

Building the International Competitiveness of Macedonian Wines Through Sustainability

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Abstract

North Macedonia has a long-standing tradition of viticulture, with more than 85% of its wine production destined for export markets. In this highly competitive global environment, the effectiveness of marketing strategies relies not only on product quality and authenticity, but also on alignment with the evolving values of international consumers. Contemporary wine markets increasingly emphasize sustainability, environmental stewardship, and the presence of compelling brand narratives. This paper examines the principal consumer drivers shaping global wine demand, with particular attention to the role of sustainability and Environmental, Social, and Governance (ESG) practices. It further analyzes sustainable approaches in viticulture and winemaking, highlighting the case of Tikveš Winery as a regional leader in the integration of ESG principles into production and marketing. The study concludes with strategic recommendations on embedding sustainability as a central pillar of Macedonian wine branding, positioning the industry to enhance competitiveness, strengthen consumer trust, and ensure long-term resilience in international markets.

Keywords: wine industry, ESG practices, viticulture, branding, consumer behaviour, international market, sustainability

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Introduction

The global wine market is undergoing profound transformation, shaped both by evolving consumer expectations and by regulatory frameworks such as the European Green Deal, which emphasize sustainability and environmental responsibility (European Commission, 2020). For small and emerging wine regions such as North Macedonia, which exports more than 85% of its wine production (OIV, 2023), differentiation in international markets is not merely desirable but essential for long-term competitiveness. Macedonian wines are strongly rooted in authenticity through indigenous grape varieties such as Vranec, Kratošija, and Smederevka (Hall et al., 2009). However, to succeed abroad, these wines must signal not only authenticity and quality but also innovation and sustainability, aligning with what international consumers increasingly value (Carlsen & Boksberger, 2015; Getz & Brown, 2006).

Research by the International Organisation of Vine and Wine (OIV, 2023), Wine Intelligence, and Geisenheim University highlights three consistent consumer drivers in the global wine market: quality, authenticity, and environmental responsibility. For Macedonia, where export markets dominate production, these drivers imply that the national wine brand must be strategically positioned around these values. Quality and recognition remain baseline expectations, with awards, medals, and international ratings serving as powerful trust signals (Mitchell & Hall, 2006). Authenticity and storytelling are equally important, as consumers increasingly seek narratives of terroir, cultural heritage, and winemaking traditions that foster emotional connection and differentiation (Hall et al., 2009). Branding and packaging also strongly affect consumer choice, with design and label narratives linking tradition, sustainability, and culture proving central for market positioning (Carlsen & Boksberger, 2015). Finally, sustainability and ethics have become decisive factors, particularly for younger consumers, who increasingly demand organic, biodynamic, or ESG-certified wines that align with personal values (Getz & Brown, 2006).

Within this context, sustainability practices are gaining strategic importance. Conventional approaches focus on maintaining productive capacity while minimizing ecological harm, whereas regenerative agriculture advances a more proactive framework that seeks to restore and enhance natural systems. Both models share a focus on soil health, biodiversity, and environmental stewardship, yet regenerative viticulture emphasizes long-term resilience to climate change and greater ecosystem functionality (Wine Enthusiast, 2023). Practical methods such as cover cropping, reduced tillage, crop rotation, integrated pest management, and livestock integration enhance soil carbon sequestration, water retention, and vineyard biodiversity.

At the same time, challenges with organic viticulture remain significant. Certification procedures are costly and complex, often creating barriers for small and medium-sized producers. Lower yields, higher labor costs, and reliance on copper-based treatments raise questions about the long-term ecological and economic viability of organics. Moreover, consumer willingness to pay a premium is inconsistent across markets, limiting organic wine's growth despite rising demand (OIV, 2023).

These challenges have accelerated a visible shift toward regenerative agriculture within the global wine industry. Regenerative viticulture offers flexibility over rigid certification rules, enabling producers to tailor practices to local ecologies while strengthening ecosystem services. Case studies from Bonterra Estate in California and Familia Torres in Spain illustrate how regenerative practices can simultaneously improve vineyard health, enhance grape quality, and deliver

economic benefits at scale. Industry observers argue that regenerative viticulture represents the next evolutionary step beyond organic production, as it addresses both environmental and market imperatives (Wine Enthusiast, 2023).

