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WORKING WITH NATURE IN AGRICULTURE AND LIVESTOCK

This document is part of the "Working with Nature" Quick Tips series, comprising 7 sectoral Quick Tips on Cities, Disaster Risk Reduction, Forestry, Renewable Energy, Transport, and Water.

Working with Nature in Agriculture and Livestock

Agriculture is a fundamentally important human activity **that intrinsically depends on nature and at the same time poses a threat to it.**

Agriculture depends on healthy ecosystems and ecosystem services, such as fresh water, soil fertility, nutrient cycling, pest regulation and pollination. Biodiversity forms the foundation of food production: without biological diversity, no fertile soils; without pollination, no yields; without aquatic ecosystems, no water and no agriculture; without wild genetic diversity no new (natural) crop varieties or resilience to diseases.

The extensive transformation of natural ecosystems into agricultural lands for crop production or pasture have been the principal cause of **natural habitat loss**. Reducing the variety of landscapes and habitats has detrimental effects on animal life and destroys many native plants and species.

Conventional intensive agriculture relying on industrial farming methods is harmful to nature. **Habitat degradation** occurs through deforestation, land use change, further aggravated through unsustainable farming practices, such as monocropping, excessive pesticide or fertilizer use or heavy tilling. Intensified agricultural production **degrades soils and ecosystems**, impacting the productive capacity of the land, as well as above- and below-ground ecological communities. Heavy tillage, monocropping and excessive use of agrochemicals are harmful to beneficial and indispensable micro-organism and invertebrate populations that help plants with nutrient availability and disease management.

Conventional food production is also heavily **resource intensive** – it depends on the use of fertilisers, pesticides, energy, water and land. The use of pesticides, fertilisers and energy in agriculture can lead to **soil, water and air pollution and global warming**. Livestock farms and operations generate greenhouse gas emissions from animal digestion and manure and leads to water pollution.

Agriculture is responsible for a third of greenhouse gases, **80%** of deforestation, **70%** of terrestrial biodiversity loss, and **52%** of land degradation. *(WWF, 2021)*

Agriculture alone poses a threat to **24,000** of the 28,000 (**86%**) species at risk of extinction. *(UNEP, 2021)*

How the agriculture sector can contribute to and benefit from nature

Agricultural land, if maintained in a sustainable manner, can provide **a variety of benefits to nature and environment** – such as habitats for plants, birds and insects, attenuation of global warming by sequestering carbon, water conservation and protection from floods and soil erosion, and features with aesthetic and touristic value. Agro-biodiversity is essential for making farming systems more stable and sustainable, it increases natural soil fertility and health, reduces dependency on external inputs, and contributes to sound pest and disease management, to name some of its importance.

The 2022 *Global Biodiversity Framework* requires us, by 2030, to ensure that areas under agriculture are managed sustainably, including through a substantial increase of the application of biodiversity friendly practices (target 10), as well as to restore, maintain and enhance nature's contributions to people, including ecosystem functions and services (target 11).

The *Farm to Fork Strategy* and the *Biodiversity Strategy for 2030*, both address the need to reduce the use and risk of pesticides, the use of antimicrobials and fertilisers in agriculture, increase the share of organic farming and to enhance the share of landscape elements set aside for nature. For the period 2023-27, the *Common Agricultural Policy* (CAP) will be built around ten key objectives, including contributing to climate change mitigation and adaptation, fostering sustainable development and efficient management of natural resources (highlighting the importance of policies which promote soil protection), as well as halting and reversing biodiversity loss, enhancing ecosystem services and preserving habitats and landscapes.

The International Union for Conservation of Nature (IUCN) explored pathways towards the future of farming, identifying various approaches to sustainable agriculture, such as **Agroforestry, Agroecology, Nature-inclusive and nature-centred agriculture**, Permaculture, Biodynamic agriculture, Organic farming, **Conservation agriculture,** Regenerative agriculture, Carbon farming, Climate-smart agriculture, **High nature value farming**, Low external input agriculture, Circular agriculture, Ecological intensification, Sustainable intensification *(see IUCN (2020): Approaches to sustainable agriculture, FAO (2021): Nature-based solutions in agriculture, The case and pathway for adoption).*

Many approaches share **comparable nature-friendly and nature-centred principles and practices**, which are at the heart of agro-ecology and agro-forestry, including:

- **Holistic landscape management:** around the field (e.g. windbreaks, agro-forestry, insect strips and living fences), across fields (mosaic of crop types) and at the landscape level (e.g. river buffers, woodlots, pastures, wildlife corridors) towards sustainable food systems – with due consideration of patch sizes and spatial arrangement on edge effects (on both agricultural and natural areas), ecological connectivity and fragmentation.
- **Conservation tillage:** no or minimum tillage retains soil structure and organic matter.
- **Cover crops and mulching:** reduce erosion and evapotranspiration, provide nutrients to the soil and enhance biological control of pests.
- **Mixing crops in a single plot or at household level (home-gardens)**, such as intercropping / polycultures: biological complementarities improve nutrient and input efficiency, use of space and pest regulation, thus enhancing crop yield stability.
- **Crop rotation and fallowing:** nutrients are conserved from one season to the next, while the life cycles of insect pests, diseases and weeds are interrupted.
- **Seeds selection, production and conservation:** of high nutritious species and varieties better-adapted to local conditions and resilient to climate change effect, as well as to pests and disease.
- **Integrated nutrient management:** the use of compost, organic manure and nitrogen-fixing crops allows for the reduction or elimination of the use of chemical fertilisers.
- **Integrated pest management:** decrease long-term incidence of pests and reduce environmental and health hazards caused by the use of chemical control.
- **Integrated Water Resources Management (IWRM):** promoting the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.
- **Valorisation of traditional crop and animal species and varieties**

Priorities for action

Embed agriculture and pastoral activities in a broader landscape approach *aiming at both the enhancement of biodiversity and the creation of multiple benefits from biodiversity for agricultural productivity and resilience with the adoption of sustainable agriculture practices based on agro-ecology and agro-forestry.*

- Promote **healthy and sustainable diets** that uphold high standards of safety and quality, plant health, animal health and welfare, and human health.
- Promote sustainable agriculture and food systems that **integrate the conservation, recognition and promotion of biodiversity throughout food production and value chains.**
- **Reduce the use of chemical and hazardous pesticides. Instead, promote Integrated Pest Management (IPM) and alternative control techniques** of protecting harvests from pests and diseases, such as crop rotation and mechanical weeding.
- **Reduce the use of chemical fertilizers and excess fertilization. Instead, promote Integrated Soil Fertility Management (ISFM) and precision agriculture** – approach to sustainable agricultural production that aims to optimize soil health and fertility and crop productivity through the balanced use of organic nutrient sources, soil conservation practices, and crop rotation.
- **Promote initiatives to target the management of associated biodiversity** (species such as pollinators, soil organisms and pest natural enemies found in and around production systems) or its role in providing ecosystem services to food and agriculture.
- **Reduce post-harvest losses** to improve food availability/access instead of increasing cultivated area.
- Safeguard the livelihoods of **small-scale producers and indigenous peoples and local communities** as custodians of biodiversity and emphasize the role of all relevant stakeholders as custodians of biodiversity.
- **Promote (and if feasible scale-up) local solutions adapted to local knowledge and conditions** (see the case of traditional cropping in Tunisia, below).
- **Ensure collaboration among a range of stakeholders:** Ecosystem and landscape approaches require cross-sectoral thinking and collaboration between local communities, governmental and non-governmental organizations, producers, consumers, etc. at local and regional (transboundary) level.
- **Strengthen Technical and Vocational Education and Trainings (TVET)** on sustainable agricultural practices at all levels, including: better integrating biodiversity issues into educational courses on food and agriculture and other aspects of land and water use, strengthening awareness-raising efforts among policy-makers and the general public on the importance of biodiversity for food and agriculture.
- **Support research and development** on agriculture practices, extreme weather events preparedness, seeds selection and climate change adapted varieties/species, post-harvest conservation, etc.
- Replace distortionary subsidies with **more effective and less costly forms of public support:** Payments based on commodity output or input use without imposing environmental constraints on farming practices tend to be the most harmful to biodiversity, as they encourage intensification of production. On the other hand, payments for ecosystem services or revenues sharing mechanisms based on non-commodity criteria (such as the provision of trees and hedges) and payments for input use linked to environmental contribution from sustainable farming practices, may reduce agricultural pressure on biodiversity.
- **Promote green finance mechanisms** to award those initiatives that directly contribute to environment and biodiversity conservation rather than just with a “do-no-harm” or environmental and social safeguarding (business-as-usual) approach.
- **Support the implementation of the deforestation-free regulation** by promoting the consumption of such products and reducing the EU’s impact on global deforestation and forest degradation, in order to bring down greenhouse gas emissions and biodiversity loss.

Good practice examples of biodiversity-friendly agriculture

The Case of Clima-EAST: Ecosystem-based landscape management in Azerbaijan, Armenia, Georgia, Moldova, Ukraine and Belarus

The CLIMA East project focuses on pasture and forest restoration and **sustainable silvopastoral and pastoral management** in 4 countries and peatlands conservation and improved **peatlands management** in 2 countries. Through the project, rotational grazing, new roads, water supply systems etc. have been introduced in order to minimize the pressure on pastoral ecosystems and therefore improve their productivity and biodiversity. In Armenia, a mixed stand of climate-resilient trees is established, creating a new forest belt which mitigates heavy winds.

