Bioversity International

Bioversity International in Focus

Biological diversity encompasses all the variation in living things on Earth. Part is used by people to meet their needs for food, shelter, medicines, building materials and so on. That portion is usually referred to as agricultural biodiversity. Bioversity International exists to conduct research on agricultural biodiversity that will enable poor people to improve their livelihoods. This booklet outlines the areas of agricultural biodiversity on which the organization focuses.

Bioversity International in Focus

Poverty, malnutrition and environmental degradation are pervasive problems, especially in the developing world, where many poor people live in rural areas and depend on agriculture and forests for their livelihoods and well-being. The success of the Green Revolution enabled the world's farmers to feed many more people, but at a cost to crop and agricultural diversity and to environmental services. Nevertheless, biological diversity remains one of the key assets that poor people can still control and use.

Bioversity International is the world's largest organization dedicated to the use and conservation of agricultural biodiversity to improve the lives of poor people. The organization works through partners to research biodiversity and how it can be used to boost livelihoods. The classic use of genetic diversity, especially within species, is to improve crop varieties and livestock breeds through scientific, directed breeding. But there is more.

Diversity of plants and animals offers unparalleled opportunities not only through breeding but also by delivering a raft of far-reaching benefits. Some are direct, such as the better nutrition and greater sustainability that come with locally adapted crops. Others are more indirect, like the ecosystem services delivered by healthy populations of pollinators, biological control agents and soil microbes. Bioversity seeks not only to provide the necessary compelling evidence of the wider benefits of agricultural biodiversity for human well-being, but also to explore what types of diversity can make the greatest contribution and in what ways this can be done. However, because the field of agricultural biodiversity is so broad, the organization has chosen to focus on six well-defined areas.

Focus Area 1

Demonstrating

Managing agricultural biodiversity for better nutrition, improved livelihoods and more sustainable production systems for the poor

We see: Accumulated evidence for the many benefits of agricultural biodiversity informs policies and practical activities that together improve the productivity, resilience and resistance of farming systems, thereby improving the lives of poor farmers, especially in marginal areas.

Agricultural biodiversity is always associated with a body of local knowledge about how to use and manage it. The two aspects of this asset—the diversity itself and the accompanying ability to make use of it—are being lost or used sub-optimally because they are not properly understood, valued or managed. Poor people themselves may not make best use of agricultural biodiversity, perhaps because knowledge about it has already been lost. Other sectors of society, notably decision-makers and professionals, similarly may be unaware of the value of agricultural biodiversity, particularly under conditions of rapid economic development and cultural change. What is needed is evidence.

Enhanced understanding of the broad benefits of agricultural biodiversity is crucial to promoting its wider use to advance the well-being of the poor. Nutrition, income and sustainability can all be improved with agricultural biodiversity; clear demonstrations of these benefits, with better management of the resources, will result in improved conservation as well as increased use. An important activity will be to understand how systems work in one place and under one set of circumstances and then to use that knowledge to tailor solutions in other places. This will help to build a body of widely applicable approaches, rather than off-the-shelf solutions that may not succeed. There is also a need for greater efforts in public awareness and advocacy to ensure that politicians and other agents of change are aware of the ways in which agricultural biodiversity can improve the well-being of poor people.

Among the outputs of this area will be greater recognition of the nutritional and health benefits of agricultural biodiversity and the identification of options for increasing incomes, especially for the most marginalized people who need it most. These will be linked to the use of agricultural biodiversity to improve productivity, resilience and resistance in farming systems and to strengthening areas such as the informal seed sector that enable communities to make use of diversity. This is particularly important in marginal areas, where greatest poverty occurs. As a result, agents of change at all levels, from the international to the local, will mobilize in support of the use of agricultural biodiversity. Most importantly, as farmers see the benefits of agricultural biodiversity they become self-motivated agents of change, making better use of their resources.

