IPGRI

NEWS LETTER for the Americas

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Contents

Diversity for Development

A new strategy for a new era

Ten years ago, the International Plant Genetic Resources Institute (IPGRI) published its first institutional strategy. *Diversity for Development* focused on the conservation of the plant diversity that underpins agriculture. Six years later, IPGRI revisited its vision in the context of the Convention on Biological Diversity and the FAO Global Plan of Action, placing the conservation of plant genetic resources for use at the center of its work.

Against the background of a changing policy framework for genetic resources and the Millennium Development Goals, IPGRI recognizes that if it is to rise successfully to the challenges facing our world today, it needs to reassess its goals and objectives and the means by which these are accomplished. For these reasons, IPGRI is developing a new strategy. IPGRI's new vision will be one that places people firmly at its center. Diversity is the foundation required for building improved agricultural systems. We believe people will need improved agricultural systems to work their way out of hunger and poverty and to build themselves a sustainable future.

Since its earliest days, IPGRI has sought to work primarily through partnerships. The organization acts as a catalyst, a facilitator, working with others to achieve shared goals. As such, the process of developing IPGRI's strategy has also been highly inclusive and consultative to ensure that all our partners and stakeholders share IPGRI's view of how it will achieve its vision of the future.

The process has been based on external consultations with IPGRI's traditional partners in genetic resources, but also with new and potential partners in agricultural development, as well as with a wide range of stakeholders. The aim of these consultations has been to assess the global context, challenges and opportunities that IPGRI will face in the foreseeable future and to ensure that these shape the new strategy.

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The International plant Genetic Resources Institute (IPGRI) is an autonomous international scientific organization, supported by the Consultative Group on International Agricultural Research (CGIAR). IPGRI's mandate is to advance the conservation and use of plant genetic resources for the benefit of present and future generations. IPGRI operates through three programmes: (1) the Plant Genetic Resources Programme, (2) the CGIAR Genetic Resources Support Programme and (3) the International Network for the Improvement of Banana and Plantain (INIBAP). The international status of IPGRI is conferred under an Establishment Agreement signed by 48 countries.

For the consultation process IPGRI has employed a range of information-seeking tools. External input has been sought in meetings, virtual and live, workshops, conferences, expert consultations, and via the Internet. Opportunities to comment on the strategy have been offered in many modalities, including, for example, a web-based survey. In this way, IPGRI has heard the opinions of 650 stakeholders of the widest range possible.

The document with the new strategy is currently being refined and will be published in the next few months. For further information, visitour website at http://www.ipgri.org.

Treaty on PGRFA enters into force

At the end of March 2004, eleven European countries, Egypt and the European Community as a FAO member organization signed the International Treaty on Plant Genetic Resources for Food and Agriculture (PGRFA). This fact triggered the countdown for the Treaty to enter into force. The Treaty became law on 29 June, 2004, after 48 eight developing and developed countries had ratified it. Forty ratifications were needed for the Treaty to enter into force.

The Treaty will ensure that plant genetic resources for food and agriculture, which are vital for human survival, are conserved and sustainably used and that benefits from their use are equitably and fairly distributed. Scientists, international research centers and plant breeders from public and private organizations will benefit from enhanced access to genetic biodiversity.

“The Treaty provides an international legal framework that will be a key element in ensuring food security, now and in the future. The challenge is now to ensure that the treaty becomes operational in all countries,” said José Esquinas-Alcázar, Secretary to the Commission on Genetic Resources for Food and Agriculture.

The Treaty will institute, for the first time, a multilateral system of facilitated access and benefit sharing for the crops and forages most important for food security. This system will also ensure the fair distribution of benefits derived from the use of genetic resources, in particular for farmers in developing countries that have for centuries contributed to conserving world's food storage.

The system also provides for the obligatory sharing of monetary benefits arising from utilization, including from commercialization of new varieties by the private sector.

Adapted from a FAO press release from 31 March, 2004 (http://www.fao.org/newsroom/en/news/2004/39887/index.html)

Egypt and Cape Verde sign
Agreement to Establish Food Security Fund

An ambitious plan to set up a global fund to conserve the diversity of crops took a major step forward in early March, when Cape Verde and Egypt became the first governments to sign the agreement to establish the Global Crop Diversity Trust.

The Global Crop Diversity Trust will provide a permanent source of funding for collections of crop diversity around the world. This diversity is an essential source of the traits needed by farmers and plant scientists to adapt crops to their food and livelihood needs and to changing environmental conditions.

The goal of the Trust is to raise a US $260 million endowment from governments, foundations and corporations. The proceeds of the endowment will support the ongoing conservation costs of the world's most important crop diversity collections, many of which are in desperate need of financial assistance.

"This is an important day for agricultural development," said Geoff Hawtin, Interim Executive Secretary of the Trust. "We are delighted that Cape Verde and Egypt have signed the Establishment Agreement. This brings us an important step closer to our goal of ensuring that farmers can use crop diversity to improve their diets, their incomes and their food security, both now and long into the future."

The initiative to establish the Trust is led by the Food and Agriculture Organization of the United Nations (FAO) and the International Plant Genetic Resources Institute (IPGRI) on behalf of the *Future Harvest* Centres of the Consultative Group on International Agricultural Research. The Establishment Agreement will come into force once it is signed by seven governments from five FAO-designated regions. Four of the signatories must be from developing countries. Cape Verde is from the African region and Egypt from the Near East region.

Emile Frison, Director General of IPGRI, welcomed the first signatures on the Establishment Agreement, which came just one day after twelve European countries and the European Community ratified the International Treaty on Plant Genetic Resources for Food and Agriculture, an event that triggered the 90-day countdown to the Treaty's entry into force. "The Trust is an important element of the funding strategy of the International Treaty," said Frison. "It is very apt that the first formal steps to establish the Trust should take place just as the Treaty is set to come into force."

The Establishment Agreement was signed at FAO by H.E. Jorge Maria Costódio Santos, Ambassador and Permanent Representative of Cape Verde to FAO, and by H.E Helmy Bedeir, Ambassador of the Arab Republic of Egypt to Italy and the United Nations Organizations in Rome.

