The grape harvest software

A smart app to control the effects of climate change on vineyards.

by **Amanda Saint** 03 AUGUST 2020

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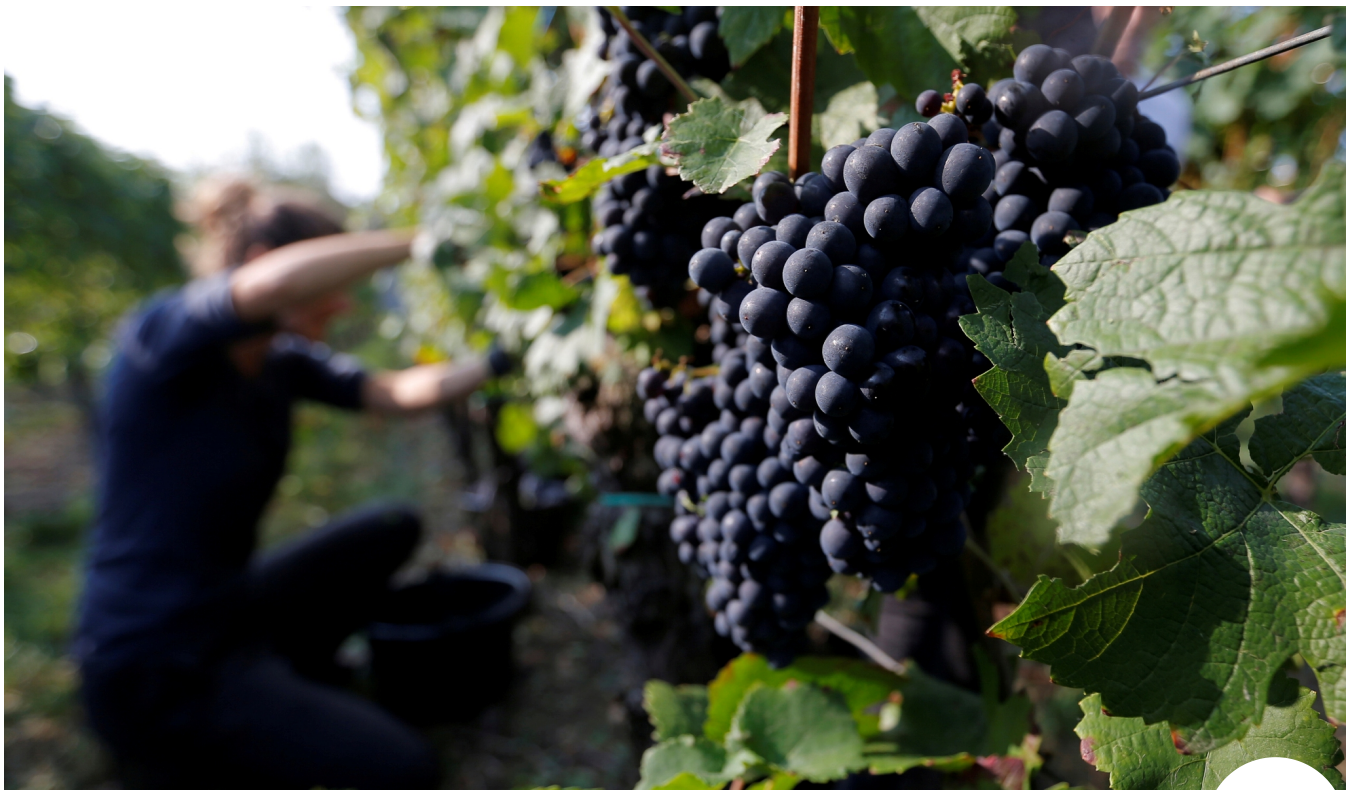
climate change on their grapes. Funded by the European Union's **Horizons 2020** research and innovation programme, the app aims to help vineyards become more resilient to the impact of changing weather patterns.
The global **wine** market has been growing steadily and in 2018 was valued at USD $354.7 billion. It is projected to grow another 21% by 2023 to a value of more than USD $429 billion, so managing the effects of climate change on this significant commodity is vital.

