



Mapping Natural Terroir Units using a multivariate approach and legacy data

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Natural Terroir Unit (NTU) is a volume of earth's biosphere that is characterized by a stable set of variables related to the topography, climate, geology and soil. Methods to study the association soil-climate-vines are numerous, but the main question is always: which variables are actually important for the quality and the typicality of grapevines, and then wine, for a particular scale?

This work aimed to setting up a multivariate methodology to define viticultural terroirs at the province scale (1:125,000), using viticultural and oenological legacy data.

The study area was the Siena province in the Tuscany region (Central Italy). The reference grapevine cultivar was "Sangiovese", which is the most important cultivar of the region.

The methodology was based upon the creation of a GIS storing several viticultural and oenological legacy data of 55 experimental vineyards (vintages between 1989-2009), the long term climate data, the digital elevation model, the soil-landscapes (land systems) and the soil profiles with the soil analysis. The selected viticultural and oenological parameters were: must sugar content, sugar accumulation rate from veraison to harvest, must titratable acidity, grape yield per vine, number of bunches for vine, mean bunch weight, and mean weight of berries. The environmental parameters related to viticulture, selected by an explorative PCA, were: elevation, mean annual temperature, mean soil temperature, annual precipitation, clay, sand and gravel content of soils, soil water availability, redoximorphic features and rooting depth.

The geostatistical models of the variables interpolation were chosen on the best of mean standardize error, obtained by the cross-validation, between "Simple cokriging with varying local mean", "Multicollocated simple cokriging with varying local mean" and "Regression kriging".

These variables were used for a k-means clustering aimed to map the Natural Terroirs Units (NTUs). The viticultural areas of Siena province was then subdivided into 9 NTUs, statistically differentiated for the used variables.

The vineyard areas of Siena province was subdivided into 9 NTU, statistically differentiated for the used variables. The study demonstrated the strength of a multivariate approach for NTU mapping at province scale (1:125,000), using viticultural legacy data. Identification and mapping of terroir diversity within the DOC and DOCG at the province scale suggest the adoption of viticultural subzones. The subzones, based on the NTU, could bring to the fruition of different wine-production systems that enhanced the peculiarities of the terroir.