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Deliverable D4.9:
Main Barriers and Solutions found on the DSS application

WP	4	Demonstration	
Task	4.6	Main Barriers and solutions found on DSS application	
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[1] Dissemination level: **PU** = Public, **PP** = Restricted to other programme participants (including the JU), **RE** = Restricted to a group specified by the consortium, **CO** = Confidential, only for members of the consortium

[2] Nature of the deliverable: **R** = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other

Version history

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Deliverable abstract

The objective of the present deliverable is describing the last activities of design optimization and usability assessment with project end users and external stakeholders. Starting from the previous evaluation activities and from the suggestions received from the MTR, the design solutions to improve the data visualization and interaction are presented. These solutions have been object of a design review, aiming at discussing and validating the solutions before to implement them. Finally, the updated version of the VISCA dashboard UI has been finally introduced and assessed with a wider sample of professionals. The methodology and results of the remote usability inspection are presented and commented in terms of potential developments of VISCA.

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[3] Creation, modification, final version for evaluation, revised version following evaluation, final.

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1 Introduction

This deliverable reports on the last activities of design optimization and usability assessment realized with project end users and external stakeholders. Starting from the previous evaluation activities and from the suggestions received from the MTR, new design solutions aimed to improve the data visualization and the user interaction have been realized and are herewith presented. These new solutions have been object of a **design review**, aiming at discussing and validating the solutions before to implement them. Finally, the updated version of the VISCA dashboard UI has been introduced and assessed with a wider sample of end-users, including external stakeholders. The methodology and results of the remote usability inspection are presented and commented in terms of potential developments of VISCA.

All the activities have been set up and conducted according the User Centred Design approach (UCD) in order to adopt a perspective centred on the direct users' feedback, their needs and experiences. The involvement of the winemaker's partners of the project has guaranteed to work in depth in terms of qualitative evaluation and discussion of the barriers, risk and opportunities of the improvements to bring. To meet and complement this approach with a broader vision and wider involvement of different professionals, a remote evaluation session was organised. An open e-workshop has been organized to meet these goals. The document reports the methodology, tools and results of the activity.

The document is structured as follows: after a brief methodological introduction, related to the goal to adopt an end-user's perspective to evaluate the usability of the systems, the section 2 describes the VISCA design optimization starting from the results (barriers and solutions) resulting from previous activities and include the static mock-up that have supported their review with the project partners. Once implemented the validated solutions, the remote usability inspection with an external sample is described in section 3, plus additional data presented in the Annexes 1 (the question of the survey) and 2 (additional data collected). Finally, the section 4 reflects on the potential and further possible improvements emerged from the encounter with the sample.

2 The VISCA evaluation perspective

One of the core outputs of VISCA project is the integration of several data sources into a Decision Support System able to provide relevant information to the end-users about the vineyard management with the appropriate level of details about phenological phases, irrigation management, weather data. The VISCA Dashboard has been conceptualized, prototyped and refined along an iterative and participated process, inspired by the principles of the **User Centred Design (UCD) approach**[4]. Based on the centricity of the user perspectives, the multi-disciplinary and the iterative

[4] ISO Standard 13407 - Human-centred design process for interactive systems.

evaluation, the approach aims at designing effective and efficient systems, able to guarantee reliability, sustainability of the system as well as the perceived usefulness, ease of use and feeling (in terms of frustration/enjoyment). The benefits of User Centered Development (UCD) in research and development (R&D) are well known (Bano & Zowghi, 2015: Chammas et al., 2015; Lowdermilk, 2013). The main characteristics of such an approach (e.g., the user's involvement, iterative design and development, etc.,) have an important impact on the quality of the research results, user acceptance of the developed technology and overall usability, as well as time and cost savings during the R&D process (Norman & Kirakowski, 2018). The scope of UCD is enabling researchers and developers to focus the R&D process on the needs of the end users, so the final technologies will address their needs and usage environment as closely as possible. As said, the iterative evaluation is core for this approach. If at the beginning, the User Research aims at knowing better the target and collect the user and system requirements, intermediate evaluations allow the project's stakeholders to timely solve possible problems, that would be too expensive to solve afterwards. Moreover, opportunities of innovation can be discovered along the process. The UCD focuses on the user's perspective to drive the project results effective and satisfactory in terms of quality of experience, needed for the adoption.

Nowadays the User Experience (UX) has entered in the culture of the research and innovation practices. **UX is a longitudinal construct** that entails the interaction among a user and a system from the expectations (before the usage), to the impact (after the usage), including the actual interaction (Figure 1 - Usability Standards [source: Franzreb and Franzreb, 2016]Figure 1). The experience during the usage specifically refers to the **Usability**, defined as "the extent to which a product can be used by "specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO 9241:2010).

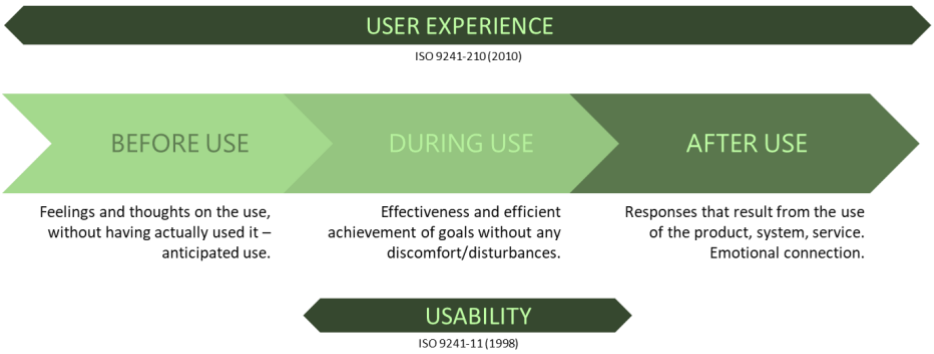


Figure 1 - Usability Standards [source: Franzreb and Franzreb, 2016]

Even though the standards and literature provide a wide range of Usability dimensions and metrics, it is also suggested to complement the assessment with qualitatively evaluation. Qualitative research methods applied to the usability evaluation leverage small size sample of subjects, to collect information and a deep understanding of the most relevant usability issues of the system. This has

become a guideline widely accepted and adopted, thanks to the study of Nielsen (2012), that showed that small samples of end-users, in particular about 5 subjects for usability tests and 20 subjects for quantitative studies, are enough to get the great part of the usability issues of a system (Nielsen, 2012). Nevertheless, over the sample size, it is important that a Usability assessment guarantees the **representativeness of the real target** and the **iteration of the assessment** along the design and development **process**.

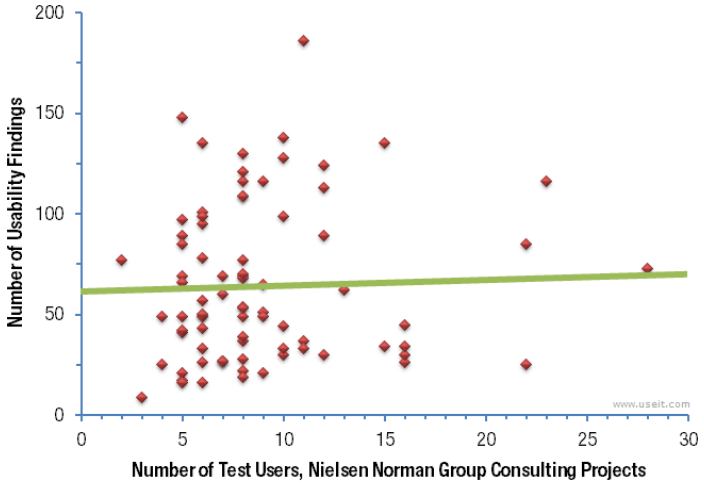


Figure 2 – Nielsen chart showing the distribution of usability findings and user sample size (Nielsen, 2012)

According to this background, the VISCA dashboard design optimization and test has been conducted in continuity with previous activities[5]. Further activities, object of the present document, have been the following:

- **UI optimization** based on the results and recommendations gathered from previous evaluation activities and project review [6]
- **Design review with direct users** (qualitative discussion to collect feedback)
- **Usability inspection** with a wider sample of potential users (e-Worksop)

In the next sections, details about methodology and outputs of each step are described.

2.1 UI Optimization of the VISCA DSS design

A wide range of hints on useful improvement of the intermediate version of the VISCA dashboard have been collected both from the deliverable 4.6 and the Mid Term Review. The highlighted issues have

[5] Deliverable D4.6: Main Barriers and Solutions found on the DSS application.
[6] General Project Review Consolidated Report, 23/04/2020.

been object of redesign. Per each weak point some improvements have been identified, discussed from a technical point of view and sketched, in order to be validated with the project end- users.

In the follows, the most **relevant design recommendations** are **collected and then visualized in static mock-up** that enabled the further discussion and validation with the end-users.

SOLUTIONS TO DECREASE THE GENERAL COMPLEXITY OF THE UI (

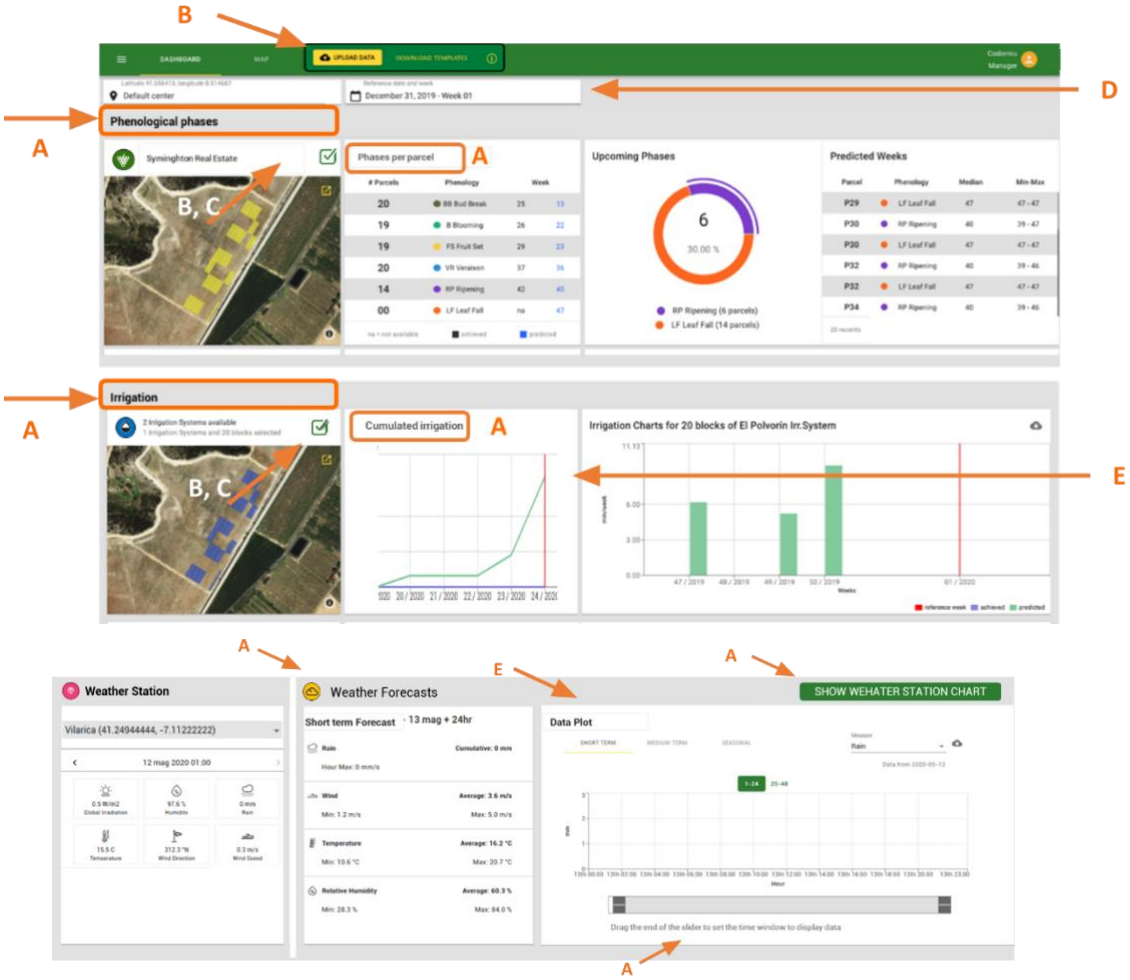


Figure 3):

