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Biodiversity and land degradation

A mutual combat for sustainable development in dryland areas

"Nature is declining globally at rates unprecedented in human history." The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) published an alarming report in 2019 on the state of biodiversity worldwide, while calling on everyone to react right away. According to IPBES, about 1 million living species are threatened and global species extinction is occurring at a 100 to 1,000 times faster rate than previously. What about drylands? CSFD offers its outlook and proposes nine recommendations to combat both land and biodiversity degradation and support sustainable development in these regions.

IPBES (2018) considers that combating land degradation is a priority to protect biodiversity and ecosystem services that are fundamental to all life on Earth, in line with the Sustainable Development Goals[1]. **In drylands, this would secure the future of ecosystems, as well as the sustainable development of the human societies that closely depend on them.**

The 15th meeting of the Conference of the Parties (2021, Kunming, China) to the Convention on Biological Diversity (CBD) will adopt a new Post-2020 Global Biodiversity Framework[2] as a stepping stone towards the 2050 Vision of "Living in harmony with nature".

DESERTIFICATION, CLIMATE CHANGE AND BIODIVERSITY LOSS – THE SAME COMBAT!

The three Rio Conventions address global environmental issues that are primary concerns for humanity—climate change, biodiversity loss and desertification—and the threats they pose to life on Earth:

- Anthropogenic activities are pivotal with regard to their impacts and the solutions they can provide.
- Policies and measures urgently advocate a paradigm shift and a profound change in production strategies an environmental management.
- Measures based on land improvement, preservation and restoration are among the mutual solutions put forward in these conventions.
- Land degradation, climate change and biodiversity loss can no longer be treated separately, as the economic and social dynamics to be transformed to safeguard land, biodiversity and climate are the same.
- Biodiversity loss, climate change and desertification are interdependent, while keeping in mind that the implementation of solutions can sometimes produce tensions and contradictions, e.g. the construction of a hydroelectric dam to reduce the reliance on fossil fuels may have negative impacts on biodiversity in downstream rivers. Its sustainability depends on measures taken to combat desertification upstream.

1 SDGs related to terrestrial biodiversity (SDG 15), climate (SDG 13), poverty (SDG 1), food and nutrition security (SDG 2), sustainable production and consumption (SDG 12).
2 Being drafted at the time of the drawing up of this factsheet.

Importance and role of biodiversity in dryland areas

Drylands—which are found on all continents, from the African savannas to the steppes of Asia and the Mediterranean shores—host multiple and sometimes unique biomes, such as oases or ephemeral rivers. The species diversity is lower than in humid environments, yet endemism is high. The marked climatic variability and heterogeneous soils have shaped the ecosystems and the species that depend on drylands. These habitats are vital for wildlife and play an important role in ecosystem diversity.

Many species are invaluable for climate change adaptation strategies. Indeed, efficient strategies have been developed by dryland species and ecosystems to cope with the prevailing extreme and unpredictable environmental constraints (water scarcity, excessive temperatures, droughts, etc.) and to survive: deep roots, small leaf areas, adapted reproduction, underground or nocturnal animal lifestyles, etc. It is therefore crucial to safeguard these species and their adaptation capacities in a world under increasing climatic pressure.

Genetic diversity is high by virtue of these adaptations. This is the case in Saharan Africa with its unique genetic heritage, such as that of millet and related wild species, as well as its mosaics of biodiversity adaptation and evolution hotspots. This genetic diversity and the ecophysiological adaptation properties of species underpin agricultural production diversification—e.g. crop and forage plants and domestic livestock derived from wild species—while also serving as a basis for breeding new varieties adapted to different ecological conditions as well as to current and future environmental variability, including climate change.

Biodiversity has a vital functional role in ecosystems. Genetic and species diversity contributes to ecosystem evolution and resilience in the event of disturbances—this is the basis of ecosystem functions and provides many benefits to human societies: **ecosystem services** (food production, biological control, pollination, etc.). This is conducive to biomass production, while ensuring better use of water and trophic resources by plants and animals.

Biodiversity is the basis of human subsistence strategies. Societies that have been settled in these regions for thousands of years have developed agricultural systems adapted to the prevailing climatic and edaphic constraints. Wild species are traditionally gathered. People depend on a broad range of plant and animal products for family consumption and sale—these products contribute significantly to household economies.