Children in a cañihua field near Sillustani, Juliaca, Peru.
M. Hermann/Bioversity International

Focus Area 2

Promoting

Conserving and promoting the use of diversity in selected commodity crops of special importance to the poor

We see: Smallholders use a wider range of commodity crops and locally processed products to meet the food security, income and health needs of their communities. Formal and informal networks link farmers, extension workers and researchers, who learn from one another and improve livelihoods further.

Certain crops play a special role among poor rural communities. Commodity crops such as banana, coconut and cacao (specific Bioversity targets) are often the mainstay of poor communities, but to date research and development on these crops has been for the benefit of consumers in industrialized countries and of industrial producers and processors in developing countries. The poor people who grow and depend on banana, coconut and cacao require a research agenda that meets their needs and that will help farmers and their families to derive maximum benefit from effective use and management of biodiversity.

A pro-poor research agenda for banana, cacao and coconut needs to address two intertwined issues: low incomes and sub-optimal use of genetic diversity. Genetic diversity is threatened by market forces that sideline traditional varieties, by epidemic diseases that attack the crops and their wild relatives and by the loss of habitat that supports wild relatives. Research needs to identify traits of value to poor people, such as the ability to withstand biotic and abiotic stresses and also to deliver better nutrition. Conventional research is predicated on low-diversity high-input production systems that deliver a uniform, low-cost product. Bioversity will develop and promote alternative approaches using diversity to enhance productivity and sustainability. Higher incomes for smallholders and their communities will also follow from research on biodiversity to provide novel products, novel processes and novel ways to capture a greater portion of the income stream, for example by finding new ways to link traditional varieties to markets.

Breeding—and conserving the diversity on which breeding depends—are important activities in commodity crops. Bioversity maintains the *ex situ* collection of banana diversity in trust for humanity, and works with partners to secure collections of coconut and cacao. Bioversity also gathers the information breeders need to use these resources, and conducts and coordinates multi-site trials of improved material. Effort is devoted to using biodiversity to deliver ecosystem services such as healthy soil and resistance to pests and diseases, so that production is improved with lower inputs. Work will also continue to devise, develop and disseminate high-value products based on the commodity species.

A successful pro-poor research agenda for commodity crops will see smallholders use a wider range of those crops to meet their food security and health needs while conserving the resource base. Linking a range of partners, encouraging collaborative research, promoting information exchange and supporting formal networks will contribute to these outcomes and build national capacity to conduct independent research.

A fruit stall in Bogor, Indonesia
Ilona deBoreghyi/Bioversity International

Focus Area 3

Conserving

Enhancing the *ex situ* conservation and use of diversity

We see: Genebanks effectively conserve fully representative collections of the genetic diversity of useful species, which farmers and scientists use to create varieties that help to deliver better and more resilient production systems.

Even if people are aware of the benefits that agricultural biodiversity can deliver in general, they may be unable to make use of it in specific cases, either because the diversity itself has been lost or is unavailable or because information about it is lacking. There is thus a need to ensure that properly maintained *ex situ* collections of diversity are both representative and well characterized and that people have the capacity to make use of the resources and information in the collections. This need assumes greater urgency in the face of the challenge to feed a population that is still increasing on land that is increasingly degraded and subject to other stresses, such as those caused by climate change. Useful and potentially useful diversity must be collected, evaluated and conserved and then made known to researchers, breeders and others who can use it to help people feed, clothe, heal and shelter themselves.

In the wake of the Green Revolution strenuous efforts were made to build collections of crop diversity and hundreds of thousands of varieties are currently conserved in genebanks. However, many of the collections were assembled hurriedly and *ad hoc* and as a result contain gaps and duplications that diminish their efficiency and cost-effectiveness. Furthermore, many important species are not conserved in genebanks, either as a result of scientific neglect or because their biological characteristics do not allow them to be dried and stored at low temperatures. Another challenge is inadequate management of many genebanks. Research on conservation and additional well-targeted collecting missions will ameliorate the situation, as will disseminating best practices and training genebank staff to make use of them. Research is also needed to improve *ex situ* storage, in particular for species, including forest trees, with seeds that require specific storage techniques. Bioversity will work with partners to conduct this research.

