

EGU24-9239, updated on 15 Mar 2025

<https://doi.org/10.5194/egusphere-egu24-9239>

EGU General Assembly 2024

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## **SWAP model potentiality in the viticultural system study and analysis.**

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The SWAP model allows studying the behavior of agricultural systems at different spatial and temporal scales, addressing climate change adaptation and mitigation issues.

In recent years, it has been used in the viticultural sector to study the soil-plant-atmosphere (SPA) relationships in vineyards and to define and support the terroir concept and its resilience under climate change.

This contribution presents the results relating to the ability of the model to (i) shed light on the relationships between water stress and grape quality characteristics and (ii) evaluate the impact of climate change on the responses of the vineyard system of three vine varieties cultivated in southern Italy (Aglianico, Cabernet sauvignon and Greco).

In each case study, the calibrated and validated SWAP model output has been used to explore the relations between the plant water stress realized during the growing season and vine responses (physiological and productive responses). The identified relations were successively applied to evaluate the climate change (CC, RCP 4.5 and 8.5 ) adaptation of each vineyard system studied. Furthermore, in the case of the Aglianico grapevine, the evaluation of adaptation to CC was spatially extended to a region of southern Italy (Valle Telesina, BN; 20.000 ha) devoted to high-quality wine production, and the resilience of the terroir concept evaluated.

Finally, the strengths and limitations of SWAP application in the viticultural context will be discussed.

Keywords: grapevine, SPA system, terroir, climate change, vine water stress, grape quality.