UNEP

CBD

CONVENTION ON BIOLOGICAL DIVERSITY

Distr.
GENERAL

UNEP/CBD/COP/5/INF/10
20 April 2000

ENGLISH ONLY

CONFERENCE OF THE PARTIES TO THE
CONVENTION ON BIOLOGICAL DIVERSITY
Fifth meeting
Nairobi, 15-26 May 2000
Item 16.2 of the provisional agenda*

AGRICULTURAL BIOLOGICAL DIVERSITY: REVIEW OF PHASE I OF THE PROGRAMME OF WORK AND ADOPTION OF A MULTI-YEAR WORK PROGRAMME

Agricultural biological diversity: summaries of case-studies on soil biota, pollinators, integrated landscape and farming system management, and crop and livestock genetic resources and summaries of agricultural biological diversity coverage in national reports.

Note by the Executive Secretary

1. By decision III/11, the Conference of Parties invited countries to share case study experiences addressing the conservation and sustainable use of agricultural biological diversity (paragraph 10) and encouraged interested Parties and international agencies to conduct case studies on two issues as identified by the Subsidiary Body on Scientific Technical and Technological Advice (SBSTTA) namely pollinators and soil micro-organisms of importance to agriculture (para 11). By decision IV/6, COP expanded the focus of the latter to include all soil biota (para 5), and also invited governments and organizations to conduct case-studies on different land-use options, with regard to the identification and promotion of sustainable agricultural practices, integrated landscape management of mosaics of agriculture and natural areas, as well as appropriate farming systems that will reduce possible negative impacts of agricultural practices on biological diversity and enhance the ecological functions provided by biological diversity to agriculture (para 4).

2. Two Parties provided the Secretariat with case studies on pollinators and soil biota: Canada, five cases and India, two cases. Additionally Brazil organized “the International Workshop on the Conservation and Sustainable Use of Pollinators in Agriculture, with an Emphasis on Bees,” in Sao Paulo, Brazil, in October 1998, with the participation of experts from fifteen countries as well as international organizations. Further case studies were provided as inputs to the workshop on “Farming Systems Approaches for the Sustainable Use and Conservation of Agricultural Biodiversity and Agro-Ecosystems”, organized in Rome in December 1998, by FAO and the Secretariat of

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* UNEP/CBD/COP/5/1

the Convention on Biological Diversity with the financial support of the Netherlands.

3. Summaries of selected case-studies on these three topics (pollinators, soil biota, and agricultural biodiversity at the landscape/farming system levels), are available in section II. The Executive summaries of the two workshops is provided in section III. The full workshop reports were available at previous meetings of the Conference of the Parties and/or SBSTTA, and are available as background papers for fifth meeting of the Conference of the Parties (www.biodiv.org/agro/casestudies.html). Those case studies which were received in time were drawn upon in the preparation of the assessment of ongoing activities and instruments on agricultural biological UNEP/CBD/SBSTTA/5/INF/10), the main findings of which (summarized in UNEP/CBD/COP/5/11. annex 1) were used by SBSTTA as a basis for the further elaboration of the programme of work.

4. The compilation and analysis of case studies is a central feature of several work programmes under the Convention. The experience to date would suggest that additional ways and means are needed to encourage and assist Parties to respond to ongoing and future requests for case studies, and that international organizations can play a significant role in facilitating the preparation of case studies. Workshops can be a particularly useful mechanism to elicit reports. However, particular efforts may be needed to support the preparation of case studies from the least developed countries and other small developing countries.

5. Besides the calls for case-studies under the various thematic programmes of the Convention, the compilation and analysis of case studies are also important in cross-cutting work on the ecosystem approach, sustainable use, alien invasive species, benefit-sharing, and on Article 8(j) and related provisions. It is important that the maximum synergy is derived from these various efforts to avoid duplication of effort, and to promote coherence between the various programmes of work under the Convention. Guidelines may be useful to ensure that the case studies carried out under the programme of work on agricultural biodioversity address these cross cutting issues as appropriate.

6. To facilitate the synthesis of lessons learnt from further case studies on agricultural biodiversity, a common framework may be useful. Such a framework could also facilitate integration of the ecosystem approach and considerations of sustainable use, and other cross-cutting issues. Section IV contains a possible indicative outline for the case studies on agricultural biodiversity. It will be further developed and refined in the light of the decisions of the Conference of the Parties at its fifth meeting and other feedback received.

7. Most countries which have submitted their first national reports to the Conference of the Parties include references to agricultural biological diversity. They can be found at <http://www.biodiv.org/natrep/index.html>. Of the 111 national reports submitted, 58 provide significant coverage of agriculture and/or agricultural biodiversity. Some of the main points of these reports are summarized in Section V of this note. Coverage is very variable; different countries focus on different matters ranging from general descriptions of agriculture in the country, to specific information about particular topics. There are, however, a few matters each of which are covered by several countries. These include:

- Information on the use of plant genetic resources, plant breeding needs and *ex situ* collections, and genetic erosion. A few countries also mention animal and microbial genetic resources;

- The negative impact of certain agricultural practices, such as pesticides, overuse of fertilizers, and inappropriate mechanized tillage, on biodiversity; and

- Changes taking place due to economic difficulties (for example, in Eastern Europe) and in agricultural policies (for example, in Western Europe).

8. Few countries describe comprehensive policies, programmes or strategies for agricultural biodiversity, though a number indicate that they plan to develop these (see also UNEP/CBD/SBSTTA/5/INF/10). A common reporting format, in the second national reports, will facilitate comparison between countries.

II. SUMMARIES OF CASE STUDIES

A. Case studies on pollinators

A1: Title: Pollination: A Plinth, Pedestal and Pillar for Terrestrial Productivity. The Why, How, and Where of Pollination Protection, Conservation and Promotion (Peter G. Kevan, University of Guelph; Ontario, Canada)

Problem: Conservation of honeybees, other domesticated bees, wild bees, and other pollinators is an important requirement issue for agricultural biodiversity.

Objective: To promote increased recognition of the need for conservation of honeybees, other domesticated bees, wild bees, and other pollinators, and to promote imaginative approaches to management, and basic biological research by biologists, ecologists, agriculturists and civil society.

Approach: A review of current knowledge on pollinators.

Lessons learned/Results: Although the major pollinators from many crops grown in the world's temperate zones are known, the quantitative relationships of pollinator populations, activities, and densities with plant and flower density and resultant seed-set are largely unknown. Pollinators and breeding systems of many tropical crops are misidentified, unknown, or assumed to be honeybees. Pollination ecology is a new field; demonstrating that an apparent pollinator is actually a pollinator that requires care. Color preferences, floral size, shape, other visual attributes, odor and olfaction are important for pollinators in their recognition of specific plant species.

A2: Title: Biodiversity of Pollinators in Canadian Agriculture (Submitted by the Government of Canada)

Problem: Changes in land use, pesticides, air pollution and agricultural and apicultural practices result in declining populations of native bee and managed bee populations in Canada. This is happening at a time when greater crop diversification and consumer demand for high quality produce and variety of food, particularly vegetables, demands a greater variety of bee species to pollinate.

Objective: To describe the importance of pollinators in Canadian agriculture and to address threats to pollinators.

Approach: A review of current knowledge.

Lesson learned: It is important for researchers to expand their horizon to embrace the culture of non-Apis pollinators in agriculture. The needs for conservation, imaginative approaches to management, and basic biological research must be fully recognized by biologists, ecologists, agriculturists and other Canadian citizens.

Results: Honey bees managed by beekeepers across Canada are primarily derived from the Italian, Carniolan and Causian races. Native bees, *Halictus* and *Andrena spp* are known to be common visitors to apple bloom in Nova Scotia and the same genera are recognized as the main pollinators of lowbush blueberry in eastern Canada. Bumble bees, commercially reared colonies currently provide excellent pollination of greenhouse crops such as tomato. They are often rare

in areas of intense agriculture because of pesticide usage, lack of suitable nesting sites and insufficient food plants to sustain the colony over the active season. Recent trends in Canada to reduce the use of pesticides in agriculture and forestry and to increase education about pesticide-pollinator interactions have gone far to lessen the impact of pollinator poisonings. Certain pesticides, such as aldrin, chlordane and DDT, are no longer used in Canada, although levels of these substances continue to be detected in the environment due to current use in other jurisdictions as well as revolatization from past domestic use. As pesticides applications become more regulated and applications are required to take courses in safety and use before certification, these problems should diminish.

C.3 Title: Pollinators: Literature Overview. (Submitted by the Government of United States of America)

Approach: Bibliography of 267 references

C.4 Title: Potentials of Bees and Beekeeping for Increasing Fruit/crop production through pollination. (Submitted by the Government of India)

Problem: The population of non-Apis pollinators is declining at an alarming rate as a consequence of deforestation, vast clearance of wasteland for cultivation, and increased use of pesticides in India.

Objective: To promote the reorientation of crop production technologies, emphasizing yield enhancement through packages based on biological inputs.

Approach: Considering the importance of bees in pollination, colonies of *Apis cerana* are being lent to orchard keepers for the pollination of apple crops. Cross pollination through honeybees can increase yields: somatic, reproductive and adaptive heterosis or hybrid effects occur in plant progeny either single or in combinations. Such hybrid effects were found to stimulate generation of pollen on stigmas of flowering and improve selectivity in fertilizer; increase viability of seeds, embryos and plants; help form more nutritious and aromatic fruits; increase the vegetative mass and stimulate faster growth of plants; increase number and size of seeds and yield of crops; enhance resistance to diseases and other adverse climatic conditions; increase nectar production in the nectaries of plants; increase fruit set and reduces fruit drop and increase oil content in oil seed crops.

