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Turning climate-related information into added value for traditional **MED**iterranean **Grape**, **OL**ive and **Durum** wheat food systems

Deliverable 3.7

Second Feedback report from users on wine pilot service development



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DOCUMENT STATUS SHEET

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Brief Description	This document reports the new end-user feedback collected since the first participatory workshop ([RD.1]). It contains a summary of the actions carried out during this period derived from the first round of feedback. The new feedback on the dashboard has been obtained along three different interactions: the discussion of the functional characteristics of the dashboard tool; the dashboard sprints; and Sogrape's internal meetings with decision-makers. It also includes a methodology to help the user identify the economic impact of using seasonal forecasts in their decision making.	
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All partners involved in the production/implementation of the deliverable should comment and report (if needed) in the above table. The above table should support the decisions made for the specific deliverable in order to include the agreement of all involved parties for the final version of the document.

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EXECUTIVE SUMMARY

This report accounts for deliverable 3.7, “Second feedback report from users on wine pilot service development”. It contains the work performed in this regard during the period comprising [RD.1] submission and M30. It is structured as follows. In the first part, the feedback gathered in the first participatory workshop is reviewed. This workshop involved 12 decision-makers from SOGRAPE and their feedback on the beta version of the tool (e.g. the change of color palettes in the maps, among others) was collected. This participatory workshop confirmed an integrated visualization display (hereafter Dashboard) as the best option to embrace the multiple types of information to be included in the pilot service tool for the wine sector. The second part follows the co-production development of the tool considering the feedback gathered for its composing elements. It encompasses the ongoing feedback strategy established to facilitate the co-development with SOGRAPE in order to maximise its usefulness from an end-user perspective. The collection of this feedback is divided in three different stages detailed below.

The first stage consisted of drafting a master document with the description of the functional specifications of the Dashboard based on the work presented by scientific partners (BSC, ENEA and NOA) in the first participatory workshop. This master document was created by Beetobit and ENEA and shared with SOGRAPE and the rest of WP3 partners for the co-production planning of the fundamental aspects of the Dashboard. This shared document enabled a fruitful exchange of ideas, doubts and expectations among scientific partners and SOGRAPE that led to consolidation of the features of the wine pilot service. The second stage consisted of the implementation of the Dashboard, taking into account the discussion achieved through the master document. After the creation of this version of the Dashboard, so-called ‘Dashboard Sprints’ were introduced as a way to bring together in periodic on-line meetings scientific partners and developers (Beetobit, ENEA, BSC, UTH, NOA and MetOffice) with end-users (SOGRAPE) in the MED-GOLD team (R&D). In these meetings Beetobit presented the different elements of the Dashboard and received feedback from end-users mainly, but also from the rest of the partners. At the same time, scientific partners were able to solve any doubts users had regarding the climatic information provided in the dashboard (i.e. predictions of essential climate variables, bioclimatic indicators and risk indices). After each “Dashboard Sprint” meeting, the feedback received was ingested by Beetobit, UTH and ENEA, who implemented the agreed suggestions in the Dashboard, presenting the new features and changes to end-users in the following “Dashboard Sprint” meeting. In the final stage, and due to the COVID-19 situation, a series of virtual meetings were held by SOGRAPE for introducing the Dashboard to end-users of different operational departments (viticulture, enology, ICT) not directly involved in the development of the wine pilot service. The main aim of those virtual meetings was the collection of independent feedback from real-world decision-makers on the Dashboard for further testing and improvement.

In parallel SOGRAPE and BSC have worked on the co-development of a methodology to help decision-makers retrospectively assess the economic impact of the use of seasonal forecasts compared with their reference methods. In conclusion, the recurrent collection and implementation of the feedback provided by end-users (SOGRAPE in this case), allowed for optimisation and strengthening of the usability of the tool by considering the views of experienced SOGRAPE decision-makers in all the stages of its development.





With this deliverable, the project has contributed to the achievement of the following objectives (DOA, PartB Table1.1):

No.	Objective	Yes
1	To co-design, co-develop, test, and assess the added value of proof-of-concept climate services for olive, grape, and durum wheat	X
2	To refine, validate, and upscale the three pilot services with the wider European and global user communities for olive, grape, and durum wheat	
3	To ensure replicability of MED-GOLD climate services in other crops/climates (e.g., coffee) and to establish links to policy making globally	
4	To implement a comprehensive communication and commercialization plan for MED-GOLD climate services to enhance market uptake	X
5	To build better informed and connected end-user communities for the global olive oil, wine, and pasta food systems and related policy making	X



1. INTRODUCTION

Seasonal predictions and long-term climate information are critical for several aspects of decision-making in the wine sector, such as pest management and vineyard plantation planning, among others. MED-GOLD seeks to create innovative climate services to assist the adaptation of agricultural management to supporting information provided on these time scales. The service proposed for the wine sector comes in the form of an online integrated visualization display (hereafter Dashboard) that centralizes and supplies the information accessible to end-users. In this framework, the Champion Sogrape Vinhos SA (SOGRAPE) provides guidance on the usability of the Dashboard to the scientific and technological partners (Beetobit, BSC, ENEA, NOA, Met Office and UTH), together with feedback on the visualization of seasonal- and long-term essential climate variables (ECVs), bioclimatic indicators and risk indices, all of which are displayed via the Dashboard.

1.1 PURPOSE

The objective of this deliverable is twofold. On the one hand, it aims to detail the actions taken for the co-design and co-development of the Dashboard derived from results obtained in the first participatory workshop ([RD.1]). On the other hand, it aims to summarise the feedback exchange carried out during the current development period. This information has been critical for the construction of a robust and usable tool that meets end-user needs and expectations. The collection of this feedback came through three different stages: (i) a first interaction with SOGRAPE R&D for drafting a master document of the Dashboard, (ii) the so-called 'Dashboard sprints' between developers of the Dashboard and SOGRAPE R&D and (iii) several virtual meetings with representatives of different departments of SOGRAPE (viticulture, enology, ICT) to obtain independent feedback from operational decision-makers not directly involved in the project.

1.2 SCOPE

Agriculture is very sensitive to climate variability, extremes and impacts of climate change. Seasonal climate predictions and long-term climate projections are some of the available sources of information that allow end-users to adapt their decision making strategies to future climate evolution (e.g. using temperature and precipitation information from one to several months in advance). MED-GOLD seeks to adapt the agricultural management of three staple crops of the Mediterranean diet: durum wheat, grapes and olives to the supporting information provided at these time scales. The co-development of the climate services' tool for the wine sector involves collaboration between scientific partners and decision-makers through specially designed interaction events: workshops, on-line collaborative documents and both virtual and face-to-face meetings.





