



SUSMEDHOUSE

Sustainability and Competitiveness of Mediterranean Greenhouse and Intensive Horticulture.

BACKGROUND

Innovation of Greenhouse Technologies that support Sustainability and Circular Economy through SUSMEDHOUSE project in the Mediterranean region.

Sustainability of agro - environmental resources is considered of main importance at global scale. Simultaneously, the provision of qualitative food products for the increased needs of the rising population (it is estimated to be more than 9 billion towards 2050), is causing further pressures to the overall spectrum around the agricultural sector, enhanced by the related climate change issues.

Such pressures combined with demographic growth in the area promote further an urgent need to invest in productivity improvement, farming efficiency and agricultural sustainability. Through development and testing of innovative, greenhouse-related technologies the SUSMEDHOUSE project aims to help address these issues. Such perspectives constitute a very demanding framework of applications provided by multidimensional, scientific disciplines that need to cooperate efficiently together to develop different, advanced technologies, so as to provide sustainable, agricultural production. Such activities are perfectly combined in the core of objectives of SUSMEDHOUSE project, so as to deliver a state-of-the-art, inclusive base for further exploitation by operational actors in the field, and to increase further the positive impacts towards employment and economic effects of the agricultural sector in the region and beyond.

The Need

Sustainability of agro environmental sector in the Mediterranean region.



Response

The consortium and the deliverables



The consortium which will develop the targeted technologies, is established by a partnership of 7 organizations from 6 countries of the 3 continents around the Mediterranean Sea and beyond (Germany), representing the extended interest of the overall area to the current challenges tackled by the project's deliverables:

Climate change causing an adverse effect on the arable lands in the region.

Sustainability around the Mediterranean is limited due to several natural and anthropogenic reasons, such as rudimentary greenhouse technologies and cultivation techniques,


Circular recovery is insufficient and almost zero in the countries around the Mediterranean region,

Pest and pathogen control methods are environmentally hazardous, not efficient enough and non-precise.

Growers unconsciously use and exploit the resources.

Four cultivation methods, namely, conventional, aquaponic, hydroponic, and agro-photovoltaics will be implemented on separate benches of SUSMEDHOUSE in order to examine the effect of cultivation method on the greenhouse efficiency and preservation of resources. Experiments mainly focusing on lettuce, tomatoes and pepper plant growth will be conducted.

Benefits of advanced, innovative greenhouse technologies and tools listed below:

 Maximization of the output of the greenhouse production while minimizing the input need via AI based optimization and advanced control and sensor systems including Smart Biosensors

 Sunlight and lightning optimization via new solar coating selective low emission cover materials

 Integrated pest and pathogen management using sexual confusion, spraying robotic tools and pathogen suppressive media

 Sustainable and biodegradable growth media

 Decision support system focusing harvest prediction time for the best income

Benefits of advanced, innovative greenhouse technologies are combined successfully within SUSMEDHOUSE. By exploitation of the Information and Communication Technology (ICT) sector and the dominance of 5G+ networks and beyond, such establishments will promote further opportunities to the farming community, increasing the efficiency of cultivation systems while preserving soil, water, and energy through energy efficiency practices and clean energy generation by exploiting novel approaches. Such approaches can promote further positive results driving customer-oriented innovation across Europe for more productive and sustainable agriculture by:

Helping increasing greenhouse production quantity and quality by boosting overall efficiency by at least 20%

Developing new safer methods for pest and pathogen management

Providing efficient resource usage by optimizing energy, soil and water resources

Preventing eutrophication

Contributing to circular economy in agriculture by promoting sustainability

Creating fully automated eco-friendly greenhouses with less intensive hand-labour

Utilizing excessive solar energy for plants for electricity generation

Utilizing functional coatings for thermal and optical optimization of the greenhouse

Partners

The consortium consists of seven partners from six countries.



**Italy, Turkey, Germany,
Portugal, Egypt, Spain**

ARTECS

AR & TeCS Anadolu AR-GE
Technology Engineering and
Consulting Co.
Ankara, Turkey

Fraunhofer ISE

Fraunhofer Institute for Solar
Energy System
Freiburg, Germany

AVIPE

Associação de Viticultores do
Concelho de Palmela
Palmela, Portugal

ANTALYA TARIM

Antalya Tarım Üretim
Danışmanlık ve Pazarlama A.S.
Antalya, Turkey

WOLA

Water On-Line Analysis Europe S.L
Moncofar (Castellón), Spain

CNR-ISAFOM

Consiglio Nazionale delle Ricerche
Istituto per i Sistemi Agricoli e
Forestali del Mediterraneo.
Perugia, Italy

PROTEUS

PROjects Technology EUropean
Systems
Cairo, Egypt

Compost Cultivation

Roberto Altieri and Alessandro Esposito

CNR-ISAFOM

Compost cultivation trials have started within the scope of the Susmedhouse project. Work package 6 Trials were conducted under the leadership of CNR-ISAFOM, the leader of Biodegradable Growth Media Development. Compost made from greenhouse waste will both recycle and be economically friendly to farmers. On March 15 - 2023, tomato, pepper and lettuce plants were planted. These tests will be compared with the normal aquaculture varieties, cocopeat and soil methods. The results will be shared with greenhouse companies.



