



Cyprus
University of
Technology

Faculty of Geotechnical
Sciences and Environmental
Management

Master's Thesis

***Assessment of short-term Post-Wildfire Changes in Soil
Physicochemical Characteristics in Vineyard Soils in Cyprus***

Zacharias Kouis

Limassol, May 2026

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Supervisor

Prof. Menelaos C. Stavrínides

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Approval Form

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The approval of the thesis by the Department of Agricultural Sciences, Biotechnology and Food Science does not necessarily imply the approval by the Department of the writer's views.

I would like to express my sincere gratitude to my supervisor Prof. Menelaos C. Stavrinides, for his valuable guidance and constructive feedback throughout the development of this thesis.

I would also like to thank the faculty and staff of the Department of Agricultural Sciences, Biotechnology and Food Science at the Cyprus University of Technology for providing the academic environment, facilities, and resources necessary for conducting this study.

Special thanks are extended to the ERATOSTHENES Centre of Excellence personnel, Dr. Christiana Papoutsas, Stavroula Dimitriadi, Maria Prodromou and Thrasos Stylianou who assisted with field sampling, satellite images and laboratory analyses during the research process. Their contribution was greatly appreciated.

The present work was carried out in the framework of CARBONICA project that has received funding from the Horizon Europe HORIZON-WIDERA-2022 Research and Innovation Actions, under Grant Agreement No 101087233.

ABSTRACT

Viticulture in Cyprus is firmly combatting new threats posed by climate change resulting in rising temperatures, increased winds and droughts, consequently creating favorable conditions for wildfires. Unfortunately, such an event occurred in Limassol region, Cyprus in July 2025 resulting in 120.7 km² of burned land, including agriculture areas mostly consisting of grapevine cultivations. Wildfire induced changes in soil's physical, chemical, and biological properties due to high temperatures and ash incorporation in the soil matrix making the need for environmental restoration and regeneration essential.

Several impacts such as decreased clay content and weakened soil stability, higher pH, reduced EC, differences in soil respiration, decline of soil microorganisms, and an overall decline in soil structure are provoked in fire-affected sites. The aim of the present study is to provide a preliminary evaluation of these wildfire-induced changes regarding soil physicochemical characteristics by comparing selected burned and unburned soil samples.

Implementing a comparative sampling design, two vineyards within the affected region with burned points and nearby unburned control points representing similar soil and environmental conditions were selected, located in the villages of Agios Ambrosios and Potamiou, cultivating the Lefkada and Xinisteri variety respectively. Samples were collected 50 days post-fire from burned (B1-5) and unburned (U1-5) points from each site. Soil texture was determined by the hydrometer method, while soil pH was determined with a pH meter in a 1:5 sample-to-water suspension. The same suspension was used for soil EC measurements using a benchtop conductivity meter. Field measurements were conducted using the on-field diagnostic CARBONICA Toolbox. On-field measurements including ΔCO_2 estimations were conducted using a chambered CO₂ data logger in 30 minutes intervals; soil temperature and water content were measured with a high accuracy pocket tester. For the infiltrations, two intervals of 500 ml of water each were applied in-situ, using the single-ring infiltration method.

Results indicate notable differences between burned and unburned vineyard soils across several measured parameters. Burned soils exhibited a decrease in the percentage of clay particles in the soil matrix. The presence of ash rich in basifying cations led to a slight increase on burned surfaces' pH and a decline in EC values compared to unburned surfaces. There was a trend of higher ΔCO_2 values in burned than unburned replicates. Soil Temperature increase in burned replicates owed to direct sunlight and elimination of vegetation interception and plant evapotranspiration.

Preliminary insights of the post-fire dynamics underscore the importance of monitoring soil responses following wildfire disturbances, since their acknowledgment is essential for evaluating soil recovery processes and apprising management strategies in fire-prone regions. Future research analyses with expanded sampling will bestow on to a more comprehensive understanding of wildfire impacts on agricultural soils in Cyprus.

Keywords: Post-fire Soil Dynamics; Vineyard Soils; Soil Physicochemical Properties; CARBONICA toolbox