

Climate Detectives – Final Report

Project title:

“OS BASTIDORES DO VINHO” (*Behind the scenes of wine*)

What is your research question?

What is the influence of Climate Change on the grapevines’ vegetative cycle and productivity?

Summary of the project:

The Alto Alentejo region is an administrative division in Portugal where viniculture and, consequentially, viticulture are widely practiced. This region is characterized by its hot and dry Mediterranean climate and low yearly precipitation (between 500-560 mm), which during the summer represents a problem. In general, hot and exuberant wines are produced in Alentejo, being the Portuguese region where the most modern, concentrated and fruity wines are made. However, climate changes have been taking a toll on the productivity of grapevines, creating adverse conditions for good grape production, such as droughts and unpredictable weather, and studies show that these conditions will only happen more and more regularly in the future. In order to investigate how the productivity of grapevines has concretely been affected by the climate changes, we decided to study the vineyard Boavista located on “Monte da Boavista”.

We started by using satellite images of this vineyard taken from Sentinel-2. We compared these pictures with the average of maximum and minimum normalized difference vegetation index (NDVI) of the month of July, the evolution of the NDVI from march to august (which are typically the months when the vegetative cycle occurs), the average precipitation and the average temperature in the years investigated (2018-2023).

With this project, we hope to contribute to UNESCO’s 13th (Climate Action) and 15th (Life on Land) Sustainable Development Goals, raising awareness to this problem that concerns us greatly and making an active impact in our society.

Main results and conclusions:

By extracting the values of the NDVI from march to august of each year and calculating the equation that better adapted to them, we observed that the bigger the module of the slope, the worse had been the harvest of said year, which means the bigger the variation in the NDVI (which is usually related to the health of the vegetation and consequentially to the climate surrounding it), the highest the chance of a lower production of grapes (Figure 1).

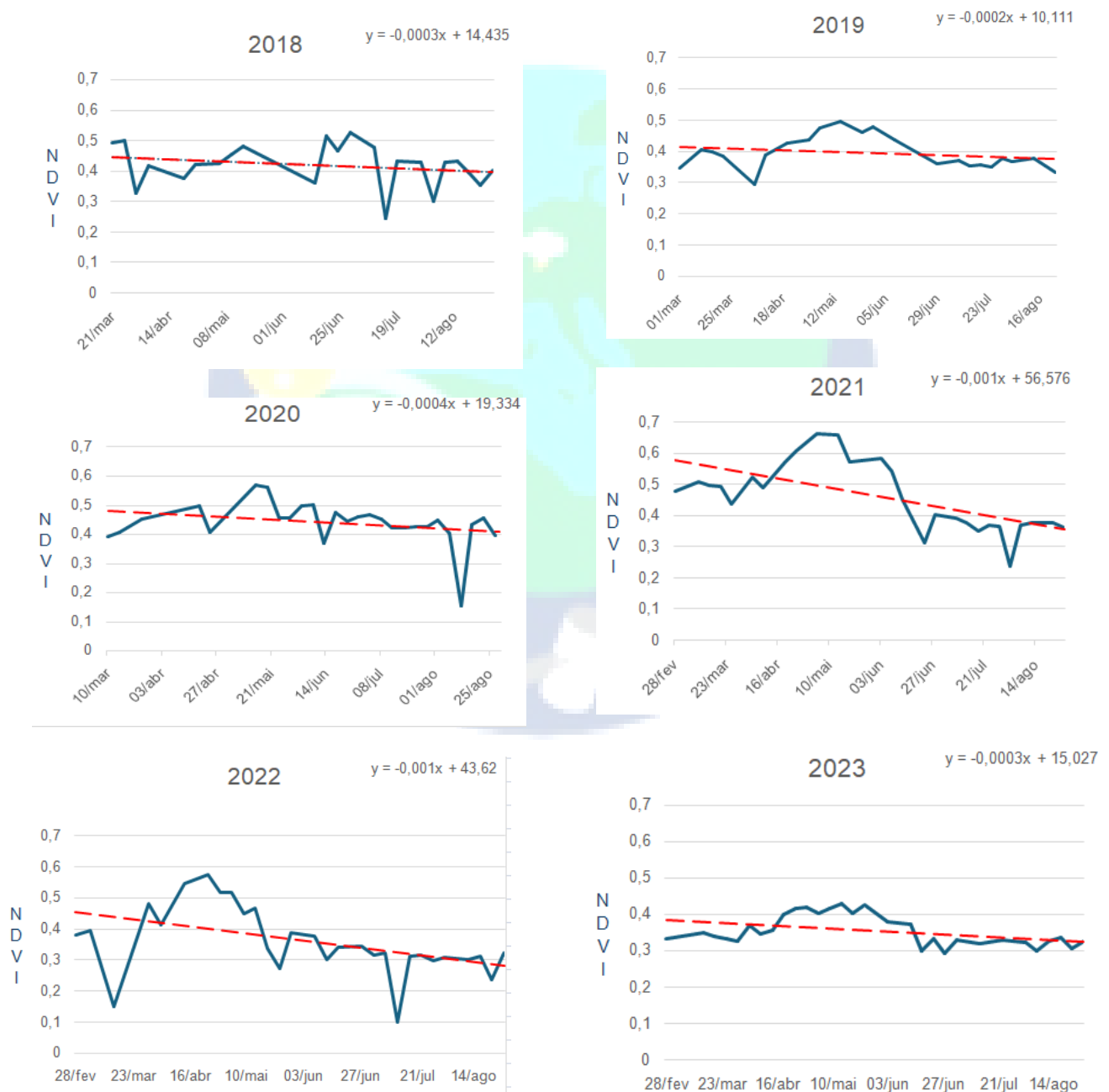
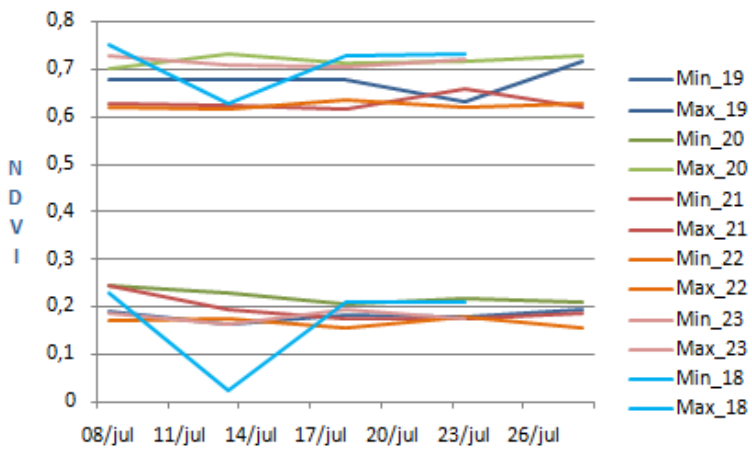