Lessons learned/Results: This programme has created great awareness among orchard keepers about the importance of honeybees for pollination. Many of the mountain crops grown in Himalayan region benefit through pollination by bees in several ways. More fruit or seed is perhaps the most common benefits, in clovers, fruit quality can be improved, in apple or seed ripening can be synchronized, in oil seed rape, oil content of seed can be improved, in sunflower hybrid vigour with better germination and seedling establishment can be incorporated.

B. Case studies on soil biota

B1. Title: Biodiversity of mycorrhizal fungi, Canada (the Eastern Cereal and Oilseed Research Centre of Agriculture and Agri-Food Canada. Submitted by the Government of Canada)

Objective: To promote healthier cropping systems and reduce the use of chemical inputs, while ensuring crop profitability and environmental quality, by selecting the best plant-fungus combinations.

Approach: To overcome the obligate symbiont status - which means that fungi can only grow in the presence of a living plant – an *in vitro* culture method on excised roots was developed. Through this method isolated arbuscular mycorrhizal fungi were developed, and are not specific in the choice of their partner plant. This means that the same fungus can be grown on a large number of plant species.

Lessons learned/Results: Through appropriate management of mycorrhizae (plant-fungus combinations) in agriculture, it is also possible to maintain soil quality and sustainability while protecting the environment over the long term and reducing the cost of production.

B2. Title: Worm Watch, Canadians solving the soil puzzle one piece at a time, (Rhizospere Ecology Research Group, Agriculture and Agri-Food, Canada. Submitted by the Government of Canada)

Objective: To study the distribution of earthworms in Canada and promote awareness of their importance for sustainable agriculture.

Approach: Scientists gather and share data, collected by special Worm Watch school programs, farmers and other special interest groups to study the distribution of earthworm species in Canada. The results further elaborated by the Geographical Information System (GIS) technology and other techniques will be used as one of a suite of bioindicators of environmentally sustainable land use practices.

Results: Introducing earthworms is a sustainable solution for waste management, integrated pest management, soil improvement, and site reclamation; the distribution of earthworms could be used as an indicator for soil biodiversity; the worm watch school programme gives lots of back-up and activity for teachers and will educate policymakers for the future.

B3. Title: Microbial Biodiversity and Grass Seed Cropping Systems (L.F. Elliot, USDA-ARS. Submitted by the Government of Canada)

Objective: To develop sustainable cropping systems through the characterization of soil biodiversity and its relationship with soil erosion, and crop production, environmental effects and economic viability.

Approach: Studies are needed with regard to tillage and cropping interactions and how they effect soil biodiversity. If you are able to define components of soil biodiversity that promotes soil health and sustainable cropping systems, you have the solution for promoting soil biodiversity.

Lessons learned/Results: Tillage reduces the soil organic matter content, the microbial biomass content, earthworm numbers, and generally greatly increases soil susceptibility to erosion. Grasses in the rotation appear to protect soil biodiversity and are an important component of sustainable cropping systems. Therefore grasses should be integrated in the rotation.

B4. Title: Azotobacter – A Case Study (Submitted by the Government of India)

Objective: To develop type culture collections for Azotobacter microorganisms in India in order to realize the tremendous potential for making use of microorganisms in increasing crop production.

Approach: There exists an immense diversity among microorganisms and conservation of this diversity is essentially needed to get continuous benefit of microbes. The maintenance of this potent battery of prototype and new microorganisms is the very basis of impressive investment in long term basic and applied microbiological research. The importance of conservation is growing steadily as the number of those preserved is continuously increasing by isolation and genetic manipulation. There is also need of awareness of the importance of proper preservation of microorganisms because important microbes preserved improperly may be lost forever or face genetic instability.

Lessons learned/Results: Since there are other nitrogen fixers, phosphate solubilizers growth promoting rhizobacteria (PGPR) which play important role in improving soil fertility and crop productivity, there is an urgent need to conduct fundamental as well as problem-oriented basic and applied research especially on the occurrence and distribution of strains and their isolation, maintenance and preservation; physiology, genetics, biochemistry and economic utilization.

C. Case studies on integrated Landscape and Farming System Management

C1. - Title: Enhancing soil biodiversity in intensive crop production through conservation tillage, Brazil. (Jose Benites, Theodor Friedrich, Helvecio Mattana Saturnino)

Problem: Tillage systems in Santa Catarina, Brazil have been leading to soil erosion.

Objective: To enhance soil biodiversity through conservation tillage, or zero tillage.

Approach: More than 30% of the soil surface is covered with crops residues after planting. This reduces soil erosion, builds up soil biodiversity and organic matter and stabilizes yields and lower maintenance requirements for farm equipment. Soil biota carry out many of the beneficial functions of conventional tillage through "biological tillage". Having in mind the rehabilitation of degraded soils to a level where soil life can prosper, the effect of surface plant residues on planting equipment, the different timing and ways of application of fertilizers through the surface cover, the initial increases in weed populations and greater herbicide use, a high level of

management skills was required to achieve successful transition from conventional to conservation tillage systems. This was achieved by the development of proper technologies.

Lessons learned: The initiative taken was successful because of well organized farmer groups, together with scientists, technicians and the private sector.

Results: Conservation tillage results in 70% less herbicide use run-off, 93% less erosion and 69% less water as compared with mould-board or disc-ploughing. As a result of the uptake of conservation tillage in Santa Catarina, there has been a sustainable increase in production of maize and wheat with yields up by more than 200%. It is estimated that about 1.93 million households in 20 countries now have more than 4 million ha of land under conservation tillage with significant improvements in production and agricultural biodiversity at all levels.

C2- Title: Sustainably using agricultural biodiversity through integrating soil and pest management in diverse farming systems, Senegal. (Lori Ann Thrupp (WRI), Doris Mutta (ACTS), Anthony Simons (ICRAF))

Problem: Degraded soils and pest problems.

Objective: To integrate soil and pest management into agricultural management practices and respond to the concern of smallholder farmers for a system that would regenerate degraded soils, increase production and maintain an ecological balance.

Approach: The techniques employed include: the use of large applications of compost and livestock manure; intercropping of legumes and crop rotations to build up soil organic matter, water retention, nutrient balance and health, which in turn, increases resistance to soil-borne pathogens and insect populations and provides a more nutritive and drought-tolerant environment for the root system of crop plants. This is being achieved through effective partnerships and two-way exchanges of information between farmers, NGOs, extensionists and scientists who together, under the direction of the communities, select techniques and methods of implementation. Farmers monitor results and share this information with others in order to assess impacts.

Lesson learned: Thanks to effective partnerships and two-way exchanges of information between farmers, NGOs, extensionists and scientists who together, under the direction of the communities, select techniques and methods of implementation, integrated methods are.

Results: The outcome of this initiative has shown that integrated methods have restored soil and plant health, increased yields and incomes and improved conservation of resources needed for sustainable production.

C3- Title: Improving agricultural biodiversity functions in intensive rice production through integrated pest management and aquatic life management, Viet Nam (Peter Kenmore, Matthias Halwart)

Problem: Pesticide use and poor utilization of biological resources in rice crops in Vietnam.

Objective: To improve agricultural biodiversity functions in intensive rice production through integrated pest management and aquatic life management.

Approach: Non-formal adult education through Farmer Field Schools. Farmers learn and apply ecological principles to crop and pest management, through local experimentation.

Lessons learned: Better utilization of resources, healthy crops of rice and fish and increased income and food security reinforce farmer's acceptance of IPM and their rejection of pesticides. An enabling policy environment, such as putting a tax on pesticides, can support such approaches. In rice monocultures wider agricultural biodiversity is important, species that decompose organic matter contribute through an aquatic food chain to the build up of predator populations early in the season. Ecologically, this renders the agro-ecosystem more resilient and therefore more productive. As long as pesticides are not used some 700 arthropod species can be found, which keeps these highly productive agroecosystems well balanced between pests, predators and parasitoids. This renders the agro-ecosystem more resilient and therefore more productive.

Results: Farmers achieve higher production of rice and other crops by using Integrated Pest Management (IPM) systems and also conserve and enhance agricultural biodiversity. Financial benefits per hectare surveyed in a sample of Farmers Field Schools in more than 1300 villages averaged from 20 to 25% higher compared to regular fields. In the case of double cropped irrigated rice, in Viet Nam, farmer's advanced knowledge about rice field biodiversity has also led to experimentation with different management options. One example is growing a crop of fish together with rice in the same field, using the rice field to grow the crop of fish between two rice crops, or growing fish after rice instead of a second rice crop.

C4- Title: Increasing biodiversity conservation within coffee landscapes through eco-labelling, El Salvador (Random Dubois)

Problem: Negative impacts of "sun-coffee" on biodiversity, especially the removal of habitats of native and migratory birds.

Objective: To promote environmental restoration and biodiversity in existing productive landscapes, through the maintenance and enhancement of habitats within "shade-coffee" plantations.

Approach: There was a consensus, achieved through collaborative project design, that the focus of biodiversity efforts needed included environmental restoration and promotion of biodiversity in existing productive landscapes, through the maintenance and enhancement of habitats within "shade-coffee" plantations. This would provide habitats for globally significant biodiversity through the establishment of a biological corridor composed of

"shade-coffee" plantations. It required the promotion, certification and marketing abroad, especially in the United States, of biodiversity-friendly coffee production. The Global Environment Facility is covering the cost of "risk" to market the new product, through a grant of some US$ 3 million.

Lessons learned/Results: The project is showing that market forces, driven by consumer choice, can be harnessed to promote ecologically-sustainable and bird-friendly form of management of coffee production and that the 5% premium for this new type of coffee is proving to be an incentive to keep lands in traditional, lower yielding but lower cost, production systems.

