AGROSOLAR

Double harvest for a sustainable future

Innovative agrivoltaic solutions for agriculture

The production of agricultural products is land-intensive – just like the reliable supply of solar power. Wouldn‘t it be ideal to simply combine them with each other?

Secure supply – clean energy: Photovoltaics in agriculture

Climate Change and its consequences are already being felt all over the world – **especially in the agricultural sector**, **where changes in climate** and extreme weather conditions make it difficult to grow food in many places, while population growth is increasing demand. At the same time, the demand for renewable energy is rising.

This means that **agriculture** and **solar energy** are often **in competition with each other** – because in many regions of Germany and Europe the sites for open-space photovoltaics are exhausted.

Agrivoltaic systems from AgroSolar are an innovative and practical solution to this problem. Because they intelligently **combine agriculture with renewable power generation.** At the same time, agricultural businesses profit from another lucrative source of income with a future!

Healthy growth for plants and farms

In AgroSolar agrivoltaic systems, solar modules are erected above and between agricultural land to generate electricity, so that they can continue to be farmed profitably.

The systems thus offer most fruit and vegetable plants the best conditions for healthy growth, as the partial roofing provides additional **protection against excessive heat and solar radiation as well as hail, frost and drought damage.** The soils can also store a larger amount of water, which has a positive effect on crop yields, especially for shade crops and in dry regions, and reduces the need for irrigation.

Double harvest with agrivoltaics

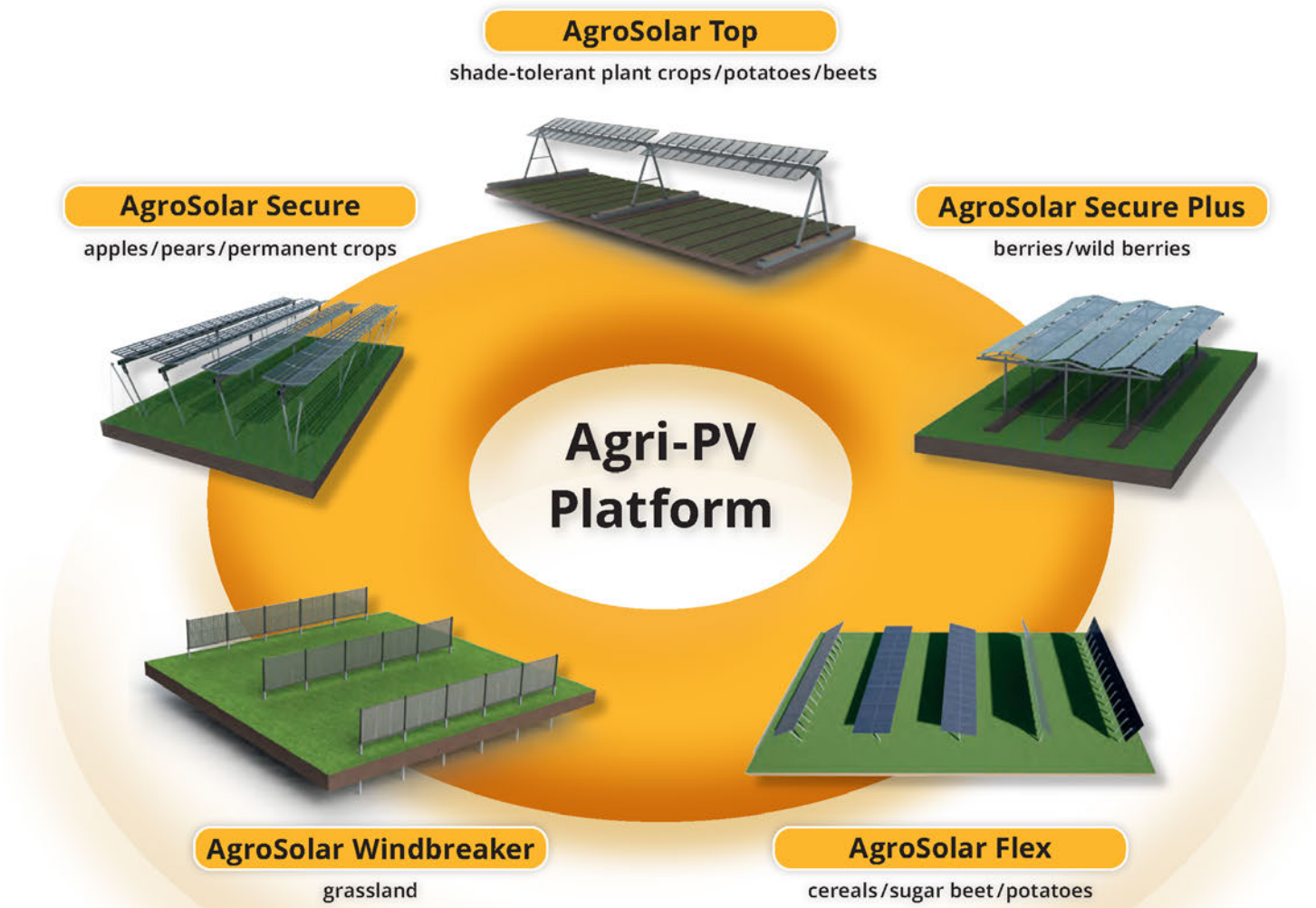
The dual use of land for agriculture and energy production in Agri-PV eliminates the competition for land between food and energy harvests. This is a real win-win situation that benefits not only the climate and security of supply, but also farmers. This ”double harvest“ enables income diversification and thus contributes to the sustainable strengthening of farms and rural areas.

Individual like nature:
Our system types.

