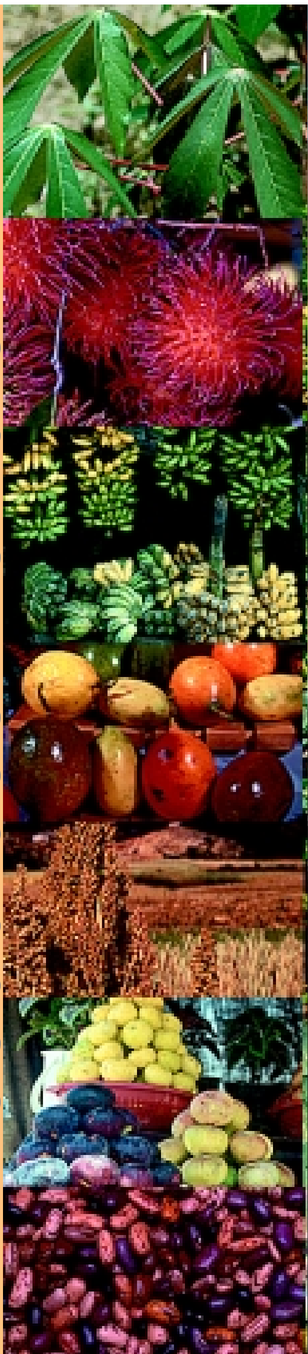
IPGRI

Annual Report 1998

International Plant Genetic Resources Institute



Strategic choices

Improving conservation strategies and technologies
Understanding the extent and distribution of diversity; supporting collecting of genetic resources; improving *ex situ* and *in situ* conservation and developing integrated approaches

Increasing the use of plant genetic resources
Improving methods of using *ex situ* conserved germplasm; supporting conservation through use; supporting increased use of diversity in production

Managing and communicating information
Improving germplasm documentation; supporting SINGER and the *Musa* germplasm information system; providing technical information; increasing public awareness

Addressing socioeconomic and policy issues
Determining links between diversity and socioeconomic factors; meeting gender concerns and increasing participation; valuing genetic resources; supporting improved policy-making

Conserving and using specific crops
Supporting work on *Musa* (through the INIBAP programme), coconut and cocoa; improving conservation of neglected and underused species; conserving wild relatives of crops

Conserving and using forest genetic resources
Conserving intraspecific diversity through sustainable use; supporting network development; improving *ex situ* conservation techniques

Working with networks
Supporting established regional, crop and thematic networks and helping to develop new ones to strengthen international collaboration

Strengthening national systems
Supporting improved germplasm management strategies and technologies; providing training and assistance in capacity-building; giving advice and information on policy

Acronyms

ADB	Asian Development Bank
APO	Asia, the Pacific and Oceania
BMZ	Bundesministerium für Wirtschaftliche Zusammenarbeit, Germany
CAPGERNet	Caribbean Plant Genetic Resources Network
CFC	Common Fund for Commodities, EU
CGIAR	Consultative Group on International Agricultural Research
CIAT	Centro Internacional de Agricultura Tropical, Colombia - CGIAR
CIP	Centro Internacional de la Papa, Peru - CGIAR
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement
COGENT	International Coconut Genetic Resources Network
CTA	Technical Centre for Agricultural and Rural Cooperation, the Netherlands
CWANA	Central and West Asia and North Africa
DFID	Department for International Development
DIT	Documentation, Information and Training
ECP/GR	European Cooperative Programme for Crop Genetic Resources Networks
EUFORGEN	European Forest Genetic Resources Programme
FAO	Food and Agricultural Organization of the United Nations
GIS	Geographic Information Systems
GPA	Global Plan of Action
GRST	Genetic Resources Science and Technology
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit, Germany
IAEG	Impact Assessment and Evaluation Group
IDB	Inter-American Development Bank
IDRC	International Development Research Centre, Canada
IFAD	International Fund for Agricultural Development
IICA	Instituto Interamericano de Cooperación para la Agricultura, Costa Rica
IITA	International Institute of Tropical Agriculture, Nigeria - CGIAR
IMTP	International *Musa* Testing Programme
INIBAP	International Network for the Improvement of Banana and Plantain, Montpellier - IPGRI/CGIAR
IPGRI	International Plant Genetic Resources Institute, Italy - CGIAR
IRRI	International Rice Research Institute, the Philippines - CGIAR
KUL	Katholieke Universiteit Leuven, Belgium
LACNET	INIBAP Regional Network for Latin America and the Caribbean, Costa Rica
NRI	National Resources International, UK
PARC	CGIAR Public Awareness and Resources Committee
PROCISUR	Programa Cooperativo para el Desarrollo Tecnológico Agropecuario del Cono Sur, Argentina
RAPD	Random amplified polymorphic DNA
REDARFIT	Andean Network on Plant Genetic Resources
REMERFI	Mesoamerican Network on Plant Genetic Resources
RISBAP	Regional Information System for Banana and Plantain - Asia and the Pacific, INIBAP
SSA	Sub-Saharan Africa
SGRP	System-wide Genetic Resources Programme - CGIAR
SINGER	System-wide Information Network for Genetic Resources - CGIAR
TBRI	Taiwan Banana Research Institute
TROPIGEN	Amazonian Plant Genetic Resources Network
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development, USA
USDA	United States Department of Agriculture, USA
VIR	N.I. Vavilov Institute of Plant Industry, Russia
WANANET	West Asia and North Africa Network for Genetic Resources

Foreword to IPGRI's 1998 Annual Report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Girls in a Zambian wheatfield

In the four years since the publication of its first strategic plan, *Diversity for Development*, IPGRI has worked hard to keep pace with the rapid evolution of global genetic resources efforts. The growth in the institute's programmes, its increased emphasis on policy and on promoting the use of genetic resources led IPGRI to commence a process of internal stocktaking in 1998. The process, which drew on the wisdom and experience of IPGRI's staff and partners, will result in the production of a new strategy, to coincide with the institute's 25th anniversary next year.

IPGRI's strategy for the coming years is based on the knowledge that the use of plant genetic resources makes a vital contribution to the development of human society. Plant genetic resources are the key to food security, providing a vast array of cereals, pulses, vegetables, fruits and other foods for human consumption in addition to feeding the animals that supply us with meat, milk and eggs. They contribute to the eradication of poverty, both by providing cheaper food and raw materials for poor consumers and by raising and diversifying the incomes of rural producers and processors. And they protect and enhance the environment, through enriching the soil, preventing erosion by wind and rain, sustaining birds, insects and animals and absorbing atmospheric carbon.

IPGRI has chosen to concentrate its efforts on eight strategic areas of work. All are essential to fulfilling IPGRI's mission and reflect a strong demand from its partners: national and international institutions, non-governmental organizations, universities, advanced research institutes, farmers and community groups.

This Annual Report provides a glimpse of IPGRI's work in each of these strategic areas. We are confident that, given the sustained support of the CGIAR and our donors, we can continue to make a strong and focused contribution to global efforts to conserve and use genetic diversity for the benefit of the poor and disadvantaged throughout the developing world.

Geoffrey Hawtin
Director General

Marcio de Miranda Santos
Board Chair

Contents

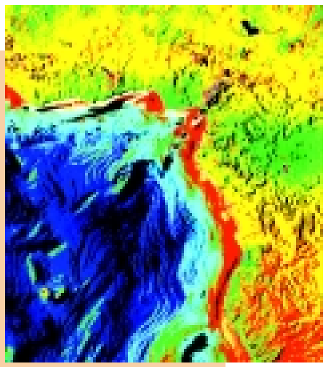
Conservation strategies

Knowing how genetic diversity is distributed within a genepool and how it changes in time is the first step in planning a strategy for how to conserve it. IPGRI and its partners are measuring and monitoring genetic diversity with ethnobotanical, molecular and more conventional morphological approaches. For example, a study in southern China compared how local people's knowledge of genetic diversity in taro (*Colocasia esculenta*), an important root crop cultivated in the region for thousands of years, compares with the results obtained from DNA markers. The local people had a deep understanding of variation within the crop, particularly the morphological characteristics of the material that were most important to the users. The results of the study were a significant input into the national conservation strategy developed for the crop by the Chinese national programme.

Analyzing diversity using geographic information systems

Once the genetic diversity occurring in different places within a country or region has been measured, national programmes need tools and methodologies to manage and analyze the information to reveal patterns, associations and anomalies. Geographic information systems (GIS) are becoming valuable tools for managing information on plant diversity. IPGRI is carrying out case studies applying GIS methodologies to the distribution of diversity of different crops and wild species in Latin America and Africa. One study is looking at cultivated peanuts in a number of Latin American countries. The distribution of genetic diversity in crops depends not just on environmental factors such as climate and soil, but also to a great extent on the preferences and practices of farmers. Associations between socioeconomic

What is a geographical information system?