- **A.** "**Speak more**": add titles for non-described boxes, refine labels of the commands, make more readable the items in the lists. Provide feedback on errors and guidance to recover.
- **B.** Facilitate **procedures**: highlighting the main buttons that enable the core actions (Upload data), facilitate the use of the lists, make core buttons more visible and clearer.
- **C.** Make the **maps** more readable and actionable: make the navigation commands near the objects, organize better the icons, improve the interaction.

D. **Declutter** what introduce confusion: 2 calendars are too many. The higher is enough to control all the related components.

E. Improve the **data visualization**: provide relevant missing data (e.g. the Cumulated irrigation chart) and improve the micro-copy and description of sections and charts.

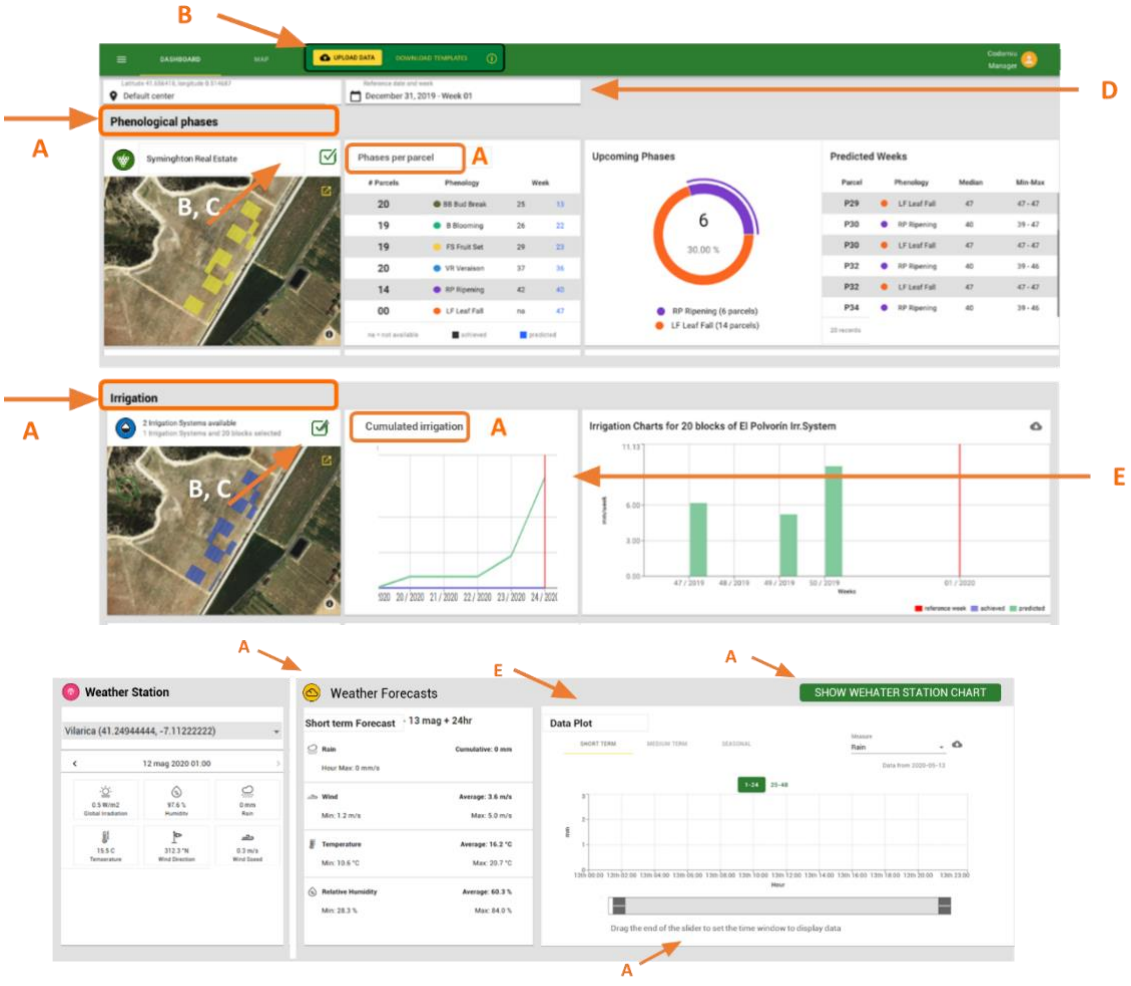


Figure 3 – UI optimization proposed on the main screen of the dashboard

SOLUTIONS TO IMPROVE THE SPATIAL VISUALIZATION:

- Fix and add interactions with the **mini-maps**
- Make clearer and visible the **commands** enabling the interactions with the mini-maps (Figure 4)
- Tide up the **icons**, collect the buttons to manage the visualization on the map, occupying only one and the same part of it. Keep consistent the position of icons.
    - Avoid using the company letter to indicates the vineyard, and provide the extended name close to the mini-map, strengthen by a descriptive icon).

  - The icon of a pencil it's usually applied for editing features. Better to use icons that recall the selection actions (e.g. flagged option ☑).
- Provide the **tooltips** to explain the icons (e.g. "Select the vineyard or parcel" would describe the correspondent icons)
- Enable to **click** the whole mini-map-header to open the parcels list.
- Allow **selection** from mini-map (click, click with Ctrl like windows explorer to select multiple parcel)
- Allow to **ZOOM** the map, not to pan to avoid that the end user will move to a location different than the selected one.
- Arrange geographic elements and commands **nearby the map** (Figure 5).

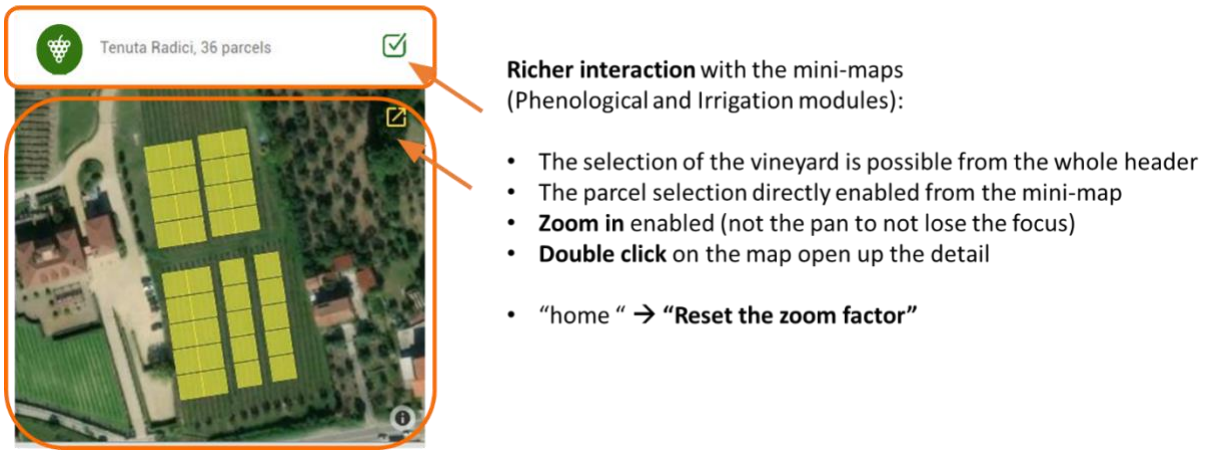


Figure 4 – Optimization proposed on mini-maps (Phenology and Irrigation module)

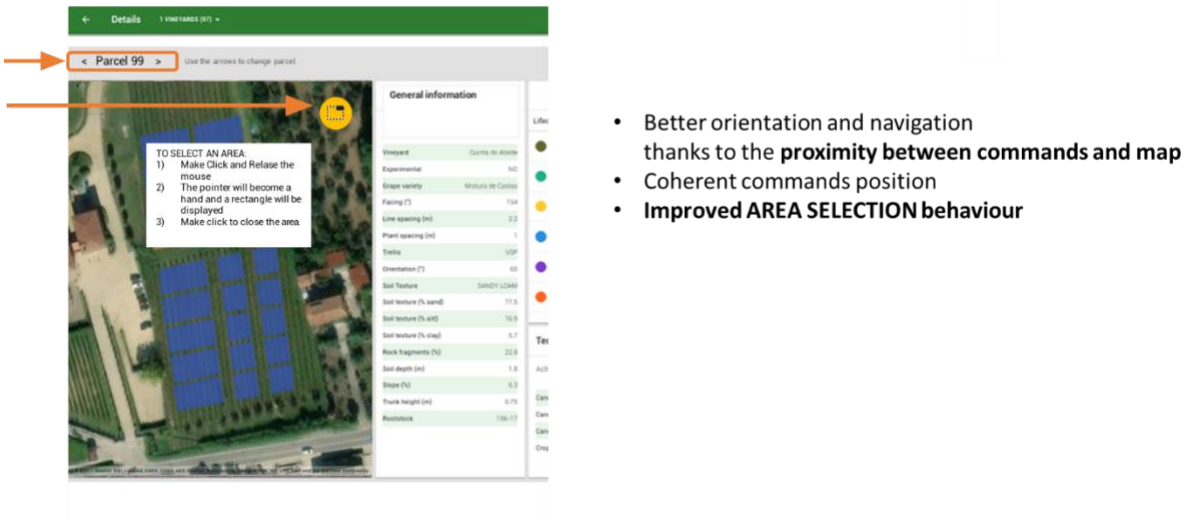


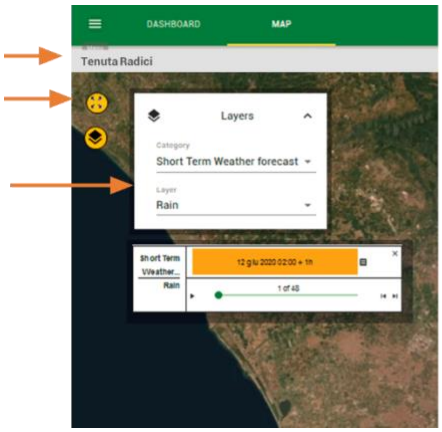
Figure 5 – Optimization proposed on mini-maps (Detail section)

In the MAP-VIEW (Figure 7):

- Put the Icon of the Weather Station near the weather station Label (i.e. widget title) to link the data and its position in the map.
  - Put the same icon (pink one) the same in all the maps
  - Make the icon style uniform and well visible throughout the zoom levels. Adopt the same semantic of the weather station: high contrast icon with solid filled round shape with a white icon.
  - Change the icon of the yellow pin to have a pin with inside the icon of a weather forecast. The icon of the pop-up should be the same of the icon in the map.
- To spot the Vineyard icons a higher zoom factor is required. Better to set a different default zoom factor as a default.
- Substitute the prompt "set centre here" with "**Set the weather forecast location here**" otherwise it is not understandable that the pin controls the weather forecast location (Figure 6).

