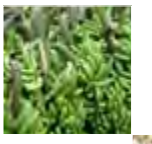
Sector Programme on Sustainable Management
of Resources in Agriculture

Agrobiodiversity – The key to food security and adaptation to climate change

Discussion paper

giz Sustainable management of resources in agriculture

BMZ On behalf of Federal Ministry for Economic Cooperation and Development



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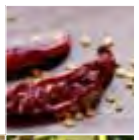

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Summary

What is agrobiodiversity? Biological diversity – or biodiversity – is the "variability" of living organisms. It includes diversity within species, between species and among ecosystems. Agrobiodiversity is part of biodiversity: it covers the species and their ecosystems that are used for agriculture.

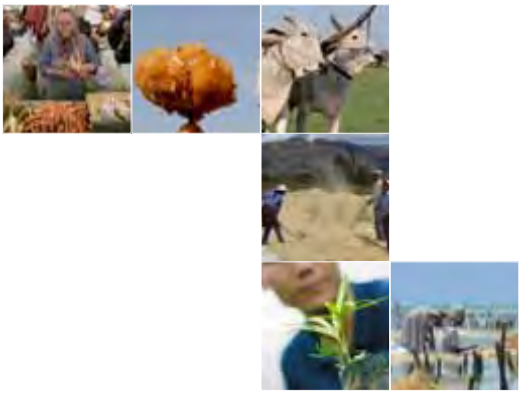
Loss of agrobiodiversity. Agricultural diversity has fallen sharply since the beginning of the 20th century in the industrial world, though this decline has since slowed. Today, genetic erosion is taking place mainly in the developing world, especially in tropical regions that initially had very high initial diversity. This loss of diversity in the tropics is also important for developed countries: it means the irretrievable loss of options to ensure food security and to adapt agriculture to climate change.

Importance of agrobiodiversity. Agricultural biodiversity makes it possible to use infertile land in a productive way, so contributing to the food security of people who are subject to poverty and hunger. In doing so, it boosts global farm production. Genetic diversity is crucial to enable agriculture to adapt to changes in the climate and the environment, for example through crops that tolerate heat or drought.

Causes of the decline in agrobiodiversity. Major reasons for the disappearance of species and varieties include the industrialization of agriculture, the introduction of genetically modified varieties, a lack of economic incentives to conserve biological diversity, and the increasing privatization of genetic resources.

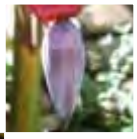
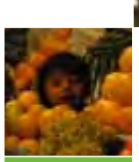
Existing agreements. In the past 50 years, three international agreements have been created that are relevant to biodiversity:

- The Convention on Biological Diversity (CBD) grants signatories the rights to the biological resources in their territories and requires them to maintain these resources. The Convention includes the Cartagena Protocol on Biosafety that aims to avoid the risks of gene technology.
- The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), administered by the World Trade Organization, deals with patenting issues for plants and animals.
- The International Seed Treaty (the International Treaty on Plant Genetic Resources for Food and Agriculture or ITPGRFA), requires member countries to maintain agricultural crops, ensure their free exchange, and recognize farmers as custodians and users of genetic diversity (this is known as "Farmers' Rights").



Action required. To enhance the conservation of agricultural diversity, it is necessary to place Farmers' Rights on the same legal footing as TRIPS and national legislation on seed. In terms of development policy, the incorporation of Farmers' Rights into national laws and regulations has high priority. Because many developing countries lack technical expertise on the links between biodiversity conservation, food security and poverty reduction, there is a considerable demand for advice to enable these countries to design appropriate policies. A further urgent task is to implement the Cartagena Protocol on Biosafety.

Such legislation must be accompanied by appropriate agricultural policies. These include targeted economic development (e.g., ensuring that biodiversity-related products have an economic value), developing infrastructure (such as creating gene banks at the farmers' level), research (e.g., breeding crops and animals to adapt to climate change), and training of specialists and raising awareness in this field. A separate policy area should not be created; rather, agricultural biodiversity should be incorporated as an integral part of existing initiatives.


1 Agrobiodiversity and its loss

What is agrobiodiversity?

Agriculture is an important but little-regarded component of biological diversity. Agricultural biodiversity is special because it was created by humans: it is a cultural asset. Ever since agriculture was developed over 10,000 years ago, farmers have bred crops and animals. Over time, farmers have created an enormous range of crops from more than 10,000 plant species. The resulting varieties are suited to different conditions. Each has its own characteristics and cultivation requirements, and produces a specific type of product. In India, for example, there were at one time up to 30,000 different local rice varieties. A similar process took place in livestock to create different breeds of cattle, sheep, goats, pigs, etc. Over the last 12,000 years, livestock keepers have developed more than 5,600 breeds of 40 species of animals.

Parallel to this biological diversity, farmers have developed detailed knowledge about how to protect, use and develop these crops and animals. This is closely linked to the emergence of humanity's enormous cultural diversity. The term "agrobiodiversity" encompasses this spectrum. It is a major contributor to our survival, providing us with food, clothing, fuel, building materials, medicines, spices, dyes and perfumes.

Agrobiodiversity has enabled humankind to colonize new habitats, build civilizations, cope with environmental changes, and survive in difficult locations. Agrobiodiversity plays a growing role outside the agricultural sector: in food processing, as raw materials for industry, in the pharmaceutical and cosmetics industries, and recently also for energy supplies.

