A predictive model of spatial soil ECa variability in the vineyard to support the monitoring of plant status

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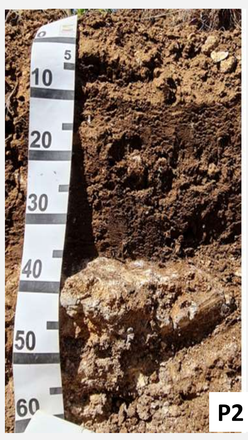
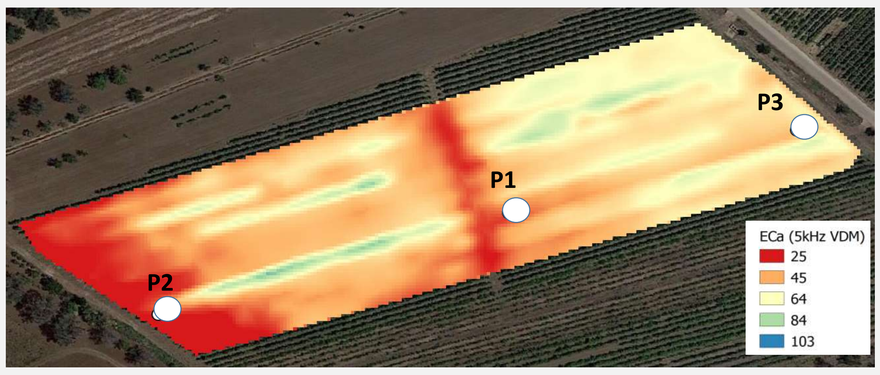
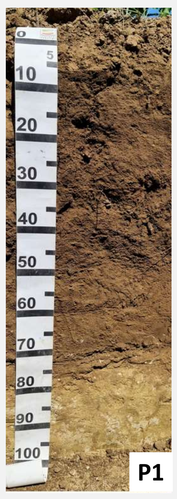
1. INTRODUCTION

In a vineyard, plant water status variability dependent on soil spatial variability.
The more the soil and its characteristics vary in space (horizontally and vertically), the less homogeneous the productive and qualitative response within the vineyard will be.



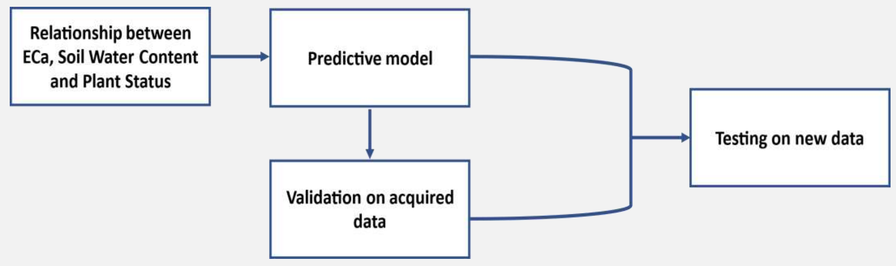




With the geophysics, we can study the soil spatial variability and monitoring the soil water status

2. MATERIALS AND METHODS

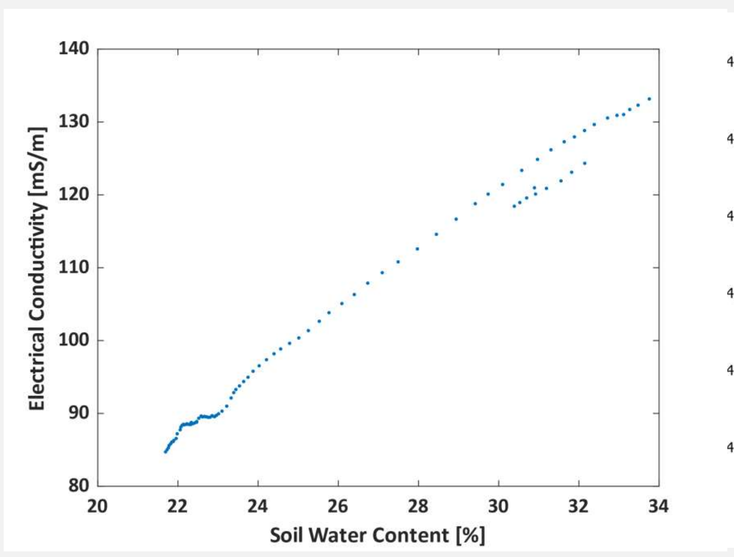
Within the project **"Sustainable models of cultivation of the Greco grapevine: efficiency of use of resources and application of 'Footprint family' indicators"** – GREASE (Greco EfficienzA uSo risorsE) https://www.progettogrease.com/, we propose a new predictive model in order to use the geophysics to monitor the plant status. The full process can ben summerize through the following workflow:



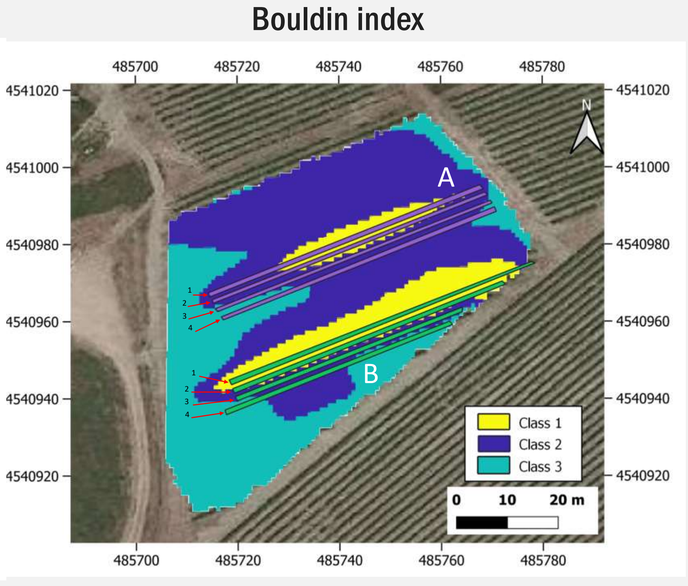
3. RESULTS AND DISCUSSION

1) Relationship between ECa, water content and plant status

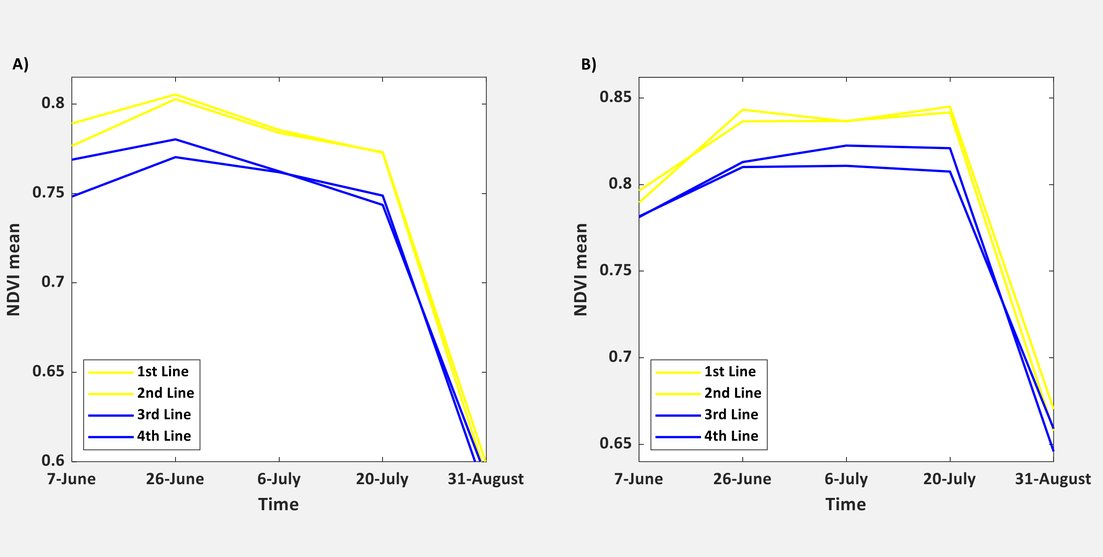
Trend between Electrical Conductivity and Soil Water Content



Clustering model of geophysical measurements using k-means and Davies-Bouldin index