A geographical information system assembles, stores, manipulates and displays different types of data identified by their location on the Earth's surface. It makes it possible to integrate complex spatial information from many different sources, and then analyze and model the data in different ways to reveal patterns, relationships and alternative scenarios. GIS technology has enhanced the efficiency and analytic power of traditional mapping. Now, as the scientific community recognizes the environmental consequences of human activity, GIS technology is becoming an essential tool in the effort to understand the process of global change. Data from different map and remote sensing sources can be combined in models that simulate and predict the interactions of complex natural systems. The outputs of these models - not just maps, but drawings, graphs, animations - allow researchers to view the condition of the Earth's surface, atmosphere and subsurface in novel ways. GIS technology gives researchers the ability to examine the variations in Earth processes over days, months, and years. As an example, the changes in vegetation cover in a semi-arid region through the year or at a given point in the growing season in a number of successive years can be compared to determine when the rains began and when a drought was at its most severe. These techniques can be applied to many aspects of plant genetic resources work, including tracking deforestation and desertification, locating sites of potential occurrence of a particular species and determining the most appropriate time to collect germplasm.

Thanks to the U.S. Geological Survey (http://www.usgs.gov/research/gis/title.html) for this description.

Improving conservation strategies and technologies

IPGRI is supporting the development of new knowledge on the strategies and technologies of conserving genetic resources. It is also looking for the best way to apply this knowledge, particularly in resource-poor environments. Understanding the extent, structure and distribution of genetic diversity is vital to effective conservation. Effective ways to measure, describe, classify and monitor genetic diversity are essential. An IPGRI project is identifying key problems in measuring genetic diversity. Case studies with collaborating national programmes have made locating, monitoring and collecting genetic diversity much more efficient. *Ex situ* conservation remains a fundamental element in genetic resources work. IPGRI is making important advances in the technology of *ex situ* storage, in particular in developing ways to store seed effectively without expensive and energy-dependent refrigeration facilities.

and cultural factors and genetic diversity might therefore be expected.

The national programme of Ecuador, the United States Department of Agriculture (USDA) and IPGRI collected peanuts throughout Ecuador (Fig. 1). Characterization data are being analyzed in conjunction with digital information on climate, elevation, communications, land use and a variety of socio-economic variables. The resulting maps (Fig. 2) pinpoint hotspots of peanut genetic diversity. Americas Group staff, working closely with scientists from the Centro Internacional de Agricultura Tropical (CIAT) GIS Laboratory, the USDA National Germplasm Resources Laboratory and national programmes are looking for correlations between different environmental and socioeconomic variables and the level of peanut diversity in different regions within Ecuador. Two scientists, both GIS users, one from Ecuador and one from Guatemala, contributed invaluable environmental and census data from their countries in digitized form and learned new techniques of applying this information to specific conservation problems.

The predictive model developed with the Ecuadorian data will be tested in Guatemala, where the extent and distribution of native peanut diversity is largely unknown. Maps similar to those developed for the Ecuador model will be assembled using the same environmental and socioeconomic variables. To test the model, peanut diversity is being collected throughout Guatemala. Field observations and subsequent characterization will determine the efficiency of the model in predicting areas of highest diversity of peanut landraces.

Significance

The model and methodology are an exciting combination of well-established and innovative methods. They will be a valuable tool for planning both collecting missions and *in situ* conservation efforts in areas where there is little prior information on the distribution and structure of genetic diversity. IPGRI is also collaborating with CIAT and CIP in developing specialized, easy-to-use software to analyze and display genetic resources information on maps. Such maps, with their immediacy and clarity, will be useful to genetic resources scientists in planning their work and making it more effective and also have great potential as decision-support tools for communities and policy-makers.

Peanut genetic diversity in Ecuador

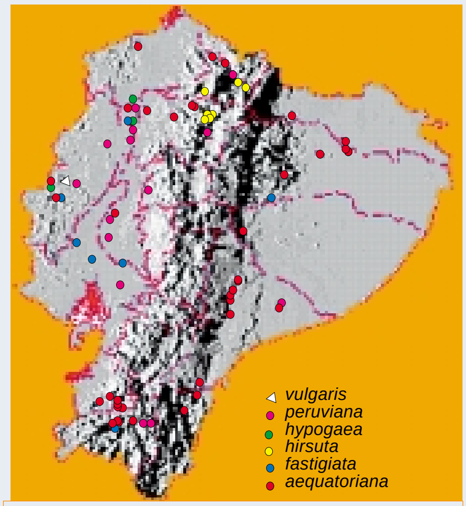


Fig. 1. Botanical varieties of peanut (*Arachis* spp.) accessions collected in Ecuador

Luigi Guarino *et al.*

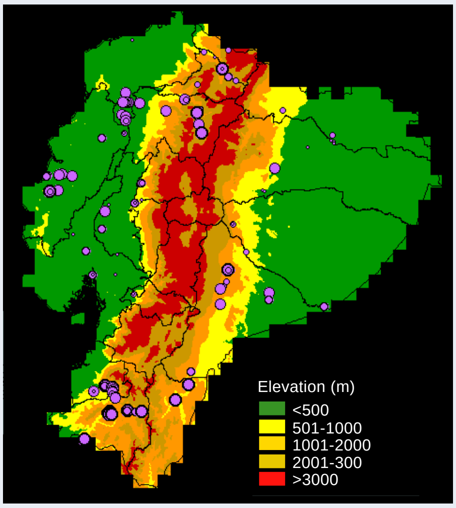


Fig. 2. Combining different forms of data reveals the concentrations of peanut genetic diversity. (The larger the spot the greater the diversity)

Luigi Guarino *et al.*

Sorting the peanuts that were collected in Ecuador

David Williams

Conservation technologies

Many species produce 'orthodox' seeds that can be dried and stored for up to 50 years at low temperatures (-18ºC). These low-temperature genebanks hold a great deal of valuable material. It is fairly simple to hold and monitor the seeds of species that will tolerate such conditions. However, the genebanks themselves are expensive to construct and maintain and a reliable source of electricity is fundamental to running the refrigeration systems. The power supply in resource-poor countries is often unstable and genebanks often find the cost of the electricity, and back-up systems, too high. In addition, many seed genebanks do not have the facilities or resources to conserve seeds under the very best conditions, i.e. low temperatures and low water contents. IPGRI is working on a global experiment with the Chinese Academy of Agricultural Sciences, the International Crops Research Institute for the Semi-arid Tropics in India and the National Seed Storage Laboratory in the US to develop alternative approaches.

Ultradry storage

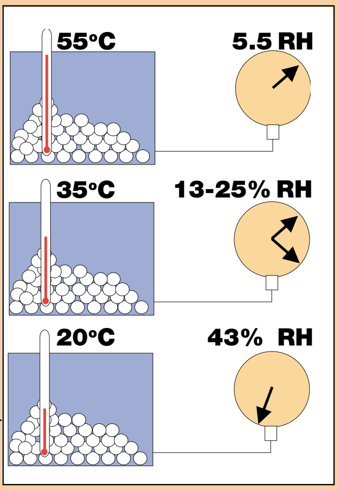
Research has shown that many seeds will stay viable for long periods, even when they are stored at room temperature, if they are dried more than usual. This is called 'ultradry storage.' A lower moisture level allows the seeds to be stored at higher temperatures and hence more cheaply. They do not need so much elaborate and costly refrigeration. The two parameters, water content and storage temperature, are closely linked. Researchers are working to find the combination that will keep the seeds in the best condition for the longest period.

In 1999, another thread of the research work illustrated the damage that over-drying seeds can cause. Early damage shows itself when the plantlets produced from the dried seed begin to lose their vigour as they grow. Greater damage decreases the viability of the seeds themselves, until finally all germination ability is lost. The different levels of damage had never been illustrated clearly before. These very significant results have allowed the participating laboratories to begin to systematically eliminate the conditions that produce these effects.

Significance

This approach will be extremely valuable, especially in developing countries. The work is producing a set of specific conditions for longer term storage of seeds at higher temperatures. These experiments open the way for workers to find the water content at which seeds of various species live longest when stored at room temperature or just below. The protocols will be far more economical and almost as effective as expensive low-temperature storage methods, producing tremendous benefits for the way seeds are stored and the diversity they contain. The end result will be more secure storage of germplasm to guarantee its availability for use into the future.

Ultradry lettuce



Paul Stapleton

Results obtained during 1998 showed that lettuce seeds stored at 50°C and dried over zinc chloride were best stored with a moisture content of 5.5% relative humidity (RH). Further work indicated that the optimum level for seed stored at 35°C would fall between 13% and 25% RH. Seeds stored at 20°C have their optimum somewhere below 43% RH. Researchers are using these limits to work out the combination of conditions that will conserve the seeds in good condition for the longest period.

Core collections: accessing diversity

Core collections consist of limited sets of accessions of an existing collection, chosen to represent the spectrum of the genetic diversity of the whole collection. The cores include as much as possible of the genetic diversity found in the whole collection. This makes using the resources much easier and helps genebank managers identify gaps or over-represented groups of material in their collections. IPGRI has supported a range of initiatives to develop, manage and use core collections. The work has successfully developed and tested methodologies to establish representative core collections, published the data internationally and developed tools to transfer the knowledge direct to genebank staff.