1.3 DEFINITIONS AND ACRONYMS

1.3.1 DEFINITIONS

Concepts and terms used in this document and needing a definition are included in the following table:

Table 1-1 Definitions

Concept / Term	Definition
Climate change projections	Climate scenarios for the future, commonly, for the next century
Climate memory	Personal memory from climate conditions in recent years
Climate models	Climate models are mathematical algorithms that simulate the interactions of the important drivers of climate (e.g. atmosphere, oceans, land surface, ice).
Dashboard	Integrated visualization display
Essential Climate Variables	Basic variables used to characterise the earth's climate
Index	An aggregation of different indicators
Indicator	A parameter describing a reality, i.e., synthesizing the effects of future climate change with relevance to a specific sector and business
Percentile	Division of the population distribution in 100 categories
Seasonal forecasts	Predictions of the climatic conditions for the coming months
Tercile	Division of the population distribution into three categories



1.3.2 ACRONYMS

Acronyms used in this document and needing a definition are included in the following table:

Table 1-2 Acronyms

Acronym	Definition
COVID-19	Coronavirus Disease 2019
ECMWF	European Centre for Medium-Range Weather Forecasts
ECMWF SEAS5	ECMWF Seasonal Forecasting System 5
ERA5	ECMWF Reanalysis 5
ECV	Essential Climate Variable
EU	European Union
EURO-CORDEX	European Coordinated Regional Climate Downscaling Experiment
GA	General Assembly
ICT	Information and Communication Technology
MED-GOLD	Project “Turning climate-related information into added value for traditional MEDiterranean Grape, Olive and Durum wheat food systems”
PHRES	Portugal High Resolution
RCP	Regional Climate Projection
R&D	Research and Development
SprR	Spring Rain
WP	Work Package



2. REFERENCES

2.1. REFERENCE DOCUMENTS

The following documents, although not part of this document, amplify or clarify its contents. Reference documents are those not applicable and referenced within this document. They are referenced in this document in the form [RD.x]:

Table 2-1 Reference Documents

Ref.	Title	Code	Version	Date
[RD.1]	MED-GOLD Deliverable 3.6 -First feedback report from users on wine pilot service development			2019
[RD.2]	MED-GOLD Deliverable 1.3 Assessment of quality of European climate observations and their appropriateness for use in climate services for each sector			2019
[RD.3]	MED-GOLD Deliverable 1.4: Report assessing the quality of seasonal forecast information and climate projections, and their appropriateness for use in climate services for each sector			2019
[RD.4]	MED-GOLD Deliverable 3.1: Report on the two case studies at seasonal- and long-term timescales for the wine sector			2019
[RD.5]	CLARA Deliverable 4.1: Assessment report and methodological toolkit			2018
[RD.6]	Research paper: Economics and climate applications: Exploring the frontier. Rubas et al. (2006). Climate Research 33.			2006
[RD.7]	The Scrum Guide. https://www.scrumguides.org/docs/scrumguide/v2017/2017-Scrum-Guide-US.pdf			2017
[RD.7]	MED-GOLD Deliverable 2.7: Second Feedback report from users on olive oil pilot service development			2020
[RD.9]	MED-GOLD Deliverable 4.7: Second Feedback report from users on durum wheat pilot service development			2020



3. ACTIONS LINKED TO THE 1ST PARTICIPATORY WORKSHOP

3.1 SUMMARY OF THE FEEDBACK FROM THE 1ST PARTICIPATORY WORKSHOP

During the first participatory workshop users were presented with different visualization options of climate-related information (e.g. maps, graphs and colour bars) for them to provide feedback on the best way to communicate results on essential climate variables, bioclimatic indicators and risk indices. Their preferred choice was the use of maps along with tercile / percentile plots and explanatory text. They also selected the blue-red gradient as preferred colour scheme for temperature and green-brown for precipitation. On the other hand, for risk indices, the ‘traffic light’ approach (red-yellow-green) was favoured.

A progressive disclosure of information was suggested by end-users (providing the option to access information gradually rather than all at once). This would allow the user to decide to go only for the risk index or proceed further to see the information on the bioclimatic indicators and/or the essential climate variables (ECVs).

Regarding seasonal forecasts, the users understood that using terciles provides a more reasonable representation of the prediction (due to the limited amount of ensemble members currently available), and accepted it as the minimum, but indicated that the ideal situation would be percentiles. They set a minimum of 70% hit-rate probability for a tercile to trigger a particular decision, assuming that the prediction has some skill and highly valued the possibility to have essential climate variables up to six months ahead. Turning to climate projections, the end-users were interested in the relative increase / decrease of the variables, both ECVs and bioclimatic indicators. However, they were not interested in projections of the risk indices. They also asked to have a layer of altimetry superimposed on the maps.

3.2 THE MED-GOLD DASHBOARD

During the MED-GOLD GA 2019, held in Cagliari (Italy) from 15 to 17 October 2019, there was a common agreement on the need to develop a new web-based application, the [MED-GOLD Dashboard](#), that should allow the MED-GOLD Wine pilot service users to easily visualize, interact with and download the climate information (essential climate variables, bioclimatic indicators and risk indices) presented in the first participatory workshop [RD.1] through maps and multilevel charts. It has been a direct consequence of the feedback obtained from users who clearly required an easy and interactive way to visualize and download tailored data (see MED-GOLD [RD.1]). In this regard, in the GA 2019 was finally agreed that the new MED-GOLD Dashboard should be one of the main tools to get feedback from users for the MED-GOLD Wine pilot service in the second round of planned interactions.