Desertification and changes in land use and land cover are the main drivers of biodiversity loss, along with overexploitation of natural communities and habitat destruction. 12 million ha of land are degraded annually and the resulting cost associated with the loss of species and ecosystem services is estimated to be at least 10% of the annual global GDP (IPBES, 2018).

A FEW DEFINITIONS

Desertification, according to the United Nations Convention to Combat Desertification, is "the degradation of land in arid, semiarid and dry subhumid areas that is caused primarily by human activities and climatic variations." It has multiple impacts on the environment—soil erosion, water shortages, fauna and flora loss, etc.—and on humans—poverty, famine, migrations, conflicts, etc. Drylands cover nearly 40% of the land area on five continents worldwide. They host many species and unique ecosystems as well as 38% of the world population, i.e. more than 2 billion people, the majority of whom (90%) live in developing countries and are highly dependent on natural (including wild) resources.

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Land degradation neutrality in desertification affected areas is: "a state whereby the amount and quality of land resources necessary to support ecosystem functions and services and enhance food security remains stable or increases within specified temporal and spatial scales and ecosystems." It geared towards enhancing sustainable development and combating land degradation by focusing on two key points:

- global food security, through the reduction of cropland degradation and the restoration of degraded land
- ecosystem preservation and restoration to maintain ecosystem services for human wellbeing.

Source: UNCCD, 2015

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Agroecology encompasses a diverse range of sustainable approaches and practices at agricultural and landscape levels. Several recent reports have illustrated that agroecology: (1) contributes to the transition towards more sustainable food and agricultural systems; and (2) can generate positive environmental externalities, including biodiversity preservation. Agroecological practices are amongst nature-based solutions. For the post-2020 agenda, IPBES has requested the CBD Secretariat to foster the dissemination and implementation of agroecological practices in its projects and programs for the protection of biodiversity and ecosystems.

For further information: www.fao.org/agroecology/overview/overview10elements/en

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Nature-based solutions are defined by IUCN as: "actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human wellbeing and biodiversity benefits." These involve three types of actions which can be combined with civil engineering solutions in target areas:

- preservation of functional ecosystems in good ecological condition
- enhanced management of ecosystems for sustainable use in human activities
- degraded ecosystem restoration or ecosystem creation.

This concept, which was internationally recognized at the IUCN World Conservation Congress in Hawaii (2016), is based on the 'use' of nature and biodiversity to address major societal challenges. Agricultural, soil and development issues are anchored in this concept: "The goal of this programmatic engagement is that governments, businesses and land managers (including farming communities) implement a common vision to protect and restore biodiversity on farms and in agricultural landscapes, including the ecosystems on which agriculture depends."

For further information: https://www.iucn.org/theme/nature-based-solutions
www.iucn.org/theme/ecosystem-management/our-work/agriculture-and-land-health

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CSFD recommendations

These recommendations are addressed to multiple actors. Some mainly concern international bodies (1, 2, 8, 7), decision makers in charge of environmental and development policies (1, 2, 7, 8, 9), others responsible for regional planning, conservation, agricultural policies and the scientific community (3, 6, 7, 9), field agents and local project leaders (3, 4, 5).

1. Preserve, foster and restore species diversity and genetic resources to enhance agroecosystem resilience and sustainable development of populations

Ecosystem stability increases with their extent of diversity. The complexity associated with biodiversity stabilizes ecosystems by buffering temporary fluctuations in natural populations[3]. Indeed, species' ecological functions are so interlinked that if one species disappears, its function is compensated by other species. Some species have been identified as being essential in upholding ecosystem integrity, for instance perennial steppe species (e.g. *Plantago albicans*), which play a key role in the restoration of Tunisian steppe rangelands.

Agrobiodiversity—the diversity of living organisms managed by farmers—associated with the wild species present, contributes to ecosystem services at the field level and impacts the production and sustainability of agricultural systems: pollination, biomass production, soil fertility maintenance and crop protection. It thereby reduces the risks for farmers and their families by enhancing the stability of agricultural systems, in turn ensuring food security despite the hazards and climate change. Wild biodiversity also plays an important socioeconomic role for local communities: food, traditional medicine, extractivism, biotechnologies and ecotourism.

Some varieties and breeds are known to have genetic traits that can be used in breeding programs worldwide, such as millet and fonio, which are adapted to drought and infertile soils. Indeed, the very ancient agricultural systems that prevail in these regions—oases, agroforests, shifting cultivation, pastoralism, etc.—have led farmers to adopt and develop many conventional cultivated plant varieties and domestic livestock breeds adapted to heat, aridity and long journeys, while also being able to withstand periods of undernourishment or delayed watering.