One key objective of IPGRI's work has been to explore how developing country genebanks with limited resources can best establish core collections. China and India have each established germplasm collections of over 4000 accessions of sesame. These collections contain largely indigenous cultivated material (local varieties) and represent a significant part of the world's *ex situ* holdings (30-40%). To improve the management and use of this germplasm, the Oil Crops Research Institute of the Chinese Academy of Agricultural Sciences and National Bureau of Plant Genetic Resources, India worked with IPGRI to develop core collections.

Both core collections consist of about 10% of the collections from which they were made, i.e. approximately 400 accessions each. They were established by grouping accessions from similar ecogeographic regions with similar agromorphological characters and taking a sample from each group. In China seven agroecological groups were established. In India agroecological and agromorphological grouping formed 20 groups from which accessions were selected. Tests using morphological and isozyme variation indicated that both core collections contained over 70% of the diversity present in the original collections, proving that the concept of core collections was worthwhile.

IPGRI co-hosted a one-day symposium on core collections with the Crop Science Society of America at their annual meeting in Baltimore in 1998. Papers discussed core collection methodology and described work on establishing and using core collections of peanut, cassava, beans, grasses, *Medicago* and other crops. The results of an international survey of core collections made by IPGRI showed that

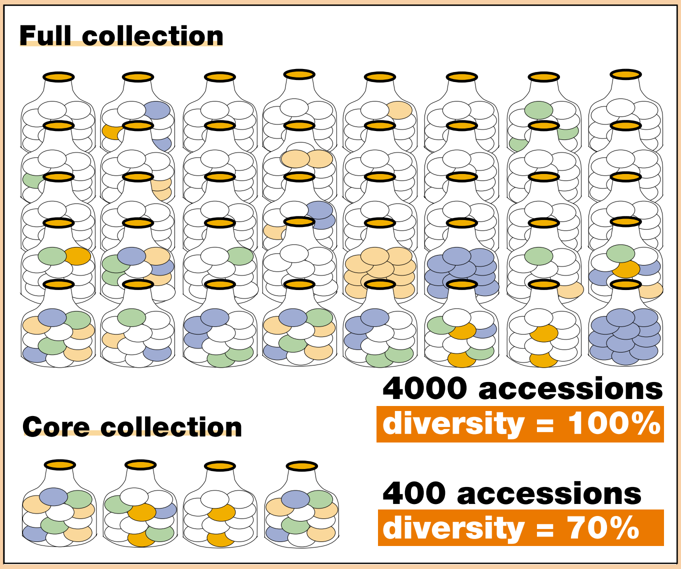
Increasing the use of plant genetic resources

IPGRI's new strategy emphasizes *using* diversity for development. By 'use', IPGRI means exploiting diversity to support genetic enhancement, genetic enhancement itself, and deploying traditional or enhanced germplasm to enrich production systems. IPGRI is increasing its work on promoting the use of conserved germplasm by professional plant breeders, researchers, development workers and others involved in improving agricultural productivity. The Institute is also looking for ways to increase the access that farmers have to the material and exploring ways to increase the diversity of production systems. *Ex situ* collections can become very large and finding accessions with specific, useful characters can be difficult. One approach is to develop a subset of the material, known as 'core collections'. They represent as much as possible of the collected diversity in a limited number of germplasm samples. An IPGRI initiative, these core collections are making access easier to the diversity of a crop genepool and in particular to that present in large genebank collections. IPGRI has taken a leading role in developing this innovative concept to the stage where the methodologies are now practical and reliable.

Strategic choice

Sesame core collections make diversity easier to manage

A core collection made up of 10% of the 4000 sesame accessions in Indian and Chinese collections contained 70% of the genetic diversity represented in each collection.



Paul Stapleton

the methodology is now mature enough for wider distribution. A technical bulletin is being prepared giving detailed guidelines on how to establish a core collection. Together with the ways of making sure that enough diversity is available for sampling, the methodology also advises on the subsequent maintenance of the collection.

Significance

Core collections have proved themselves as a useful way to manage a significant part of the diversity present in whole collections. In both China and India the core collections have been made available to plant breeders and, in India, users have already requested further studies of the core to find variation in key characters such as germination capacity, establishment and resistance to waterlogging. Publishing the methodology is stimulating the development of core collections around the world. This will make it much easier to access resources with useful or needed genetic diversity. Using this material in breeding programmes will ultimately lead to more productive crops and safeguard the income of many resource-poor farmers.

Core collections

A. Sánchez, CIMMYT

Core collections make managing genebanks like this one easier and the diversity in the material more accessible

Information initiatives

Increasing access to data

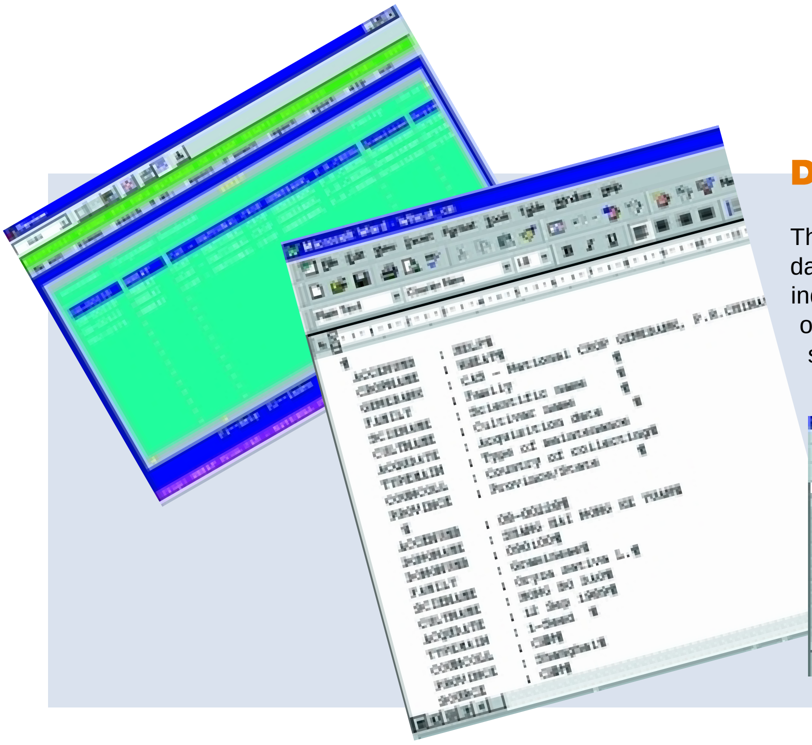
Information networking involves both active exchange of information and preparing the national programmes for information exchange. The IPGRI's Regional Office for APO is working to develop tools that national programmes can use for information exchange. Staff developed a data interchange protocol (DIP) that can be used to set up networked information systems. Most national programmes are understandably reluctant to change their existing information systems (see below, left). The invaluable feature of DIP is that the control and maintenance of the information stays with the provider, but virtual central databases can be established to increase the use of existing data and add value to the resources. The system allows data to be exchanged between different software systems to quickly establish information networks. The protocol is being promoted around the region and has increased the access to data resources of many institutions. For example, the DIP format and DIPVIEW software are being used by the National Bureau of Plant Genetic Resources, New Delhi to develop electronic germplasm catalogues. Ten catalogues have so far been prepared. The software is also used by other institutions in India such as the Indian Institute of Horticulture Research, Luknow and the All India Coordinated Research Project on minor millets, Bangalore. The South Asia Network on Plant Genetic Resources agreed to use the DIP format to develop an information network among South Asian countries.

Managing and communicating information

Information plays a central role in plant genetic resources work. Accurate information about conserved materials is essential if they are to be used well. Computerized documentation systems assist in the management of material in genebanks and provide information to users. IPGRI maintains databases on *ex situ* germplasm holdings and in 1998 significantly increased the accessibility of these data by making its databases available for searching on the Internet (http://www.cgiar.org/ipgri/doc/dbintro.htm). IPGRI continues to participate in the System-wide Information Network on Genetic Resources (SINGER), a project of the System-wide Genetic Resources Programme (SGRP) that provides Internet access to information on genetic resources available in the CGIAR in-trust collections. As well as distributing conventional publications, IPGRI has expanded the information that it has available for downloading from its Web site. It also continued an active public awareness programme on the importance of genetic resources.

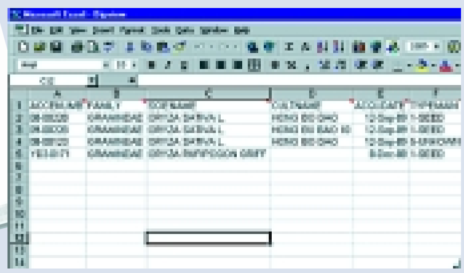
Significance

DIP is a low-cost system that makes germplasm databases widely accessible, allowing information networks to be quickly established and increasing the usefulness of the material.



DIP in action

The protocol is able to obtain information from a variety of databases and display it all in the simple DOS form. The individual parts can then be manipulated in a word processor, or amalgamated and displayed in a specially developed spreadsheet or database system. Adding value to the data in this way allows the users to gain access to a wide range of information resources previously denied to them.



