Agrivoltaics 101

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Agrivoltaics, agrophotovoltaics, agrisolar, **agri-pv** or **dual-use solar** is the simultaneous use of areas of land for both solar photovoltaic power generation and agriculture.

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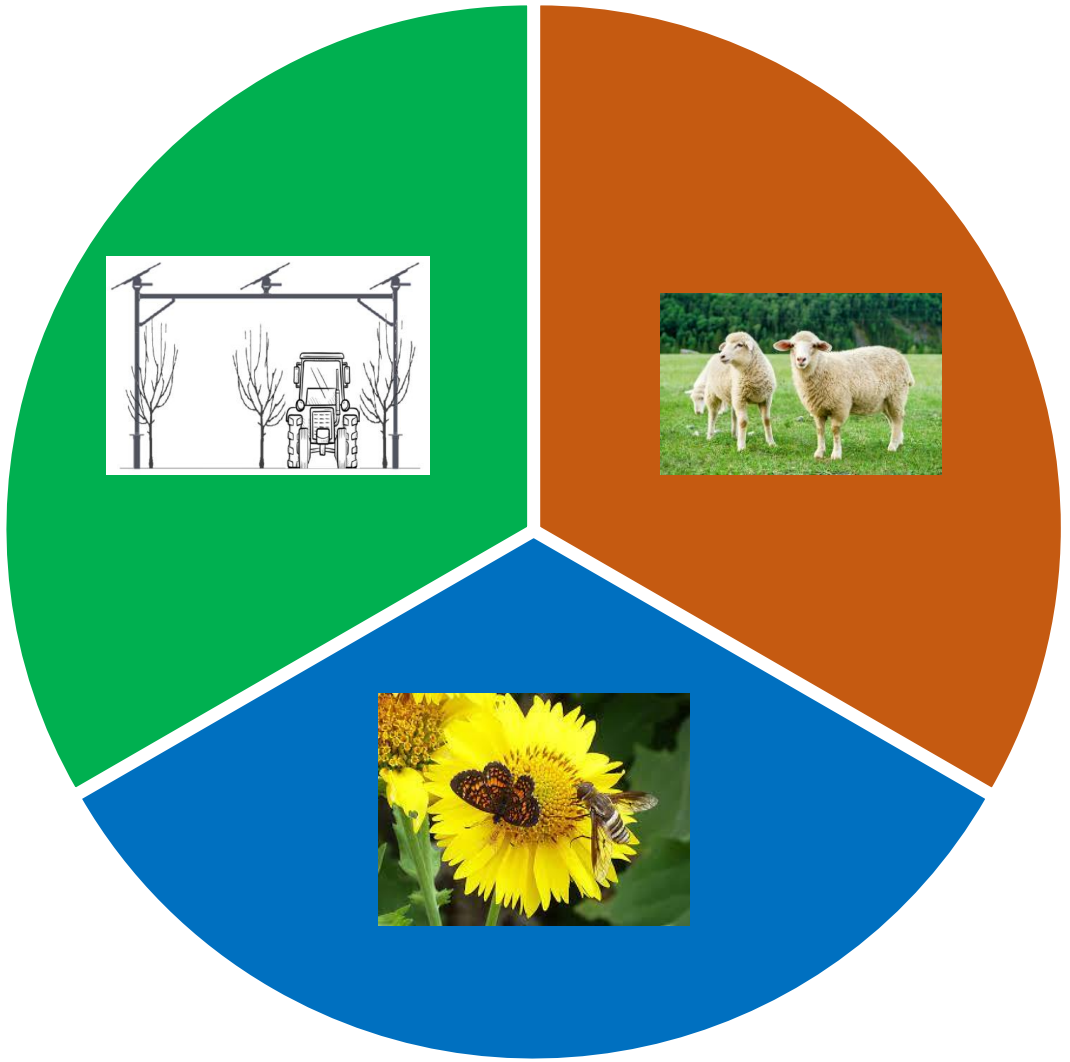
Types of Agrivoltaic Installations



Solar Grazing Pollinators / Biodiversity Dynamic Agrivoltaics

Solar Grazing

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What is Solar Grazing?