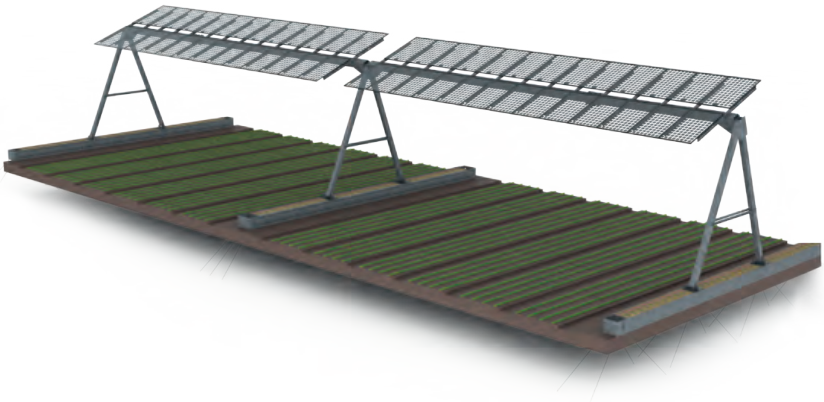
The requirements of farms are as varied as the needs of crops in terms of soil and Microclimate. A vineyard or fruit orchard, for example, has different management requirements than a potato field measuring several hectares. That is why AgroSolar has developed different agri-photovoltaic systems that can be optimally adapted to the respective conditions. We advise farmers individually on which type of system is best suited for them. Among other things, the size of the area, the crops grown and the geological conditions are taken intoaccount.

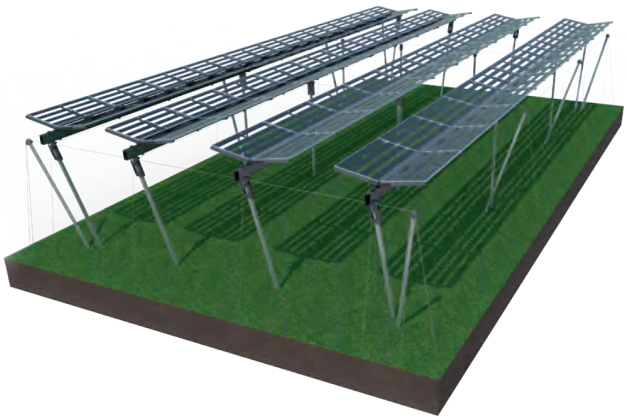
We currently offer five types of systems

High-level systems



Ground level vertical systems





AgroSolar Top

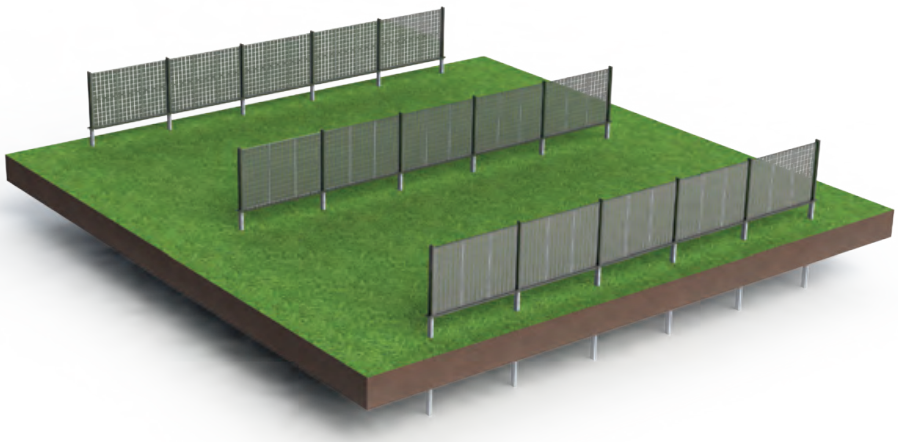
is the largest agrivoltaic system and was developed for intensive, mechanised agriculture. The partial canopy can be up to 6 metres high and 18 metres wide and protects sensitive plants from environmental influences. It is particularly suitable for potatoes, beets and shade-tolerant plants.

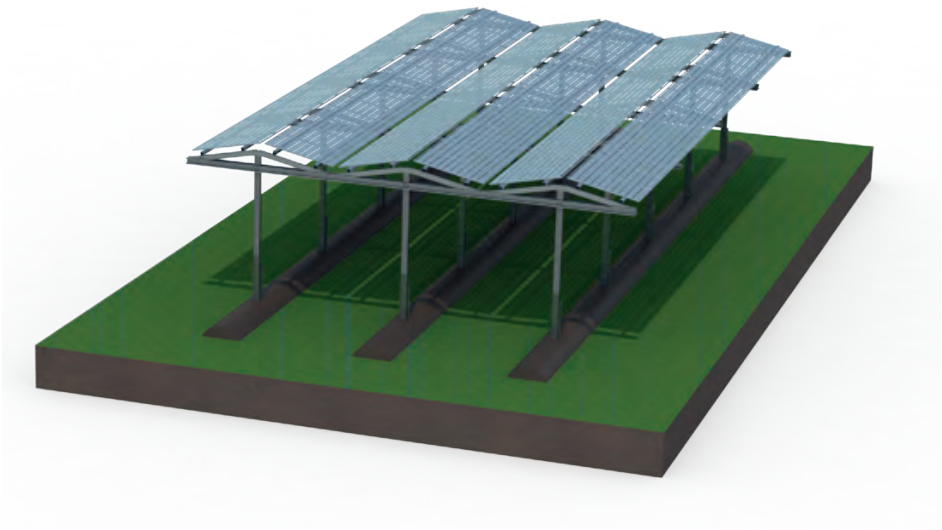
AgroSolar Secure

is characterised by a small span and height. The system can be combined with foils or nets. It is particularly suitable for special crops from fruit and vegetable growing, and permanent crops.

AgroSolar Windbreaker

has a vertical array of the photovoltaic modules and is therefore particularly suitable for agricultural areas where no shading is desired. These can be, for example, wheat or grassland.



