VISCA

VINEYARDS INTEGRATED SMART CLIMATE APPLICATION

Deliverable 4.7: First preliminary report between research teams (WP2), DSS developers and end-users on the first experiences of the application of the CS-DSS

WP	4	Demonstration	
Task	4.3	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

Document Version	Date	Author	Comments[3]
0.1	11-03-19	Joan Girona (IRTA)	Pre-to-final version shared with MET including the results of 2nd General Meeting
1.0	11-03-19	Josep Maria Solé (MET)	FINAL

Deliverable abstract

After the development of the first version of the VISCA Decision Support System (DSS) application and Web Response, it was presented to the end-users and the rest of VISCA partners in the Second General Meeting in Naples in December 2018, where the first feedback was collected and next steps were defined. DSS will be applied and tested during next season within the established vineyards of the three end-users (winegrowers) in three different regions (Italy, Spain and Portugal). This document summarizes the first feedback collected in the meeting, the suggested improvements proposed by the VISCA partners and the agreed methodology for the DSS evaluation.

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

List of acronyms and abbreviations

BSC	Barcelona Supercomputing Center
CF	Crop Forcing
COD	Codorniu
DSS	Decision Support System
IRTA	Institue of Agrifood Research and Technology
LINKS	LINKS Foundation
MBD	Mastroberardino
MET	Meteosim
NAP	University of Naples
PAB	Project Advisory Board
SV	Symington
SEM	SEMIDE
SYM	Symington
UNAP	University of Naples
UPORTO	University of Porto
WP	Work Package

Contents

1. Document objectives

The objective of this document is to report all those interactions held in the Second General Meeting on Radici Resort[4] between 10th and 12th December of 2018. This objective is threefold:

1) To report the first impressions about the DSS application among end-users and VISCA partners.
2) To report the suggested improvements by end-users and VISCA partners.
3) To define the methodology to test the DSS on the demonstration sites.

2. DSS presentation to VISCA partners

During the 2nd General Meeting, held on Radici Resort, the first version of the VISCA DSS was presented to all partners. On 11th December, Francesco Peciarolo (LINKS) and Claudio Rossi (LINKS) presented the frontend with all included functionalities. End-users gave their feedback and modifications and further improvements were agreed. On 12th December 2018, VISCA DSS was presented to PAB members and feedback was also collected.