Ambassador Fernando Gerbasi, Chair of the Trust's Interim Panel of Eminent Experts, expressed his pleasure at the fact that Cape Verde and Egypt were the first countries to sign the Agreement. "Africa has been extremely generous in sharing its crop diversity with the world. It is supremely fitting that two African nations should be the first to support the establishment of the Trust as an initiative to safeguard this diversity, for the benefit of African food security as well as food security in every country around the world."

Given the benefits the Fund may bring to genebanks in Latin America and the Caribbean, we hope that countries in this region also sign the Establishment Agreement. For further information visit page www.startwithaseed.org or www.globalcropdiversitytrust.org.

The GLOBAL CROP DIVERSITY TRUST
A FOUNDATION FOR FOOD SECURITY

Global Challenge Programme

Unlocking Crop Genetic Diversity

Rich genetic resources, whose diversity could benefit the global community, are kept in trust for humanity by *Future Harvest* Centres of the Consultative Group on International Agricultural Research (CGIAR). National genebanks, too, hold immense reserves of untapped riches.

Advances in molecular biology can put this diversity to work in powerful and exciting ways. But at present, the power of modern biology is rarely used to improve crops grown by poor people in the developing world. The Challenge Programme *Unlocking Crop Genetic Diversity*, one of the three Global Challenge Programmes recently launched by the CGIAR, aims to create a public platform that will use molecular methods to unlock genetic diversity and put it to use in better crops for the world's poorest farmers. IPGRI, together with the International Maize and Wheat Improvement of Center (CIMMYT) and the International Rice Research Institute (IRRI), is a founding partner of this Programme, geared to place more emphasis on international, multi-institute, cross-disciplinary collaboration.

The Programme will address the need for increased food security and improved livelihoods in developing countries by unlocking the genetic potential, and enhancing the use, of public genetic resources in plant breeding programmes. This will be accomplished through the concerted generation, management, dissemination and application of comparative biological knowledge. Drought tolerance has been chosen as the pilot characteristic for genomic analysis and crop improvement because it is a difficult trait to improve by traditional breeding and it is important for both virtually all developing countries and virtually all 22 crops under investigation by the Programme.

The major output will be a unique public platform for accessing and developing new genetic resources using both molecular technologies and more traditional means. New science-based enabling and intermediate technologies will be generated and made available and an unprecedented array of genomic and genetic resources, ready for direct use in plant improvement, will be made available as public goods. The result will be to contribute to the closing of the biotechnology divide between North and South.

A technology transfer plan will be designed to ensure that the products of research undertaken by the Challenge Programme be delivered to and used by plant breeders and farmers in developing countries. The plan will include consideration of joint venture agreements, license agreements with humanitarian clauses and market segmentation provisions, as well as material transfer agreements.

By virtue of its *modus operandi*, based on working with partners from developing as well as developed countries, IPGRI is well-placed to play a leadership role in the Challenge Programme. IPGRI also houses the coordination of the CGIAR's System-wide Genetic Resources Programme (SGRP), which enables it to play an influential role in determining how the wealth of diversity housed in the CGIAR germplasm collections can be unlocked to solve the problems being addressed by the Challenge Programme.

In addition to IPGRI, CIMMYT and IRRI, the Generation Challenge Programme consortium includes another five CGIAR Centres–the International Center for Tropical Agriculture (CIAT), the International Potato Center (CIP), the International Center for Agricultural Research in the Dry Areas (ICARDA), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the International Institute for Tropical Agriculture (IITA). Advanced research institutes participating include Wageningen University in the Netherlands, Cornell University in the United States, the Agropolis in France, the National Institute of Agrobiological Sciences (NIAS) in Japan and the John Innes Centre in the

United Kingdom. The national agricultural systems of China and Brazil are also participating. The Global Forum for Agricultural Research (GFAR) plays an important advisory role. The Challenge Programme is based at CIMMYT in Mexico and is led by Dr. Robert Zeigler.

To meet its objectives and carry out its plan of work, the Generation Challenge Programme is divided into five sub-programmes: Genetic Diversity of Global Genetic Resources, led by Agropolis; Comparative Genomics for Gene Discovery, led by IRRI; Gene Transfer and Crop Improvement, led by ICRISAT; Genetic Resources, Genomic, and Crop Information Systems, led by the University of Wageningen; and Capacity Building, led by IPGRI.

The Challenge Programme is expected to last between five and ten years. Its first year of operation began in October 2003 with a funding base of US$7,500,000. For more detailed information, visit page http://www.generationcp.org/.

From face-to-face to web-based training on PRG

Human learning occurs within the learners' minds regardless of the physical conditions in which it is provided. Traditional learning environments gather trainees at the same time and place to deliver instruction but, provided there are media to facilitate different learning conditions, learning can occur simultaneously for a group that is not receiving instruction at the same time or at the same place. Information and communication technologies allow the creation of virtual environments to learn at a distance.

E-learning, or learning in a virtual environment, is a form of distance education that uses web browsers to access content from remote locations on the Internet. Besides allowing a number of people in different places to gather virtually to learn, it fosters interaction between learners and content, between learners and instructors, and among learners themselves, making the learning experience more pleasant, relevant and applicable to reality. Compared to face-to-face learning, e-learning is more cost efficient because it allows to reach economies of scale. Though it requires an initial investment in the development of the courses, materials and making the delivery system operational, it does not have the highest costs associated with traditional face-to-face training in an international setting, such as transportation and lodging.

The need to disseminate research results to a variety of audiences at a lower cost motivated IPGRI, the International Center for Tropical Agriculture (CIAT) and Universidad Nacional de Colombia to explore ways to use information and communications technologies to deliver training. Starting in 2003, IPGRI and CIAT joined forces to look for alternatives to offer genebank staff in Latin America and the Caribbean distance training on *ex situ* conservation of plant genetic resources, taking advantage of IPGRI's experience in delivering face-to-face training in this area, sometimes done in collaboration with CIAT.

