IWRM Action Hub

CASE STUDY

Mediterranean: Valorization of Mediterranean Almond orchards through the use of intercropping integrated strategies (VALMEDALM Project)

Summary

Almonds are a crop adapted to the conditions of the Mediterranean region. However, the intense soil management practices and the current climate change scenario have led to decreased organic matter, water stress, and biodiversity loss. Therefore, experimenting with innovative practices such as intercropping and drip irrigation techniques is important to ensure sustainable almond production. The VALMEDALM project aims to identify and promote intercropping practices across the Mediterranean, evaluate the effect on pests and weed control, assess the economic, social, and environmental impacts of intercropping, and promote training and knowledge transfer towards local farmers and associations.

Background

In the Mediterranean region, almond orchards are on a mono-cropping system with long tree spacing for rainfed farming or intensively cultivated (with intensive irrigation, fertilization, and plant protection practices), which increases cultivation costs with high yield expectations. Soil management practices used over the last decades, in conjunction with the climatic conditions of the Mediterranean region and the current climate change scenario, have led to decreased soil organic matter, soil erosion, water scarcity, and biodiversity loss. Hence, there is a critical need to improve and spread scientific knowledge and initiate a change towards sustainable orchards that can truly impact the Mediterranean basin.

To empower local almond production in the Mediterranean region, the VALMEDALM (PRIMA funded project) aims to improve the implementation of intercropping practices as an integrated strategy aligned with economic and social aspects and sustainable principles towards an adaptation to climate change. For that, five demo sites were implemented in five Mediterranean countries (Portugal, Croatia, Italy, Israel, and Morocco) and eight field trials were implemented with twelve different intercropping systems.

The VALMEDALM project is studying the effect of intercropping practices in pests and weed control; assessing the nutritional and functional properties of almonds and associated crops; assessing the economic, social, and environmental impacts of the tested methodologies; and promoting training and knowledge transfer towards local farmers and farmer associations. At the end of the project, it is expected that the obtained results contribute to the adoption of sustainable and productive agricultural systems based on plant diversity, to increase farmers' income and competitiveness of small producers in the Mediterranean markets.

Actions taken

The VALMEDALM project is implementing the following set of actions:

1. Demo Sites to evaluate various factors that might affect the implementation and later success of intercropping practices;
2. Inventory of practices associated with intercropping for pest and weed management;
3. Creation of interaction channels and network strategies to promote knowledge transfer and collaborative work within local farmers and associations.
4. A study on an integrated strategy of the use of intercrops within almond orchards and the economic, social and environmental aspects and implemented across the Mediterranean basin.

Here is more information on each of the demo sites:

Portugal Demo

GPS Location:

1. Macedo de Cavaleiros (41°60'13.2''N, 6°59'05.6''W)
2. Macedo de Cavaleiros (41°36'16.4''N, 6°58'18.9''W)
3. Argozelo (41°38'11.1'N 6◦34'34.9''W)

Demosite Area: 3 ha

Field Trials: 3

Almond cultivars:

1. Ferraduel, Ferragnès
2. Ferraduel, Ferragnès
3. Makako, Lauranne, Belona

Intercrop System: Inter-row

Crop system(s):

1. Non-irrigated almond orchard in full production
2. Irrigated almond orchard in full production
3. Newly planted irrigated almond orchard

Modality:

1. Covered with chickpeas (sowing in April/May)
2. Covered with short cycle clover (sowing in October)
3. Mobilized (Witness)

Italy Demo

GPS Location: Licata, Agrigento, C.da Volpara, 92027 (37°12’31.2″N 13°50’38.2″E)

Demosite Area: 7 ha

Field Trials: 1

Almond cultivars: Tuono

Intercrop System: Inter-row

Crop system (s): Irrigated 4-years old orchard

Modality: RCBD with 3 replications. Treatments: 1. Sulla (3 years); 2. Medicago spp. (3 years); 3. Soil tillage (control; 3 years). Sowing in October/November

Israel Demo

GPS Location: Model Farm for Sustainable Agriculture Newe Ya’ar Research Center (32.715148, 35.188401)

Demosite Area: 1.5 ha

Field Trials: 1

Almond cultivars: Matan

Intercrop System: Service crops between all rows. With/without service crops on the tree rows