C5- Title: Feasibility Study for the implementation of agro-environmental programmes in Central Europe, Poland (Zenon Tedrko, Martien Lankester)

Problem: Unsustainable agricultural practices since the introduction of market economy in 1989. The breakdown of public sector, followed by ownership of former state and co-operative farms led to fallowing of many agricultural lands. There is an urgent need in the country to maintain sustainable agricultural practices already existing in the region or to change towards more sustainable ones in order to protect their most valuable and environmentally sensitive areas taking also into account the preparation process of the future accession to the EU.

Objective: This programme aims to influence agricultural practices in Northeast Poland, which impact on environmental conditions.

Approach: To reduce the use of fertilizers by introducing organic farming and more extensive forms of crops, conversion of arable land into extensive grassland, maintenance of landscape; through financial aid given to local farmers for undertaking these activities. Expectation for financial support in this relatively poor area is very important. The project has to develop a proposal for the practical implementation of agro-environmental programmes, based on tested packages, including modes of operation, rules for participation and ways for providing financial aid.

Lessons learned: Information will be presented to governmental organizations and donor agencies interested in their financing.

Results: The project will provide instruments /procedures and capacity building. To provide assistance in further implementing such programmes, a set of documents will be elaborated, including guidelines for valorization of biological diversity on agro-ecosystem level and proposal for biological diversity monitoring. The final assessment of the project impact on maintaining and enhancing biological diversity will be possible only after several years of monitoring results of its implementation.

C6- Title: Conservation of Biological Diversity through Land Use Policy – The Great Sand Hills Case Study, Canada (Richard Laing)

Problem: Potential long-term loss of biological diversity in the area of the Great Sand Hills. Heritage resources in the area of the Great Sand Hills, located between the Trans-Canada Highway and the South Saskatchewan River, are being lost while the area is being developed.

Objective: Some of the objectives are to: maintain biological diversity, protect representative and unique landscapes, ensure sustainable use of renewable resources, ensure that development of non-renewable resources occurs in an environmentally sound manner and to support heritage awareness and understanding.

Approach: In order to achieve conservation of *in-situ* biodiversity, in the author's opinion, the following steps must occur: ensure that the conservation of biological diversity is a primary land use objective in multiple use areas; establish a system of representative protected areas; and minimize the extent and effects of intensely developed areas on biological diversity.

Lessons learned: Protected areas are very important in conserving biological diversity as well as having many other values such as providing wilderness experience and research opportunities. However, they should not be relied upon as the single mechanism to conserve biological diversity.

Results: Land use planning was successful in identifying key development issues in the Great Sand Hills, establishing multiple land use objectives and zoning or allocating land based upon land opportunities and constraints.

C7- Title: Case-Study: Below-ground biodiversity, land-use change and sustainable agricultural production: research in the alternatives to slash and burn project (ASB) (TSBF)

Problem: Large number of farmers in the tropical regions have limited access to inputs but are nonetheless forced by circumstances to drastically reduce the complexity of their agroecosystems in an attempt to intensify production; even though the maintenance of a limited diversity of crops is widely accepted as a means of buffering farmers against short-term risk. Increased use of pesticides and fertilizers, mechanized tillage has negative impacts on below-ground biodiversity (bacteria, fungi, protozoa and invertebrate animals).

Objective: The research on below-ground biodiversity has the following objectives: to determine the impact of land-use change associated with agricultural intensification on soil biodiversity; the effect on agricultural productivity and other ecosystem functions of reduction in the diversity of key functional groups of soil organisms and land management practices with increased agricultural productivity and other ecosystem functions and contribute to the rehabilitation of degraded lands through enhancement of soil biodiversity.

Approach: Global food supply depends on intensive agriculture. As intensification occurs, above-ground biodiversity is reduced with the intention of increasing the economic efficiency. There is increasing evidence that the diversity of the below-ground community is strongly influenced by the above-ground biota. The biological regulation of soil processes is thus altered during the switch from traditional to modernist agriculture. The approach is to seek alternative solutions to intensify production whilst at

the same time retaining a greater degree of above-ground diversity. Agricultural diversification at the scales of both field and landscape may have long-term benefits through the enhancement of functional diversity and structural complexity, particularly in degraded lands.

Lessons learned: The biological regulation of soil processes is altered during the switch from traditional to modernist agriculture and eventually substituted by the use of chemical fertilizers and increasingly mechanized tillage. Enhanced biodiversity and complexity above-ground contributes to the re-establishment and multiplicity of organisms below-ground able to carry out essential biological functions; these are factors which increase resilience, sustain productivity and buffer ecosystems against risk.

Results: Sampling using standard methods was conducted in benchmark in 3 countries (Brazil, Cameroon and Indonesia). For example, there was a drastic reduction in the number of termite species as land use intensity increased and in particular, as tree biomass decline in Indonesia and Cameroon. In Brazil, pastures derived from the forest have a significantly different soil biodiversity profile than any other type of system. The next stage of this research is to determine the significance of these changes in below-ground biodiversity for soil fertility, nutrient cycling and system productivity.

C8- Title: Utilization of agricultural biodiversity for management of cereal stemborers and striga weed in maize-based cropping systems in Africa – A Case Study (Z.R. Khan, W.A. Overholt, A. Hassanali)

Problem: Pests and weeds causing extremely heavy pre and post-harvest losses in Maize crops in African countries. Parasitic weeds of genus striga threaten the lives of over 100 million people in Africa and infest 40 percent of arable land in the Savanna region causing an annual loss of $7 to $13 million. Among 23 species of striga in Africa, *Striga hermonthica* is the most important parasiting species of crops such as maize, sorghum, millet, fonio, rice and sugarcane. No single method of control has so far provided a solution to stemborer and striga problems.

Objective: To reduce the losses caused by stemborers and striga weed through improved management strategies thereby increasing maize production and the nutrition and purchasing power of maize growers.

Approach: To put stemborer and striga control within the reach of African farmers, through the development of simple, inexpensive measures, tailored to the diversity of African cropping systems, based on the management of habitat management through the manipulation of grain and legume crop diversity and the natural enemies of pests in and around the cropping environment. These approaches are based on the work of ICIPE, The Institute for Arable Crops Research, the Kenya Agricultural Research Institute and the Ministry of Agriculture, Livestock and Marketing. A novel pest management approach utilizing a push-pull strategy has been developed based on an understanding of the volatile semiochemicals employed by the stemborers in locating suitable hosts and avoiding non-hosts. Insects are repelled from the main crop and are simultaneously attracted to a discard or trap crop. Plants, which repel stemborers as well as inhibit striga weed have also been identified. Some of

these plants are: napier grass (*Pennisetum purpureum*), sudan grass (S*orghum vulgare sudanense*), molasses grass (*Melinis minutiflora*) and the legume silverleaf (*Desmodium uncinatum*). All these four plants are of economic importance to farmers in Africa as livestock fodder and have shown great potential in stemborer and striga management in on-farm trials. Nappier grass, for example, has its own defense mechanism against crop borers. When the larvae enter the stem, the plant produces a gum like substance, which causes the death of the pest

Lessons learned/Results: Cultivation of Napier grass for livestock fodder and soil conservation is being encouraged in Eastern Africa and is already widely applied. During 1998, on-farm trials using these fodder plants, conducted with 90 farmers in Kenya confirmed that these approaches worked, giving significant crop yield increases.

D. Case studies on crop and livestock genetic resources

D1- Title: Promoting on-farm conservation of Andean tubers through agro-Ecotourism, Cusco, Peru (Ramiro Ortega)

Problem: Loss of traditional conservation practices. Use of high yielding species and varieties in commercial agriculture, climatic factors, pests and diseases, inappropriate agrarian policies and development activities and poverty have resulted in the erosion of the biocultural wealth of local communities.

Objective: To promote on-farm conservation through ecotourism, in Cusco, Peru.

Approach: Incentives provided by the development of agro-ecotourism to facilitate new mechanisms for promoting traditional conservation and sustainable use practices in the communities of this initiative.

Local farmers who have conserved the wide range of local varieties of Andean root crops on farm with exceptional success, mainly because they do not seek maximization of yield or income but rather, recognize the need to spread risks through plant mixtures of different genotypes on small parcels of land, guarantee sustainable production every year.

Lessons learned: How communities can use traditional conservation practices to promote sustainable development.

Results: In this ongoing initiative, one of the expected results is that during guided tours to the communities, tourists will see the remarkable morphological and agronomic variety of Andean plants and tubers in demonstration plots, a potato museum and restaurants with menus based on traditional Andean produce.

D2- Title: Rebuilding the endangered Aubrac cattle breed through niche marketing of cheese, France (Guy Bouloc)

Problem: Endangered Aubrac cattle breed.

Objective: To rebuild the endangered Aubrac cattle breed through niche marketing of Laguiole cheese.

Approach: With the help of the Laguiole Syndicate and the Livestock Institute, producers are selecting and breeding improved dairy cow from some 15 mature Aubrac cows.

Lessons learned/Results: Local production and niche marketing of a named cheese has lead to the revival of the Aubrac miling cow. The milk yields are rising dramatically and from an average of some 1993 litres in 1956, it has reached 3200 litres to date. The aim is to reach 4000 litres per lactation through breed improvement over 10 to 20 years.

D3- Title: Recovering Local Maize in Brazil, Brazil (Angela Cordeiro, Breno de Mello)

Problem: The loss of genetic diversity in food crops as a serious threat to agricultural development in Brazil. The negative consequences of a legislation on patenting life on a community effort to develop farmers self-sufficient and good quality maize seed, based on the conservation and use of local maize varieties.

