



ClimWine2016: A scientific update on the challenges of climate change for the vine and wine sector

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Great success for Climwine2016 Symposium held in Bordeaux from the 10th to 13rd April 2016. 180 participants from twenty countries to exchange about the effects of climate change on the vine and wine industry and analyze the possible adaptations. This symposium was organized¹ by INRA in collaboration with the Institute of Sciences of the Vine and Wine-University of Bordeaux and Bordeaux Agro Sciences which hosted the event, under the patronage of the OIV and the Association European Society of Wine Economists. Many institutional partners, including the Aquitaine-Limousin Poitou-Charentes Region and the Interprofessional Council of Bordeaux wines, contributed to the implementation of this meeting. Finally Bordeaux wine estates, but also of trade unions and representative bodies of other wine regions, offered the best of their production to delegates.

During the symposium, 46 oral presentations and 60 as posters presented an overview of all climate change issues that viticulture and wine production in the world will faced at the mid and end of the XXI century. The expected climate change and associated impacts are not too alarming by 2050, but may be extremely serious by the end of the century if nothing is done, given the quantities of greenhouse gas (CO₂ in particular) already released into the atmosphere. Elevated air temperatures and changes in rainfall patterns have of course been widely addressed, but the attention of the audience was also drawn to the question of soil temperature and wind that can have major consequences (mineralization and evaporation of water and others). Climate simulations were presented for different regions. Several speakers emphasized the importance of the knowledge of local-scale climate to meet the challenges of adaptation. The field visit to St Emilion, related to the European project Life-ADVICLIM and the network of temperature sensors was a good illustration of the local variability of situations.

The responses of the vine to the increase of temperature, CO₂ and changes in water regime and their consequences on the stages of development, growth, water use and the composition of the grapes have been addressed by many communications. Several works underlined that the interactions between several climate factors can completely modify the effects of a single parameter. The multiannual effects must also be addressed. It appears that if water is not limiting, an additional two degrees could be quite harmless on the ability to grow grapes. The consequences in terms of composition of the grapes may be more pronounced. The development of plant and crop models, and a better understanding of the genetic determinants of the responses to environmental factors,

¹ The laboratory in charge of organizing the symposium was UMR « Ecophysiology and Functional Genomics of grapevine » led by Pr Serge Delrot. Members of this laboratory and of the organization committee belong to INRA, Bordeaux Sciences Agro and Bordeaux Sciences Agro.

are crucial to simulate the performances of the grapevines and to consider adaptation measures. French teams are leaders on the genetic aspects, in particular regarding the adaptation to drought and the responses to temperature in terms of stages of development and composition of grapes. The thorny problem of disease has not been forgotten and many approaches (surveys, modeling, experiments) were presented to better analyze these issues in the context of climate change.

The adaptation issues were also presented, covering a wide range of techniques that can be mobilized to the field and in the cellar. Traditional techniques may be considered in dry vineyards playing on planting density or training system, playing on the leaves / fruits ratio, the date of pruning ... Modern oenological techniques can be also implemented in the winery, as well as precision irrigation, or taking advantage of the existing genetic diversity to change grape varieties by introducing exogenous varieties or creating new ones through research to combine disease resistance fungal and good adaptation to climate change. But no single technique can provide the solution. Their combinations have to be managed at the local or regional level, and that matter will be further studied by scientists in partnership with winegrowers.

But adaptation is not a technical issue, only. The studies of perception and adaptability of different players presented during the symposium pointed out that climate change is not necessarily considered as an immediate threat by winemakers. They mainly consider adaptation in the long term through the framework of practices and investments they already implement to face the inter-annual climate variability. Of course this situation may vary from one region to another. This vision of adaptation will not be enough if the changes of the climate beyond 2050 are as simulated by the climatologists. Especially since experimental economics studies at the consumer level have shown that if wines, illustrating the impacts of climate change (from very ripe grapes), are appreciated when first tasted, they are no longer preferred after a repeated consumption. Other studies with consumers show that the acceptance of innovations for adapting to climate change is good, but varies with the links that the consumer has built with the wine and the environment.

The major conclusion of this symposium could be that it is crucial to better take into account the perception of climate change by all stakeholders in the sector to adapt to future challenges. Thus, the networks that link professionals, education, extension services and research are a major component of the vineyards adaptability. A foresight study led by scientists of the Laccave project (INRA), France AgriMer, the INAO and Montpellier SupAgro, resulted in the definition of four adaptation paths: conservative, innovative, nomadic and liberal. These paths lead to 4 potential "futures" for the industry. The outputs of this work will now be a major tool to elaborate real adaptation strategies with professionals in each wine region. These collective strategies will be suited to their local conditions.

In addition to the working sessions, the participants were able to exchange, a glass in the hand, with colleagues of the wine sector and some politicians: during the opening cocktail held in CAP Sciences in collaboration with the Interprofessional Council of Bordeaux wines, during a reception at the Hotel de Region organised by the Regional Council in the presence of its president Alain Rousset, or at the Gala dinner in Saint Emilion in the magnificent hall of Dominicans in partnership with the Wine Council of Saint Emilion. These social events illustrate perfectly the challenge of adapting to climate change: working internationally and locally with all stakeholders (business actors, public authorities, training, research) and in a multidisciplinary way.

Feedbacks are unanimously positive about the value of such international meeting to move forward together on the subject. A second edition has been considered. Two young researchers, Etienne Neethling and Lucile Allamy were rewarded for their communications. The organizers thank warmly all the funders and partners whose list can be found on the symposium website (<https://colloque.inra.fr/climwine2016>).

Bordeaux, on the 27th of April, 2016

NB:

This symposium was organized as the concluding event of four years of research on the topic, structured nationally by LACCAVE and PERPHECLIM projects. These multidisciplinary projects aimed at studying the impacts and adaptations of Vine and French wine industry to climate change, and at elaborating tools and methods to study the phenology of perennial species respectively. They have been implemented as part of INRA Metaprogram on Climate Change Adaptation of Agriculture and Forestry (MP ACCAF). They federated respectively 23 and 28 research teams on the subject.