Crop system (s): Irrigated almond orchard with servisse crops

Modality: 1. WITH service crops on tree row. 2. WITHOUT service crops on the tree row, crossed with: 1. Standard fertigation 2. Flexible fertigation (responding to field conditions)

Morocco Demo

GPS Location:

1. Azilal mountains (31°56’42 N, 6°35’50 W), 1400m above sea level
2. Aknoul (34°49’31 N, 03°42’34 W) 1000m above sea level
3. Ain Taoujdate (33°56’11 N, 5°09’32W) 550 m above sea level

Demosite Area: 12 ha

Field Trials: 3

Almond cultivars: Ferragnès, Ferraduel, Local genotypes (Beldi almond)

Intercrop System: Inter-row

Crop system (s):

1. Calcareous soil, Annual rainfall: 400 mm, Drip irrigation, Standard agricultural practices (fertilisation, protection…), Non-irrigated almond orchard in full production
2. Calcareous marl soil, Annual rainfall: 340 mm, Traditional practices, Non-irrigated almond orchard in full production
3. Clayey, calcareous and brown soil, Annual rainfall: 470 mm, Average of chill availability: 540 hours of temperature below 7°C., Drip irrigation., Standard agricultural practices (fertilisation, protection…), Newly planted irrigated almond orchard

Modality: Three treatments for each demo site:

1. Separated almond (without intercrop)
2. Separated Bean / broad bean crop (without almond)
3. Mixte: almond and intercrop

Croatia Demo

GPS Location: Selca-island Brač, (43°1656 N,16°4833E), 250m above sea level

Demosite Area: 1 ha

Field Trials: 1

Almond cultivars: Ferragnès, Ferraduel, Ai, Texas

Intercrop System: Inter-row

Crop system(s): Rocky soil with approximately 40% soil in the 60 cm soil depth, coupled with rock 1-5 cm diametre, Orchard planted in 2017, Drip irrigation system, Production organized as organic production

Modality: Intercrops planting in October or November. Four rows of almond trees, each row will have a row of intercrop on both sides. Intercropping will be done with the following plants: Artichoke, Imortela, Rosemary, and Salvia. Intercrop rows will have one or two rows of almond trees without intercrop plants that will function as controls.

Outcomes

At the end of the VALMEDALM project, we expect to achieve the following outcomes:

- Improve sustainable food production by the introduction of different intercropping systems that could increase the crops yields, contributing as extra income for small scale farmers by producing legumes, vegetables and aromatic plants; Increase

farmer’s income, also including other possible agricultural-linked income sources and ensure transparency and fair pricing structure along the value chain;
- Promote access to work for young workers and women and create transfer of knowledge and technology between academia and farmers through the organization of demonstration sessions, trainings, and best practices guides;
- Enable access to markets, i.e., ensure access of local producers to distribution channels and markets, providing the general population with healthy and sustainable products;
- Improve sustainable food production systems with efficient use of water and natural resources and with eco-friendly processes with low GHG emissions; all the technical and economic data on intercropping practices in project demo sites are being collected, analysed and exploitaion results will be shared;
- Reduce food losses along production and supply chains, including post-harvest losses and potentially valorising the waste left.

Lessons Learned

The project explores the multiple potential benefits of intercropping agriculture, including in terms of nutrition, reduction of pesticide use, soil and plant/entomofauna biodiversity, pest incidence, reduction of inorganic fertilizer, and water use efficiency.

Since the project is testing almonds intercropping techniques that are highly potentially scalable and replicable across the Mediterranean region, replication can contribute to the adoption of sustainable and productive agricultural systems based on plant diversity, while aiming to increase farmers’ income and competitiveness of small producers in the Mediterranean markets.

At the end of the project, we aim to have a good understanding of:

- the impact of intercropping practices in pest and weed management in almond orchards from Mediterranean area;
- the impact of crops co-association on the nutritional and bioactive properties;
- the economic, social and environmental impacts of the tested intercropping practices in different edaphoclimatic regions.

VALMEDALM aims to increase agro-food stakeholders’ skills by sharing obtained knowledge on intercropping practices, contributing to sustainable agriculture among Mediterranean countries.

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Related IWRM Tools
Efficiency in Water Management
