NATAE
North African Transition to AgroEcology

Intercropping between date palms in oases

Agroecological zones

Oasis

Introduction

The date palm is a crop well adapted to the hot, dry climates characteristic of the arid regions of North Africa. Nearly 35% of the world's date production comes from North African countries (Algeria, Tunisia, Mauritania, Morocco, Libya and Egypt), where the sector is an economic mainstay of the Saharan regions.

Date palms are the central element of oasis systems. Given the wide spacing between the trees, this ecosystem is highly conducive to agroforestry.

Source: INAT, Tunisia

Historically, traditional oases have been areas of great diversity, where fruit trees and herbaceous crops cohabit with date palms to form a multi-storey system that helps to create the microclimate that is characteristic of oases. This system can provide useful inspiration for more recent palm groves developed in the peri-oasis environment or in newly-developed areas in the Sahara.

The benefits of intercropping in oasis systems

This intercropping system under date palms is an agroecological approach with several advantages:

- **Optimising the use of:** The date palms are planted with a relatively wide spacing (around 7 to 10 metres between each tree), which creates spaces between the rows that can be used for intercropping.

- **Creating an oasis microclimate:** Multi-storey intercropping creates shade, limits wind and reduces water evaporation. This creates a humid microclimate in the oases. This microclimate is important in more ways than one, as it activates the small water cycle and reduces the impact of certain palm pests, including mites, which proliferate in hot, dry climates.
- **Combating soil erosion:** Intercropping helps to stabilise the soil, reducing wind and water erosion. In Saharan regions, characterised by frequent strong winds, herbaceous crops and fruit trees act as windbreaks within the farms and contribute effectively to reducing wind erosion.
- **Weed control:** Intercropping creates a vegetation cover that smothers weeds, reducing the need for manual or chemical weeding and the associated costs.
- **Improving soil fertility:** Intercropping captures carbon and contributes to soil formation in oases. Occupying the spaces between palm trees improves the biological fertility of these soils by contributing to the organic matter cycle, reducing soil temperature during the summer and protecting the soil from solar radiation. Intercropping legumes help to improve the chemical fertility of the soil by fixing nitrogen from the air.
- **Pest diversity and control:** Crop diversity helps to limit the risks associated with diseases and pests by providing a habitat for many beneficial species, including pollinators and biological control aids. In this way, intercropping contributes to an integrated and sustainable management approach in oases.
- **Income diversification:** Intercropping generates additional income for farmers, reducing their dependence on date production alone. In many cases, a significant proportion of the production of fruit and herbaceous intercrops is used for self-consumption, helping to improve the self-sufficiency and nutritional balance of farmers and their families. In addition, fodder crops enable farmers to incorporate livestock into their production system, leading to diversification of income as well as the production of manure and the return of organic matter to the agro-ecosystem.

Choosing intercrops in oasis systems

Intercrops should be chosen according to their physiological requirements. They must be adapted to the hot, dry climate. In addition, the availability of water in excess of the date palm's needs has a major influence on the choice of species to grow.

The most common intercrops in oasis or peri-oasis systems in North African countries include several families:

- **Food legumes:** including beans, broad beans and certain drought-tolerant legumes such as chickpeas and lentils.
- **Fodder legumes:** mainly alfalfa, but also certain ecotypes of clover and vetch.
- **Cereals and feed grains:** Some indigenous varieties and ecotypes of wheat, barley and millet are grown, often for home consumption. Barley is also grown for fodder. On farms where water resources are not limiting, summer cereals such as fodder sorghum or maize can be grown in association with date palms.
    - **Cereals Pomegranate trees:** These are adapted to arid conditions and can be grown alongside palm trees to diversify fruit production.
    - **Olive trees:** These are well adapted to Mediterranean regions and can be grown between palm trees to diversify agricultural production.
    - **Fig trees:** Well-adapted to the climatic conditions of oases and to drought due to their deep root systems which allow deep access to water.
    - **Citrus:** Lemon trees, as well as ecotypes of certain less common citrus fruits, including limes
    - **Apricot trees:** Some local, early varieties are suited to oases. Varietal mixing is important when varieties are self-incompatible.

Management methods for intercropping under olive trees

Spacing and planning

The spacing between palms and intercropping plants must be sufficiently wide to avoid competition for water and nutrient resources. Generally, fruit trees are planted between the rows of palms, while herbaceous crops are grown under the palms, often in the wide basins used for irrigation.

Source: INAT, Tunisia

Irrigation and water management

Date palms have high water requirements, but intercrops, such as legumes or fodder plants, may require less irrigation. It is essential to plan an irrigation system to meet the needs of all crops while minimising wastage. In addition, herbaceous crops can be planted only during periods when the palm's water requirements are low.

Source: INAT, Tunisia

Fertilisation

Fertilisation requirements vary from crop to crop. Date palms require large quantities of nitrogen, phosphorus and potassium. Intercrops such as legumes can reduce dependence on chemical nitrogen fertilisers by naturally enriching the soil.

Source: INAT, Tunisia

Crop rotation

Intercrops should be grown in rotation to prevent the spread of pests and diseases; for example, alternating crops of legumes and cereals.

Pest and disease control

Some polyphagous pests and diseases that affect intercropping can also attack date palms. For example, the date moth (*Ectomyelois ceratoniae*) also attacks pomegranates. Rigorous monitoring of pomegranate trees is necessary to prevent the proliferation of this insect and avoid strong epidemiological pressure on the palm.

Source: INAT, Tunisia

Challenges and limitations

There are certain limitations to intercropping olive trees:

- **Competition for resources:** Date palms are large plants and can compete with intercrops for water, light and nutrients. This affects the choice of intercropping species (and varieties). Intercrops can inject nutrients and carbon into the agrosystem, particularly legumes, but can also compete with the palm for mineral elements and water. In several oases, for example in Tunisia, water turns can be very far apart and below the palm's theoretical needs. In this case, intercropping species that tolerate long periods without irrigation and have a cycle that coincides with periods when the palm's needs are low should be favoured.
- **Labour management: I**ntercropping requires more labour for managing different crops, harvesting and disease control. Their presence can also limit the use of mechanisation in oases, especially where fruit trees are concerned.
- **Management of common diseases and pests:** Certain diseases can affect both date palms and intercropped crops, increasing the risk of attacks spreading. For this reason, pomegranate trees need to be controlled and prophylactic measures taken against the date moth (*Ectomyelois ceratoniae*). This involves, in particular, the release of Trichogramma *cocaeciae* and the collection and destruction of infested pomegranate fruit.

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