IPGRI and CIAT established an alliance with two key partners–REDCAPA and Universidad Nacional de Colombia (Palmira campus). REDCAPA is a network of organizations in Latin America and the Caribbean concerned with training in agricultural economics, policies and sustainable rural development. It has ample experience in distance education and a platform to deliver courses in a virtual environment. Universidad Nacional de Colombia is a highly reputed scientific and technological organization, which currently offers a M.Sc. programme in Plant Genetic Resources. The outcome of this alliance is the first e-course on *ex situ* conservation of plant genetic resources. The course will be offered from mid-August to mid-November 2004 at the virtual campus of REDCAPA (http:/ www.redcapa.org.br).

The course, on fundamentals of *ex situ* conservation, is aimed at professionals and technicians who work in genebanks, botanic gardens or arboreta. Curators and support staff and professionals working on projects or programmes on the conservation and use of plant genetic resources in Latin America and the Caribbean will also be able to participate. The geographic location of the target audience is Latin America and the Caribbean but participants from Spain, Portugal and the Lusophone countries of Africa will be able to participate, provided they can connect and follow instruction in Spanish.

The course will be run by a group of professionals from IPGRI, CIAT and Universidad Nacional. Professors Rigoberto Hidalgo, from Universidad Nacional, and Benjamín Pineda, from CIAT's Genetic Resources Unit, both specialists in genetic resources and genebank management, will be the permanent tutors. Advisors from partner organizations will lead discussions in the various modules and respond to students' queries.

By delivering this course, IPGRI and its partners in this initiative expect to enhance the genetic resources management capacity of staff in the 230 genebanks that exist in Latin America, that all together maintain over 200,000 samples of native and introduced materials. An interesting aspect of this experience has been the creation of a community of practice among professionals in the partner institutions, in which its members are sharing their knowledge and experience on plant genetic resources conservation, and developing a methodology for distance learning that can eventually be available to others.

For further information, contact Margarita Baena, Information and Training Specialist in the Americas Group <m.baena@cgiar.org>.

Revealing the poten

Highland or mountain papayas belong to the genus *Vasconcellea* (family Caricaceae), recently upgraded from a section of the genus *Carica*, that remained with only one species–*Carica papaya*. The 21 species in the genus *Vasconcellea* are native to the Americas and are found from Mexico to Chile, between 0 and 2500 masl.

Highland papayas are smaller and less succulent than the common papaya, but very tasty. The most important species are *Vasconcellea cundinamarcensis*, found at higher altitudes from Panama to Bolivia, the natural hybrid *V.* x *heilbornii*, highly appreciated in Ecuador, and *V. goudotiana*, locally marketed in Colombia.

Highland papayas have an unexploited potential for use. They grow in small Andean farms for home consumption of their aromatic fruits. However, they could increase the income and nutritional contents of the diet of farmers in developing world highlands. They are also considered a source of papain, a proteolytic enzyme used by the food and pharmaceutical industries, and a genetic resource to breed common papayas.

In Andean households, highland papayas are eaten fresh, roasted, in juice, marmalades, preserves and dairy products, or cooked in sauces, pie fillings and pickles. Most fruits and processed products are rarely marketed, except in the case of the hybrid *V.* x *heilbornii*, known as babaco, that is commercially important in Ecuador and has been introduced with limited success to New Zealand, Australia, Italy, Spain, France and South Africa. *V. cundinamarcensis* is marketed locally in Ecuador, Colombia and Peru, and has been successfully introduced to northern Chile, where it has gained local importance and from where it is exported to Europe and the United States.

Little research on the commercial potential of highland papaya latex has been conducted so far, despite the claim that they could be grown as a source of papain. The few studies done so far confirm that the latex extracted from green fruits of *V. stipulata*, *V. cundinamarcensis and V.* x *heilbornii* does indeed have a high proteolytic activity, superior to that of papaya latex, the main source of papain at present.

otential of **highland papayas**

Breeding efforts involving highland papayas are mainly targeted to improving the characteristics of common papayas. Highland papayas have desirable traits that can be introduced to papaya genotypes such as their organoleptic characteristics, their resistance to the papaya ring spot virus and their tolerance to cold weather.

Knowledge about the taxonomy, ecology, distribution and potential uses of highland papayas is currently limited. IPGRI started its activities on highland papayas in 1999, with a regional project funded by the Regional Fund for Agricultural Technology (FONTAGRO), in which partners from Colombia, Costa Rica, Ecuador and Venezuela participated. Diversity studies using morphological, biochemical, molecular, cytogenetic and palinologic characterization showed biochemical differences among *V. cundinamarcensis* accessions from Ecuador and Colombia. Natural hybrids also posed problems to identify many accessions at the species level.

Phytopathological research confirmed that several species of *Vasconcellea* are less susceptible, and even resistant, to nematodes, bacterial canker and the papaya ring spot virus, confirming their potential as a genetic resource to improve common papayas. Interspecific and intergeneric hybridization trials using *in vitro* culture of ovules or embryos have allowed the development of techniques to transfer resistance genes from *Vasconcellea* to *Carica*.

A project on *Vasconcellea*, funded by the Colombian Centro Nacional de Investigaciones del Café (CENICAFE) and coordinated by IPGRI, started in 2003, to enhance knowledge from previous studies and to analyze the potential of highland papayas in the coffee-growing area of Colombia. In collaboration with partners from Colombia, Ecuador, Venezuela, Belgium and France, georeferenced data from 1553 collecting sites of *Vasconcellea* were analyzed to obtain a detailed map of the distribution, diversity and ecology of these species in Latin America.

IPGRI expects that the results of this project increase the interest of the international scientific community in these underutilized fruits. Work on highland papayas will continue, focusing on cultivation and market potential.

For further information contact Xavier Scheldeman, Tropical Fruits Specialist in the Americas Group <x.scheldeman@cgiar.org>.

Woman selling fruits of *V. cundinamarcencis* in Pasto, Colombia

Jonh Albeiro Ocampo, IPGRI

Passion fruit and papaya diversity **in the coffee-growing area of Colombia**

Post-harvest processing of papaya J. Ocampo, IPGRI

The coffee-growing area of Colombia is located in the Andean region of the country, at between 800 and 1800 masl, and covers over fifteen departments. Besides coffee, this region is planted to maize, beans and tropical fruits, the last being the main option for crop diversification and generation of farmers' income. Because it is also the most disturbed area of the country, it has fragmented forests and reduced populations of wild plants and animals. As the area of distribution of some species in this region has decreased, their risk of extinction has increased.

