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Baccus: from framework to web platform for self-assessment of wine sustainability

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Abstract. Baccus was initially a framework developed with the aim of supporting the internalization of sustainability principles in winemaking in the context of Brazil, based on best international practices. Published in 2015, BaccuS is structured into five dimensions of sustainability (environmental, economical, social, political-institutional, territorial) which are unfolded into 18 themes and 100 indicators. In 2020, the framework began to be used by wineries to support sustainability management, as assessment and planning support. During this period, data collection and checklist instruments were developed, as well as performance reports and planning notebook models. With the aim of expanding the framework application in the country, from 2023 the project migrated to the development of a web platform, which allows the registration of wineries and winegrowers and their self-assessment regarding sustainability. The technologies used in the development include html, css, javascript, js framework vue.js, php, laravel, mysql database. The development of uis (user interfaces) are parameterized to adapt to different languages, allowing for future expansion of the platform. The platform will be available free of charge. For 2025, one of the proposals is to expand to an assessment on a territorial scale, which can be used for geographical indications and denominations of origin.

1. Introduction

Sustainability is a challenge to society and production systems, whether due to an increase in the level of perception and demand from consumers and stakeholders or to the growing pressure on natural systems [1,2]. On the other hand, working on the theme of sustainability presents opportunities for innovation in products and processes, gains in operational efficiency, and a greater appreciation of local and territorial aspects [1]. Brazil is considered a reference in several areas regarding environmental management and the debate involving sustainability and its macro issues. For example, the country participated directly in the development of ISO26000 and the chemical industry is a reference in the subject, adopting the "Responsible Care" program as mandatory, a rigorous standard that is optional in other countries. However, considering the wine sector, the country does not yet have a broad-scope methodological proposal to support programs with an integrated sustainability approach, as can be seen in other countries.

Discussions involving sustainability often place conventional cultivation systems in opposition to ecologically based systems (such as biodynamic, organic, agroecological agriculture, among others), without considering alternative systems that already exist, such as integrated production, or the development of new proposals. Restricting the discussion of sustainability to the adoption of ecologically based production systems can be a limiting factor, considering that in 2017, according to the Agricultural Census, only 1.4% of Brazilian rural establishments practised organic agriculture and were certified [3]. According to OIV data [4], organic viticulture is present in 63 countries with an estimated area of 454 mha, representing 6.2% of the total wine-growing area in the world; Spain, Italy and France answer by 75% of this production.

While conversion to organic production is not possible in all contexts, this does not mean that alternative actions cannot be taken to a conventional production system in order to internalize sustainability principles in production. The aim is to build a third way that makes production parameters viable, combining commitment with actions that make practices more sustainable. In this sense,

although sustainability is a much-discussed topic, its application is not clear. The broad scope of action and doubts regarding the concepts end up hindering the establishment of bases for initiatives and harm communication with stakeholders, and may even affect the credibility of the company or producer. In fact, a cross-country study shows that consumers and even winegrowers have doubts regarding the concept of sustainability and its application [5].

Sustainability in viticulture has also been a topic of debate within the International Organization of Grape and Wine (OIV) and has several supporting documents [6, 7, 8]. For the OIV, sustainable viticulture is a broad concept, including environment, quality, security and health, and valorization of heritage, historical, cultural, ecological and landscape aspects.

In parallel, several producing countries have been articulating programs and actions at regional or national level, which can take the form of self-assessment, certification, seal or footprint [1, 9]. Among the main initiatives, South Africa, Australia, New Zealand, California (USA), Chile and, more recently, Uruguay stand out. The topic remains on the agenda in terms of initiatives and also scientific, addressing a broad scope, as shown by the study that investigated more than 2,300 works on the field [10].

This paper presents the development of a web platform for self-assessment of wine sustainability, based on the BaccuS framework [11]. Baccus was initially a framework developed with the aim of supporting the internalisation of sustainability principles in winemaking in the context of Brazil. Framework's development was based on best international practices, in addition to current experiences from Brazil. Since the framework was developed, studies have been carried out to ensure its applicability in real contexts. Between 2020 and 2023, projects were carried out in partnership with two important wineries to diagnose and implement an action plan. This entire process has laid the foundations for a diagnostic format that can be scaled and shared with other producers. The platform can expand the project's impact by sharing the methodology so that producers themselves can carry out their own self-assessment and improve understanding and initiatives in terms of sustainability.

2. Materials and methods

The project was developed based on the Design Science Research [12] and lean startup methodology [13] in 2 main scopes that will be developed in parallel: (1) rigor cycle and (2) design cycle.

The rigor cycle corresponds to the applied research stage for the development of the protocol bases, data collection instruments, as well as technological updating. The rigor cycle deals with the development of the artifact, which in this case will be an online platform. The phases are foreseen in the DSR methodology and will be carried out concurrently. The rigor cycle had 5 stages: (1) updating the state of the art; (2) development of data collection instruments; (3) testing and validation with users; (4) proposal of evaluation criteria; and (5) systematization and final evaluation.

