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Advancing precision irrigation in olive farming: from sensor data to digital twin- based decision making (SENSOLIVE)

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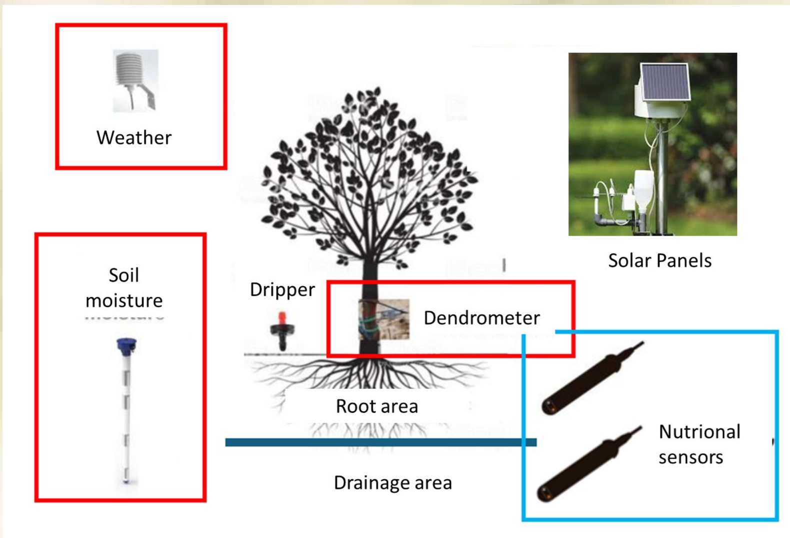
The **Sensolive Project** addresses a key challenge in olive cultivation, a vital part of Spanish agriculture, especially in Andalusia. In a region where water scarcity is intensified by frequent droughts, maintaining good production requires efficient resource management. This initiative focuses on turning promising technologies into practical, commercial solutions by developing a fully autonomous system that supports irrigation decisions in olive groves.

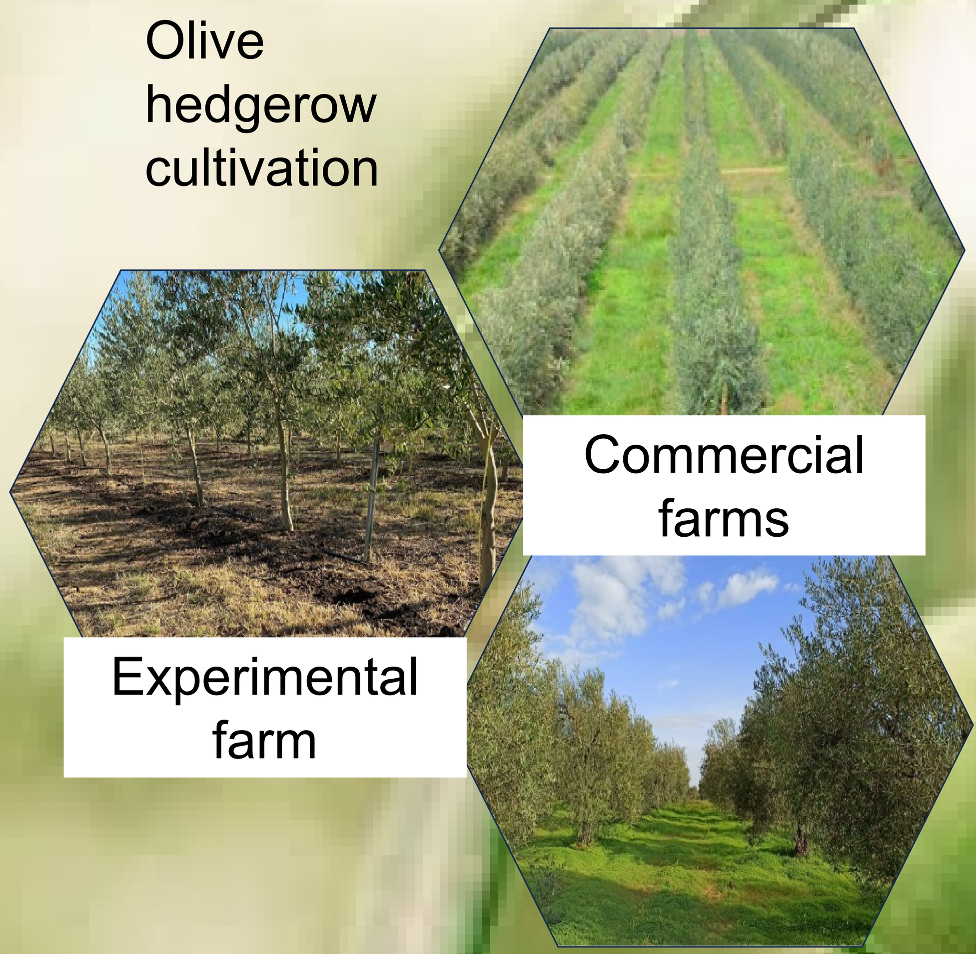
How it works

•**Dendrometry** + complementary **sensors** monitor olive trees.



•**Digital twin** models estimate water stress in real time across whole orchards.