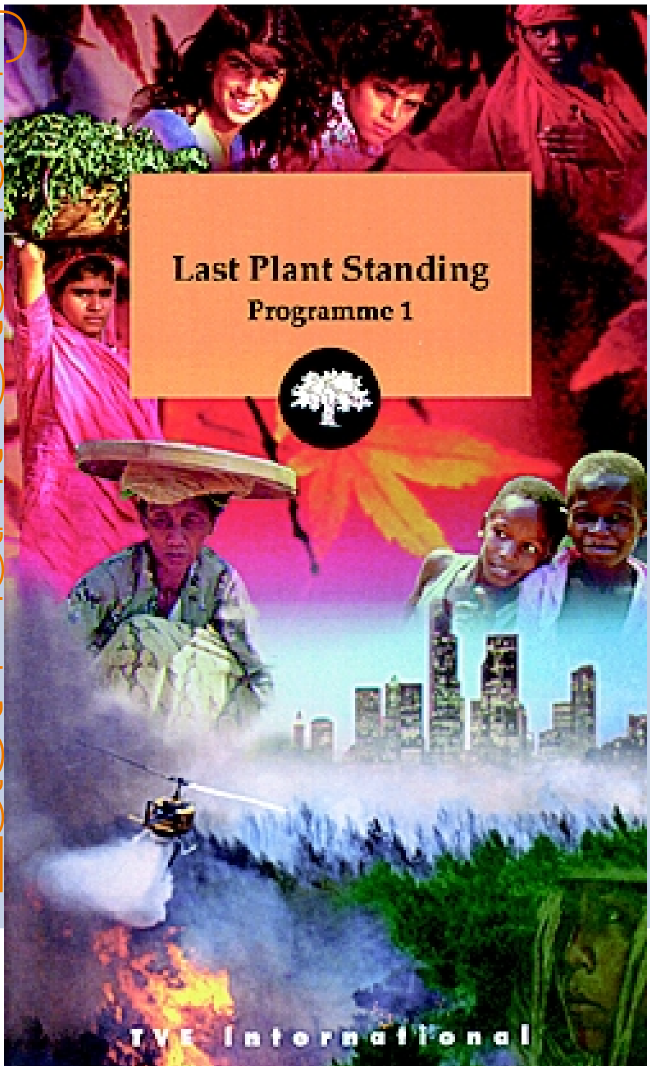
Threatened diversity on television

Increasing the public's awareness of the importance of genetic resources is essential to maintain long-term support. IPGRI staff helped supervise the production of a four-part series of television documentaries entitled 'Last Plant Standing.' The series dealt with threats to genetic diversity around the world and the benefits that come from conserving the material. Programmes were produced on behalf of the CGIAR by Acacia Productions for Television Trust for the Environment, an international non-governmental organization that uses broadcast television and other ways to raise environmental awareness. Japan provided principal funding for the project. Further support came from the International Development Research Centre, Canada, the Department for International Development, UK and the Danish Ministry of Foreign Affairs. The full series was broadcast in Japan to very positive response, and a half-hour version was broadcast on BBC World Television in November 1998. After airing on the world's two biggest public service networks, the series was made available to TV stations throughout the world and has been shown in many countries since.

Significance

The television programmes were received in 90 million homes in the first year, making the issues involved in conserving genetic resources understandable to a wider audience and informing the general public about the impact that diversity can have in agricultural productivity, increasing food supply and protecting the environment.

Last Plant Standing



The CGIAR series 'Last Plant Standing' was seen in 90 million homes

Leafy vegetables: an essential crop

Even though leafy vegetables are important in the diet of many African countries, development specialists and agricultural scientists believed that the vegetables were not widely cultivated. Farmers were thought to pay little attention to variation of specific characters within the species but IPGRI project research found the reverse. Farmers actively cultivated leafy vegetables and the diversity within the species often influenced how the farmers managed their growing activities. For example, bitter leaf (*Vernonia amygdalina*) turned out to have several distinct genotypes with different degrees of bitterness that meet the different dietary preferences of different cultural groups. Farmers would select the material they planted depending on who would be eating and buying the leaves.

Addressing socioeconomic and policy issues

IPGRI's work on the human and policy dimensions of genetic resources seeks to strengthen the link between managing genetic resources, rural development and food security. Key socioeconomic issues addressed include gender, nutrition, incomes, equity and value. In the policy area, IPGRI provides information and analysis of legal and policy developments and their implications. This work contributes to better informed and more effective policies for conservation and use of genetic resources. IPGRI investigates how key economic and policy factors affect national and international decisions on the management and the availability of genetic resources. A project on traditional African leafy vegetables in Africa yielded some important insights into the diversity, uses and farmer management of germplasm that challenged conventional beliefs, conclusions supported by work in China.

The black nightshades (*Solanum nigrum* complex) are valued in the food cultures of the forest zones. While *S. nigrum* grows easily and spontaneously, the seeds for the preferred types are produced outside the forest zone and are the subject of a lucrative seed trade. It is essential for farmers to grow the right variety so that they can supply seeds of plants that meet consumer tastes, require little preparation and produce most yield. The studies documented the value of these leafy vegetables in maximizing the productivity of small parcels of land and maintaining the stability of ecosystems within the farming systems.

Once farmers invest significant amounts of time and resources in producing these crops, they begin to make choices concerned with the genetic diversity they know is contained in the varieties. For example, some traditional leafy vegetables such as *Cleome gynandra* have insect-repellent properties that may make them important in reducing pest infestation and pesticide use in the intensive cultivation of vegetables for export. This cultivation can also provide affordable and nutritious vegetables for local consumption. It is this sort of ethnobotanical knowledge that is most valuable when it is passed on to other farmers.

A study made in southern China compared how ethnobotanical knowledge and molecular markers describe and classify genetic diversity in taro (*Colocasia esculenta*), an important crop cultivated in the region for thousands of years. The diversity revealed by the molecular analysis showed that farmers and ethnic communities use a broader range of taro genetic diversity. The farmers were actively developing new uses for taro from genetically divergent sources, such as cultivating taro flowers as a high-value vegetable. This local knowledge highlighted the morphological characteristics of the material that were most important to the actual users.

Significance

Subsistence crops and wild plant species are major parts of the agriculture in many developing countries and have a significant role in nutrition, food security and income generation. IPGRI's socioeconomic work is opening up ways to increase the food supply to the local populations, raise incomes and stimulate economic activity, as well as increase the effectiveness of *in situ* conservation of valuable biodiversity.

IPGRI photo

The black nightshades

The black nightshades are widely used as leafy vegetables and as a source of fruit and medicinal herbs. Increasing their productivity and protecting their genetic base is essential to protect the livelihood of low-income farmers in West Africa.

Musa and coconut

Strategic choice

Conserving and using specific crops

From the perspective of both conservation and use, IPGRI pays special attention to a number of specific crops. IPGRI does not have systematic, focused programmes of work on any crops that are covered by the mandates of other international centres, other than *Musa*. However, it is successfully working with these centres on their mandate crops where they form the basis for research on other issues, such as cryopreservation and the development of core collections. The crops to which IPGRI currently devotes special attention fall mainly into two categories: crops of worldwide importance, such as *Musa*, coconut and cocoa, and underused or neglected species that are regionally or locally important and especially vulnerable to genetic erosion. In the future, IPGRI will also seek opportunities to increase its work on a third category, consisting of a range of wild species with a strong potential for crop improvement and for increasing income-earning opportunities among poor people.

Viruses - a major constraint in *Musa*

Banana and plantain are extremely important food and cash crops for hundreds of millions of people throughout the developing world. The International Network on Banana and Plantain (INIBAP) is responsible for conserving the world collection of *Musa* diversity, which is maintained at the INIBAP Transit Centre in Belgium. By the end of 1998, 51% of the collection had been duplicated for safety and 66% had been virus indexed. The molecular techniques used in characterizing the collection are confirming previous classifications based on morphologic characteristics. This work, together with greater efficiency in detecting virus contamination with the opening of a new virus indexing centre in South Africa in 1998, is increasing the use of the material in the collection.

Virus contamination is a constant threat in *Musa*, and the banana streak virus (BSV) is now the most widespread virus infection, causing damage and loss of income in the developing world. Sequences of the DNA of the virus are actually integrated into the host's genetic material and have been found in all the *Musa* lines tested. In some *Musa* cultivars, these sequences can be activated to produce an infection. Research supported by IPGRI at the John Innes Centre, UK on the sequences integrated into the cultivar Obino l'Ewai has indicated ways to develop a diagnostic technique to reveal these virus segments. It is likely that only a subset of the virus material is hazardous, so being able to identify this threat within apparently healthy *Musa* plants will be an invaluable aid to banana breeders and other researchers.