There are several combined issues with regard to agricultural genetic resources: the availability of local varieties adapted to agroclimatic conditions and that can be sold on local and international markets. *In situ* conservation of species and genes is an especially crucial issue because *ex situ* gene banks are costly and hard to maintain. This implies recognizing communities and farmers as major actors in safeguarding species[4].

3 Diaz *et al*., 2007. Incorporating plant functional diversity effects in ecosystem service assessment. *PNAS*. 104(52): 20684-20689.
4 Bonkoungou E.G., 2001. *Biodiversity in drylands: challenges and opportunities for conservation and sustainable use*. The Global Drylands Partnership. UNDP, New York.

2. Increase protected areas and enhance their effectiveness by promoting their status diversity and innovative management mechanisms

Only 9% of drylands have an official protection status and some of the richest dryland ecosystems are under-represented in protected areas (FAO, 2015). The draft Post-2020 Global Biodiversity Framework proposes to increase the extent of land and sea area protected to 30% for areas with high biodiversity; the terms still have to be clarified to be able to assess the feasibility of this initiative, particularly in drylands.

Numerous tools of mixed efficacy are available for protecting biodiversity in integral nature reserves and various protected areas where human activities are regulated to various extents. These can include traditional deferred grazing areas and the preservation of lands of indigenous peoples under participatory management schemes. The creation and management of protected areas are strategies currently widely applied at the international level, but the outcomes are sometimes mixed depending on their status, participatory or state management and financing conditions. **A current challenge is to identify statuses and innovative management mechanisms for these protected areas in order to meet the dual objective of preserving biodiversity and the wellbeing of communities.**

Biodiversity conservation cannot be limited to safeguarding a sample of natural habitats through a small number of protected areas. Adjacent areas also have a major role to play in preserving resources, as well as the integrity and biological diversity of protected areas. **Biodiversity protection in most drylands must be considered in environments affected by human activities and thus subject to various uses.** Tailored environmental and economic practices are essential to reconcile these uses and types of exploitation with conservation objectives.

3. Preserve, foster and restore the diversity of habitats, ecosystems, landscapes and cultural mosaics

Biodiversity conservation strategies must be devised at different application scales—from local to global—to take the biodiversity levels (ecosystemic, specific and intraspecific genetic) for its conservation into account.

Ensuring the representativeness of protected areas, their connectivity and multiscale networking is a key to their success. This network must reflect the diversity of ecological systems at the landscape level so as to offset the impacts of land-use changes (including ecosystem fragmentation), direct human resource use, pollution, invasive alien species and climate change. Ecological and exchange networks must therefore be rebuilt to ensure that animal and plant species will be able to complete their lifecycles, while facilitating exchanges between natural populations and the movement of species to more favorable environmental conditions.

These networks must be mainstreamed in development decisions regarding an area so as to foster: (1) multifunctional and resilient land-use management to reduce impacts on biodiversity, and (2) the participation of local communities and other stakeholders in the target area to ensure concerted management of natural resources.

Outside of protected areas, the promotion of land-use diversity at landscape and farm levels helps preserve ecosystem services and biodiversity.

4. Preserve, foster and restore tree cover

Trees play an essential role in maintaining crop and rangeland productivity by helping the soil preserve its water retention capacity and fertility, while also contributing to the resilience of human communities and landscapes. Studies conducted in the Sahel have highlighted the essential role of trees—including those outside of forest stands—in maintaining biodiversity. Their canopy and shade provide habitats for many plant and animal species, under favorable microclimatic conditions; their litter contributes to maintaining soil biodiversity[5].

Recent agricultural innovations promote multistratum plant associations, especially crop/tree associations, while boosting woody cover in anthropized drylands: agroforestry, hedging, etc. Assisted natural regeneration contributes to soil protection and increases crop productivity. It is a dryland biodiversity maintenance and conservation instrument.

Many development projects increase the woody cover on local lands (e.g. tree stands in cotton-growing zones). However, the extent of groundwater pumping can have negative long-term impacts. Moreover, the landscape standardization induced by large-scale reforestation can reduce species diversity and negatively impact ecological systems and associated usage practices.

5 Grouzis M., Akpo L.E., 2003. Influence d'*Acacia raddiana* sur la structure et le fonctionnement de la strate herbacée dans le Ferlo sénégalais. *In*: Grouzi M. et Le Floc'h E. (eds), *Un arbre au désert : Acacia raddiana*. Paris, IRD Éditions: 249-262.

