

OPTIVINYA: Grape harvest ripening and quantity control optimisation

Summary

The aim of the project is to use technology to assess the condition of the crop as a whole, considering the vineyard to be a set of plots. The management and study unit will be the current agricultural plots. This will ensure that the tool to be developed is useful for associations that group large numbers of producers together, such as cooperatives, Plant Defence Groups (ADVs), and Designations of Origin (DOs).

The project will be based on assessing the effectiveness of high-resolution remote sensing by means of satellite image time series and images taken with drone systems to determine the maturation status of the grapes. Accordingly, in addition to capturing data from aerial systems to calculate the vegetation index to establish crop growth parameters, intensive field work will be conducted during the project in order to measure grape yield and quality parameters from the end of the veraison (100%) through to the harvest. The relationship between these parameters will enable the establishment of algorithms that can be used to make advanced predictions about the harvest yield and the optimal harvest date in accordance with the maturation speed of the grapes, assuming that one of the variables that affect ripening is the condition of plant cover (robustness, density, health, etc.). It should also be stated that grapes in the area of El Penedès are cultivated in dry land conditions, which makes the monitoring and forecasting of the grape growth and ripening parameters more complicated.

Objectives

The main objective of the project is to provide the cava sector, and by extension the entire wine industry (especially the dry land wine industry), with tools to monitor the harvest yield and to control the ripening of the various plots and more accurately determine the harvest date based on data from remote sensing systems.

The specific objectives are as follows:

1. Correlate the aerial data and validate them against the field variables for each one of the varieties being studied (Xarel·lo and Macabeu).
2. Prepare growth curves throughout the grape ripening period in order to make harvest predictions.
3. Determine the classification models to predict quality parameters in the various plots being studied.
4. Assess the quality of the wine produced from the harvest of the various groups being studied.
5. Assess the economic viability of the implemented actions.

Description of initiatives outlined in the project

1. Plot selection. The plot data of each winery and the satellite images have been used to verify the information on the area in order to establish the suitability of each plot.
2. Acquisition of multispectral images using drones and satellites. The analysis of the images consists of various subtasks depending on the acquisition source: satellite or drone.

- a. Satellite: each plot is marked out with the polygon that defines it. This enables the calculation of the average value of each one.
- b. Drone: the image is segmented to retain only the pixels that define the plant life. This enables the calculation of the average per plot of each one of the calculated plant life indices.
3. Grape yield and quality measurements.
4. Analysis of the must and microvinifications. The must is analysed upon arrival at the winery. The vinifications are prepared in accordance with a protocol agreed by the wineries' technicians and technicians from the Catalan Institute of Vines and Wines (INCAVI).
5. Analysis of field and laboratory data. These analyses are used to start the generation of relational models between the agronomic parameters and the indices resulting from the image analysis process.
6. Establishment of the predictive models. A data matrix with various quantitative and qualitative variables will be obtained from the analysis of the drone and satellite images and from the quality analyses conducted during the sampling period.
7. Dissemination of the results.

Expected results and practical recommendations

The expected results consist of robust models based on remote sensing data to allow the wineries to determine the ripeness of the various plots in the territory. This is essential to:

1. Define which plots are at optimal ripeness (or rank the plots by ripeness in order to visit them to carry out more exhaustive laboratory analyses).
2. Determine harvesting batches to make the harvest more homogeneous and anticipate the harvesting processes.
3. Prepare vinifications based on specific field information to increase the quality of the end result and strengthen differentiated marketing in the future. The aim is to increase the harvest prediction capacity (to six weeks before the harvest) and reduce plot production forecasts to below 10%. The developed models must enable a 40% reduction in the time spent on field samples or at least enable more directed and effective sampling.
4. INCAVI harvest prediction network. Equip the sector with a predictive tool that complements or improves the ripening and harvest prediction system implemented by the INCAVI in El Penedès in order to assess the production potential of each season and establish strategies to add value to the product in accordance with the final quantity produced.

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Typology of entity:

Subject area(s) of application

Agricultural production system
Farming practice
Landscape/land management
Plant production and horticulture

Geographical area(s) of application

Province(s)

Barcelona

Region(s)

Alt Penedès
Anoia

Dissemination of the project (publications, conferences, multimedia...)

The project was presented at an INNOVI seminar.

Project website

www.innovi.cat/optivinya

More information on the project

Project dates

Starting date (month-year): June 2018

Completion date (month-year):

Current status: *Underway*

Budget approved

Total budget: €211,998.49

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Resolution ARP/1868/2017, of 20 July, calling for applications for grants for the year 2017.

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