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UC-FARM2
Smart Vineyards

Infocom 2024
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6G-PATH project has received funding from the Smart Networks and Services Joint Undertaking (SNS JU) under the European Union's Horizon Europe research and innovation programme under Grant Agreement No 101139172.

- Viticulture domain & Edge
- Flexible ingestion of sensor data
 - Locally via edge device
 - Directly via 3rd party service
- Business Goals
 - **Implement water use efficiency using Aquaview**
 - Better and more efficient yearly productions.
 - Implement environmentally friendly practices.
- **Technical Goals:**
 - Explore hybrid approaches for the deployment of Aquaview, in collaboration with:
 - **Athonet**, to advance towards a virtualized 5GCore.
 - leveraging the cloud continuum for service placement
 - Integrating commercial backhuls onto private 5G/6G networks.
 - **TEL** on access to sensors over network
 - **UMA** on testbed
 - **ONE** on imaging support, operations, technology

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Champion: TER

Testbed: UMA

Operator: TEL

Partners: ONE, ATH



Optimising Water Use Efficiency (WUE)

Challenge 01

Precise understanding of soil moisture content

- 01 Expensive soil moisture probes needed!
- 02 Provides just point data!
- 03 Sensors aren't reliably installed.
- 04 Many get destroyed during field operations.

Challenge 02

Spatial resolution matters

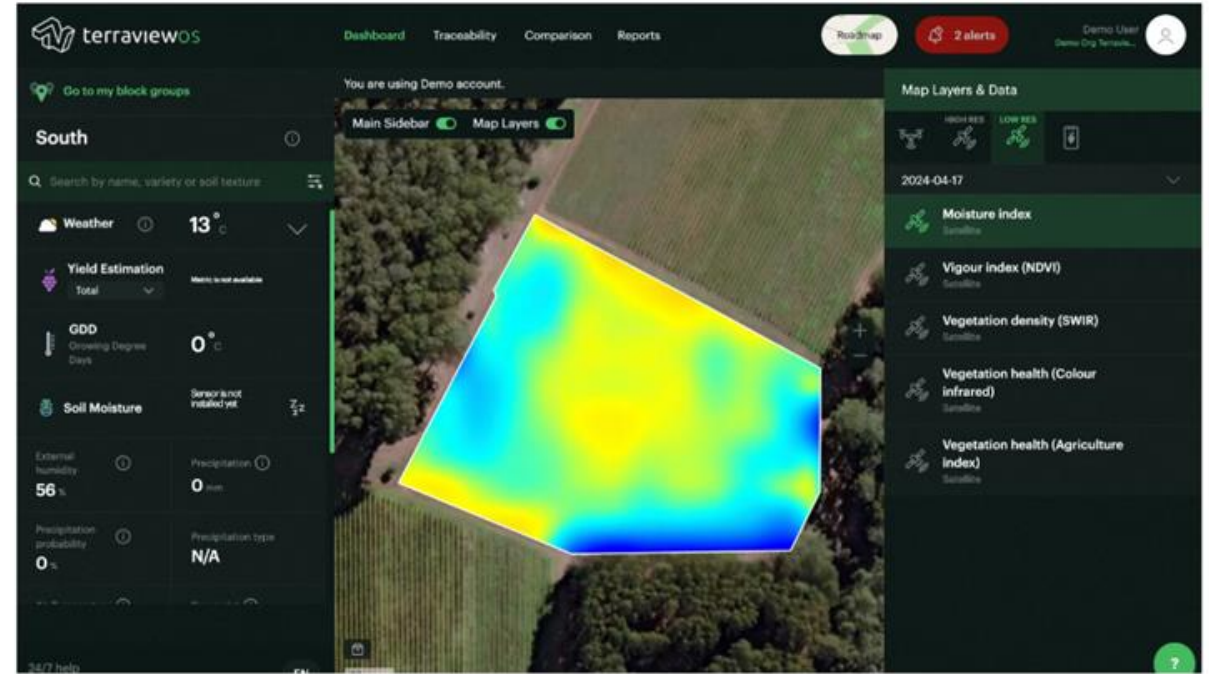
- 01 Need precise sector by sector soil moisture understanding to optimize irrigation
- 02 Most current satellite-based indices only deal with crop water stress and not soil

Aquaview and the rest!



