The Euragri Webinar Series 2

A series of three webinars hosted by MED Uevora (Portugal), INIA-CSIC (Spain), and ACTA (France) focused on

CLIMATE CHANGE ADAPTATION FOR AGRICULTURE AND FOOD SYSTEMS IN THE MEDITERRANEAN REGION

The theme of the **INIA-CSIC webinar** was the adaptation responses for horticulture, viticulture and olive production in the Mediterranean region.

The host and Moderator was Dr Rocio Lansac, INIA's Coordinator of International Scientific Relations, who opened the webinar, the focus of which was on horticulture, including olive groves, wine grapes and fruit tree crops in the Mediterranean region. It was set against the background of the vulnerability of these horticultural crops to the expected regional climate change, water management, and the sectors' ability to adapt to the current conditions. There were four presentations. One presentation outlined the work of the Partnership for Research and Innovation in the Mediterranean Area (**PRIMA**) (https://prima-med.org/). There were presentations from three Mediterranean regional projects - **SOILOLIVE** (https://soilolive.eu/), **SUPROMED** (https://www.supromed.eu/index.php/en/, and **FREECLIMB** (https://primafreeclimb.com/). The project activities and outcomes will assist in developing the adaptation responses to horticultural, viticulture, and olive farming systems.

Prof. Ali Rhouma, Project Officer with PRIMA, provided an overview of the PRIMA's contribution to the adaptation and mitigation of Climate Change. PRIMA is involved in over 90 projects covering **incremental adaptation** (*i.e.,* soil, water and plants), **systems adaptation** (climate change crops, precision agriculture, diversification, and risk management), and **transformational adaptation** (land use change and ecosystem services).

The broad research outcomes and outputs have provided knowledge to assist in the on-farm adaptation responses. These include smart tools and Decision Support Tools for managing system inputs, variety testing, and reducing inputs in greenhouse production systems. The potential use of land for food and energy (solar panels) production is also being investigated.

The PRIMA project has secured additional Horizon Europe funding for three years to continue its work as FUTURE4PRIMA. Its work will focus on fostering collaboration among the R&I funding bodies of the 16 PRIMA Participating States, broadening PRIMA's thematic scope through advocating an integrated resource management approach in the ecosystems, energy, and health sectors, thus advancing PRIMA's commitment to sustainable water management and food systems. Climate change adaptation, including mitigation, is a critical pillar of the new project and will assist in maturing the knowledge that will contribute to policy and market uptake and on-farm (small-scale farming systems) implementation of its outcomes. It will continue to promote and highlight the integrated Water-Energy-Food-Ecosystems (WEFE) Nexus for climate-resilient sustainable development. The WEFE emphasises using a systems approach, giving equal consideration to all four sectors. Finally, FUTURE4PRIMA will increase its activities to promote the on-farm implementation of innovations.

Prof Antonio Manzaneda of the Department of Animal Biology, Plant Biology and Ecology described elements of the four-year funded Horizon Europe project SOILOLIVE activities. The olive tree is Europe's most socioeconomically important fruit tree, especially across the Mediterranean basin. However, climate change is one factor contributing to the recent decline in European olive production from the approximately six million hectares of cultivated olive trees. The soil health in olive groves is critical to their resilience in the adaptive responses to climate change. Soil erosion losses of between 29 and 47 tonnes per year from the bare ground associated with many olive groves and the high inputs of phytochemicals for pest control and productivity over the last 50 years are creating significant challenges for soil quality. The proposed EU soil monitoring laws aim to have all EU soils in "healthy condition" by 2050. The EU Joint Research Council states that 60 to 70% of EU soils are unhealthy. The assessment criteria include fertility, compaction, erosions, contamination, biodiversity, and soil organic matter loss. The SOILOLIVE project will provide the first rigorous assessment of European olive orchard soils regarding the microbiome of the olive rhizosphere, soil biodiversity, and ecosystem services, investigate their relationships with oil quality, and explore effective soil amendments and ecological restoration practices to improve soil quality. The work will be conducted in 52 living labs across the Mediterranean basin. A holistic model will be used to grow the knowledge of the agronomic drivers of olive quality.