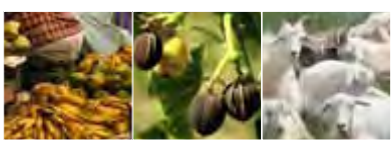
What are the implications of agrobiodiversity loss?

The rich diversity of crops and livestock has been declining for over 100 years. In developed countries most losses took place in the 20th century, though the rate of decline there has now slowed. But the trend continues unabated in developing countries. In China, for example, there were still 10,000 local varieties of wheat in 1949; today fewer than 1,000 are grown on a large scale. In other words, 90 percent of the wheat varieties have disappeared from farms in just half a century. The rapid fall in agricultural genetic diversity in the countries of the South is important for developed countries too: almost all the centres of biodiversity for crops – and many of those of livestock too – are found in the developing world.

Definition of agrobiodiversity:

Biodiversity is the diversity of life. The Convention on Biological Diversity defines biological diversity as "variability among living organisms". It includes the diversity of ecosystems, the range of species, and genetic diversity within species. The so-called functional diversity adds a fourth level, which considers the interactions within and between the other three levels.

Agricultural diversity, or agrobiodiversity, is part of biodiversity. It includes the ecosystems and species (including their wild forms) that are used for agriculture. In contrast to natural diversity, it was created by humans.



2 Why conserve agricultural biodiversity?

European history shows how risky the cultivation of just a few varieties can be. One example is the potato disease, late blight (*Phytophthora infestans*). In the 1840s, this disease was able to spread easily throughout Europe because all potatoes grown there were derived from only two varieties. In Ireland, this narrow genetic base led to the Great Famine, when more than one million people starved and another million emigrated.

At the start of the 21st century, we are still dependent on agrobiodiversity. We need it:

- for food security, especially in developing countries, and
- to enable farming to adjust to global environmental changes such as climate change and desertification.

2.1 Food security

Of the more than 925 million hungry people, around four-fifths live in rural areas. They are mainly farmers and livestock keepers. They are dependent on a wide range of local crop varieties and locally adapted breeds – which ensure their survival even in difficult environments. They do this even though the farmers use few inputs such as fertilisers, pesticides and irrigation. These people have few alternative sources of income. That means they can overcome hunger and poverty only by using the resources they have available in a better, more sustainable way.

Food is in short supply worldwide, and food prices are rising. The main reasons are:

- Continued population growth
- Changing diets, including a shift from plant to animal products and rising consumption of animal products in emerging and developing countries
- The associated increase in fodder production for livestock
- Competition for land from crops grown for biofuels

There is little opportunity to expand the world's agricultural production area significantly. But intensifying production in high-potential areas is not enough to overcome the shortage of food. At the same time, it is necessary to exploit the huge potential of agrobiodiversity to develop ecologically disadvantaged regions. In areas with low soil fertility and without reliable rainfall, local varieties often outperform high-yielding varieties, and mixed cropping significantly reduces the risk of total crop failure. They make it possible to stabilize and boost food production even without peak yields.

In many developing countries, edible wild plants and minor traditional local crops are important sources of food for people in rural areas, especially if harvests are poor and in times of crisis. Knowledge about these plants must be preserved because of its contribution to food security.

2.2 Adapting to climate change

Global warming is expected to have dramatic consequences for agriculture and food security, though the effects will be different from region to region. The first credible projections indicate that by the year 2080 the 40 poorest countries, located mainly in the tropics of Africa and Latin America, will lose up to 20 percent of their grain production capacity because of drought. Individual crops in rainfed areas have already reached the upper limits of their heat tolerance.

Adapting farming to climate change will soon be a central task for rural development efforts. Agricultural biodiversity is gaining new importance as "risk insurance" for the future.

Their genetic diversity gives plants and animals the ability to cope with challenges such as drought and rising temperatures. This adaptation is a dynamic process through which the organism comes to terms with its environment. Research in molecular biology has revealed the mechanisms responsible for the inheritance of adaptability to environmental influences. That means that drought-tolerant millet varieties, for example, should not only be stored for decades in a gene bank (this is known as *ex-situ* conservation). They must also be grown and bred in the field under various environmental conditions (called *in-situ* conservation) so they can adapt to the changing environment. At the same time, policies must ensure that the scale of environmental change does not exceed the potential of the organisms and ecosystems to adapt – otherwise a collapse could threaten previously stable systems.

The social dimension of climate change is also important. Poor people must be enabled to adapt to changing environmental conditions, and their traditional knowledge and social organization must be strengthened and further developed.

3 Problem areas

The reasons for the dramatic loss of biodiversity in agriculture are varied and complex. **Structural changes** in agriculture have played the most important role. Intensification has reduced diversity through such measures as increasing field sizes, the removal of hedges and field margins, more limited crop rotations and increasing monoculture, and the increased use of external inputs (chemical fertilizers and pesticides). Today, industrially oriented intensification is increasingly questioned, but not intensification itself.

The lack of **economic incentives** also has a major impact on the conservation of agrobiodiversity. Subsidies often support the use of high-yielding varieties and agrochemicals, and the expansion of large-scale monocultures. Encouraging the widespread cultivation of sugarcane for ethanol production in Brazil is an example of this. By contrast, there is an almost complete lack of support for breeding improved, locally adapted crops and livestock. There is a similar lack of encouragement for the marketing of products that help conserve agricultural diversity, such as certificates of origin or special labels.