It's the practice of grazing livestock on solar farms. Sheep are the most common solar grazing animals, as they are the best-suited species.

Sheep are naturally suited to the job of solar grazing. They enjoy the shade of the solar panels on hot days, napping and grazing where humans would struggle to reach. They are resourceful foragers, walking to search for vegetation that might otherwise become a shady nuisance for the solar company.

For the safety of the existing, low-mount solar arrays, goats, cows, pigs, and horses are not recommended.

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Why Solar Grazing?

Ground mounted photovoltaics (PV) are expanding in size and number nationwide, and the most desirable sites for solar projects are often already in cropland.

Solar grazing keeps farmland in farm production.

Farm incomes are down, and solar grazing allows farmers to increase and diversify revenues without taking land out of food production.

Solar grazing contributes dairy, meat, and wool to regional markets.

Solar grazing reduces or eliminates the need for mowing at solar sites, reducing emissions and costs.

With solar grazing, the vegetation at solar sites becomes a source of nutrition and a pasture for sheep.

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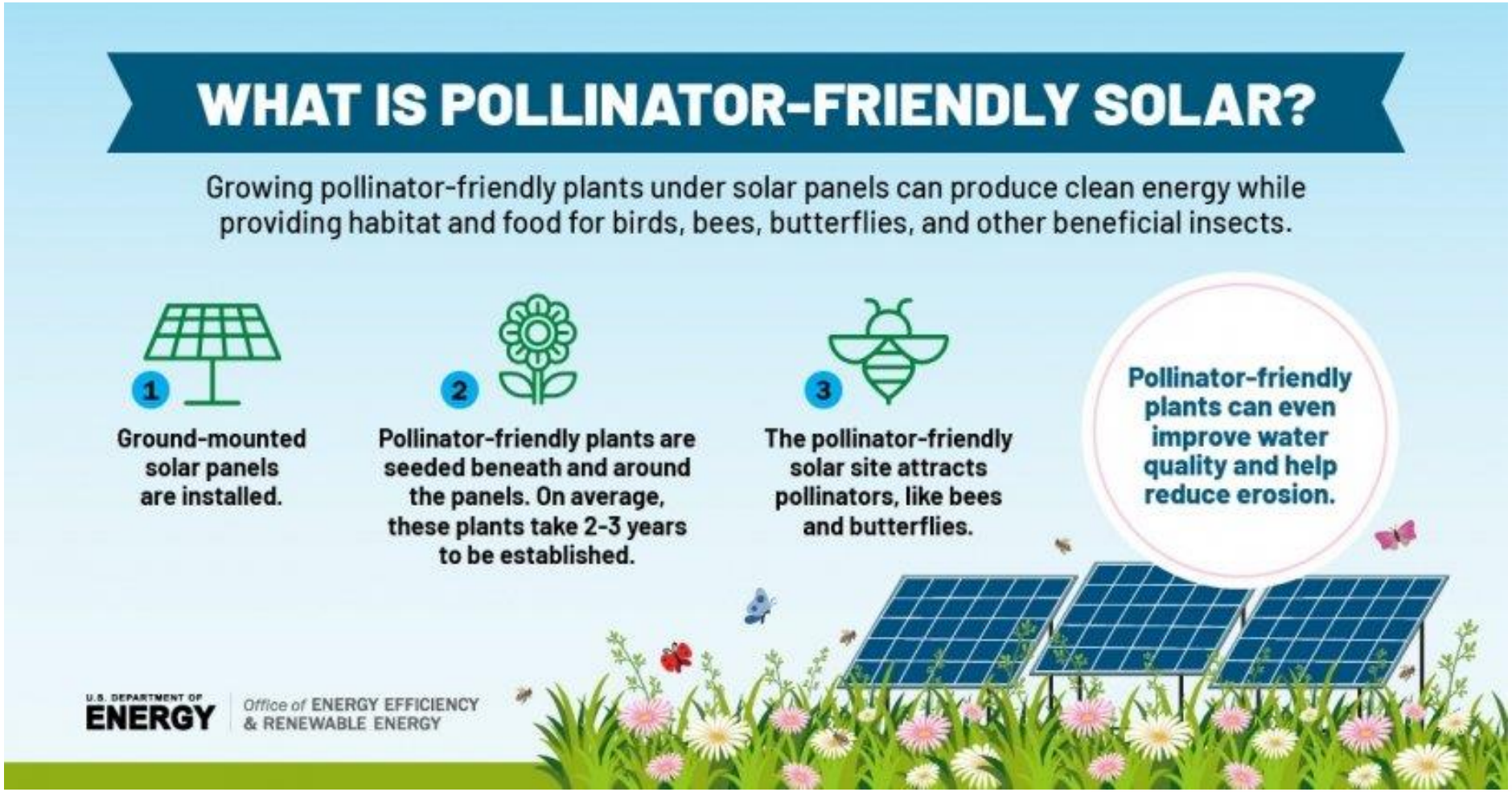
Pollinators / Biodiversity