Highly accurate topsoil moisture content data

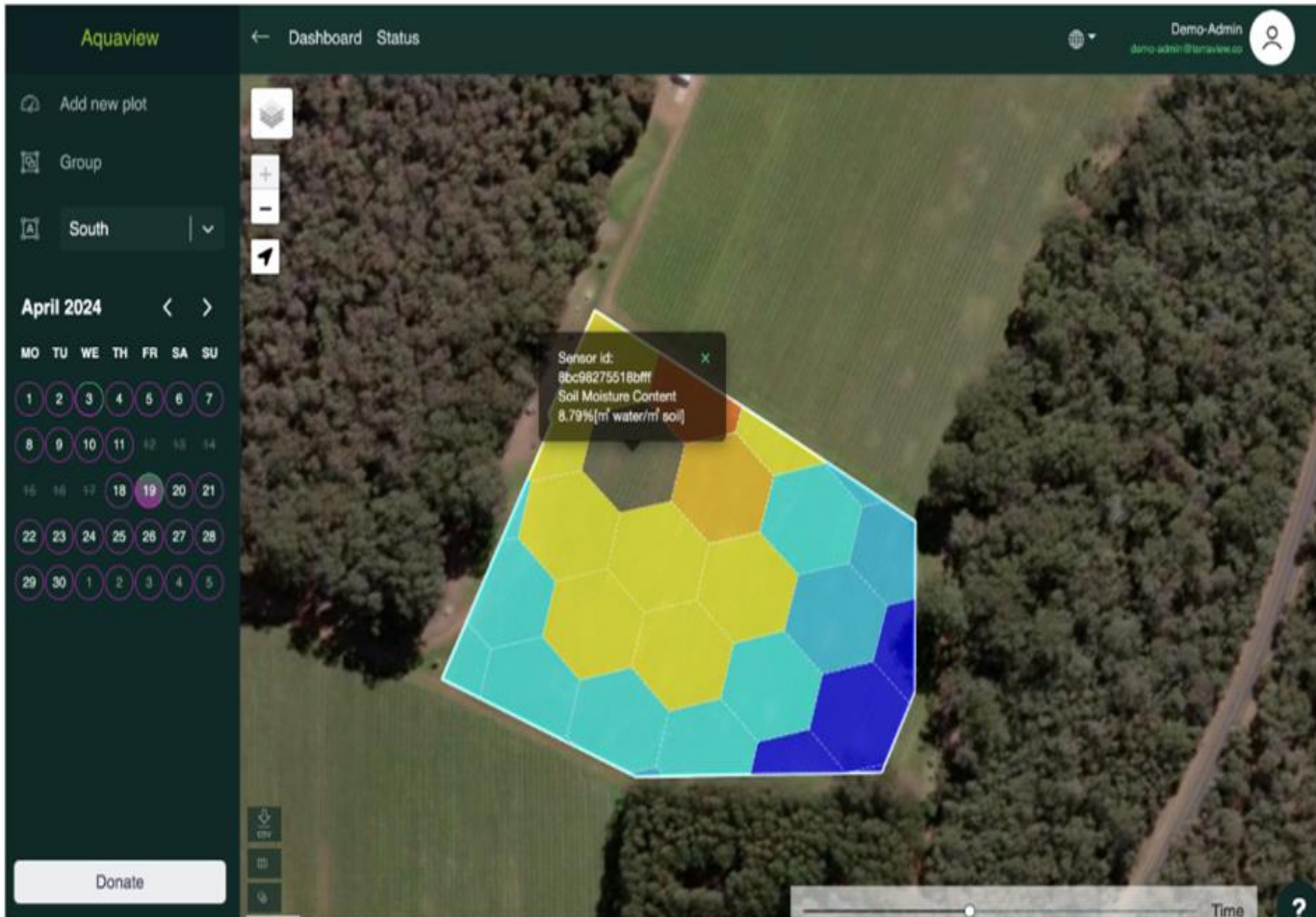
Delivers precise 30m radius soil moisture data using advanced algorithms and AI/ML enhancements.