For Macedonian wineries, embedding regenerative and sustainable practices into brand identity offers an opportunity to strengthen their distinctiveness in global markets (Figure 1). By aligning indigenous authenticity with sustainability narratives, the national wine industry can enhance competitiveness, build trust among environmentally conscious consumers, and secure resilience in the face of climate change.

Figure 1
Certifications for sustainable s



Source: Authors' Illustration

Sustainable Practices in Macedonian Viticulture and Methodological Approaches

Sustainable viticulture and winemaking represent an integrated approach that balances three pillars: environmental care, economic viability, and social responsibility. This paradigm has become increasingly central to the global wine industry, as consumer expectations and regulatory frameworks emphasize long-term resilience and ecological accountability (OIV, 2023; Carlsen & Boksberger, 2015). For North Macedonia, whose wine sector is deeply rooted in terroir and indigenous grape varieties, sustainability offers a powerful opportunity to combine authenticity with global competitiveness. Semi-arid conditions in key wine regions such as Tikveš and Povardarie render viticulture both an opportunity and a challenge, making resource-efficient and climate-resilient practices indispensable.

Soil and Water Management

The foundation of vineyard sustainability lies in maintaining soil fertility and optimizing water resources. Cover cropping, mulching, and green manures are widely adopted practices that improve organic matter, reduce erosion, and increase water retention while simultaneously fostering soil biodiversity (Hall et al., 2009). Minimal tillage further supports soil microbial health and carbon sequestration. In Macedonian valleys, the transition from traditional flood irrigation toward precision drip irrigation systems has already demonstrated potential in conserving scarce water supplies. Advanced

monitoring tools — including porometers, sap flow sensors, dendrometry, and automated weather stations — enable growers to assess plant water stress in real time, tailoring irrigation schedules to actual vine requirements (OIV, 2023). The introduction of drought-resistant rootstocks strengthens resilience against climate change, a factor of growing importance for semi-arid viticultural landscapes.

Pest Management, Biodiversity, and Carbon Reduction

A second cornerstone of sustainability is reducing chemical dependency through Integrated Pest Management (IPM). This strategy combines biological control methods, disease monitoring, pheromone traps, and resistant grape rootstocks, lowering pesticide use and aligning with both organic and regenerative viticulture frameworks (Wine Enthusiast, 2023). Biodiversity conservation is equally critical. Establishing hedgerows, ecological corridors, and natural vegetation not only sustains pollinators and beneficial insects but also creates balanced ecosystems that reduce long-term vineyard vulnerability. Complementary measures, such as solar-powered pumps and renewable energy integration in vineyard operations, directly reduce carbon footprints and align viticulture with broader decarbonization goals (Mitchell & Hall, 2006).

Energy Efficiency in Winemaking

Winemaking itself is a resource- and energy-intensive process, with refrigeration and cooling representing some of the largest energy demands. Studies in comparable wine regions show that energy audits, installation of photovoltaic systems, and adoption of geothermal energy significantly lower both operating costs and emissions (Carlsen & Boksberger, 2015). Life-cycle assessment (LCA) methodologies further provide wineries with a systematic framework for measuring their environmental footprint and identifying areas for improvement. Such approaches are increasingly used in international best practices and could offer Macedonian producers both operational benefits and reputational value in export markets.

Waste Management and Circular Economy Practices

Sustainable wineries increasingly embrace circular economy models, where by-products are valorized rather than discarded. Grape pomace, skins, and stems can be processed for biomass energy, converted into animal feed, or used for extracting valuable compounds such as polyphenols and antioxidants (OIV, 2023). Winery wastewater, once considered an environmental liability, is now frequently treated and reused in closed-loop systems, reducing water consumption and pollution risks. Composting organic residues further closes nutrient cycles, enriching vineyard soils. Packaging innovations contribute significantly to reducing the sector's carbon intensity: lighter bottles, recycled glass, biodegradable inks, and alternative formats (e.g., Bag-in-Box or aluminum cans) are all gaining traction in international markets as eco-friendly choices (Wine Enthusiast, 2023).