Two developments are particularly of concern for developing countries: advances in biotechnology in agriculture, and the global enforcement of intellectual property rights for inventions related to plants and animals. We discuss these below.

3.1 Biotechnology and its impacts

In the last ten years, genetically modified (GM) crops have found a place in farming worldwide. Some 40 percent of the area cultivated with such crops is in a small number of developing and transition countries.

While the number of countries growing GM crops has remained more or less constant, the area of GM crops in these countries has risen. The four main GM crops are soybean, maize, cotton and rapeseed. Genetic engineering has introduced two characteristics into these crops: first, the plants are tolerant to a broad-spectrum herbicide, making it easier to control weeds; and second, the liquid in the GM plant cells has an insecticidal effect, protecting the plant against certain pests. But genetic engineering has so far failed to result in much progress towards food security. It has not yet raised the yield potential of food crops or made them more adaptable to environmental changes – such as raising their tolerance to drought or salt. Such innovations are still subject to traditional breeding.

The introduction of genetically modified varieties has made some types of intensive farming even more profitable. But it has speeded up the spread of monocultures, displaced biological diversity, and worsened the food situation. In Argentina, for example, large-scale monocultures of herbicide-resistant soybeans are replacing mixed smallholder farms, and the production of staple foods has been cut drastically.

A second problem is the unintentional crossing of genetically modified varieties with traditional varieties in centres of biodiversity. In Mexico, the uncontrolled introduction of genetically modified maize results in the genetic contamination of natural gene pools. The international agreement on biosafety (the Cartagena Protocol) could offer effective protection because it sets rules for the cross-border movement of viable genetically modified organisms. But only a few countries have implemented the protocol.

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Biotechnology has also led to a significant concentration in the seed industry. In 2007, two-thirds of the global seed market was controlled by just ten seed companies. For genetically modified seeds, the market is effectively dominated by a single firm: around 90 percent of the area under GM crops is planted to varieties originating directly or indirectly from the company Monsanto. This makes farmers dependent and farming systems genetically uniform. It also means that the private sector exerts increasing control over genetic resources through patents and licenses. This limits others' breeding strategies and programmes.

Genetic engineering has so far offered no answers to the global challenges of food security and adaptation to climate change. The possible risks that it poses to biodiversity are unclear and difficult to monitor. The cultivation of GM crops is still concentrated in a few countries, but many other countries import such crops, creating the need for biological safety systems so as to minimize the risks to biodiversity and human health.

3.2 Intellectual property rights and rights of farmers

The trend towards privatization of genetic resources also plays an important role in the decline of agricultural biodiversity. Trends include the granting of intellectual property rights such as patents, as well as the increasing dominance of a small number of firms or even monopolies by a single firm in certain fields. These trends limit producers' access to genetic resources and make it difficult for farmers to use traditional practices, such as sowing seed they have harvested themselves. But it is precisely such traditional practices that make it possible for small farmers in developing countries to do their own breeding and selection and to conserve and develop agrobiodiversity.

In addition, intellectual property rights may affect agricultural research. For example, many medium-sized plant breeders find it difficult to get suitable breeding material, which is a prerequisite for breeding new varieties. While intellectual property rights are an important driver of innovation and technology transfer, a level of protection that is too stringent and one-sided does not meet the socio-economic needs of many developing countries.

Increasing competition between different interest groups over the use of genetic resources has serious socio-economic impacts. This is the result of the demand for fair access and benefit sharing under the Convention on Biological Diversity. In essence, traditional users and industry have opposing interests. Farmers and livestock keepers in traditional communities regard plants, animals and micro-organisms as common property which they reproduce, maintain and bequeath to future generations. They are usually unaware of the potential value of such genetic resources and the associated knowledge to industry. Unlike commercially raised and marketed plant varieties and animal breeds, these local resources are not subject to legal protection. Such farmers and livestock keepers do not participate in government research and breeding programmes, and have little influence over issues relating to the maintenance, improvement and utilization of genetic resources.

The International Seed Treaty recognizes so-called "Farmers' Rights" and calls on signatories to implement them. These aim to ensure that farmers benefit fairly from outsiders' use of their traditional varieties, are enabled to take part in government decisions on issues related to the conservation and use of agricultural genetic resources, and can continue exercising their traditional practices subject to national legislation.

Industry, on the other hand, sees private intellectual property rights on cultivated plants and animals as a way to obtain protection for its extensive research, innovation and product development in

this field. To secure such rights, it is necessary to control the propagation of the genetic material. By using plant breeders' rights or patents, for example, it seeks to protect its investment in past and future research and development.

These different claims to ownership over genetic resources lead to increasing conflicts between rural people and industry. The battle is becoming more intense, and is being fought with unequal means. Civil society representatives accuse certain companies of biopiracy, while the private sector and developed countries accuse farmers of patent infringements, for example in the illegal proliferation of GM soybeans in Argentina. The privatization of genetic resources and the creation of monopolies have negative effects on the conservation and development of agrobiodiversity.

