

Change – The transformative power of citizen science

VifAdept project: participatory research on grapevines to adapt wine production to climate change

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Abstract

Vifadept is an on-farm data collection project. It has its origins in the VitAdapt (for Vitis Adaptation) research project (Destrac-Irvine and van Leeuwen 2016), which provided the basis for creating a network of plots on which winegrowers participate in climate change adaptation by experimenting with new varieties in cooperation with researchers and the wine industry.

Keywords: grapevine, climate change, adaptation, new varieties.

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A climate change context

Everything started after the 2003 heatwave, when winegrowers raised their concerns about climate change with the interprofessional council of Bordeaux wines (CIVB). After discussions to develop adaptation strategies, the VitAdapt research project was launched in 2007 to study the response of a wide range of grape varieties to climate change in Bordeaux, France.

Among various adaptation levers to climate change, varietal diversity is an available and suitable tool to adapt vineyards. Effectively, more than 6,000 grape varieties are listed worldwide, but only 33 account for half of the world's vineyards. In France, 10 varieties account for 70% of the surface area and only three varieties (Merlot, Grenache, Ugni blanc) account for 30% (OIV 2017). This situation is linked to the history

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of the grape growing areas and the production under Appellations with their specific authorized grape varieties. Another reason is the ever-growing share of varietal wines in the market. For varietal wines, the name of the variety acts like a brand. Because consumers only know the names of a limited number of varieties, growers tend to plant only well-known varieties like Chardonnay and Cabernet-Sauvignon.

Faced with this loss of use of natural diversity, the researchers wanted to assess the potential of grape varieties to respond to climate change, in particular by experimenting with varieties coming from hot and dry regions.

The VitAdapt research project, advantages and limitations

The VitAdapt project, implemented by Bordeaux researchers, represents an extensive phenotyping study of 52 different grape varieties over a long period of time. The project is based on an experimental setup with vines planted in 2009 on the same rootstock, with five repetitions to neutralize the effect of possible soil variability. The objective is to study the response of reference varieties from Bordeaux and varieties from different origins: France, Spain, Italy, Greece, Portugal, Bulgaria and Georgia. After more than 10 years of study, a database was established with a wealth of information concerning the adaptation and the behavior of this large range of varieties. The VitAdapt project showed a wide diversity of responses between the 52 varieties and the necessity of multi-year monitoring to characterize the varieties.

However, this research project was carried out on a single site with a single type of soil and cultural practices. The second step was therefore to develop on-farm research to test grapevine varieties on farmers' fields under variable environments and management conditions compared with those of a research plot. Moreover, considering the farmer and his local conditions means appreciating the perception and knowledge that farmers have of their own farm (Stroud 1993).

Ways of involving the farmer in the research process

To support research into the contribution of plant material to adaptation to climate change, a national directive was published (Directive INAO–DIR–CNAOV–2023- 01). Since 2018, the law authorizes winegrowers in the Appellations to experiment with new Varieties of Interest For Adaptation purpose (VIFA) under some conditions: maximum 5% of the surface area, 10% of the blend, 20 varieties (10 red, 10 white) and a 10-year evaluation period with a possible 10-year extension. Each Appellation should define a list of varieties to test.

The “Bordeaux” and “Bordeaux-Supérieur” Appellation (50% of Bordeaux vineyard with more than 53000 ha) used the results of the VitAdapt project to select six new varieties to be introduced into its specifications in 2019. For each Appellation, the results produced by the project were a valuable resource for making an informed choice.

The authorization to cultivate these six new varieties on Bordeaux AOC vineyards offers the opportunity to co-construct knowledge with winegrowers by monitoring the behavior of new varieties in a network

of on-farm trials and characterizing their potential in response to the expectations of the INAO (National Institute of origin and quality) and the various actors in the appellations.

Experimental conditions and the VifAdept project's contribution to on-farm trial management

For the duration of the experiment (10 years renewable), these plots have to be monitored using standardized protocols and centralized management of the data produced. This monitoring, which winegrowers may find fastidious, could limit the involvement of professionals in these initiatives. This is why we proposed the VifAdept initiative (for VIFA deployment) to support winegrowers in this experiment and encourage them to take an active part in adapting their vineyards to climate change.

This project, which associates scientists, winegrowers, professionals and wine growers' associations, has allowed us to create a network of production plots in different pedoclimatic contexts (with different rootstocks and on different soil types). To enable the monitoring and production of reliable data on this network, research protocols have been adapted, leading to the development of new data acquisition tools.

One of the most important parameters studied on the farms is phenology, a highly effective marker for establishing and validating climate models. Under the influence of climate change, the three main phenological stages of the vine (budburst, flowering and veraison, i.e. the onset of ripening) occur significantly earlier. This has a major impact on vine-growing conditions, leading us to reconsider the way the vineyards are managed. Knowledge of the phenology of vineyard plots enables winegrowers to adapt their vineyards and their practices to changing climatic conditions.

To support the requirements of the VIFA experiment, improve and facilitate the acquisition and supply of phenology data, and then encourage and facilitate phenology notations by winegrowers involved in the newly created plot network - and beyond - we are currently developing a very easy-to-use and fully accessible tool. This work complements a published methodology for phenology monitoring (Destrac et al. 2019) and consists of PhenoVit, a free smartphone application and its associated website. Smartphone technologies offer great potential for participatory agricultural research and large-scale data collection. Dehnen-Schmutz et al. (2016) quantified and explored farmers' use of smartphones in Europe and assessed the potential of smartphones for farm-based participatory research. They showed that farmers have sufficient access and knowledge of the technology, as well as enthusiasm for participation in citizen science, which formed the basis for developing our application. This enthusiasm was also justified since involved winegrowers also volunteered to participate in the development of the specifications for this application on phenology. Based on the concept of ApeX-Vigne (Pichon et al. 2021), this tool uses an image recognition system. The aim of the application is to provide a simple tool for winegrowers and technical managers to facilitate the collection of phenological observations. It will automatically calculate the dates of phenological stages, georeference phenological observations and automatically transfer phenological data to a database on a server to facilitate future analysis and sharing of this data. This database is essential for modelling the behaviour of new varieties and simulating their development in different terroir and climate scenarios.

This innovation, intended for a large community of end-users, will help to further investigate climate-vine interactions. It also informs professionals about the importance of assessing phenology and teach them how to implement notations, for optimizing risk management in the vineyard and adapt grape varieties and practices to changing climatic conditions.

In conclusion, the VifAdept project encourages and supports winegrowers in their active participation to adapt their vineyards to climate change, by advancing our knowledge of new varieties and support the industry as it considers the grape varieties of the future.

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