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Pollinators / Biodiversity

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Solar developers can make a positive environmental impact by planting pollinators around solar panels. Pollinators do more than just provide habitat for bees, butterflies, insects, and other wildlife. They also sequester carbon, help prevent stormwater runoff, and reduce the use of fertilizers, herbicides, and pesticides; resulting in improved water and soil quality.

- Pollinator plants can decrease the ground temperature under solar panels, helping panels work more efficiently and produce more power.
- They can also reduce maintenance costs for solar farms, because mature pollinators require far less mowing than other ground covers.
- Pollinators can help in several ways, such as by improving solar farm aesthetics.
- Beekeepers can keep hives around solar pollinator fields to help with honey production.
- And bringing more pollinating insects to a region helps increase yields for nearby farms.

Dynamic Agrivoltics

System combining an agricultural crop (viticulture, arboriculture, field crops, or market gardening) and photovoltaic panels on the same surface area, positioned high up and controlled as per the plant's physiological needs. This innovative technology aims to improve the agricultural production by modifying the climate above plants, then producing clean, renewable, and low-cost electricity.

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Why Dynamic Agrivoltics

Climate

Agriculture is a main victim of climate change. Without methods to mitigate the damage caused by current climatic changes, entire regions are becoming uncultivable.

Improved Production

By controlling the agroclimatic conditions Dynamic Agrivoltaic systems positively impact crops, protects them from many hazards and stabilizes the harvests.

Agricultural Benefits

- Reduced temperature peaks
- Reduced risk of spring / fall frost
- Reduced water stress
- Improved crop vitality and resilience

Other Economic Benefits

- Reduced operational costs by applying electricity to utility bills
- Excess electricity produced can be sold to subscribers utilizing community solar rules

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Dynamic Agrivoltics – How it Works

Sun'Agri's dynamic agrivoltaic technology is based on 14 years of agronomic research and 5 patents.

The dynamic agrivoltaic structure is comprised of solar panels arranged as blinds which are controlled by artificial intelligence, depending on conditions and the crop's needs.

Solar systems are installed high enough to allow for farming operations to be conducted underneath them.

The control of the solar blinds is based upon:

- Real time agroclimatic and physiologic measurements from sensors
- Scientific models of crop growth
- Weather forecasts
- The farmer's production objectives

Management of the system is provided by the MySunAgri® app that provides farmers with agroclimatic data collected by sensors installed in the plot. Alerts can be set to inform farmers in real time of the of the occurrence of extreme climatic hazards or specific needs of their crops