Figure 6 – Labeling and wording optimization in the Map view

- Ensure the **proximity** among elements in the map, putting the Layer widget closer to the related command.
- Keep the widgets active so that, when the user enters the map, there are **Call to Actions** and features ready to be used, otherwise it is very difficult to get some value from it. Moreover, for visual consistency, better to make the Widget icon coherent.
- Amend the erroneous use of the home icon for the command that reset the zoom of the map!



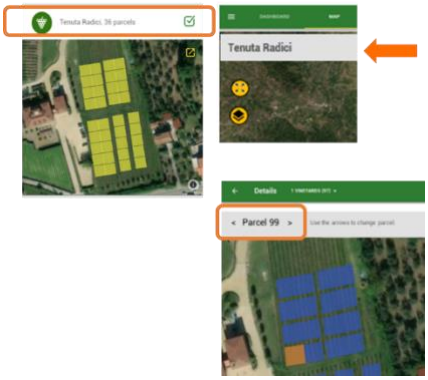
- The **proximity** between commands and object they control, to improve the **readability**.
- Proactivity: layer selection already open to facilitate the user to use this section
- Reset zoom made more **clear and visible**
- The UI objects keep being floating so you can **adapt the visualization** to your preferences and needs.
- Clearer commands:

home → "**Set the weather forecast location here**"

Figure 7 – Map view improvements

SOLUTIONS TO IMPROVE THE NAVIGATION:

- Always indicate the spatial reference selected
- Repeat where useful the location name or the current visualization
- Use extended name



SOLUTIONS TO IMPROVE THE MOBILE EXPERIENCE:

In order to optimize the VISCA dashboard features for the mobile use, a selection of the most relevant features for in-field activities has been proposed (Figure 8):

- NO data input module
- NO charts
- NO extended map

In addition, to facilitate the mobile interaction with maps, conventional gestures are allowed:

- one finger to scroll the page
- two fingers to explore the map

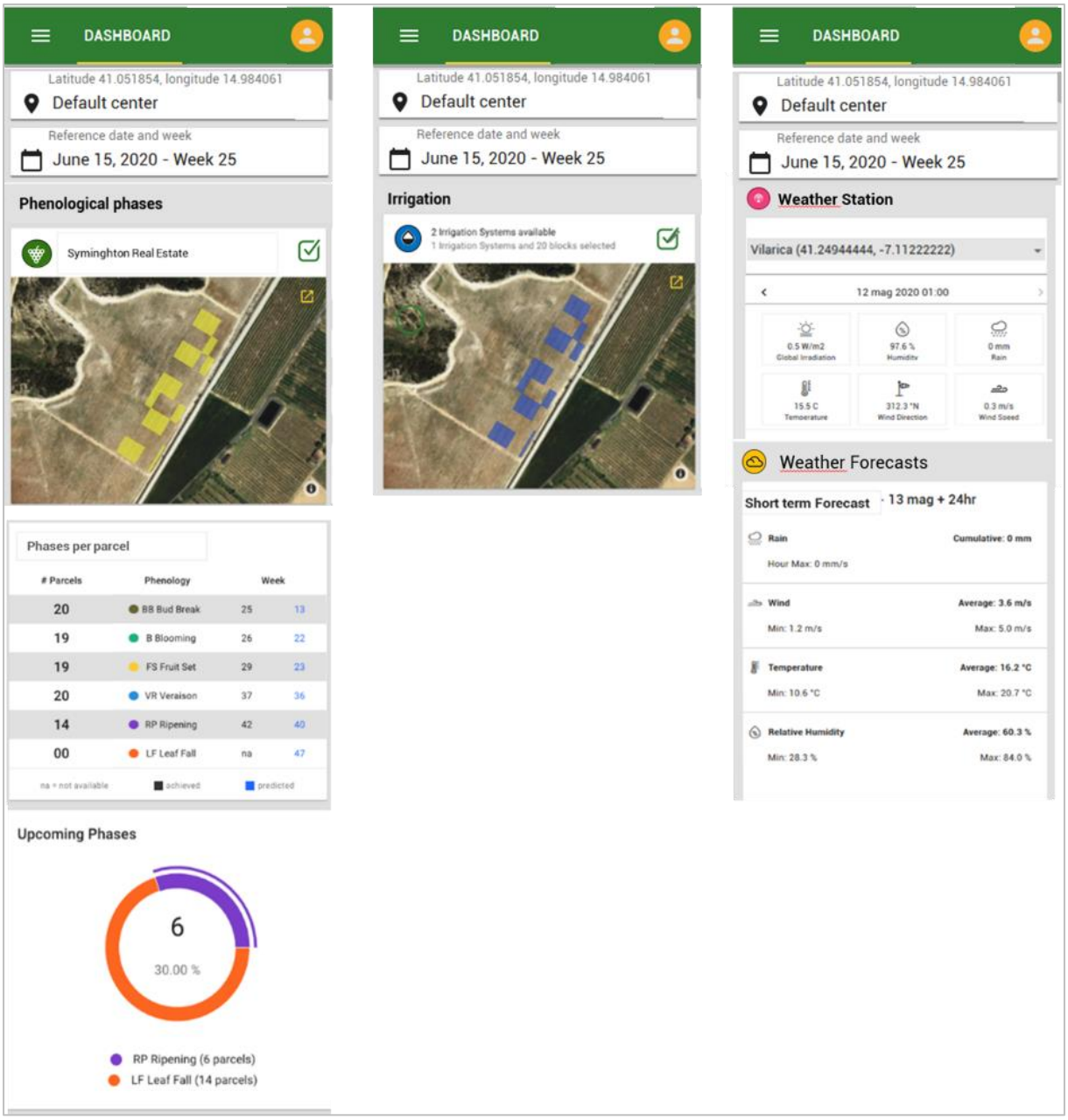


Figure 8 – Mobile adaptation of the VISCA Dashboard

SOLUTIONS TO FACILITATE THE MANUAL INPUT:

- Improve the affordance and priority of commands (Figure 9)
- Give more emphasis to the upload button and provide the supporting command with less weight, following conventions of very common procedures, such as the log-in: the main action is the most visible and the supporting functions are presented with a different visual weight but very well related to the main action. The elements prioritized by their appearance need

also to be grouped to make them more recognizable: a box will strengthen the connection between them.

- Provide the direct link to the user-guide to support better the use in this core procedure
- Describe all the elements with tooltips that do not repeat the label but explain the result of the action on the commands.

Figure 9 – Manual input module redesign

- To prevent the unwanted log-out, move the command in the side menu (Figure 10)

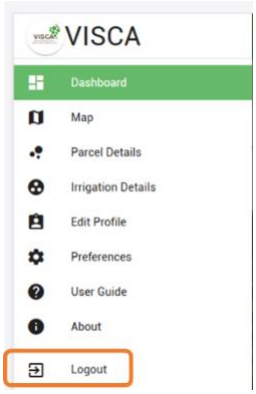


Figure 10 – Log-out improvement

2.2 Design review with direct users

The definition of design recommendations useful to solve the reported and observed issues was followed by a **technical review**, to guarantee the feasibility and the compatibility of solutions with the running prototype. After that, the suggested improvements were visualized in a **static mock-up** (print screens in the previous subsections). Providing a visual support to explain the design recommendation is a fundamental design best-practice. **Visual supports a wide range of activities**, all beneficial to the final result:

- A visual mock-up enables the interaction both with technician and final-users to **collect evaluation and feedback**, that are core part of an effective design and development process.
- It **makes ideas more comprehensible** in their content and impacts, encouraging reflection and facilitating further decisions.
- A mock-up is a quicker **communication device**: to see and interact with a visual concept or prototype is easier than read a document with narrative descriptions.
- It is very **easy to amend**, improvements and changes can be tested in many different variants with no costs or risk to affect the current version of the system.

On this base, the visual mock-up of the improvements of the VISCA dashboard was proposed to the project end-users for a discussion and feedback collection, before to implement them. The **design review of the optimization** was carried out remotely in June 2020, involving the VISCA end-users (6 people), that were shown a presentation of the improvements of the VISCA dashboard

and invited to provide their feedback in the discussion and by replying to a set of questions, integrating the discussion with the instant polls to collect and validate the users feedback[7].

The discussion has been very useful to collect expected obstacle and risks to be timely addressed, such as possible impacts on the production software environment or specific usage pattern such as the very scares usage of the Map view.

The discussion allowed to point out some details to fix, such as the **units of measure** not always clear or available as well as the possibility to change the time on the weather forecast widget. Finally, relevant further implementations were suggested, such as **integration of data automation** where possible (weather station done, irrigation ongoing for SYM) to facilitate data ingestion and integration with existing systems.

After the discussion, the UI improvements suggested were rated by the end-users on a scale ranging from 1- Absolutely inappropriate to 7 - Absolutely appropriate.

- **DASHBOARD MAIN MODULES** (**Error! Reference source not found.**Figure 11): the general complexity of the main modules of the dashboard is well addressed by the improvements suggested. To improve the readability and add relevant information, such as the chart on Cumulated irrigation exploit better the room and the attentive resources of the users.
- **UX/UI IMPROVEMENTS** (Figure 11): the proposals concerning the UI and interaction have collected positive feedback. The additional interaction on mini-maps, the user guidance for the manual input and the mobile version simplified for in-field usage collected positive feedbacks. The general review of the micro-copy and icons as visual hook allows to identify better the main modules.

[7] To integrate instant polls into presentations the tool Mentimeter was used - www.mentimeter.com

CONSOLIDATION

Please rate the proposed improvements on the Spatial visualization.