In the MED-GOLD Dashboard users could obtain information in shape of interactive maps and time charts on:

1. **Historical climate:** main observed features in terms of ECVs of interest, bioclimatic indicators and compound risk indexes, all of them over specific regions.
2. **Seasonal forecast:** historical seasonal forecasts since 1993, along with some examples of real forecasts for the following growing seasons for ECVs of interest,





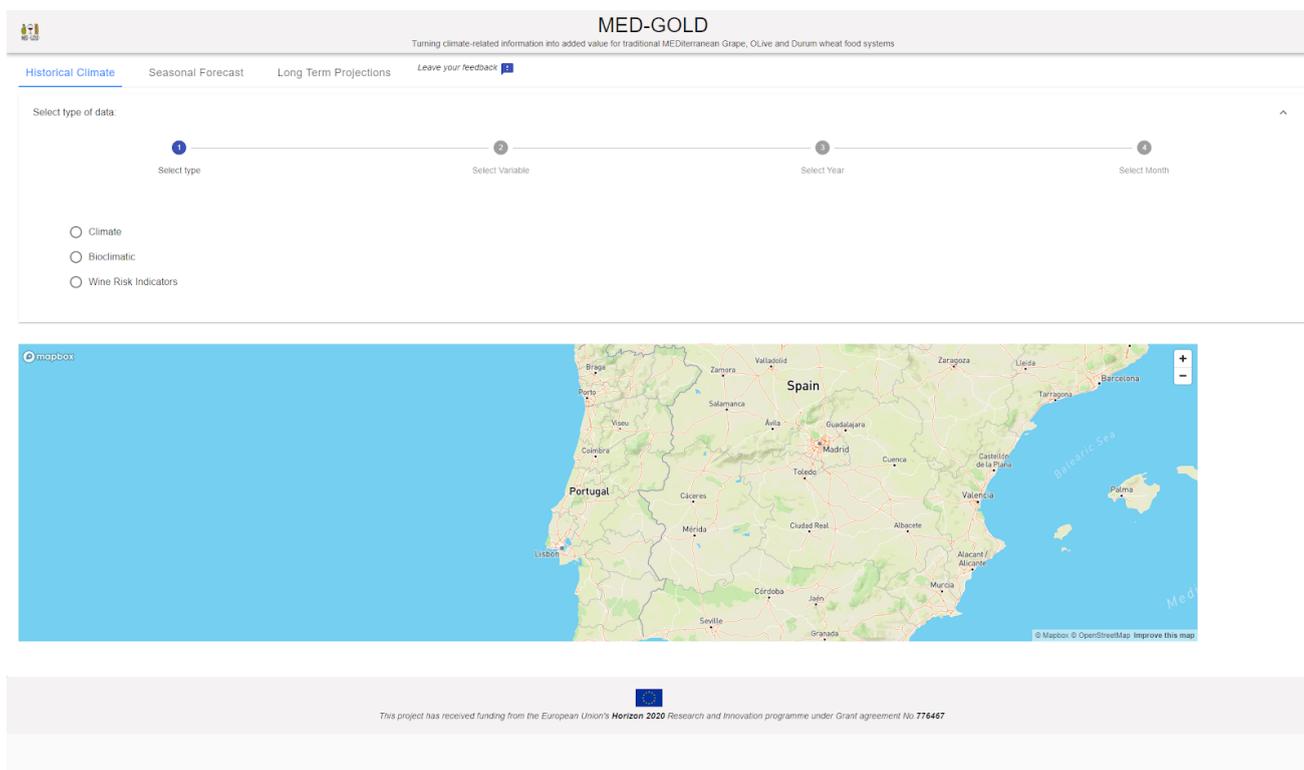
bioclimatic indicators and compound risk indexes previously identified. Also indications on the skill of the climate predictions will be provided.

3. **Long term climate projections** of the ECVs and bioclimatic indicators of interest for different time intervals and different RCPs.

Some explanatory pop-up, linked also with the [MED-GOLD Glossary](#), will guide end-users for the interpretation of the results.

In Fig. 3-1 we report as an example the landing page of the first release of the MED-GOLD Dashboard (updated May 2020). In this example, the historical climate tab is reported, showing the navigation panel where the users can select the type of climate information (ECVs, bioclimatic indicators or risk indices), the variable of interest and the period of time.

Figure 3-1 Landing page of the MED-GOLD Dashboard V1.0 (May 2020)



The MED-GOLD Dashboard has been also considered as part of the MED-GOLD Olives/Olive Oil pilot service with some adaptation of the content to the particular interest of this sector and, in a future perspective, also of possible interest for the MED-GOLD Durum wheat/Pasta pilot service. Some bioclimatic indicators of interest for the olive oil sector over the Iberian Peninsula will be included in the Dashboard (see also MED-GOLD D2.7).



3.3 ILLUSTRATION ON THE USE OF SEASONAL FORECASTS FOR DECISION MAKING

During the first interactions with SOGRAPE (Medgold GA 2018 in Porto), an existing gap between the understanding of seasonal forecast information and its actual use in decision-making was identified. In fact, end-users did not understand how climate predictions for past years (hindcasts) could be used to estimate the payoff of seasonal forecasts as compared to their current methods. As a result, several interactions between the seasonal climate predictions provider (BSC) and the end-user for the grape and wine sector (SOGRAPE) were held to co-develop an illustrative example (case study) of how seasonal predictions could impact the value of specific viticulture decision-making. For that, a long retrospective period (1993-2015) was used..

The case study was carefully selected together with SOGRAPE and involved the use of seasonal forecasts of Spring Rain (SprR) to make decisions regarding *plant protection* and *canopy management* and comparing the economic outcome with the use of climate memory, the current user practice. The underlying questions, from a vineyard decision-maker perspective were: when is the seasonal forecast worthy? How much risk am I willing to bear? How and when can the forecasts influence my choices? And, perhaps more importantly, how the use of seasonal forecast information compares to our current methods in saving and making value?

The overall objective was to assess the potential value of forecasting a bioclimatic index (SprR) for MED-GOLD's grape and wine users' decision-making at a seasonal time frame. Each indicator is used by one or more user type, within SOGRAPE, to evaluate possible decisions. Here, the approach used one indicator (referring to the previous example, SprR) and one decision at the time, on a case study basis. We made a retrospective analysis using hindcasts and comparing them with observations.

The approach is based on a widely used methodology in climate services evaluation: decision theory. BSC applies a retrospective analysis that relies on the comparison of hindcasts and observations to simulate changes in decisions triggered by the information provided by the seasonal forecasts (the service). Ultimately the value of the service is equivalent to the value of the information conveyed by the service to the final user [RD.5].

The full methodology will be described in D3.2 (Report on the Methodology followed to implement the wine pilot services) together with the other methods followed for tailoring the seasonal predictions to the user needs, such as bias adjustments or skill assessment.



4. CONTINUOUS FEEDBACK

4.1 CO-DESIGN PHASE: DISCUSSION ON THE FUNCTIONAL SPECIFICATIONS OF THE DASHBOARD

In the overall context of co-design of the MED-GOLD Grape/Wine Service, the main functionalities of the first release of the MED-GOLD Dashboard have been agreed starting from specific needs highlighted by the MED-GOLD wine industrial partner, SOGRAPE.

Since the GA 2019, a shared master document of the functional specifications of the MED-GOLD Dashboard has been drawn up in collaboration with the ICT partner Beetobit, with the overall coordination by ENEA, and with contributions from all the partners involved in the development of the MED-GOLD Grape/Wine service.

