CULTURAL PRACTICE

CROP DIVERSIFICATION

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CROP DIVERSIFICATION CAN BE AN EFFICIENT TOOL FOR ENSURING FOOD SECURITY AND MITIGATING THE IMPACT OF CLIMATE CHANGE.

Rural populations are highly vulnerable to the changeable environmental conditions caused by climate change (extreme weather, higher temperatures, variable rainfall, etc.) because they exclusively rely on crops for their food supply and livelihoods (Mustafa et al. 2019).

The loss of genetic diversity, also a consequence of climate change, diminishes the soil quality and increases the occurrence of pests and diseases, thus impacting crops yield (Chaudhry et al. 2022).

Monoculture has been widely developed in the last centuries in response to the increasing food demand, linked to the demographic explosion (Tilman et al. 2002). Simultaneously, a lot of environmental challenges are linked to agriculture such as soil and water pollution, loss of biodiversity, and greenhouse gases emission, that highlight the need for the development of sustainable agricultural practices.

Crop diversification is one of these sustainable practices, and can take different forms and scales. It is defined by IPES-Food (2016) as a maintenance of "multiple source of production, and varying what is produced across farming landscapes (intercropping) and overtime (crop rotation). "

It can be implemented through many ways, such as cover crops, crop rotation, intercropping or agroforestry.

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THREATS TO THE PRACTICE

Despite the large scientific consensus on the potential agro-ecological and socio-economic benefits of crop diversification, the agronomic solutions for crop diversification strategies are often hampered and not always affordable by various technical, organisational, and institutional barriers, linked to the overall functioning of the dominant agro-food chains (Di Bene et al. 2022).

Some potential challenges for the adoption of crop diversification are (Morel et al. 2020):

- Market demand may be limited by a range of factors, such as government policies, subsidies, etc.
- Lack of infrastructure for storage and transportation
- Absence of suitable equipment
- Price and supply of inputs
- Fear of increased complexity

RECOGNITION AND FUNDING

At EU level, the launch of the Farm to Fork and Biodiversity Strategies within the Green Deal aimed at encouraging a more sustainable and resilient form of food production systems, with a neutral or positive environmental impact (European Commission, 2019; European Commission, 2020 a,b).

There is a gap on the specific local knowledge of soil and land management to support transitions towards diversified cropping systems by involving local stakeholders and actors of agri-food systems from the beginning of research activities with participatory methods (Bampa et al., 2019).

Mosaic landscape High Atlas © Inanc Tekguç GDF

1. CULTURAL SUSTAINABLE LAND-USE PRACTICES

Scientists agree that agricultural sustainability still needs crucial changes to balance an economically viable and socially fair food production with environmental goals. This is particularly evident in the Mediterranean Basin, where the highly specialised agricultural systems are mostly oriented on cereal-based intensive cropping systems under rainfed or irrigated conditions as monoculture, or short-rotations such as wheat-summer irrigated crops, leading to high incidences of pests and diseases, loss of soil fertility and biodiversity.

Enhancing crop diversification in arable cropping systems can improve crop productivity and resource use efficiency, by delivering multiple ecosystem services through crop rotations, green manure, and species mixtures such as multiple cropping and/or intercropping that can include legumes, leys, grassland, and minor crops of local interest (Di Bene et al. 2022).

RESEARCH BY THE ALLIANCE FOR MEDITERRANEAN NATURE AND CULTURE (AMNC)

AMNC partners undertook research and implemented the traditional land use practices in the different pilot sites. Notably, in High Atlas, crop rotation and intercropping were carried out, and crops were chosen according to the type of soil. These land use practices, enhanced through implementation of sustainable agriculture, permaculture and agroecology, resulted in improved crop production and reduction of chemical inputs. In Menorca and Lemnos, autochthonous breeds and varieties are prioritised as they are adapted to the local climate, and farms use less water by leveraging rainwater harvesting practices. Dehesas and Montados of Spain and Portugal, considered High Nature Value Systems, are rich in flora and fauna wildlife species and habitats, as they are based on crop rotation, intercropping and the selection of appropriate crops and farming management practices at local levels.

Harvesting crops, Lebanon © Shouf Biosphere Reserve

2. BENEFITS OF THE PRACTICE

2.1. BIODIVERSITY

Crop diversification increases agricultural biodiversity (genetic, species and ecosystem), improves crop yields and produces quality to address both food and nutritional security. This practice also acts as a buffer against pests and diseases, as it can yield many agronomic benefits in pest management by breaking insect and disease cycles, reducing weeds and soil erosion, and conserving soil moisture. The more diverse a farming system is with plants, animals and soil-borne organisms, the more varied the population of beneficial pest-fighting microbes in the soil.

2.2. CULTURAL

This land-use approach is part of traditional cultural heritage practices, where evolution of socio-cultural patterns, cultural values, governance structures and natural elements are interconnected. The traditional knowledge of local communities for ecosystem management and sustainable use of natural resources is key in adapting agriculture to climate change and it is an essential element of local adaptive capacity that can be enhanced through local seed systems, farmers' rights to traditional crops and market access for local varieties. Compared with modern hybrids, traditional crop varieties are cheaper, easier to access, more diverse and more resilient to climate pressures (Swiderska et al. 2011).

2.3. CLIMATE CHANGE

Crop diversification provides resilience against extreme and highly variable weather conditions resulting from climate change. It increases carbon sequestration in soils while mitigating greenhouse gas emissions. The most promising sustainable agricultural management strategies to maintain existing soil organic carbon stocks and restore them in carbon-depleted soils include crop diversification practices such as intercropping in woody cropping systems, which simultaneously address soil degradation, climate change and food security. In particular, several studies already demonstrated the potential of intercropping for restoring soil organic carbon losses derived from the conversion of native ecosystems to croplands in Mediterranean environments (Martínez-Mena et al. 2021)

2.4. SOCIO-ECONOMICAL

Through crop diversification, farming households can spread production and economic risk over a broader range of crops, thus reducing financial risks associated with unfavorable weather or market shocks. The inclusion of a variety of crops, in some areas, can lead to the development of new agriculture-based industries, improving the economic potential of a rural community. This approach can reduce production costs and increase income in small farm holdings. For example, the inclusion of legumes into rotation reduces spending on nitrogen fertilizer or adding crops into the rotation, resulting in fewer pest problems and reducing expenditures on pesticides.

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Clover growing in a field at Mongofra Nou farm, a multiannual rain-fed cover crop loved by pollinators
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