Bas-relief, Bali, Indonesia

Paul Stapleton

Banana and plantain are vulnerable to many diseases, so breeding for disease resistance is extremely important. Phase 2 of the International *Musa* Testing Programme was completed in 1998. Initial results show that FHIA-23, a dessert banana hybrid produced by the Fundación Hondureña de Investigación Agrícola, has a very good level of resistance to black Sigatoka disease, even under high levels of disease pressure, and produces good yields across a range of environments. This is a highly significant achievement, as black Sigatoka is a virulent infection that is destroying huge areas of banana production all over the tropics.

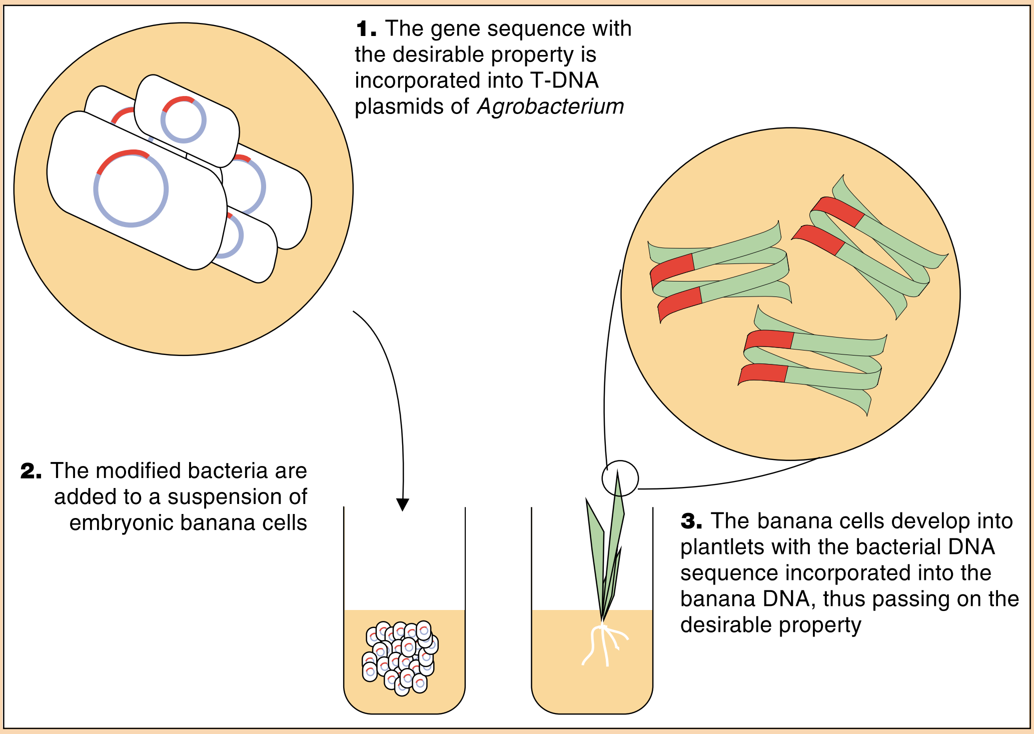
Significance

Musa is essential for food security and income to millions of poor farmers, but viruses are a major constraint, not only on production worldwide, but also to the international movement of its germplasm. The ability to detect viruses in *Musa* will slow the spread of infection and ultimately increase the supply of healthy plants to assure the security of the crop into the future.

Chromosome transformation

Bananas and plantains are difficult crops to breed because the most important and popular varities are virtually sterile and do not produce seeds. INIBAP-supported research at the Katholieke Universiteit, Leuven, has made good progress on the *Agrobacterium*-mediated transformation of bananas. This technique uses bacteria to carry new sequences of DNA into suspensions of embryogenic *Musa* cells to give the subsequent plants disease or pest resistance. Shoots have been produced from some of these transgenic cell lines and the presence of the new genes has been confirmed in the plants. This technique is being developed as an alternative to particle bombardment as it allows the manipulation of larger pieces of DNA comprising several genes. As traits such as pest and disease resistance are generally controlled by more than one gene, this technique holds great potential in the research on germplasm improvement.

Bacterial mediated chromosome transformation in bananas



Paul Stapleton

Significance

Bananas and plantain are predominantly smallholder crops and most growers cannot afford costly chemicals to control pests and diseases. Developing and evaluating new varieties with inbuilt resistance is lowering costs, improving production and increasing the earning potential of the crop of its low-income cultivators. At the same time, these new varieties are reducing environmental damage by the pesticide the older varieties need.

Emile Frison

Cooking and dessert species of *Musa* on sale in a Philippines market

Paul Stapleton

Coconut palms growing in a Balinese village

Coconut - conservation and use

Coconut is an extremely important crop to millions of poor farmers throughout the tropics. Through the Coconut Genetic Resources Network (COGENT), IPGRI supports collaborative work on the conservation and use of the genetic diversity of the crop. Twenty countries in the Asia-Pacific region are collecting and conserving coconut germplasm and characterizing existing and new collections. Similar initiatives are being planned in Africa and the Latin American countries. COGENT is also establishing a multi-site International Coconut Genebank, under the auspices of the FAO, in Southeast Asia, South Asia, South Pacific and Africa to guarantee the security and availability of coconut germplasm.

In another area that is invaluable to breeding, IPGRI and COGENT are collaborating with advanced laboratories to develop and apply molecular marker techniques to locate and characterize coconut diversity. A hybrid/variety trial began in countries across the Pacific region, funded by CFC, that will provide a wealth of essential data on the diversity and performance of the material being tested. These data are invaluable to coconut researchers and breeders around the world in helping them choose material with the most useful genetic traits for breeding work.

In 1998, the network organized a series of training courses for coconut researchers on breeding research techniques, collecting and conservation, farmer participatory research (Davao and Fiji), embryo culture (Albay), biotechnology (Long Ashton) and computer use and statistical data analysis (Fiji).

Significance

This work will greatly increase the security and accessibility of the coconut genetic resources and assist coconut workers in using the material in their breeding programmes. Development work and capacity-building are having a major impact on the capabilities of the specific country's national programme, which inevitably means greater security and sustainability in the coconut-growing activities of the countries.

Coconut's contribution

The global coconut industry is very healthy, with a strong demand for the many products that can be derived from this versatile species. New hybrids and high-yielding varieties are increasing the supply of raw material in the developing countries, as well as raising the standard of living of the small-scale farmers growing coconut as a cash crop.

Photodisc

Bamboo and rattan: major forest products

Researchers in Thailand and Malaysia studied the genetic diversity of two important rattan species. Work comparing random-amplified polymorphic (RAPD) and isozyme methods for identifying diversity in *Calamus palustris* in Thailand revealed highly polymorphic isozyme gene loci in this species. This meant that isozyme analysis alone is enough to assess genetic diversity of *C. palustris*, allowing scientists more easily and economically to investigate genetic structure, differentiation and genetic diversity in greater numbers of populations.

Rattan species are very difficult to distinguish. IPGRI-sponsored research in Malaysia, using a combination of molecular markers and microscopic anatomical characters, developed for the first time simple techniques for separating species, and also assessing genetic diversity, that will have a tremendous impact in future studies. Similar genetic analysis revealed high levels of genetic diversity in particular populations. Being able to identify such diversity means that the best populations can be chosen to use in intensive breeding and selection programmes.

Research on the impact of extraction of bamboo and rattan was started in India to allow the national programme to plan effective conservation measures. Another activity used molecular techniques to distinguish two distinct populations in the bamboo-rich forests of the Western Ghats in the north of India. This is the first time that such genetically unique populations have been revealed. It means that the technique and the information it provides can be used to design the best conservation and exploitation strategies for the species.

Indonesia supplies 80% of the world's rattan but definite information on the distribution of rattan species was only available for 40% of the 17 000 islands that make up the country. Project staff organized a meeting to gather more information on the species. Discussions showed that the use and trade of the species can be a driving force for its conservation. The species for which there is most information are in fact the species that are the most exploited, which means that future conservation efforts should be well received by the farmers and gatherers.

Conserving and using forest genetic resources

IPGRI's project on forest genetic resources develops methodologies to conserve, manage and use forest genetic resources. It also promotes partnership and participation at national, regional and international levels. While *in situ* conservation remains the principal strategy for managing forest genetic resources, the project aims at integrating *in situ* with *ex situ* conservation approaches. In 1998 the project achieved substantial results in the areas of locating genetic diversity, monitoring genetic erosion, seed handling and storage, as well as establishing or building up a number of networks. Work on bamboo and rattan was particularly significant. Bamboo and rattan provide employment and valuable income to rural people, but the current extraction processes are leading to severe genetic erosion. Project staff based in IPGRI's APO Regional Office have been supporting a variety of fundamental studies, many financed by the government of Japan. The work has been done in close collaboration with partners in the region, guided by the International Network for Bamboo and Rattan (INBAR)-IPGRI Working Group on bamboo and rattan. This information has built up into a comprehensive understanding on bamboo and rattan distribution and use that allows effective conservation strategies to be developed.

Significance

Bamboo and rattan are good examples of non-food plants that can make a substantial contribution to eradicating poverty. They are two of the most important non-timber forest products in Asia with a world trade value of US$14.5 thousand million. IPGRI's work is directly assisting in conserving the genetic resources of the species for sustainable future use, identifying diversity and facilitating breeding efforts to increase yields and income derived from the crop.