Objective: To encourage farmer production of maize seed, based on the reintroduction of local varieties.

Approach: When searching for a solution for the maize seed problem, the NGOs of the Alternative Technologies Project (PTA), found that a few farmers who were still maintaining local varieties and getting satisfactory yields despite their poor production conditions. A series of training courses were initiated for technicians of the PTA network to discuss the potential and limitations of promoting the use of local varieties. Valorization of local varieties and farmer's participation were the main principles to guide any search for solutions to the problem of seed dependency. The final objective being that farmers produce their own seed. For this, it was necessary to substitute hybrids with open-pollinated varieties. With a greater knowledge about the different varieties and better information about how to work with them, farmers can make their own choices and organize seed production at the community or individual level.

Lessons learned: Supported by the NGOs of the PTA (Alternative Technologies Project), the experience shed light on the possibility of innovation in plant breeding, in such a way that farmers, technical support people and plant breeders work together.

Results: The experience is showing that farmers can get equally good yields from locally-controlled maize varieties, debunking the myth about the superiority of hybrids.

III. SUMMARIES OF WORKSHOPS

A. Executive Summary of the Workshop on Sustaining Agricultural Biodiversity and Agro-Ecosystem Functions

Background

Agricultural biodiversity is essential for global food production, livelihood security and sustainable agricultural development. It is a major theme for implementation of the Convention on Biological Diversity (CBD). In this context, the CBD Secretariat together with FAO, the lead partner for the implementation of agricultural biodiversity activities, and with the support of the Government of the Netherlands, organized an international workshop on agricultural biodiversity from 2 to 4 December 1998 in Rome, Italy. This workshop is a follow-up to the first joint CBD – FAO technical workshop on agricultural biodiversity "Farming Systems Approaches for the Sustainable Use and Conservation of Agricultural Biodiversity and Agro-Ecosystems" *(June 1997, Rome).*

Workshop purpose and process

Over 60 participants attended from 20 countries representing all regions and 15 international and regional organizations. A dynamic discussion and review process, facilitated through small working groups and plenary sessions, led to the identification of key issues and related opportunities and proposed actions, mechanisms and linkages.

Focusing on agro-ecosystems and production systems levels, the workshop helped to identify the main elements required in order to provide enabling environments and technical, policy, institutional and legal incentives, from global to local levels, for the conservation and sustainable use of agricultural biodiversity. It was also a contribution to the assessment of ongoing activities and instruments being conducted by the CBD Secretariat and FAO, in accordance with COP decisions III/11 and IV/6.

The workshop was designed to:

- stimulate work at country level and within institutions;
- provide expert advice to FAO and the CBD on the assessment of ongoing activities and existing instruments;
- assist FAO and the CBD to identify complementary and synergistic activities;
- contribute to the FAO-Netherlands Conference on the Multifunctional Character of Agriculture and Land.

Conclusions and recommendations

The workshop concluded that four sets of actions for the conservation and sustainable use of all agricultural biodiversity, especially at agro-ecosystem levels, should be prioritized. These are summarized under the headings: Information, assessment and indicators; Research and development; Awareness raising and capacity building; and Development of policies and instruments.

The workshop prioritized the following actions related to information, assessment and indicators:

- to identify, develop and document indicators for assessment and monitoring as well as understand the causes of and changes in agricultural biodiversity;

- to focus specifically on indicators for assessing changes at agro-ecosystem levels and on the economic forces that influence these changes;

- to link indicators and assessment with particular dimensions of agricultural biodiversity, such as sustainable production, biological or life support and ecological and social services.

Actions prioritized for research and development included:

- emphasizing greater coordination and information sharing between research and development programmes and better formal and informal sector linkages;

- strengthening national agricultural research systems on agricultural biodiversity related issues;

- furthering farmer-driven participatory research and technology development processes, for example through farmer field schools;

- emphasizing three main issues: threats and positive incentives for agricultural biodiversity; ecosystem approaches and ecosystem functions; and specific research areas such as soil biota, pollinators and predators;

- developing communication methods and facilitating the exchange of information on relevant scientific research and practical information between different actors and stakeholders, especially South-South.

Concerning awareness raising and capacity building, the workshop prioritized actions for:

- capacity building to improve awareness, knowledge and information on agricultural biodiversity;

- capacity building to disseminate sustainable methods for agricultural biodiversity conservation;

- capacity building for decision-making and planning and policy-making on agricultural biodiversity.

In relation to the development of policies and instruments, the workshop prioritized actions for:

- integrating agricultural biodiversity in national biodiversity programmes and action plans as well as in national environmental action plans and agricultural strategies and plans;

- developing coordination and policy coherence at national, regional and international levels between relevant organizations, ministries and sectoral bodies at all levels;

- mitigating the influences of (and reforming where possible) the market, market forces and the existing economic framework which have major impacts on agricultural biodiversity;

- introducing incentive measures as important instruments to counter the above, including fees, charges, environmental taxes, certification and eco-labelling, as well as removing perverse incentives;

- developing and implementing a Code of Conduct on Agricultural Biodiversity, drawing together all existing agreements.

In the light of these priorities, and bearing in mind the opportunities, incentives and approaches discussed in the workshop, the participants made the following recommendations.

- Widening the understanding of the agricultural biodiversity by promoting a concept whereby agricultural biodiversity encompasses the variety and variability of animals, plants and micro-organisms which are necessary to sustain key functions of the agro-ecosystem, its structure and processes for, and in support of, food production and food security. Three dimensions of agricultural biodiversity could be useful for increasing understanding and as a structure for future programmes and plans:

i. Sustainable production_of food and other agricultural products emphasizing both strengthening sustainability in production systems at all levels of intensity and improving the conservation, sustainable use and enhancement of the diversity of all genetic resources for food and agriculture, especially plant and animal genetic resources, in all types of production systems.

ii. Biological or life support_to production emphasizing conservation, sustainable use and enhancement of the biological resources that support sustainable production systems, particularly soil biota, pollinators and predators.

iii. Ecological and social services_provided by agro-ecosystems such as landscape and wildlife protection, soil protection and health (fertility, structure and function), water cycle and water quality, air quality, CO_2 sequestration, etc.

- Encouraging the maintenance, sustainable use and enhancement of all types and levels of agricultural biodiversity in all types of production systems from diverse to specialized, small- to large-scale and intensive to extensive systems. The workshop recognized that the interdependence among the plants and animals that are harvested with the agricultural biodiversity that provides biological or life support systems and ecological and social services is as relevant and essential to production in intensive specialized agricultural systems as it is in more diverse production systems.

- Improving integration and coordination of activities and processes for sustaining agricultural biodiversity, productivity and agro-ecosystem functions is urgently required as is the inclusion of action plans for the conservation and sustainable use of agricultural biodiversity in national biodiversity, environmental and agricultural policies, strategies, plans and programmes as well as in those of key institutions.

The workshop also recommended that all organizations in the field of sustainable development need to work further to integrate and mainstream agricultural biodiversity in their policies, programmes and activities.

B. Report on the Recommendations of the Workshop on the Conservation and Sustainable Use of Pollinators in Agriculture with Emphasis on Bees

One-third of the world's crops demand pollination to set seeds and fruits and the great majority of them are pollinated by many of the estimated 25,000 species of bees. The annual value of this service in the U.S. is calculated at US $6-8 billion and the estimate worldwide is US $ 65-70 billion. The most widely used species in crop pollination is the honeybee (*Apis mellifera*). A major problem is emerging for the world's agricultural production reflecting the risk involved in relying on a single pollinator species. Honeybees in many parts of the world have contracted a serious disease and the numbers of honeybee colonies have decreased dramatically. Fruit and vegetable growers in the U.S. and Europe are complaining about poor fruit sets despite good blooming. As the disease has spread throughout most of the world, specialists consider all countries will become seriously affected. Farmers and growers now wish to use native of bees. Many species of native bees are known to be efficient pollinators of crops and a few species have been managed for this purpose. However, the numbers of native bees are dwindling; some species seriously so. Declines in numbers have been reported in North and Central America and Europe. The losses are due mostly to the use of agrochemicals and monocultures, to deforestation, and possibly to the introduction of exotic pollinators.

The emergence of a serious and widespread disease has made it clear that native pollinators need to be protected and sustainably managed for the pollination service they can provide and that agricultural practices be designed to incorporate the protection and sustainable management of bee populations. The pollinator crisis exemplifies the intimate relationship existing between the welfare of natural environments and their biodiversity and the needs of sustainable agriculture.

As a contribution to the development of the CBD work program approved by Decision III/11 on the "Conservation and Sustainable Use of Agricultural Biological Diversity", which identified pollinators as one of the initial priorities, the Brazilian Government held an international workshop of experts to propose a framework for an *International Initiative on Pollinators* as a key element in this program. The workshop was attended by 61 scientists from 15 countries and four international organisations (CBD

Secretariat, FAO, IBRA and ICPBR). Six groups of specialists discussed: 1- Reducing the Taxonomic Impediment on Pollinators, 2- Monitoring the Decline of Pollinators, 3- Identifying the Causes of Pollinator Decline, 4- Quantifying the Economic Value of Pollinators to Agriculture, 5- Conservation of Pollinator Diversity, and 6- Sustainable Use of Pollinators.

The recommendations of the Workshop include a proposal that COP5 formally establish an *International Pollinators Initiative* based on the framework for action contained in this report and request SBSTTA to co-ordinate, with support from the Executive Secretary, the preparation of a first Global Diversity Outlook Report on Pollinators. The Workshop participants also requested that COP5 call for international co-operation to develop the *International Pollinators Initiative* and request the financial support of GEF for this initiative and, furthermore, propose the creation of a *Pollinators Specialist Group* within the Species Survival Commission of the IUCN.

