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Sustainable Wine: An Exploratory Analysis of Certification Frameworks and Producer Perspectives in Germany

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ABSTRACT

Sustainability standards for wine production seek to address the climate crisis from several perspectives. The study analyzes three organic (Demeter, EU organic farming regulations, ECOVIN) and two explicit sustainability standards (FairChoice, FAIR'N GREEN) based on available documentation, supplemented by follow-up communication. Additionally, twelve producers were interviewed to better understand their choices. Findings indicate that while standards have overlapping characteristics, they differ notably, especially in scope and granularity of requirements and approaches to social and economic dimensions. Producers' expectations and experiences also differ. Organically certified producers highlighted production standards' challenges and valued preservation; those with explicit sustainability certifications primarily valued flexibility.

Keywords*: Certification, comparative analysis, organic winemaking, sustainability frameworks, viticulture*

1 Introduction

In light of rapidly accelerating climate change, global agriculture is becoming increasingly vulnerable to fluctuating temperatures and extreme weather events. Among the affected agricultural sectors is the wine sector, where the entire growing cycle of vines is shifting due to warmer temperatures, impacting the characteristics of wines, their quality, and taste (van Leeuwen et al., 2024). At the same time, consumer interest in sustainable agricultural practices is rising, with wine as a luxury product more affected than commodities. Driven by growing consumer awareness and regulatory support, the global organic vineyard area grew from 100,000 hectares to 454,000 hectares between 2005 and 2019 (OIV, 2021).

Globally, over 70 wine sustainability certifications exist (Sustainable Wine Roundtable, n.d.). Early frameworks, typically initiated by winegrower associations, targeted specific issues, such as the usage of agrochemicals or soil health, before expanding into more comprehensive approaches addressing environmental, social, and economic aspects (Moscovici & Reed, 2018). Notable programs like Sustainable Winegrowing New Zealand (SWNZ), the California Sustainable Winegrowing Alliance (CSWA), and Sustainable Wines South Africa (SWSA) illustrate these developments (Flores, 2018). In Europe, certifications such as Terra Vitis (France) and FairChoice (Germany) emphasize localized adaptations while facing challenges of comparability across regions (Merli et al., 2018; Rugani & Lamastra, 2023).

Frameworks often prioritize the environmental pillar, focusing on soil management, biodiversity, and agrochemical reduction (Merli et al., 2018). Social and economic dimensions, while acknowledged, tend to receive less attention and are inconsistently integrated (Flores & Medeiros, 2016). This imbalance underscores the need for a unified sustainability framework that equally emphasizes all three pillars while accommodating regional contexts (Rugani & Lamastra, 2023).

Producer attitudes toward sustainability certifications vary widely, influenced by personal philosophies, operational goals, and external pressures. Many winemakers associate sustainability primarily with environmental preservation, though understanding of its broader dimensions is growing (Szolnoki et al., 2013; De Steur et al., 2019). Motivations for adopting sustainable practices often stem from producers' intrinsic values, such as ethical responsibility and biodiversity conservation, with economic and regulatory factors more commonly in secondary roles (Baird et al., 2018; Giacomarra et al., 2016). In contrast, in New Zealand SWNZ certification is mandatory for international market access, providing an example of regulatory influence (Baird et al., 2018).

Despite producers' motivations, barriers persist. Financial costs, labor intensity, and administrative burdens act as deterrents, particularly for smaller wineries (Moscovici & Reed, 2018). Additionally, confusion arising from the proliferation of certifications and concerns about greenwashing further complicate adoption (De Steur et al., 2019).

According to previous studies of the wine sector in different countries, sustainability certifications yield diverse benefits, including improved resource efficiency, enhanced marketability, and increased consumer trust (Gilinsky et al., 2015; Ingrassia et al., 2022). Certified producers often report better environmental outcomes, such as reduced usage of agrochemicals and improved biodiversity, alongside economic gains like cost savings on inputs (Szolnoki et al., 2013). Certifications also support knowledge sharing and community building, fostering industry-wide improvements in sustainability practices (Borsellino et al., 2016).

