What is Agricultural Biodiversity?

Agricultural biodiversity is a broad term that includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agricultural ecosystems, also named agro-ecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem, its structure and processes (COP decision V/5, appendix).

Agricultural biodiversity is the outcome of the interactions among genetic resources, the environment and the management systems and practices used by farmers. This is the result of both natural selection and human inventive developed over millennia.

The following dimensions of agricultural biodiversity can be identified:

1) Genetic resources for food and agriculture:

- Plant genetic resources, including crops, wild plants harvested and managed for food, trees on farms, pasture and rangeland species,
- Animal genetic resources, including domesticated animals, wild animals hunted for food, wild and farmed fish and other aquatic organisms,
- Microbial and fungal genetic resources.

These constitute the main units of production in agriculture, and include cultivated and domesticated species, managed wild plants and animals, as well as wild relatives of cultivated and domesticated species.

2) Components of biodiversity that support ecosystem services upon which agriculture is based. These include a diverse range of organisms that contribute, at various scales to, *inter alia*, nutrient cycling, pest and disease regulation, pollination, pollution and sediment regulation, maintenance of the hydrological cycle, erosion control, and climate regulation and carbon sequestration.

3) Abiotic factors, such as local climatic and chemical factors and the physical structure and functioning of ecosystems, which have a determining effect on agricultural biodiversity.

4) Socio-economic and cultural dimensions. Agricultural biodiversity is largely shaped and maintained by human activities and management practices, and a large number of people depend on agricultural biodiversity for sustainable livelihoods. These dimensions include traditional and local knowledge of agricultural biodiversity, cultural factors and participatory processes, as well as tourism associated with agricultural landscapes.

Why is Agricultural Biodiversity Important?

Biodiversity and agriculture are strongly interdependent

Biodiversity is the basis of agriculture. It has enabled farming systems to evolve ever since agriculture was first developed some 10,000 years ago. Biodiversity is the origin of all species of crops and domesticated livestock and the variety within them. It is also the foundation of ecosystem services essential to sustain agriculture and human well-being. Today's crop and livestock biodiversity are the result of many thousands years of human intervention.

Biodiversity and agriculture are strongly interrelated because while biodiversity is critical for agriculture, agriculture can also contribute to conservation and sustainable use of biodiversity. Indeed, sustainable agriculture both promotes and is enhanced by biodiversity. Maintenance of this biodiversity is essential for the sustainable production of food and other agricultural products and the benefits these provide to humanity, including food security, nutrition and livelihoods.

Importance of agricultural biodiversity

Biodiversity is essential to:

- ensure the production of food, fibre, fuel, fodder...
- maintain other ecosystem services
- allow adaptation to changing conditions - including climate change
- and sustain rural peoples' livelihoods

Agricultural biodiversity provides humans with food and raw materials for goods - such as cotton for clothing, wood for shelter and fuel, plants and roots for medicines, and materials for biofuels - and with incomes and livelihoods, including those derived from subsistence farming. Agricultural biodiversity also performs ecosystem services such as soil and water conservation, maintenance of soil fertility and biota, and pollination, all of which are essential to human survival. In addition, genetic diversity of agricultural biodiversity provides species with the ability to adapt to changing environment and evolve, by increasing their tolerance to frost, high temperature, drought and water-logging, as well as their resistance to particular diseases, pests and parasites for example. This is particularly important regarding climate change. The evolution of biodiversity, and therefore both its and our survival, mainly depends on this genetic diversity.

The importance of agricultural biodiversity encompasses socio-cultural, economic and environmental elements. All domesticated crops and animals result from human management of biodiversity, which is constantly responding to new challenges to maintain and increase productivity under constantly varying conditions.

Special nature of agricultural biodiversity

The Conference of the Parties has recognized "the special nature of agricultural biodiversity, its distinctive features, and problems needing distinctive solutions" (COP decision V/5, appendix).

Indeed, several features set agricultural biodiversity apart other components of biodiversity:

- Agricultural biodiversity is essential to satisfy basic human needs for food and livelihood security.
- Agricultural biodiversity has been - and is still - shaped and developed through human activities and practices over generations. Farmers' communities play a key role as custodians and managers of agricultural biodiversity. This is why local and traditional knowledge and culture are considered as integral parts of agricultural biodiversity management.
- Because of the degree of human management, conservation of agricultural biodiversity in production systems is inherently linked to sustainable use.
- Nonetheless, much agricultural biodiversity is now conserved *ex situ* in gene banks or breeders' materials.
- For crops and domestic animals, diversity within species is at least as important as diversity between species and has been greatly expanded through agriculture.
- Many farming systems are based on alien crop species introduced from elsewhere; this creates a high degree of interdependence between countries for the genetic resources for food and agriculture.
- The interaction between the environment, genetic resources and management practices that occurs *in situ* within agro-ecosystems often contributes to maintaining a dynamic portfolio of agricultural biodiversity.

What's the Problem?

Agriculture has to face two main challenges in relation with biodiversity:

- to sustain agricultural biodiversity and ecosystem services provided by, and necessary for, agriculture, and
- to mitigate the negative impacts of agricultural systems and practices on biodiversity which is not used directly whether in the same or other ecosystems.