Environmental Management Systems and Certification

Institutional frameworks are essential for standardizing and demonstrating sustainability. Many global wineries adopt Environmental Management Systems (EMS) such as ISO 14001 or the EU's Eco-Management and Audit Scheme (EMAS), both of which require structured monitoring, reporting, and continuous improvement. Certification programs including EU Organic, Demeter (for biodynamic viticulture), Ecocert, and IFOAM validate compliance with sustainability standards, providing both accountability and marketing value (Getz & Brown, 2006). For North Macedonia, participation in such certification schemes could not only build credibility in export markets but also help consolidate a national image of

environmentally responsible winemaking. The relative lack of international recognition of the Macedonian wine brand underscores the importance of these steps (Hall et al., 2009).

Methodological Approaches to Sustainability Measurement

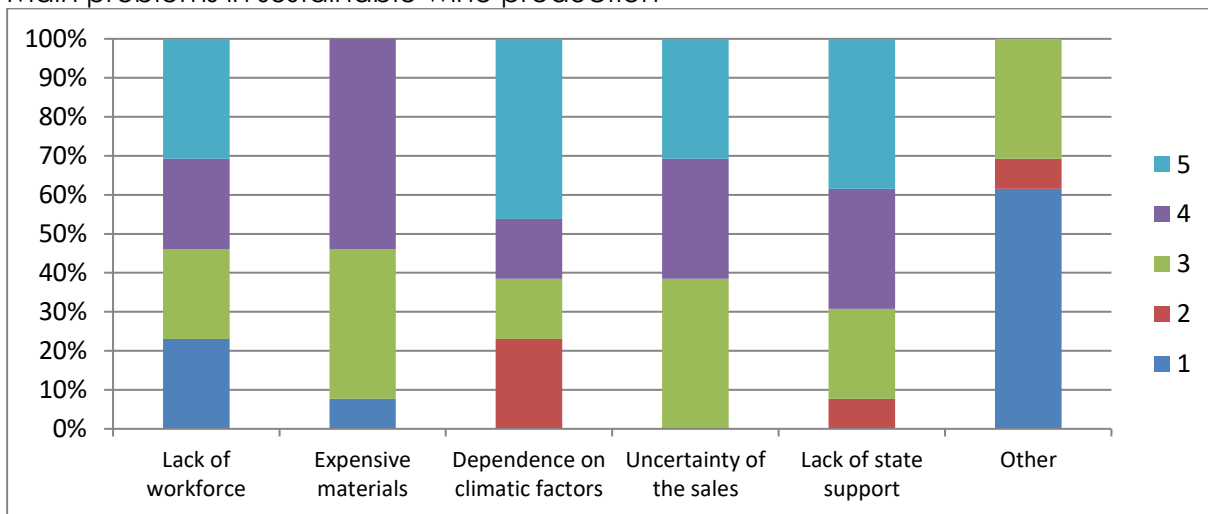
A critical methodological dimension of sustainable winemaking is the application of life-cycle assessment (LCA) and carbon accounting. These tools quantify inputs and outputs across the entire production chain, from vineyard to bottle, enabling evidence-based decisions for reducing environmental impact. Similarly, water footprint analysis and biodiversity monitoring schemes provide systematic data for managing scarce resources and preserving ecosystem services. Adoption of such methodologies by Macedonian wineries would not only enhance operational transparency but also meet growing demands from international consumers and regulators for verifiable sustainability metrics.

Sectoral Challenges and Strategic Gaps

Despite growing investment in sustainability by Macedonia's larger wineries over the past 15 years, several systemic obstacles remain. The most pressing issue is the absence of a coordinated strategic approach between wineries, grape growers, and government institutions. Without standardized and enforced sustainability practices, industry-wide transformation remains fragmented. Financial constraints, insufficient human resources, and limited technical expertise further hinder the implementation of advanced sustainability standards (OIV, 2023). In addition, the Macedonian wine brand continues to face insufficient international recognition, limiting the export potential of even those producers who have adopted forward-looking sustainable practices (Mitchell & Hall, 2006).