The fragmented nature of existing certifications may indicate a need for greater harmonization and transparency. Addressing these gaps could enhance the adoption and efficacy of sustainability frameworks, benefitting producers, consumers, and the broader wine industry. Of the wide variety of sustainability-related certification frameworks on the global wine market, seven are available in Germany: five voluntary certification standards – Demeter, the oldest organic standard worldwide, EcoStep, ECOVIN, FairChoice, and FAIR'N GREEN; a voluntary free-of-charge guideline on sustainable production for viticulture, German Sustainability Codex ("Deutscher Nachhaltigkeitskodex"); and the EU organic farming regulations.

In the past, only three studies that compared wine certifications included German certifications in their scope, limiting the selection to only two sustainability certifications FairChoice and FAIR'N GREEN (Klohr et al., 2013; Merli et al., 2018; Rugani & Lamastra, 2023). A study focusing on the German market and including a broader spectrum of wine certifications and comparing them in a meaningful way has not yet been conducted. The current study explores the German wine sector's adoption of non-conventional winemaking practices, analyzing organic and sustainability certification frameworks and producer perspectives. It aims to identify the characteristics that distinguish organic, biodynamic, and sustainability certifications in the German wine sector and to explore producers' perceptions of wine certifications, their benefits and challenges.

2 Methods

Out of the seven frameworks active in the German wine sector at the time of the study, five have been selected for analysis – four voluntary certification standards and the EU organic farming regulation. The EcoStep certification was excluded from the analysis due to the scarcity of available information, and the German Sustainability Codex for viticulture was excluded because, as a voluntary free-of-charge guideline, it cannot be meaningfully compared to the certification frameworks.

The analysis encompassed the latest available documentation from the official websites of the certifications selected, including guidelines, checklists, and regulatory acts, supplemented by follow-up emails and video calls when the available materials appeared insufficient for comparison purposes. The materials and information collected were then used for comparing and contrasting the frameworks based on a set of criteria determined based on prior studies (in particular, Merli et al., 2018; Moscovici & Reed, 2018; Rugani & Lamastra, 2023). The criteria for the analysis encompassed such categories as system basics, where geographic scope, supply chain boundaries, and management tools used by the certifications (e.g., checklists, guidelines, etc.) are analyzed; three pillars of sustainability, where environmental, social, and economic topics evaluated by certifications are examined; control mechanisms, where certification governance, audit practices, and fee structures are surveyed; and transparency and communication, where the quality of information disclosure to the public is evaluated.

To be able to contact producers to analyze their perspectives, databases and lists of certified producers available in open access on the certifications' webpages were used to source names and contact information of certified wineries. Wine producers that had only the EU organic certification were not included in this study, as for the purpose of the current study, producers with additional certifications, and thus a broader perspective on wine certifications in Germany, were of particular interest.

A total of 86 producers were contacted by e-mail, with follow-up via phone or social media platforms (mainly Instagram, but also Facebook). Twelve of them agreed to be interviewed, representing all five certification frameworks (Table 1). Several participants had obtained more than one certification, providing them with a relatively broad perspective regarding certification options. Producer interviews were conducted in English via online video conferencing tools and based on a semi-structured interview guide with open-ended questions addressing five main topics: (1) motivation to practice non-conventional winemaking; (2) reasons to pursue certification; (3) hurdles associated with certification; (4) benefits associated with certification; and (5) importance of the three pillars of sustainability to interviewees.

Table 1. Meta-information on the producers interviewed for the study

	Role	Gender	Founded	Size, ha	Region	Certification	Certified in
Organic winemakers							
1	Owner	Male	1844	5-15	Baden	Demeter	2010
						ECOVIN	1987
						EU Organic	n/a
2	Owner	Male	n/a	5-15	Baden	Demeter	2016
						ECOVIN	2016
						EU Organic	2016
3	Owner	Female	n/a	5-15	Rheinhessen	Demeter	2020
						ECOVIN	1993
						EU Organic	n/a
4	Owner	Male	2014	<5	Baden	Demeter	In conversion
						ECOVIN	In conversion
						EU Organic	In conversion
5	Owner	Female	2015	<5	Württemberg	Demeter	2018
						EU Organic	2018