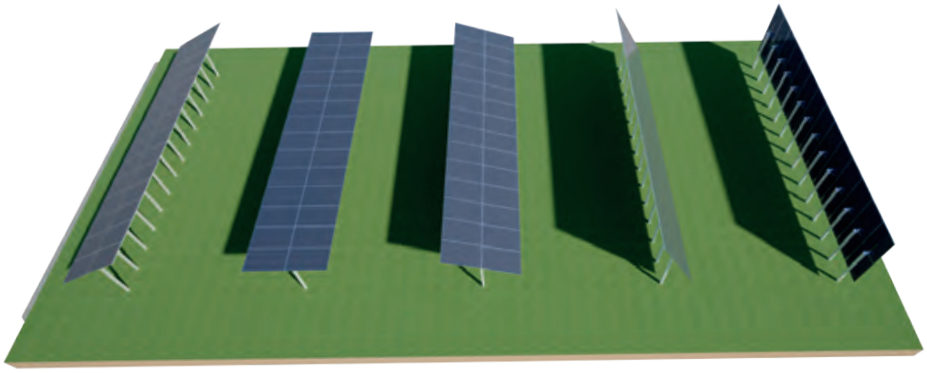


AgroSolar Secure Plus

has proven itself as a self-picking system, as there is a pleasant climate and good ventilation. It protects the plants from heavy rain and intense sunlight and is suitable, for example, for permanent crops such as berries or shade-tolerant plant cultures.

AgroSolar Flex

has a different angle of inclination for each season and can also be tilted vertically. The system is suitable for agricultural cultivations that are oriented from west to east. Possible crop rotations can be cereals, sugar beet or potatoes.



Advantages of agrivoltaics for agriculture

Each agrivoltaic system can be individually and flexibly adapted - among other things, to the size of the area, the types of crops being cultivated and the geological conditions.

Agri-PV **protects crops and harvests** from weather extremes such as heat, drought, heavy rain, hail and wind.

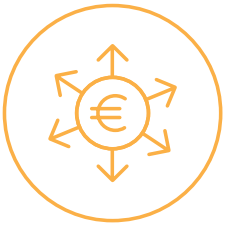
Agricultural machines in different sizes can be used as usual under the agrivoltaic systems.

Agricultural enterprises receive a **yield guarantee for electricity production** and a functional guarantee on selected components of the agrivoltaic system.

The need for irrigation of agricultural land is reduced by up to ,20 percent and the water storage capacity of the soil is increased.

Carbon farming: With agrivoltaics, humus can be built up in a controlled way, which **reduces fertiliser consumption** and enables more CO_2 to be in the soil.

The use of agrivoltaics promotes crop harvests and thus **enables higher** income for the farm.



Flexible and profitable: In addition to investing in its own system, AgroSolar also offers a lease model, so that the agricultural business has no expense whatsoever with the installation and distribution of electricity.

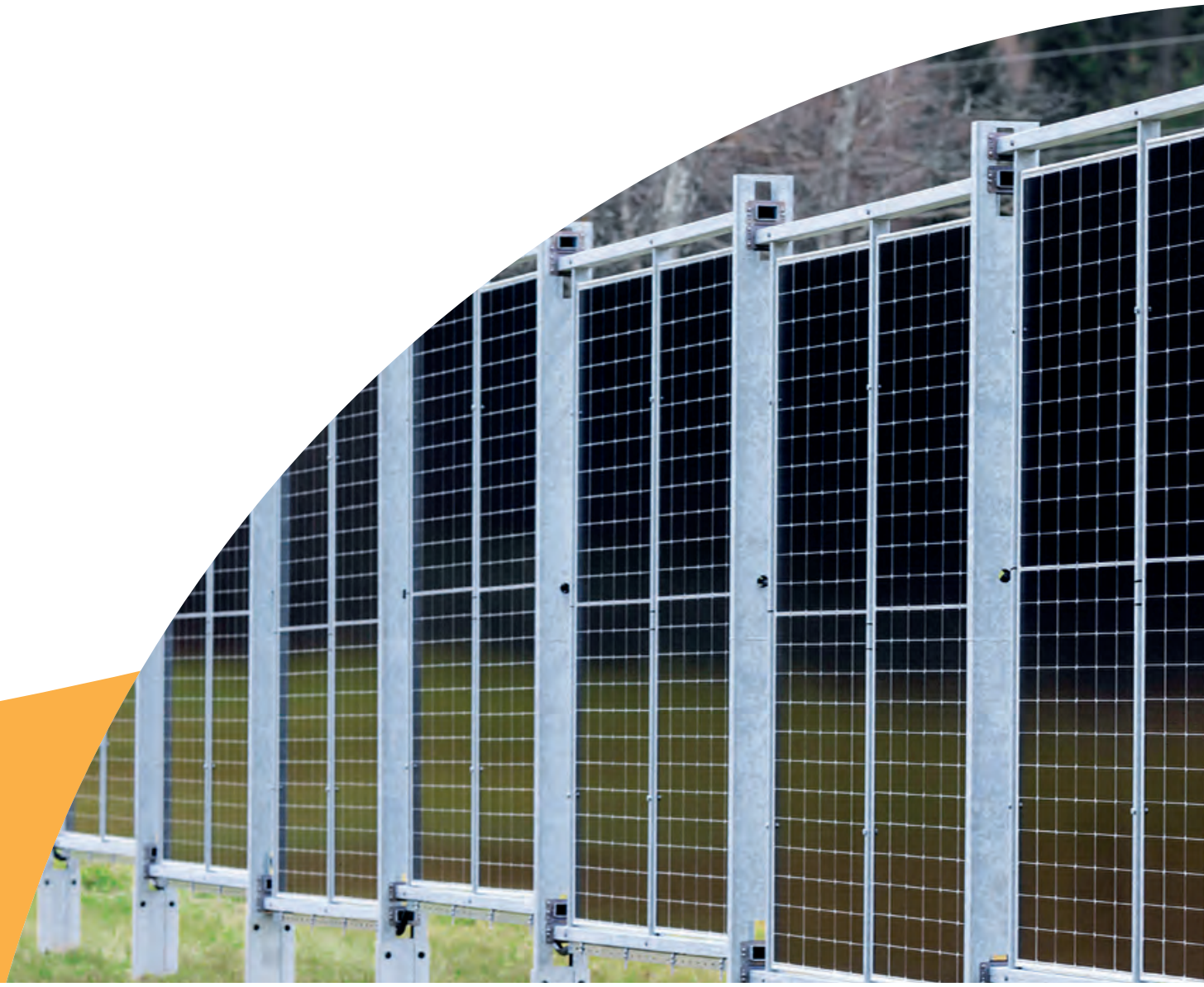
A secure and forward-looking technology

Optimal fruit and energy harvesting, soil-friendly installation, and efficient management – all AgroSolar system types are characterized by innovative technical features, making them a future-proof investment.