4 International initiatives

Discussions about the conservation, use and development of agrobiodiversity go back 50 years. During this time, various sets of rules and institutions have emerged. These include the International Seed Treaty, the most important agreement for agriculture, which is based on a resolution of FAO (the Food and Agriculture Organization of the United Nations) passed in 1959. The Convention on Biological Diversity was negotiated between 1990 and 1992 in the run-up to the "Earth Summit" in Rio de Janeiro. Parallel to these and largely independently from them, agreements on the protection of trade-related intellectual property rights (TRIPS) were developed as part of the process of creating the World Trade Organization. It is now necessary to harmonize these three major sets of rules in relation to the conservation and sustainable use of agrobiodiversity, and to specify how they should work in detail.

4.1 Convention on Biological Diversity

The 1992 United Nations Conference in Rio de Janeiro passed the internationally binding Convention on Biological Diversity (CBD). The Convention has three objectives:

- the conservation of biodiversity,
- its sustainable use, and
- the fair and equitable sharing of benefits arising from the use of genetic resources (access and benefit sharing, ABS)

Before then, genetic resources were often regarded as the common heritage of mankind, and it was assumed that they should be freely accessible to all. Rio saw a paradigm shift. Drawing on the principle of national sovereignty, the CBD recognized the rights of states to regulate access to genetic resources in their territories.

In 1996, the CBD signatories launched a programme for the conservation of agricultural biodiversity. This is regularly reviewed and updated. However, it is very general and is not seen as a high priority in the CBD process. Currently, the topics of agrobiodiversity, climate change and biofuels are under discussion in this context. These also played a prominent role at the CBD Conference of the Parties in Bonn in May 2008 (COP 9) and in Nagoya, Japan (COP 10) in October 2010.

The Cartagena Protocol on Biosafety was adopted in 2000. This stipulates that the import of genetically modified plants intended for cultivation may occur only with the consent of the importing country. It applies the precautionary principle, which requires someone taking an action (such as importing a GM crop) to prove that the action will not result in harm. It allows signatory states to restrict or ban imports even if there is no conclusive evidence that the GM organism might cause damage. International shipments of GM organisms capable of reproduction but not intended for cultivation, are regulated by an internet-based information system, the Biosafety Clearing House.

4.2 Agreement on Trade-Related Aspects of Intellectual Property Rights

As part of negotiations that led to the creation of the World Trade Organization (WTO), the Agreement on Trade-Related Aspects of Intellectual Property Rights, TRIPS) was adopted in 1994. This obliges the signatory states to introduce protection for intellectual property (usually in the form of patents) in all fields of technology, specifically in biotechnology. This protection also extends to living organisms. However, the TRIPS agreement permits the exclusion of plants and animals from patent protection. In such a case for plants, however, a special (*sui generis*) system of protection, or a combination of patents and a *sui generis* system, has to be introduced.

Such a special protection system already exists in the form of "Plant Variety Protection", established under the International Convention for the Protection of New Varieties of Plants (UPOV). But there is disagreement about the right of farmers to plant and reproduce seed of a protected variety on their own farms (the "farmers' privilege"). There is also

disagreement about how far it is possible to protect traditional varieties and the rights of farmers to exchange seeds and seedlings among themselves ("Farmers' Rights") at the same time as maintaining patents and protecting plant breeders' rights. Without plant breeders' rights and without Farmers' Rights, the conservation and sustainable use of agricultural biodiversity would be severely restricted

4.3 International Seed Treaty

The International Seed Treaty (International Treaty on Plant Genetic Resources for Food and Agriculture, ITPGRFA) was adopted by the members of the Food and Agriculture Organization (FAO) in 2001. It is an international agreement based on FAO's constitution. The treaty obliges member states to conserve their plant genetic resources for food and agriculture in accordance with the CBD, to ensure their sustainable use, and to share equitably the benefits arising from their use via information exchange, technology transfer and capacity building. The treaty also recognizes "Farmers' Rights": the traditional rights of farmers as producers, maintainers and developers of agrobiodiversity. Farmers' Rights include:

- The protection of farmers' traditional knowledge of plant genetic resources,
- The equitable sharing of the proceeds arising from their use,
- Participation in decisions on issues related to conservation and sustainable use of these resources, and
- Their right to keep seeds and planting materials grown on their farms, to plant them, to share them with others and develop them.

The implementation of Farmers' Rights is the responsibility of the signatory states.

The International Seed Treaty established a multilateral system to facilitate access to plant genetic resources for food and agriculture. It also created a system for sharing benefits, covering 64 food and forage crops of special importance for food security. This is in essence an association of national and international gene banks. For them, it provides for the exchange of genetic material between the parties and the equitable sharing of benefits arising from commercial use. It enables them to do this on the basis of standard contracts and without the need for negotiations.

The International Seed Treaty has resulted in an improved multilateral exchange of genetic materials and has strengthened joint efforts to preserve seeds and planting materials in gene banks (this is known as "*ex-situ* conservation"). The conservation of plant genetic resources by farmers in the field ("*in-situ* conservation") and their sustainable use are key provisions of the treaty. But implementation, concepts and funding for this aspect are lacking.

As a signatory to all three agreements, Germany is committed to implement them at home as well as to support its partners do so through development cooperation activities.