Further software development

Teofilo Diez-Caballero

WOLA

The work done during this final period is to teach and inform ARTECS personnel about ASIB functioning so they can use it in an independent way. WOLA has prepared different documents and videos explaining the different parts that compose the ASIB and its individual functions, furthermore WOLA has developed a video showing how to use the software composed by 4 modules: DBO Analyses, Biocounter Analyses, Maintenance Mode and Report Mode. WOLA also has sent to Ankara Greenhouse the necessary reactives to make the nutrient media and refill the liquids following the user manual where specifies the capacities, approximate consumption and refilling frequency of the liquids consumed for the different biosensors.

To do the machine maintenance properly it is necessary to clean the tubes and cells of the device, just activating the specific pump.

Also the sensor probes need a maintenance once a month. It is of utmost importance to change the electrolyte and the membrane of the Oxygen Dissolved Sensors.

The image displays three panels related to the WOLA software and hardware:

- Competitive Advantages:** A white panel with a blue header. It lists the following advantages: Ability to offer accurate, reliable, cost-effective, and versatile solutions. The advantages are categorized into: WEB CONTROL, REALTIME ANALYSIS, AUTOMATED DEVICE, SENSITIVITY & RELIABILITY, AFFORDABLE, FLEXIBLE, TECHNICAL SUPPORT, and BIOLOGICAL BIOCHEMICAL & PARAMETERS.
- Data:** A blue panel showing a smartphone screen displaying a data visualization interface. The screen shows a line graph with multiple data series and a table of samples with columns for date, time, and status.
- Biosensors:** A blue panel featuring a small image of the ASIB device at the top. Below it, three white boxes list biosensors with their respective measurement times: 60' for BOD (Measurement of Biochemical Oxygen Demand), 45' for POLITOX (Quantification of the overall toxicity presented in a sample of water), and 15' for BIOCOUNTER (Quantification of total aerobic living microorganisms).

Artificial light LEDs

Babak Baeb

ARTECS

Artificial light LEDs were installed in the Venlo greenhouse

Susmedhouse Project work package 5 Task 5.4. As part of the Developing Artificial Lighting System for Optimal Plant Growth, trial studies were carried out in the demonstration greenhouse. Artificial lighting test trials were carried out between March 1, 2023 and April 1, 2023. Artecs started its second term tests on March 1st, for the Susmedhouse project. In this scope to evaluate the artificial light effect in the agro-pv section of the SusMedHouse greenhouse, artificial light LEDs were designed and assembled in the Venlo greenhouse to test lettuce. The implemented system has IoT and is controlled through DSS. Also, the system has a log so that at the end of the cultivation, the amount of electricity used can be calculated and based on the price of the crop, its economic efficiency can be calculated. It should be mentioned that lettuce will be cultivated in four ways (hydroponic with artificial light, hydroponic without artificial light, conventional with artificial light and conventional without artificial light) and the growth rate will be evaluated and compared by artificial intelligence (image processing). The artificial lighting system will be introduced to local farmers and its positive and negative aspects will be explained.



Integration of the coating in greenhouse

Dr. Sophie Gledhill and Özal Emre Özdemir

Fraunhofer ISE

Two types of coating on PET have now been manufactured and delivered to ARTECS: one exhibiting 70 % PAR transmittance and a second exhibiting 45 % PAR transmittance. Both coatings have a low emittance in the IR. Three tunnel greenhouses are then due to be constructed to test the influence and also the durability of the coatings.



Delivered coating.

The third face-to-face meeting of the SusMedHouse project was held in Portici, Italy in May 2023 with the presence of all partners. In this meeting, there was a discussion and exchange of opinions about the remaining work packages and final public event. Also, the partners each got a presentation about the achievements and results. In addition, CNR company and its compost production infrastructures were visited, and discussions were held about the compost produced by AR&TeCS. On the last day of the meeting, several greenhouses in Salerno, Portici and Naples were visited by the partners.



**SusMedHouse
partners during
Meeting**



Efficient, Eco-Friendly, Sustainable Mediterranean Greenhouse Integrated with Artificial Intelligence, Hi-Tech Automation and Control System.

SUSMEDHOUSE

Project Info:

Coordination:

AR&TeCS
www.ar-tecs.com

More info:

www.susmedhouse.eu

Contact:

info@susmedhouse.eu

Social media:



Coordinator:

Dr. T.Yaşar KATIRCIOĞLU
AR&TeCS, CEO&General Director
Ankara University Teknokent D-7
Bahçelievler Mah., Gölbaşı 06830 Ankara/ Turkey
Tel:+90 (312) 484 55 15
Fax:+90 (312) 484 55 16
E-mail: info@ar-tecs.com
www.ar-tecs.com



This Project has received funding from the European Union's Partnership for Research and Innovation in the Mediterranean Area (PRIMA) Programme under Agreement number: [1917] [SUSMEDHOUSE] [Call 2019 Section 1 Farming IA]



This project is part of the PRIMA programme supported by the European Union's Horizon 2020 research and innovation programme