Viticulture finds new environments

Wine grapes thrive in places where the summers are long, warm and mainly dry, and the winters are pretty cold and rainy. While traditionally regions in France, Spain, Italy, Portugal, California, Chile, Australia and New Zealand have been top spots for premium grape-growing, **global warming** means countries that were previously inhospitable for grapes, such as England, Belgium and Canada, are now seeing new vineyards thriving in their changed climate.
At the same time, world-famous wine regions are having to look at the possibility of changing the grape varieties they grow to adapt to the shift in weather patterns. Wineries in Bordeaux, France and the Napa Valley, USA, known for producing the finest cabernet sauvignons, have been trialling several new grapes to see which may be more suitable for their new climate.
According to **eVineyard**, in order to ripen properly, wine grapes need >1390 to <2220 growing degree days (GDD) of temperatures above 10 °C.
Calculating the number of GDD, as well as when they will happen and the kind of temperatures and weather they are likely to deliver, is a crucial element of grape farming. Wine grapes are very sensitive to changes in climate plus the farmers have traditionally used weather indicators to know when pests are most likely to cause a problem, as they too thrive in certain climatic conditions.
According to **climate projections** for the regions in southern Europe where the vineyards involved in the trial of the new app are based, they can expect to see more intense heatwaves, droughts and wildfires. Plus winters will likely be warmer meaning the cold spells grapes need during their dormant phase, in order to see healthy growth during the spring and summer months, will become less frequent.
VISCA, which stands for Vineyards Integrated Climate Change App, is focused on helping grape farmers understand and adapt to these factors, and more, in a changing world.



Developing climate change resilience

Since late 2017, the development team has been working with grape farmers in Spain, Italy and Portugal to understand what they need from the app to become more resilient to climate variability and climate change. Each region is focused on different grape varieties and different climate features. The Spain trial is looking at Chardonnay and Tempranillo; Italy is focused on Aglianico grapes; and Portugal has its sights set on Touriga Nacional.
The VISCA application has been implemented as a **Decision Support System** (DSS), which integrates climate and agricultural models with the grape farmers' management specifications to help them design short, medium- and long-term adaptation strategies and practices that will improve the vineyard's resilience to climate change.
The VISCA DSS is organized as a dashboard, combining different information widgets in a single view and a map viewer, to provide three key forecasts.

Phenology forecasts: phenology is the study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life. The DSS forecasts are based on phenological phases for seasonal forecasts combined with actual phases that have been observed by the farmer. They also include a quality forecast based on sugar accumulation and expected alcoholic level. The information in these forecasts can help grape farmers with specific aspects of crop planning, such as harvesting, defoliation and pruning.
Irrigation forecasts: the amount of water grape plants receive—and when—is a vital element of healthy crops. This forecast enables farmers to plan better, especially in the face of unpredictable seasonal rain patterns. The DSS estimates the amount of water grape plants should receive one week in advance based on past weather observations, weather forecasts, a water stress strategy and the irrigation already applied. This information is a vital element of healthy crops enabling farmers to react to a forecasted deficit of rain.
Weather forecasts: the farmers can access short-, medium- and seasonal predictions based on weather- and climate-modelling tools that use weather observations from different sources such as land-based stations and Earth Observations (EO). The weather forecasts are integrated into the phenology and irrigation forecasts that enable grape farmers to anticipate the effects of coming weather on the vineyard and properly plan weather-sensitive activities.

New techniques

Besides developing a DSS, VISCA is also testing two innovative management techniques: the first one is **crop forcing**, which is based on moving the grape-ripening period from the hot summer months to a cooler month later in the growing season. This is achieved by making an additional pruning, which stops the natural cycle of the plant thereby “forcing" it to restart its cycle later.

The second one is **shoot trimming**, a post-veraison summer pruning technique (veraison is the onset of ripening) that vineyards use to decrease leaf-to-fruit yield ratio and slow down carbon partitioning to berries. In doing so, it also minimizes sugar accumulation, which is responsible for the increase in alcohol concentration in the wine.
To date, the effects of crop forcing and shoot trimming have been tested in the field during three growing seasons, from which very promising results are expected. In the VISCA DSS the end users are able to introduce these management techniques so that the phenological model consider their effects.
According to the latest progress report published on the VISCA site, VISCA end users have recognised clear added value from the app, although they currently find the inputting, accessing and analysing of data too complex.
So far, validation feedback has been collected during two growing seasons and will be collected in one more so that the VISCA team can fine-tune the DSS. Once the app has been fully validated, it is expected that the VISCA DSS can be replicated to other grape varieties and even to other kind of crops, extending the benefits of VISCA within the agriculture sector. The ultimate goal: To help farmers of all crops find ways to increase their resilience to climate change.

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