FEASR

REPUBBLICA ITALIANA

REGIONE AUTÒNOMA DE SARDIGNA
REGIONE AUTONOMA DELLA SARDEGNA

PROGRAMMA DI SVILUPPO RURALE PSR sardegna 2014 2022

FONDO EUROPEO AGRICOLO PER LO SVILUPPO RURALE: L'EUROPA INVESTE NELLE ZONE RURALI

RURAL DEVELOPMENT PROGRAMME 2014/2020

MEASURE 16

16.1 – SECOND PHASE – Support for the establishment and management of EIP operational groups on agricultural productivity and sustainability

Grant Award Decision: No. 3972 of 12/07/2023

Project:

*Progetto pilota per la **C**ompetitività e la **S**ostenibilità del settore **Viti**vinicolo in **S**ardegna*

(Pilot Project for the Competitiveness and Sustainability of the Wine Sector in Sardinia)

CSVitiS

FINAL REPORT

RESPONSIBLE PARTY: Lead Partner - Vitivinicola Antichi Poderi Jerzu Agricultural Cooperative

COLLABORATIONS:
Partner 1 Radarmeteo Srl
Partner 2 Enogis Srl
Partner 3 C.S.C. di Contu Salvatore & C Sas
Partner 4 Serra Giovanni
Partner 5 Valoritalia Srl

WP2 – DIGITALIZATION

TASK		PARTNER	ACTIVITY PERIOD
1	Creation of a georeferenced IT platform for the management of farm and vineyard registries	Partner 2	
2	Georeferencing of vineyard land registry units	Partner 2	
3	Digital Field Registers with the possibility of monitoring as supply chain leader	Lead Partner Partner 2	
4	Visualization of DSS (Decision Support System) for vine diseases	Lead Partner Partner 2	
5	Alert tools and cartographic visualization for extreme weather events (e.g., heatwaves)	Lead Partner Partner 1	
6	Digitalization of inspections by the Certification Body	Lead Partner Partner 5	

Partner 1 - Radarmeteo Srl

Task 5 – Alert tools and cartographic visualization for extreme weather situations (e.g., heatwaves)
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Introduction
The PSR Sardinia project aimed to develop advanced tools for decision support in agriculture, with particular focus on climate and weather risk management. Within the partnership, our activity focused on the development of the early warning and cartographic visualization system integrated into the DSS (Decision Support System) developed by ENOGIS.

The main objective was to set up a processing chain capable of transforming reanalysis and weather forecast data into operational tools for issuing alerts on extreme weather events relevant to regional agriculture, such as heatwaves, frost, hailstorms, and heavy rainfall.

Activities Carried Out

1. Setup of the processing chain
A data processing chain for meteorological data was implemented based on:

- Reanalysis and observational data: acquired from official agencies and project IoT sensors.
  Forecast data: obtained through physical models (e.g., WRF) and AI-based regression models (neural networks), with temporal horizons ranging from nowcasting to medium-term forecasts (up to 7 days).
- High-resolution georeferenced grid: designed as a network of "virtual weather stations" to provide data representative of the microclimate, particularly in the vineyard area of the municipality of Jerzu.
- This infrastructure enabled the production of high-resolution meteorological datasets, supporting both historical analyses and operational forecasts.

2. Development of APIs and integration with ENOGIS

Timeseries APIs were developed and made available to the ENOGIS DSS, allowing the extraction of processed meteorological data on a point basis (time series for specific coordinates). The data provided through these APIs deliver information on recent past weather (near real-time mode) as well as forecasts.
The activated variables are as follows:

- Precipitation
- Potential evapotranspiration
- 2-meter air temperature

During the API activity period, nearly 1,000,000 monthly calls were recorded, distributed as shown in Fig. 1.