Conservation, however, is not enough. To yield benefits, the diversity conserved in genebanks must be reintegrated into agricultural systems. Thousands of accessions need to be screened and information about the accessions and their characteristics made available to all who can make use of them to improve sustainable agricultural production. Research will show how new molecular tools can best be used to reveal useful characteristics. Other tools will enable subsets of collections to be assembled and will assist in pre-breeding. Bioversity will also work to strengthen the links among genebanks, breeders and farmers so that each is better able to make use of the others' resources. The end result will be more material conserved more effectively and more widely used to improve the overall performance of poor farmers' agriculture.

Potato accessions maintained in an *in vitro* genebank.
C. Ynouye/CIP

Focus Area 4

Expanding

Conservation and sustainable use of forest and other wild species

We see: *In situ* conservation in protected areas and managed forests and *ex situ* conservation in genebanks and botanic gardens stem the loss of useful wild species. The widespread planting of wild species improves livelihoods.

There is a continuous spectrum between the utterly wild and the thoroughly domesticated, and while domesticated crops receive the lion's share of attention, people also make use of thousands of wild species for subsistence and for income. Chief among those that people use directly are forest species that supply timber and non-timber products. The wild relatives of crop species are also valuable to breeders for the many useful genes they possess. Wild species are often useful in themselves, for example as medicinal species, forages, and sources of timber and living fences. Farmers may also select and then make use of diversity introduced accidentally into their crops from the wild. Bioversity has a clear interest in the diversity of wild species, which are especially important to some of the world's most marginal groups of people living in forests and woodlands where agricultural production is uncertain.

Wild species are vulnerable in part precisely because they are wild; they usually have no property rights associated with them and so fall prey to overexploitation, environmental degradation, climate change and other impacts, human and otherwise. If the importance and value of wild species were better appreciated, that might help in their conservation, so Bioversity works with partners to analyse and document those values. One obstacle is that the thousands of important wild species differ in so many ways, for example in their biological characteristics, ecogeographic distribution, conservation status and type of use. This makes it essential to identify priorities and criteria so that insights derived from the careful study of a reasonably small number of species can be applied much more broadly.

Wild relatives of crops need to be conserved in the wild, where they can continue to evolve the characteristics that make them such important sources of traits to improve agricultural plants. Tree species must also be conserved in the wild, because most of them cannot be conserved in *ex situ* collections. Bioversity works with partners to develop strategies and mechanisms to conserve populations of useful wild species and, equally important, to promote them to relevant stakeholders. Forest trees pose particular challenges, partly because reafforestation efforts commonly reduce the diversity of the cut trees they replace. Also, plantations typically replace diverse multispecies forests with monocultures. Bioversity will work with partners to address these issues, and also to domesticate some species that are threatened by overexploitation in the wild.

Through this work, Bioversity expects to integrate criteria and indicators for sustaining the diversity of species harvested in the wild and to work with other players to ensure that they place sufficient emphasis on within-species diversity. It will also contribute to the protection of important populations, especially crop wild relatives, in protected areas. As a result these species will be better conserved and used and will thus make a more effective contribution to sustainably improved livelihoods.

Collecting wild relatives of crops in Lesotho.
Helen Moss/Bioversity International

Focus Area 5

Collaborating

International collaboration on conservation and use of agricultural biodiversity

We see: An improved system of global conservation and use, as foreseen by the International Treaty on Plant Genetic Resources for Food and Agriculture, is supported by robust and effective policies, a sound and sustainable funding framework and the necessary knowledge and evidence.

Agricultural biodiversity is essential to global food security and it cuts across national borders; no country's agriculture is independent. Global interdependence on the diversity of species important for food and agriculture requires the entire world community to be concerned about threats to such diversity, regardless of where they occur. Similarly, a global response is often appropriate. Cooperation at national, regional and global levels is needed to address scientific, policy and practical constraints on the efficient conservation and equitable use of genetic resources. Bioversity's role is to support such processes and to ensure that the specific requirements of agricultural biodiversity are understood and acted upon in international and regional plans and programmes.