6	Owner	Male	2005	5-15	Mittelrhein	ECOVIN	In conversion
						EU Organic	In conversion
7	Owner	Male	1978	<5	Mosel	ECOVIN	1984
						EU Organic	n/a
Sustainable winemakers							
8	Owner	Female	1780	5-15	Rheingau	FairChoice	2023
9	Owner	Male	1990	5-15	Mosel	FairChoice	2023
10	Head of Sales	Male	1655	>15	Rheinhessen	FAIR'N GREEN	2016
11	Owner	Male	1337	5-15	Mosel	FAIR'N GREEN	2014
12	Head of Sales	Male	1959	>15	Pfalz	FAIR'N GREEN	2013
						EU Organic	In conversion

Next, a thematic analysis of the transcribed interviews was conducted. The six-step approach suggested by Braun and Clarke (2006) and illustrated by Maguire and Delahunt (2017) was applied with the support of the Atlas.ti software (version 23.4.0) for the analysis. In the first step of familiarization with the dataset, the files were organized into two groups – organic winemakers, which included those certified with the EU organic standard, ECOVIN and/or Demeter, and sustainable winemakers certified with FairChoice or FAIR'N GREEN. Next, hundreds of codes were created for the segments of the transcripts that appeared relevant to the study. During this step, the codes underwent multiple modification cycles, where they were merged with other, similar codes, renamed for improved clarity, or their relevance for the study was revised, and they were thus removed from the analysis. In the third and fourth steps, the codes were organized into broader themes, which were then revised and refined before their final definition and naming. As a result of these two steps, such themes as the motivation of the producers to practice non-conventional winemaking, reasons to seek certification, hurdles and benefits associated with certification (as two separate themes), and the impact of certification in the context of climate-related risks were analyzed for the two groups of winemakers (organic and sustainable). In the last step, the results of the thematic analysis were discussed among the authors, written up, and compared with the prior published work.

3 Results

Findings indicate that while organic, biodynamic, and sustainability standards have overlapping characteristics, a considerable number of features distinguish them. For instance, the standards differ significantly in the scope and granularity of requirements, as well as in their approach to social and economic dimensions of sustainability. Moreover, while certified producers generally recognize the benefits of certification, notable contrasts exist in their views and experiences. For example, those with organic (including biodynamic) certifications often highlighted challenges related to stringent production standards. In contrast, producers with other sustainability certifications placed greater emphasis on continuous but flexible improvement with the consideration of the local context, rather than radical transformation. Some producers appeared to seek a flexible sustainability certification primarily to meet export market requirements, focusing on achieving certification with limited effort and cost rather than focusing on specific certification content.

3.1 Comparative analysis of frameworks

One distinct feature of the organic associations, Demeter and ECOVIN, is that farmers founded both to give alternative viticultural (and generally agricultural) practices a formal status long before public legislation emerged. The two sustainability certifications were developed either by academic experts in the field or in cooperation with them. Enhanced knowledge transfer, promotion of non-conventional viticultural practices, and operational improvement appear as common objectives of all five certifications. The EU Organic standard, the international biodynamic certification Demeter, and the

organic wine association ECOVIN emphasize ecological viticultural principles. FairChoice and FAIR'N GREEN expand beyond ecological goals to include social and economic dimensions.

All five frameworks operate nationwide in Germany, and three of them are also active outside of Germany. The EU organic standard covers all EU member states, the FAIR'N GREEN certification operates in six European countries, and Demeter covers 65 countries globally at the time of data collection. All frameworks regulate operations in the vineyard and cellar; most address packaging and the two sustainability frameworks also address distribution.

All frameworks provide certification for the whole winery for a respective vintage. In FAIR'N GREEN, as elaborated by an Athenga GmbH consultant, single-product certification is also possible for cooperatives and wineries that have several production lines. For instance, if a winery produces wine from both own and purchased grapes, the certification for the first vintage might apply only to the wines made from own grapes and in consecutive vintages also include wines made from purchased grapes, as the sustainability of externally procured grapes takes longer to assess. In contrast, FairChoice only certifies wines produced from a winery's own grapes, as requirements for purchased grapes have not yet been developed within that framework, as explained by the certification's representative.