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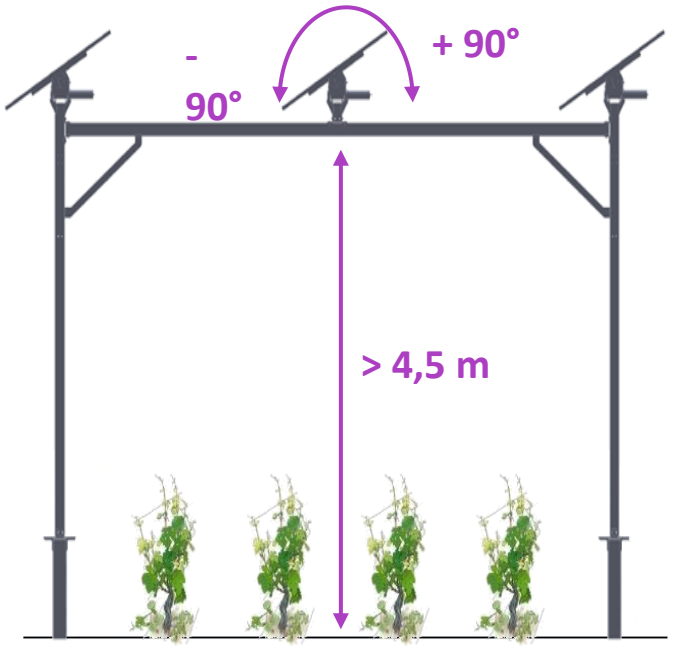
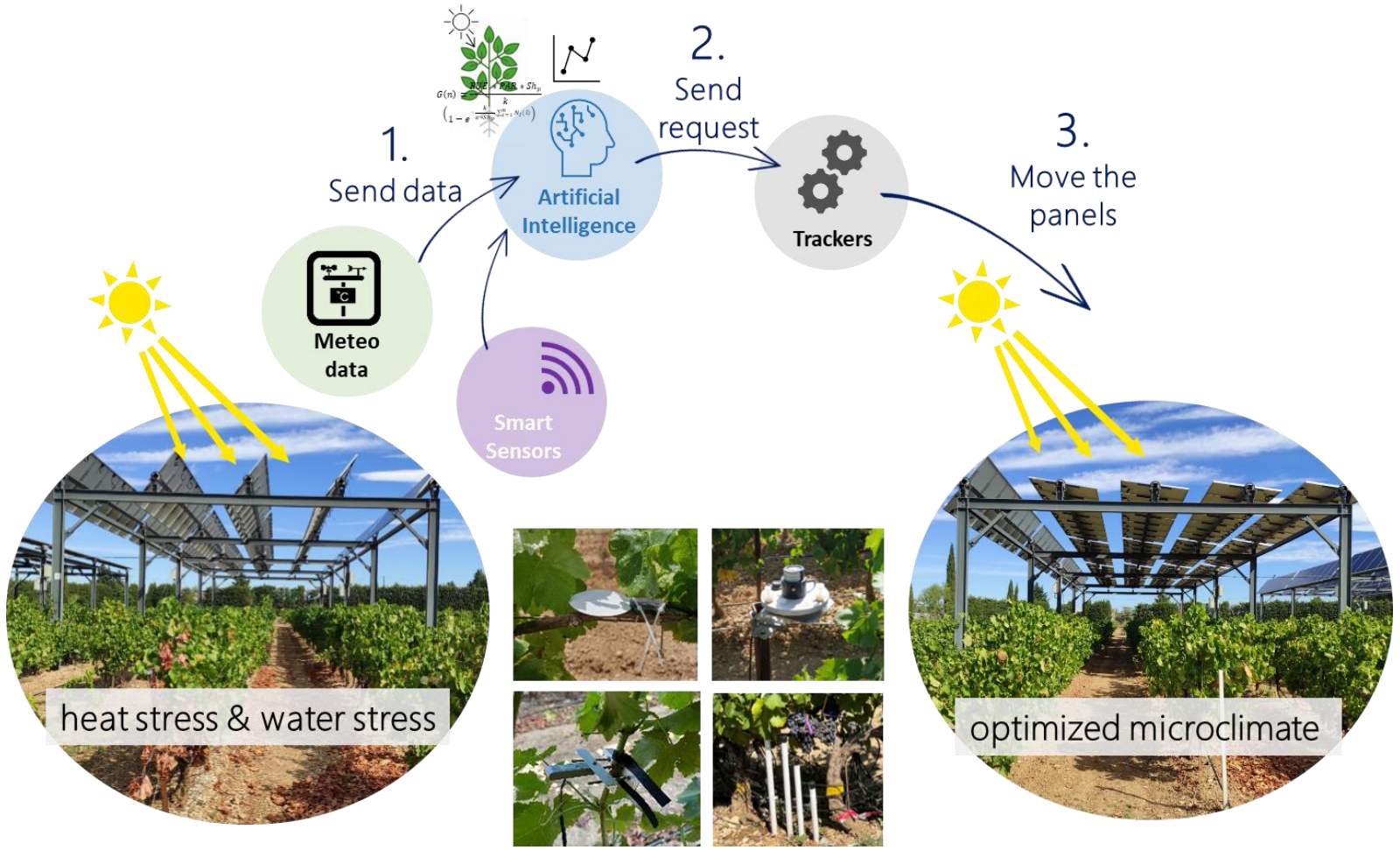
Dynamic Agrivoltics – How it Works





