

Intercropping in olive groves

Agroecological zones

Cereal plain

Mountains

Introduction

The olive tree is an emblematic crop of the Mediterranean basin. Adapted to hot, dry climatic conditions, this crop plays an important economic and ecological role. However, climate variability, dwindling water resources and soil degradation are major challenges to its sustainability.

Intercropping olive groves in the Mediterranean offers a number of agronomic and environmental advantages.

Combining olive trees with crops optimises land use, improves soil fertility and diversifies farmer income. This agroforestry system is fully in line with an agroecological transition, contributing to a more sustainable Mediterranean agriculture adapted to climate challenges.



Source: INAT, Tunisia

The benefits of intercropping olive groves

Integrating annual or multi-annual crops (legumes, fodder crops, aromatic and medicinal plants, etc.) between the olive trees has several advantages:

- **Optimising land use:** The spacing between olive trees, which in extensive systems in North Africa can range from 6 to 24 m, means that intercropping can be introduced without significantly affecting tree productivity.
- **Improved biodiversity:** The coexistence of several species on the same plot promotes biodiversity, by creating a suitable habitat for a wide range of beneficial insects and soil organisms.

- **Diversification of farm income:** Intercropping can generate additional income. They improve farm resilience by reducing dependence on the olive value chain. Some of the crops, such as certain aromatic and medicinal plants, are suitable for local processing and can be of particular value to women.
- **Improved soil fertility:** Certain intercrops, such as legumes, fix nitrogen in the soil, improving its fertility and helping to reduce the olive tree's nitrogen requirements.
- **Better water management:** Intercropping can help limit evaporation and improve water retention in the soil.
- **Reducing weeds and erosion:** Intercrops act as a protective plant cover against soil erosion. They are also more competitive than weeds, which encourages natural weed control by reducing weed seed stocks in the soil.
- **Reduced maintenance costs:** intercropping eliminates or reduces the use of herbicides and chemical fertilisers.

Examples of intercropping adapted to Mediterranean conditions

The choice of intercrops depends on their compatibility with olive trees and their adaptation to the Mediterranean climate. Commonly used intercrops include:

Food legumes

- **Chickpea:** This species of legume is fairly tolerant of water stress and helps to improve soil fertility.
- **Fava beans:** Fava beans fix atmospheric nitrogen and considerably enrich the soil in this element (100 to 150 kg N/ha). It also adapts well to Mediterranean soils.
- **Lentil:** Lentils are a low-nutrient crop, well suited to poor soils. It is also resistant to water stress.

Cereals

- **Wheat:** A crop with high economic value in the Mediterranean, which can also be intercropped for family consumption.
- **Barley:** Barley is a more drought-tolerant crop than wheat, and is often preferred in semi-arid areas. It can be used for human consumption or as animal fodder.

Fodder plants

- **Clover:** Nitrogen fixer and excellent soil cover.
- **Alfalfa:** A legume that improves soil structure and provides quality fodder.
- **Vetch:** Vetch is a nitrogen-fixing legume. It is often used in a mixture (association) with oats to produce fodder.
- **Oats:** Oats are an important grass for fodder, and are often grown in association with vetch.
- **Fodder mixtures:** Fodder mixtures (e.g. vetch + oats) are often intercropped in olive groves to optimise the composition of the resulting fodder (see Fodder associations adapted to Mediterranean areas sheet).

Aromatic and medicinal herbs

- Several aromatic and medicinal species can be intercropped with olive groves, including **thyme** (*Thymus vulgaris*), **rosemary** (*Rosmarinus officinalis*), **oregano** (*Origanum vulgare*) and lavender (*Lavandula*). These crops do not require much water, are compatible with olive trees and offer high added value on the market.

Management methods for intercropping under olive trees

Spacing

Intercropping is possible in olive groves where the rows of trees are at least 6 to 8 metres apart, i.e. at a density of around 200 vines/ha or less. Intercropping is best carried out at a distance of 2 metres from the olive trees. This distance depends on the height of the tree and the type of intercropping.

Irrigation

Intercropping is mainly rain-fed and the species are chosen to complete their cycle during the rainy period. In semi-intensive irrigated olive groves, intercropping can be irrigated, although this is rare.

Fertilisation and crop rotation

The use of compost and organic fertilisers is recommended in this cropping system in order to limit competition between the intercropped plant and the olive tree. Species rotation is also essential in intercropping to introduce atmospheric nitrogen-fixing legumes and prevent the proliferation of specific pests or the depletion of soil nutrient reserves.

Challenges and limitations

There are certain limitations to intercropping olive trees:

- **Competition for water and nutrients:** Precise management of inputs is essential to avoid mineral deficiencies and competition for water resources, particularly in semi-arid environments. Farming methods such as hay harvesting or green mowing, which shorten the development cycles of intercrops, can be favoured.
- **Increased labour requirements:** Crop diversification requires more monitoring and additional labour.
- **Risks of disease and pests:** Certain intercrops can encourage the spread of pathogens. Vegetable crops from the Solanaceae family should be avoided as they can be sources of diseases and pests for olive trees, such as nematodes.



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