Figure 1- Graphics of the values of the NDVI from march to august of the years studied (2018-2023)



By investigating the maximum and minimum NDVIs throughout the month of July of each year, we also found a strong correlation between the values of the maximum NDVIs and the best production years, Figure 2.

Figure 2- Maximum and minimum values for the NDVI throughout the month of July on the years 2018-2023

We also verified that in the two best years, 2018 and 2023, the average precipitation during Summer was the highest and the temperatures were milder. On the contrary, in the year when the temperature was the highest 2022, the grape production was the worst, followed by the years when the temperature was the lowest. With this we can correlate that milder temperatures and higher precipitations were the most favorable to the production of those types of grapes on that set area (Figure 3 and Figure 4).

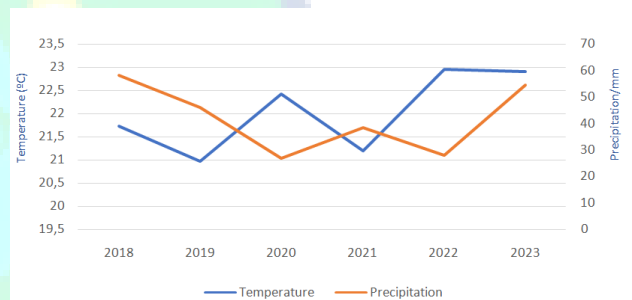


Figure 3- Average temperature and precipitation during Summer

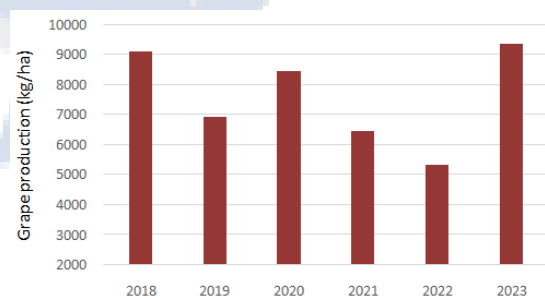


Figure 4- Grape production on each of the studied years (2018-2023)

Actions to make a difference and help lessen the problem:

Our team (Etxis) has been actively publicizing our project and some tips to help our planet, both on our Instagram class account (@chemistry_seniors) and a tour school through presenting this project to our classmates and school board. We also organized a school trip. The field trip to the Terras d'Alter winery happened on

January 9th with the main objective of showing to the 12^ºA class of Ponte de Sor Secondary School (ESPS) how the wine making process happens. At the visit, the students were able to observe the laboratory, where wine quality control is carried out, including the tasting and the evaluation of the multiple parameters that characterize it (such as the alcohol level). They also visited other places where the winemaking phases occur and where the wine is aged and stored.

During our research, we discovered some practices that can help to revert the effect of climate changes on the quality of the wine such as:

- Early pruning, which delays the vegetative cycle of the grapevine up to 2 months;
- Investing in late-maturing grapevine varieties since those are better adapted to warm temperatures. This would postpone the maturation and harvest phases to October and November which, climatically, are equivalent to the August and September of the 80s (and which are the months when these phases usually occur);
- Investigating the control of daytime temperatures and insolation through computer-controlled shading panels adjusted to the times of light and heat in the vineyards also prospect for the future.

All these practices work towards mitigating the effects of climate changes on grape production. But help to minimize the progression of climate changes and global warming so that these solutions don't even have to be administrated to help we promote small acts such as buying second-hand clothes; consuming locally produced products; opting for walking or public transportation instead of moving by car and recycling our trash.

Link to project website

[Home | Etxidetetivesclima \(brandruralis.wixsite.com\)](https://www.brandruralis.com)

Webgraphy:

<https://www.ciencia-e-vinho.com/2020/12/27/different-strategies-in-the-vineyard-planting-to-face-global-warming-in-viticulture/>

<https://www.internationalwinechallenge.com/Canopy-Articles/3-simple-strategies-for-dealing-with-climate-change.html>

<https://g1.globo.com/pr/parana/especial-publicitario/porto-a-porto/noticia/2022/10/28/as-5-principais-regioes-vincolas-de-portugal-e-suas-uvas-icnicas.ghtml>

<https://cfs.climate.esa.int/index.html#/?globe=S10.00I25.00I23840000I0.00I171294917744911I>

<https://apps.sentinel-hub.com/eo-browser/?zoom=10&lat=41.9&lng=12.5&themeld=DEFAULT-THEME&toTime=2024-04-12T19%3A14%3A39.596Z>

<https://www.ipma.pt/pt/index.html>