Overall, the Macedonian wine sector demonstrates significant progress in integrating sustainable viticulture and winemaking practices, yet success remains uneven across the industry. For sustainability to become a true competitive advantage, collective action, institutional support, and methodological standardization are required. By systematically embedding soil and water conservation, pest and biodiversity management, renewable energy, waste valorization, and transparent certification into their operations, Macedonian wineries can position themselves not only as producers of authentic wines but also as leaders in sustainable innovation.

Figure 2
Main problems in sustainable wine production



Source: Authors' Illustration

Case Study: Tikveš Winery – a Regional Leader in Sustainable and ESG-integrated Winemaking

Founded in 1885 in Kavadarci, Tikveš Winery is both the oldest and the largest winery in North Macedonia, positioning it as a central institution in the country's wine sector (Hall et al., 2009). Over time, Tikveš has evolved from a traditional producer into a modern enterprise that combines heritage with innovation. With financial and strategic support from the European Union and the European Bank for Reconstruction and Development (EBRD), the winery became the first ESG-certified winery in Southeast Europe, setting a precedent for integrating sustainability into viticulture, winemaking, and corporate governance (OIV, 2023). This achievement not only strengthens its competitive position abroad but also establishes a model for the Balkan wine industry in demonstrating how ESG practices can enhance credibility and consumer trust (Carlsen & Boksberger, 2015).

Sustainable Digital Viticulture and Vineyard Management

A hallmark of Tikveš's sustainability strategy is its embrace of digital viticulture and precision agriculture. Collaborating with international experts such as Giovanni Bigot and Perleuve, the winery employs the 4Grapes system combined with AI-driven predictive models to monitor vine health, soil conditions, and climatic variables. These tools allow for data-driven decisions on irrigation efficiency and pest management, reducing environmental impacts while maintaining grape quality. According to the Bigot Index, plots such as Vranec Babuna and Plavec Veles scored 92 points, highlighting their high sustainability potential (WineNews, 2024). These results align with broader evidence that precision viticulture can simultaneously increase ecological efficiency and economic performance (Mitchell & Hall, 2006).

Energy Efficiency and Carbon Reduction

Tikveš has invested significantly in energy transition initiatives. A 1.6 MWp solar power plant supplies around 15% of the winery's electricity demand, cutting carbon emissions by roughly 1,500 tons of CO₂ per year. This infrastructure is complemented by ISO 50001 certification, ensuring systematic monitoring and management of energy use. The winery has also replaced traditional mazut boilers with cleaner

energy technologies, verified through programs such as Young Energy Europe. These initiatives reflect global industry trends where renewable energy and energy-efficient equipment are key to lowering operational costs while advancing sustainability goals (Getz & Brown, 2006).

Water and Waste Management

Water scarcity poses a critical challenge for semi-arid wine regions, including North Macedonia. Tikveš addresses this by implementing closed-loop water recycling systems and advanced wastewater treatment facilities. Beyond water conservation, the winery valorizes by-products such as grape pomace and stems, which are repurposed as biomass and compost for use in both vineyards and local farms. The adoption of lightweight, recyclable packaging reduces solid waste while lowering transport-related emissions. These practices illustrate the circular economy model that is increasingly central to international wine industry sustainability frameworks (OIV, 2023).

Social and Governance Dimensions

Sustainability at Tikveš extends to social and governance dimensions. The winery organizes training programs for employees and grape suppliers, ensuring that knowledge of sustainable viticulture and winemaking is shared across the supply chain. To promote accountability, Tikveš publishes annual ESG reports, publicly disclosing progress and challenges. It supports local cultural initiatives, strengthening its role as both an economic and cultural anchor in the Tikveš region. Internationally, the winery is a member of the International Wineries for Climate Action (IWCA), thereby committing to science-based climate targets and global sustainability goals. Additionally, Tikveš promotes gender equality and diversity through its participation in the Women on Boards Adria initiative, exemplifying how social governance can reinforce brand reputation and consumer trust (Carlsen & Boksberger, 2015).

