

Retracing recurring vine mortality patterns over a long duration: case study of a Mediterranean viticultural estate

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This study was aimed at performing both long term historical and spatial tracing, focusing on the vine mortality patterns and their temporal repetition, across a 6 ha-farm, “Domaine des Chauvets”, mainly planted with rainfed black Grenache and Syrah varieties in the Southern Rhone Valley in France. In this estate of long-standing wine-growing history, were mortality patterns randomly distributed or were they related to soil or historical management?

Along with soil parameters, soil surface condition, vine biological parameters including vigour, presence of diseases, stock-unearthing were collected in the field at a total of 112 sampling locations. A total of 25 aerial photographs in digitized format from the French National Institute of Geographic and Forest Information (IGN) were examined over the 1947-2010 period, of which 7 were retained for further rectification and processing. This dataset was used to retrace the landuse and planting history for each plot, and then extract the frequency of missing vines. Within-field terroir units were demarcated using support vector machine classification of a set of present-day very high resolution data, including soil apparent electrical conductivity EM38 maps and very high resolution Pléiades satellite images of May 2014 and July 2015.

Field and recent data revealed important soil erosion rates which are likely to ruin terroir sustainability and pointed out those units for which soil restoration practices are urgently needed, while the temporal dataset exhibited a repeated spatial pattern of missing vines, throughout several plantings, uprootings, and vine replacements. The frequency of missing vines was related to within-field terroir units and also to past landuse, particularly forest or orchard dating back the 1940s, and current soil organic carbon content. This brings renewed questions about the determinism of vine decline, suggesting contribution of soil degradation processes.