All five certifications prioritize the environmental pillar. The three organic certifications largely focus on this dimension, and within the FAIR'N GREEN and FairChoice systems, environmental aspects account for the largest number of criteria. The certifications commonly address the topics of biodiversity, soil health, and agrochemical reduction, however, with a different degree of granularity and restriction. Demeter appears to be the strictest standard in terms of plant protection and other materials used in vineyard and cellar operations, followed by ECOVIN, which expands upon the EU Organic standard. One distinctive feature of Demeter is that it requires six biodynamic preparations made of plant, mineral and animal substances in the format of compost or spray to be applied to the soil in accordance with the lunar calendar to enhance soil health. Demeter provides a separate regulation on the preparation and application of these substances (Demeter, 2023). The FAIR'N GREEN and FairChoice standards generally appear more liberal in this regard, as there are only a few criteria where compliance is mandatory for certification, and most criteria offer wineries flexibility and allow for various exceptions.

One distinct feature of the two sustainability certifications is that both quantify the CO_2 footprint of wineries, unlike the organic ones. FairChoice does it with the support of three independent consultancies for climate strategies in Germany. FAIR'N GREEN has its own CO_2 footprint calculation system, and the calculation is performed by the program consultants. FAIR'N GREEN uses an online platform to manage footprint-related data. At the time of data collection, FairChoice was in the process of full digitalization of the framework, meaning all data would be collected and managed digitally, according to the program consultant (Fair and Green e.V., n.d.).

Social and economic dimensions receive varying attention, with FAIR'N GREEN and FairChoice appearing the most comprehensive in this regard and ECOVIN incorporating some social considerations. All three organic (incl. biodynamic) certifications lack in assessing the economic well-being of the farm, addressing this aspect only vaguely within either a limited number of rules (Demeter) or the mission statement (ECOVIN).

All frameworks make information about their evaluation systems available to the public. However, the degree of transparency varies. Demeter appears to be most transparent, as all documents describing its assessment system are available in open access, from guidelines to the catalog of sanctions and the fee structure. As discussed earlier, FairChoice and FAIR'N GREEN also calculate the CO_2 footprint of

participating wineries, however, the certifications do not disclose the methodology of CO_2 emission calculations to the public. All frameworks, except FAIR'N GREEN, disclose their fee structures publicly or, in the case of ECOVIN, upon request. In this regard, the EU organic standard presents a special case, as it is legislation-based, and its fee structure consists of only one item, an audit fee charged by the respective control bodies that perform the audit. All frameworks, except the EU organic standard, use social media as communication tools, with Demeter having by far the largest audience.

While all five certification bodies conduct annual audits to ensure compliance with their standards, there is a distinct difference between the approaches of organic and sustainability certifications (Demeter, 2023; ECOVIN, n.d.; FairChoice, n.d.; Fair and Green e.V., n.d.). The aspect of conversion, in its definition of formal transition from conventional to organic production[1], only applies to the three organic (incl. biodynamic) certifications, Demeter, ECOVIN, and the EU organic standard. They require that a period of 36 months passes from the application and start of organic (or biodynamic) treatment to the winery being awarded the respective certificate and label. These certifications perform audits on a pass-or-fail basis, meaning that certification is granted upon successful conversion when all rules stated in the guidelines or regulations are adhered to.

The two analyzed sustainability certifications allow for wineries to obtain the certification already in the first year and they are expected to improve their practices over time. A winery's performance is then evaluated either based on scores with pre-defined improvement thresholds (FAIR'N GREEN), where a winery is expected to achieve a higher total score year on year, or a traffic light system (FairChoice), based on the fulfillment of the FairChoice criteria.

All certifications, except FAIR'N GREEN, are audited by a common group of control bodies that are in charge of the control system of organic production in the EU, approved by the German state, and included in the official list of approved control bodies for organic production by the European Commission. The audit for FAIR'N GREEN wineries is conducted by the international accreditation body GUTcert, which is not eligible to audit organic production standards. FAIR'N GREEN is the only certification that is audited by only one private accreditation body.

In case of non-compliance with standards, the three organic certification bodies may impose a range of sanctions, including warnings, fines, prohibition of placement of labeled products in the market, and expulsion from the association (in the case of Demeter and ECOVIN). FairChoice and FAIR'N GREEN do not have pre-defined sanctions. Violation of program rules is reviewed on a case-by-case basis with the support of consultants and commonly results in the reduction of the winery's sustainability performance score or, in critical cases, the label for the non-compliant vintage may be denied. However, the non-compliant winery may remain part of the association.