5 Action required

5.1 International policy dialogue

The main points to secure intellectual property rights and conserve agricultural biodiversity are now subject to international regulation. In October 2010, the 10th Conference of the Parties of the CBD in Nagoya adopted an international agreement on access and benefit sharing. In addition, developing and some developed countries demand that the TRIPS agreement be adapted to the CBD. There is a need for improved coordination and cooperation between the organizations that oversee the treaties and with relevant United Nations agencies. And finally, it is necessary to implement the Cartagena Protocol on Biosafety.

CBD and the International Seed Treaty. Cooperation should be intensified between the United Nations Environment Programme (UNEP), which is responsible for the CBD, and the Food and Agriculture Organization of the United Nations (FAO), which is responsible for the International Seed Treaty. The work programmes of the signatory states and the secretariats of the two agreements and other concerned international organizations should be more closely coordinated to avoid duplication and exploit synergies. In addition, civil society should be more involved in international negotiations on the implementation of the International Seed Treaty.

Farmers' Rights. In view of their major role in development, the International Seed Treaty secretariat should accord more attention to Farmers' Rights, and the signatory states should support their national implementation. This could be done through:

- Documentation, analysis and dissemination of experiences gained in the implementation of Farmers' Rights,
- The development of voluntary guidelines to assist member states in implementing Farmers' Rights, since the treaty itself describes such rights only in a vague way, and
- Financial support for the development of concepts and implementation of Farmers' Rights and the training of technical specialists.

TRIPS Agreement. The current review of the TRIPS Agreement (particularly Article 27.3.b) should be used to consider the interests of agrobiodiversity conservation, to ensure that the TRIPS Agreement is compliant with the provisions of the CBD and the International Seed Treaty, and to promote the implementation of these provisions. Specifically this involves:

- The recognition of documentation systems (such as biodiversity registers) to protect traditional knowledge from patenting,
- The prohibition of patents that contradict the objectives of the CBD and the International Seed Treaty,
- A mandatory requirement that patent applications must specify the geographical origin and legal status of the genetic resources used, and
- The exclusion from patenting of conventionally bred plants and animals, including those where patented methods are used to describe them. This would, for example, invalidate patents that have been granted for pigs and broccoli.

5.2 Support for partner countries

National laws and regulations. Many developing countries lack expertise on the relationships between TRIPS, biodiversity conservation, food security and poverty reduction. Their governments have a significant need for advice so they can design appropriate policies. Important areas for action are:

- Legislation on patents and plant breeders' rights must be designed so that it permits traditional seed-multiplication and exchange practices and ensures the preservation of traditional knowledge.
- For biodiversity conservation, it would be best to exclude plants and animals completely from patent applications. If this is not possible, then at least the existing flexibility of the TRIPS Agreement should be exploited to exclude plants and animals from patenting as far as possible.
- National patent laws should be designed to support the implementation of access and benefit sharing of the Convention on Biological Diversity. In particular this means:
  - Requiring patent applications to indicate the geographical origin of the genetic resource(s),
  - Requiring applications to provide evidence of compliance with national legislation on access and benefit sharing,
  - Rejecting patent applications if those requirements are not met, and
  - Imposing sanctions for providing false information.
- Measures should be taken to avoid the unintended contamination of seeds and other genetic resources by genetically modified plants, animals and micro-organisms. Centres of biodiversity are especially in need of protection. For the implementation of the Cartagena Protocol on Biosafety, this means:
  - Adoption of national legislation on biosafety,
  - Building biosafety authorities to implement these laws,
  - Information and awareness raising, and
  - Promoting networks of government and civil society actors at national and regional levels.

Agricultural policy action is required in the following areas:

- Economic development. The potential of agrobiodiversity should be used to develop new markets. However, trade must take into account the provisions of the CBD and the International Seed Treaty.

  It is necessary to develop criteria, certification procedures and control systems for the sustainable use of agricultural biodiversity, especially for the promotion of international trade in agricultural commodities and foodstuffs.
- Infrastructure development. Gene banks at the farmers' level should be promoted. They enable genetic resources to be maintained in current land-use systems (*in situ*) and on individual farms.
- Research. The adaptation of crops and livestock to climate change (e.g., tolerance to drought, heat and flooding) will become more important in the future. The systematic use of agricultural genetic resources for intensification, especially in marginal areas (e.g., improving nutrient uptake by crops) will also rise in priority. Greater research in these areas is needed.
- Financial fund. It is important to establish national development funds to support those farmers who invest in the conservation and use of agrobiodiversity. Such funds could support programmes to promote certification of origin, to produce organic products or plant-based medicines, and to add value to products. The marketing of regional agricultural biodiversity products should also be supported with funds from such a development fund.
- Specialist training and public awareness. Priority should be given to developing local specialists to improve the understanding of agrobiodiversity, its

importance, and the role of Farmers' Rights. The same applies to promoting awareness among the general public of these issues.

Overall, care should be taken that the "protection and use of agricultural diversity" does not result in the creation of a separate domain for policy and action. Rather, agrobiodiversity should be seen as an integral aspect of existing areas of work – as indeed is in accordance with Article 6 of the Convention on Biological Diversity. This is true for general agricultural policy concerns as well as specific programmes to combat hunger, alleviate poverty, develop the rural economy or promote health.