5. Preserve, foster and restore soil biodiversity, the foundation of all continental ecosystems

Soil organisms in drylands are exceptionally diversified, with millions of fauna (microfauna to macrofauna) and microbiome (fungi, bacteria, algae, etc.) species, including several billion individuals per hectare with high levels of endemism.

These organisms are essential to ecosystem functioning and ensure soil fertility. They form food webs that fuel soil ecosystem processes and functions, e.g. nutrient cycling and carbon capture, while also being major matter, energy and nutrient cycling components. Soil food webs play a key role in maintaining ecosystem services.

Unsuitable cultivation techniques, a lack of organic matter recycling and chemical input and pesticide use soil biodiversity loss. This loss is not only a conservation problem, but also hampers multiple ecosystem functions. However, safeguarding of soil health and biodiversity is often overlooked in biodiversity conservation strategies and the soil status and biodiversity are also often overlooked in environmental assessments.

Eliminating the drivers of soil biodiversity loss is a key to restoring degraded soils.

6. Consolidate—via tailored practices—the role of certain types of agriculture and agrarian systems as a biodiversity dynamics factor

The preservation of agrobiodiversity and diversified agricultural systems is an essential component in the sustainable management of areas and biodiversity preservation. Farmers traditionally maintain many wild species and a variety of habitats in their fields and adjacent areas through their diversified land management practices. However, population growth, globalization and climate change are prompting major transformations in these agricultural systems. How can biodiversity loss due to land-use changes be curbed while feeding a growing population?

Agricultural intensification is essential to boost production and avoid farmland expansion into natural areas. Agroecological intensification is among the different ways of intensifying agriculture. This strategy is possible and compatible with biodiversity preservation and is based on ecological engineering inspired by mechanisms that govern ecological systems (CSFD, 2018). In predominantly family farming systems, the agroecological transition helps maintain multifunctional agriculture while reducing the environmental impacts of cultivation practices.

The challenge is to develop practices and design productive, biodiversity-friendly agricultural systems and to achieve a transition towards sustainable, adapted food and agricultural systems that produce enough while enhancing the socioeconomic and environmental performance of farms of all sizes.

7. Restore degraded lands through long-term commitments and effective community-based practices implemented by local people

Ecosystem restoration can and should be an essential component of conservation and sustainable development programs worldwide. The international community acknowledges that this is an important means of enhancing biodiversity and ecosystem services. It is taken into account in most CBD Programmes of Work (COP 11, 2012). Aichi Biodiversity Target 15 called for the restoration of at least 15% of degraded ecosystems by 2020 (target not met). For the post-2020 period, a more ambitious target (30% restoration) could be adopted at CBD COP 15.

The adoption of SDGs under the aegis of the United Nations in 2015 brought the land degradation neutrality (LDN) concept to the political forefront. It defines a prioritized response **at the local scale** (territory, watershed, etc.), adapted to the context and extent of degradation, via three components:

1. avoid degradation and reduce the risk factors in non-degraded lands and ecosystems
2. reduce ongoing land degradation
3. restore degraded land.

This hierarchy of responses recognizes that **prevention is better than compensation.** The net result of LDN is also at the local level. **Aligning LDN targets and actions with existing and future biodiversity and climate change commitments would be an essential efficacy element and source of multiple cobenefits.** Biodiversity loss, land degradation and climate change are linked and evolve together, with overlapping and even common drivers. LDN helps address these factors and thus provides a tool for preserving biodiversity through concerted actions to protect ecosystems and manage land sustainably. National strategies and targets that may be adopted to implement the Post-2020 Global Biodiversity Framework could seek alignment with current national LDN commitments (GM, 2019).

There are different types of restoration: ecological restoration, rehabilitation, restoration of natural capital, most of which do not seek to restore the original natural conditions before disturbance, which is generally impossible (!), but rather to rehabilitate ecosystem components and functions.

Many authors mention **the need to develop a holistic vision and protocol, encompassing ecosystem service conservation[6].** There may be different combined targets in land restoration operations: (1) ecological restoration of ecosystems to enhance biodiversity and services within a conservation framework, (2) rehabilitation of degraded lands to restore their productivity and integration in sustainable farming systems, while avoiding farmland expansion into natural areas.

