# HIDROVINYA: a tool to determine the water status of vineyards using meteorological and soil data

## Summary

The main objective of the project was to gather the meteorological and soil data required to determine the water status of plants in vineyards in the Penedès and Costers del Segre regions, as the basis for working to adapt vine cultivation techniques to the conditions caused by climate change.

A network for monitoring soil moisture levels was created in order to relate it to meteorological and plant development data. The network uses continuous data gathered in a digital environment that enables it to be analysed and studied.

This network was created to obtain accurate data to support decision-making in the management of vineyards. Maintaining the network over some years will provide useful records for making predictions about a vine's agronomic behaviour in response to various agricultural practices, and therefore improve the vine grower's ability to react. The network has been created; its good results are linked to its continuity.

## Objectives

The main objective of the project is to create and install a network of sensors that collect the meteorological and soil data required to determine the water availability in vineyards, and based on the data, to predict the plant's response to stressful situations as the basis for working to adapt vine cultivation techniques to the conditions caused by climate change.

The main specific objectives of the project are to:

- Relate water availability data to levels of plant water stress, obtained by reading leaf water potential.
- Assess the performance of different vineyard soil and vegetation management actions, as measures for adapting to situations of increasing water stress.
- Optimise water management in vineyards using the data from the monitoring network for irrigation management (where available), soil management and vine vegetation management.

## Description of the actions carried out in the project

- Action 1: installation of meteorological observatories
- Action 2: installation of humidity and soil temperature sensors in each meteorological observatory
- Action 3: adaptation of the vite.net platform to the needs of the project for collecting and viewing data and recommending agronomic improvement actions over the Internet
- Action 4: classification of soils in plots
- Action 5: collecting and monitoring of meteorological and soil moisture data
- Action 6: monitoring of the plants' water potential
- Action 7: vegetative and productive development of the vine
- Action 8: monitoring of the health of plots
- Action 9: must quality
- Action 10: collection of agronomic data
- Action 11: data analysis and discussion of results
- Action 12: preparation of reports
- Action 13: dissemination of the results.

## Final results and practical recommendations

**Initial historical data: the role of soil moisture in the development of the vine**

The meteorological and soil moisture monitoring network has been collecting data since late 2019. The historical data, and therefore the experience as a basis for future decisions in the management of vineyards, began at that point. Regular observation of these data based on the records for each point and relating them to the behaviour of the vine can be very useful in decision-making, and especially in soil management.

**The relationship between soil moisture and leaf water potential**

A parallel evolution between conditions with and without cover was observed until the beginning of April, involving much lower levels of water potential in the soil in the zone with cover.

Between the spring and late July, the stress level is highest in the area under cover. From that point on, it is practically the same.

This comprehensive monitoring shows how cover is a very important factor in competition in years with low levels of rainfall. Quantifying these values can help with effective management of the cover, and in particular, to take advantage of its positive contributions to the vineyard.

**Soil management as a factor in the evolution of the water available to plants**

This comprehensive monitoring shows how cover is a very important factor in competition in years with low levels of rainfall. Quantifying these values can help with effective management of the cover, and in particular, to take advantage of its positive contributions to the vineyard.

In general, these results enable the continuation of work with the network to generate algorithms providing continuous monitoring of the plant's water status.

## Conclusions

The results of this project were:

- A network was created to monitor meteorology and soil moisture, with continuous data readings. This network consists of 22 observation points: 18 in the Penedès region in dry farming vineyards, and 4 in the Raimat region on irrigated plots.
- A website was created, which displays the data graphically, and provides it in spreadsheet format for analysis.
- The characteristics of the plot and the crop that can have an impact on the dynamics of the water in vineyards were examined and measured: these are the soil's characteristics and the measurement of vegetation.
- Leaf water potential was monitored as a parameter in the assessment of plant water stress, and therefore as the ultimate objective in water management in vineyards.
- A database was created which will become a useful tool for decision-making in wine growing, and for soil and vegetation management in particular as it is completed over the years.
- Correlations were defined between soil moisture measurements and leaf water potential which may be very useful in determining and predicting situations that are stressful for plants.
- The impact of the maintenance of spontaneous vegetation cover on the dynamics of water in the soil compared to mechanical ploughing of the vineyard was studied.
- The creation of the network has enabled the technical staff of the Catalan Vine and Wine Institute (INCAVI), the Plant Defence Groups and the companies participating in the project to expand their knowledge and experience of the use of sensors and interpreting their results.
- The results and the knowledge obtained will enable this technology to be disseminated in the wine industry, especially in the Penedès and Costers del Segre regions.

## Leader of the

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## Other members of the Operational Group (grant recipients)

ORGANISATION: CODORNIU, SA

ORGANISATION: GRAMONA, SA

ORGANISATION: JUVÉ & CAMPS, SA

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## Other members of the Operational Group (not recipients of the grant)

ORGANISATION: INCAVI

## Subject area(s) of application

- ☒ Agricultural production system
- ☒ Vegetable production and horticulture
- ☒ Soil management
- ☒ Genetic resources
- ☒ Water management
- ☒ Climate and Climate Change

## Geographical area(s) of application

**PROVINCE(S):**

Barcelona and Lleida

**REGION(S):**

L'Alt Penedès, L'Anoia and El Segrià

## Project website

https://innovi.cat/hidrovinya

## More information on the project

| PROJECT DATES | TOTAL BUDGET |
|---|---|
| Start date: July 2019 | Total budget: €212,000.00 |
| End date: September 2021 | DARP funding: €86,639.98 |
| Current status: executed | EU funding: €65,360.02 |
| | Own funding: €60,000.00 |

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