The recommendations produced by this workshop should help foster support from agencies to enhance initiatives on all continents on pollinator conservation and sustainable use. This would help to mainstream the issue of biodiversity in our society and to direct the conservation movements to promote the maintenance of biodiversity as an essential component to ecosystem functioning.

The workshop participants concluded that there is insufficient reliable data on the reported declines in the numbers of pollinators and their effects on agriculture, but that the necessary expertise to collect such data is available. Furthermore, they agreed that such an effort is viable provided the institutional support is available. However, the difficulties in obtaining reliable identification of pollinators (especially of bees), which are vital for the success of both the monitoring programme and pollination research, was also stressed. They also emphasized that the pollination requirements of relatively few crops are known. The experts spoke of the need to produce manuals and catalogues and agreed that the creation of websites with databases of specialists, publications and reports and information on the pollination requirements of crops and on their pollinators is vital and that success of the proposed actions will be greatly enhanced with public awareness of the problem. The spread of successful pollinators for some cultures should be regulated, in order to avoid their introduction in areas outside their natural distribution and avoid competition with local pollinators.

The proposals for action of this Workshop are varied, and many are concerned with the collection of reliable information and its dissemination. The predominance of these two subjects demonstrates the participants’ desire to have access to standardized extra data. Some of this information already exists but is not readily available, while much additional data need to be collected. An international training program was suggested, with standardized methodology and well-defined goals in order to create a worldwide network of experts capable to develop appropriate actions for the conservation and sustainable use of local pollinator diversity.

PROPOSALS FOR ACTION

TAXONOMIC IMPEDIMENT:

1. Assess the scale of the Taxonomic Impediment

2. Maintain continuity of existing taxonomic and reference collections of bees

3. Establish Centres of Excellence in Bee Taxonomy

4. Train bee taxonomists

5. Train parataxonomists

6. Repatriate data [Capacity building and benefit sharing]

7. Stimulate taxonomic output

8. Hold a Workshop on motivation and training of parataxonomists

9. Hold a Workshop on automated systems for bee identification

MONITORING THE DECLINE:

1. Establish a committee to co-ordinate a global monitoring plan and network

2. Refine plans and methods for implementation of a global monitoring plan

3. Assess methods, prepare manuals for monitoring pollinators and train participants

4. Implement a pilot global monitoring program in selected areas worldwide

5. Assess the potential impact of exotic pollinators on native pollinators

6. Establish a network of websites with databases for all pollinator monitoring data

7. Prepare a Global Biodiversity Outlook Report on the status and trends of pollinators

8. Promote follow up activities to ensure continuity and improve the proposed program

CAUSES OF DECLINE:

1. Assess pollinator diversity and pollinator efficiency in representative agroecosystems and adjacent natural and seminatural environments

2. [This issue needs further attention, as workgroup report was not submitted]

ECONOMIC IMPORTANCE:

1. Establish a network of experts and a network of databases

2. Determine the pollination requirements of each crop species

3. Determine best pollinators for each crop species

4. Determine impact of pollinator presence/absence on fruit and seed yield

5. Establish pollination models for selected crops

6. Develop a generalised economic method for evaluation of crop-pollinator-pollination systems

7. Conduct cost/benefit analyses for different crop and pollination systems, at the farm level

8. Conduct total crop production cost analyses for different crop-pollinator-pollination systems, at the national level, including externalities

9. Conduct cost analyses for changes from one crop-pollination system to another, at the international level, including infrastructure maintenance

10. Disseminate information generated by various means

CONSERVATION AND RESTORATION:

1. Establish an international advisory group on pollinator conservation

2. Establish an international information network on pollinator conservation and a global directory of pollinator experts

3. Assess the state of scientific and indigenous knowledge on pollinator conservation

4. Develop and update global and national lists of threatened pollinator species

5. Develop model-testing protocols for the introduction of non-native pollinators and to assess impacts of agrochemicals on pollinators

6. Develop an international communication outreach capacity

7. Produce multilingual manuals on pollinator conservation and restoration for farmers

8. Create “bee smart” certification labels for “pollination friendly” products

SUSTAINABLE USE:

1. Disseminate information on pollination in agricultural environments through data bases, websites, and networks

2. Establish a roster of existing pollination and pollinators experts to serve as a pool for consultations in technology transfer

3. Promote applied research on pollination in agricultural ecosystems through training of post-graduates to work on gap issues

4. Protect natural habitats, within agricultural landscapes, as sources of wild pollinators for crop improvement

5. Evaluate positive and negative effects of alternative practices and technologies in agricultural production on pollinator conservation and effectiveness

6. Evaluate impacts on pollination of practices and technologies used in agricultural production

7. Improve the knowledge on the real needs of pollination of tropical crops and forest trees

8. Gather and disseminate/exchange information of best practices

9. Conduct risk/impact assessments of main causes of pollination decline

10. Develop guidelines for policy makers and for farmers

IV: INDICATIVE OUTLINE FOR CASE STUDIES ON AGRICULTURAL BIOLOGICAL DIVERSITY.

Background

Within the programme of work on agricultural biodiversity, the Conference of Parties has called for case studies on soil biota, pollinators, and landscape and farming systems (Decisions III/11 and IV/6). The draft programme of work as elaborated by SBSTTA (Recommendation V/10) makes provision for case studies on various topics to identify management practices, technologies and policies that promote the positive and mitigate the negative impacts of agriculture on biodiversity, and enhance productivity and the capacity to sustain livelihoods, and more specifically:

(a) to identify key goods and services provided by agricultural biodiversity; needs for the conservation and sustainable use of components of this biological diversity in agricultural ecosystems; and threats to such diversity;

(b) to identify best management practices; and

(c) to monitor and assess the actual and potential impacts of existing and new agricultural technologies.

Additionally, SBSTTA recommendations V/11 and V/12 call for case studies on the application of the ecosystem approach and on best practices for the sustainable use of biological diversity, including studies within the context of the thematic areas of the Convention.

The use of a common framework is suggested to facilitate synthesis of lessons learnt from the case studies and integration of the ecosystem approach and considerations of sustainable use. The following indicative outline will be further developed and refined in the light of the decisions of COP-5 and other feedback received.

Indicative Outline

Overview: In one page, please provide a summary of the case study using bullet points to highlight: the context/problem to be solved; the objectives; the approach; application of the ecosystem approach; and lessons learnt.

I. Background/Problem statement: Please describe the context or situation of the case study, and identify problem that is addressed by the activities of the case. Consideration of threats to biological diversity, the goods and services derived from it, and the distribution of benefits among stakeholders may be included, and, if known, the underlying causes of such threats may be described.

II. Objectives/Purpose of the Activities: Please provide, in one or few sentences the main objective(s) of the activities proposed and/or carried out.

III. Details of the case study and the approach taken: Please describe the activities, the approach taken, and the main actors involved

IV. Analysis: Please analyse the case study in the framework of the various programmes of the Convention, using, as appropriate the checklist in Appendix 1. (Note, this should be used as an aide memoir. It is not necessarily appropriate to address each and every part in the appendix). This section might be presented in tabular form, and should complement section III.

V. Conclusions.

A. Outcome of the activities. Please provide a brief note of the results, or expected results, of the case study, and the extent to which the objectives were met.

B. Lessons Learnt. Please highlight any critical factors that led to the success or failure of any of the activities carried out. It would be useful to note any practical conclusions that would assist others in carrying out similar activities, as well any policy-relevant lessons.

Appendix: Checklist for the analysis of the case study (section IV)

A. Application of the Ecosystem Approach.

1. Describe how the case study illustrates any of the 12 principles of the ecosystem approach under the Convention (see SBSTTA recommendation V/10), and identify any constraints in applying these principles.

2. For the case study:

(a) Identify the goods and services provided by biodiversity in the area of case study (and additional ones that could be provided with improved management);

(b) Identify the beneficiaries of these goods and services, who should as well as additional groups be beneficiaries, their participation and barriers in the benefits;

(c) Describe approaches to adaptive management noting, what works and what does not;

(d) Describe scale(s) of management, used, additional scale(s) of management needed to address the problem, and any barriers to exercising management at the appropriate scales.

(e) Identify sectors involved, and those that should be involved, and identify changes required to provide an enabling policy environment.

B. Relevance to the operational objectives of the Programme of Work on Agricultural Biological Diversity

3. Indicate whether and how the case study contributes to:

(a) An assessment of status and trends of the world's agricultural biodiversity and of their underlying causes;

(b) The identification of management practices, technologies and policies that promote the positive and mitigate the negative impacts of agriculture on biodiversity, and enhance productivity and the capacity to sustain livelihoods;

(c) Strengthening of the capacities of farmers, their communities, and organizations and other stakeholders, including agro-enterprises, to manage agricultural biodiversity, and the promotion increased awareness and responsible action;

(d) The development of national plans or strategies for the conservation and sustainable use of agricultural biodiversity and their mainstreaming and integration in sectoral and cross-sectoral plans and programmes.

C. Relevance to the thematic work programmes of the Convention

4. Indicate whether or not the case study is relevant to the following thematic areas, and if possible how they are relevant:

(a) Forest biological diversity

(b) Marine and Coastal biological diversity

(c) Biological diversity of inland waters

(d) Biological diversity of dry and sub-humid lands (including Mediterranean, Savannah and Grasslands)

(e) Biological diversity of mountain areas

D. Relevance to the cross-cutting workprogrammes of the Convention

5. Indicate whether or not the case study is relevant to the identification, control or mitigation of the effects of invasive alien species.

6. Indicate whether or not the case study employs indicators of biological diversity, or of impacts on biological diversity.