The coffee-growing area of Colombia is rich in *Passiflora* and Caricaceae. *Passiflora* species are herbaceous or woody vines, rarely bushy or arborescent, supported by diverse ecological niches. Caricaceae are monoic or dioic trees, sometimes hermaphrodite, with succulent trunk and abundant latex, attractive for their bright colors.

Both *Passiflora* and Caricaceae are native to Colombia and highly diverse–Colombia is the first country in *Passiflora* diversity and the second in Caricaceae diversity. For this reason, they are considered promising fruit or medicinal species and potential bioindicators. Forty-five of the 140 species of *Passiflora* reported for Colombia are endemic; 28 Andean passifloras are threatened and five are considered extinct, even if they have not been properly studied.

Among the goals of the Colombian Ministry of Housing, Land Development and the Environment are enhancing knowledge of the wild and cultivated biodiversity of the country and looking for ways in which it can be maintained and monitored. In the context of these objectives, a project to study the diversity of *Passiflora* and Caricaceae in the coffee-growing area of Colombia started in 2003. The project is being conducted by IPGRI in collaboration with the Centro Nacional de Investigaciones del Café (CENICAFE), the Centre de Coopeération Internationale en Recherche Agronomique pour le Développement (CIRAD) and the International Center for Tropical Agriculture (CIAT).

The project also aims at using *Passiflora* and Caricaceae as indicators to assess genetic erosion in the area under study as well as their impact in the development of conservation strategies and environmental management. Bioindicator and promising species of *Passiflora* and Caricaceae, that can become alternatives to improve farmers' livelihoods and favor agrobiodiversity, will thus be identified. Considering that the wealth and stability of an ecosystem is reflected on its biodiversity, the project proposes to use some *Passiflora* species to monitor natural biodiversity and look for conservation alternatives.

The project started with an inventory of the target species in herbaria and on the field. By reviewing herbarium data and by doing field observations, the geographic origin of 2744 *Passiflora* and 416 Caricaceae samples was recorded to study their distribution in the coffee-growing area of Colombia. Within the 145 *Passiflora* and 15 Caricaceae species reported to be present in Colombia, 83 and 12, respectively, were found in the area under study, with a higher concentration of diversity in the central mountain range. Within the genus *Passiflora*, subgenera *Plectostemma* and *Passiflora* were better represented.

Two new Colombian species of *Vasconcellea* have been reported. New samples of the targeted species were collected using a distribution map done with geographic information systems; data were recorded in 69 locations in 12 departments, along with herbarium specimens for the reference herbarium of the project that now contains over 150 exciccata.

The over 150 newly collected samples of *Passiflora* and Caricaceae have been planted in two experimental substations of CENICAFE to evaluate them and identify promising species. These materials are being characterized through studies of their morphology, anatomy, pollen, number of chromosomes, meiotic behavior and DNA. These studies will allow a better understanding of how these species behave and the development of management and conservation strategies as well as breeding programmes.

After finalizing characterization work, partners in the project will confirm in the field if the species studied are still available in the places where they were reported in the past. Herbarium data from previous collecting trips will be compared with current observations to test the current ecological niche and geographic distribution of *Passiflora* and Caricaceae, and to infer their degree of genetic erosion and likely changes in geographic distribution. This knowledge, as well as the risk factors identified to have greater impact on biodiversity, will be used to develop a methodology to monitor the coffee-growing area of Colombia and to define efficient environmental policies.

For further information contact Creuci Maria Caetano, IPGRI consultant on *Passiflora* and Caricacae and expert in cytogenetics and plant genetic resources <cmcaetano@cgiarrog>.

Landscape of the coffee-growing area of Colombia J. Ocampo, IPGRI

Understanding community-based **seed supply systems**

On-farm conservation of local crop varieties rests, to a large extent, on seed supply and gene flow systems. These systems refer to the array of strategies small farmers use and the actions they perform to get planting material for the next cultivation cycle.

When looking for seed of a local or improved variety, with minimum quality and desirable characteristics, farmers either multiply and select their own seed, or get it from their neighbors or relatives, in local markets, in other communities and even from commercial or government suppliers. Seed multiplication, selection and storage as well as the means to obtain seed are key elements of seed supply systems.

Seed systems, combined with farmers' decisions to continue planting local varieties, have made possible to maintain a vast gene pool in farmers fields. Understanding how these systems work can help design actions to strength them, improve them and reduce genetic erosion risks. IPGRI acknowledges the importance of community-based seed supply systems for on-farm conservation of agrobiodiversity and has included this topic in its projects on *in situ* conservation conducted in the Americas.

In the central Amazon forest of Peru, for example, a project on *in situ* conservation is being conducted with mestizo and indigenous communities (Ashaninka, Shipibo-Conibo and Cashibo-Cacataibo) that grow cassava, peanuts, beans, maize, chili peppers and some cotton. Farmers in these communities obtain seed within their local systems and to a lesser extent from neighbor communities. The long distance between communities settled along the rivers in the Peruvian Amazon influences seed exchange and access to markets. Seed is given for free, exchanged (seed for seed or for another product), purchased and loaned. Farmers also multiply and select their seed of local varieties.

The seed supply flows through the social networks or links among members of the community, that is, among relatives, friends and neighbors and at the local markets. Some weaknesses found in the seed systems of the communities studied include size of the sample of planting material and storage conditions.

Ashaninka women select the cassava cuttings they will store to plant in the next season
Luis A. Collado

At the end of 2003, IPGRI convened a meeting in Pucallpa, Peru, where a group of professionals from the Americas, Africa, Europe, Asia and Australia met to discuss seed systems and exchange their experiences. Some of the topics discussed were the various strategies farmers use to multiply, select, storage and exchange seed, community-based seed multiplication and supply, and the impact of local seed systems in agrobiodiversity conservation.