Annexe

GIZ's agrobiodiversity portfolio

Context

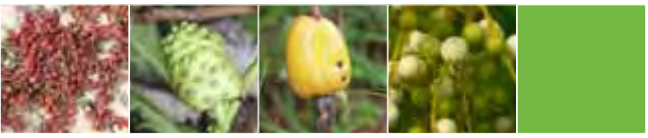
Germany has played a leading role in international efforts to protect biodiversity. This was also true for the 9th Conference of the Parties on Biological Diversity (COP 9 CBD[1]) in May 2008 in Bonn. For the period 2009–12, the Federal Chancellor made available the additional sum of €500 million for the protection of international forests and ecosystems. This facility for biodiversity and forest protection is managed under the auspices of the Federal Ministry for Economic Cooperation and Development (BMZ). As a major donor, Germany is positioned as a leader in facing the challenges in the United Nations Decade of Biodiversity (2011–20), which follows the International Year of Biodiversity in 2010. It presents an opportunity to redirect and systematically expand Germany's development cooperation in the fields of biodiversity, agrobiodiversity and forest conservation.

GIZ has allocated high priority to biodiversity for many years. The agency's agrobiodiversity unit has more than 10 years of experience and is now part of the sector programme that deals with sustainable resource use in agriculture. The unit deals with the conservation and use of agrobiodiversity in its widest sense. Its main responsibilities are:

- Supporting projects through funding acquisition, feasibility studies, the preparation of tenders, participation in planning workshops and staff training.
- Advising the Federal Ministry for Economic Cooperation and Development on policy options, representing Germany in international forums, and ensuring that agrobiodiversity-related issues are covered in national and international discussions.
- Promoting public awareness by participation in exhibitions and events and through newspaper articles.
- Knowledge management by preparing studies, progress reports and fact sheets on current and future-oriented topics related to agrobiodiversity.

The agrobiodiversity unit offers services – especially for projects – and provides support on a wide range of topics. By networking and cooperating with other biodiversity initiatives and experts at home and abroad, the unit is able to deal with complex issues in an interdisciplinary way.

The need to make agrobiodiversity a funding priority in development cooperation is indisputable. But it is less clear what this might look like in practice. The following paragraphs describe the main areas for possible interventions, along with possible activities. This compilation is based on recurring themes and questions on the conservation and development of agrobiodiversity. They are relevant to GIZ projects on biodiversity, or as components of projects in resource management and agriculture, climate and food security as well as in agricultural research, policy and trade promotion. The endnotes provide further in-depth information.



Action area 1
Biodiversity, resource management and agricultural development

1.1 Inventory and monitoring of plant and animal genetic resources

Many developing countries are suffering a dramatic loss of genetic diversity in agriculture. Local varieties are being displaced by high-yielding varieties, and local livestock breeds are increasingly threatened with extinction. That means the loss of important characteristics for breeding. To save this diversity, it is important to know first what it consists of.

Important activities include:

- The identification, collection, description and documentation of local varieties (cereals and vegetables, fruit and other food crops) including wild relatives, and local animal breeds. Important tools include biodiversity registers and biocultural protocols.
- Detection and screening of local plant varieties and animal breeds in terms of their suitability for adaptation to climate change[2,3] and use for food and in industry.
- Development of practical monitoring systems to assess changes in agrobiodiversity in land-use systems and rural areas.

1.2 Conservation strategies

Strategies to conserve agricultural biodiversity are largely confined to *ex-situ* conservation. For crops, this means that seeds are stored in gene banks outside their natural habitat (usually frozen). While such *ex-situ* gene banks are necessary, this form of conservation is expensive, can handle only limited quantities, and prevents the crops from adapting themselves to environmental changes (such as climate change[4]). It is therefore urgent that *ex-situ* conservation be complemented by *in-situ* methods.

Important activities include:

- The restoration of *ex-situ* populations in their natural habitats and in farm settings.[5]
- The development of *in-situ* gene banks[6,7] at the local level (for example, drawing on material from international agricultural research centres and national gene banks).
- Participatory land-use planning and agrobiodiversity conservation, e.g., through the designation and management of protected areas at the village and district levels.
- Promoting the sustainable collection of wild plants (e.g., through FairWild and the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP)).

1.3 Plant breeding and seed distribution

It is not enough to merely conserve agricultural genetic diversity; it must also be developed further so as to improve food security, identify new utilization potential and enable agriculture to adapt to climate change. Current crop breeding methods, breeding organizations and seed distribution are insufficient. The activities below are highly innovative because they serve smallholders who are rarely covered by the formal seed sector, even though this market offers considerable potential.

Important activities include:

- Balancing between market and nutritional requirements when developing varieties and utilizing varieties that have special properties.
- Establishing national breeding objectives and breeding programmes with the participation of various stakeholders, including farmers, scientists, politicians and the private sector.
- Research to optimize plant breeding and the development of appropriate breeding strategies (e.g., the role of evolutionary, participatory plant breeding, which relies on selection under different environments with farmers).
- The expansion of established breeding methods with evolutionary plant breeding to develop superior local varieties, which can produce stable yields even under adverse conditions thanks to their high genetic diversity, so are superior to conventional high-yielding varieties.[8]
- The development of new ways to organize breeding and new models for ownership of varieties (such as open-source) with the participation of farmers' groups (participatory plant breeding[9]).
- The development of new enterprise forms and business models for the propagation and distribution of seeds in smallholder areas.[10]

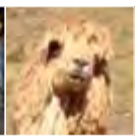
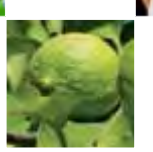
1.4 Biosafety and coexistence

Finally and not least, it is necessary to examine ways for local and genetically modified varieties to coexist, in conformance with the Cartagena Protocol on Biosafety, in order to protect biodiversity-rich areas from contamination by GM varieties.[11].