In the perspective of the utilization of MED-GOLD Dashboard as part of the Olives/Olive oil and Durum wheat/Pasta pilot services also DCOOP and Barilla have been involved, during the co-design phase, in the identification of the main features of the first release of the application, achieving synergies across the three MED-GOLD sectors. The writing phase of this working document was closed at the end of November 2019.

The link to the master document on the functional specifications of the first release of the MED-GOLD Dashboard is reported in Annex A. The main aspects addressed in the master document include:

- The overall structure of the application should include three tabs: Historical Climate, Seasonal Forecast and Long Term Projections.
- The geographical area covered: for the first release the Iberian Peninsula (with a zoom on the Douro Valley of Portugal).
- The ECVs climate variables, bioclimatic indicators and compound risk indexes that should be included since the first release.
- The main features for the interactive maps and time charts reported.
- The color palettes adopted.
- The format for exporting figures and data.

The data to be taken into account have been chosen on the basis of the work done in WP1 on the overall quality of climate data. For historical climate data, basing on the analysis made in [RD.2] the best option seems to be ERA5 (resolution 30 km, period 1979-2019) and PTHRES data for a zoom over Douro valley region (resolution 1 km, period 1951-2015), as explicitly requested by the industrial partner. For seasonal forecast, based on the analysis performed in [RD.3], the data included in the first release come from ECMWF SEAS5 (1 degree), while for the long term projections, data from Euro-Cordex (0.11 degrees) zoomed over Douro Valley have been included (). Major details on the climate data used will be reported in MED-GOLD D3.2 "Report on the Methodology followed to implement the wine pilot services".

For the first release of the MED-GOLD Dashboard not all variables and features have been included, since this release should be mainly considered as a test to verify the overall usability of the tool and to collect feedback towards forthcoming releases. In the first development phase of the MED-GOLD Dashboard, access has been granted to consortium members, through the credentials



of the [MED-GOLD ICT Platform](#), and to other internal users from MED-GOLD industrial partners through accounts provided on demand.

A more detailed description of the full functionalities and technical aspects of MED-GOLD Dashboard, along with users manual, will be included in future MED-GOLD deliverables (namely D3.8 and D3.5) once all the feedbacks and comments from users will be addressed and the final version will be released.

4.2 CO-DEVELOPMENT PHASE: THE DASHBOARD SPRINTS AND THE SCRUM FRAMEWORK

In order to assure an effective co-development of the MED-GOLD Dashboard, during the development phase of the first release (initially planned for the first months of 2020), a number of periodic “sprint meetings” with ICT partners Beetobit and UTH, in charge of technical development of the application, ENEA and the MED-GOLD industrial partners (Barilla, DCOOP and SOGRAPE) have been organized every two weeks, starting from January 29th 2020. All other MED-GOLD partners possibly interested could also attend these meetings.

The organization of sprint meetings followed the broader Scrum framework for the development of innovations and complex products [RD.7]. Although we have not formalized a strict adoption of the Scrum framework, we have followed the main guidelines by taking into account the constraints of the project which implies the cooperation of a team scattered across different organizations.

With reference to the main components of the framework described in the Scrum Guide [RD.7], the development of the MED-GOLD dashboard was based on the following roles and activities:

- A product backlog was prepared by BeeToBit on the basis of the master document described in section 4.1 (Figure 4-1)
- SOGRAPE and the other industrial partners played the role of the product owner by continuously indicating priorities for the implementation of new feature to best achieve the goals of the development of the tool
- BeeToBit and UTH have played the major role in the development team, with additional support from ENEA and from other partners as specific needs emerged during the development phase.
- ENEA played the role of the Scrum Master by ensuring that the goals of the development were understood by everyone in the team, facilitating the overall process and supporting the team in understanding the needs as they emerged during the development process.

The development of the dashboard has been broken down into a set of time-boxes, or sprints, of two weeks during which a usable release of incrementally complex versions of the dashboard have been created, from a simple setup of the main tabs to a fully interactive platform.

Every two weeks, two separate meetings occurred, one sprint review meeting (typically involving ENEA, BeeToBit and UTH) to update on the progresses of the implementation and, and one retrospective/planning meeting (with the participation of the industrial partners from SOGRAPE, DCOOP and BARILLA) as an opportunity to inspect how the last sprint went identify potential improvements/changes to be adopted and agree on the plans for the next sprint.

The aim of engaging with this process was two-fold. On one hand we have ensured that all developments followed as closely as possible the expectations of the industrial partners. At the same time, it was possible for the first adopters of the MED-GOLD dashboard (the industrial partners





of MED-GOLD) to familiarize with the tool and become independent in promoting its usage in the respective sectors.

One unexpected impact of this process was the full engagement of DCOOP and BARILLA, who were first engaged as observers for the development of a tool which was mainly designed after the needs emerging from SAGRAPE and lately expressed a more specific interest in using the MED-GOLD dashboard as a tool to access information for their respective sectors as documented in the parallel deliverables 2.7 [RD.8] and 4.7 [RD.9].

Figure 4-1 Example of Dashboard tasks in MED-GOLD internal platform

Task ID	Task Name	Category	Created	Assigned
T27	Data indexing	DASHBOARD	Thu, May 7, 2:07 PM	
T89	Climatology-tp-1963-March	BUG	Mon, Apr 27, 3:36 PM	f.stocchino
T85	Export chart value in excel format	FEATURE	Apr 9 2020, 10:03 AM	
T24	Interface: Projection components	DASHBOARD	Jan 21 2020, 2:50 PM	
T23	Interface: Seasonal Forecast components	DASHBOARD	Fri, Apr 24, 5:52 PM	f.stocchino
T21	Low resolutional dataset integration in climatology tab	DASHBOARD	Feb 12 2020, 3:59 PM	
T19	Interface: Projection Chart component	DASHBOARD	Dec 18 2019, 12:03 PM	
T18	Interface: Seasonal Forecast Chart component	DASHBOARD	Fri, Apr 24, 5:56 PM	
T17	Interface: Climatology Chart component	DASHBOARD	Fri, Apr 24, 5:56 PM	
T16	Interface: Map component	DASHBOARD	Mon, Apr 27, 3:35 PM	a.kalkanof
T15	Interface: Main component	DASHBOARD	Mon, Apr 27, 3:35 PM	
T14	Dashboard Front-end	DASHBOARD	Apr 9 2020, 10:07 AM	f.stocchino

The first release of the MED-GOLD Dashboard should have been presented to staff members from SOGRAPE in the second participatory workshop originally planned to be held in Porto for April 7th 2020. The main aim of this workshop would be testing the usability of the Dashboard and collecting further feedback for development in the perspective of the final release scheduled for M40 of the project (end of March 2021).