Implications for the Macedonian Wine Industry

The Tikveš Winery case highlights how sustainability, when systematically embedded, can generate competitive advantages in export-driven markets. By combining precision viticulture, renewable energy, waste valorization, and transparent governance, Tikveš demonstrates that Macedonian wineries can achieve international recognition without compromising authenticity. However, replication across the sector requires greater institutional support, financial resources, and coordinated branding efforts (Mitchell & Hall, 2006). In line with findings from global wine tourism and marketing research, the Tikveš model confirms that sustainability and profitability are mutually reinforcing rather than contradictory (Hall et al., 2009; Carlsen & Boksberger, 2015).

Challenges for the Macedonian Wine Industry

Despite Tikveš's pioneering role and numerous sustainability achievements, there remains a significant challenge in leveraging this leadership for greater brand visibility and international recognition. Beyond IWCA membership and occasional announcements, these green practices are not widely communicated to global or domestic consumers. Increased education, media campaigns, and governmental support are essential.

Other Macedonian wine producers face barriers such as lack of vision, limited financial resources, and insufficient knowledge and human capital to invest in sustainability. State incentives, subsidies, and reward schemes for sustainable

viticulture and winemaking are necessary to encourage broader adoption and improve the international competitiveness of Macedonian wines.

This comprehensive ESG integration positions Tikveš Winery as a benchmark for sustainable innovation in Southeast Europe's wine industry. Their example underscores the critical link between sustainability, quality, and global market success that Macedonian wines must embrace to build and elevate their international competitiveness.

Conclusion

Macedonian wines hold a strong potential for international recognition, drawing on their authenticity, indigenous grape varieties, and centuries of winemaking tradition. Yet, in a global market where sustainability, environmental responsibility, and ethical branding increasingly shape consumer choices, tradition alone is insufficient. To remain competitive, sustainability must transition from being an optional add-on to becoming a core strategic pillar of the Macedonian wine industry.

The systematic adoption of sustainable practices in viticulture and winemaking has the capacity to generate transformative benefits. These include an enhanced international reputation as producers of authentic and eco-conscious wines, greater competitiveness in premium export markets, and increased rural development through eno-gastro tourism. Furthermore, alignment with EU sustainability frameworks and global climate goals strengthens the industry's market access and resilience against climate change risks. For Macedonian producers, sustainability thus represents not only an adaptation strategy but also a vehicle for innovation, resilience, and long-term value creation.

To unlock this potential, policy and institutional support are critical. Several targeted recommendations emerge:

1. **National Branding and Marketing:** A coordinated campaign, led by government institutions and industry associations, should position "Macedonian Wine" as a brand synonymous with authenticity and sustainability. This requires joint investment in international promotion and unified messaging around terroir, tradition, and eco-conscious production.
2. **Capacity Building and Training:** Public-private partnerships should establish training programs for grape growers and winemakers on precision viticulture, regenerative practices, and ESG reporting. Knowledge transfer is essential for enabling small and medium-sized producers to adopt sustainable innovations.
3. **Financial Incentives and EU Funding Utilization:** Targeted subsidies, tax reliefs, and low-interest loans can support investments in renewable energy, wastewater management, and eco-friendly packaging. Access to EU pre-accession and rural development funds must be streamlined to accelerate industry-wide transformation.
4. **Certification and Quality Standards:** A national sustainability certification scheme aligned with EU and international benchmarks (e.g., ISO 14001, EMAS, IWCA) should be introduced to validate eco-friendly practices. Certification not only increases credibility abroad but also harmonizes sustainability standards across producers.
5. **Research and Innovation:** Collaboration with universities and research institutes can foster innovation in soil and water management, pest control, and circular economy models, while also supporting the conservation of indigenous grape varieties as genetic and cultural resources.

By pursuing these strategies, Macedonian wineries can ensure that “green transition” is not only a response to consumer demand and climate pressures but also a competitive advantage that defines their global identity. Ultimately, a sustainable Macedonian wine brand can emerge as a national symbol of quality and resilience — wines rooted in authenticity, enriched by tradition, and shaped by sustainability. If supported by coherent policies, collective action, and strategic investment, Macedonian wines can transform from being a niche export into a globally recognized hallmark of eco-conscious excellence.

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