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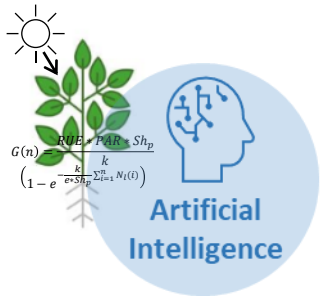
Dynamic Agrivoltics – How it Works



Meteo data

3D scene

Solar panel management

Global radiation

Microclimate

- Compute microclimate under panels
- Compute electricity production

Mechanistic model

Water balance

Energy balance

Carbon budget

Crop system

Geolocation

Weather

3 crop indicators

Take field decisions:
Management of panels orientation throughout the day and season

Design strategies:
Re-evaluate strategies already performed
Evaluate new *virtual* strategies (set of policies)

Water potential

Avoid water stress and water logging

Canopy temperature

Avoid heat stress

Carbon production

Ensure yield and harvest quality

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Dynamic Agrivoltics – How it Works

Dynamic Agrivoltics – How it Works

Measurements

- Microclimatic variables
- Water Status
- Growth
- Photosynthesis
- Yield & quality








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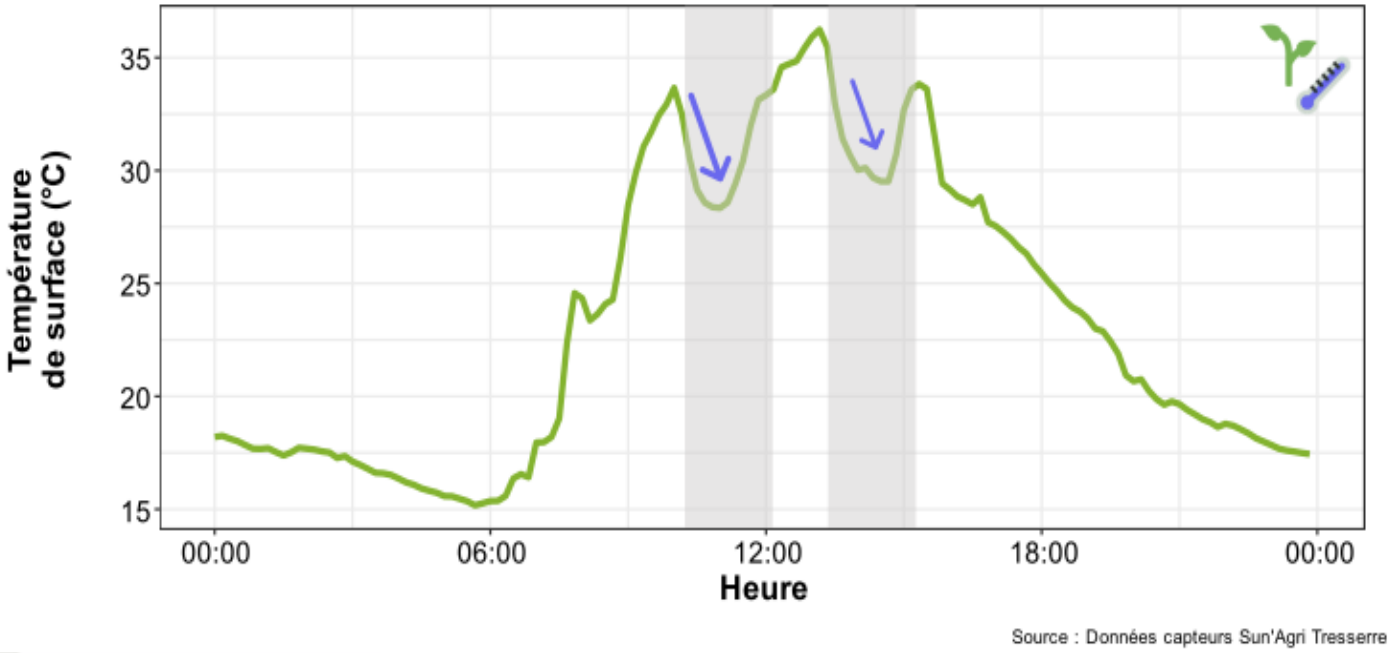
Results - Reduced heat stress