- Our concrete-free, patented spider anchor technology for the substructure of the agrivoltaic system ensures very low soil compaction and is completely deconstructible.

- **Bifacial PV modules** ensure light utilisation via the front and rear sides and thus generate up to 25 percent more electricity than conventional PV modules.

- In addition to the already existing trackers for the automatic adjustment of the Agri-PV modules, integrated systems for the use of storage technologies and irrigation techniques, as well as the integration of robotics and automation processes, are planned.



Full service with AgroSolar

During individual consultation, we offer different agrivoltaic systems which can be adapted perfectly to the farmers‘ respective needs. However, advice is only one component of our offer - because at AgroSolar you get everything from a single source!

Our service includes:

- Individual system planning
- Agricultural consulting
- Mains supply
- Planning application + construction
- System operation
- Marketing of electricity
- Maintenance and repairs

We are experts in agriculture, solar energy and agrivoltaics

AgroSolar is the European leader in the construction of large-scale agri-photovoltaic systems. The aim is to strengthen farms and give them security of supply by diversifying their income.

Are you interested and would like personal advice? Do you have questions about our products and techniques?

Then contact us!

AGROSOLAR

IRRIGOPTIMAL®

A new AI-based integrated operational management system to address water scarcity

WEST
water - energy - security - trade

IRRIGOPTIMAL® MAKES AGRICULTURE SMART

MISSION

ICT SOLUTIONS (ARTIFICIAL INTELLIGENCE, MACHINE LEARNING)

WATER MANAGEMENT SOLUTIONS

WASTE MANAGEMENT

AIRPORT SOLUTIONS

INTEGRATED SOLUTIONS

NANOTECHNOLOGY

ENERGY

DEFENSE AND SECURITY

AGRICOLTURE

INTERNATIONALIZATION OF SERVICES AND LARGE LOGISTICS AND MANAGEMENT PROJECTS

WHY WAS IRRIGOPTIMAL® CREATED?

The southern Mediterranean, particularly the MENA region, is at the epicentre of this water scarcity crisis as it is home to 15 out of the 20 of the world's most water-scarce countries.On the other hand, the efficiency of the resource is very low. In fact, water losses and inefficiencies, including those in transport and irrigation, amount to more than 100 km3 per year, representing approximately 45% of the region's total water demand.

IRRIGOPTIMAL® is an integrated solution designed with the support of a qualified team of agronomists, developed and registered by WES TRADE. The solution is composed of grounded sensors, meteorological Services and a centralized software based on Artificial Intelligence and Machine Learning algorithms capable of:

- Anticipating and detecting possible diseases and pests, reducing the risk of crop losses.
- Predicting optimal irrigation needs with significant energy and water savings.
- Supporting farmers with corrective and preventive actions to improve yields.

GOALS

REDUCE COSTS by reducing the use of PESTICIDES and FERTILIZERS through optimal prevention of pests and diseases.

REDUCE COSTS by reducing WATER and ENERGY during IRRIGATION through a preventive estimate of the crop's water needs in the next three days.

IMPROVE CROP QUALITY AND YIELD by optimizing water and nutrient supply.