7. Indicate whether the case study employs the use of incentive measures, or identifies perverse incentives.

8. Indicate whether the case study employs impact assessments (environmental, socio economic) or indicates the need for impact assessments.

9. Indicate whether the case study employs the use of benefit-sharing measures.

10. Indicate whether the case study draws upon the knowledge, innovations and practices of indigenous and local communities and whether it contributes to the protection and wider application of such knowledge, innovations and practices.

11. Indicate any other measures taken to promote the sustainable use of biological diversity.

12. Indicate if the case study is part of, or contributes to, a National Biodiversity Strategy and Action Plan.

V. SUMMARIES OF COVERAGE OF AGRICULTURAL BIODIVERSITY IN NATIONAL REPORTS

Argentina: The section on agriculture of the report on Argentina cites agriculture and livestock programs in the country, that aim at promoting sustainable development. The programmes range from those that encourage small and medium agricultural enterprises, to those that propose to develop financial mechanisms to improve the services of the economic and agro-livestock sectors; to ones that seek the sustainable development of agriculture and fisheries sectors through defined activities in terms of animal and vegetal health, agricultural technology, investigation of fishery resources, integrated information systems and others.

Armenia: The report of Armenia explains that studies conducted by scientists who have worked on crop diversity have aided the development of new varieties which has resulted in the production of a series of high-yielding crops in the country. Also, a range of micro-organisms are important in maintaining ecological balance, soil quality and human health, in particular, those used in food production.

Austria: The report of Austria notes that sustainable agriculture in the country is a result of site specific adaptation of production methods and diverse cultural landscape. The main reasons for the decline of species in agriculture, are related to increasing intensification of agriculture altered usages. New breeding measures and biotechnological approaches will exacerbate this trend in farm animals.

Belarus: Belarus reports that the use of agriculture has substantially changed the spatial structure and functional features of the vegetation cover in the country. Ploughing of land has resulted in the decrease in the number of natural localities for many species of plants and animals and, consequently, a reduction of habitat areas. Other factors such as the enlargement of crop rotation fields, expansion of agricultural land areas through land reclamation, increase of the dose of applied fertilizers, have changed the spatial outlook of landscapes and resulted in the fragmentation of landscape into large-area land use facilities and large area woods, not allowing the proper maintenance of biological diversity of ecosystems.

Belgium: Belgium reports on its different regions, citing specific examples with relevance to agriculture in the country. A Communal Agricultural Policy has resulted in regulations of integration of forestry in agriculture and the introduction of agricultural production methods which are compatible with the demands of environmental protection and nature management. In Flanders, agricultural land is increasingly managed with attention to environmental protection and recreation as well as production. The Brussels Capital Region has a ban on the use of pesticides by public institutions on public properties. In the Walloon Region, some measures have been adopted to remunerate farmers for their contribution to the quality of the environment, such as late cutting of pastures and keeping livestock populations low. In areas defined as being sensitive or priority areas, farming operations may be further assisted technically and subsidized to improve the overall environmental impact of farming.

Benin: In Benin, the problem rests mainly at the level of the production of seeds since the quantity produced is insufficient for the needs of farmers producers. The vulnerability to parasites increases as the production of certified seeds remains low. Benin, as others developing countries, lacks

capital, research infra-structure and qualified personnel for the bio-industry sector.

Bhutan: As described in the report of Bhutan, farmers have been using cross breeding or pure exotic breed for higher production and better income. The population of the country is low but land available for cultivation is very limited, that being the constraining factor for cultivation. Another limiting factor is the nature of the terrain, which makes intensification difficult. Therefore, agriculture is practiced as subsistence farming, relying on an integrated system of crops, livestock and small-scale forest management. The Bhutanese farmers choose to replace traditional varieties with new cultivars for many reasons including market conditions, family food security and environmental sustainability and these choices.

Botswana: In Botswana, the constraints anticipated in implementing strategies on plant diversification and conservation of natural resources are limitations due to manpower, their shortage and lack of experience working with indigenous plants since they are not commonly grown. According to its national report, the agricultural development strategy is to concentrate on small-holders since they are the custodians of landraces, which provide an insurance for, continued evolution of crop plants for agricultural development. Conservation through seed storage (*ex-situ*) is being applied for conservation of crops like sorghum, cowpeas, pearl millet and forage species. Other species such as sweet potatoes are conserved vegetatively in field genebanks.

Brazil: Brazil reports that agriculture is facing many difficulties and contradictions in the incorporation of programmes for conservation and the sustainable use of biodiversity. Widespread and serious erosion by wind and water, excessive use of pesticides, uncontrolled use of water for irrigation, and conflicts generated by these problems with other sectors, are serious environmental problems affecting both agriculture and biodiversity conservation. Abusive use of agrotoxic chemicals is also a serious problem. Mechanised agriculture and the activities of small farmers lead to overexploitation of natural resources and the modification of frequently extremely fragile ecosystems. Believing that biodiversity is inseparable from the concept of sustainability is essential for agriculture, a series of policies and initiatives have been developed.

Canada: In its report, Canada mentions that ex-situ preservation plays a critical role in providing continued access to viable seed stocks and cell lines, that would otherwise be lost as wild populations and species and traditional crops and breeds change or become extinct. Efforts are underway in Canada to preserve rare breeds of domesticated plants and animals in on-farm conditions. On a broader scale, the impact of agriculture on other aspects of biodiversity have been recognized such as, problems associated with soil erosion, the chemical contamination of water, wetland drainage, urban encroachment, pollution and waste management and solutions are being implemented in many cases.

Cape Verde: In the report of Cape Verde, there is mention that the adoption of modern intensive agricultural commercial practices has resulted in the loss of genetic diversity in the country while little efforts have been made to conserve traditional genetic materials.

China: In China, the ministry of agriculture has formulated policies for conservation of agricultural biodiversity, development of ecological farming and development and conservation of energy resources in rural areas. Ecological agriculture, for instance, aims at conserving and utilizing sustainable natural and agricultural resources, preventing and controling the pollution from township enterprises and agricultural chemicals, using the traditional and suitable farming techniques to improve the rural and agricultural environment and conserve the agricultural biodiversity through construction of ecological projects.

Denmark: Denmark reports that agriculture has changed significantly in terms of production patterns and structure and the main trend has been a development towards fewer and larger holdings with a more intensified and specialized production. This development has included an increased mechanization and use of fertilizers and pesticides. Biodiversity has been affected negatively both by the physical changes in the landscape and by the changes in the production methods. However, in recent years, this negative trend has been reversed by the removal of perverse economic incentives for activities such as draining and land reclamation. Denmark also adopted an Action Plan for the Reduction of Pesticide Use, with the objective of restricting its quantity and frequency of application.

Egypt: In Egypt, intensive and unregulated use of pesticides and fertilizers has plagued the agricultural landscape. Runoff with pesticides and fertilizers has changed the ecology of many wetlands, particularly in its northern Delta. Also, indiscriminate methods which were often employed by farmers and promoted by the Ministry of Agriculture to control birds and other wildlife perceived as pests, led in many cases to extensive damage to non-target species. Today, use of pesticide has been dramatically reduced in the country although the direct effect on biodiversity in rivers, lakes and in refuges still linger.

Finland: According to the report of Finland, although agriculture has altered natural biodiversity by reducing woodlands in its most fertile area, it has also introduced new species and produced new and open habitats such as fields, pastures, meadows, banks of ditches and a variety of fringe areas. Intensification of agricultural production has considerably reduced traditional Finnish crops as well as stocks of native breeds of domestic animals. At present, there is no mention of the conservation or maintenance of biological diversity in the legislation on agriculture. It is estimated that changes in agriculture have caused 300 plant and animal species to become endangered. It has also caused thousands of other species to decline. While erosion and groundwater pollution are not a real problem in the country, use of fertilizers and pesticides has decreased the number of for example, headlands, on the sides of ditches and roads. Plant species have developed many unique genetic adaptation and resistance mechanisms for conditions of day length and amount of light in the country.

France: In France, farmland accounts for about 55 % of the total land area. The development of improved varieties has been accompanied by a decrease in crop genetic diversity as traditional landraces are no longer competitive in intensive agriculture. It should be recognized that agriculture has a role both in preserving diversity and in contributing to world food needs . The accelerated intensification of farming practices, the ever greater use of

machinery and chemicals, particularly since the Second World War, the upheavals due to the transformation of land for cash crop growing and land consolidation operations have all put significant pressures on the environment and on biological diversity.

Gambia: Gambia reports that, its Department of Agricultural Services is responsible for reducing the deterioration of the country's soil and water resources and to improve agricultural production through conservation practices and crop protection by pest control. It also works closely with farmers providing extension and training services. The report cites as some of its main strategies in agrobiodiversity, halting inappropriate farming practices and soil erosion and regulation of the use of chemical fertilizers and to encourage the adoption of the use of organic manure.

Greece: In Greece, an inventory project of indigenous breeds of cattle, goats, sheep and equines is being carried out. The programme for the "conservation of rare farm animal races" allows incentives for the preservation of 31 races of cattle, goats, sheep and equines, and in particular, 6 races of cattle, 18 races of sheep, 1 race of goat and 6 races of horses – all of which are endangered, critical or vulnerable. The programme will attempt to preserve 63 species and 281 varieties of agricultural plants and about 100 species, subspecies and varieties of native plants which possess some financial interest.

Germany: The report of Germany, describes some European Community regulations that are being implemented in the country. For example, through an EC regulation on environmentally sound agriculture, farmers may be given bonuses for significantly restricting the use of fertilizers and plant protection agents, for ecological farming methods, and for reducing cattle and sheep stocks on pastures, among other things.