For further information contact Jose Luis Chávez-Servia <j.l.chavez@cgiar.org> or Devra Jarvis <d.Jarvis@cgiar.org>, *in situ* conservation specialists in IPGRI.

Molecular tools help prove significance of **genetic diversity in home gardens**

Home gardens are known to play a significant role in supplying people in rural areas with food, home remedies and a variety of products. Awareness of the fact that the genetic diversity kept in home gardens is unique has motivated their study to better understand their role in the *in situ* conservation and management of diversity.

Home gardens are dynamic ecosystems that maintain a diversity of adapted species. Understanding what they contain, how they work and how they are managed by farmers offers possibilities to include them in conservation strategies. IPGRI and the Deutsche Gesellschaft fur Technis-che Zusammenarbeit (GTZ) conducted a study to assess the potential of home gardens as *in situ* conservation environments for agrobiodiversity in Cuba, Ghana, Guatemala, Nepal, Venezuela and Vietnam. A number of species typically grown in home gardens of these countries were chosen. Peppers (*Capsicum* spp.) and lima beans (*Phaseolus lunatus*) were among those selected for Cuba and Guatemala.

The genetic variation of home gardens in Cuba and Guatemala was evaluated with traditional me-thods and with a molecular marker technology known as AFLP (amplified fragment length polymorphism). Molecular markers allow diversity

analysis at the basic level, the ADN molecule, which carries and transfers heritable information from one generation to the next.

The analysis of Guatemalan peppers consisted in comparing the genetic diversity of 34 materials collected in home gardens in Alta Verapaz with a sample of 30 materials conserved *ex situ*, representing 13 departments throughout the country. The diversity of peppers found in the home gardens of Alta Verapaz was found equivalent to that of the national collection, suggesting that this site could be regarded as a priority to maintain *in situ* the pepper diversity of Guatemala. Similar results were obtained when assessing pepper diversity maintained in the home gardens of Cuba. Fifty-two materials collected in the three main regions of the island (West, East and Central) were compared with 11 materials from the national *ex situ* collection, selected at random. Home garden peppers proved to represent the diversity of the country, the Central region being identified as the minimum unit of conservation.

Lima beans are a very important legume in the Cuban diet, although the national collection of this crop virtually vanished in the last decade. The prospect of recovering the genetic resources of *P. lunatus* was the driving force to assess the diversity still present in home gardens. Sixty lima bean materials were collected in 25 home gardens spread in the three main regions of Cuba, which represented three of the four morphological types available in the island–Sieva, Sieva-Potato, Potato and Big Lima, which was not included. The study showed that the three morphological types analyzed are comparable in terms of genetic diversity; no variation pattern was found to differentiate among geographical regions. Molecular markers were able to separate three groups of lima beans with different genetic composition, indicating that this aspect should be taken into account when planning future collecting trips to re-establish the *P. lunatus* collection of the country.

These examples of research involving the use of molecular technologies to assess genetic diversity of crops in home gardens show that they are environments that deserve being taken into account when designing plant genetic resources complementary conservation strategies.

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Adding value to **Andean grains**

Quinoa (*Chenopodium quinoa*) and cañahua (*Chenopodioum pallidicaule*) are Andean crops whose main center of diversity is located in Bolivia and Peru, around Lake Titicaca, shared by both countries. They were widely cultivated in pre-Hispanic times but are currently under extinction.

In a survey to study the genetic variability of quinoa and cañahua, conducted by the Fundación para la Promoción e Investigación de Productos Andinos (PROINPA) among 467 households in the area surrounding Lake Titicaca in Bolivia, these crops ranked third in farmers preference after lima beans and oca (*Oxalis tuberosa*). The families surveyed reported to grow only 40 local varieties of quinoa and 20 of cañahua, the number of varieties grown per family ranging from one to four.

The survey also revealed that 85% of the farmers only plant one variety, which gives an idea of the extent to which genetic diversity of quinoa and cañahua is decreasing in the region studied. The most preferred quinoa and cañahua varieties are grown in 32% and 22% of the households, respectively. Measures to prevent their disappearance have been taken as a follow-up to the survey.

Peasant family exhibits quinoa and cañahua grains at the Tiwanaku diversity fair in Bolivia Fundación PROINPA

With support from a project to enhance the contribution of neglected and underutilized species to food security and increase the income of poor farmers, conducted by IPGRI and funded by the International Fund for Agricultural Development (IFAD), an annual biodiversity fair is being held in Tiwanaku, Bolivia, to recover quinoa and cañahua diversity as well as the traditional knowledge that farmers still have on these invaluable genetic resources.

The fair convenes farmers from the country highlands, where they show and exchange their diversity of quinoa and cañahua, as well as their traditional recipes. The fair also helps improve the image of these crops among urban consumers and is a way to find out why they accept or reject the products exhibited.

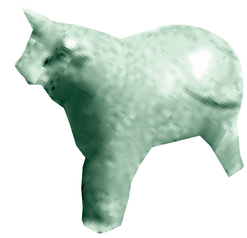
The fair is also used to show and disseminate technological advances in the production and utilization of these crops, and strengthens links between production, processing and commercialization. Exhibiting processed products in the fair is increasing the value of Andean grains and promoting their consumption.

Maintaining and using quinoa and cañahua diversity in farmers fields is the responsibility of women. They plant them, store the grain separating the one devoted to seed from the one for consumption or sell, and process the grains to prepare food. Women also decide which varieties to plant in the following cycle, taking into account taste and cooking characteristics.

Women participation in the fairs also contributes to recover knowledge on traditional uses. Older women, for example, share a great deal of knowledge they have on how to use quinoa and cañahua for medicinal and ritual purposes.

Making the fair a yearly event has been a goal for farmers, agribusiness and organizations working with quinoa and cañahua. With support from the local authorities of Tiwanaku as well as the Council of Ayllus and Communities of the region, a decree to make the fair official was recently issued, on occasion of the Aymara New Year. This will allow the continuous promotion of consumption and use of Andean grains among rural and urban families.