However, owing to the current situation of lockdown in most of Europe with COVID-19, the second participatory workshop has been postponed (see section 7 of the present document). As a contingency plan, the sprint meetings have been extended to provide a first release of the Dashboard which includes feedback from MED-GOLD industrial partners and a series of virtual interactions with decision-makers from SOGRAPE, not involved in previous sprint meetings (see next sub-section for further details).



4.3 TESTING PHASE: SOGRAPE INTERNAL MEETINGS WITH DECISION-MAKERS

Since March 12th 2020, following early warnings of the spread of COVID-19 and anticipating the declaration of the state of emergency in Portugal, SOGRAPE recommended all its staff with compatible functions to start working from home. The workshop planned for April 7th had to be postponed as international travelling was suspended, SOGRAPE premises were inaccessible by non-essential outsiders and physical meetings stopped altogether. Furthermore, to reduce the risk of spread of COVID-19, the staff working in technical functions that were on-site had to work «mirror schedules» which halved the available staff at any given moment. Directors and managers of technical departments (viticulture, enology, quality, IT, etc.) had to ensure the needed output with less than ideal resources, their attention being diverted to multiple locations and having to make frequent last-minute adjustments to their schedule, making it very hard to make commitments towards the project.

To address the situation, several WP3 coordination meetings were held and a final format was decided upon: the physical workshop was postponed until late 2020 / early 2021 as a function of easing travelling restrictions. In the meantime, and to gather as much feedback as possible under the difficult situation, it was agreed that SOGRAPE's MED-GOLD team members (from SOGRAPE's Direction of R&D) would host online user feedback sessions with a small number of users, typically one to three at a time (see Annex B with examples of representative pictures of these meetings). Each user would share his screen during the session, while using the MED-GOLD dashboard.

A loose script to use in each session was developed between SOGRAPE and UNIVLEEDS:

1. The user tested the dashboard without guidance, trying to find information they were looking for. The session host would only intervene if the user was stuck at some point during this phase. Notes would be made on what the user found easily and what they missed.
2. The host would direct the user to try those features they missed and would question him/her on how hard or easy it was to understand the information presented on the screen and the functions available on the dashboard
3. The host would ask a series of predefined questions on different aspects of the dashboard, such as:
 - a. Structure and interface of the dashboard:
 - i. Is the structure of the dashboard intuitive for you?
 - ii. Is it easy to navigate through the menus and toolbars (i.e. user-friendly)?
 - iii. Would you change how it is structured and if so how (and why)?
 - iv. Are there elements that you feel are not necessary and/or are missing from the dashboard?
 - b. Content of information:
 - i. Is it clear to you what information you're looking at?
 - ii. Is it easy to understand?
 - iii. Is this type of information useful to help you with your activities (and if so, how)?
 - iv. Would you like to remove and/or include additional information to what's being provided; and if so, what?
 - c. Presentation and visualisation of information
 - i. Is it clear how the information is represented?
 - ii. Is it easy to understand?





- iii. Would you prefer to have this information in a different format (e.g. text, graphics)?
- iv. Would you change the way the information is represented/visualised and if so, how?
- d. Would you like to add any other comments or suggestions?

By the end of the session, the host would encourage the user to use the feedback page to evaluate the experience and provide feedback with improving suggestions and identifying errors or anomalies. These sessions lasted no more than 90 minutes each. Microsoft Teams was used as the communication platform.

All sessions were recorded after obtaining authorization from each user, the consent being granted at the beginning of the session before proceeding. The session videos and a summary of the most important insights were made available to project partners in the two working days following each session through the #dashboard channel of the MED-GOLD Slack workspace. Whenever necessary, sessions would be repeated with the same users.

Online feedback sessions, user identification and function and dates are listed below:

- ✓ *May 4 - José Manso, Director of Viticulture Douro*
- ✓ *May 8 - João Porto, Director of Viticulture_VV Dão Bairrada Lisboa Alentejo*
- ✓ *May 11 - Luis Sottomayor, Director of Enology Douro; Diogo Moreira, Winemaker Douro Superior; David Miranda, Winemaker Douro Cima Corgo*
- ✓ *May 13 - second session with José Manso, Director of Viticulture Douro*
- ✓ *May 15 - Carla Guerra, Vineyard Manager Douro*
- ✓ *May 18 - Joana Martins, ITC programmer*
- ✓ *May 19 - Ivone Tomás, Vineyard Manager Douro*
- ✓ *May 19 - António Pereira, ITC Manager*
- ✓ *May 20 - Paulo Gomes, Viticulture Support Douro*

The overall impressions of the MED-GOLD Dashboard were quite positive. Users evaluated interaction at 3,2/5 and likeliness to recommend to friend or colleague at 8,1/10.

Main feedback disclosed from the above mentioned sessions have been organised in three main blocks: 1) overall assessment, which in turn is divided in two aspects, perceived value and ergonomics; 2) reported desired features, that encompass feedback on map visualisation, chart visualisation and content; 3) problems or difficulties found in the Dashboard, divided in general aspects, maps and charts.

A list with the feedback obtained in each block is detailed below, highlighting in bold those points referred by more than one user, being the number of referring users in brackets.



1. Overall assessment

(i) Perceived value

- **If forecast data are reliable, meaning being right more than 70% of the time, it may be useful for decisions related to plantation, protection management, stock management and so on. (2)**
- Overall the feeling is that the tool is interesting and useful.
- As a general comment, the long-term tool seems to be an excellent help for planning of future vineyards, much more so if improved from observations and suggestions from these sessions to allow for better use from untrained users (director of viticulture).
- The information is important for use in the company's applications for viticulture and enology. It should be possible for those applications to query the MED-GOLD tool by location and time and receive a corresponding dataset that would be used to feed the application algorithms of visualization and / or calculations.

(ii) Ergonomics

- **Navigation is overall easy and intuitive. Mostly, map updating is quick enough. (3)**
- **The dashboard in English slows down and makes interpretation sometimes difficult. It would be much better if in Portuguese (vineyard manager and administrative support). (2)**
- Not too hard to use, except for a few features. Nothing too much nor too little, features are adequate.
- Structure is intuitive but attention is required to work through it. Careless users will find it hard and probably abandon it after a first try without tutorial, guidance or training.
- Content is overall clear.
- Base-map colour, mainly using blue overtones confuses visualization of information specially those using blue shades (related to rainfall).
- Very nice tool, important information but without supervision would not have gone anywhere.