3.2 Producer perspectives

The wine producers interviewed for this study seem to prioritize the environmental pillar and assign less importance to the economic and social dimensions. They also mentioned that the German state generally has high social standards and equate these with employment laws, which is why they do not perceive the social pillar of sustainability as a priority for certified non-conventional winemaking practices.

Most certified sustainable producers in this study did not perceive organic and biodynamic frameworks as sustainable, arguing that they excluded social and economic factors from consideration. They also

[1] Regulation (EU) No 2018/848 of the European Parliament and of the Council on organic production and labelling of organic products (2018) Official Journal L 150, pp. 1-92.

regarded these frameworks as inflexible. In turn, multiple organic producers did not seem to regard sustainability-certified producers as truly sustainable according to their understanding of the concept either. They argued that organic practices are a vital pillar of sustainability and that practices are hardly sustainable if they are not organic. Additionally, one organic and one sustainable producer in this study recognized that sustainability in winemaking often implies trade-offs among the three components, for instance, the trade-off between machine harvest (pressure on the environmental dimension) versus hand harvest (pressure on the social dimension), sustainable energy management versus required financial investments, as well as the challenges of steep-slopes and wet-climate conditions.

When adopting non-conventional practices, wine producers in this study purported to be driven rather by internal than external factors. They commonly cited ethical beliefs and land preservation for future generations as primary drivers for certification. What did play an important role for the interviewed producers in the context of external recognition, however, is “proving” the responsible nature of their practices, documenting and communicating their ideas to customers and other stakeholders, and setting an example for younger generations and other producers. Knowledge-sharing appeared to be an important driver for participation in certification in both the organic and sustainable groups. In this context, organic winemakers emphasized the quality of the educational offers of the two organic associations (ECOVIN and Demeter) and recognized it as a vital component of their value proposition. Another factor that played a role in organic wine producers’ decision to join an association like ECOVIN and/or Demeter was their political activity. For Demeter producers, it was also the biodynamic concept of winemaking itself and the strictness of its rules, which they associated with better soil and product quality, as well as positive environmental impacts. In turn, for sustainable winemakers, it was the ability to improve continuously in all three dimensions of sustainability but having the flexibility to consider the context in which they operate and avoid instant, sometimes radical, transformation of operations that could have detrimental economic impacts on their business. Finally, external requirements, such as a new rule on sustainability certification introduced by the Association of German Wine Estates of Superior Quality (VDP) that the two FairChoice participants of this study are part of and admission requirements of organic market fairs, also played a role for some sustainable wine producers. Economic factors such as price premiums and increased revenues did not seem to be part of the motivations for the wine producers interviewed to pursue certification.

High additional costs associated with certification were one of the hurdles most commonly mentioned by producers in this study. They emphasized that the financial burden of certification is particularly high for smaller wineries compared to larger wineries and cooperatives that benefit from economies of scale. Cumbersome bureaucracy and labor intensity were some other commonly named hurdles of certified winemaking, as thorough documentation of practices is required and a strong focus is placed on manual labor as opposed to machine work. Additionally, this study found that giving up conventional treatments, such as pesticides, fungicides, and insecticides in the vineyard and processing aids in the cellar appeared to be a challenge among organic winemakers. Finally, organic producers voiced greenwashing concerns associated with sustainability certifications. The factors that seemed to contribute to these concerns most were active marketing, particularly that of FAIR’N GREEN, and flexibility of requirements, which some organic producers perceived as a way to become part of the non-conventional winemaking community without having to implement drastic business transformations in the viticultural and oenological domains.

In the study presented, benefits associated with a network and the exchange of knowledge and experience appeared to be most important for German winemakers. Some distinct benefits of sustainability frameworks identified were a better understanding of daily operations, achieved through the evaluation of their own performance against past results and benchmarking against peers, increased awareness of the environmental impact of winemaking, and, as a result, the ability to

improve operational efficiency. Some organic and sustainable winemakers also associated certified practices with positive effects on vineyard health and, as a result, the quality of the wine and terroir.

4 Discussion and Conclusions

The study presented contributes to the evolving discourse on sustainable wine production by addressing gaps in understanding certification frameworks and producer perspectives, specifically within the German wine sector. It expands upon prior research by offering a detailed comparative analysis of organic, biodynamic, and sustainability certifications while also exploring how these frameworks impact producers' practices, motivations, and challenges. By bridging critical gaps and providing actionable insights, the study lays a foundation for more effective implementation of non-conventional practices in the wine industry, supporting environmental resilience, economic viability, and social equity across the sector.