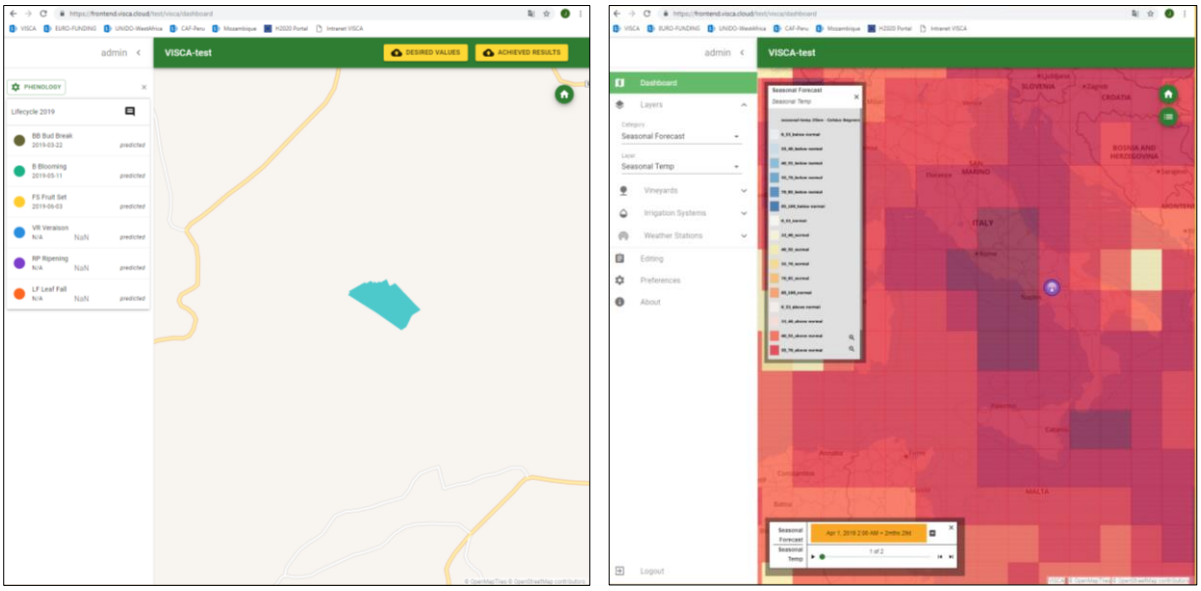

Figure 1. Presentation of first version of the VISCA DSS. Phenological forecast (left) and seasonal forecast (right).

The VISCA DSS has been built by LINKS according to SCRUM principles, consisting in a definition phase (PLAN), a realization phase (DO) and a testing phase (TEST). The definition phase was implemented in collaboration with end-users and involved partners in WP3 (**LINKS**, MET, BSC, COD, IRTA, NAP, MBD, SV, UPORTO, SEM) and WP2 (**BSC**, MET, COD, IRTA, ISMB, NAP, SV, UPORTO) in the sense of the

[4] Radici Resort is located in the Mirabella Eclano comune (Avellino, Italy). In the Mirabella Eclano, where the offices of MBD are located)

analysis of the needed functionalities and outputs for the end users. The results of this analysis can be found reported in D3.1: "End User Requirements". At the same time, the details about the technical specifications of the DSS can be found in D3.2: "Technical specifications".

After the meeting in Radici Resort, LINKS was committed to send the DSS access credentials to all partners for a further evaluation of the first version of DSS.

3. DSS feedback and suggested improvements

The DSS feedback from end-users and VISCA partners was mainly positive, although a few improvements were suggested. End-users requested to reorganize the phenological and irrigation along with the meteorological and climate forecasts in the frontend, so that it can be accessible at the same time (aggregated in a single dashboard) in an easier and effective way. This would ease to end-users to make general decisions integrating all the available information. Other minor improvements regarding the graphics in the platform were suggested.

LINKS team committed to implement the aforementioned requirements in a second version of the DSS Web Application, which will be released to the VISCA partners around May. The impact of the first and second version the DSS will be analyzed in the D4.3 and D4.5.

Besides visualization, DSS usability in making decisions about the considered vineyard management techniques was also discussed. As requested by end-users from the beginning of the project, the DSS is giving recommendations about when to apply Crop Forcing[5] and Shoot Trimming[6] taking in consideration the meteorological forecasts. In the current version of the DSS, the recommendations are being updated accordingly to the meteorological forecast on a daily basis. At this point, end-users suggested that recommendations would be useful to be updated instantaneously and on-demand, instead of daily. Namely, given the desired date for applying a management technique, the DSS would run and give the corresponding predicted effects in the vineyard. This would allow the user to simulate the effect applying the technique on different dates. This requirement raised the first time in the 2nd General Meeting and was not collected in the Deliverable D3.1 ("End-User Requirements"). As including on-demand simulation requires a substantial effort in the models as well as important modifications in the VISCA Service Bus (see Deliverable 3.2), LINKS was not committed to implement this improvement, although it will be evaluated for further version of DSS once its second version is finished in time.

End-users also requested to add other commercial parcels in the DSS (at the moment only experimental parcels are included). This would give an extended information to end-users and would

[5] Crop forcing is based on moving the grape-ripening period from hot summer months to a cooler month later in the growing season. This is achieved by making an additional pruning, stopping the natural cycle of the plant and "forcing" it to restart its cycle later

[6] Shoot trimming is a post-veraison summer pruning techniques for vineyards to decrease leaf to fruit yield ratio and to slow down carbon partitioning to berries and therefore sugar accumulation (responsible of the increase in alcohol concentration in the wine). This technique is tested in the Italian Demonstration site.

improve the demonstration phase with more results. For this, end-users committed to provide the required information of additional commercial parcels to be ready for the next second version of the DSS.