Important activities include:

- The adoption of national legislation on biosafety.
- The development and strengthening of biosafety authorities.
- The development of strategies and legislation to enable genetically modified and unaltered crops to coexist.[12].
- The preparation of the necessary scientific information and baseline studies.
- The provision of objective information and lessons based on experience for policy makers and the public.
- Awareness-raising, public communication and networking on biosafety and coexistence.



Action area 2

Biodiversity and agricultural research

As part of a development cooperation effort, research on agrobiodiversity must be highly applied. Themes include monitoring, conservation and sustainable use and development of agro-genetic resources. Agrobiodiversity research is dominated by the approaches used in agricultural science; they are complemented by other natural sciences.

Important research topics include:

- The development and maintenance of "red lists" of endangered agricultural varieties and breeds.
- The monitoring of invasive species and targeted risk analysis.
- The monitoring of wild relatives.
- The development of national strategies to combine ex-situ and in-situ conservation of plant genetic resources.
- The systematic reintroduction of varieties stored in the gene banks of agricultural research centres into national in-situ gene banks and in farming situations.
- Baseline studies on the economic value of agrobiodiversity ecosystem services, analogous to The Economics of Ecosystems and Biodiversity (TEEB) initiative,[13] such as pollination, soil fertility and plant protection.

Action area 3

Biodiversity and agricultural policy

Many of Germany's development partners have a great need for advice in designing agricultural policy and legislation. This is true among government agencies as well as in civil society organizations in each country.

Important activities include:

Implementation of international agreements

- The implementation of Farmers' Rights[14] (subject to the International Seed Treaty[15,16]). This concerns the conservation of traditional knowledge, participation of farmers in policy making that affects plant genetic resources, and the right of farmers to practise traditional seed management.
- Implementation of the Cartagena Protocol on Biosafety in accordance with Convention on Biological Diversity.
- Implementation of the Nagoya Protocol on access and benefit sharing in the use of agricultural genetic resources.
- Implementation of the action plan for animal genetic resources and the Interlaken Declaration, which promotes the sustainable use, development and conservation of animal genetic resources for food and agriculture.[17]

Agricultural policy

- Adaptation of legislation on plant variety protection and patent protection to international standards (CBD, International Seed Treaty, UPOV[18]) and national requirements (in terms of agriculture, the conservation and development of locally adapted varieties; and from an economic perspective, the promotion of a national seed sector).
- Remuneration of farmers for the conservation of landscapes and agricultural biodiversity (payment for environmental services).
- Determining the importance and use of transgenic varieties and their impact on agrobiodiversity.[19]
- Consideration of property rights for agricultural genetic resources in trade agreements.[20]
- Promotion of cross-sectoral cooperation in agricultural policy in recognition of the cross-cutting nature of agrobiodiversity.

Capacity building

- • Capacity building of policy makers to enable them to contribute actively to international negotiations (CBD, International Seed Treaty, UPOV).
- • Capacity building of specialists to enable the national implementation of the International Seed Treaty[21]).


Action area 4
Biodiversity and economic development

To conserve agricultural genetic resources, it is not enough merely to store them in gene banks; they must also be used. Proven strategies are now available to create value of "neglected" crops and products that previously had no economic significance. These make it possible to create new value chains and to improve existing chains, so reducing rural poverty. Some approaches to product differentiation have been tried and tested; others need further development.

Important activities include:

- The development of value chains for products[22,23]
- a) with geographical indications[24]
  b) from (certified) organic or sustainable agriculture
  c) from sustainable collection of wild plants[25]
  d) according to Nagoya protocol on access and benefit-sharing, and
  e) in the field of agrotourism.[26,27]
- Advising the private sector on product differentiation.[28]
- Consulting with civil society (farmers, the public, etc.) to safeguard their interests.
- Assisting government authorities to design appropriate legal and institutional frameworks to create sustainable value for agrobiodiversity.[29]
- Promoting policies to integrate agrobiodiversity products into state-sponsored initiatives, such as nutrition programmes (e.g., school kitchens), public canteens, state tourism initiatives, and special events (e.g., fairs and sporting events).
- Promoting the seed sector (technical, legal and business aspects).
- Promoting voluntary services by the seed industry to conserve biodiversity.

Action area 5
Biodiversity and disaster prevention and reconstruction

During emergencies such as drought, flood and civil war, seeds from other regions – often high-yielding varieties – are frequently distributed. But in adverse conditions and with low inputs of fertilizer and pesticide, they may yield poorly. It is often better to rely instead on native varieties and breeds, sourced through local markets and traders, because they are better adapted to local conditions and can result in higher yields.[30]

Important activities include:

- Identification and analysis of seed systems and animal stocks (before an emergency occurs).
- Development and implementation of good-practice guidelines to ensure that the agrobiodiversity is considered in disaster relief.
- Development of ways to procure seeds, planting material and breeding animals from local and regional sources. Examples include credit for traders to transport and store seed from the region, vouchers to enable farmers to buy seed, and the organization of seed markets.
- Including agrobiodiversity in the training of disaster-relief specialists.

