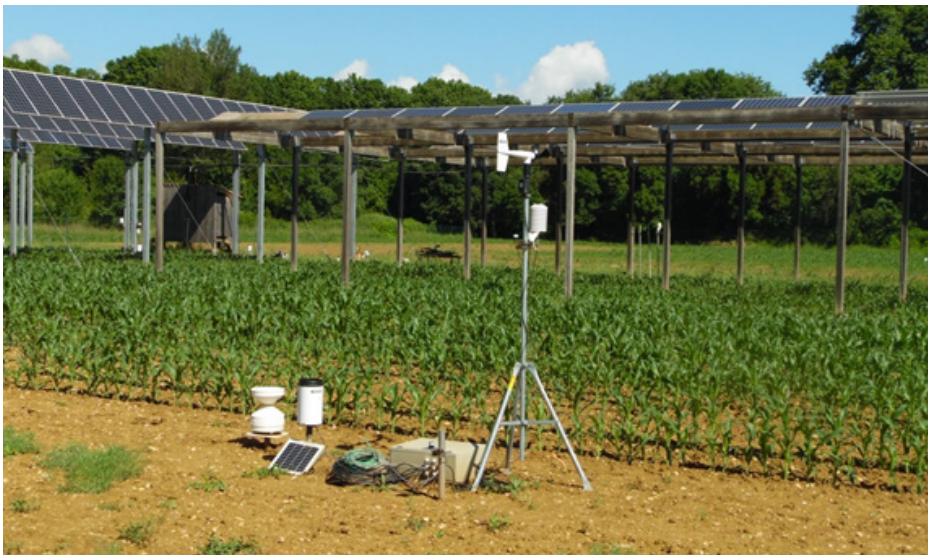
CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

FRANCE: Dynamic Agri-Voltaism

Dynamically controlling solar panels to optimise crop growth and produce clean energy



Weather monitoring devices (CR1000 datalogger, SP1110 radiation sensor, CS215 thermo-hygrometer, ARG100 and 52203 rain gauges, 05103-5 anemometer).

Case Study Summary

Application:
Measurement of water balance variables with Agrivoltaic devices

Location:
France (Montpellier - Tresserre - Mallemort - Piolenc)

Contributor:
Irstea

Participating Organizations:
Sun'R - Sun 'R Smart Energy - ITK - INRA - Photowatt

Campbell Products Used:
CR1000, AM16/32B, CS650, CS215, 05103-5, ARG100, SP1110

Measured Parameters:
Solar radiation, air temperature and relative humidity, wind speed and direction, precipitation, water content and soil temperature.

Associated websites:
www.sunagri.fr
www.irstea.fr
www.g-eau.fr
www.ademe.fr/sunagri-3

Agrivoltaics is described as the co-development of the same area of land for agriculture and solar photovoltaic (PV) power. At a particular light intensity, a crop will reach a light saturation point, beyond which the rate of photosynthesis will not increase, effectively "wasting" the excess photons. The introduction of solar panels into the same agricultural space is a method of capturing these excess photons and using them to generate solar power whilst maintaining the optimal level of light for the crops.

Dynamic photovoltaism is the same concept but rather than be a static install, the solar panels are dynamically controlled and adapt as per the plant physiological needs. These systems combine an agricultural crop, for example vineyards, tree farms, field crops or market gardening and photovoltaic panels on the same surface area, positioned high up and dynamically controlled.

This innovative technology aims to improve the agricultural production by changing the climate above plants, then produce clean, renewable and low-cost electricity.

As part of the Sun'Agri program run by Sun'R; IRSTEA (UMR G-eau, Montpellier) is studying the importance of the shade created by variable slope photovoltaic panels on crops, with the aim of reducing water consumption and thus increasing the efficiency of water use in agriculture.

Ultimately, this work will help adapt and feed crop development and water balance models in order to optimize shade management via the inclination of photovoltaic panels. This optimization should then improve the agricultural yield (quantity and/or quality), promote the development of renewable energies and maximize the efficiency of land use while saving water resources.

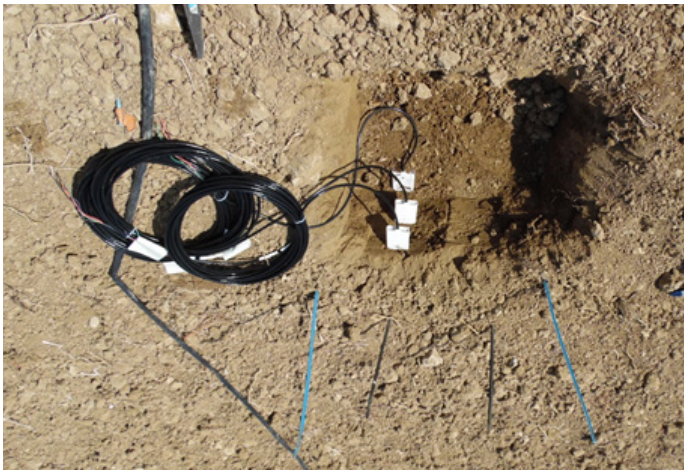
To reach this goal, 4 agri-voltaic devices have been or will be built in the south of France on field crops, vines, market gardening and apple trees, as part of the Sun'Agri 3 Investment Program funded by ADEME. These devices are equipped with Campbell Scientific equipment to allow:

- Evaluation of the effect of shading on microclimate and evapotranspiration using SP1110 radiation sensors, CS215 thermo-hygrometers, ARG100 rain gauges and vane anemometers (05103-5);
- Monitoring crop water consumption using CS650 soil water content reflectometers.

Monitoring of radiation, rainfall, air temperature and humidity under photovoltaic panels

(CR1000 datalogger, SP1110 radiation sensor, CS215 thermo-hygrometer, 52203 rain gauge).

Solar radiation monitoring under photovoltaic panels (CR1000 datalogger, SP1110 radiation sensor).



Monitoring of soil moisture's volume and temperature (CS650 soil water content reflectometers).