- Air temperature Decrease **2 to 4°C**
- Less **leaf burns & fruit burns**



Source : Données capteurs Sun'Agri Tresserre

Tresserre, 2020

Control, 02/07/19

AVD, 02/07/19

Piolenc, 2019

Results - Heat waves protection - grapevine






Veraison (29/07/2022)

Harvest (06/09/2022)

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Results – Improved Yields

Control Plot

Agrivoltaics Field

harvest (06/09/2022)

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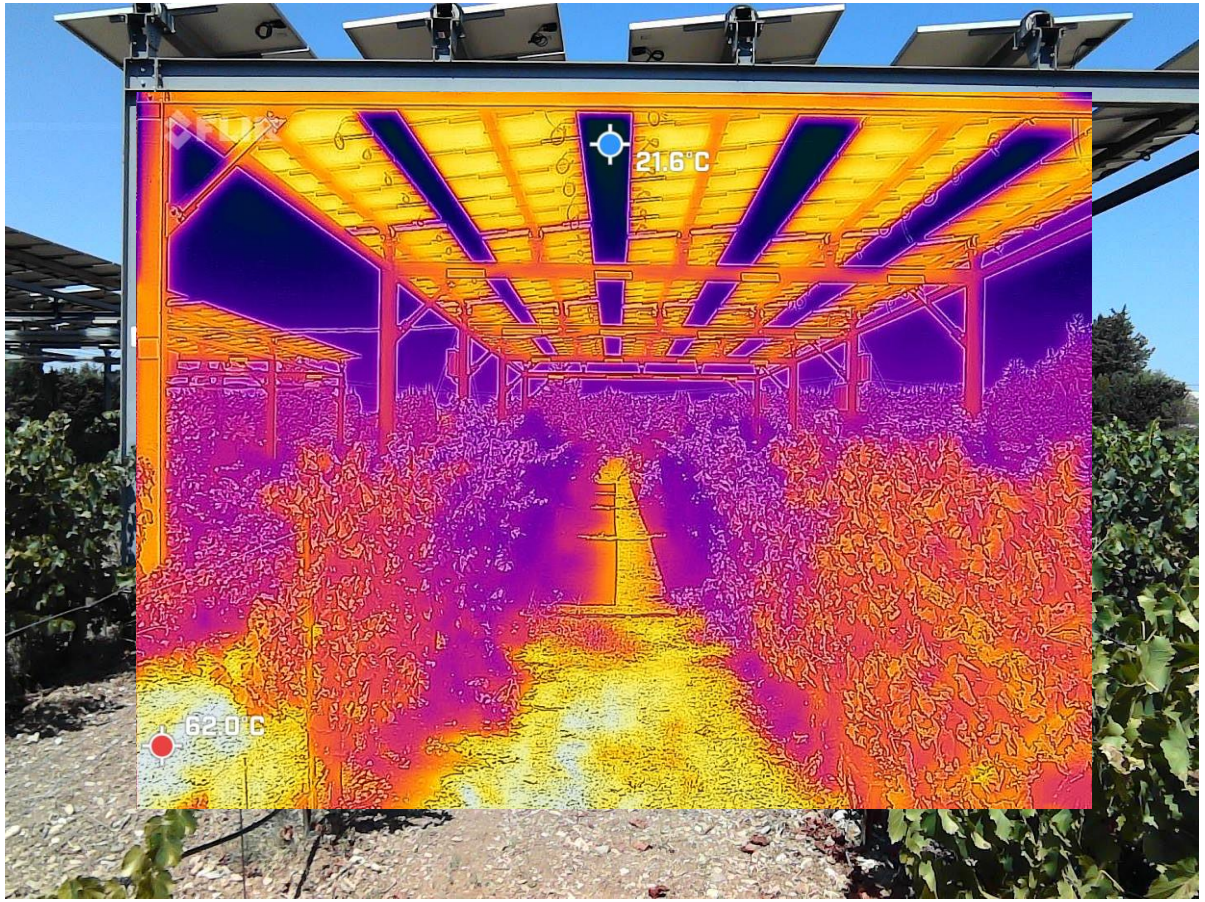
Results – Temperature Management Under Solar



