NATAE
North African Transition to AgroEcology

Crop diversification in the Mediterranean: associations and crop rotations

Agroecological zones

Suburban | Cereal plain | Mountains | Irrigated | Oasis

Introduction

Crop diversification enhances the resilience of agricultural and food systems in the Mediterranean, a region particularly affected by climatic instability, international market volatility and nutritional imbalances. Good soil fertility management and soil health are particularly important in the Mediterranean, where soils are often poor in organic matter and vulnerable to degradation.

The benefits of crop diversification

Crop diversification improves soil fertility, particularly through the introduction of nitrogen-fixing legumes; reduces phytosanitary risks, as disease and pest cycles are interrupted; and optimises the use of water resources (through the introduction of crops adapted to drought, the exploitation of different soil layers by root systems at different depths, the creation of a local microclimate, etc.). At farm level, it also provides income diversification. Crop diversification enhances biodiversity, improving the ecological balance (plants, beneficial insects, etc.) and farming systems resilience. Finally, crop diversification, whether for self-consumption or for consumption on local and national markets, helps to diversify the diet, providing solutions to nutritional problems (obesity, dietary imbalances, nutrient deficiencies), which are critical public health issues in North Africa.

Approaches to crop diversification in the Mediterranean

a. Crop associations

Crop associations consist of growing several species simultaneously on the same plot of land to optimise the use of natural resources (soil, water, nutrients), improve soil fertility, reduce disease and pest pressure, and combat weed growth. Crop associations are generally more resilient to climate hazards than monocropping.

Examples of crop associations:

- **Legumes + Cereals:** Combining one or more cereals with one or several legumes to produce fodder production the nutritional value of livestock feed and enriches the soil. Cropping vetch with oats is one of the most common combinations. ***(see Fodder associations adapted to Mediterranean areas factsheet)***
- **Tomatoes + Basil:** These two crops interact favourably, with specific basil varieties helping to keep pests away from tomatoes.

b. Crop rotation

Crop rotation is the distribution of farm land between different crops according to a multi-year cycle. Different crops are grown successively on a plot (crop rotation or cropping sequences). Crop rotations help prevent soil impoverishment, reduce pests and diseases and improve productivity. They reduce or eliminate the need for chemical inputs, and improve farm profitability.

Example wheat followed by legumes.

This rotation maintains soil fertility and reduces the need for nitrogenous fertilisers for growing wheat. Broad beans, fenugreek, peas and chickpeas are legumes used by farmers in the wheat/legume rotation at the Living Lab of El-Krib in Siliana, Tunisia. ***(see Crop rotation in the Mediterranean: legumes and cereals factsheet)***

Source: INAT, Tunisia

c. Forest farming or agroforestry

Agroforestry involves growing annual or biannual crops between trees in an integrated system, thereby improving soil quality, water management and biodiversity. With the following associations, for example:

- **Olive trees + aromatic and medicinal herbs, cereals or pulses:** Space between the trees is used to plant crops. This system limits weeds and adds value to the farm. ***(see Intercropping in olive groves factsheet)***

- **Date palm + fruit trees + herbaceous plants:** This combination diversifies production and income sources, improves water management and reduces phytosanitary risks. The cultivation of fruit trees and annual herbaceous plants with date palms is typically adopted in three-layer oasis systems, when sufficient water is available. Fig and pomegranate trees are the most widely grown fruit species, while alfalfa and barley are the herbaceous plants most often grown in association with date palms in oases. ***(see Intercropping between date palms in oases factsheet).***

Challenges and limitations

The introduction of several crops on a farm, while highly advantageous, does present certain challenges:

- **More complex management:** Crop diversification requires more rigorous planning, more in-depth knowledge and mastering techniques by farmers (human capital). Associated crops, in particular, require adjusting seeding density, crop spacing and crop spatial organisation. Different planting dates may be required to optimize crop combinations. Crop diversity is also associated with a diversification of farming practices and often leads to greater labour requirements.
- **Competition for resources:** The choice of crops to be planted together is important to ensure optimum distribution of resources (water, nutrients, light), by choosing crops with different root systems, exploiting different soil layers.
- **A high initial investment:** Diversifying crops on a farm often has an additional cost. Economies of scale are reduced and costs per unit area may be higher. The equipment needed to grow the different crops may not be the same, resulting in additional costs, or requiring the organisation of equipment pooling systems.

The role of crop diversification in agroecological systems

Diversity is one of the ten elements of agroecology defined by the FAO. Crop diversification (associations and crop rotation) is essential to ensure the sustainability and resilience of agricultural and food systems in the Mediterranean. By making efficient use of available natural resources, safeguarding natural and cultivated biodiversity, and adapting agriculture to climate hazards, crop associations and crop rotations can be agroecological practices that promote more efficient, more environmentally-friendly farming, and more stable yields and incomes. Crop diversification plays a crucial role in the agroecological transition, helping to boost food security and nutrition while preserving, protecting and enhancing natural resources.

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