To address these challenges, agriculture is required to take into account different drivers of change such as:

- indirect drivers, e.g. demography (and the expected major growth world population and food demand), economy (e.g. globalization, market, and trade forces), socio politics (e.g. consumption choices, and policy, institutional and legal frameworks), and science and technology;
- direct drivers, e.g. climate change, natural resource availability (in particular water), overuse of agricultural chemicals, land-use changes.

All these drivers contribute to the loss of biodiversity both in agricultural and other ecosystems, threatening human well-being. While agriculture contributes significantly to conservation and sustainable use of biodiversity, it is also a major driver of biodiversity loss. The Earth's biodiversity is being lost at an alarming rate, putting in jeopardy the sustainability of agriculture

and ecosystem services and their ability to adapt to changing conditions, threatening food and livelihoods security. The major challenge for agriculture is to ensure food security, adequate nutrition and stable livelihoods for all, now and in the future, by increasing food production while adopting sustainable and efficient agriculture, sustainable consumption of resources, and landscape-level planning to ensure the preservation of biodiversity. **The evolution of agriculture...** A rapidly growing global human population, and therefore a rapidly growing world demand for food, coupled with changing production and consumption patterns have stimulated the evolution of agriculture from traditional to modern, intensive systems.

However, while modern agriculture has enabled food production to increase, contributing much to improving food security and reducing poverty, it has also been responsible for considerable damage to biodiversity, primarily through land-use conversion which is expected to remain the largest driver of biodiversity loss beyond 2010 and at least to 2050, but also through overexploitation, intensification of agricultural production systems, excessive chemical and water use, nutrient loading, pollution and introduction of alien species.

...threatens agricultural biodiversity, and biodiversity in other ecosystems

During the last decades, worldwide biodiversity has been lost at an unprecedented rate in all the ecosystems, including agro-ecosystems. Homogenization of agricultural production systems, mainly due to intensification of agricultural systems coupled with specialization by plant and animals breeders and the harmonizing effects of globalization, is one of the greatest causes of agricultural biodiversity loss, through genetic erosion and the increasing levels of genetic vulnerability of specialized crops and livestock. According to the FAO, it is estimated that about three-quarters of the genetic diversity found in agricultural crops has been lost over the last century, and this genetic erosion continues. For example, today, 90% of our food energy and protein comes from only 15 plant and 8 animal species, with disturbing consequences for nutrition and food security. Wheat, rice and maize alone provide more than 50% of the global plant-based energy intake.

In addition to agricultural biodiversity, modern agricultural practices can also impact biodiversity in other ecosystems through several ways such as unsustainable demands on water (for irrigation for example), overgrazing, as well as excessive use of nutrients and chemical inputs to control weeds, pests and diseases that result in problems of pollution and eutrophication. Furthermore, land and habitat conversion (in particular forests, wetlands, and marginal lands) to large-scale agricultural production also cause significant loss of biodiversity.

Although farmers' traditional knowledge is key to both sustain biodiversity and to ensure global food security, today it is as well considered by many to be part of the much-threatened global commons. Farmers are requested to both preserve biodiversity and contribute to meet the nutritional needs of a growing population. However, they do not control all factors involved including those related to agricultural policies, incentives , markets or consumption patterns, and therefore need support from government policy.

What Needs to be Done?

The CBD programme of work on agricultural biodiversity (decision V/5, annex) is designed to address these challenges. It is structured to take into account the different dimensions of agricultural biodiversity and is based on four elements:

- assessing the status and trends of the world's agricultural biodiversity, the underlying causes of change, and knowledge of management practices;
- identifying adaptive management techniques, practices and policies;
- building capacity, increasing awareness and promoting responsible action; and
- mainstreaming national plans and strategies for the conservation and sustainable use of agricultural biodiversity into relevant agriculture sectors.

In addition, three cross-cutting initiatives have been adopted under the programme of work to address specific issues:

- the International Initiative for the Conservation and Sustainable Use of Pollinators (decision V/5, section II) and its action plan (decision VI/5, annex II)

- the International Initiative for the Conservation and Sustainable Use of Soil Biodiversity (decision VI/5, para 13) and its framework for action (decision VIII/23 B); and

- the International Initiative on Biodiversity for Food and Nutrition (decision VIII/23 A) and its framework (decision VIII/23, annex).

The ecosystem approach is promoted as a tool to address multiple issues and objectives

across cultural, socio-economic and environmental dimensions, resulting in balance between the production of food and the sustained delivery of other ecosystem services necessary to sustain human well-being.

The programme of work identifies policy issues that governments can consider when addressing such matters, while considering various ways and means to improve the capacity of stakeholders and to promote the mainstreaming and integration of agricultural biodiversity into sectoral and cross-sectoral plans and programmes at all levels. The programme of work also promotes studies the impacts of trade liberalization on agricultural biodiversity.

The programme of work on agricultural biodiversity was reviewed by SBSTTA 13 (In-depth review of the implementation of the programme of work) for the ninth meeting of the Conference of the Parties in 2008 with the full participation of the Parties, relevant international and other organizations, the private sector, civil society, and local and indigenous communities. SBSTTA concluded that the programme is a relevant framework for achieving the objectives of the Convention on Biological Diversity, and to address emerging issues such as climate change.