For further information contact Wilfredo Rojas, Focal Point for Genetic Resources at PROINPA, Regional Altiplano <w.rojas@proinpals.org>, José Luis Soto, Focal Point for Gender and Socioeconomic Issues in PROINPA, Regional Altiplano <jl.soto@proinpalp.org> or Wilfredo Marín, Director of Agronomy at the Tihuanaku Farmer Academic Unit of Universidad Católica Boliviana <wpmp74@hotmail.com>.



Useful tools to collect germplasm

When collecting germplasm, defining the geographic coordinates of the site as well as its altitude above the sea level are fundamental to complete the passport of an accession, to analyze the outcome of a collecting trip, to assess the diversity of a collection or to identify spots where specific genetic traits prevail.

Germplasm collectors have traditionally used maps and compasses to determine the geographic coordinates of a collecting site. Technology currently available in the market, such as the global positioning system (GPS), records these data quickly, accurately and easily. The GPS, a device as small as a cell phone, gives the exact location of a place or object based on signals it receives from a network of at least 24 satellites located 20,000 km away from the Earth. In its early days, the GPS was used for military purposes but it has been available to the civil society since the 80's. Today, it is widely used in aerial and maritime navigation, in cartography and even in recreational activities such as hiking and biking.

Defining the geographic coordinates and altitude above the sea level of a collecting site is the most common function of a GPS that germplasm collectors know. This tool, however, has other useful functions such as showing on a mini-screen how the collector has moved during a trip, at what speed and the distance covered.

Another useful characteristic is its ability to define and record routes towards a collecting site. As a collector moves to a place of interest, the GPS can record the most relevant reference points in a route, even if these do not follow a straight line and regardless of the distance covered. To go back to the point of departure, the germplasm collector only has to select the track back function. This function will activate a navigation system that will visually and accurately guide the collector to the beginning, the same way a navigation system would guide an airplane or a ship pilot to their destination.

Users of a GPS may define routes according to their needs and use them in future collecting trips. Alternatively, they can record reference points manually, as long as they move from one place to another, and then create routes suited to their needs using the information recorded.

GPS tools come in simple and sophisticated models that range between US$ 100 and 350 dollars. Simple models contain the basic functions described above while more sophisticated ones have color screens, built-in digital maps, greater memory to store reference points and maps downloaded from external sources. Regardless of their price, most recent GPS models come with a device to plug them in to a computer to allow transferring data or maps between the computer and the GPS.

When collecting in dense forests or in places surrounded by high mountains, GPS devices may experience difficulty in receiving satellite signals. Some will perform better than others under difficult topographical and climatic conditions. Considering that collecting trips are not usually done under ideal geographic and topographic conditions, it is important to know your GPS well and to search the market for alternatives before purchasing one. GPS manufacturers have web sites where potential users can find information on models, specifications and prices. There are also sites where you can find evaluations conducted by independent users that comment on the advantages and disadvantages of the various brands and models available in the market.

The GPS has certainly become an indispensable tool for a germplasm collector because of its accuracy, relatively low cost and easy data management functions. Using it skillfully requires a few hours of training and practice that should be complemented with reading about the basic concepts of terrestrial navigation.

For further information contact Tito Franco, Plant Genetic Resources Documentation Specialist at the Americas Group <t.franco@cgiar.org>.

New germplasm information systems

Finding information systems that link independent germplasm databases in a network environment is getting more and more common. In this issue we would like to introduce two examples of germplasm information systems, developed in a collaborative way, each with a single entry point that allows users to browse groups of germplasm databases maintained by organizations in various countries.

The *Musa* Germplasm Information System

The International Network for the Improvement of Banana and Plantain (INIBAP), one of the three IPGRI programmes, has established the *Musa* Germplasm Information System (MGIS) to allow exchange of germplasm data. MGIS is a database containing detailed and standardized information on the accessions stored in different *Musa* genebanks around the world.

MGIS is based on a network of genebanks whose curators are responsible for entering data into the system. All data in MGIS remains the property of the genebanks. INIBAP compiles, verifies the information provided by curators and disseminates it on CD-Rom and through the MGIS website. MGIS contains data from 16 organizations in 14 countries.

MGIS is a valuable resource for researchers. It provides an inventory of *ex situ* collections of *Musa* and related research results, such as taxonomic descriptions, agronomic performance of varieties in various environments, molecular characterization, disease resistance, health status, origin and environment in collecting sites. MGIS can be used in association with geographic information systems to generate maps illustrating the distribution of *Musa* diversity. It allows identification of duplicates or unique materials in conservation and helps identify data gaps and problems in classification.

For further information, visit page http:// mgis.grinfo.net/.

Eurisco: A window on Europe's PGR

http://eurisco.ecpgr.org

Europe, a continent with a large diversity of cultures, languages and infrastructure, has managed to create one common window on its plant genetic resources as part of a project funded by the European Commission. EPGRIS, the European Plant Genetic Resources Information Infra-Structure, coordinated by the Center for Genetic Resources in the Netherlands (CGN), links with the national inventories of plant genetic resources of member countries of the project and with a searchable catalogue of *ex situ* collections maintained by genebanks in Europe. The search engine is called EURISCO and stands for European Internet Search Catalogue.

EURISCO, which in ancient Greek also means 'I find', is the first regional catalogue of plant genetic resources. It offers a single entry point for researchers worldwide to access the plant diversity maintained by the 41 countries. Many of these countries are from Eastern Europe and the new independent states of the former Soviet Union. EURISCO allows users to reach more than one million accessions maintained in over 590 European organizations, that is, 15% of the total germplasm holdings conserved worldwide.

IPGRI coordinated the development of EURISCO through its Regional Office for Europe. The System-wide Information Network for Genetic Resources team of the CGIAR (SINGER) developed the technical infrastructure. EURISCO is hosted at and maintained by IPGRI on behalf of the European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR). It is in use since 2003 and may serve as a model for the development of similar projects outside Europe.

Vavilov-Frankel Fellowships for 2004 and 2005

IPGRI

Tamar Jinjikhadze from Georgia (left) and Ourou Gaoué from Benin (right), winners of the Vavilov-Frankel Fellowships in 2004.