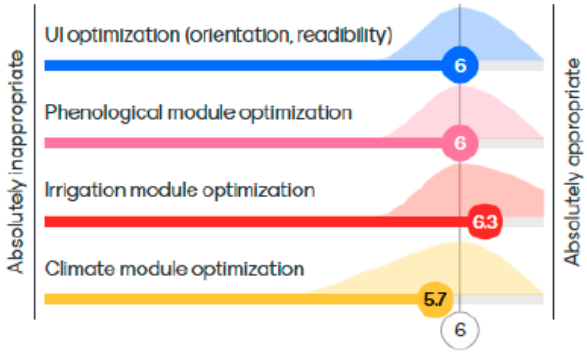


Figure 1 - Design review with end-users – Main modules improvements

Please rate the proposed improvements on the UX/UI optimization.

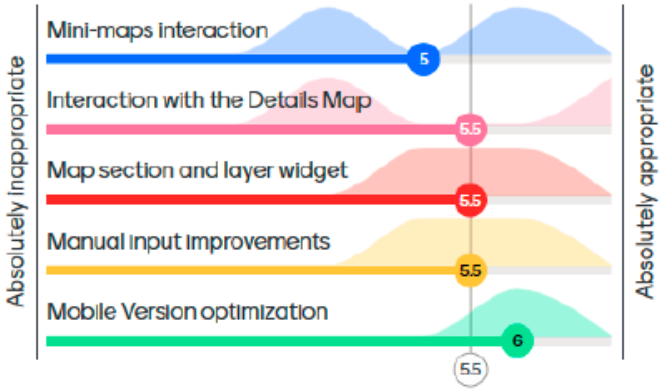


Figure 11 – Design review with end-users – UX UI improvements

3 Remote usability inspection with a wider sample

After the end-user feedback and validation, the improvements on VISCA dashboard have been implemented accordingly. The updated version of the solution was the subject of a further iteration that allowed to introduce the dashboard to a wider and heterogenous audience of external actors, invited to participate to an e-Workshop, held in September 2020.

The workshop aimed at introducing the ICT innovation for the agri-food sector and in VISCA dashboard in particular, that were presented in a live-demo that allowed to enter in detail of all the functionalities and features. The live demo has worked as a system walkthrough finalized to perform a usability inspection. An ad-hoc survey has been designed and distributed via Mentimeter, making the live demo interactive and collect user feedback on understandability of the general layout, quality and readability of the provided information and applicability and utility in real contexts. The 18 questions of the survey have been grouped in 6 sections, submitted during the walkthrough, in relation to the modules/feature presented.

In the following, the sample and the collected feedback are described in detail.

3.1 The remote sample

The walkthrough and the usability inspection were attended by 52 subjects, voluntary attendees, invited by the consortium partners directly and indirectly via social media. The most part of the sample was composed by scientific community representatives (56%) and domain professionals (17%) (Figure 12), coming from Europe, mainly (Figure 13), of quite mature age and not too unbalanced in terms of gender (Figure 14).

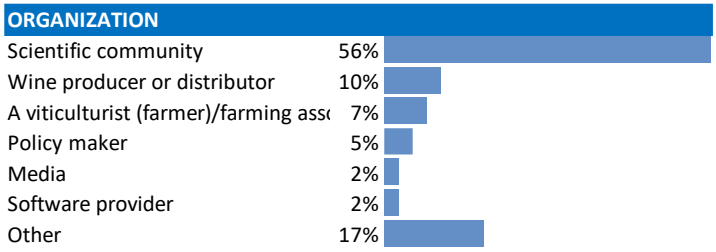


Figure 12 – Sample composition

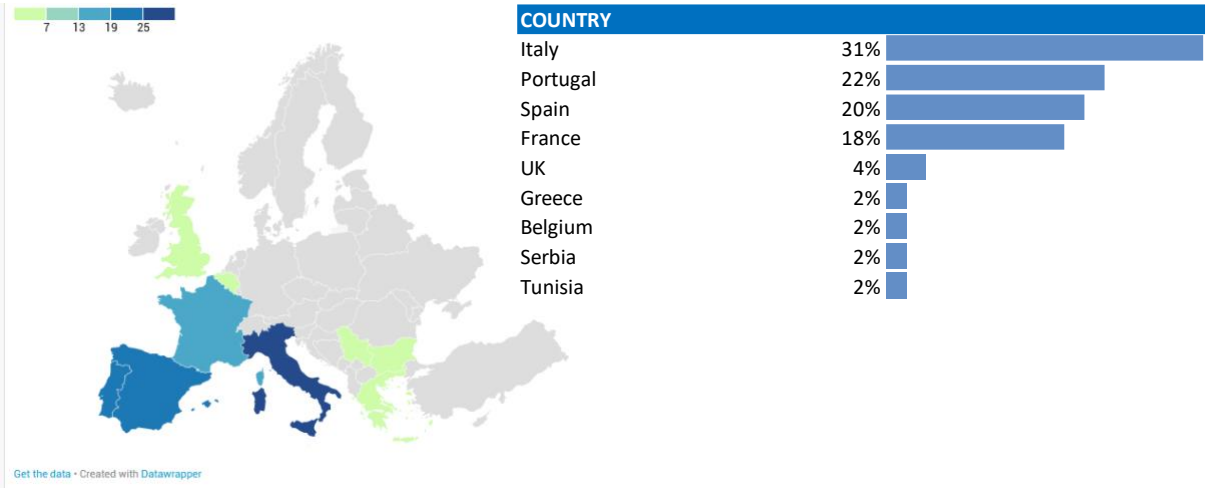


Figure 13 – Geographical distribution of the sample

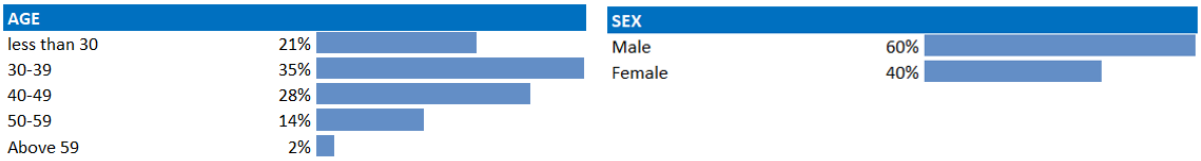


Figure 14 – Demographics

3.2 The results of the remote usability inspection

VISCA has been evaluated by a sample balanced concerning the familiarity with Decision Support Systems (DSS) for the specific domain (Figure 15). Similarly, the sample is used to receive weather data from different sources, in majority represented by owned weather stations (Figure 16).

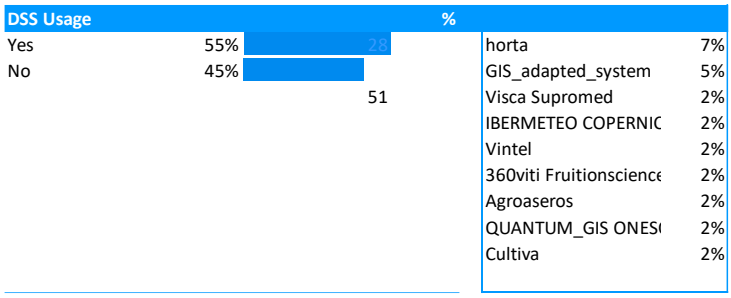


Figure 15 – Confidence with DSS

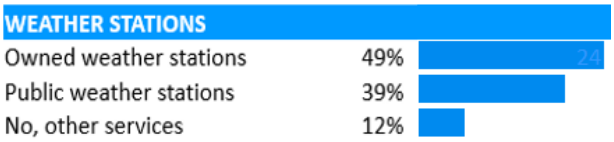
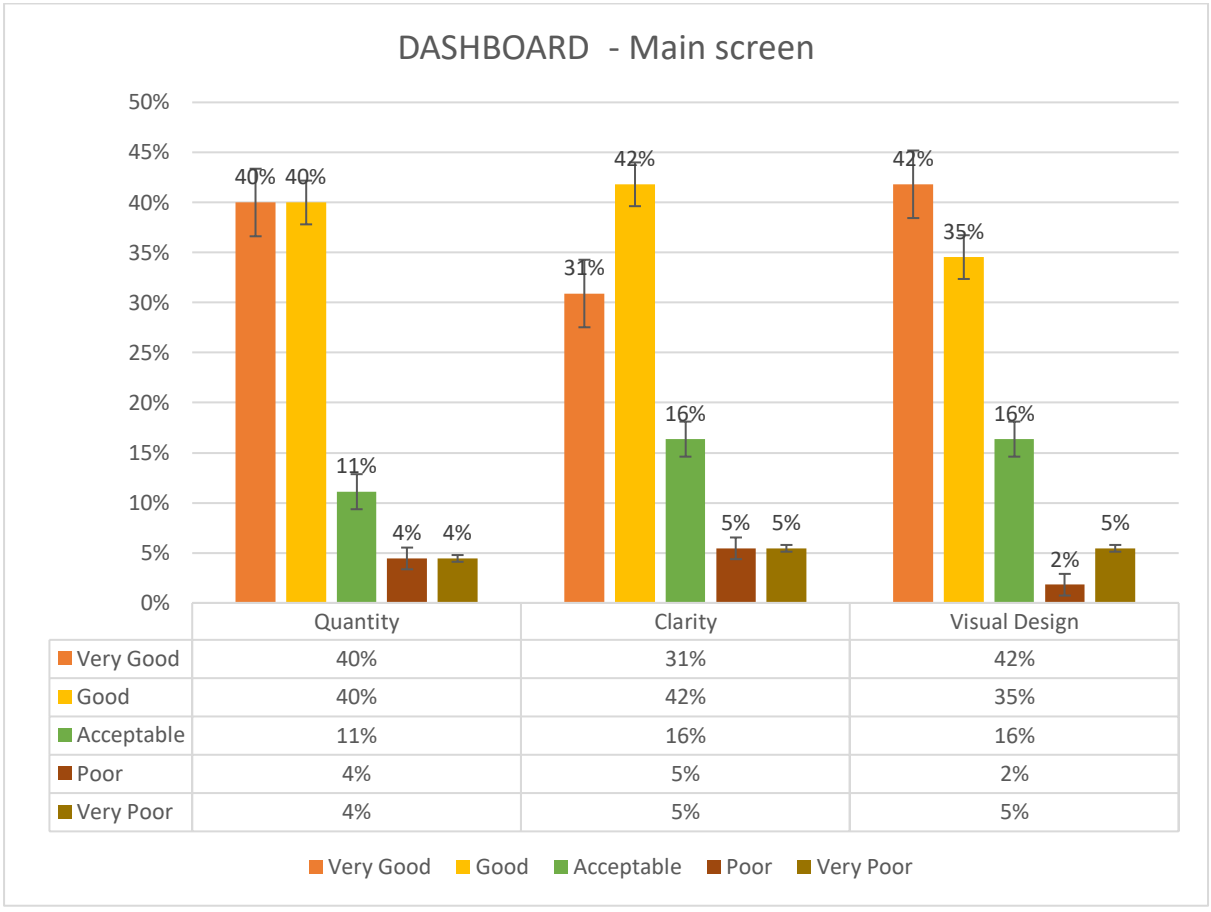


Figure 16 – Weather data sources

MAIN SCREEN

The general evaluation of the VISCA dashboards is positive. Asked to provide a feedback on QUANTITY of information (the amount of displayed data and values, in terms of perceived density, redundancy or gaps), CLARITY (the understandability of descriptions of data and their relationship through text, labels, details) and VISUAL DESIGN (the layout and graphic solutions applied), the sample has expressed very positive feedback (Figure 17), evaluating easy also the starting operations such as the parcel selection.