Evapotranspiration Analysis

Focuses on vegetation, **not soil state**, can lead to less accurate soil watering needs assessment.

Aquaview overview



- Crop agnostic*
- Topsoil & depth
- Historical:
 - back to 2013
- Future:
 - +7-12 days predictions
- Export via CSV,
- Early support for water diary.

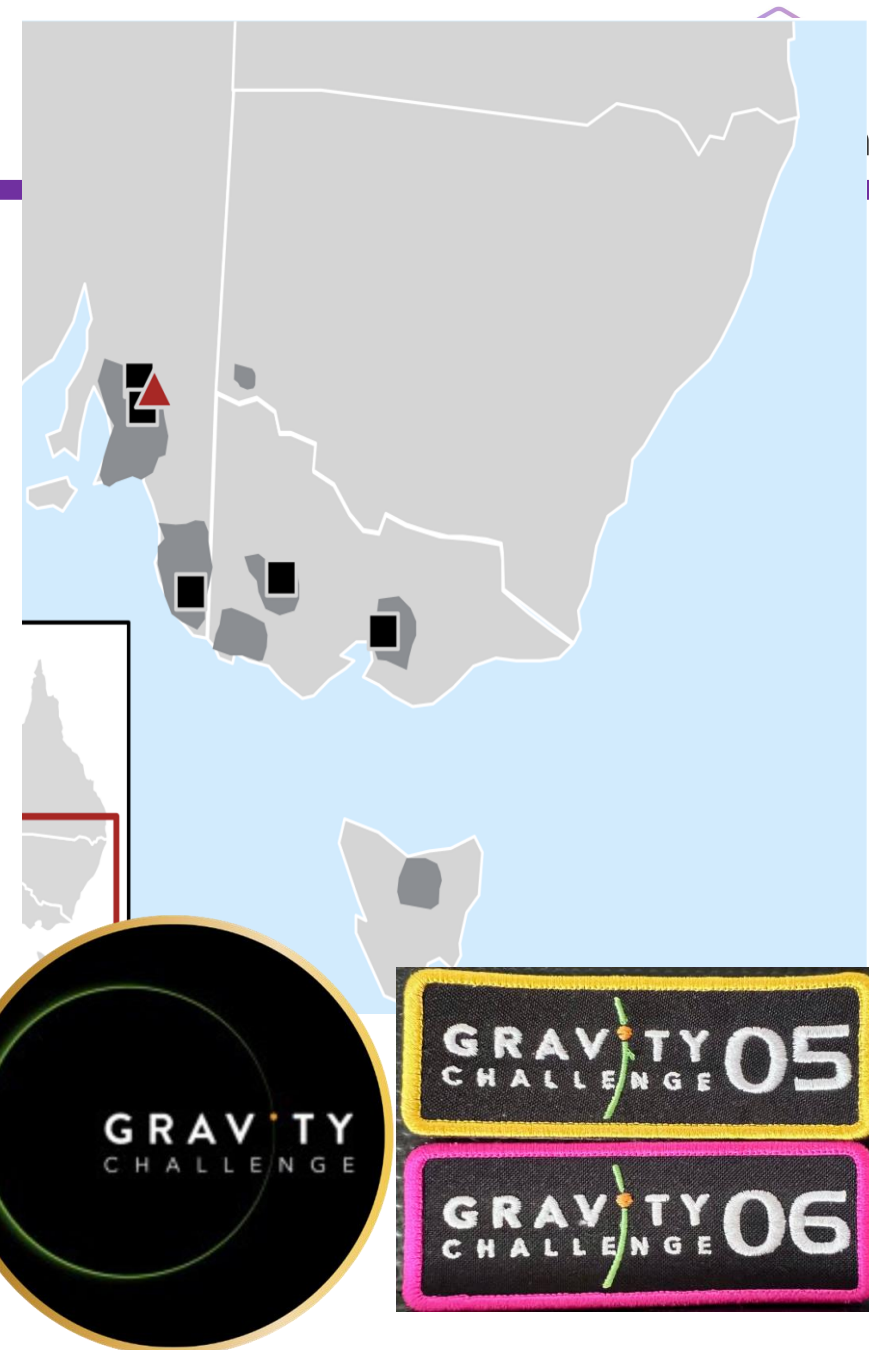
Large Viticultural Operations

A Large Australian Wine Producer