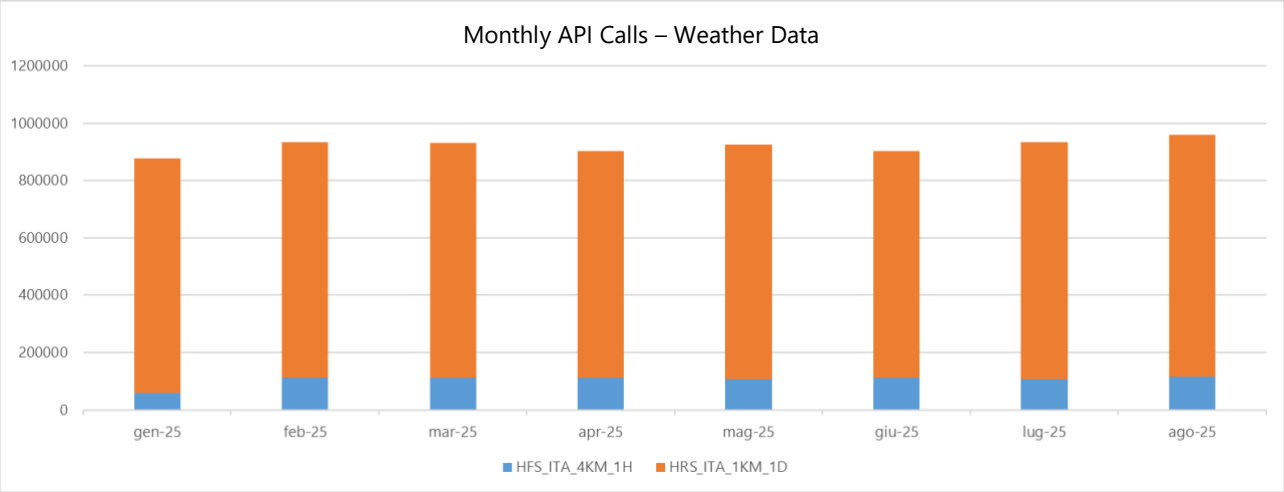

Figure 1: Monthly volume of API calls recorded by the system set up by ENOGIS for the project.

3. Definition of Alert Thresholds

Early warning thresholds were identified and implemented for various types of weather hazards, with particular focus on those most impactful for grapevine cultivation. The following table lists the monitored hazards along with details on update frequency and activation thresholds:

CODE	Hazards	Threshold	Update Frequency	Monitored Time Window
1	Thunderstorm	YES/NO	5 minutes	Next 1 hour
4	Rain	1-year return period	1 hour	Next 6 hours
5	Wind	95th percentile of the annual mean wind speed distribution	1 hour	Next 6 hours
7	Late frost	2-meter air temperature (TC2M) < +1°C during the period March 15 – May 31	1 hour	Next 24 hours
8	Heatwave	2-meter air temperature (TC2M) > 38°C	1 hour	Next 24 hours
9	Drought	SPEI < -1.5	1 hour	Next 72 hours

These thresholds serve as triggers for classifying event intensity and for the automatic activation of notifications.

4. Implementation of the Early Warning System

During the project, the operational version of the early warning system was released, complete with dedicated APIs that provide data in geoJSON format, allowing for the cartographic representation of alert polygons.
The system was integrated into the DSS developed by ENOGIS, enabling functionalities for consulting alerts and visualizing extreme events on maps.
An automated notification system was developed for both past events (recalculated using reanalysis data) and forecasted events (based on short- and medium-term predictions).

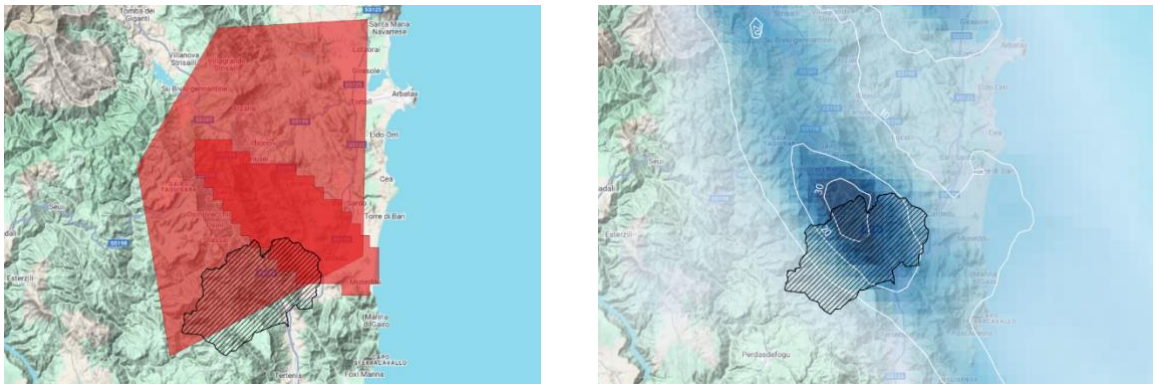

Figure 2: Example of a thunderstorm alert issued on June 22 (left) and daily cumulative precipitation as seen by the reanalysis system (right). The municipality of Jerzu is highlighted in black.

Achieved Results

1. Implementation of the processing chain: historical and forecast data made continuously available and regularly updated.
2. Availability of integrated APIs: providing point-specific meteorological data directly to the DSS.
3. Operational early warning system: with thresholds calibrated for extreme weather events with the greatest agricultural impact.
4. Integration into the ENOGIS DSS: allowing end users to view and receive alerts in real time.

Conclusions

The work carried out has equipped the DSS developed by ENOGIS with advanced tools for managing meteorological risk, enhancing the ability to predict and respond to extreme events. The integration of APIs and the early warning system ensures that data is operationally accessible to agricultural users and provides a solid foundation for future system developments, both in terms of new types of alerts and territorial expansion.