Action area 6
Biodiversity and climate change

Agriculture is one of the sectors most affected by climate change. The already noticeable effects of global warming have been markedly different from region to region. They affect agriculture mainly through the rising number of extreme weather events, droughts, floods and rising temperature. The genetic diversity of plants and animals offers a means to cope with climate change.

Important activities include:

- Screening and identification of local plant and animal varieties, breeds and species for their ability to adapt to climate change (e.g., tolerance to stress, heat, flooding and drought).
- Establishment of gene banks at local, regional and national levels to protect this diversity.
- Breeding programmes with farmers, the private sector and research organizations to develop customized crop varieties and livestock breeds.
- Advice to farmers and farmers' organizations on how to adapt their enterprises and production systems to climate change (crop diversification to minimize risk).



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More information / Internet addresses

1 Convention on Biological Diversity www.cbd.int

2 Issue Paper: Landraces. Allies in the fight against animal epidemics: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-fundamentals.zip

3 Issue Paper: Agrobiodiversity and climate change – A complex relationship: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-crisis-situations.zip

4 Issue Paper: Agrobiodiversity and climate change – A complex relationship: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-crisis-situations.zip

5 Issue Paper: Deep-frozen? Alive and kicking? Different approaches to the conservation on farm animal diversity: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-fundamentals.zip

6 Issue Paper: Landraces. Allies in the fight against animal epidemics: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-fundamentals.zip

7 Issue Paper: Farmers as bankers – Community seed banks: www.gtz.de/de/dokumente/gtz2008-en-agrobiodiv-generating-economic-value.zip

8 Issue Paper: Biodiversity and agricultural intensification – How farmers' varieties can contribute: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-fundamentals.zip

9 Issue Paper: Farmers as breeders – Participatory plant breeding: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-fundamentals.zip

10 Issue Paper: Markets make a come-back – Diversity displays and seed fairs: www.gtz.de/de/dokumente/gtz2008-en-agrobiodiv-generating-economic-value.zip

11 Issue Paper: Genetic engineering in agriculture: How does it impact on biodiversity?: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-fundamentals.zip

12 Issue Paper: A question of coexistence – Genetically engineered crop plants in farmers' fields: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-fundamentals.zip

13 www.teebweb.org

14 www.farmersrights.org

15 www.planttreaty.org

16 Issue Paper: The International Treaty on Plant Genetic Resources – Status of implementation: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-managing-agrobiodiversity.zip

17 www.fao.org/docrep/010/a1404e/a1404e00.htm

18 www.upov.int/index_en.html

19 Issue Paper: Genetic engineering in agriculture: How does it impact on biodiversity?: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-fundamentals.zip

20 Issue Paper: The role of intellectual property rights in agriculture: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-managing-agrobiodiversity.zip

21 Issue Paper: International Treaty on Plant Genetic Resources for Food and Agriculture: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-managing-agrobiodiversity.zip

22 Issue Paper: Promoting the diversity of useful plants and animal breeds through marketing. The example of the Schwäbisch–Hällische Landschwein pig: Agrobiodiversity and climate change – A complex relationship: www.gtz.de/de/dokumente/gtz2008-en-agrobiodiv-generating-economic-value.zip

23 Issue Paper: Value chains and the conservation of biodiversity: www.gtz.de/de/dokumente/gtz2008-en-agrobiodiv-generating-economic-value.zip

24 Issue Paper: Creating value from products with protected designations to conserve agricultural diversity: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-managing-agrobiodiversity.zip

25 Issue Paper: Utilising biodiversity – Cui bono? The case of stevia, the sweetener of the Guaraní people: www.gtz.de/de/dokumente/gtz2008-en-agrobiodiv-generating-economic-value.zip

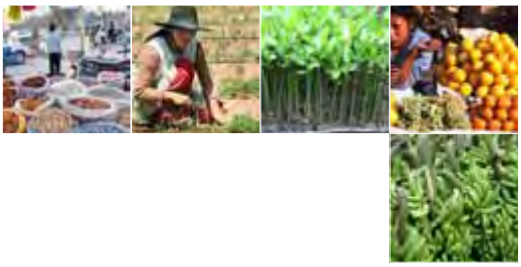
26 Issue Paper: Agrotourism and agricultural diversity: www.gtz.de/de/dokumente/gtz2008-en-agrobiodiv-generating-economic-value.zip

27 Issue Paper: Maintaining and promoting agricultural diversity through tourism: www.gtz.de/de/dokumente/gtz2008-en-agrobiodiv-generating-economic-value.zip

28 Issue Paper: Promoting the diversity of crop plants and animal breeds through marketing. Example: Fine flavor cocoa from Ecuador: www.gtz.de/de/dokumente/gtz2008-en-agrobiodiv-generating-economic-value.zip

29 Issue Paper: Value chains and the conservation of biodiversity: www.gtz.de/de/dokumente/gtz2008-en-agrobiodiv-generating-economic-value.zip

30 Issue Paper: A basis for a better future: Agrobiodiversity and emergency response: www.gtz.de/de/dokumente/gtz2010-en-agrobiodiv-crisis-situations.zip



The GTZ/GIZ web site is currently being redesigned. The documents listed above will be available later this year at other links.
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