Irrigation demands in the Mediterranean region are projected to increase between 4 and 18% by the end of the century due to climate change alone; while population growth and increased demand, may escalate these numbers to 22-74%.

Food products, crop and fish yields are projected to decline in many Mediterranean areas due to climatic and other stress factors.

Urgent need for technological updating of greenhouse industry to
- face the increasing competition arising from globalisation
- minimize the environmental impacts (e.g. discharge of nutrients and growing eutrophication trends, intensive water use, excessive pesticide use...)

Optimal greenhouse management is required to ensure unrestricted growth at a yield close to the maximum potential, while minimizing unsustainable exploitation of resources, especially energy, soil & water.
Overall objective
HortiMED aims to provide the Mediterranean farming community with innovative tools to enable resource efficient year-round greenhouse cultivation by harnessing the potential of both simple & advanced technologies for smart nutrient, irrigation & climate control, and Integrated Pest Management (IPM) taking into account their feasibility and cost-effectiveness at individual greenhouse level.

Specific objectives

SO1- To develop and test a user-friendly and flexible Decision Support System (DSS) allowing smart nutrient, irrigation & climate control, and integrated pest management in greenhouses through: (1) Expert advisory services to help farmers in intensive knowledge tasks where climatic, crop and nutrient variables decisively influence crop growth and productivity; and (2) efficient and cost-effective partial or full automation of greenhouses.

SO2- To demonstrate the potential of biological agro-ecological technologies to close the loop in Mediterranean greenhouses by validating aquaponics systems based on the combination of IMTA and hydroponics to deliver high quality Mediterranean horticultural and fish products with improved WUE and NUE.

SO3- To provide farmers with tools for environmentally friendly integrated pest management by testing bio-based pest management tactics for effective pest control in horticultural greenhouses.

SO4- To validate HortiMED technologies in low, medium and high technology greenhouses from Egypt, Algeria and Spain.

SO5- To achieve well-targeted communication and effective transfer of the project results to stakeholders to successfully embed the HortiMED results into local horticultural community systems.
EXPECTED IMPACTS

IMPROVED RESOURCE EFFICIENCY AND INCREASED CIRCULARITY

- Water Use Efficiency (WUE) (m3/m2/kg) improved by 15%
- Nutrient Use Efficiency (NUE)(kg of fertilizer/m2/kg) improved by 10%
- Energy Use Efficiency (EUE) (Kwh/m2/kg) improved by 10%
- Reduction of chemical pesticides use by 5%
- Feed Conversion Ratio (FCR) improved by 10% in IMTA system
- Net aquatic species biomass production in IMTA increased by 15%

REDUCTION OF ENVIRONMENTAL IMPACTS

- Reduced pollution from nutrient leaching thanks to precise fertiliser applications
- Minimized GHG thanks to optimized fertiliser applications and minimised energy use
- Reduction of chemical pesticides residues in food, soil & water

INNOVATIONS ENABLING SUSTAINABLE AND EFFICIENT AGRICULTURE AND FOOD SYSTEMS

- Automatic control system for the management of aquaponics and hydroponics
- AI-based software platform for smart monitoring of greenhouses
- IMTA aquaponics for water and nutrient efficient fish and crop production
- Hybrid modelling for smart greenhouse control

ACCESS TO NOVEL TOOLS

- User friendly and easy to integrate DSS for greenhouse production

INCREASED COMPETITIVENESS

- Reduction of production costs by 5% thanks to improved WUE, NUE and EUE
HortiMED Expert users Board

The HortiMED Expert users Board (EuB) was officially launched in May 2020. It is an external board comprised by 30 members from 11 different Mediterranean countries and embracing diverse type of stakeholders such as farmers associations, universities and research institutes, private producers, greenhouse technology providers, etc. HortiMED EuB's main purpose is to serve as an external source of information and guidance for the HortiMED Project.

A series of questionnaires, specifically designed for each target group of end-users, was developed and distributed among HortiMED EuB members and other relevant stakeholders in order to obtain their feedback for the design of HortiMED tools and to identify their main needs and requirements.