The Government has pursued strategies in relation to environmentally compatible agriculture and focused on reducing the impacts of fertilizers, for example, seeking to guarantee that they are being applied properly and in a manner compatible with protection of the environment.

Hungary: Hungary describes in its report, how agriculture has undergone a considerable recession during recent years. The economic-political changes caused uncertainty, agrarian cut backs, loss of the domestic and foreign markets and reduction in the agrarian subsidies. Also, the presence of weeds in arable lands increased considerably, probably due to the inappropriate use of herbicides in recent years. For the maintenance of the state of the agricultural environment and minimizing the impact of production to the environment, several Acts and regulations have come into existence.

Ireland: In Ireland, at present, two major negative impacts of agriculture are reportedly increased water pollution, and overgrazing, mainly of sheep. The latter problem arose as a consequence of the EU headage payments to farmers. Quantities of pesticides used in the country have more than doubled over the past 20 years, although it is low compared to some other EU countries. A voluntary code of good practice intended to avoid damage by pesticides has recently been produced.

Israel: In Israel, commercial agriculture relies on high-performance hybrids and intensive year-round cultivation. Together with spreading urbanization this threatens many old landraces, some of which date back many centuries.

It considers an imperative the preservation of the country's wild genetic resources, in view of the spreading urbanization, habitat destruction, intensive farming .

Japan: Japan reports that its agriculture is sustainable -- based on a paddy field farming which does not have to deal with damage caused by continuous cropping, salt accumulation, and soil erosion, and causes few groundwater pollution problems. It also provides permanent, stable, and diverse water and soil environments, helping to maintain the ecosystem. However, in recent years, excessive emphasis on productivity and economic efficiency and inadequate consideration to ecosystem integrity, has led, in some cases, to excessive monocultural cropping in upland fields, improper use of fertilizer and agricultural chemicals, poor handling of livestock waste. To promote sustainability, management techniques to reduce the use of agricultural chemicals are being developed, including methods to control plant pests such as the use of biological defense mechanisms, immunity, and weeds control techniques.

Korea, Republic of: In Korea, agricultural policy has so far negatively affected the agricultural ecosystem due to the development and supply of high-yield varieties to enhance food production, the expansion of fertilizer and chemical use, the development of stockbreeding and promotion of the use of machinery, for example. The degradation of agriculture resulting from excessive use of pesticides and chemical fertilizers, heavy cultivation, influx of pollutants and waste water into farm lands have recently become an issue. However, there has been a lack of precise data on farm land pollution and the investigation of the causes is still insufficient. Economic development has also increased the demand for livestock products, resulting in the increase of the number of livestock. Consequently, waste water produced by livestock seriously contaminating watercourses will be a concern.

Kenya: In Kenya, genetic resources are in imminent danger of genetic erosion. The Government has discouraged deforestation and established protected areas with high genetic diversity, trying to check the erosion rates. A land tenure policy that encouraged land sub-division, registration and privatization gave farmers the security, confidence and incentive to devote their time, and capital to agriculture expecting to reap the benefits there-off. This worked well while population pressure was still low but now this is leading to land fragmentation below economically viable units. Out of the plant species recorded, 258 are threatened. There exists large information gaps about lower plants which form a significant portion of Kenyan's total plant species. This is because very little survey work has been done. Trade policies implemented by various national institutions have generally had a positive impact on plant genetic resources development in the country.

Kyrgyz Republic: The Kyrgyz Republic has important genetic resources for plant breeding, and for the development of new varieties with beneficial attributes such as pest and disease resistance, and climate tolerance. For instance, in the south the forest, fruits and nuts, such as walnut, apple, almond, pistachio and pear are particularly valuable. Forest ecosystem represent an extremely valuable storehouse of genetic richness. However, the gene pool of many of these plants is now being threatened by anthropogenic impacts. Both populations and species diversity have been reduced, and a number of species are on the verge of extinction.

Lebanon: Lebanon reports that it is currently experiencing a tremendous loss of biodiversity primarily due to the conversion and degradation of habitats. Biological resources are degraded and lost through activities such as: the conversion of agricultural and wild lands to urban areas, indiscriminate and uncontrolled use of pesticides leading to soil erosion, desertification, deforestation use of intensive farm animal production systems, and the declining use of many traditional native plants and animals. The increase in population growth and associated development have also led to an unprecedented rate of genetic erosion. Misuse and abuse of land have been two major causes of arable land degradation. Also, the construction of touristic resorts and other different projects has lead to the destruction of large sensitive zones where biodiversity is strongly endangered.

Malaysia: Malaysia reports that the primary causes of soil degradation in the country are mining, agriculture, logging and urban development. Over 6.5% of steep land have been developed for various uses in Peninsular Malaysia, increasing the potential for soil erosion. The severity of soil erosion under agricultural use is determined by its slope, crop types and management practices. Further, one of the problems associated with the use of chemicals in the agricultural sector is the users' ignorance of pesticide toxicity and limited understanding of pesticide usage. Farming methods are increasingly aimed at production on a large commercial scale. Typically in Malaysian traditional farms, livestock is also reared on the same piece of land with their wastes used as fertilizer. Further research on the causes of genetic erosion and vulnerability; increased training to develop local expertise on maintaining plant genetic resources are some of the actions needed to maintain agricultural genetic diversity in the country.

Mali: Mali reports that a major limiting factor in the country is the low and variable rainfall. The Central Delta is important for many crops and also for fish production. More than 500 000 people's lives depend on the area's potential. Mechanised agriculture requiring that the soil be cleared of its natural vegetation plays a great role in the degradation of biodiversity. Agroforestry in its modern conception appears like a viable alternative to solve problems caused by these practices.

Mauritius: Mauritius reports that, the main threat to natural agricultural land is conversion to other uses. Potential negative impacts on existing agricultural biodiversity are caused by pollution by pesticides; eurotrophication by fertilizers, loss of biological diversity, loss of nutrients, declining soil fertility and falling crop yields, soil erosion, salinisation induced by irrigation and soil degradation by over cultivation or imbalanced use of fertiliser. A major concern is water pollution caused by misuse of agrochemicals. At present little is known about the link between the concentration of agrochemicals in hydrological, estuarine and marine environments and on-going agricultural practices. The Ministry of Agriculture and Natural Resources has prepared a blueprint on the modernization of the agricultural sector and some measures have been taken to make agriculture more environment friendly.

Mongolia: In Mongolia, in the past the economy was largely based on traditional nomadic livestock husbandry but it has recently been developed according to the emerging needs of new industries related to agriculture, construction, mining, transportation and communication systems, for example. Because of the increase in the population growth and industrial activities, there will be a need to re-design the land use patterns through the country.

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Biodiversity has been reduced by soil pollution, three cutting or logging, continuous degradation of pasture and arable land.

Mozambique: Mozambique reports that small-scale farming systems (comprising cultivated, fallow and grazing subsystems) is the mainstay of agriculture in the country. In variable environments higher production may be obtained by using a range of crop varieties; farmers often use intercropping and agroforestry techniques that employ a mixture of species with complementary requirements. Some specific actions are being taken towards the sustainable use of agricultural biological diversity, such as the review and evaluation of legislation, policies and programmes related to the agricultural sector with regards to conservation and sustainable use of agricultural biodiversity, and the promotion of activities and incentives aimed at developing and implementing agricultural practices supporting the conservation of biodiversity.

Namibia: In its report, Namibia is described as being mainly an agricultural and mining nation, with important marine fisheries. As an arid country with infertile soils, Namibia has large tracts of land that are unsuitable for livestock or crop production, and almost no potential for irrigation, and its agriculture is in many ways typical of dryland farming with heavy emphasis on livestock production. Most of the land zoned for agriculture in Namibia is suitable only for nomadic or rotational grazing due to poor surface water availability, erratic rainfall and thin, infertile soils in much of the country.

Nepal: In Nepal, population growth and inadequate knowledge of the importance of biological species has resulted in their loss. The Nepalese society as majority of the people depend on agriculture and livestock raising. There are various ongoing activities in the agriculture sector, namely, germplasm exploration, monitoring of genetic erosion, crop improvement and seed research, development of high yielding varieties. Various activities on germplasm exploration and monitoring of genetic erosion, crop improvement and seed research, development of high yielding varieties etc. are on-going.

The Netherlands: The Netherlands reports that priority is being given to measures to reduce pollution, reduce the risk of pesticide use, promote environmentally-sound production methods and products, encourage organic farming and to set standards for environmental considerations in agricultural operations. One objective of its agricultural policy is to ensure that maintenance of the qualities of the natural and cultural environment is an integral part of agricultural activities. Economic and legislative instruments are intended to maintain settlements in rural areas, conservation of biological diversity and other environmental qualities. The report further describes a strategy that aims at the development of agricultural techniques that maintain life-sustaining ecological systems and promote sound use and conservation of genetic resources through research, breeding programmes and the development of biotechnology, with the aim to intensify efforts to maintain herds of traditional breeds of livestock *in situ* and to develop an efficient system of gene banks for crop plants.

Norway: In Norway, intensification has led to an increased uniformity of agricultural landscape and its biological diversity has been reduced by the growing use of chemical products. In addition, the expansion of towns and built-up areas has taken place to a large extent on valuable agricultural land which has resulted in the loss of agricultural biodiversity. About 3 per cent

of the plant species and 10 per cent of bird species are considered to be endangered by developments in the agricultural landscape. One of the main objectives of Norwegian agricultural policy is to prioritize measures to reduce the risk of pesticide use, promote environmentally-sound production methods and products and encourage organic farming.