Although the CLIMA East project primarily had a strong climate adaptation and mitigation component (avoiding GHG emission by replacing fossil fuel with biomass, and through the restoration of peatlands, forests, and pastureland), benefits for biodiversity were more than evident - over 66,000 hectares of key ecosystems and at least 57 key species of flora and fauna have either reduced climate-related threats and/or improved their biodiversity status. Some of the lessons learnt through the project:

- Healthy ecosystems are more resilient to climate change and can help farming communities to cope with it.
- Local farming communities play a central role in the process of ecosystem-based land management. Since a shift in regular practice is needed, awareness raising among the local communities on the benefits of this approach is crucial.

Source: Clima East – Shifting ground

The Case of traditional Ramli cropping practices in Ghar El Melh, Tunisia

The Ramli agricultural system in the lagoons of Ghar El Melh in Tunisia, represents an ingenious method of cultivation on sand, using sea tides to irrigate crops with fresh rainwater. In 2020 the Ramli agricultural system was recognized by FAO as one of the 62 Globally Important Agricultural Heritage Systems (GIAHS) of the world.

It is based on a **passive irrigation system** where the roots of the plants are fed throughout each season by rainwater stored and floating on the surface of the sea through the movement of the tides. The traditional knowledge preserved over the centuries enables farmers to maintain the lagoon plots through the precise supply of sand and organic matter so that the crops reach the right height, allowing the roots to be irrigated by a fresh water and not to be affected by salt water. Hedges of fruit trees and shrubs on the lagoon **barrier protect the cultivated plots from wind and sea spray**, help slow down evaporation and fix the sand. Such a multifaceted system makes it possible to grow crops all year round without artificial water supplies, even during periods of drought.

Sources: Africa Renewal; The Ramli Agricultural System in the Lagoon of Ghar El Melh in Tunisia

The case of conservation agriculture in northwest Morocco

Conservation agriculture[1] has been introduced in dry areas of Morocco as a response to issues of soil conservation, drought mitigation and soil quality management. No-tillage systems have resulted in reduced soil erosion, greater soil water conservation, improved soil quality and stable and higher crop yields. Changes in crop production practices resulted in an increase of organic matter in soil and consequently improved nutrient and water holding capacity of the soil, as well as higher soil biodiversity. It has potential to slow and even reverse the rate of emissions of CO_2 and other greenhouse gases. Conservation agriculture practices benefited both farmers and society in terms of higher returns and efficiencies. Under no-tillage, besides the benefits from improved agriculture's environmental performance, additional benefits included production cost reduction and improved well-being of farmers. Other strong benefits come from the opportunity for early sowing and savings in time, machinery and fuel.

Source: The conservation agriculture in northwest of Morocco (Merchouch area): The impact of no-till systems on physical properties of soils in semi-arid climate (2020)

The case of Farms and forests: connecting landscapes in India

The Central Indian landscape is one of the most important tiger conservation areas in the world. It is a forest-agriculture mosaic landscape, mostly made up of small and medium scale, relatively diverse agriculture systems which play a crucial role in **providing ecological connectivity** across the landscape, allowing tigers and other large mammals to disperse. However, the ecological corridors of the Central Indian landscape are threatened by diminishing returns in farming and directing economic activities towards mining, tourism, urbanization and industry.

To counter this trend, and contribute to the viability of agriculture, WWF India worked with civil society organizations, community institutions and local governments to **promote agroecological practices** in cotton cultivation and create new markets. Practices such as the growing of farmers' own seeds and the application of organic manure, bio-fertilizers and bio-pesticides were promoted. Farmers established chemical-free cotton production systems and used nitrogen-fixating pulses (plants from the legume family such as beans, lentils, chickpeas) as a fertilizing intercrop. In addition, market linkages were created for organic cotton. Local farmer organizations were connected directly to organic brands, retailers and certification agencies, thereby avoiding intermediaries. These efforts reached about 6000 farmers in the corridor.

Source: WWF 2021. Farming with Biodiversity – more examples provided such as Farmer Field Schools spread agroecological practices in coastal Mozambique, Enhancing livelihoods and forest conservation with Yerba Mate in Paraguay, etc.

Further information and support

- *QuickTips on Working with Nature*
- *Business@Biodiversity*
- *FAO (2020): Strategy on Mainstreaming Biodiversity across Agricultural Sectors*
- *FAO (2021): Nature-based solutions in agriculture, The case and pathway for adoption*
- *Handbook for developing and implementing Pro-Biodiversity Business Projects, 2009*
- *IUCN (2020): Approaches to sustainable agriculture*
- *OECD (2021): OECD work in support of biodiversity*
- *Practical guide on biodiversity for SME s in the agri-food sector, 2022*
- *UNEP (2021): Food system impacts on biodiversity loss*

All documents are available on capacity4dev (public group: *Environment, Climate Change and Green Economy*)

Contact INTPA and NEAR Environment & Climate Change Mainstreaming Facility:
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[1] Conservation agriculture is characterized by three principles: minimum tillage, even the total absence of tillage (no-tillage) in the case of direct seeding, permanent soil cover by mulch, and diversification of crops.