



Irrigation management in olive orchard

KEY MESSAGES

1. Olive cultivation is critical to Mediterranean agriculture and heavily dependent on water.
2. Efficient irrigation conserves groundwater and sustains productivity.
3. Integrating soil moisture sensors and weather monitoring improves irrigation timing and amounts.
4. Use of IoT and modelling enhances decision-making.
5. Aim is to reduce water abstraction and irrigation costs.
6. Adaptation to drought strengthens resilience of olive systems.
7. Technical and financial barriers can impede farmer adoption.
8. Supportive policies and capacity building enhance uptake.
9. Business opportunities exist in services, data analytics, and smart irrigation technologies.
10. Aligns with EU water directives and sustainable water use goals

SUMMARY

In many Mediterranean regions, groundwater is the primary source of water for irrigation, yet many aquifers are being depleted faster than they can recharge. Olive cultivation, a cornerstone of the regional economy, is increasingly reliant on irrigation to maintain productivity in the face of rising temperatures. The theme of "Irrigation Management (IM) in Olive Orchards" focuses on moving away from "calendar-based" irrigation toward "demand-

based" precision systems. This involves the integration of Internet of Things (IoT) technologies with sophisticated Weather Research and Forecasting (WRF) models. Related themes include the "Water-Energy-Food" nexus, where reducing water use also reduces the energy required for pumping, thereby lowering the carbon footprint of olive oil production. Furthermore, the topic addresses the socio-economic necessity of sustaining high-value crops in water-scarce areas while ensuring that agricultural practices do not compromise the availability of water for other essential uses, such as domestic supply and the maintenance of natural ecosystems.

RESEARCH AND RESULTS

The project's research demonstrates that the combination of soil moisture sensors and atmospheric modeling can drastically reduce water misuse without compromising olive yields. By utilizing IoT-based platforms, farmers can receive precise data on when and how much to irrigate. The results indicate that this technology is particularly effective in arid and semi-arid regions, where it helps in main-





taining crop resilience during prolonged dry spells. A key finding of the research is the importance of the "Data-Information-Decision" chain; sensors alone are insufficient without a modeling tool that translates raw data into a decision-making framework. The project also identified that while the technical reliability of these systems is high, social and financial constraints—such as a lack of technical training and the high cost of high-end sensors—hinder widespread adoption. Interestingly, the research found that over-reliance on irrigation could potentially lower the long-term resilience of olive trees if not managed carefully, highlighting the need for "deficit irrigation" strategies that encourage deeper root growth.

RECOMMENDATIONS

- **Subsidize "Smart" Infrastructure:** National and regional policies should offer substantial grants or tax credits for the installation of soil moisture sensors and automated irrigation controllers, targeting small and medium-sized olive growers who face the highest financial barriers.
- **Integrate Regional Weather Forecasting:** Agricultural ministries should provide free access to high-resolution WRF modeling data to help farmers synchronize their irrigation

schedules with predicted rainfall, thereby preventing water waste.

- **Establish "Water-Efficiency" Labeling:** Create a certification or labeling system for olive oil produced using verified precision irrigation techniques. This would allow farmers to command a premium price, offsetting the costs of technology adoption.
- **Strengthen Water User Associations:** Support the formation and training of local water user associations to manage collective groundwater resources more effectively, using shared IoT data to monitor and regulate total abstraction levels.
- **Promote Technical Education:** Launch comprehensive training programs focused on "digital literacy" for farmers. These programs should emphasize how to use data analytics and software tools to optimize farm management and resource efficiency.
- **Align with Environmental Regulations:** Use these technologies as a tool for monitoring compliance with the EU Water Framework Directive. Providing data-sharing incentives could help regulatory bodies manage aquifer levels more proactively while reducing the burden of manual inspections.



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