- Aquaview: Global Deloitte Gravity '05
- >10,000 HA of productive land (50% in AUS)

In Pilot

- Plots in Coonawarra & Barossa regions
 - Total area in pilot: 1,300 HA
- Accuracies of
 - Surface: < 1.5% deviation from ground control
 - **Depth:** < 5% deviation from ground control



Irrigation planning for future

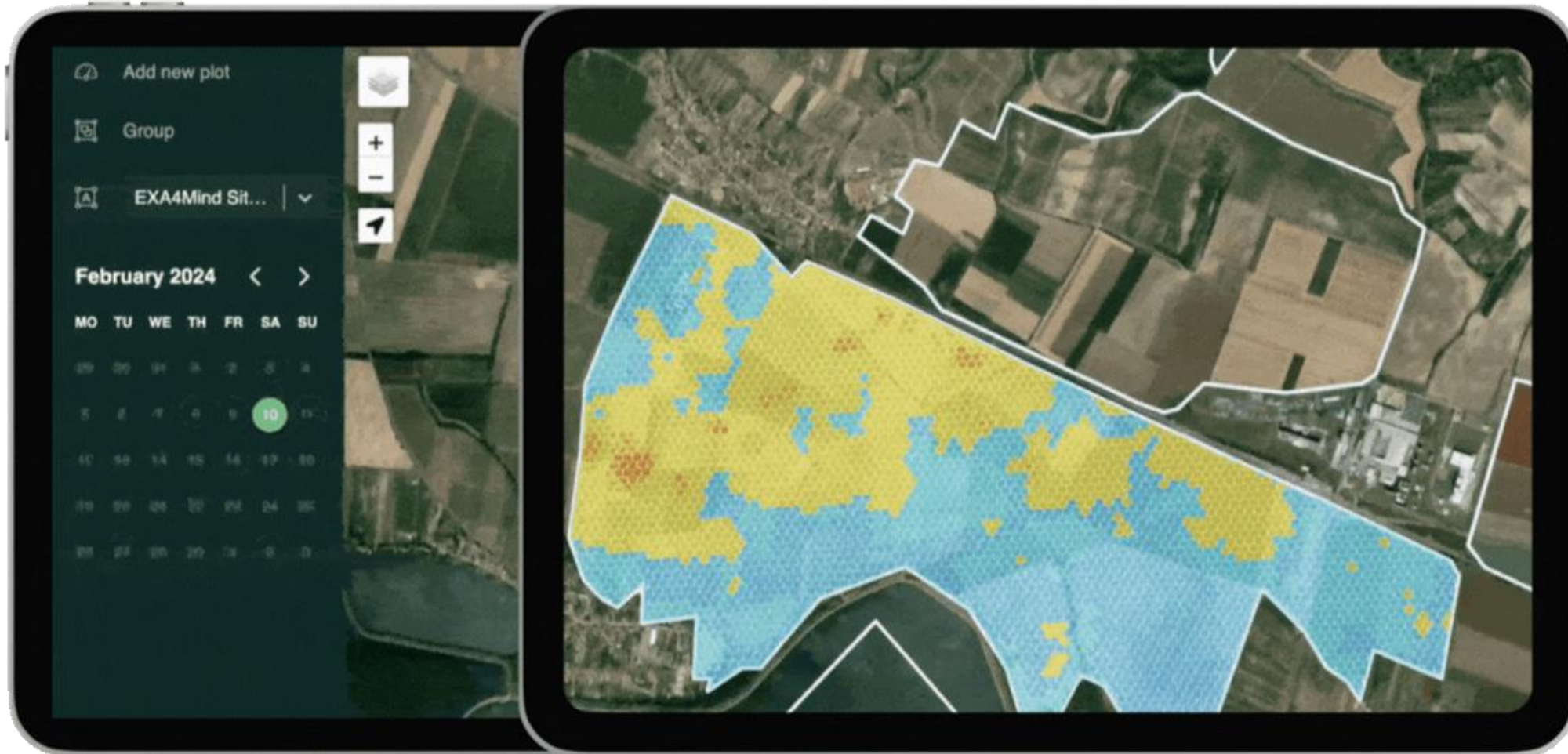
Irrigation network were designed decades ago