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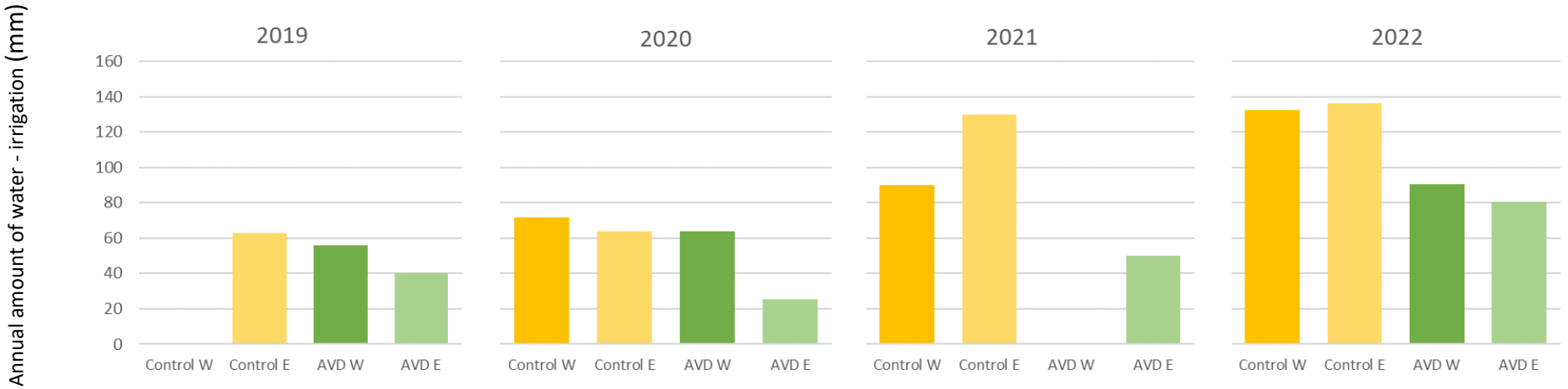
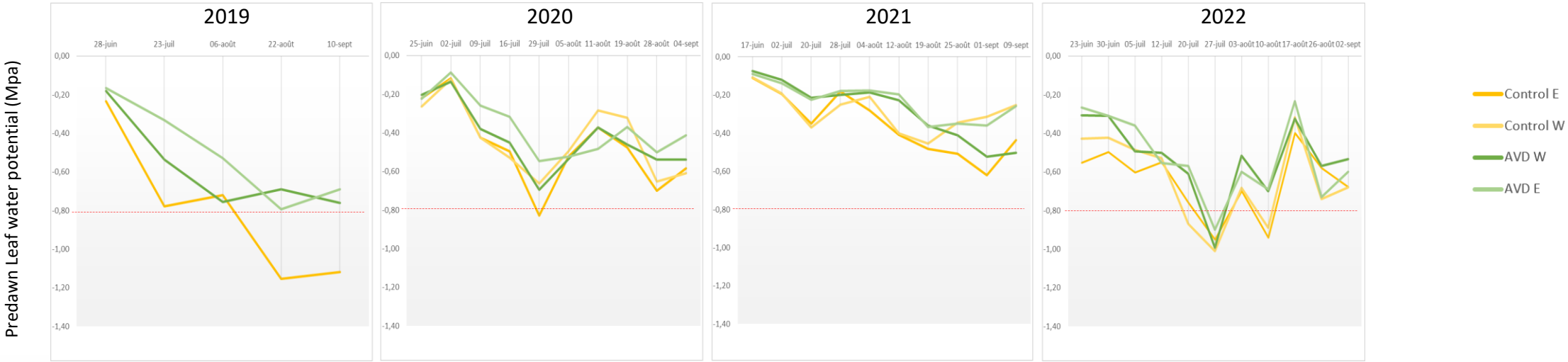
Results – Reduced Water Use