Over roughly the past 35 years, collaborative initiatives on genetic resources have sprung up all around the world, often associated with a significant level of international participation. One such initiative is the collaboration of CGIAR-supported centres united in the System-wide Genetic Resources Programme. Bioversity has hosted the Secretariat of the SGRP since its inception, and will build on that experience to ensure close collaboration and representation in global efforts concerned with agricultural biodiversity. One of the most important efforts will be directed to developing the Global System envisaged by the International Treaty on Plant Genetic Resources for Food and Agriculture.

At the moment several elements of a global system exist, among them the genebanks of the CGIAR-supported centres and information systems such as SINGER, the System-wide Information Network for Genetic Resources. Bioversity will contribute to the development of a rational global system that can underpin the effective and efficient conservation and use of important plant genetic resources.

The negotiations of the International Treaty on Plant Genetic Resources for Food and Agriculture were successful at least partly as a result of Bioversity's provision of unbiased and technically sound policy analysis on behalf of the CGIAR centres. Work on policy will grow in importance as Bioversity helps countries to implement the Treaty and works with a range of stakeholders to ensure that they are able to take full advantage of the Treaty's provisions. In other areas too, Bioversity will use its policy expertise both to inform and to influence discussions. A more general aspect of policy is the need to ensure that potential participants do indeed appreciate the benefits of joining larger collaborations. Bioversity will work to facilitate processes that optimize collaboration, and will go beyond plants to become increasingly involved with international collaboration for the conservation and use of animals and microbes.

As a result, influential people around the world will be informed of the importance of the conservation and use of genetic resources and will respond with supportive policies. Mechanisms to encourage collaboration in the conservation and use of genetic resources will reinforce global political efforts, and increased awareness will prompt greater support. A more effective Global System, able to deliver the benefits of agricultural biodiversity, will result.

Farmers assessing diversity of upland rice, Nepal.
B. Sthapit/Bioversity International

Focus Area 6

Monitoring

Status, trends and valuation of agricultural biodiversity

We see: Bioversity makes available information on the status and trends of within-species diversity of economically important plants and promotes strategies and actions that will sustain this diversity and, better yet, reduce its loss.

Agricultural biodiversity continues to be lost around the world, and yet the extent of the changes and their causes are not fully understood. A key problem is that while the conventional benefits of biodiversity have been measured and recognized, especially in terms of the value of *ex situ* conservation, the broader range of benefits are not properly valued by decision-makers or societies. Complicating the matter, much of the value is shared between private and public goods. Thus, poor farmers maintain agricultural biodiversity and derive private goods from it, but they are neither recognized nor compensated for the wider public benefits to society at large—now and in the future—that flow from their efforts. To a large extent this is because tools for capturing these values are lacking. Assessing the status of genetic diversity and monitoring erosion and other trends is also hampered by lack of tools. There are currently no tested procedures for collecting, compiling, analysing and interpreting data on diversity over space or time for crop and forage production systems (as opposed to for specific genebank holdings or production areas).

Bioversity will work to fill the gaps, developing tools that can be applied locally, nationally and regionally. Case studies at regional and national levels will address selected target crops and wild species of socio-economic importance. Bioversity will also work with partners to ensure that they are able to use these tools to deliver the information on which sound policy decisions can be based. For banana and coconut, where it has a special mandate, the organization will play a more active role in carrying out global evaluations of status, trends and values.

Limited resources require rational decisions on what to conserve, where and how. Many international decisions and programmes of work have stressed the need not only to understand more fully the current status of genetic diversity but also to be able to monitor genetic erosion and other trends. Vital partners in all this area's activities will be national agricultural research systems, especially of developing countries, who will need training and tools in order to implement their obligations under the various agreements.