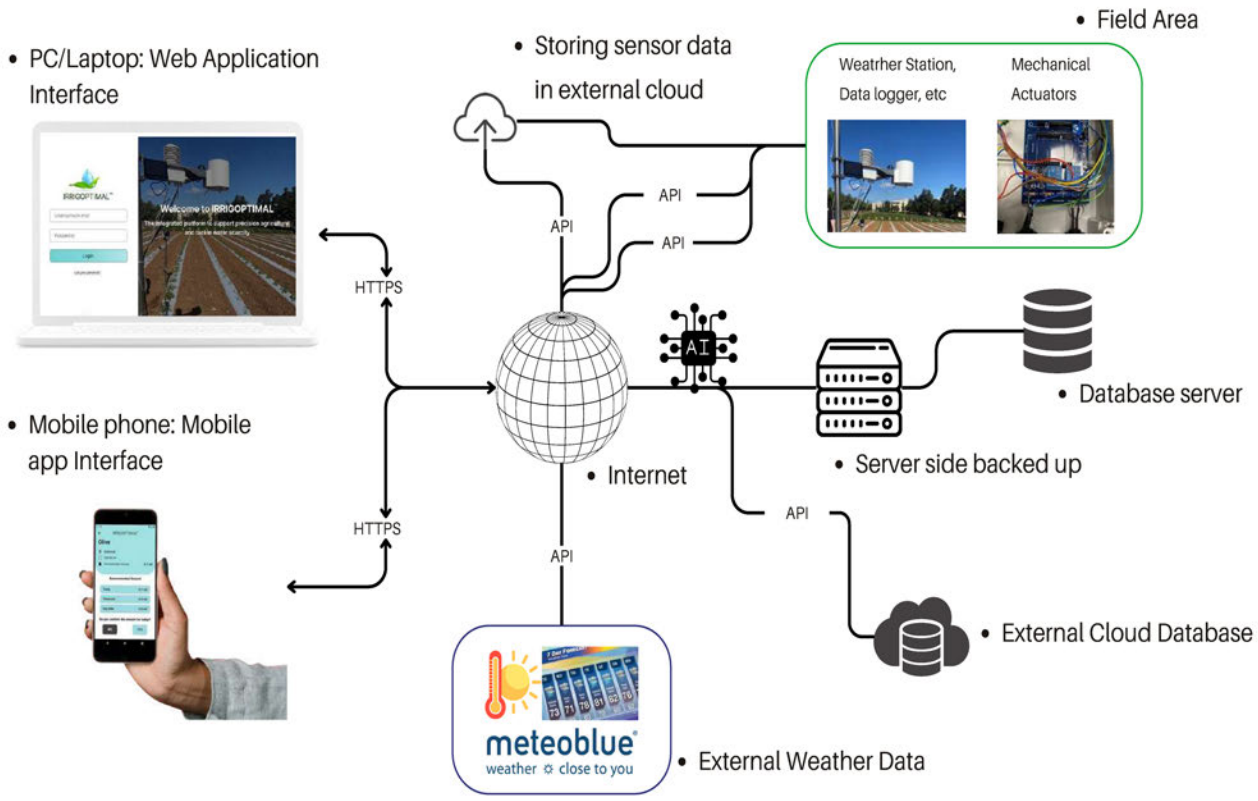
POSSIBLE APPLICATIONS OF IRRIGOPTIMAL®

1. In **open fields** and in **greenhouses**.

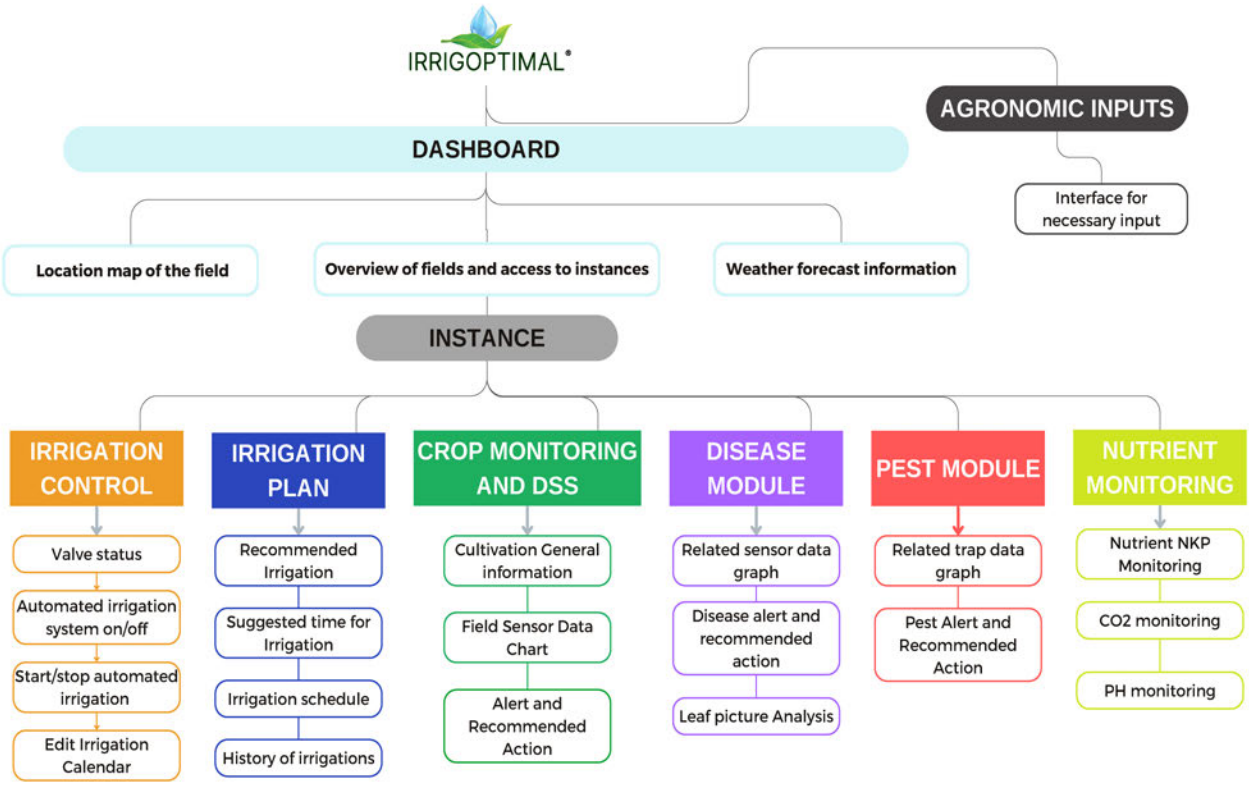
2. For **seasonal crops**, **trees** and **flowers**.

3. For **public** or **private green areas** (gardens,flower beds.

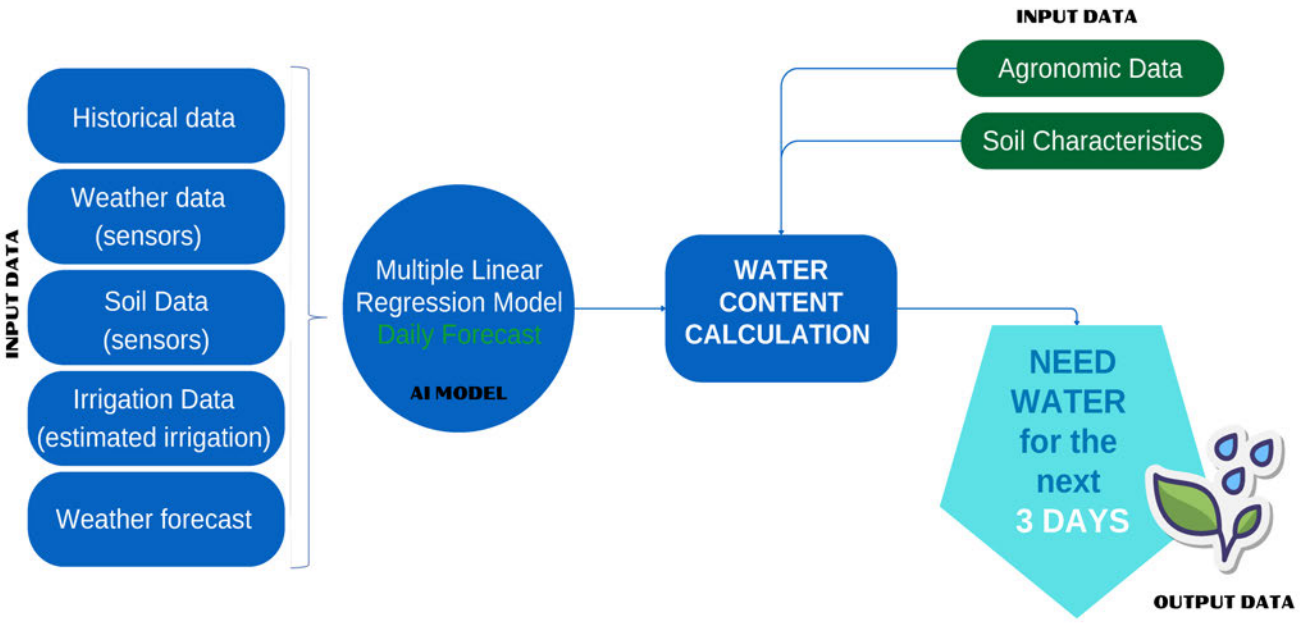
IRRIGOPTIMAL® CONCEPTUAL MAP



IRRIGOPTIMAL® SOFTWARE MODULES



IRRIGOPTIMAL® IRRIGATION PLAN
HIGH LEVEL CONCEPT MAP



IRRIGOPTIMAL® DISEASE MODULE

The new DISEASE module of the IRRIGOPTIMAL® system includes a computer vision algorithm divided into two parts: one for leaf image analysis using a mask for green pigments and leaf shapes, and another for plant disease detection. In fact, a script monitors the optimal disease conditions based on the weather, sending alerts when necessary.