The study reinforces earlier observations by Moscovici and Reed (2018), Santiago-Brown et al. (2014), and Corbo et al. (2014) that enhanced knowledge transfer and operational improvement were some of the key missions of wine sustainability certifications. It also expands the existing knowledge base by analyzing organic certifications, showing that the education of winemakers and the promotion of non-conventional viticulture are vital parts of the mandate of organic grower associations.

The study presented corroborates previous research that organic, biodynamic, and sustainability certifications generally tend to prioritize environmental aspects, often underrepresenting the social and economic dimensions. Sustainability certifications do adopt a more comprehensive triple-bottom-line approach that incorporates social equity and economic resilience, however, to a limited extent (Flores & Medeiros, 2016; Merli et al., 2018). The current analysis also expands the previous understanding of these certifications by highlighting differences in their structural elements, control systems, and transparency.

By examining producer perspectives, the study confirms as well as contrasts prior findings regarding drivers of and barriers to certification and associated challenges and benefits. Personal motivation of the owner and heritage preservation emerge as key drivers for certification adoption, aligning with trends previously observed in Germany, France, Greece, Hungary, Italy, Spain, and California/US (Szolnoki et al., 2013) and New Zealand (Baird et al., 2018). When it comes to the benefits of certification, previous studies with winemakers from the US (Szolnoki et al., 2013; Gilinsky et al., 2015), Italy (Gilinsky et al., 2015), and Greece (Szolnoki et al., 2013) cited operational and financial efficiency associated with cost reduction as a result of sustainable practices. Such benefits, however, did not seem pronounced among the German winemakers in this study. Although some winemakers did mention savings through reduced inputs in the vineyards, most interviewees referred to the financial aspects of certification rather as a hurdle. Along with research conducted by Szolnoki et al. (2013) and Pomarici et al. (2015) in Italy, this study found that German winemakers associated certified practices with positive effects on vineyard health and, as a result, the quality of wine.

Certifiers need to strive for greater standardization and transparency to reduce industry confusion and greenwashing risks. The development and integration of robust social and economic indicators into sustainability frameworks is essential to achieve a more balanced approach. Another important area of focus could be enhancing accessibility for smaller wineries by reducing financial and administrative burdens. Transparent communication of the benefits and requirements of certifications can further improve trust and adoption rates. Producers are encouraged to engage with certifications that align with their values and operational goals while leveraging the branding and market advantages of

sustainability labels. Cooperation among wineries of diverse ages and sizes and knowledge sharing can amplify collective efforts toward more responsible and sustainable winemaking.

The findings of the current study can assist consumers in making informed purchasing decisions by helping them understand what each certification label represents in terms of sustainability-related practices associated with the production of the labeled wines, as well as other products that the analyzed standards apply to, and dispel confusion about the multiplicity of existing labels. However, more transparency by the certifiers is needed for consumers to be able to evaluate the different certifications and determine which one best meets their needs. Consumer choice could be further enhanced by including score respectively traffic-light information on the label of a given vintage to allow consumers a more differentiated evaluation, in the case of FAIR'N GREEN and FairChoice. To increase transparency regarding sustainability certification and labeling, as well as ameliorate greenwashing concerns, a regulatory intervention similar to the EU organic regulations seems necessary. Sustainability claims could benefit from a factual basis on the EU level, listing minimum requirements and control points to ensure consumers' trust, truth in advertising, and fairness in competition. Similar to the organic regulations, producer organizations, and others could then compete upon developing and implementing even higher standards, providing improved choices for both producers as well as consumers.

The present study examined five major certifications applicable to the German wine sector. Future research could further narrow the gap in the field of wine certifications by including additional certifications, such as Bioland and Naturland, two organic certifications that have a very strong presence in the broader German agricultural sector. Additionally, an interesting area for further investigation could be the rationale of such associations as the VDP in Germany, which motivated the two FairChoice wineries in the study to pursue that certification and require member wineries to obtain a broader sustainability certification rather than an organic one. Future research in the German and global wine sector could look more in-depth into regional differences in producer attitudes toward non-conventional winemaking practices and certification by considering factors specific to the regions, such as climatic conditions and geographic landscape.

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