Assessment of soil and vegetation index variability in a traditional olive grove: a case study

Perna C.\* 1, Sarri D. 1, Pagliai A. 1, Vieri M. 1

1University of Florence, Department of Agriculture, Food, Environment and Forestry (DAGRI), Piazzale delle Cascine 15, IT50144 Florence, Italy

\*Corresponding author: Carolina Perna, carolina.perna@unifi.it

**Keywords.** Precision Agriculture, data collection, olivegrowing, innovation

**Abstract.** Precision Agriculture (PA) is nowadays one of the most feasible solutions to reduce input and pollution in agriculture (EC, 2019). One of the most important techniques of PA is the identification of in-field spatial variability. Multiple techniques can be used to identify the variability: soil analysis and vegetation index identification are two of the most applied. In this study, the variability of an olive grove was assessed to evaluate the best option for creating variability maps and assessing the relationship between soil and vegetative variability in the case study. The study was carried out in two olive orchards, with a 6x4 m planting layout; the mean plants’ heigh was 3 m. To assess soil variability an EMI analysis was performed. The field was completely mapped at 0-50, 100 cm deep. After the evaluation of the electric resistivity, maps were created. The proximal OptRx Crop Sensor (Ag Leader, Iowa, USA) was used to assess the plant vegetation index. This sensor was mounted on a tractor and positioned at a height of 2 m from the ground to assure the acquisition of the vegetation index for all the assessed plants. NDVI and NDRE index were measured. To georeferenced all the acquisitions, a GNSS system was installed on the tractor ( Ag Leader GPS6500 GNSS receiver, Ag Leader, Iowa, USA). Through this method, site-specific olive canopy NDVI NDRE data gathering was performed. Soil characterization maps revealed significant in-field differences in electric resistivity for all the evaluated deeps, through this analysis a homogeneous resistivity-value map was created. The data points of every soil sampling were interpolated within the whole plots by ordinary kriging through the GIS software QGIS (GNU General Public License). NDVI and NDRE predictive maps were developed using ordinary kriging fitting the best variogram. An exploratory correlation analysis was performed between NDVI, soil proximal sensing (ECa1, ECa2, TC\_gamma), and soil strength, to highlight the statistical relationships between the main parameters used for this study. Collected data were analyzed and interpolated by k-means clustering to make thematic maps. Results showed maximum R-squared correlations of 0.24 (p<0.05) were found between the value of soil variability and proximal vigour measurements.

References:

European Commission. (2019). The post-2020 common agricultural policy: Environmental benefits what the future CAP will bring to the table. Agriculture and Rural Development, 19.