

Transferring scientific knowledge of climate change impact on European viticulture: the Clim4Vitis project

C. Dibari¹, G. Padovan¹, P. Merante¹, L. Leolini¹, J.C.A. Santos², M. Bindi¹, M. Moriondo³

¹Dep. of Agriculture, food, environment, and forestry (DAGRI), University of Florence, 50144 Florence, Italy.

²Centre for the Research and Technology of Agro-Environmental and Biological Sciences, CITAB, Universidade de Trás-os-Montes e Alto Douro, UTAD, 5000-801 Vila Real, Portugal

³IBIMET-CNR, Via G. Caproni 8, 50145 Firenze, Italy

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Presenting author email: camilla.dibari@unifi.it

Abstract

Since decades, climate change is affecting European grapevine cultivations, determining variations in phenology, yield and quality of the most relevant varieties. This, in turn, is impacting the winemaking sector with consequences on the economy of farmers and industries. Therefore, crop simulation models are effective tools to predict present and future performances of grapevines under projected climate change. In this context, the H2020 EU funded project Clim4Vitis focuses on the scientific consolidation of a European Research Institutions with particular emphasis on the climate change domain and its potential impacts on the European viticulture sector. Its rationale rests on two pillars: i) enhancing grapevine modelling performances and ii) assessing climate change impacts on the European viticulture in terms of productivity, quality and pests and diseases risk. Clim4Vitis, based on an integrated and participatory approach, aims to boost knowledge on these issues within the international consortium, but also with relevant stakeholders and decision-makers.

Purpose

Growth and development of grapevine cultivation are affected by climate, soil, topography and management practices, which can be recalled to the French term “*Terroir*” (Van Leeuwen, 2010). Among all these factors, climate has a predominant role for grapevine production, determining the quality and quantity of the wine produced. Indeed, the impact of high temperatures and extreme events (e.g. effect of temperatures > 35-40°C on photosynthesis) coupled with prolonged drought periods may lead to relevant grapevine yield losses (Moriondo et al. 2011; Greer and Weston, 2010; White et al. 2006). Thus, the projected climatic scenarios are expected to negatively affect wine production, especially in the Mediterranean basin, a climate change “hotspot”, where wine production is one of the most important economic activity (Sirnik *et al.*, 2018). Crop simulation models are able to realistically reproduce the interactions of the climate-soil-crop system, thus becoming important decision support tools for monitoring crops and for assessing the impacts of environmental conditions, such as soil, weather, climate and climate change or anthropogenic interferences, like agronomic management. Although several models are currently applied for estimating trends of vine development and growth in Europe (Leolini et al. 2018, Fraga et al. 2016, Moriondo et al. 2013), new studies are needed for investigating the impact of climate change and climate variability on grapevine development. The activities of the EU funded Clim4Vitis project are presented herein.

Methods

The project, started 1st September 2018, is funded under the European Commission action H2020-WIDESPREAD-05-2017-Twinning, and is coordinated by Universidade de Trás-os-Montes e Alto Douro (UTAD), in consortium with the Potsdam Institut für Klimafolgenforschung (PIK); the Università degli studi di Firenze (UNIFI); the Luxembourg Institute of Science and Technology (LIST); and the Sociedade Portuguesa de Inovação (SPI). The project is grounded on two pillars: i) enhancing grapevine modelling performances and ii) assessing climate change impacts on the European viticulture in terms of productivity, quality and pest and disease risk.

Clim4Vitis is leveraged on long-term research collaborations between partners, as well as with other external stakeholders and decision makers, which are engaged and involved throughout the project lifetime and beyond. The project is structured into six work packages (WPs), strongly interlinked. Besides project coordination and management (WP6), one of the core Clim4Vitis activity regards the identification, collection, compilation and synchronization of all the existing and already validated and applied models for the simulation of grapevine growth and development (WP1), aiming to disclose best R&I practices in the sector enabling the consortium more homogeneous with respect to the state-of-the-art. Specific educational, training and mentoring actions to promote technology transfer between partners (with a primary focus on transfer towards UTAD) are also envisaged (WP2) so as to enhance the S&T capacity of the linked institutions and to raise their respective staff research profiles, with a principal focus on the coordinating institution. Concurrently (WP3), a close and systematic monitoring and

evaluation of Clim4Vitis results (also in terms of knowledge transfer and capacity building) will be performed, defining guidelines and tools and evaluating short-term Clim4Vitis impacts.

Long-term sustainability of the Clim4Vitis partnership will be planned and ensured in WP4, identifying ways for future joint collaborations and ways to exploit project outcomes. Such sustainability will guarantee the continued enhancement of UTAD's S&T capacity, as well as its research profile, and thus the long-term impacts of Clim4Vitis. Finally, UTAD's networks will be enlarged in WP5, enhancing its and partners' visibility towards national and international stakeholders, as well as the general audience, so as to boost its international and national reputation and attractiveness, ensuring the project long-term goals and impacts.

Capacity building actions are crucial activities of the project and they imply educational, training and mentoring actions to promote the technology transfer between partners. These activities are deployed through the organization of periodical thematic workshop and seminars, staff exchanges, short courses, webinars and conferences (e.g. the first thematic workshop was already held in Vila Real on February 2019 and further are in planning).

Results

By enhancing the whole partnership visibility and competencies, the expected results of the project can be summarized in the following long-term outcomes: i) assessing climate change impacts on European viticulture through the use/improvement of climate and crop simulation models; ii) strengthened and standardized means and methodologies to predict and effectively analyze the effects of climate change on viticulture; iii) new opportunities for economic growth, and an increased EU competitiveness along the wine value chain; iv) establishment of further working partnerships with academic and business stakeholders; v) creation and exploitation of new synergies and business opportunities; vi) higher security of essential resources supply, by creating the optimal conditions for vineyard preservation in time; vii) a consolidated transnational network (ranging from stakeholders to academic/scientific and industrial means) for the promotion and adoption of a homogeneous and top-quality approach/methodology to prevent and rapidly respond to climate change impacts on European viticulture; viii) the development of a White Paper on Climate Change impacts on Viticulture, providing guidance on further integrating adaptation under the Common Agricultural Policy and Cohesion Policy; ix) better informed decision-making by filling still remaining gaps in the knowledge on adaptation.

Conclusions

Clim4Vitis mission is to contribute to the general reinforcement of European capacities to reduce the detrimental impacts of climate change on viticulture, suggesting appropriate actions to prevent or minimise the negative impacts on this sector. Thus, Clim4Vitis is expected to contribute to the sustainability of European viticulture under the projected climatic changes, thus ensuring, or even enhancing, the European Wine sector competitiveness worldwide.

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