Papua New Guinea: Papua New Guinea reports that agriculture is the backbone of its economy earnings opportunities in rural areas and that all rural households engage in subsistence activities, and combine subsistence with cash crop production. The report further describes each crop grown in the country. A major issue from a biodiversity perspective is the permanent clearance of forest for plantation agriculture, and particularly oil palm. Few estimates of the effects of agriculture on soil erosion have been made although increasing intensification of the agricultural systems is likely to be placing some stress on the soil resources. The use of pesticides and fertilizers is at a generally low level and is confined largely to the plantation sector and a few market gardeners. Careful use of fertilizers in particular, and agro-chemicals in general, are perceived to be potentially beneficial in sustaining ecosystems and biodiversity through reducing pressure on uncultivated land.

Peru: In Peru, erosion is one of the major threats, in agricultural systems. The overuse of pastures with no practice of rotation or regulations are leading to permanent alteration of natural vegetation. In relation to the conservation and sustainable use of biodiversity, the Ministry has chosen to take action on agricultural lands, forest and drylands. Activities are mentioned, such as the "Programa Nacional de Recursos Geneticos y Biotecnologia", which aims at protecting and conserving biological diversity through the collection, evaluation and documentation of genetic resources of animals and plants.

Phillipines: In the Phillipines a total of about 10 million hectares have been converted to agriculture and used for the production of various crops. Low crop diversity areas represent about 24% of the total cultivated lands in the country and are devoted to monocropping systems such as irrigated rice system. The massive damage by the rice Tungro disease on IRRI bred-rice in the Philippines is a clear example of the danger of monoculture over large areas to the exclusion of the traditional diverse land race species. Many species, some endemic, are confined to Cordillera region in the country, where in the paddies of the rice terraces are found. Rice is planted in this region for local consumption and for the production of a traditional beverage. Conversion of these lands into the more profitable vegetable farms will result in the irrevocable loss of these many species including endemic ones.

Poland: Poland reports that protective actions are needed to preserve the traditional animal breeds because of intensification of animal production as well as progress in animal breeding. Following the implementation of the Plant Gene Resources Protection Programme, a Ministry of Agriculture financed *ex situ* collection has been set up, comprising the most important crop plants. The collections include mainly the Polish gene resources: wild species, ecotypes, native varieties and crop forms, registered varieties as well as those removed from the register, but also valuable genetic material created in research facilities. Seventy-three thousand genotypes are covered with *ex-situ* preservation forms. Polish agriculture is subject to intense impact exerted by the European Union agricultural policy mechanisms, through settlements of association agreement and a strong association with markets of the European Union countries.

Portugal: Portugal reports that the intensification of agriculture is one of the obvious threat factors in the country. The centers of intensive agriculture, which employ limited numbers of species cultivated in a rapid rotation regime requiring the use of irrigation, mechanization and chemical and phyto-pharmaceutical fertilizers have caused significant breakdowns when used in unsuitable places and without special care. Initiatives aimed at the expansion of traditional extensive agricultural systems include measures intended to avoid the desertification of rural areas by providing support for *inter alia*: non-irrigated cereal systems; extensive pasture systems; traditional olive groves. An exodus of rural dwellers to the cities has also marked the loss of biodiversity in the country.

The Russia Federation: The report for the Russian Federation describes the changes in agriculture due to decreased State involvement and increased private activities. It mentions some changes that may be beneficial to biodiversity such as decreased use of pesticides and mineral fertilizers, and changing patterns of livestock farming.

Rwanda: Agriculture in the country is characterized by a lack of legislation, the decrease of fertility due to overexploitation of the soils and erosion, excessive farm sub-division, and the use of poorly adapted techniques. To overcome these difficulties, the Ministry of Agriculture, Livestock, Environment and Rural Development, with the assistance of national and international partners, have elaborated a new strategy of agriculture development with the aim to ensure food security and increase monetary revenue in the rural areas.

Samoa: The strategy presented in Samoa's Fifth Development Plan (1985-87) encourages crop diversification to overcome pest/disease constraints and market uncertainties. Examples include the diversification of the agricultural base with the introduction of exotic fruit trees as well as the development of economically viable crops in ecologically suitable and sustainable farming systems for production by farming communities.

Senegal: Senegal reports that, even though many farmers continue to cultivate traditional crops, a number of traditional local varieties of cowpea, voandzu (*Bambara groundnut*) rice (*Oryza glaberrima, Oryza sativa*), fonio (*Digitaria exilis*), millet (*Pennisetum americanum*) and sorghum (*Sorghum bicolor*) are disappearing due to the introduction of modern varieties and the effects of drought.

Seychelles: In the Seychelles, the main crops consist of tree crop plantations, mostly coconut. Minor crops are vegetables or other annual crops. Large arable areas have been lost to other uses, particularly housing. There are 270 registered farms of which some 20 are large (averaging 100 ha each). Several aquaculture projects have been successful, namely those for the production of pearl oyster and oyster clam. Following a change in the Government policy, the production of fruits and vegetables have increased, and exports of traditional cultures of cinnamon and copra have also increased.

Slovakia: Land use in Slovakia is undergoing many changes resulting from the new economic and ownership relations. Whereas lowlands were changed into habitats with very low biodiversity, pasture and meadows constitute one third of the agricultural land with the highest level of biodiversity. Vineyards, gardens and orchards cover small areas throughout the country and represent

islands of higher biodiversity and are important for the preservation of genetic diversity of cultivated plant species.

Slovenia: In Slovenia, changes in agriculture practices (technology, intensification, abandonment of less favoured areas for agriculture, use of new cultivars and hybrids, promotion of monoculture) have lead to losses of biodiversity. *In-situ* conservation has been practiced and a number of protected areas have been established, some of which are in less favoured areas for intensive agriculture where farmers can get financial support for maintaining biodiversity and applying traditional farming methods.

St.Lucia: The main objective of the Department of Agriculture, and even though there are no formal programmes for the conservation of biological diversity, is to sustainably optimize production through activities such as: multiplication of plant and animal materials, protection of plants and animals; product development and enhancement, and soil and water utilization.

South Africa: South African ecosystems have recently been changing with the pace and extent of agricultural and industrial development. Present estimates suggest that largely agriculture, among other factors, have led to the transformation and degradation of a substantial proportion of natural habitats. South Africa decided to adopting uniform set of principles to control access to genetic resources. It recognizes the need for equitable benefit sharing, in particular, the development of specific strategies to ensure continued access to genetic resources for food, agriculture and forestry.

Sweden: Sweden reports on its agri-environmental programme which implements, on a national basis, the EU's support arrangements for environmental measures in agriculture. The action plan for the conservation of biodiversity in agricultural landscape, in reindeer herding and in the livestock sector is divided into a number of areas, such as: hay meadows, grazing lands, small-scale habitats on arable land, arable weeds, the farmstead environment and old varieties of cultivated plants. It also describes measures which have been or are in the process of being implemented in each of these areas.

Switzerland: In Switzerland, agriculture has experienced changes in methods of production which have led to the restricted number of cultivated species. According to statistics offered in the report, one square meter of agricultural natural land disappears at every second to be replaced by urban development. One of the main instruments to reverse this trend is through ecological compensation, in the form of direct incentive payments given to farmers to safeguard biotopes, organic or integrated culture.

Thailand: In Thailand, approximately 18% of the country's 28 million ha are cultivated lands. Unlike natural ecosystems, agricultural land is much less complex and diverse in features and compositions. They are sub-divided into 3 systems, slash and burn, rain-fed and irrigation supplemented. Diversity of agriculture ecosystems depends, for the most part, on varieties of cultivated crops and commercial plant species. Promotion of integrated farming systems has been practiced and included in plans of the Department of Agriculture, with emphasis on maintaining soil fertility through multicropping and crop rotation.

Tunisia: In Tunisia, the expansion of modern commercial and intensive agricultural practices in the country have resulted in the loss of diversity

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and even the disappearance of others. Tunisia has recently restructured its national programme. Earlier, poor links with breeders and other researchers led to poor use of the central facility they then had which resulted in the erosion of the political and financial commitment that was needed, to sustain the facility. The new approach is based on a network of research institutions, each with its own mandate.

Turkey: In Turkey, traditional and unsustainable agriculture practices and a lack of policies has adversely affected agrobiodiversity. Incentives provided to the agriculture sector have resulted in excessive use of chemicals and fertilizers leading to improper irrigation practices. Economic pressure due to population increase in rural areas and a lack of legislation preventing the fragmentation of farms into less than optimal units has resulted in decrease of the number of farmers which already have very low income. This situation has forced small farmers to illegally clear forests, conduct heavy grazing, ploughing or rangelands.

Uganda: In Uganda since modern agriculture used in the country requires high inputs, some exotic crops have become too costly to produce by the majority of farmers and this has significantly reduced food security in the country. The adoption of modern agricultural practices have also encouraged the use of various types of pesticides and other agricultural chemicals, resulting in loss of biodiversity.

Uzbekistan: Uzbekistan reports that it is a primarily agricultural nation, where an unbalanced development placing too much emphasis on agriculture production, has resulted in damage to the environment and total reduction in the size of some biomes. The agricultural sector has also been developing excessively on the basis of the extensive use of irrigation technologies and the cotton monoculture as one of the country's distinctive features. The unsustainable pattern of agricultural development was also the main contributor to the current water crisis. At present, pesticide pollution is mainly a result of waste water from production sites.

United Kingdom: The report of the United Kingdom notes that while most agricultural grassland has been improved with fertilizers or re-seeded, unimproved grassland remains a significant component within agricultural ecosystems. Changes in agricultural practices can happen under the influence of the Common Agricultural Policy, but only a small proportion of its resources are channeled towards achieving environmental objectives through appropriate land management.