Networking in the Americas

Regional networks in South and Central America and the Caribbean

IPGRI has been actively promoting plant genetic resources networks in collaboration with regional partners. The Interamerican Institute for Cooperation in Agriculture (IICA), operating under the aegis of the Organization of American States, and its Cooperative Research Programs, or PROCIs, are key partners of the networks, providing an essential political umbrella under which IPGRI can work. CATIE, the Tropical Agronomic Center for Research and Training, in Costa Rica, is a key partner in the Mesoamerican network. CARDI, the Caribbean Agricultural Research and Development Institute, is an important partner in the coordination of the Caribbean network.

REDARFIT	**Andean Network of Plant Genetic Resources** Bolivia, Colombia, Ecuador, Peru, Venezuela
REMERFI	**Mesoamerican Network of Plant Genetic Resources** Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama
TROPIGEN	**Amazonian Network of Plant Genetic Resources** Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, Venezuela
PROCISUR	**Sub-Programme for Plant Genetic Resources of the Southern Cone** Argentina, Bolivia, Brazil, Chile, Paraguay, Uruguay
CAPGERNet	**Caribbean Plant Genetic Resources Network** Antigua & Barbuda, Belize, Barbados, Bahamas and the Cayman Is., Cuba, Dominica (Commonwealth of), Dominican Republic, Grenada, Guadeloupe, Guyana, French Guiana, Haiti, Jamaica, Martinique, Montserrat, St. Kitts & Nevis, St. Lucia, St. Vincent, Suriname, Trinidad & Tobago, British Virgin Islands, and US Virgin Islands.

Working with networks

Networking is an extremely effective approach to conserving genetic resources. Networks allow countries with similar agro-ecologies and crop species to work together to share germplasm and set common goals. Both thematic and regional IPGRI Groups contribute to networking. During 1998, the Steering Committee of the West Asia and North Africa Network for Genetic Resources (WANANET), with support from IPGRI's Regional Office for Central & West Asia and North Africa (CWANA), started restructuring the network by including non-governmental organizations and policy-makers in its work, and by seeking greater support and recognition by governments and regional donor organizations. The CWANA Regional Office provides the Secretariat for this network, which is a major element in the continuity of genetic resources work in the region. The network operates within crop working groups that in 1998 developed improved strategies and technologies for *ex situ* and *in situ* germplasm conservation. In Europe IPGRI supports the European Cooperative Programme for Crop Genetic Resources Networks and the European Forest Genetic Resources Programme, both working towards conservation and sustainable use of crop and forest genetic resources. INIBAP, which operates essentially through networking, supports banana research activities by coordinating and supporting regional networks. 35 coconut-producing countries are now members of COGENT, the coconut network that IPGRI supports; five regional sub-networks were organized and fully operational by the end of 1998. The Asia, Pacific and Oceania (APO) and Sub-Saharan Africa (SSA) regions are also having significant successes with the network approach.

The impact of IPGRI's networking activities in the Americas is beginning to be seen in the increased level of research that is being done by the network members and the strength of their national programmes. The member countries are increasingly self-sufficient but benefits come also from widespread interlinking among networks.

The priority crops identified by the Andean network REDARFIT are native Andean fruits, grains, roots and tubers. Many of the constituent national programmes are under-funded. However, collaboration within the network has brought a number of benefits, in the form of shared expertise and experience. Members identified germplasm documentation as a priority need in the subregion. IPGRI had already started a wide-ranging inventory detailing the collections and facilities of over 200 genebanks in 30 countries in the region. This work is proving a valuable aid to network members in the exchange and use of material conserved in the region. Work on the genetic diversity of passion fruit (*Passiflora* sp.), which are extremely important tropical fruits in the region, continued in Colombia, Ecuador and Venezuela. This extensive research yielded valuable results on ways to characterize the fruits, their genetic diversity and their distribution in the wild.

Collaborative research with CIAT in Colombia gave excellent results on cryopreserving seed from three species of passion fruit, something that has never been done successfully before on these species. Apart from the results, the actual implementation of the research is an important milestone for REDARFIT, and will help establish research programmes in other national partners.

An EU-funded project, prepared with the assistance of IPGRI staff for implementation through TROPIGEN, is collecting and breeding resistant varieties of pineapple. During its collecting missions, the project located new sources of resistance to fusariosis, which is a major fungal disease in Brazil, Paraguay and Bolivia. This material is being used to breed resistant varieties. Work on molecular characterization and gene mapping provided new insights into the genetic diversity of pineapple that will have a major impact on subsequent characterization and breeding activities.

The plant genetic resources sub-programme of the Southern Cone was established in 1993 by PROCISUR. This is the only plant genetic resources network in the region that is supported primarily by funds contributed by the member countries, the majority of which have some of the best developed economies in Latin America. Consequently, this network is very active and IPGRI's contribution to its effectiveness focuses on assisting the network's weaker countries so that they may participate more fully in network activities. IPGRI has supported the development of projects and activities leading to the creation of national programmes in Paraguay and Bolivia. This is particularly important as the two countries have high levels of agrobiodiversity that is being conserved on-farm and in the wild, but are still without coordinated national programmes to study, improve and protect this untapped genetic wealth. IPGRI is supporting the compilation of national inventories of wild crop relatives and complementary strategies for their *in situ* conservation.

Americas Regional Office

Passiflora blossom

The Mesoamerican sub-region is recognized as a centre of crop domestication and agricultural origins and is extraordinarily rich in crop genetic resources. The major constraint of REMERFI, the network encompassing the countries of the sub-region, is the fact that the national programmes in all countries are insufficiently funded and in some cases still lack strong coordination mechanisms. Nevertheless, the network has successfully developed a number of major research projects and located funding for them. A GTZ-funded project, developed by IPGRI in partnership with IICA, CATIE and REMERFI, permitted the hiring of a full-time international coordinator and the implementation of numerous institution strengthening activities in the sub-region. These activities included the establishment of national plant genetic resources commissions in each country.

The network approach has proved particularly suitable in the Caribbean. This sub-region is made up of 16 small, independent island nations and territories that share a common geographic and a valuable agrobiological heritage. CAPGERNet was launched in 1998 with strong IPGRI involvement. The new network stimulated all interested countries in the sub-region to form national committees that immediately began to work to raise the efficiency of resource utilization and conservation. One major goal of the network is to orient the management of genetic resources towards the needs of the market place, an important political priority in the sub-region.

Networks and the GPA in the Americas

Promoting sub-regional networks is a priority area for the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (GPA). At a meeting at CIAT in Cali, Colombia in September 1998, a secretariat of sub-regional representatives was established to follow up the implementation of the GPA in the Americas region. This secretariat, whose aim will be to enhance linkages and increase integration among the different sub-regional networks, planned their first meeting for August 1999.

Significance

IPGRI's networking in the Americas has assisted a number of countries to organize their own national programmes and increase their capacities in research and conservation. Bolivia and Paraguay are excellent examples of a network's effectiveness in helping establish programmes in countries where they do not yet exist. In Mesoamerica, networking helped establish national commissions that strengthened the national programmes. Networks have proven to be an effective framework for training, documentation and research activities. The collecting, research and information sharing among the networks is having a direct benefit on the security of the region's genetic resources.

Safeguarding unique resources

Vavilov Institute

Vavilov in 1927 after returning from a collecting mission in Ethiopia

The N. I. Vavilov All-Russian Research Institute of Plant Industry (or VIR) in St. Petersburg, Russia holds a unique and invaluable collection of crop germplasm, comprising more than 300 000 individual seed samples of 2000 species. Named after the famous geneticist Nikolay I. Vavilov, the Institute has been collecting, characterizing, conserving and using genetic diversity for more than 75 years.

Owing to the particularly complex transition period in Russia, VIR is experiencing severe reductions both of staff and infrastructure. In 1988 the staff numbered over 2800; ten years later this figure was down to 950. Similarly, following the break-up of the former Soviet Union, the number of field stations throughout the country decreased from 19 to 13. At the same time, the management of the collections at the headquarters in St. Petersburg became critical, mainly because storage facilities were either poor or lacking. In response to these difficulties, the international community provided economic aid through IPGRI in a series of rescue operations during 1994-997. Although this relieved VIR of the most immediate problems, many others remained.

At a request of VIR, an international task force was set up to look at ways of strengthening the programme and securing the collections. The Russian Academy of Agricultural Sciences, VIR and IPGRI established an International Consultative Group (ICG) in 1997. Members of the Group were identified from various countries, with a range of expertise, including genetic resources management, plant breeding, documentation and business administration. Phase one, a detailed review of the current situation and mode of operation of the Institute, was funded by the Nordic Council of Ministers and chaired by the Nordic Gene Bank in 1998. The report resulting from this review, which included a number of missions to VIR's stations in different parts of Russia, outlined several options to meet the long-term needs of VIR.

