



**Practice Abstract 31 -
A Low-Cost Digital Assistant and Digital Twin for Irrigation
and Pest Management in Kiwi Orchards (FARM5.0 OC SIP)**

31. A Low-Cost Digital Assistant and Digital Twin for Irrigation and Pest Management in Kiwi Orchards (FARM5.0 OC SIP)

Short Summary for Practitioners in English

Problem:

Small and medium-sized kiwi farms often lack affordable and easy-to-use digital tools for field-level decision support. As a result, irrigation and pest-management decisions may rely mainly on experience, manual observation, and delayed information rather than continuous field data. In sensitive crop stages, low temperature events, water stress, humidity conditions, and pest pressure can affect fruit quality and production. Farmers also need remote visibility of orchard conditions without being physically present, while many commercial precision-agriculture platforms remain too costly or complex for small farms.

Solution:

FARM5.0 is a farmer-centric, low-cost digital assistant and lightweight digital twin platform developed within the Farmtopia project by YTHION and piloted at MORAITI FARM, a kiwi orchard in Arta, Greece. The solution combines ESP32-based sensor nodes for soil moisture, air temperature and humidity monitoring, LoRaWAN connectivity, a web-based farm dashboard, irrigation and pest-risk analytics, alerting services, and a customized LLM-based assistant that supports farmer queries in Greek and English using available farm data. The platform is containerized and can support cloud, edge, or hybrid deployment configurations, allowing core monitoring and advisory services to operate even in connectivity-constrained farm environments. Integration with Farmtopia components supports the enrichment of local telemetry with farm records and weatherrelated information. The architecture of FARM5.0 is presented below.

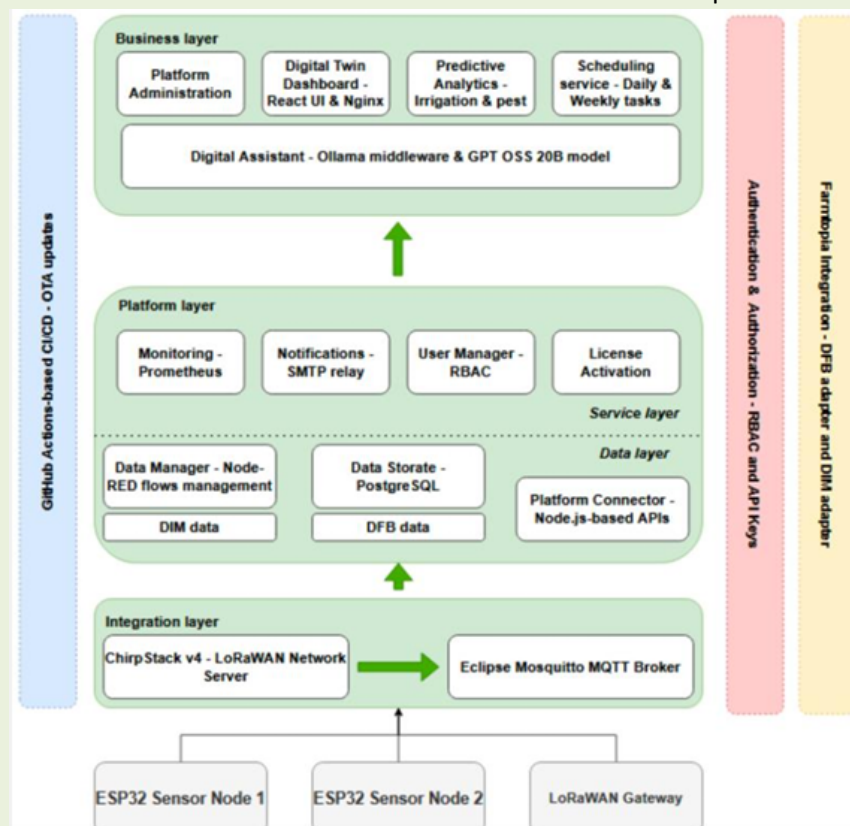


Figure: FARM5.0 SIP platform

Benefits:

The pilot deployment at MORAITI FARM demonstrated reliable technical operation, including 97.2% sensor uptime, automated alert generation within approximately 188 ms, and assistant responses delivered in under 10 seconds with approximately 90% response accuracy. These results indicate that the system can provide near-real-time visibility and decision-support information compared with previous manual observation-based practices, where relevant information could take several days to be checked or communicated. Projected fullcycle impacts indicate potential annual water use reduction from 15,000 m³ to approximately 12,500 m³, pesticide use reduction from 6 kg to approximately 5 kg per season, and yield increase from 40 to approximately 43 tons. The cost-effectiveness assessment estimates an additional gross profit of approximately €1,300 per hectare per year against an indicative annual solution cost of €500 per hectare, while structured farmer feedback showed satisfaction above 90%.

Practical Recommendations:

Farmers should start with a minimal sensing kit, such as two sensor nodes and one gateway, and expand the deployment only after the practical value has been confirmed. A four-hour data capture interval provides a reasonable balance between field visibility and battery autonomy, with an estimated battery life of approximately two months under the tested configuration. FARM5.0 outputs should be used as decision support information rather than as automatic instructions. The farmer should remain in control of irrigation and pest-management actions, ensuring that practical expertise remains part of the decision-making process.

Further information

- FARM5.0: <https://farm50.eu/>

About this practice abstract and Farmtopia

Publisher: YTHION

Authors: Alessio Costa

Contact: projects@ythion.eu

Permalink: [EU CAP Network](#)

This practice abstract was elaborated in the Farmtopia project, based on the EIP AGRI practice abstract format. ©2026

Farmtopia: The project is running from September 2023 to August 2026. The overall goal of Farmtopia (**GA No.: 101083541**) is to democratize digital farming to empower small and medium farms.

Website: <https://farmtopia.eu/>

YTHION: SIP leader, ADS provider

Website: <https://www.ythion.eu/>

Disclaimer

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.



Co-funded by
the European Union