Some other minor improvements and corrections were collected. They are listed as follows:

- It was suggested to trigger an alert when a plot reaches water stress[7]. This would be preferable notified to the users by email. This was considered as an optional improvement, but not essential.
- The phenological forecast distinguished between different states: *Bud-Break, Blooming, Fruit Set, Veraison, Harvest* and *Leaf Fall*. It was proposed to rename *Harvest* for *Ripening*, because Harvest is not actually a phenological state
- The name of Canopy management was suggested to be replaced to Shoot Trimming in the DSS.
- Regarding seasonal forecast, graphs and maps should show climatological values when there is the forecast does not have skill.

4. Demonstration and evaluation of the DSS on the Experimental Fields

On 12th of December of 2018, in the context of the 2nd PAB Workshop, a set of parallel sessions took place to deepen in the further steps of the project. One of them was dedicated to plan the demonstration and evaluation of the DSS on the experimental fields for the second year of the project. The attendees to this session were UPORTO, SYM, UNAP and IRTA.

The objective of the demonstration phase is to prove the adequacy of the treatments suggested by the DSS. Recommendations such us Crop Forcing, Shoot Trimming and Irrigation will be compared according to the field data measured during three seasons from 2017 to 2019. Details about the protocol regarding the treatments and the data collection in the plots is described in D4.2: “Report on calibration process”.

The following protocols were agreed during the meetings regarding each treatment:

- **Crop Forcing** will be performed in Codorniu and Symington in three different dates, as defined in D4.2 (CFI-Fruitset, CFII-15 days after Fruitset and CFIII-30 days after fruitset). The most appropriate Crop Forcing date will be found in relation to the plot and the climate data. The DSS recommendations will be compared to the collected measurements, being able to evaluate if the suggested treatments were finally the most appropriate. During the two first seasons Crop Forcing (2017 and 2018) has been already performed and measurements were already collected. During the third season the protocols (crop forcing dates and tracking of phenological states) will be kept in order to ensure the consistency in the results.

[7] Water stress is a physiological state that grapevines *(wood, foliage & fruit)* experience when there is insufficient water supply during the critical growing cycle.

- Shoot Trimming will be performed in Mastroberardino in three levels of leaf removing, as defined in D4.2. The final crop properties for each plot in relation to each level of Shoot Trimming will be introduced into the DSS, being able to suggest a Shoot Triming level according to the desired crop properties. During the two first seasons Shoot Trimming (2017 and 2018) has been already performed and measurements were already collected. During the third season the protocols (levels of shoot trimming and tracking of phenological states) will be kept in order to ensure the consistency in the results.
- **Irrigation** will be applied in the three demo-sites Codorniu, Symington and Mastrobeerardino. In case of Mastroberardino and Symington, an area outside the experimental plot will be selected to apply the irrigation suggested by DSS, whereas in the experimental plot, traditional irrigation will be applied. In case of Cordorniu, since the experimental plot is large enough, an inner area will be selected to apply DSS irrigation recommendations. The validation of the irrigation will be based on the comparison of DSS irrigation and traditional irrigation during the 2019 season. As new plots are needed to be included in the DSS for Mastroberardino and Symington, UPORTO and UNAP committed to select and provide the details of the selected plots according to the DSS requirements.
- Permanent feedback of the DSS performance in terms of meteorological, climate and phenological forecast will be given during the season from end-users and IRTA, UPORTO and UNAP as vineyard managers of experimental plots. This will help to developers to fine tuning the models and getting better forecasts. To promote this interaction between users and developers a weekly call is set up.

5. Conclusion and next steps

The 2nd General Meeting of VISCA project has been successfully provided feedbacks from end-users and VISCA partners about the first release of the DSS. Feedback was mainly positive, although some improvements were suggested and noted to be implemented in the second release of the DSS, which will be ready around May.

The demonstration phase is in progress. DSS validation will be performed using the data collected according to the protocols established in D4.2. During the meeting, the protocol of DSS was discussed and agreed as explained in Section 4 of this report. The results of the validation of the tool will be exposed in the D4.3: “Report on Validation Results of 1st year” and D4.5: “Report on Validation Results of the 2nd year”.