Where



SAME SYSTEMS DIFFERENT NEEDS

Water & Nutrients

•Precise irrigation scheduling and different irrigation regimens (Survival, Deficit, Full)

•Targeted nutrient management (nitrate & potassium).

•Compost or mineral fertigation to boost efficiency.

VS

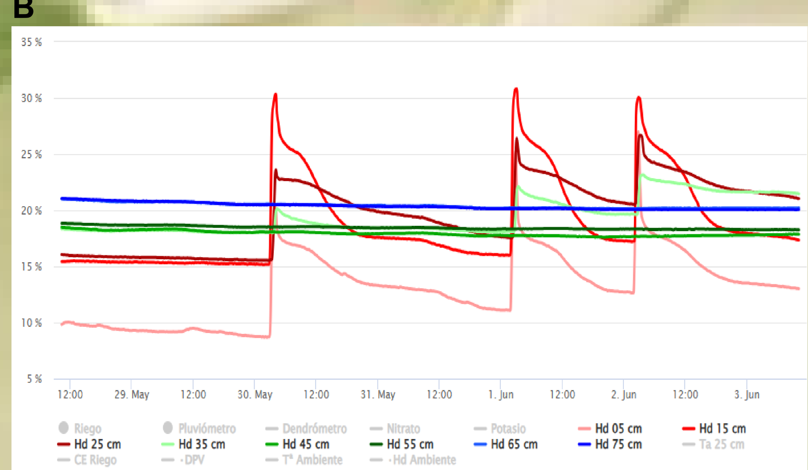
Real time monitoring

The Globalsens Platform collects sensor data every 15 minutes, measuring trunk growth changes (A), soil moisture (B), irrigation, rainfall, electrical conductivity, and nitrate and potassium levels (C).

A

it also generates alerts and visual graphics, enables station comparisons, and provides detailed reports. Early-stage results show strong potential for improved olive grove monitoring and management.

B



C

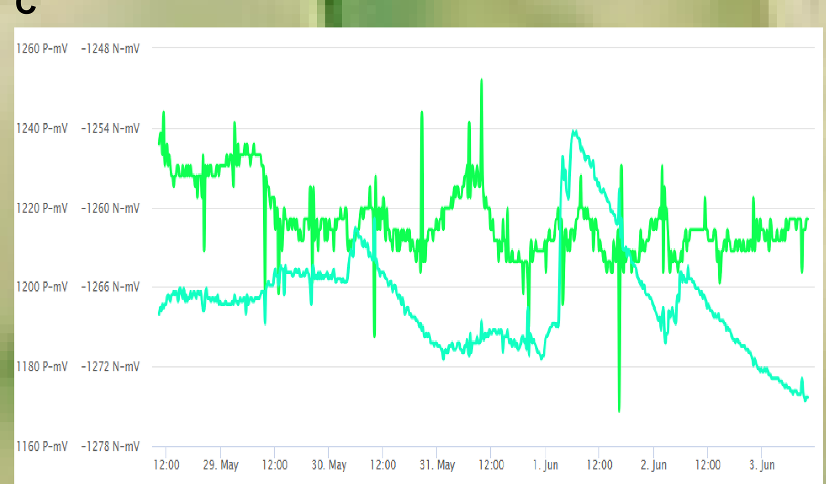


Figure 1. Continuous monitoring of (A) dendrometry data (trunk expansions and dilations), (B) moisture values in the soil profile and (C) Potassium and nitrate potential. Source : Globalsens Platform

Proven accuracy

Sensor data validated with laboratory soil analyses

Soil characteristics after compost application increase pH, electrical conductivity, organic matter content, potassium and nitrogen availability. Excessive watering may reduce organic matter and nitrate through leaching, yet organic amendments yield more favorable nutrient enrichment despite elevated conductivity.

Table 1: Soil characteristics with different irrigation regimes: survival irrigation, deficit Irrigation and full Irrigation.

Irrigation	pH	EC (mS/cm)	OM (%)	NO_3-N (mg/kg)	Kavai (mg/kg)	TN (%)
Survival	8.96 ± 0.26	98.2 ± 15.2	1.06 ± 0.10	1.16 ± 0.28	181 ± 36.2	0.06 ± 0.01
Deficit	9.01 ± 0.19	101 ± 20.9	0.96 ± 0.26	1.08 ± 0.22	187 ± 23.4	0.05 ± 0.01
Full	9.09 ± 0.04	112 ± 12.9	0.99 ± 0.30	1.02 ± 0.12	187 ± 26.9	0.05 ± 0.01

Table 2: Soil characteristics with different fertilization strategies.

Fertilization	pH	EC (mS/cm)	OM (%)	NO_3-N (mg/kg)	Kavai (mg/kg)	TN (%)
Mineral	8.96 ± 0.21	97.23 ± 20.4	0.96 ± 0.23	1.09 ± 0.20	181 ± 26.7	0.05 ± 0.01
Compost	9.09 ± 0.16	112 ± 8.15	1.15 ± 0.05	1.13 ± 0.28	200 ± 22.1	0.06 ± 0.01

Acknowledgments

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