2. Desired features

(i) Map visualisation

- **When choosing options to visualize from the drop-down menus, a short caption explaining their meaning should pop-up as the cursor hovers over each option (especially abbreviations and acronyms). The same should happen when hovering above tab names (historical, seasonal and long-term) or type of data. The question mark for info is not intuitive, would not think that it is the place to go if the user requires guidance. (7)**



- **Many features and possibilities of the tool remain undiscoverable because of insufficient on-screen guidance (e.g. the chart that opens if a spot is clicked in the map). On-screen guidance must be everywhere. (2)**
- **When visualizing seasonal forecasts, it should be possible to see the normal value in the same moment (in the popup map data-box?). (2)**
- The color-ramp in the map legend should be always the same at the initial visualization, but users should be allowed to customize limits and steps.
- Maps should have a scale, either as ruler or numerical format, this scale should be visible in exported image files.
- It should be possible to automatically center the map at any given position by inserting geographical coordinates.
- It should be possible to create and recall favorite geographical places (such as geographical placemarks).
- It should be possible to see the map in full screen mode.
- Each export format should have on-screen clarification of what it serves for.
- When visualizing average values, it should also be possible to see the chart with values for individual years, to understand the level of variation across the time series.
- On-screen guidance is needed to explain what is «mask» and when and how it should be used (seasonal forecasts).
- LONG-TERM and HISTORICAL: it would be desirable that a map visualization is pre-loaded so that the user has a first insight of what he can find there. A blank map leaves the new user clueless. For example, the last month and year available. As it is, many features are only discovered by chance. For example the map data-box is totally unknown and a user is not expecting to have to click the map to see something more than the colors.
- Legend should be customizable or users should be able to filter map visualization according to defined values or ranges (for example, seeing only places where Tmax > 35°C).
- It should be possible for the user to choose to see not just an individual month of an individual year, but also a range of months in the same year or a range of years (average values in temperature, bioclimatic and risk, summation in precipitation). An approach such as [Qlik Sense](#) would be ideal.
- Exported map needs title and legend.

(ii) Chart visualisation

- **Chart data series should also be exportable as data files (csv-type, ideally EXCEL) not just image formats. (3)**
- In the chart, the user should be allowed to choose a temporal window to see or a group of chosen years to compare.
- Users should be able to define user-profiles that would save their visualization preferences.



- Chart should have a third option of visualization of historical data for ECV's grouped by season (Winter, Spring, Summer and Fall).

(iii) Content

- **An important parameter to have in historical, seasonal and long-term is total annual precipitation. (2)**
- It is better to represent seasonal forecasts in map and chart even when probability values are below 40%. If necessary, show the two most likely terciles or even the three if probability spreads evenly across all three. Readability of forecast meaning will improve.
- Relative humidity data and forecasts would be important for protection management.
- Frost forecast would be important for protective measures implementation.
- Wind at the height of canopies would be important for canopy and protection management.
- Map data-box that pops up when clicking the grid cell also needs altitude data.
- Long-term baseline dataset should cover at least until 2015. The current one (1971-2000) reports a situation already not in the mind of most current decision-makers and totally different from the present situation. Anomalies based on that dataset are misleading.

3. Problems and difficulties

(i) General

- **The parameter panel needs to be better organized; it wastes too much space which would be better used to have more space for map viewing. (2)**
- Navigation in the dashboard without assistance is difficult, there is a lack of on-screen guidance to find what to do. The step by step procedure on top is a plus and helps a lot but is not enough.
- SprR seasonal forecast: 2020 disappears from years' options when the starting date April is chosen.
- Text in help boxes is too small and difficult to read for people with sight fatigue.
- Help box texts are not clear or understandable (user referred he was more confused after reading than before).
- Colors are hard to read by someone with sight fatigue. They should have more contrast.
- In the year and month selection, the full line from the first until the selected year / month leads the user to think he is visualizing a time interval and not a single year / month.

(ii) Map

- **Maps often take extremely long to load or do not load at all. There is a lot to be done in terms of susceptibility to user handling of the tool. It seems overly**



sensitive to movements or clicks on the map while loading. When zooming in, sometimes data colors disappear altogether and will not reappear when zooming out, especially in seasonal forecasts (3)

- Export GeoJSON and, particularly NetCDF, do not know what they are and how to use them. They should be available for those requiring them, but in a less prominent way than JPEG, PNG and other user-familiar formats. (3)
- The map data-box that pops when a map grid cell is clicked is sometimes hard to close, requiring many clicks. It won't disappear when visualizations parameters are changed, creating wrong readings from the part of users (2).
- In long term projections, is anomaly reporting %? If that is the case, the legend caption needs to be changed (2)
- The base map should not be displayed before all needed choices are made. After visualizing a map, if choices are changed, the base map should redisplay again only after loading the visual data. Maintaining the map when parameters are changed is misleading. In this way, the tool averts misreading by users (AG: this could also be obtained by a well-visible legend indicating the map is loading) (2)
- Seasonal forecast was not over all of the Peninsula. Inversely, there is a lot of ocean area covered by forecast, which is totally useless.
- Seasonal forecast color ramp for precipitation, SprR (and HarvR too) is upside down: above normal should be on top and below normal should be on bottom.
- Initial map centralization is on 40.0 x -7.55 which is outside of the Douro region. It should be in the center of a box limited by 41.0 x -8.0 and 41.5 x -6.9.
- RCP help text is not correctly clear for a good interpretation.
- Colors do not differentiate well, this problem is worse with precipitation. Problem is worsened because of color of the base-map. It would be better if the base-map would only be black and white.
- Very hard to understand what are terciles and normal («normal is when we feel good!»). After clarification, the concept was understood and interpreted correctly, but with many doubts.
- Tercile number in map data-box for seasonal forecast, being numeric was understood as variable values. This wrong interpretation was further reinforced by the presence of variable units (mm, °C) below the tercile color legend.

(iii) Chart

- **Bottom chart is confusing and hard to use when all months are displayed. (3)**
- Bottom chart is hard to interpret and use to assess how trustable a prediction is.
- The historical hit-rate of seasonal forecasts seems low.
- May 2019 seasonal forecast of monthly precipitation, observed value (blue dot) is not displayed in the chart.



- When the value in the chart is zero, hovering the cursor will not provide any data, not even the year. This makes difficult to read charts.
- In charts, the popup data window indicates the year with decimal, what is misleading.
- In the chart, hovering the mouse pointer on a forecast square, changes the colour of the square confusing the interpretation.