15 to 60% water savings



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Dynamic Agrivoltics

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Dynamic Agrivoltics - Vegetables

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Dynamic Agrivoltics - Orchards

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Dynamic Agrivoltics - Greenhouses

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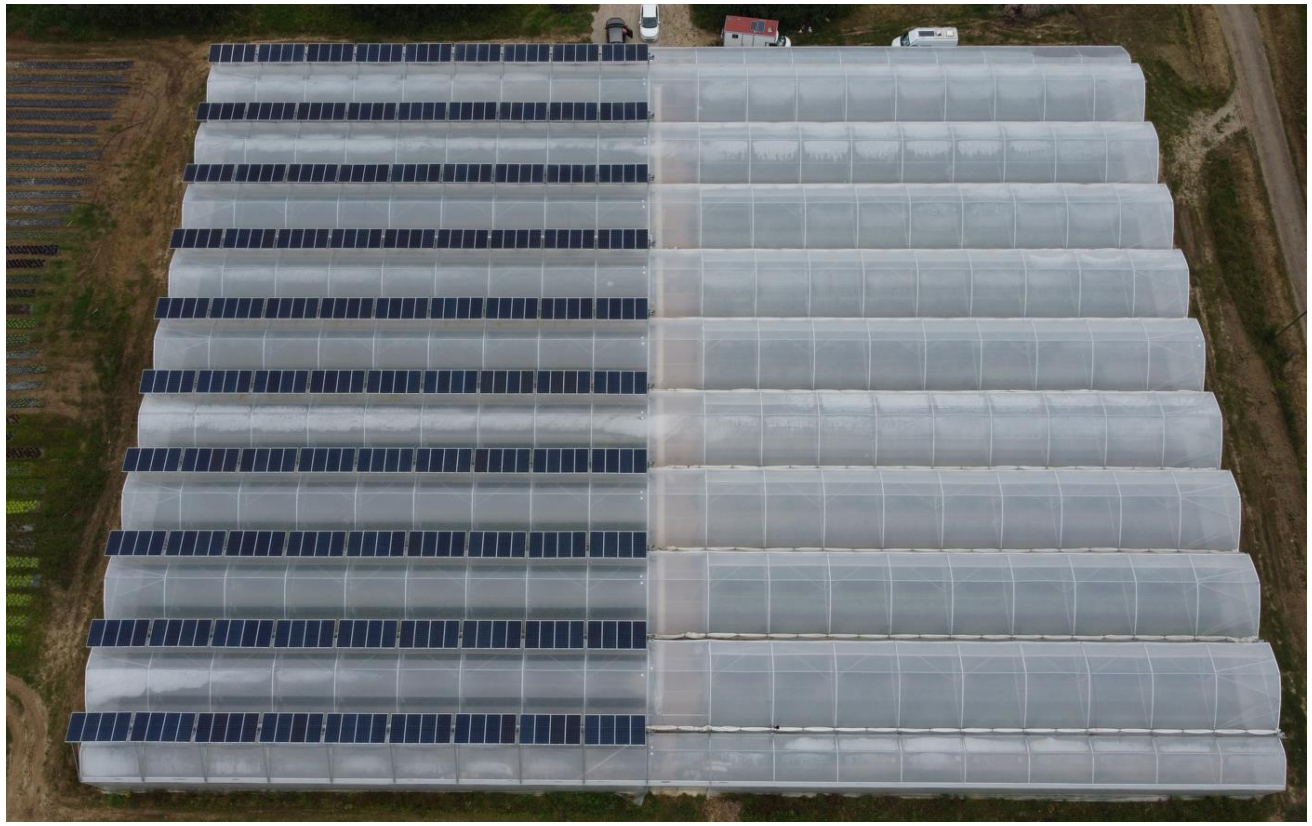
Dynamic Agrivoltics - Greenhouses



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To Learn More

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