



Precision agriculture suitability to improve the terroir management in vineyard

Jose María Terrón López (1), Jorge Blanco gallego (2), Francisco Jesús Moral García (2), Luis Alberto Mancha Ramírez (1), David Uriarte Hernández (1), and Jose Rafael Marques da Silva (3)

(1) CICYTEX-Centro de Investigación La Orden-Gobierno de Extremadura, Guadajira (Badajoz), Spain (jose.terron@gobex.es), (2) Escuela de Ingenierías Industriales, Universidad de Extremadura, Badajoz, Spain (fjmorales@unex.es), (3) Escola de Ciências e Tecnologia, Instituto de Ciências Agrárias e Ambientais Mediterrânicas (ICAAM), Universidade de Évora, Évora, Portugal (jmsilva@uevora.pt)

Precision agriculture is a useful tool to assess plant growth and development in vineyards. Traditional techniques of crop management may be not enough to keep a certain level of crop yield or quality in grapes. Vegetation indices and soil based measurements, such as apparent electrical conductivity (ECa), can estimate the variability of the terroir within a specific water treatment toward the control of grapevine canopy properties. The current study focused on establishing the variability, spatial and temporal, in the vegetative development of a traditional management vineyard through to techniques related to the precision agriculture. The study was carry out in a vineyard in the southwest of Spain during 2012 and 2013 growing seasons with two irrigations treatments, with four plots of each one, by one hand vines irrigated at 100% of crop evapotranspiration (ETc) and by other hand a dry farmed wines. Variations of soil properties across the assay were measured in each year at flowering stage by means of ECa, up to 80 cm. of soil depth, using mobile electrical contact sensors. Normalized difference vegetation index (NDVI) was determined in a concept of proximal sensing. In fact, the measures were made by multispectral sensors mounted in a terrestrial vehicle, in vertical positioning, at different stages during the ripening in both growing seasons. All measured data were statistically transformed to a behavior modeling pattern using principal component analysis (PCA) and compared by ordinary least square (OLS). NDVI showed a well-established pattern of vegetative development in both growing season for all the treatments at any irrigation treatment, let us appreciate the differences among the vegetative development of each plot within a specific irrigation treatment derived from the high soil variation that the ECa measures reflected. In this way, the local terroir of each plot and irrigation treatment influenced the vegetative growth showing that soil variations had a great importance in the expression of the vineyard vigour. All in all, irrigation and traditional management over the vineyards may be insufficient to control the vegetative development of the vines and yield and quality grapes components. Modelization of NDVI and ECa presented here could be the basis to enhance vineyard management.

Keywords: precision agriculture, vineyard, apparent electrical conductivity, NDVI, irrigation