The winners of the IPGRI annual awards for young scientists, the Vavilov-Frankel Fellowships for 2004 were Ms. Tamar Jinjikhadze from Georgia and Mr. Orou Gaoué from Benin. She will study the molecular basis of resistance to rust diseases in *Triticum timopheevii*, a species of wheat endemic to Georgia, and he will map the distribution of diversity and responses to exploitation in two species of African mahogany in his home country.

IPGRI established the fellowships to commemorate the contributions made to plant science by Nikolai Ivanovich Vavilov of Russia and Sir Otto Frankel of Australia. The fellowships are intended to enable young scientists to carry out relevant and innovative research outside their countries, thus contributing to their own professional development and to the ability of their countries to manage and conserve their crop diversity.

In 2004, for the first time, the Grains Research and Development Corporation (GRDC) of Australia and Pioneer Hi-Bred International Inc., a DuPont company, are supporting the fellowships.

GRDC is supporting Jinjikhadze's study of the little-known wheat *T. timopheevii*, which holds the promise of improving the performance of modern bread wheats grown by farmers around the world, including in Australia. It could be extremely important in Georgia, where wheat yields are low partly because of losses inflicted by rust fungi. *T. timopheevii* has already contributed to some widely used modern wheat varieties, but breeding is difficult because the genetic structures of the two species differ considerably. Jinjikhadze hopes to gather a collection of about 150 samples from her native Georgia and take them to Sydney University to assess their resistance against a panel of known races of rust.

She will also be trained to see how differences in resistance translate into molecular differences among the various samples. Capacity building is a crucial component of the Vavilov-Frankel Fellowships, which will give the Georgian Institute of Farming Plant Genetic Resources Centre, Jinjikhadze's home institute, the ability to use modern techniques in its efforts to make use of crop diversity. Jinjikhadze also hopes to start a breeding programme that will transfer new sources of rust resistance into favored Georgian cultivars.

Orou Gaoué is currently pursuing a PhD at the University of Hawaii. His fellowship, which is supported by Pioneer Hi-Bred, will look in detail at the status of *Khaya senegalensis* and *K. grandiflora*, two African mahoganies exploited extensively by people in Benin. The Red Data Book lists both species as vulnerable and some stands have been heavily exploited for generations. Heavy harvesting can affect the reproduction of tree species. Gaoué plans to use molecular techniques to map the genetic diversity of the trees in areas that have experienced different levels of use, thus discovering whether there is in fact a link between the harvesting pressure on a population and its genetic diversity. In addition he will be asking to what extent the trees in protected areas represent a richer sample of diversity than trees elsewhere, and whether plantations of *Khaya* contribute to the conservation of genetic diversity.

The project will give Benin its first detailed analysis of the diversity of forest tree species, an outcome that Gaoué believes will be important throughout West Africa. The map of genetic diversity will be a vital input into discussions between the Sub-Saharan Forest Genetic Resources Network SAFORGEN and local authorities to plan effective conservation.

The 2005 round of fellowships will be announced in July with a closing date of 1 November 2004. For further details on the Vavilov-Frankel Fellowship scheme, including application forms, contact Dimary Libreros <d.libreros@cgiar.org> at the IPGRI Americas Group or visit web page www.ipgri.cgiar.org/training/vavilov.htm.

Supporting great ideas

IPGRI-sponsored scientists have won four of the 10 awards recently announced by IFAR, a foundation that seeks to foster scientific excellence in the 15 *Future Harvest* Centres of the Consultative Group on International Agricultural Research (CGIAR) and their partners. The awards are intended to support the professional development of scientists from developing countries.

“The applications we received this year were outstanding,” said Professor Ruth Haug, Chair of the IFAR Evaluation Committee and Director of NORAGRIC, the Agricultural University of Norway. “The grantees are exceptional professionals and their work is focused on delivering global public goods.”

Dr Emile Frison, Director General of IPGRI, said, “these scientists will make a real contribution to the use of diversity to improve the livelihoods of poor people throughout the developing world. I am delighted that IFAR has recognized the importance and quality of the work of IPGRI and its partners.”

One of the four winners is Ms. Helga Rodriguez von Platen from Costa Rica, who is currently working for the Centro Agronómico Tropical de Investigación y Enseñaza (CATIE). She will develop molecular fingerprints to identify hybrid bananas made by the Fundación Hondureña de Investigación Agrícola (FHIA) in Honduras. Although the FHIA banana hybrids have been widely distributed, with great impact, their identity can sometimes be in doubt. Rodriguez says the award will benefit the entire banana research community worldwide, and thus the millions of smallholder farmers who depend on bananas.

The other three winners are Dr. Xue-Jun Ge, from the South China Botanical Garden and the Chinese Academy of Sciences, Reuben Muasya, Dean of the Faculty of Agriculture at Moi University in Kenya, and Geetha Rani, genebank manager at the M.S. Swaminathan Foundation in India. They will do research on banana, maize and millet, respectively.

These four awards to IPGRI-sponsored scientists embody the goals of the IFAR agenda. “We are confident that one of the best ways we can foster effective partnerships is through awarding fellowships which benefit both the individual and the CGIAR Centres where the fellows will work, and which produce knowledge and expertise for the public good, focusing on the needs of developing countries,” said Francisco Reifschneider, President of IFAR.

For more information, visit the IFAR web site (http://www.ifar4dev.org/index.htm) or page http://ipgri-pa.grinfo.net/.

Plant genetic resources
in the Internet

Funding and training opportunities

http://www.idrc.ca/awards
This site connects to the various training and awards programs of the International Development Research Centre (IDRC). Some grants in agronomy, forestry or biology are interesting for students or researchers in developing countries working with farmer communities.

http://www.cies.org/about_fulb.htm
This is the site of the Fulbright Program, the United States government's flagship program in international educational exchange. It grants scholarships on various disciplines including biology, agriculture, ecology and rural development, and in topics of interest for those working on plant physiology, molecular biology and plant pathology.

http://www.fas.usda.gov/info/borlaug/borlaugfellow.htm
This link connects to the site of the Borlaug program for scientific exchange with developing countries. Fellowships are granted for a short term to agronomists or biologists interested in strengthening agricultural practices through the transfer of science and technology.

http://www.foreignaid.com/foundations_db/
This is an on-line directory of more than 700 donors in the United States and Europe that fund research in various disciplines including environmental sciences, biodiversity and community work. For those interested in subscribing to it, the site contains examples of how to search in the directory and shows a donor profile.