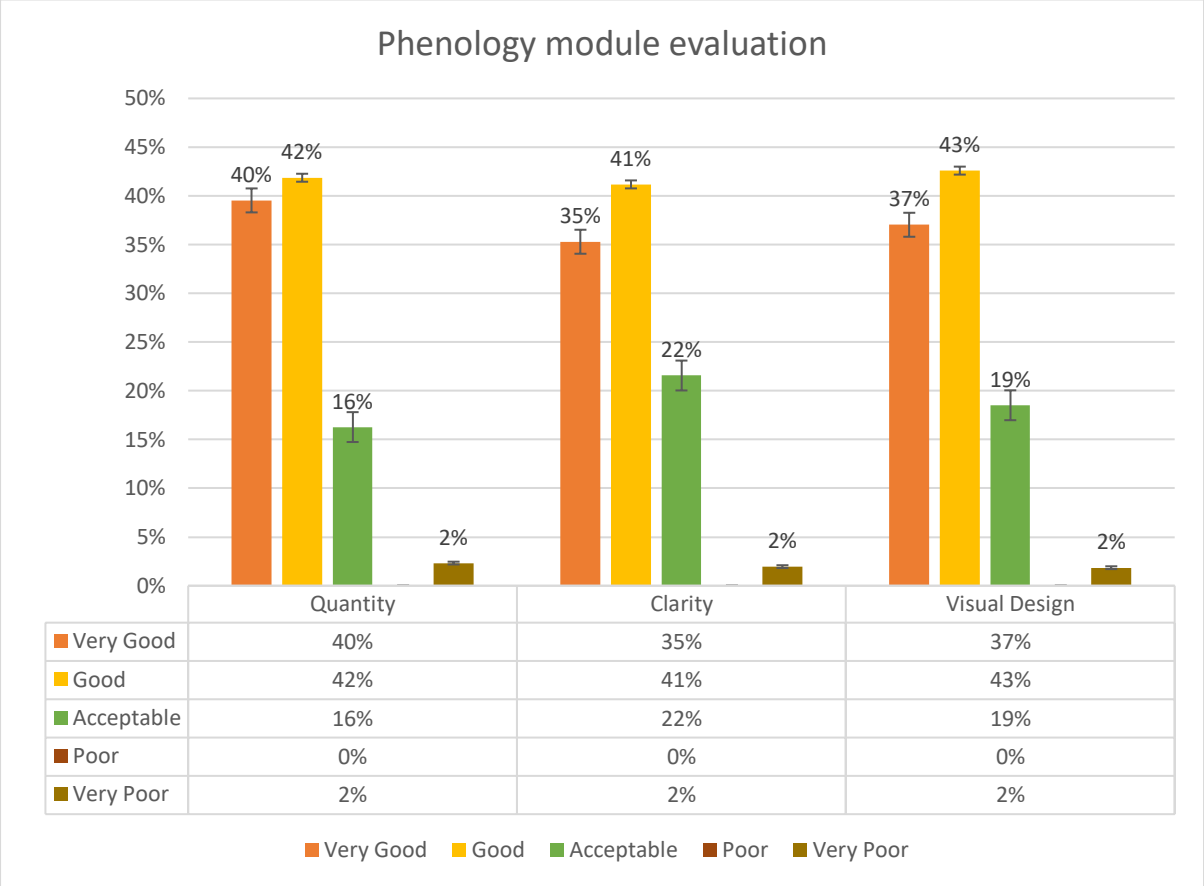


	Quantity	Clarity	Visual Design
Very Good	40%	31%	42%
Good	40%	42%	35%
Acceptable	11%	16%	16%
Poor	4%	5%	2%
Very Poor	4%	5%	5%

Figure 17 – VISCA DSS Quantity of information, Clarity, and Visual design

PHENOLOGY MODULE

Each module of the dashboard has been assessed and rated on the same variables, Quantity of information, Clarity, and Visual design. Concerning the phenological module, the three dimensions receives very satisfactory rates (Figure 18).



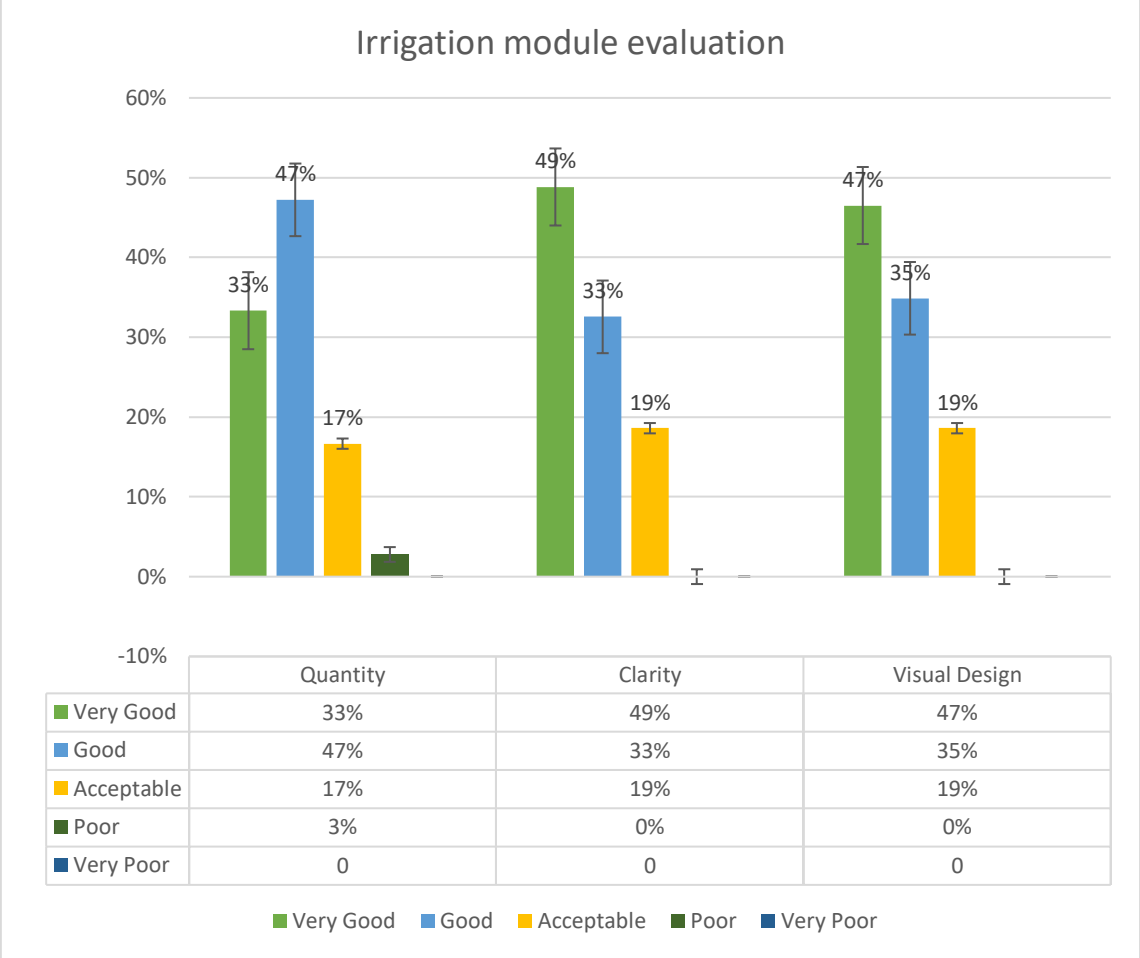
	Quantity	Clarity	Visual Design
Very Good	40%	35%	37%
Good	42%	41%	43%
Acceptable	16%	22%	19%
Poor	0%	0%	0%
Very Poor	2%	2%	2%

Figure 18 – Phenology module evaluation

Asked to rank the information provided and visualized by the phenological module, responders indicated the mini-map as the component that need for additional improvements, even the spatial visualization always available is relevant (Figure 27 in Annex 2). The level of details on the parcel sections has also be analysed and assessed. It is relevant to highlight that the relevance of this section in terms of decision support collect exclusively positive rates (Figure 28 in Annex 2).

IRRIGATION MODULE

The irrigation module, redesigned according the last iteration received even better evaluations, resulting the information provided very clear and well designed. No negative remarks have been raised (Figure 19) and judged very positive the impact of this module on the decisions that the end-user face with (Figure 30 in Annex 2).



	Quantity	Clarity	Visual Design
Very Good	33%	49%	47%
Good	47%	33%	35%
Acceptable	17%	19%	19%
Poor	3%	0%	0%
Very Poor	0	0	0

Figure 19 - Irrigation module evaluation

CLIMATE MODULE

Regarding the Climate module, in addition to the validation of the end-user partners, the usability inspection confirms the effectiveness of the changes. The rated dimensions (quantity of information, clarity and visual design) received full positive assessment. Also, in this case no remarks have been raised (Figure 20).