Restoration must: (1) be accompanied by the elimination of pre-existing degradation factors, and (2) the integration of restored land in viable production systems and in conservation and development plans at the territorial level, while taking the social conditions, constraints and aspirations of local people into account. These conditions are all the more acute in commercial land restoration situations as the role and future of users must be clarified.

Taking land tenure and land-use rights into account is essential to the success of potential actions and to ensure long-term participation of beneficiary populations[7]. Land restoration is a slow and gradual process requiring long-term financial and stakeholder commitment. It involves very slowly (!) and gradually striving to achieve a land change trajectory that will enhance productivity, biodiversity and associated ecosystem services. The environmental outcomes of restoration programs, as well as their economic and social impacts, must also be assessed.

6 Aronson J., Moreno-Mathéos D., 2015. État des lieux sur les actions de restauration écologique. In: Levrel H. et al. (éd.), *Restaurer la nature pour atténuer les impacts du développement : analyse des mesures compensatoires pour la biodiversité.* Éditions Quæ, Versailles: 164-171.

7 Larrère R., 2014. Questions éthiques à propos de la restauration écologique. *In*: Rey F. *et al.* (éd.), *Ingénierie écologique : des actions par et/ou pour le vivant ?* Éditions Quæ, Versailles: 43-50.

8. Implement economic and social incentives to preserve biodiversity

Regardless of whether it is a matter of conservation programs, protected area development or restoration, **substantial costs will be incurred for their implementation and management.** These costs, as well as those related to changes in practices, cannot be taken into account by users alone, as they will undoubtedly exceed their financial capacities.

The costs of compensating for the remote impacts of current production and marketing systems must also be taken into account. **Abolishing subsidies for unsustainable intensive practices is a priority.** Indeed, according to the French Development Agency (AFD), under the current economic system, US$1,020 billion (2019 data) is spent on subsidies that are harmful to biodiversity, compared to US$143 billion for biodiversity conservation.

Remuneration for virtuous traditional biodiversity preservation/ management practices should be provided and included in local development plans. It is essential that users be compensated for any restoration or land-use change costs, and that financial incentives be provided for sustainable land management.

The development of innovative funding tools for biodiversity conservation is encouraged. For instance, **payments for environmental services** (PES) could contribute to ecosystem conservation while improving the livelihoods of local communities (AFD, 2012). Under this concept, a compensatory mechanism is implemented so that environmental service beneficiaries will pay royalties to local communities to maintain them. Farmers are encouraged to adopt sustainable land-use systems. They are compensated for the additional production costs of implementing these new practices. PES, often of small amounts, represent an instrument to complement (but not substitute) regulatory and local governance arrangements. The State has a pivotal role and PES should be leveraged with national public policies in rural, energy and land sectors.

Another option is the economic promotion of biodiversity products (gum arabic, shea butter, etc.) within commercial sectors that guarantee resource protection and fair benefits. For example, geographical indications could be developed to foster biodiversity conservation directly via the use of a specific local biological resource, or the reintroduction of local livestock breeds or crop varieties threatened with extinction. This concept is used as a tool for rural development, nature conservation, natural resource maintenance, landscape preservation and the promotion of local know-how. Other avenues could be explored, such as the use of international financial instruments for the environment or tailored ecotourism development. Mainstreaming environmental costs in the price of imported products could also be an effective financial lever.

In order to be sustainable and effective, biodiversity preservation policies must support the **wellbeing of the local population** and be based on **increased social capital** and measures, such as: increasing their income, strengthening their powers and rights over land and its uses, enhancing their education, skills, decision-making and social structuring capacities.

9. Develop environmental assessments of biodiversity conservation and restoration projects, plans and programs

It is essential to develop environmental assessments of projects, plans and programs that address biodiversity issues in conjunction with degraded land restoration.

It is thus necessary to:

- consolidate the role of research in conservation and restoration projects
- improve the performance of global biodiversity indicators in relation to LDN
- develop new tools for assessing ecosystem services related to biodiversity (functional traits)[8]
- cobuild the contours and implementation modalities of these environmental assessments with all stakeholders by blending scientific knowledge, traditional knowledge, technical and financial partners.

8 Peh *et al.*, 2013. TESSA: a toolkit for rapid assessment of ecosystem services at sites of biodiversity conservation importance. *Ecosystem Services*. 5: 51-55.

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IPBES www.ipbes.net

UNCCD www.unccd.int/issues/land-and-biodiversity

UNCDB www.cbd.int

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IUCN www.iucn.org/tags/work-area/biodiversity

WWF www.wwf.fr

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