5. CONCLUSION

During the period comprised between [RD.1] submission and M30 the co-development of the wine pilot climate service implied an intensive and highly productive interaction between scientific and technological partners (Beetobit, ENEA, UTH, BSC, NOA and MetOffice) and end-users (SOGRAPE). Firstly, after the gathering and assimilation of all the feedback obtained during the first participatory workshop, the next step was to consolidate the MED-GOLD Dashboard as the front-end of the wine pilot service tool. This process involved a continuous flow of feedback obtained along three co-development stages.

The first one consisted in the co-design of the Dashboard, establishing its main functional specifications. In this phase the main aspects discussed were (i) the inclusion of three tabs: Historical Climate, Seasonal Forecast and Long Term Projections; (ii) the Iberian Peninsula (with a zoom on the Douro Valley) as the geographical area covered; (iii) the different ECVs, bioclimatic indicators and compound risk indexes agreed to be ready for the first release; (iv) the features for the interactive maps and time charts; (v) the format for exporting figures and data.

The second stage were the so-called 'Dashboard sprints', a number of periodic meetings between the technological partners, Beetobit and UTH, with ENEA and the MED-GOLD industrial partners (Barilla, DCOOP and SOGRAPE). The aim of these online meetings were twofold, a follow-up of development updates and an exchange of feedback in the form of suggestions, requests, bug detections and usability clarifications. All these information have been systematically collected in the internal MED-GOLD platform as specific technical tasks.

The third one consisted of virtual interaction sessions with SOGRAPE operational end-users that have not participated in previous sprint meetings, assuring the obtention of independent feedback on the Dashboard. Each session followed a format developed by SOGRAPE and UNIVLEEDS which drove the user interaction with the Dashboard. At the end of each meeting the host encouraged the user to provide feedback about its experience. The aspects assessed during the sessions were (i) perceived value; (ii) ergonomics; (iii) map visualization; (iv) chart visualization; (v) content; (vi) problems/difficulties found. This information was then transferred to the developers through an online form designed for that aim.

Users' feedback on the Dashboard was overall very positive and all participants recognized that it would be an added value to their work and a precious help in decision-making, once some corrections / improvements were introduced. As the sessions included people from different backgrounds (training, age, familiarity with ITC, previous contact with climate services and tools) it was found that their interaction with the Dashboard differed according to their level of previous knowledge with climate tools. Most users recognized that without assistance / supervision they would not have been able to navigate the Dashboard on first contact and / or retrieve all information they needed. They were particularly unanimous regarding the lack of on-screen guidance and clarification of terms, features, abbreviations, and acronyms used, many completely alien to them.





The importance of being able to export maps and data in user-familiar formats together with recurrent random problems in navigating and loading maps were also mentioned by more than two users (>20% of total). The need for a minimum threshold of forecast correctness at 70% was also mentioned, something that was already underlined in the first user interaction session reported in [RD.4] and [RD.1]. At the end of each session, users reported being more comfortable with it, demonstrating that, as is, the tool is not ready to be taken to users without prior training, something that limits its reach to users with prior knowledge and contact of climate tools and services. In any case, these individualized training sessions resulted in robust and important feedback that when used to improve the Dashboard will do much to make it a key tool for the industry and its stakeholders / participants, increasing its reach and usability also by less climate-savvy users, such as individual farmers. It also raised the awareness among SOGRAPE users, outside the MED-GOLD team, for the work developed within the project, generating enthusiasm about the perceived level of support the use of climate services may bring to their current management activities when they become accessible and user-centric.

In parallel to this feedback, the interaction with end-users put forward an existing gap between the understanding of seasonal forecasts and their actual application to decision-making. This gap is based on the difficulties found by end-users in using retrospective forecasts to compare the economic impact of using seasonal forecasts compared to their customary methods. BSC and SOGRAPE have co-developed a methodology to help decision-makers assess this impact.

In conclusion, the recurrent collection and implementation of the feedback provided by end-users, allowed for optimisation and strengthening of the usability of the wine pilot service by considering the views of experienced SOGRAPE decision-makers in all the stages of its development.

6. NOTE ON THE 2ND PARTICIPATORY WORKSHOP

The collection of part of the feedback for this second report was originally planned for another participatory workshop that should have been held in SOGRAPE's headquarters on April 7th 2020 (as it was stated in [RD.1]). The objective of this meeting was to present all progresses made to the same decision-makers that took part in the first participatory workshop. In this way we could track the evolution of their perception on the tool as well as register any new feedback they might have on it.

However, the sudden surge of the COVID-19 pandemic and the subsequent country lockdowns prevented the MED-GOLD WP3 partners from organizing this face-to-face workshop. Even if the continuous feedback retrieved from the master document co-production and the dashboard sprints was already rich, as demonstrated in previous sections, a contingency plan was applied to avoid the loss of valuable feedback coming from the decision-makers involved in the first participatory workshop. For that aim, SOGRAPE started a series of virtual meetings to introduce the improved Dashboard both to attendees of the first participatory workshop as well as 'newcomers' from different departments at SOGRAPE. The feedback gathered in these on-line meetings has also been included in this deliverable.

That said, if the overall situation with the COVID-19 improves, it is the aim of MED-GOLD to take advantage of a future face-to-face workshop to present the Dashboard presentially to SOGRAPE's decision-makers. In that case, if the outcomes of this workshop add some kind of feedback on top of





the feedback included in this deliverable and therefore, suitable for being included as a refinement of the Dashboard, it is our aim to include this information in one of the future MED-GOLD deliverables (namely D3.8 or D3.5) together with the full functionalities and technical aspects of the MED-GOLD Dashboard. This may require an extension of the project duration which, if needed, will be requested at the moment of submitting those deliverables (M40).





ANNEX A. SPECIFICATIONS OF THE DASHBOARD DOCUMENT

Link to the MED-GOLD Dashboard V1 FUNCTIONAL SPECIFICATIONS (version Nov 25th, 2019) master document [Here](#). Please note that some parts (including some variables and features) colored in red in the text, are not included in the first version of MED-GOLD Dashboard but they will be present in the future releases. Moreover, several open points are still present in the working document and will be addressed after the present round of feedback will be collected and further elaborated.



ANNEX B. SOGRAPE INTERNAL MEETINGS WITH DECISION-MAKERS

Example of Figure's epigraphs:

Figure B-1 Example of a virtual meeting held by SOGRAPE for introducing the Dashboard to end-users of different operational departments (in the picture, winemakers) not directly involved in the development of the wine pilot service.