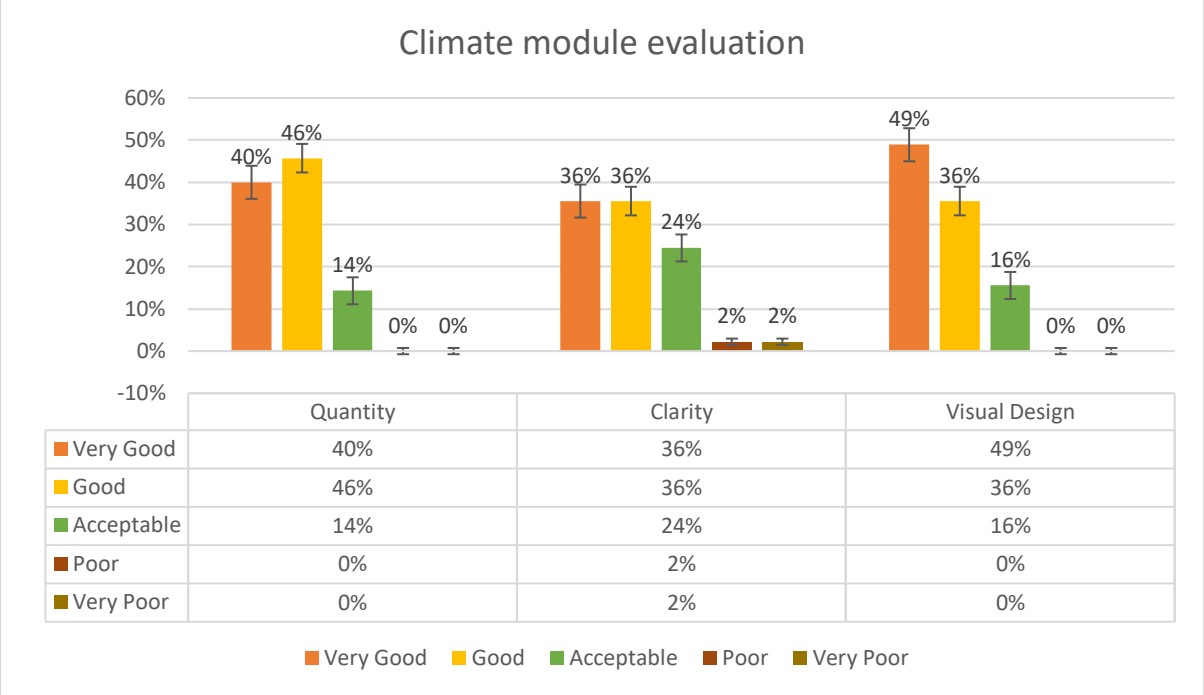
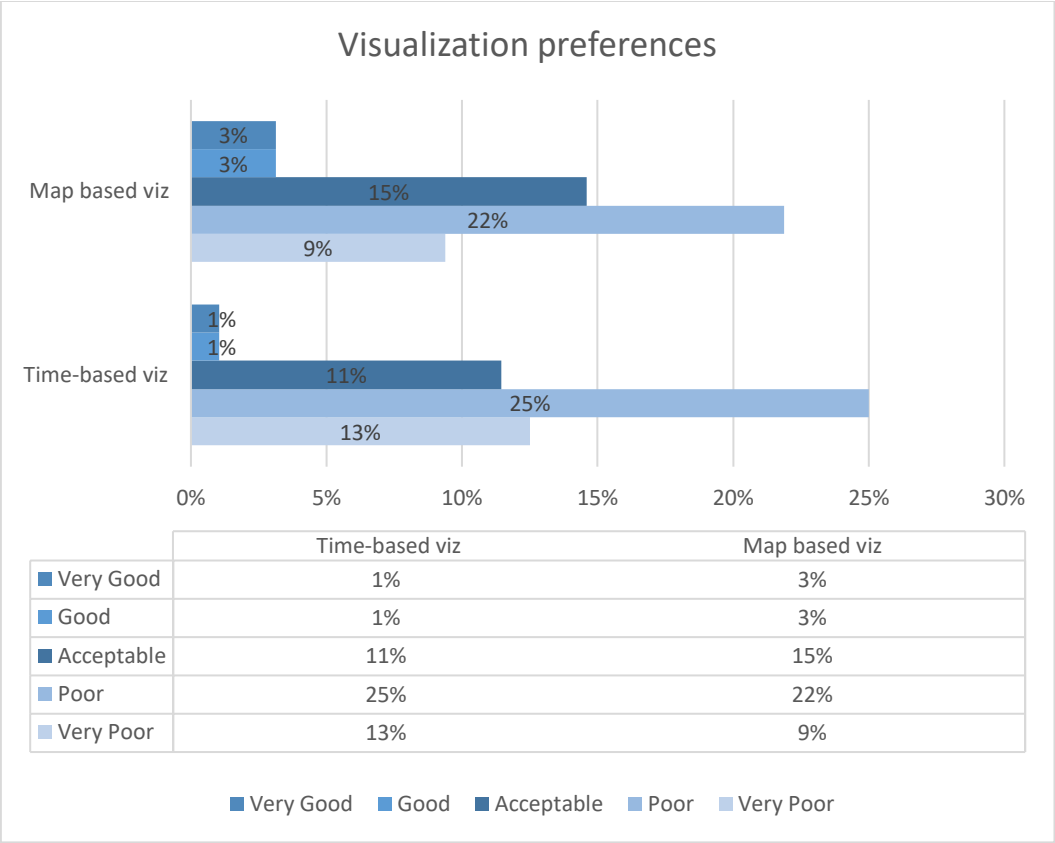


Figure 20 - Climate module evaluation

OVERALL EVALUATION

In general, the usability inspection resulted in a very positive evaluation of the VISCA Dashboard, improved in terms of data and visualization offered.

The workshop confirms the value of the design solutions introduced within the last iteration, especially to improve the data visualization and the mapping of the data with the real context they refer to. The interaction with data on the maps can be further improved. Fundamental support in this kind of applications, the interactivity of map-based visualization can be enriched to answer operational questions of the vineyard management process. Summarizing: VISCA users prefer the time-based visualization and chart over the spatial data-viz (Figure 22).



	Time-based viz	Map based viz
Very Good	1%	3%
Good	1%	3%
Acceptable	11%	15%
Poor	25%	22%
Very Poor	13%	9%

Figure 21 – Data visualization preferences

Finally, participants were asked to rank for priority each of type of forecasts available on the dashboard. It resulted that phenological forecasts are considered more relevant than others. Concerning the weather forecast, the medium-term forecasts are preferred over others (Figure 23).

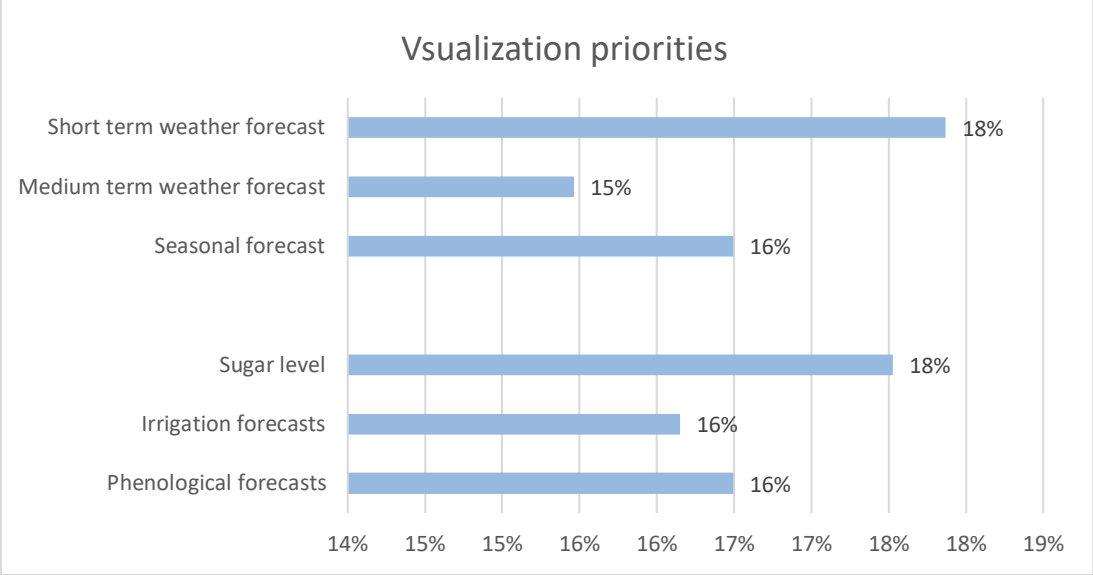


Figure 22 – Prioritization of the available forecasts

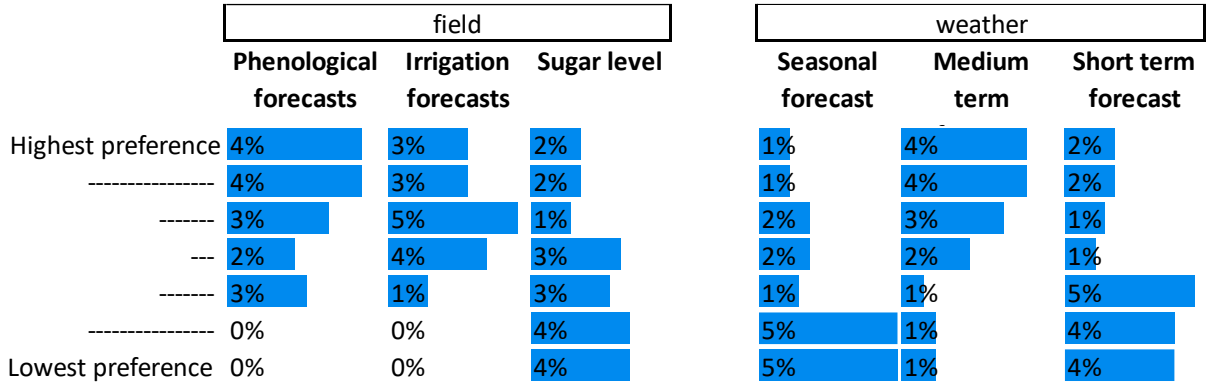


Figure 23 – Visualization preferences per type of information

At the end of the walkthrough, an overall evaluation of the current version of the system has been collected, in coherence with the previous evaluation sessions, by the System Usability Scale (SUS) (Question 21 in the Annex 1). The SUS is a 10 items scale that addresses the core Usability variables identified by the ISO 9241-210 and other dimensions such as the learnability and satisfaction. The SUS scale is generally used after the respondent has had an opportunity to use the system under evaluation. The result ranges from 0 to 100, and A SUS score above a 68 would be considered above average (Muddimer et al., 2012).

The VISCA overall evaluation measured with the SUS received encouraging scores (Figure 24): the sample evaluated the usability of the system very positively. Considering the upper poles of the Likert scale collectively, they collect the 84% of the sample. The average SUS score is 68, 6 over 100.

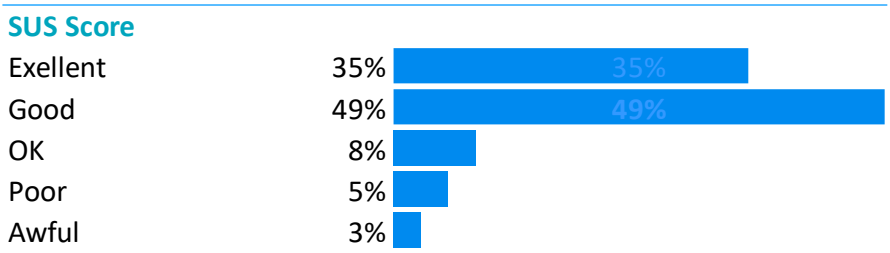


Figure 24 – SUS Score distribution

4 Final considerations on potential and limitations of VISCA DSS

The iterations of design and evaluation phases focusing the usability of the VISCA dashboard have allowed to significantly optimize various aspects of the system, from an end-user perspective. The longitudinal assessments performed over the project confirm the VISCA's potential to offer timely information and support decisions to the various operational aspects of vineyard management. This is confirmed by the data of interest collected in the last evaluation session of the system with external users, that – it is relevant to highlight it – represent different types of job profiles and at the end applicative perspectives. The whole sample of professionals attending the e-workshop confirmed the interest in keep testing or replicating the VISCA climate services in their organization /job, with a wide openness to the model of applicability: as a stand-alone system and integrated with other system in use (Figure 25).