Bioversity expects to see countries able to report on status and trends among important crops and wild species and for this information to feed directly into various global commitments. Along with information from valuation studies, this will help policy-makers to take steps to reduce the rate of loss of biodiversity. However, real progress will occur only if societies develop a greater appreciation of the services and benefits delivered by agricultural biodiversity; raising public awareness is thus another crucial activity for this area of work.

Currently, few people around the world are able to make optimal use of diversity to meet their aspirations for the future. Bioversity is focusing on providing the scientific tools and approaches needed. Ultimately farmers and others will have access to the resources they need to adapt their systems to better meet their needs.

Planting rice in Madagascar.
A. Lane/Bioversity International

The Science Council of the CGIAR has established five sets of priorities to guide centre research. This table shows in dark green how each of Bioversity International's Focus Areas links with the CGIAR's priorities.

	Priority Area 1: Sustaining biodiversity for current and future generations				Priority Area 2: Producing more and better food at lower cost through genetic improvements				Priority Area 3: Reducing rural poverty through agricultural diversification and emerging opportunities for high-value commodities and products				Priority Area 4: Promoting poverty alleviation and sustainable management of water, land, and forest resources				Priority Area 5: Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger			
Focus Area	1a	1b	1c	1d	2a	2b	2c	2d	3a	3b	3c	3d	4a	4b	4c	4d	5a	5b	5c	5d
1	■	■			■				■				■				■	■	■	■
2	■				■	■	■									■		■		■
3	■	■				■														
4	■	■							■											
5	■	■	■	■													■			
6	■	■																		

Bioversity International

Major programme and regional offices

Headquarters
Via dei Tre Denari 472/a, 00057 Maccarese, Rome, Italy
Tel. (39) 06 61181
Fax: (39) 06 61979661
bioversity@cgiar.org

Bioversity - France
Parc Scientifique Agropolis II, 34397 Montpellier Cedex 5, France
Tel. (33) 467 611302
Fax. (33) 467 610334
bioversity-france@cgiar.org

Regional Office for the Americas
Bioversity, c/o CIAT, Apartado Aereo 6713, Cali, Colombia
Tel. (57-2) 445 0048; (57-2) 445 0049
Fax. (57-2) 445 0096
bioversity-colombia@cgiar.org

Regional Office for Asia, Pacific and Oceania
Bioversity, P.O. Box 236, UPM Post Office, Serdang,
43400 Selangor Darul Ehsan, Malaysia
Tel. (60-3) 8942 3891
Fax. (60-3) 8948 7655
bioversity-apo@cgiar.org

Regional Office for Central and West Asia and North Africa
Bioversity, c/o ICARDA, P.O. Box 5466, Aleppo, Syria
Tel. (963-21) 223 1412; (963-21) 227 3683; (963-21) 227 3686
Fax. (963-21) 227 3681
bioversity-cwana@cgiar.org

Regional Office for Sub-Saharan Africa
Bioversity, c/o ICRAF, P.O. Box 30677, 00100 Nairobi, Kenya
Tel. (254-20) 722 4500; (254-20) 722 4509
Fax. (254-20) 722 4501
bioversity-kenya@cgiar.org

Regional Office for Europe
c/o Bioversity Headquarters, Via dei Tre Denari 472/a, 00057 Maccarese,
Rome, Italy
Tel. (39) 06 61181
Fax. (39) 06 6118402
bioversity-europe@cgiar.org

Credits
Text: Jeremy Cherfas
Editor: Paul Neate
Design and layout: Patrizia Tazza
Printing: Quintily

Citation
Bioversity International. 2007.
Bioversity International in focus
Bioversity International, Rome, Italy.
ISBN: 978-92-9043-760-4

Cover photo:
A.Camacho/Bioversity International

Bioversity International,
Via dei Tre Denari 472/a
00057 Maccarese, Rome, Italy

IPGRI and INIBAP
operate under the name
Bioversity International

Supported by the CGIAR