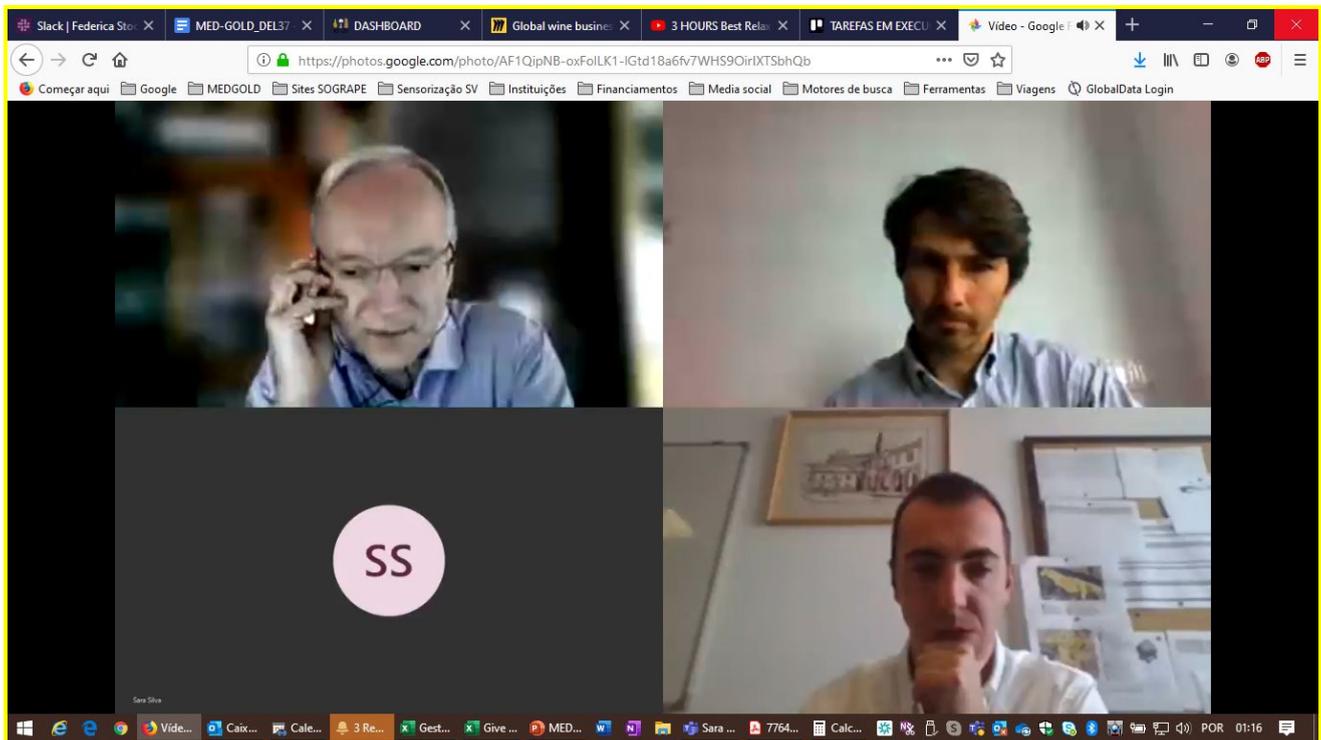




Figure B-2 The users tested the dashboard without guidance, trying to find information they were looking for. Each user shares his/her screen during the session, while using the MED-GOLD dashboard.

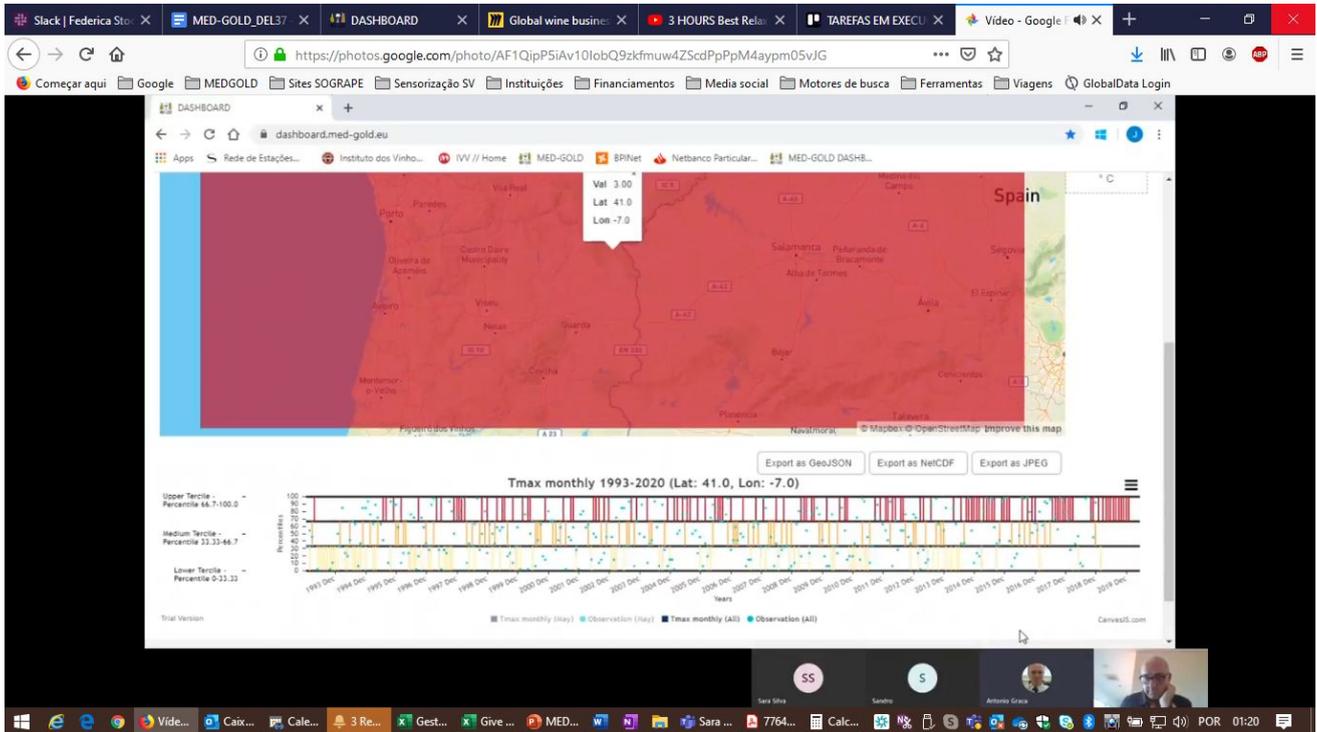


Figure B-3 Feedback page to evaluate the experience of the user and provide feedback with improving suggestions and anomalies.