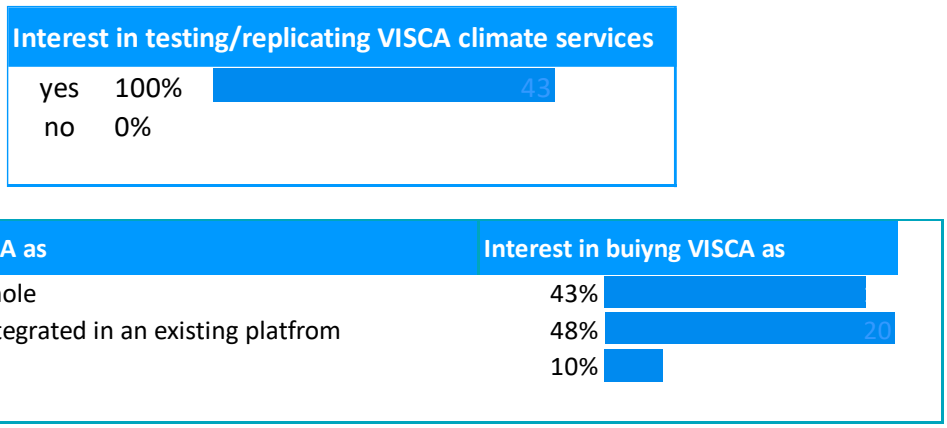


Figure 25 – Interest in using VISCA

The VISCA DSS in particular can impact on the adaptation strategies that vineyard managers can pursue (Figure 26).

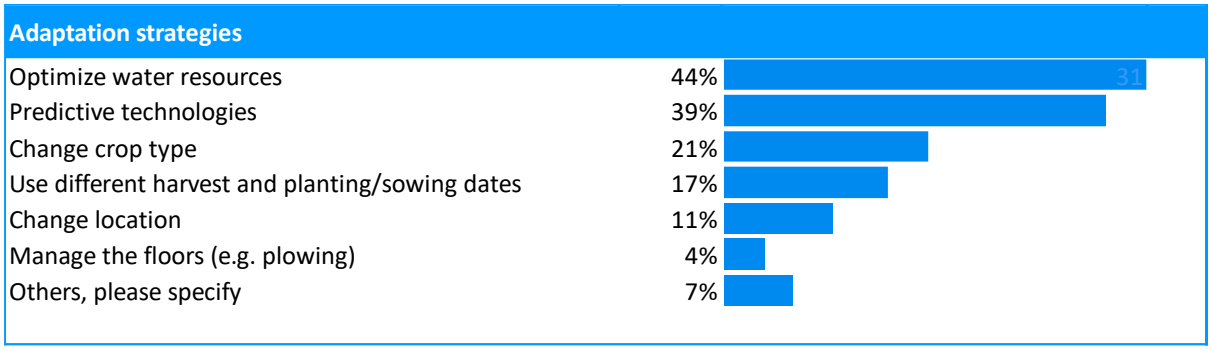


Figure 26 – Strategies that VISCA can support

Of course the system can be improved and refined to fill the gap with data and usage. Asked about missing data that would be useful to integarte in the DSS, the respondants suggested diffent, serving for various purposes, both operational and strategic. The following table report the categories suggested (Table 1). In bold the occurrence reported by different users.

MISSING ESSENTIAL FEATURES (to be further analysed)			
FORECASTS	**DATA**	**DECISION SUPPORT**	**Other**
- Sub-seasonal - High-Resolution seasonal forecast - **Disease predictions** - Long-term projections - Baseline climate normal	- Historical climate data - Economic impact - Foliar area - Leaf wetness - Presence of pests - Intercepted radiation - Presence of diseases - **Biodiversity data** - **Soil data**	- Risk management - Automatic alerts on weather - Diseases alerts - **Suggestions on treatments**	- LAI canopy - Forecast tutorial - Mixing the Modules

Table 1 – Missing features /data

5 References

[1] Bano, M., Zowghi,D. A systematic review on the relationship between user involvement and system success. Information and Software Technology, Vol. 58, 2015, pp. 148-169.

[2] Chammas, A., Quaresma, M., Mont'Alvão, C. A Closer Look On The User Centred Design. 6th International Conference on Applied Human Factors and Ergonomics (AHFE 2015) and the Affiliated Conferences, AHFE 2015.

[3] Coursaris C.K. and Kim D.J. A Meta-Analytical Review of Empirical Mobile Usability Studies. J. Usability Studies 6, 3, Article 11 (2011), 55 pages.

[4] Franzreb, D and Franzreb P. Designing with Human Centered Usability Standards, UXBooth, 2016. Retrieved from: http://www.uxbooth.com/articles/designing-usability-standards November, 2020.

[5] ISO 9241-210:2010. Ergonomics of human-system interaction — Part 210: Human-centred design for interactive systems.

[6] Lowdermilk, T. (2013). User-Centered Design. O'Really Media.

[7] Muddimer, A., Peres, S. C., & McLellan, S. (2012). The effect of experience on System Usability Scale ratings. *Journal of Usability Studies*, 7(2), 56–67. Retrieved from http://uxpajournal.org/the-effect-of-experience-on-system-usability-scale-ratings November, 2020

[8] Nielsen, J. How Many Test Users in a Usability Study? 2012. Retrieved from: https://www.nngroup.com/articles/how-many-test-users November, 2020.

[9] Norman, K.L., Kirakowski, J. (2018). The Wiley Handbook of Human Computer Interaction. John Wiley & Sons.

Annex 1 – Script of questions supporting the Remote usability inspection

WELCOME

Dear attendants, you will be introduced to VISCA dashboard.
The Walkthrough will show you the main functionalities and data visualization solution.

We're **interested in your feedback on the system** in terms of:

- Understandability of the general layout
- Quality and readability of the provided information
- Applicability and utility in real contexts

The questions will be displayed via Go-To Meeting to provide visual support and you'll be able to reply via Mentimeter.
We suggest to use a second browser window see questions and reply option at the same time or – better- a second device (such as a smartphone) to reply via Mentimeter.

1) **Go to** www.menti.com
2) **Type** the code: 88 35 304
3) Provide your feedback and opinions.
   Consider **that there are not correct or incorrect replies**.
   Replies are anonymous.

Thank you!

INTRODUCTION

1) Which type of organization are you representing?
Single choice

- ○ A viticulturist (farmer)/farming association
- ○ Wine producer or distributor
- ○ Agricultural public entity
- ○ Software provider
- ○ Scientific community
- ○ Policy maker
- ○ Media
- ○ Other:

2) In which country are you based?
Open answer _____

3) In what year were you born?

4) Which is your sex?

- ○ Female
- ○ Male

5) Have you ever used a Decision Support System (DSS)?

- ○ Yes
- ○ No

6) If you use/d DSS, can you name which DSS you used/are using?
Otherwise, can you name another software you use to support your decisions?
Open answer _____

7) Does your organization own a weather station?
If not, from where do you obtain the weather data?
Single choice

- ○ Yes
- ○ No, we obtain them from public weather stations
- ○ No, other

VISCA DASHBOARD

8) How do you rate the following aspects of the information provided by the VISCA dashboard?

QUANTITY[8]
CLARITY[9]
VISUAL DESIGN[10]

5-points scale

- ○ Very Good
- ○ Good
- ○ Acceptable
- ○ Poor
- ○ Very Poor

9) How difficult or easy is to select the parcels to be visualized in VISCA dashboard?
5-points scale

- ○ Very difficult
- ○ Difficult
- ○ Acceptable
- ○ Easy
- ○ Very easy

[8] QUANTITY refers to the amount of displayed data and values. To evaluate it, consider the density, redundancy or gaps you perceived.

[9] CLARITY refers to the descriptions of data and their relationship. To evaluate it, consider aspects such as text/labels understandability, clustering, level of details.

[10] VISUAL DESIGN refers to the layout and graphic solutions applied. To evaluate it, consider the spatial arrangement, the perceived tidiness or clutter, the use of the colour, fonts size.

PHENOLOGY

10) How do you rate the following aspects of the information provided in the PHENOLOGICAL section?

QUANTITY	*5-points scale*
CLARITY	○ Very Good
VISUAL DESIGN	○ Good
	○ Acceptable
	○ Poor
	○ Very Poor

11) Among the data visualized in the PHENOLOGICAL section, what do you think is most useful? Rank the blocks from the best to the worst.

Ranking

- Mini-map
- Summary
- Upcoming Phases
- Predicted Weeks

12) How do you rate the parcel details?

QUANTITY	*5-points scale*
RELEVANCE[11]	○ Very Good
VISUAL DESIGN	○ Good
	○ Acceptable
	○ Poor
	○ Very Poor

IRRIGATION

13) How do you rate the following aspects of the information provided in the PHENOLOGICAL section? *

QUANTITY	*5-points scale*
CLARITY	○ Very Good
VISUAL DESIGN	○ Good
	○ Acceptable
	○ Poor
	○ Very Poor

14) Among the data visualized in the IRRIGATION section, what do you think is most useful? Rank the blocks from the best to the worst.

Ranking

- Mini-map
- Cumulated irrigation
- Irrigation chart

[11] RELEVANCE refers to usefulness and capability to support the decision making.

15) How do you rate the irrigation block details?

QUANTITY	*5-points scale*
RELEVANCE[12]	○ Very Good
VISUAL DESIGN	○ Good
	○ Acceptable
	○ Poor
	○ Very Poor

WEATHER FORECASTS

16) How do you rate the following aspects of the information provided in the WEATHER FORECAST section?

QUANTITY	*5-points scale*
CLARITY	○ Very Good
VISUAL DESIGN	○ Good
	○ Acceptable
	○ Poor
	○ Very Poor

17) Which priority do you assign to the different forecasts provided by VISCA? Please, rank the weather forecasts from the most to the less useful.

Ranking

- Short Term Forecast
- Medium Term Forecast
- Seasonal Forecast

MAP BASED VISUALIZATION

18) How difficult or easy is to visualize the MAP layers?

5-points scale

○ Very difficult
○ Difficult
○ Acceptable
○ Easy
○ Very easy

19) Please, rate the types of visualization for weather forecasts provided by VISCA.

- **TIME-BASED VISUALIZATIONS (CHARTS, TABLES)**
- **MAP BASED VISUALIZATIONS (MAP LAYERS, MAP WIDGETS)**
- **SHORT TERM WEATHER FORECAST**
- **SUGAR LEVEL**
- **SEASONAL FORECAST**
- **PHENOLOGICAL FORECASTS**

5-points scale

○ Very Good
○ Good
○ Acceptable
○ Poor
○ Very Poor

[12] RELEVANCE refers to usefulness and capability to support the decision making.

- **IRRIGATION FORECASTS**
- **MEDIUM TERM WEATHER FORECAST**

20) Is there any feature that is missing and would be essential to have?
Open answer _____

OVERALL EVALUATION OF VISCA DASHBOARD

21) Considering what you've learned about it till now, to what extent do you agree with the following statements?