Plant genetic resources databases

http://www.salvias.net/
SALVIAS is a database with geographic information for plants of the world, developed by a network of ecologists, conservation biologists, biogeographers and botanists interested in understanding plant diversity patterns. It contains data such as geographic coordinates, taxonomy, phenology and biogeography of plant species. It is useful for researchers on plant diversity.

http://www.diva-gis.org/
DIVA-GIS is a software to design maps of the distribution of species. It allows users to analyze plant diversity, calculate diversity indexes and predict the presence of species in specific places. It is free of charge and comes with a tutorial and a user manual in English and Spanish.

http://pgrdoc.ipgri.cgiar.org/taxcheck/grin/index.html
The Taxonomic Nomenclature Checker is a program that contains more than 65,000 records of vascular plant names from all over the world. It is mainly focused on plants of commercial interest or agricultural importance and allows users to standardize data when developing botanic databases.

http://www.isb.vt.edu/
The Information Systems for Biotechnology focuses on responsible use of biotechnology in agriculture. It contains links to over 80 web sites related to plant biotechnology and to databases with information on genetically modified organisms, including plants.

http://www.gbif.org

The Global Biodiversity Information Facility contains links to organizations and websites on biodiversity and to a database with taxonomic information that allows searching by scientific and common names of the various organisms, by country and by group of interest within a country, or by animal, fungus, plant, bacteria or virus. It provides full species taxonomic information.

http://www.conabio.gob.mx/remib/doctos/remib_esp.html

REMIB, the international network for information on biodiversity, is managed by a network of academic organizations holding biological collections and data banks. It links to taxonomic, ecologic, cartographic, bibliographic and ethnobiologic databases and to catalogues on natural resources and other topics. It is useful for those interested in knowing about global biodiversity.

Readings on plant genetic resources

Books

Baena, M., S. Jaramillo and J.E. Montoya. 2003. Material de apoyo a la capacitación en conservación *in situ* de la diversidad vegetal en áreas protegidas y en fincas. International Plant Genetic Resources Institute, Cali, Colombia.http:/www.ipgri.cgiar.org/publications/pubfile.asp?ID_PUB=905.

This is a training module that introduces the theoretical foundations of plant diversity conservation in protected areas and on-farm. It is divided in four chapters. Chapter one explains the general concepts on *in situ* conservation. Chapter two describes the steps to design and manage a protected area. Chapter three explains how conservation of agrobiodiversity occurs in traditional cropping systems and chapter four gives some conclusions on conservation in general and *in situ* conservation in particular.

De Vicente, C., T. Metz and A. Alercia. 2004. Descriptors for genetic markers technologies. International Plant Genetic Resources Institute, Rome, Italy. http:/ www.ipgri.cgiar.org/publications/pubfile.asp?ID_PUB=913.

In an effort to define standards to document information on genetic markers, IPGRI has recently published a descriptors list for molecular characterization. Targeted to researchers that use molecular techniques, this list intends to provide standards to generate and exchange molecular data. The list defines a minimum set of initial information required to describe a genetic marker technology, and provides content and coding schemes that allow exchange of computerized and replicable data. The list can be modified to adjust it to specific needs.

IPGRI. 2003. Descriptores del ulluco (*Ullucus tuberosus*). International Plant Genetic Resources Institute, Rome, Italy. http://www.ipgri.cgiar.org/publications/pubfile.asp?ID_PUB=904.

This publication starts with definitions of descriptors and their use followed by three sections in which specific descriptors for *Ullucus tuberosus* are introduced. The first section deals with passport data, descriptors for crop management, and descriptors for the place and environment in which accessions are characterized and evaluated. The second section contains morphological descriptors and the third contains biochemical and molecular markers. A bibliography and a list of contributors to the descriptors list are included at the end.

Grau, A., R.O Dueñas, C. Nieto Cabrera and M. Hermann. 2003. Mashua (*Tropaeolum tuberosum* Ruíz & Pav.). Promoting the conservation and use of underutilized and neglected crops. 25. International Potato Center, Lima, Peru/International Plant Genetic Resources Institute, Rome, Italy. http://www.ipgri.cgiar.org/publications/pubfile.asp?ID_PUB=880.

This monograph highlights the importance of mashua (*Tropaeolum tuberosum*) within the underutilized Andean species. It is divided into eleven chapters that provide information on mashua's history, dispersal, taxonomic classification and biosystematics. Agronomic aspects of the crop are highlighted as well as its limitations. The publication contains information on the chemical composition and uses of mashua as well as on the genetic resources available for breeding. Trends for future research on the species are included as well as an extensive list of references and of researchers on mashua in various countries.

Engels, J.M.M. and L. Visser (eds). 2003. A guide to effective management of germplasm collections. IPGRI Handbooks for Genebanks No. 6. International Plant Genetic Resources Institute, Rome. Italy. http://www.ipgri.cgiar.org/publications/pubfile.asp?ID_PUB=899.

This handbook deals with the strategic management of a genebank. It is divided into nine chapters that explain the foundations of genebank management, the goals of a genebank in the context of the international treaties involving plant genetic resources, routine procedures to manage germplasm (including collecting strategies, conservation methods, characterization and viability monitoring, and distribution to users) and the costs of running a genebank. At the end, it includes six appendices with case studies, a model for a germplasm transfer agreement and a synthesis of conservation standards.

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Biodiversity and conservation

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Rogez, H., R. Buxant, E. Mignolet, J.N.S. Souza, E.M. Silva and Y. Larondelle. 2004. Chemical composition of the pulp of three typical Amazonian fruits: araça-boi (*Eugenia stipitata*), bacuri (*Platonia insignis*) and cupuaçu (*Theobroma grandiflorum*). European Food Research and Technology Vol. 218(4):380-384.

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