One of the most plausible scenarios envisaged the development of completely new genebank and research facilities at Pushkin, a site outside St. Petersburg. Among many other desirable measures, the ICG also suggested that the VIR's collections should be rationalized to meet national needs, that crop curators be located at the field stations where regeneration was to be carried out, and that the number of field stations be reduced. Furthermore, the ICG felt that the Vavilov's herbarium deserved better recognition, and might form the basis for establishing a Hermitage-type museum. It is hoped that the financial and other support needed will be secured soon, to enable the implementation phase of this important process to proceed.

Strengthening national systems

Most countries coordinate their activities in genetic resources through a national system, committee or programme. IPGRI has found that it is extremely efficient to collaborate directly with these systems as they have a central role in conserving and using biodiversity. Increasing the capabilities of these systems, in areas such as germplasm management, training and policy advice, is one of IPGRI's primary objectives, particularly in the less-developed countries, as it is these that face the greatest challenges. In 1998, all of IPGRI's regional groups continued working at the national level, providing direct support to national programmes and advising on establishing national coordination committees. The CWANA Regional Office assumed responsibility for working with the Central Asian countries. Several of its major initiatives resulted in concrete outcomes in support of national systems in the region. For example, after the first national forestry workshops on genetic resources in Syria and Lebanon, the Syrian Ministry of Agriculture established a new research section to execute and sustain work on genetic resources. After the far-reaching political and socioeconomic changes in eastern Europe, a number of valuable germplasm collections were threatened. IPGRI led the effort to provide urgent financial and technical assistance to the N. I. Vavilov All-Russian Research Institute of Plant Industry in St. Petersburg, which is one of the world's oldest and most prestigious plant genetic resources institutes.

Institutional structure

Geographical

Programme

Board of Trustees — **Director General**

Director General → **Assistant Director General**

Director General → **Deputy Director General (Programmes)** → **Plant Genetic Resources Programme**
- Regional Groups
  - Sub-Saharan Africa
  - Central & West Asia and North Africa
  - Asia, the Pacific and Oceania
  - the Americas
  - Europe
- Thematic Groups
  - Genetic Resources Science and Technology
  - Documentation, Information and Training

Director General → **Director INIBAP** → **INIBAP programme**
- Headquarters
- Regional Offices
  - West and Central Africa
  - Eastern and Southern Africa
  - Asia and the Pacific
  - Latin America and the Caribbean
  - INIBAP Transit Centre

Director General → **CGIAR Genetic Resources Support Programme**
- SGRP Support
- CGIAR Genetic Resources Policy Support

Director General → **Director Finance and Administration** → **Finance and Administration**
- Finance
- Human Resources
- Computer Services
- Office Services

Financial report

for the year ended 31 December 1998, in US dollars ('000)

Grant Revenue*

Unrestricted	
Australia[1]	295
Austria	50
Belgium[2]	419
Canada	481
China	90
Denmark	894
European Union[3]	1476
France[4]	256
Germany	291
India	75
Italy	695
Japan	1636
Mexico	10
Netherlands	1097
Norway	413
Republic of Korea	50
South Africa	40
Spain	50
Sweden	460
Switzerland[5]	659
United Kingdom	845
USA	600
World Bank	2100
Subtotal	12 982

[1] Australia's 1999 unrestricted contribution received in December 1998.
[2] Belgium's 1998 unrestricted contribution of BF400 000 at UN December rate of exchange of BF35.2=US$1.00
[3] European Union 1997 and 1998 unrestricted contributions of ECU1 900 000 at U N December rate of exchange of ECU.867=US$1.00
[4] France's 1998 unrestricted contribution of FF1 462 500 at UN December rate of exchange of FF5.72=US$1.00
[5] Switzerland's 1999 unrestricted contribution received in December 1998.

Non-Agenda	
IFAD	11
Italy	9
PARC of the CGIAR	8
Sweden	15
World Bank	6
Subtotal	49

Restricted	
Australia	80
ADB	632
Belgium	1544
Brazil	30
Canada	30
CFC	780
CIFOR	7
CIRAD	72
CTA	38
Denmark	231
European countries	590
FAO	273
Finland	79
France	163
Germany	197
IDB	99
IDRC	288
IFAD	543
IITA	8
IRRI	8
Italy	332
Japan	242
Luxembourg	53
Netherlands	358
Norway	59
NGB	5
NRI	14
Peru	9
Rockefeller Foundation	25
Spain	74
Sweden	129
Switzerland	646
TBRI	2
UK	223
UNDP	280
UNEP	31
USA	38
World Bank	57
Subtotal	8269

Total Grants 21 300

*Plus in-kind contribution of Associate Experts/Staff seconded by Belgium/VVOB (3), France/CIRAD (1), the Netherlands (6), Sweden (1).

Restricted projects

A. Restricted Research Agenda

Australia	
Taro Genetic Resources Conservation and Utilization	6
System-wide Genetic Resources Programme - ICIS	66
Nematology Research - Vietnam	8
Subtotal	80
ADB	
Coconut Genetic Resources Network and Human Resources Strengthening in Asia and the Pacific Region (Phase II)	632
Belgium	
INIBAP Transit Center - KUL	347
Collaborative *Musa* Research - KUL	448
Musa Virus Therapy - Gembloux	167
Musa Coordination in Africa	344
Studies on Breeding Systems (*Phaseolus lunatus*) Phase II	169
Study of Diversity (*Colletotrichum* and *Stylosanthes*) Phase II	69
Subtotal	1544
Brazil	
Lusophone Initiative	30
Canada	
Developing Decision Strategies on Priorities for Conservation and Sustainable Use of Forest Genetic Resources	30
CFC	
Coconut Germplasm Utilization and Conservation	38
Cocoa Germplasm Utilization and Conservation	742
Subtotal	780
CIFOR	
Forest Genetic Resources	7
CIRAD	
Musa Nematode Research	35
Musa Publications	37
Subtotal	72
CTA	
Musa Information Services/Publications	30
Workshop on Forest Genetic Resources in SSA	8
Subtotal	38
Denmark	
Effective Conservation and Use of Intermediate and Recalcitrant Tropical Forest Tree Seed	66
Junior Professional Officer - Colombia	81
Junior Professional Officer - Benin	84
Subtotal	231
European Countries	
ECP/GR - Phase V	322
EUFORGEN	232
Plant Genetic Resources Symposium	36
Subtotal	590
FAO	
Decision Guides	1
Farmer Seed Systems	3
A Case Study in the Tomobouctou Region of Mali	5
Plant Genetic Resources Newsletter	24
Support of Regional Meetings to Promote the GPA	240
Subtotal	273
Finland	
Associate Expert - Malaysia	79
France	
International Coconut Database	31
Associate Expert - LACNET Coordination - Costa Rica	83
Virology Research	7
VIC MPL Virus Indexing Centre	36
Musa Germplasm Information System	1
INIBAP West Africa Regional Coordinator	5
Subtotal	163
Germany	
BMZ/GTZ - *In Situ* Conservation (Morocco component)	108
BMZ/GTZ - Contribution of Home Gardens to *In Situ* Conservation	56
BMZ/GTZ - Underutilized Neglected Crops Project	2
GTZ - Towards a *Sui Generis* System	31
Subtotal	197
IDB	
LAC *Musa* Project	99
IDRC	
In Situ Conservation of Agricultural Biodiversity	111
Associate Scientist - Italy	66
Conserving Medicinal and Aromatic Plant Species	22
Musa Germplasm Information System	89
Subtotal	288
IFAD	
Sustainable Use of Coconut Genetic Resources in the Asia-Pacific Region	307
In Situ Conservation and Utilization of Plant Genetic Resources in Desert-prone Areas of Africa	236
Subtotal	543
IITA	
Yam Descriptors	8
IRRI	
Germplasm Collecting in Uganda and Kenya	8
Italy	
Image Processing	6
Support to National Programmes in Angola and Mozambique	79
Conservation and Use of Genetic Resources of Underutilized Mediterranean Species	168
Genetic Diversity of *Triticum* and *Aegilops* Species	28
Individual Training in Plant Genetic Resources	23
Maccarese Science Park	28
Subtotal	332
Japan	
Collaborative Activities	69
Bamboo and Rattan Research	114
Genetic Resources Policy	59
Subtotal	242
Luxembourg	
Genetic Resources of Broadleaved Forest Tree Species in Southeastern Europe	53
Natural Resources Institute	
Post Harvest Publication	14