The development of the platform follows the best practices of Agile methodologies [14] and adopts several practices of the Scrum methodology [15]. Among the practices highlighted are: the active presence of the Product Owner in the development process, which involves describing, prioritizing and validating functionalities; and incremental development, in which the platform is divided into small parts or functionalities. These parts are delivered and made available to users every 15 days, which is the duration of a sprint. With this approach, users can start using new functionalities quickly and provide feedback for continuous improvements.

The initial activities focused on eliciting and analyzing requirements, where the existing project documentation was studied and evaluated, with the aim of familiarizing those involved and better understanding the characteristics, functionalities and needs. In this phase, interviews were also conducted with users in order to understand the main objectives of the system, as well as to clarify doubts.

Based on this analysis, the project backlog was structured, with the first tasks focused on developing the system structure. From there, the functionalities were prioritized by the Product Owner and implemented by the development team. Weekly meetings are held to evaluate and review the backlog items and the progress or closure of the sprint.

3. BaccuS Platform

3.1. Framework path and structure

Baccus was initially a framework developed with the aim of supporting the internalisation of sustainability principles in winemaking in the context of Brazil. The development of the framework was based on best international practices, which included field work in three countries (France, Italy and Spain) and observation of frameworks in another five (South Africa, Australia, New Zealand, United States and Chile). At the same time, the framework took into account practices that were already adopted in Brazil, which were systematised based on a diagnosis in two important producing regions [11].

Published in 2015, the framework began to be used by wineries in 2020 to support sustainability management, as assessment and planning tool. During this period, data collection and checklist instruments were developed, as well as performance reports and planning notebook models. With the aim of expanding the framework application in the country, from 2023 the project migrated to the development of a web platform.

BaccuS is structured into five dimensions of sustainability, which are unfolded into 18 themes (Table 1). Each theme is unfolded into indicators, in which

practical examples of application in Brazil or international context were considered, in a total of 100 indicators.

Table 1. BaccuS framework structure.

Dimension	Themes
Environment	– water – air – effluents – waste – energy – biodiversity – agricultural practices
Economic	– production and operations – management systems – diversification
Social	– internal public, – community – territory
Political-institutional	– governance – territorial articulation,
Territorial	– knowledge – cooperation and heritage – landscape – culture valorization

3.2. Platform

Baccus is a web platform (https://www.baccus.net.br/), accessible online on different types of devices, such as computers, tablets and smartphones, which allows the registration of wineries and winegrowers and their self-assessment regarding sustainability.

Figure 1. BaccuS home screen.

For better organization, the system is being developed based on the MVC architectural pattern. The MVC (Model-View-Controller) architectural pattern is an approach to structuring software applications by dividing them into three main components: Model, View, and Controller. The Model manages the data logic and business rules, the View is responsible for data presentation and user interface, while the Controller acts as an intermediary, processing user input, updating the Model, and modifying the View as needed. This separation of responsibilities facilitates maintenance, scalability, and collaboration in development [16].

The development of the View layer is being carried out using HTML5, CSS3 and JavaScript, the latter based on the Vue.js framework in its most current version. Vue.js is a framework for building user interfaces, with its main library focused exclusively on the visual layer (view layer), being able to enable the creation of sophisticated Single-Page Applications when used in conjunction with modern tools and support libraries [17].

Integration between the system layers is performed using the PHP language through the Laravel framework. Laravel is an open-source web development framework for PHP, designed to make the application development process more efficient and intuitive, providing a robust and modern structure, incorporating design principles and patterns such as the MVC (Model-View-Controller) pattern. The framework offers a variety of features, including routing, authentication, and a powerful database migration tool, as well as an ORM (Object-Relational Mapping) system called Eloquent, which simplifies interaction with databases [18].

The model layer also uses the PHP language and the Laravel framework, but it implements the application's business rules and performs data persistence and recovery in the database. The most recent version of the MySQL DBMS is being used to store the data.

The system is structured into independent menus and users can complete the self-assessment partially, choosing only priority dimensions or themes or completing the assessment in stages. Also, the system is parameterized to include only viticulture or only oenology, management issues are transversal. The development of UI's (User Interfaces) are parameterized to adapt to different languages, allowing for future expansion of the platform.

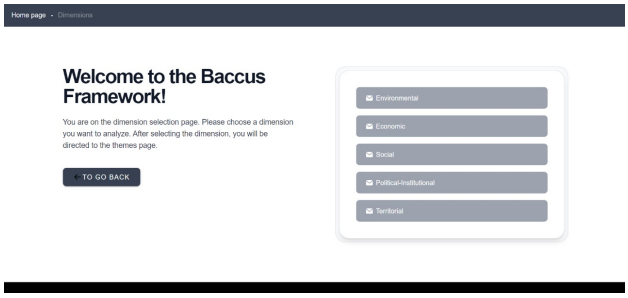

Figure 2. BaccuS dimensions screen.