Land use patterns
have since changed

Aquaview timeline trends allow planners to see moisture retention trends over the last **10 years**, helping them take informed decisions for **future irrigation** plans!



Let's analyse the temporal trends of a farm in south of Czechia



Thank you for you attention!



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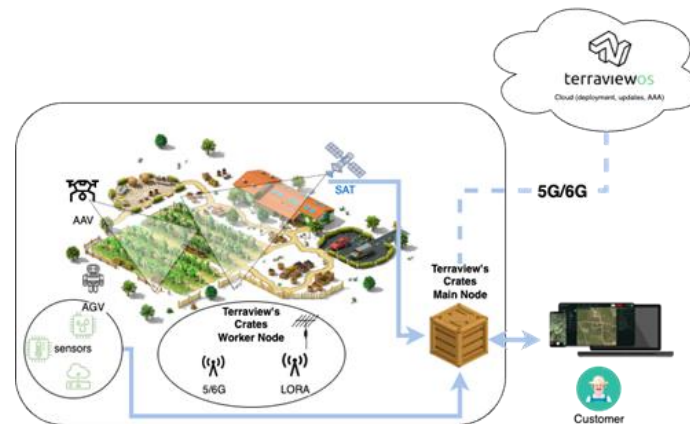
6G-Path

UC-FARM-2 – Smart Vineyards



Terraview's Crate will provide the connectivity necessary for all the devices locally, being composed of a scaled compute and storage node, coupled with a small private and secure 5G/6G cell. Depending on the area to cover, the deployment may be comprised of multiple Crates. The modularity of the Crates, together with virtualized 5GCore from Athonet will leverage the cloud continuum to properly locate the services.

The integration of AAVs and AGVs will explore the capabilities of the private network, through their requirements for low latency and high bandwidth, linked to eMBB and URLLC slices, while the energy-efficiency of the sensors will explore the capabilities of an mMTC slice. For this pilot operations, the cloud will be provided by the UMA testbed, while TEL, with its commercial network, will provide the backhaul for the connection between the edge and core nodes.



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Functional	<p>Crates can operate without external connection to the core TerraviewOS system.</p> <p>AI/ML Model updates should be delivered to the Crate when decided to be pushed from the central TerraviewOS service.</p> <p>Software upgrade strategies should be reliable and allow for multiple means to be applied.</p> <p>Process acquired drone imagery on-site without any upload to the central TerraviewOS.</p>
Security	<p>Data should be encryption at rest and movement.</p> <p>Data should be backed up locally and later where network connection allows, remotely.</p>
Performance	<p>Data transferred from property to central cloud down from GBs to MBs.</p> <p>Processing time of imagery to remain the same. No increase.</p> <p>Reduction in cost for per tenant operations by Terraview.</p> <p>A complete disconnection from central resources/services does not impact operation of the edge unit. Later reconnection ensures all state to be synchronised.</p>

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