Prof Alfonso Dominguez of the Universidad de Castilla-La Mancha described some of the activities of the SUPROMED project. The main objective of SUPROMED is to enhance Mediterranean farming systems' economic and environmental sustainability through more efficient water, energy and fertiliser management. He outlined the many significant challenges facing Mediterranean farming systems, from water scarcity, low profitability of farms and the poor uptake of knowledge and technologies. The SUPROMED objectives include end-user platforms integrating several models and tools, promoting regulated deficit irrigation techniques

for vines, fruit trees and annual crops, developing good agricultural practice and management techniques, and training programmes.

A series of farm demo sites were established in Spain, Tunisia, and Lebanon to compare traditional and SUPROMED management and demonstrate the new management's potential environmental and economic sustainability improvements. It involved 56 farms, 16 crops and 95 plots. Intensive monitoring systems were placed on each farm for each management system. The results highlighted the benefits of the new management systems over the traditional ones, with improvements in crop yields, water, nitrogen, energy and profitability.

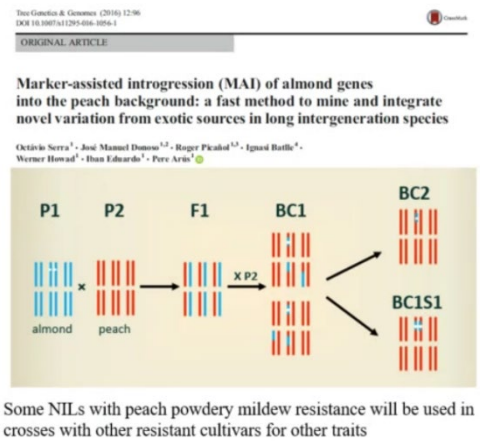
KPI	Average improvement (%)
Yield (kg ha^{-1})	13-40
Agronomic water productivity (kg m^{-3})	22-82
Economic water productivity (€m^{-3})	44-145
Water footprint decrease (m^3 kg^{-1})	12-33
Nitrogen productivity (kg kg^{-1})	29-35
Energy (kWhm^{-3})	15-30
Profitability (€ ha^{-1})	25-88

A range of Decision Support Systems were developed and available on the SUPROMED website, as well as support for affordable changes to improve Mediterranean crop systems' environmental and economic sustainability.

Dr Iban Eduardo, Centre for Research in Agricultural Genomics, Barcelona, described the work of the FREECLIMB project on fruit crop resilience to climate change in the Mediterranean basin. The main impacts of extreme climate events on tree crops were summarised. The FREECLIMB project involves 15 institutions from nine countries working on the germplasm of six fruit crops (almond, apricot, citrus, grape olive and peach). The project's activities include the exploration of the plant traits linked to sustainability and plant resilience, exploiting germplasm resources, and unravelling the molecular, biochemical and physiological basis of plant adaption. Ideotypes or objectives for six fruit types to meet stakeholder needs for more sustainable farming systems were agreed upon with stakeholders.

Main impacts of CLIMATE extreme events on tree crops:

- Increasing **evapotranspiration** deficit (spring – summer) due to higher mean temperature and lower precipitations
- Decreasing **chilling hours** due to higher winter temperatures
- Extreme events: increased incidence of **late frost damages**, **flooding** and **heat waves**
- Increasing incidence of **diseases and pathogens spreads**



Some NILs with peach powdery mildew resistance will be used in crosses with other resistant cultivars for other traits

Plant traits relevant to resilient fruit production systems were assessed using phenotyping methods. Genetic dissection and tools were used to select the desired characteristics. This work was followed by muti-site collections and developing pre-breeding materials for use in a progeny evaluation at various locations to determine the interaction between genotype and environment. New pathogen resistance genes were identified in an almond peach cross, apricot, citrus, grapevine, and olive. Some drought tolerance traits were identified in grapevine and olives.