The system provides a sustainability performance report that is automated, based on previously defined business rules. The system was initially tested with 10 producers linked to the regions of Pinto Bandeira and Campos de Cima da Serra, in southern Brazil. The demo version was available in August 2024 and the final version is expected to be available by December 2024.

4. Considerations and perspectives

The development of a self-assessment platform for sustainability performance in the wine industry represents a significant advancement in promoting sustainable practices within this sector. The implementation of this tool can offer numerous benefits for both producers and the environment. By enabling wineries to autonomously and continuously assess their sustainability performance, the platform helps raise awareness and foster the adoption of more responsible practices aligned with sustainability

principles in broad scope including environmental, economic, social, political-institucional and territorial dimensions.

Among the main advantages of the platform are the ease of monitoring and the ability to identify areas for improvement, promoting a culture of continuous improvement. Moreover, the transparency and credibility of the information obtained can strengthen the trust of consumers and investors, generating a competitive advantage for wineries that adopt sustainable practices. Data integration and benchmarking against industry standards can also serve as valuable guides for strategic decision-making.

Regarding future perspectives, the self-assessment platform could evolve to include more advanced features, such as integration with Internet of Things (IoT) technologies and artificial intelligence (AI), enabling more accurate and real-time monitoring of production processes. Additionally, expanding the platform to include specific metrics for different themes and indicators, could further enhance its applicability and effectiveness.

Another important perspective is the expansion of the platform to be used by other agri-food industries, adapting sustainability indicators and metrics to the specificities of each sector. This would enable the creation of a robust and integrated database on sustainable practices in agriculture and food production, facilitating knowledge exchange and experiences across different sectors.

Finally, partnerships with certifying organizations and regulatory bodies can be explored to validate the self-assessment results and integrate the platform into recognized certification systems. This would not only increase the credibility of the assessments but also encourage more wineries to adopt the tool, contributing to a more sustainable wine sector committed to the future of the environment.

5. References

1. S.S Flores. What is sustainability in the wine world? A cross-country analysis of wine sustainability frameworks. J. Clean. Prod., 172, 2301-2312 (2018)
2. M. Wagner, P. Stanbury, T. Dietrich, J. Döring, J. Ewert, C. Foerster, ... & Hanf, J. . Developing a sustainability vision for the global wine industry. Sust., 15(13), 10487. (2023)
3. Brazil. Brazilian Institute of Geography and Statistics. Censo Agropecuário. https://www.ibge.gov.br/estatisticas/economicas/agricultura-e-pecuaria/21814-2017-censo-agropecuario.html (2019).
4. OIV. Focus OIV le vignoble biologique mondial. https://www.oiv.int/public/medias/8513/fr-focus-le-vignoble-biologique-mondial.pdf (2021).
5. G. Szolnoki. A cross-national comparison of sustainability in the wine industry. J. Clean. Prod., 53, 243-251. (2013)
6. OIV. Resolution OIV-CST 1/2004 - Development of sustainable vitiviniculture. https://www.oiv.int/public/medias/2074/cst-1-2004-en.pdf (2004)
7. OIV. Résolution OIV-CST 1/2008 - Guide OIV pour une viticulture durable: production, transformation et conditionnement des produits. http://www.oiv.int/oiv/info/frresolution (2008)
8. OIV. Resolution OIV-CST 518/2016 - OIV General Principles of Sustainable Vitiviniculture - Environmental - Social - Economic and Cultural Aspects. https://www.oiv.int/public/medias/5766/oiv-cst-518-2016-en.pdf (2016)
9. I. Santiago-Brown, A. Metcalfe, C. Jerram & C. Collins. Transnational comparison of sustainability assessment programs for viticulture and a case-study on programs' engagement processes. Sust., 6(4), 2031-2066. (2014)
10. J. V. Montalvo-Falcón, E. Sánchez-García, B. Marco-Lajara, & J. Martínez-Falcó . Sustainability research in the wine industry: A bibliometric approach. Agr., 13(3), 871. (2023)
11. S. S. Flores & R. M. V. Medeiros . A framework proposal for sustainability management in wine industry. Int. J. of In. and Sust. Dev., 13(3-4), 348-375. (2019)
12. D. P. Lacerda, A. Dresch, A. Proença, & J. A. V. Antunes Júnior. Design Science Research: método de pesquisa para a engenharia de produção. Ges. & prod., 20, 741-761. (2013)
13. E. Reis. The lean startup. New York: Crown Business, 27, 2016-2020. (2011)
14. R. C. Martin, Desenvolvimento ágil limpo de volta às origens. Rio de Janeiro:Alta Books, 2020.
15. J. Sutherland & K. Schwaber. The scrum guide. The definitive guide to scrum: The rules of the game. Scrum. org, 268, 19. (2013)
16. E. Gamma, R. Helm, R. Johnson & J. Vlissides, J. Design Patterns: Elements of Reusable Object-Oriented Software. Addison-Wesley. (1994)
17. Vue.js https://br.vuejs.org/v2/guide/
18. T. Otwell. Laravel: A PHP Framework For Web Artisans. (2011) https://laravel.com