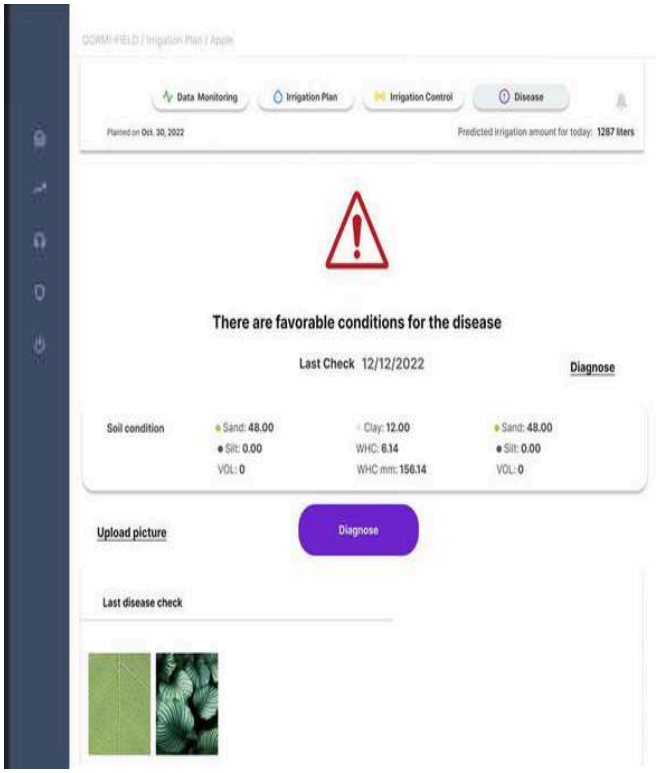
Disease detection

Crop Leaf Recognition Model: The first model focuses on recognizing leaves in images.

Crop Disease Detection Model: The second model, trained with the YOLO model, focuses on detecting crop diseases on leaves recognized by the first model.

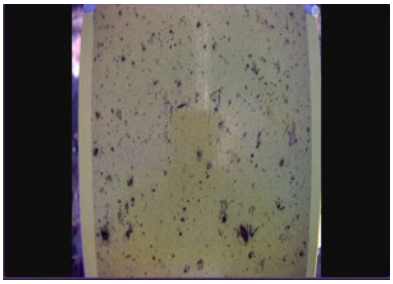
Early Alert

This model will uncover correlations between environmental conditions and disease outbreaks.



IRRIGOPTIMAL® PESTS MODULE

Timely pest control is essential to prevent crop damage. By monitoring and understanding insect phenology, it is possible to optimize the use of insecticides, benefiting the environment and human health. Monitoring insects, understanding pest history, and regular inspections are essential for a healthy and productive field.



Modern technologies, such as **electronic traps** equipped with cameras, enable effective **monitoring** and also help **predict pest-borne diseases**.

IRRIGOPTIMAL® NUTRIENT NPK, CO2 & PH MONITORING

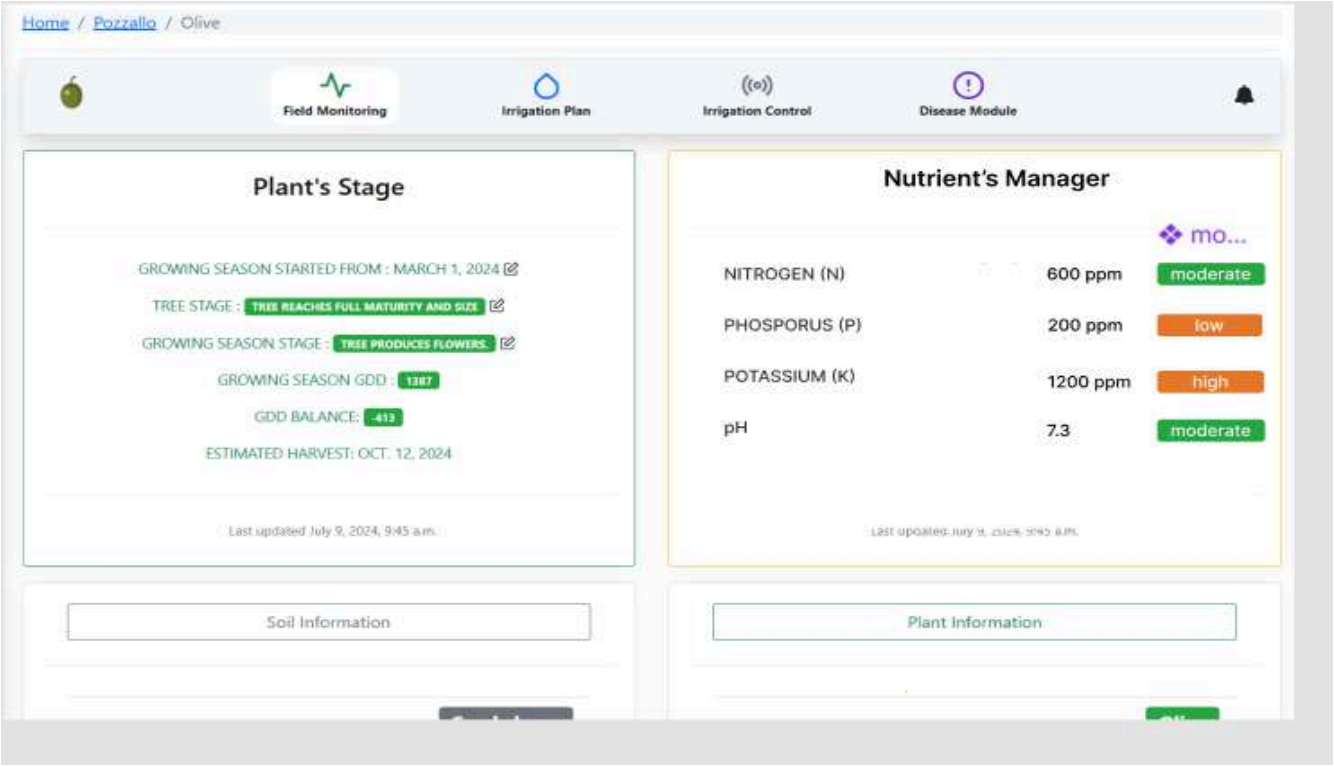
OUR MODULE for NUTRIENTS check the PRIMARY NUTRIENTS being:

1.N, P, K: Nitrogen (N): Promotes strong stems and green foliage;

2.Phosphorus (P): Crucial for root development and energy conversion;

3.Potassium (K): Helps synthesize proteins and distribute sugars throughout the plant. Provides the PH and CO2 (specific for Greenhouse).

4.IRRIGOPTIMAL® checks against PH range and NPK ratio for the specific crop in the specific phenological stage recommending the farmer usage of specific fertilisers at the right time.



CUSTOMERS AND INITIATIVES

MALTA - MINISTRY OF AGRICULTURE

BARBADOS - MINISTRY OF AGRICULTURE

CRETE

TÜRKIYE

ITALY - SICILY

GRENADE ISLAND - CARIBBEAN

ETHIOPIA

GHANA



LIVING LAB

IRRIGOPTIMAL® is used as a tool for R&D on different topics irrigation,diseases, nutrients, satellite data etc...

UC DAVIS

UNIVERSITY OF CAPE COAST
CAPE VARS • UNIVERSITY OF CHOICE

UC Berkeley

UNIVERSITY OF GHANA

UNIVERSIDAD DE MÁLAGA | uma.es

St. George's University
Grenada, West Indies

Università degli Studi di Palermo

INRAP

HELLENIC MEDITERRANEAN UNIVERSITY

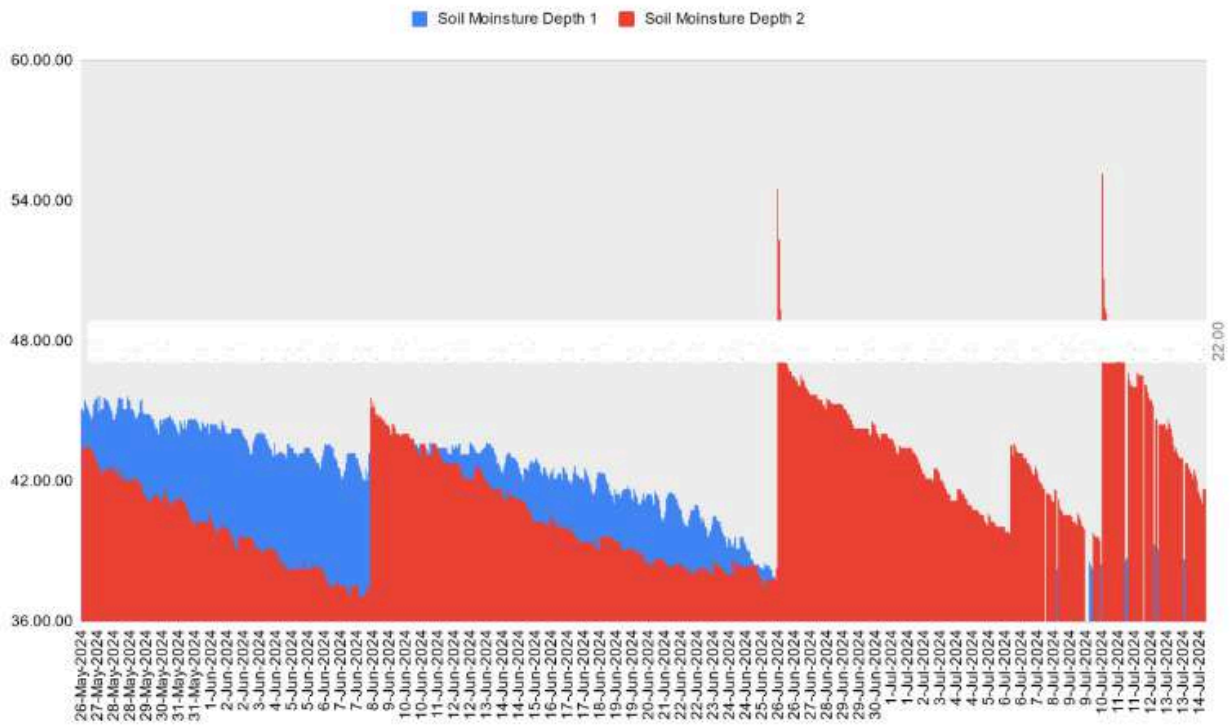
BETin
BIO & EMERGING TECHNOLOGY INSTITUTE

PROJECT CONCLUSIONS

REDUCTION IN THE NUMBER OF IRRIGATIONS

It has been verified that with the use of the system, the farmer manages to reduce the number of weekly irrigations compared to irrigation plans determined with traditional methods, or with the mere observation of the surface soil.

This is even more evident in fruit trees, where the monitoring of IRRIGOPTIMAL® of the substrate and the surface layer has given evidence of cases where often, the observation of dryness of the surface soil does not correspond to a need for water near the roots.