These surveys have allowed HortiMED consortium to:

- get insights into the current agricultural practices in the Mediterranean area in relation to protected horticulture and aquaponic systems,
- to detect major constraints that hamper the application of resource efficient practices and environmentally friendly pest management strategies among Mediterranean farming actors, and
- to identify and rank end-users preferences in relation to HortiMED DSS.

Understanding end-users needs

Listening to the voice of HortiMED end-users
HortiMED has accomplished the design and planning of the three demonstrative Case Studies, as well as the definition of the Key Performance Indicators (KPIs) and metrics for validation, including the establishment of the methodology for collecting the required data (definition of the frequency and registration procedures based on the defined KPIs) and the collection of the baseline data for each scenario.

HortiMED has identified the data sources to be handled by the HortiMED data management system, including local repositories (e.g. governmental agencies, meteorological stations…) and available data sources at each demonstrative greenhouse, considering both digital (e.g. climate, crop, soil sensors deployed in the greenhouses, outside weather stations, etc.) and non-digital data sources. The greenhouse non-digital data sources considered comprise visual inspection data, results of experimental campaigns and historic records of previous crop seasons, such as greenhouse productivity per hectare, final product quality, pest outbreaks and associated crop damages, water, energy and nutrient consumption, etc. The data sources will be used to fuel the Artificial Intelligence (AI) algorithms of the Decision Support System (DSS) that will be developed and tested in the framework of the project.

HortiMED has also addressed the characterisation of the demonstrative greenhouses to analyse the features controlling resource consumption (i.e. water, energy, nutrients & agrochemicals) and climate-fertigation-crop interactions.

HortiMED has deployed additional sensors in the demonstrative greenhouses for the automatic monitoring of relevant greenhouse climate and water quality parameters.
Unleashing the power of greenhouse data

HortiMED DSS will handle a **wide range of heterogeneous data** and will apply artificial intelligence techniques to continuously **learn from historical databases** to forecast production yields and expected greenhouse conditions, allowing developing enhanced adaptive smart algorithms for climate, irrigation and nutrient control and automation.

**HortiMED Architecture**
HortiMED has enabled semi-automated mechanisms to record the available greenhouse information, which will be especially useful for greenhouse with low technological level where most of the data are manually collected.

HortiMED FieldBook is a web and mobile application that facilitates the integration and digitization of manually collected data (e.g. visual inspection data, measurements of portable sensors, results of laboratory analysis, etc.)

HortiMED FieldBook App integrates an Optical Character Recognition system, allowing the digitization of handwritten historical information.

First Project Workshop held

The first workshop of HortiMED Project was on December 2020. The workshop was attended by 173 persons, 110 participants remotely connected by means of Zoom, and 63 attendees at the headquarters of the Institute's Branch of Inland Water and Fish Farms (Egypt).
PRIMA is the most ambitious joint programme to be undertaken in the frame of Euro-Mediterranean cooperation.

By funding R&I through competitive calls, PRIMA aims to: “build research and innovation capacities and to develop knowledge and common innovative solutions for agro-food systems, to make them sustainable, and for integrated water provision and management in the Mediterranean area, to make those systems and that provision and management more climate resilient, efficient, cost-effective and environmentally and socially sustainable, and to contribute to solving water scarcity, food security, nutrition, health, well-being and migration problems upstream”.

PRIMA also aims at to contribute to United Nations’ Agenda 2030 through the achievement of the Sustainable Development Goals (SDGs).

The PRIMA Programme is supported under Horizon 2020 the European Union’s Framework Programme for Research and Innovation.

COORDINATING ENTITY
INKOA SISTEMAS S.L.
Ribera de Axpe 11 Edificio D1 Dpto. 208
48950 Erandio SPAIN
www.inkoa.com
Nora Ibáñez Otazua nibanez@inkoa.com

PROJECT PARTNERS
Deusto
Universidad de Deusto
University of Deusto

Stay tuned!
https://www.hortimed-prima.eu/

HortiMED Project (Grant Number 1915) is part of the PRIMA Programme supported by the European Union’s Horizon 2020 Research and Innovation Programme. The contents of this document are the sole responsibility of the HortiMED Consortium and the PRIMA Foundation is not responsible for any use that may be made of the information it contains.