- **I would like to use VISCA frequently.**
- **The system is unnecessarily complex.**
- **The system is easy to use.**
- **To use the system, the support of a technical person is needed.**
- **The various functions in this system are well integrated.**
- **There is too much inconsistency in this system.**
- **I imagine that most colleagues would learn to use this system very quickly.**
- **I find the system very cumbersome to use.**
- **I will feel very confident using the system.**
- **I need to learn a lot of things before I could get going with this system.**

5-points scale
- ○ Strongly disagree
- ○ Disagree Undecided
- ○ Agree
- ○ Strongly Agree

Annex 2 – Additional results of the usability inspections

PHENOLOGY MODULE USERS' EVALUATION

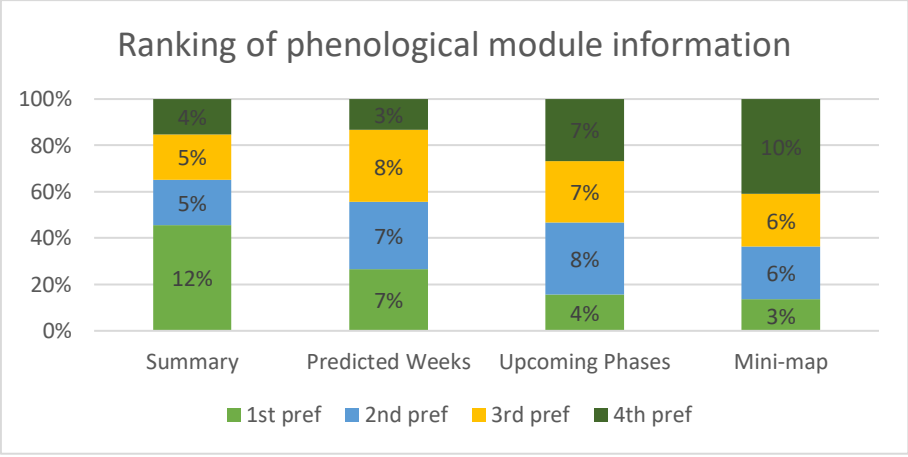
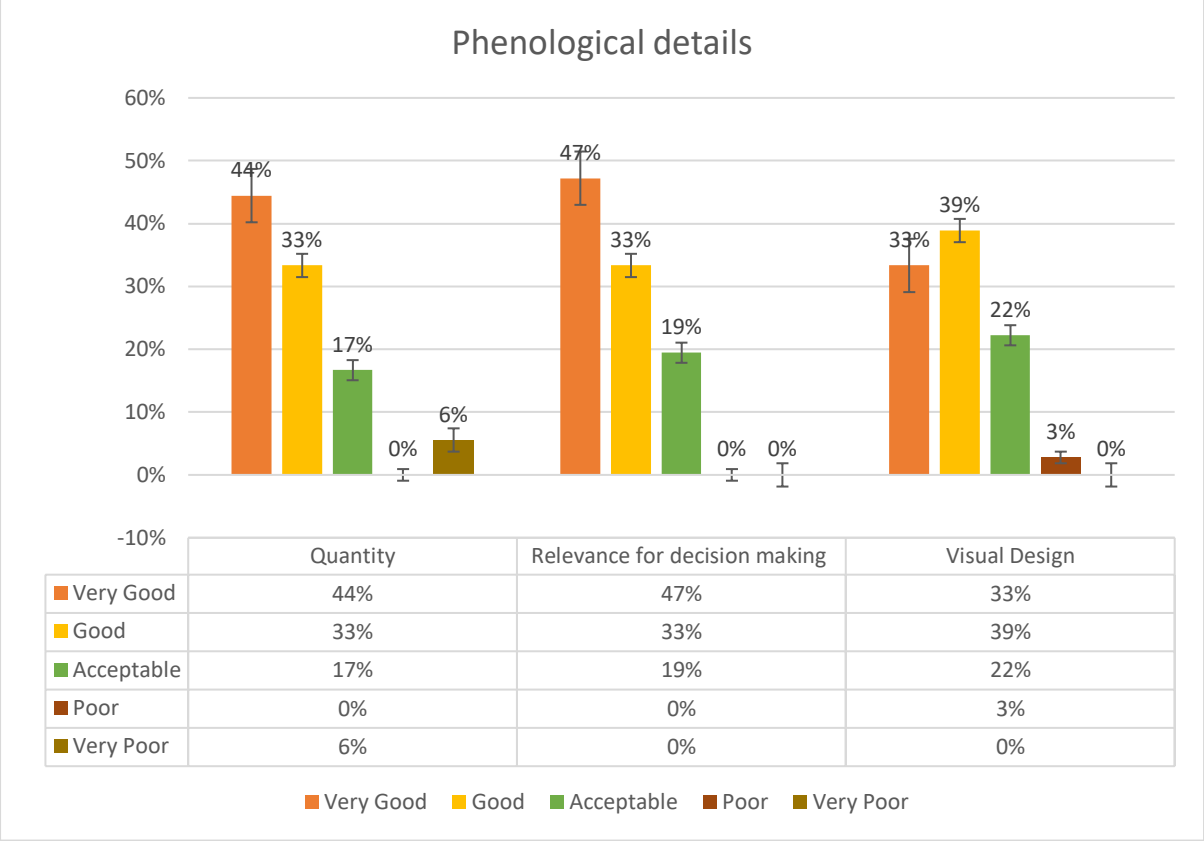


Figure 27 – Ranking of phenological module information



	Quantity	Relevance for decision making	Visual Design
Very Good	44%	47%	33%
Good	33%	33%	39%
Acceptable	17%	19%	22%
Poor	0%	0%	3%
Very Poor	6%	0%	0%

Figure 28 – Phenological details - Quantity of information, relevance for decision making, Visual design

IRRIGATION MODULE USERS' EVALUATION

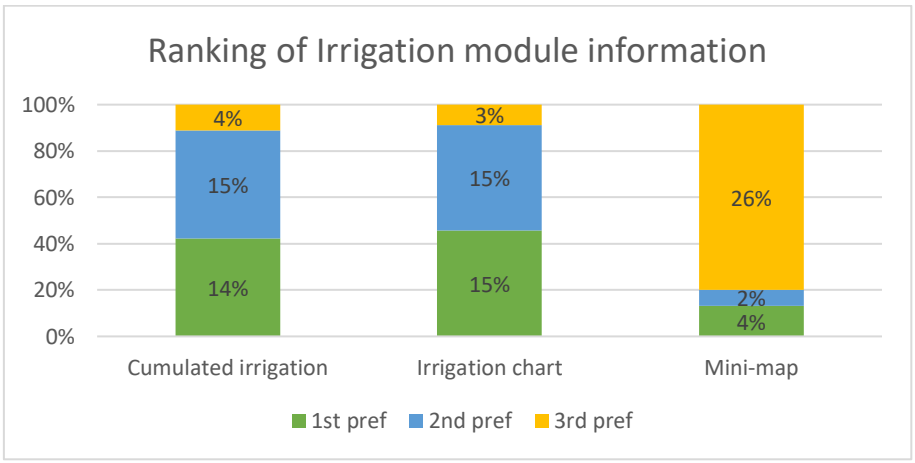
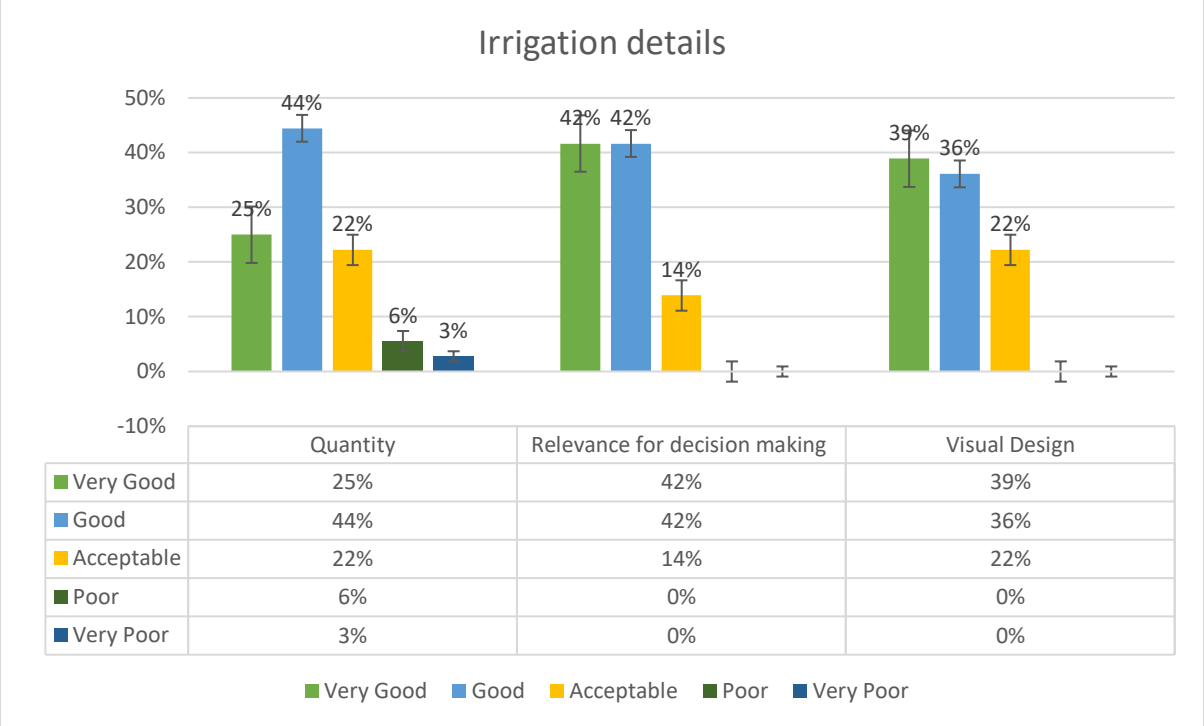


Figure 29 – Ranking of irrigation module information



	Quantity	Relevance for decision making	Visual Design
Very Good	25%	42%	39%
Good	44%	42%	36%
Acceptable	22%	14%	22%
Poor	6%	0%	0%
Very Poor	3%	0%	0%

Figure 30 – Irrigation details - Quantity of information, relevance for decision making, Visual design

CLIMATE MODULE USERS' EVALUATION

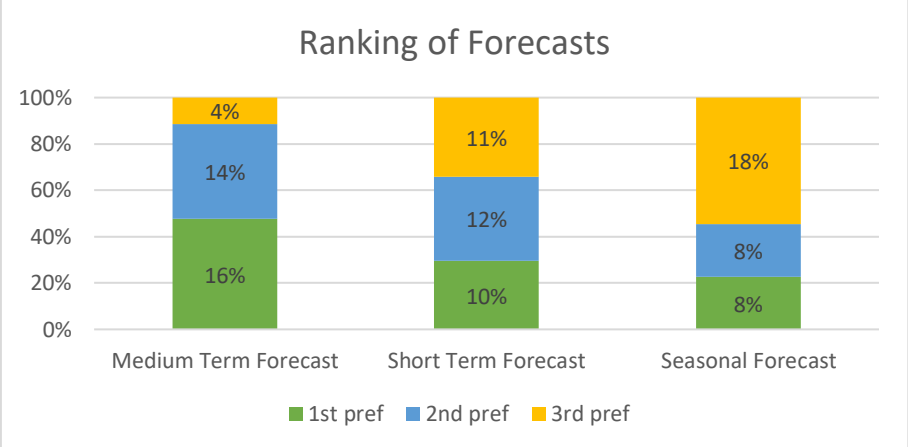


Figure 31 - Ranking of forecast