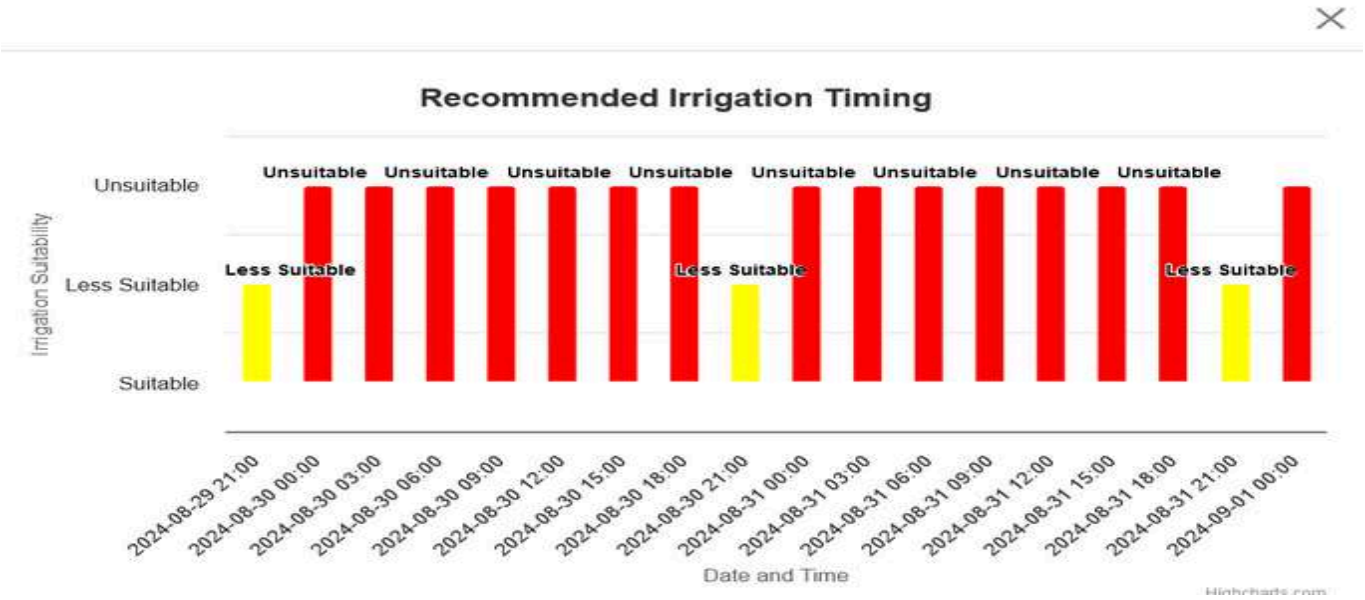


PROJECT CONCLUSIONS

DYNAMIC IDENTIFICATION OF OPTIMAL DAILY IRRIGATION TIME WINDOWS AND REDUCTION OF IRRIGATION TIMES

By identifying optimal time windows, you can also reduce daily irrigation time. Identifying these windows allows the farmer-entrepreneur to maintain the soil humidity value stable for several days (as demonstrated by the data) with less irrigation (in terms of number of irrigations performed), thus optimizing both the quantities of water consumed for irrigation (in terms of liters), and reducing the number of irrigations performed, maximizing the efficiency of those performed, in terms of duration and quantity.

The time windows identified for each field and crop are not fixed, but are constantly updated thanks to the use of data taken from the field in real time, and the artificial intelligence algorithms used by IRRIGOPTIMAL®. Different irrigation windows have been identified for each plot.



PROJECT CONCLUSIONS

REDUCTION OF FUNGAL DISEASE RISKS

Good irrigation management promotes better and higher yields, but above all it reduces the risk of fungal diseases in the field.

This is achieved through preventive monitoring, as environmental parameters that could create conditions favorable to disease development and spread have been reduced.

The optimized parameters in the surveyed fields have determined situations with a very low percentage of risk.

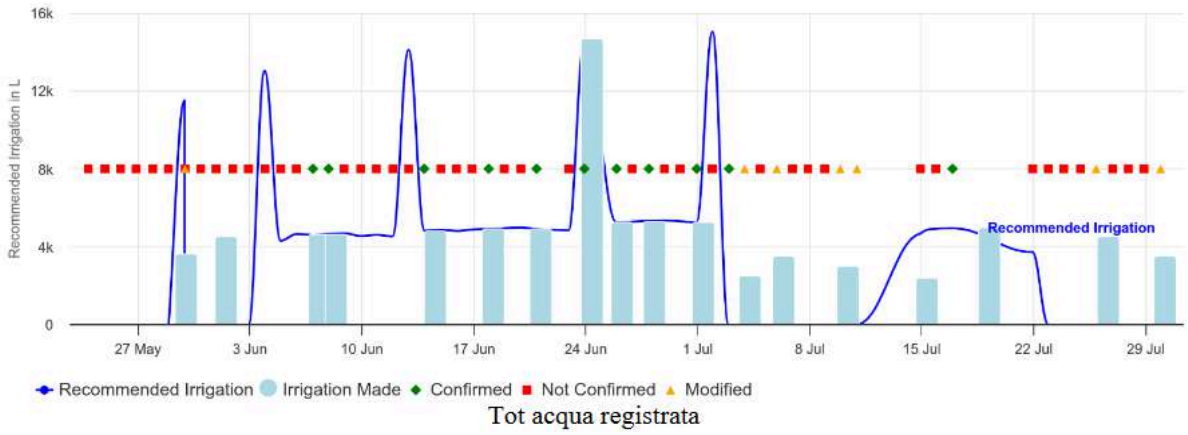
Grafico 3. Arance Mineo – Dew Point, Delta T, ET0 e VPD

PROJECT CONCLUSIONS

COLLABORATIVE FARMER MODEL - IRRIGOPTIMAL®

During the initial phase, farmers used their traditional, customized irrigation methods. After becoming familiar with IRRIGOPTIMAL® and seeing its results, farmers began voluntarily following the system's recommendations. They started combining their experience with real-time data from IRRIGOPTIMAL®.
This created a true collaborative model. The farmer remains the key decision-maker in the cultivation process, while IRRIGOPTIMAL® serves as an advanced support tool.
The system monitors, correlates, and analyzes large amounts of data. This helps farmers:

- Improve irrigation plans
- Save water and energy
- Prevent potential diseases
- Adapt to sudden climate changes



Report of suggested and performed irrigations.

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