data needed**

The review of methodologies found that, while there is scope for progress in evolving research approaches adapted to the agricultural biodiversity context, especially in the area of institutional analysis, in general, data constraints are more critical. Thus, studies are needed to generate data to value crop and livestock together, rather than treating one or the other as external factors, to quantify benefits as well as costs of conservation, and to identify optimal conservation strategies and conducive policies.

The methodologies review uncovered some important findings in the crops arena:

- Because many of the plant genetic resources are not traded on markets, their importance to those who depend on them for their livelihoods is often underestimated by a commercial valuation alone.
- While the marginal commercial value of an individual plant genetic resource may not be enough to fund its conservation, the marginal value of its exploitation in commercial agriculture does justify its conservation.
- A number of key factors determine the level of biodiversity on farms including location, cultural cohesion, environmental heterogeneity, and...
isolation from market infrastructure.

- Programmes to support the maintenance of diversity can benefit the economically marginalized, and development will not necessarily detract from the continued maintenance of diversity.
- Results are often extremely location specific, with obvious implications for research costs and care in interpretation in scale-up.
- An overwhelming conclusion is that we are not yet in a position to assess interactions between crop and other biodiversity components, or to place a value on crop biodiversity’s contribution to ecosystem services.

In the case of livestock biodiversity, the study concluded that:

- Conventional evaluation criteria are not well-tuned to the subsistence livestock context where non-income functions are important, and the benefits of cross-breeding and breed substitution tend to be overestimated.
- Despite the apparent benefits of conservation and the relatively low cost of *in situ* breed conservation when compared with subsidies in the commercial livestock sector, few conservation initiatives exist. Yet, incentives for conservation of indigenous breeds should not be particularly costly.

*Ex situ* conservation through cryopreservation is relatively underexplored for livestock, but experiences with crops would suggest scope for beneficial application of this approach on economic grounds.

- Relatively little is known about the impact of policy factors and the policies that would promote cost-efficient conservation strategies.

**Expert workshop**

The study’s findings made an important contribution to the expert workshop on valuation tools, the third follow-up action identified by the 2003 event. The workshop, Valuing Crop, Tree, Livestock and Aquatic Genetic Resources, convened by IFPRI on behalf of SGRP, took place in October 2005. The participants, drawn from the economics world and different biodiversity sectors, were set the task of designing a project to test the hypothesis that advances in research and policy would benefit from an integrated approach. Using the valuation study and literature review as inputs to their thinking, the participants identified the key research questions that would assist a better understanding of how to value agricultural biodiversity. Accordingly, priority was assigned to developing methods and research tools to:

- Prioritize taxa for conservation at pilot sites;
- Assess optimal combinations of genetic resource management approaches;
• Evaluate the contribution of genetic resources to ecosystem services;
• Estimate the public goods value of diversity and design mechanisms that will enable farmers to appropriate those values, thereby creating incentives for conservation;
• Develop action plans for sustainable management of diversity at the pilot sites.

Resonance with CBD developments

Shortly after the valuation workshop, SGRP supported the organization of a side event on valuation of agricultural biodiversity at the eleventh meeting of the Subsidiary Body on Scientific, Technological and Technical Advice (SBSTTA) of the Convention on Biological Diversity in 2005. This was attended by representatives from Bioversity, ICARDA, IFPRI and ILRI. Following the recommendations of SBSTTA, the meeting of the Conference of the Parties to the Convention in early 2006 called for action on valuation of agricultural biodiversity including through conducting pilot studies to inform public and private decision-making.

Thus, the direction of the SGRP-led initiative is very much in line with thinking at the highest levels in the biodiversity conservation community, and will find a ready audience and scope for application in the development of incentive measures. To take this work forward, SGRP is supporting the development of a project that places farmers at the centre of the process, as they alone can explain and quantify the values they assign to diversity. Moreover, the conclusions to be drawn by the project will need to be meaningful in the context of those farmers’ lives if the sought-after incentive mechanisms are to help promote the conservation of diversity.
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Project Coordinator, Forage Genetic Resources (ILRI)

Dr Olivier Hanotte
Project Leader, Animal Genetic Resources (ILRI)

Dr Ruairaidh Sackville Hamilton
(Chair)

Dr Robert Zomer
Senior Landscape Ecologist (IWMI)

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(from October 2005)
Head, Genetic Resources Unit (The Africa Rice Centre - WARDA)

Dr Moussa Sie (July 2005–September 2005)
Senior Lowland Rice Breeder, Acting Head of the Genetic Resources Unit (The Africa Rice Centre - WARDA)

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(March–June 2005)
Post-Doctoral Fellow (The Africa Rice Centre - WARDA)

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(through February 2005)
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Programme Leader, Domestication of Agroforestry Trees Programme (World Agroforestry Centre - ICRAF)

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Director General
(Bioversity International)

Ms Jane Toll, SGRP Coordinator
(Bioversity International)

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Dr Ruaraidh Sackville Hamilton,
IRRI

Dr CLL Gowda, ICRISAT
(from January 2005)

Dr Willy Roca, CIP
(through December 2004)

Ms Jane Toll, SGRP Coordinator
(Secretary of the Executive Committee)

Dr Emile Frison, SGRP Programme Leader, Bioversity International

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Ms Layla Daoud
Communications and Information

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SINGER

Dr Michael Halewood
Policy
SGRP reports and publications

Reports


Report of the Fifteenth Meeting of the Inter-Centre Working Group on Genetic Resources, held at the ICRISAT, Hyderabad, 1 to 5 March 2005.