Netherlands	
Biodiversity of Neglected Leafy Green Vegetable Crops	50
In Situ Conservation in Burkina Faso and Nepal	308
Subtotal	358
Nordic Genebank	
Darwin Initiative Training Course	5
Norway	
Genetic Resources Policy	59
Peru	
Banana Research	9
Rockefeller Foundation	
East Africa *Musa* Workshop	25
Spain	
Spain-Latin America Training Programme	51
Cherimoya Germplasm Bank in Peru	8
Canary Island Project (*Musa*)	15
Subtotal	74
Sweden	
Genetic Resources Policy	45
Eastern Africa Regional Meeting	58
Regional Meeting to Promote Implementation of the GPA in Eastern and Southern Africa, Gaborone	26
Subtotal	129
Switzerland	
Genetic Resources Policy	93
In Situ Conservation of Agricultural Biodiversity	395
Workshop on Ethics and Equity in Conservation and Use of Genetic Resources for Sustainable Food Security	12
SINGER Phase II	137
Associate Experts - Malaysia	9
Subtotal	646
TBRI	
RISBAP	2
UNDP	
IMTP - Phase II	270
IAEG/IPGRI Adoption Studies	10
Subtotal	280
UNEP	
Capacity Building for Sustainable National PGR Programmes	31
UK/Darwin Initiative	
Darwin Initiative - Ivory Coast	38
Darwin Initiative - Poland	38
UK/DFID	
Research on Coconut	74
Holdback Project R6110H (CryopreservationTechniques for Plant Species in India)	4
Coconut Publications	2
Musa Research and Training, Asia	25
Musa Evaluation in Uganda	42
Subtotal	147
USA	
Genetic Resources Policy	25
Musa Network Funding and Strategic Planning	13
Subtotal	38
World Bank	
CGIAR Genetic Resources Policy Committee	53
Agrobiodiversity in Georgia	4
Subtotal	57
Total Restricted Research Agenda Grants	**8269**
B. NON-AGENDA	
IFAD	
Conservation of Indigenous Plant Genetic Resources in the Libyan Arab Jamahiriya	11
Italy	
INTAGRES	9
CGIAR	
Public Awareness and Resources Committee of the CGIAR	8
Sweden	
Future Harvest Campaign	15
World Bank	
Germplasm Conservation in Central Asia and the Caucasus	6
Total Non-Agenda Grants	**49**
Grand Total	**8318**

Financial support

Financial support for the Research Agenda of IPGRI is provided by the Governments of:

Australia, Austria, Belgium, Brazil, Bulgaria, Canada, China, Croatia, Cyprus, Czech Republic, Denmark, Estonia, F.R. Yugoslavia (Serbia and Montenegro), Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Republic of Korea, Latvia, Lithuania, Luxembourg, Macedonia (F.Y.R.), Malta, Mexico, Monaco, the Netherlands, Norway, Peru, the Philippines, Poland, Portugal, Romania, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, the UK, the USA

and by the:

Asian Development Bank, Common Fund for Commodities, Technical Centre for Agricultural and Rural Cooperation (CTA), European Union, Food and Agriculture Organization of the United Nations (FAO), International Development Research Centre (IDRC), International Fund for Agricultural Development (IFAD), International Association for the Promotion of Cooperation with Scientists from the New Independent States of the former Soviet Union (INTAS), Interamerican Development Bank, Natural Resources Institute (NRI), Centre de coopération internationale en recherche agronomique pour le développement (CIRAD), Nordic Genebank, Rockefeller Foundation, United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), TBRI and the World Bank.

Establishment agreement

The international status of IPGRI is conferred under an Establishment Agreement which, by January 1999, had been signed and ratified by the Governments of Algeria, Australia, Belgium, Benin, Bolivia, Brazil, Burkina Faso, Cameroon, Chile, China, Congo, Costa Rica, Côte d'Ivoire, Cyprus, Czech Republic, Denmark, Ecuador, Egypt, Greece, Guinea, Hungary, India, Indonesia, Iran, Israel, Italy, Jordan, Kenya, Malaysia, Mauritania, Morocco, Norway, Pakistan, Panama, Peru, Poland, Portugal, Romania, Russia, Senegal, Slovakia, Sudan, Switzerland, Syria, Tunisia, Turkey, Uganda and Ukraine.

IPGRI's projects

Support to plant genetic resources programmes and regional networks in the Americas
assists countries in Latin America and the Caribbean in building their capacities to conserve and use plant genetic resources

Support to plant genetic resources programmes and regional networks in Asia, the Pacific and Oceania
assists countries in Asia, the Pacific and Oceania in building up their capacities to conserve and use plant genetic resources

Support to plant genetic resources programmes and regional networks in Europe
assists countries in Western and Eastern Europe in building up their capacities to conserve and use plant genetic resources

Support to plant genetic resources programmes and regional networks in sub-Saharan Africa
assists countries in sub-Saharan Africa in building up their capacities to conserve and use plant genetic resources

Support to plant genetic resources programmes and regional networks in Central & West Asia and North Africa
assists countries in Central & West Asia and North Africa to build their capacities to conserve and use plant genetic resources

Global capacity building and institutional support
enables countries to build effective national plant genetic resources conservation and use programmes. It trains scientists and trainers and develops training tools

Global forest genetic resources strategies
supports strategic research on the conservation and use of intraspecific diversity of useful forest tree species. It also aims to develop an information system on forest genetic resources

Promoting sustainable conservation and use of coconut genetic resources
promotes national, regional and global collaboration through COGENT among coconut-producing countries and partner institutions in the conservation and use of coconut genetic resources

Locating and monitoring genetic diversity
develops methods for locating and measuring genetic diversity in cultivated and wild species, combining ethnobotanical with agro-ecological approaches. It also develops methods for monitoring genetic erosion

***Ex situ* conservation technologies and strategies**
develops improved low-input technologies for the *ex situ* conservation of plant genetic resources, and investigates *ex situ* conservation strategies

***In situ* conservation of crop plants & wild relatives**
develops a scientific basis for effective on-farm conservation that meets farmer and community needs and maintains diversity; assists national systems in locating, monitoring and maintaining viable *in situ* populations of wild relatives of crops

Linking conservation and use
links conservation and use taking *ex situ, in situ* and complementary approaches; emphasizes neglected and underused crops and supports the use of cocoa genetic resources

Human and policy aspects of plant genetic resources conservation and use
strengthens links between conservation and the well-being of people, particularly poor rural people, emphasizing gender, nutrition, income, indigenous knowledge, traditional resource rights and participatory approaches

Information management and services
builds capacity in information management and service provision to meet national, regional and international responsibilities; provides publications and information to support the research activities of IPGRI staff and their partners

Public awareness and impact assessment
builds financial and institutional support for plant genetic resources activities worldwide by raising awareness among key target audiences of the role of these resources in sustainable development and food security; assesses IPGRI's impact on the conservation and use of plant genetic resources

***Musa* genetic resources management**
collects the germplasm of *Musa* and its wild relatives; promotes its safe storage, movement and use; develops standardized tools for retrieving and exchanging information on *Musa* germplasm

***Musa* germplasm improvement**
identifies disease- and pest-resistant *Musa* genotypes, researches *Musa* pathogen diversity, screening methods and molecular genetics and develops improved *Musa* genotypes; provides *Musa* germplasm

***Musa* information and communication**
supports the production, collection and exchange of information on banana and plantain; publicizes *Musa* issues and the work of INIBAP to scientific and non-technical audiences

Support to regional *Musa* programmes
supports INIBAP's global regional and national networks and other partnerships in Latin America and the Caribbean, in Asia, the Pacific and Oceania, and in sub-Saharan Africa

CGIAR genetic resources support programme
provides support to the CGIAR system in two areas: (1) genetic resources policy, conservation and use, (2) in IPGRI's capacity as convening centre of CGIAR's System-wide Genetic Resources Programme (SGRP).

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Office of the Director General
- Dr G.C. Hawtin - Director General
- Mr D.H. van Sloten - Assistant Director General*
- Dr L.A. Withers - Assitant Director General**

Finance and Administration
- Mr K.F. Geerts - Director - Finance and Administration

Office of the Deputy Director General (Programmes)
- Dr M. Iwanaga - Deputy Director General (Programmes)

Plant Genetic Resources Programme

Regional groups

Sub-Saharan Africa
Dr A.F. Attere - Regional Director

Central & West Asia and North Africa
Dr G. Ayad - Regional Director

Asia the Pacific and Oceania
Dr K.W. Riley - Regional Director

Americas
Dr R. Lastra - Regional Director

Europe
Dr T. Gass - Director

Thematic Groups

Genetic Resources Science and Technology Group
Dr J.M.M. Engels - Group Director

Documentation, Information and Training
Dr L.A. Withers - Group Director*

INIBAP Programme
Dr E.A.G. Frison - Director

SGRP Secretariat
Ms J. Toll - Coordinator

*Left during 1998
**Joined during 1998

Full details of IPGRI's staff may be found on IPGRI's Web site: http://www.cgiar.org/ipgri/Institute/Location.htm

IPGRI

About this Annual Report

This *Annual Report* highlights the immediate impact of IPGRI's work by looking at a significant achievement in each of the strategic areas that the Institute pursues. Short introductions to each section illustrate the breadth of IPGRI's research work and the geographical dispersion of its area of operation. The Report also contains information for the year 1998 on financial status, Board of Trustees and management team.

A separate publication will describe in greater detail chosen areas of our work, looking back at past achievements and forward to the expected impact and application of particular activities in its decentralized research programme across the regions and throughout the field of plant genetic resources. This production will aim at the more technical national programme audience, adopting a longer time scale to be able to report in-depth results in a clear and succinct presentation.

1998

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's headquarters is based in Rome, Italy, with offices in another 14 countries worldwide. It 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).

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