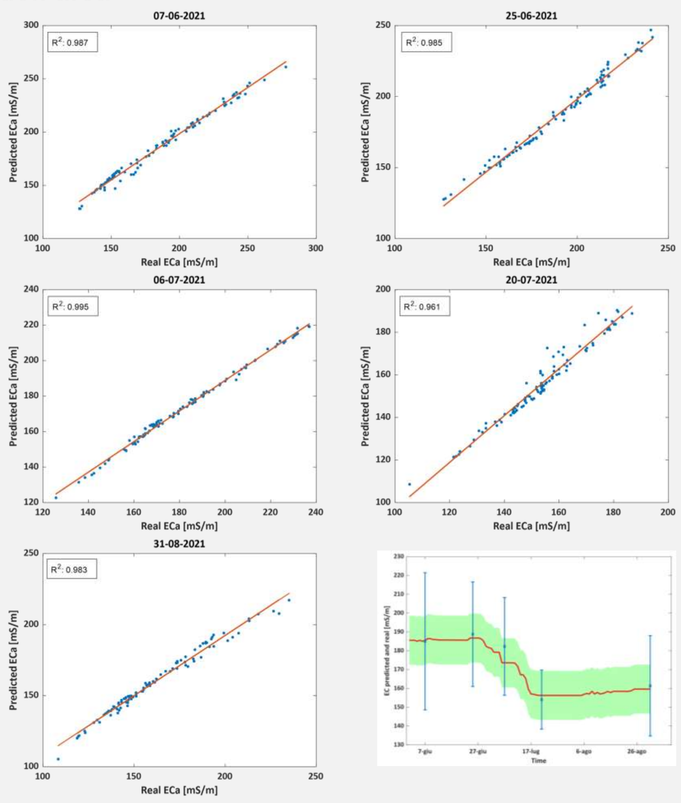


Evaluation of geophysical classes on plant status (using NDVI data). Where the ECa was higher (Class 1, yellow) the plant response during the growing season was better if compared with lower Eca values (Class 2, blue)

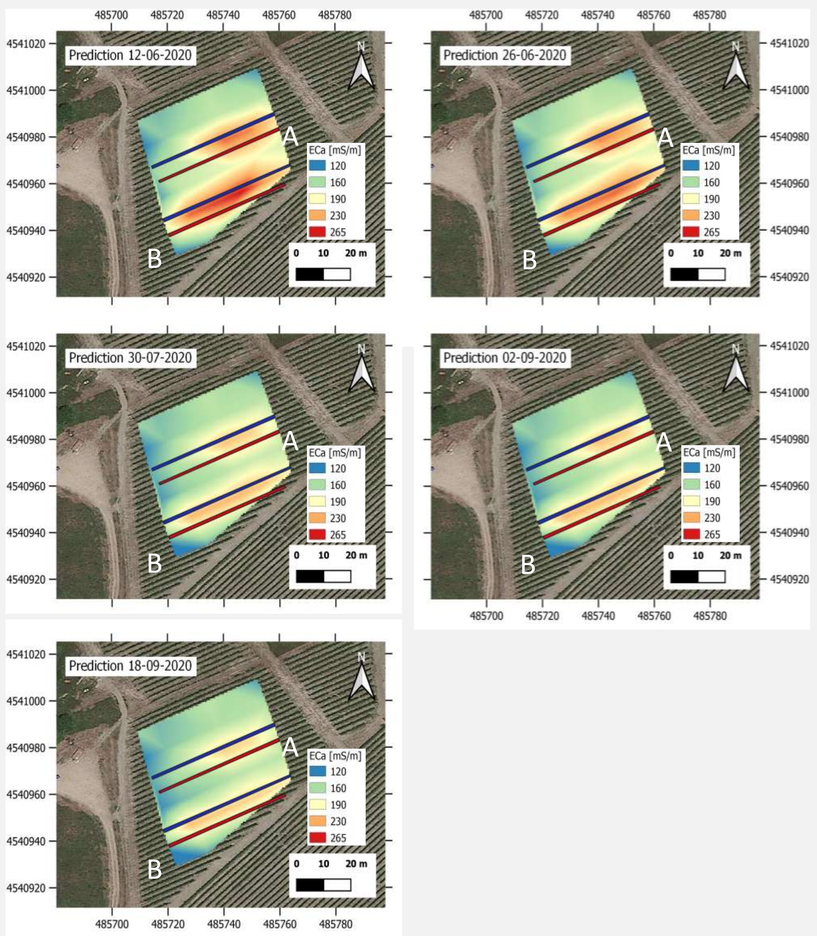


2) Model validation on 2021's data

The predicted values on 2021 shown a good correlation with the measurements data. Due the model generalises the problem it tends to predict average values losing resolution on extreme values. The validation was carried out by considering 100 random points on the prediction area



3) Model prediction and validation on 2020's data



We developed a prediction model using Random Forest algorithm.
We reconstruct five geophysical maps that we have used to study the plant status