Publications


IFPRI, ILRI and IPGRI for SGRP. 2005. ECOGENLIT: Economics Literature on Crop and Livestock Genetic Resources [CD ROM]. Published for the CGIAR System-wide Genetic Resources Programme (SGRP) by the International Food Policy Research Institute (IFPRI), the International Livestock Research Institute (ILRI), and the International Plant Genetic Resources Institute (IPGRI). IFPRI, Washington, DC, USA.


IPGRI/IRRI, 2005. Developing Access and Benefit-sharing Regimes: Plant Genetic Resources for Food and Agriculture. International Plant Genetic Resources Institute, Rome, Italy.


Reed BM, Engelmann F, Dulloo ME, Engels JMM. 2004. Technical guidelines for the management of field and in vitro germplasm collections (Handbooks for Genebanks No. 7). International Plant Genetic Resources Institute, Rome, Italy.

SGRP. 2006. Annotated bibliography: Addressing the International Pedigrees and Flows of Plant Genetic Resources for Food and Agriculture. International Plant Genetic Resources Institute, Rome, Italy.


This report presents income and expenditures for SGRP for the period 1 January 2004 through to 31 December 2004.

### 2004 Income

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<tr>
<th>Country/Program</th>
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* Funds for SINGER-related activities in the Generation Challenge Program.
** Funds for upgrading SINGER and SGRP monitoring and reporting of genebank upgrading at centres.
*** Part of unrestricted contribution to IPGRI from the Netherlands utilized for supporting SGRP activities in 2004 and 2005.
**** Funds for SINGER-related activities with ICT/KM.

This report presents income and expenditures for SGRP for the period 1 January 2005 through to 31 December 2005.

### 2005 Income

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### 2005 Expenditures

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<td>Administrative costs</td>
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# Abbreviations and Acronyms

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<td>The World Vegetable Center</td>
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<td>Biological Collection Access Service for Europe</td>
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<td>CBD</td>
<td>Convention on Biological Diversity</td>
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<td>CGIAR</td>
<td>Consultative Group on International Agricultural Research</td>
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<td>CGRFA</td>
<td>FAO Commission on Genetic Resources for Food and Agriculture</td>
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<td>CIAT</td>
<td>Centro Internacional de Agricultura Tropical</td>
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<td>CIFOR</td>
<td>Center for International Forestry Research</td>
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<td>CIMMYT</td>
<td>Centro Internacional de Mejoramiento de Maíz y Trigo</td>
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<td>CIRAD</td>
<td>Centre de coopération internationale en recherche agronomique pour le développement</td>
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<td>CIP</td>
<td>Centro Internacional de la Papa</td>
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<td>COP</td>
<td>Conference of the Parties to the Convention on Biological Diversity</td>
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<td>FAnGR</td>
<td>Farm animal genetic resources</td>
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<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<td>GBIF</td>
<td>Global Biodiversity Information Facility</td>
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<td>CGIAR System-wide Genetic Resources Policy Committee</td>
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<td>GTZ</td>
<td>Deutsche Gesellschaft für Technische Zusammenarbeit GmbH</td>
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<td>ICARDA</td>
<td>International Center for Agricultural Research in the Dry Areas</td>
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<td>World Agroforestry Centre</td>
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<td>ICRISAT</td>
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<td>ICT-KM</td>
<td>Information and Communications Technology and Knowledge Management</td>
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<td>Inter-Centre Working Group on Genetic Resources</td>
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<td>International Institute for Sustainable Development</td>
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<td>International Network for the Improvement of Banana and Plantain</td>
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<td>Institut national de la recherche agronomique</td>
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<td>ISF</td>
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<td>International Water Management Institute</td>
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<td>MTA</td>
<td>Material Transfer Agreement</td>
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<td>NARS</td>
<td>National agricultural research systems</td>
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<td>PGR</td>
<td>Plant genetic resources</td>
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<td>SBSTTA</td>
<td>Subsidiary Body on Scientific, Technical and Technological Advice</td>
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<td>SGRP</td>
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<td>Web: <a href="http://www.worldfishcenter.org">www.worldfishcenter.org</a></td>
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<tr>
<td>E-mail: <a href="mailto:worldfishcenter@cgiar.org">worldfishcenter@cgiar.org</a></td>
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