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Applications of Circular Economy and Wine Tourism in Viniculture: A Case Study

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Abstract

Sustainability of wine production is a major factor in its competitiveness and marketability. Traditional viniculture tends to be more sustainable and may provide solutions to modern issues. One such deduction is circular economy, encouraging resource efficiency, waste extraction, reducing costs, minimizing waste and pollution. Wine tourism may also contribute to synergy, by reducing distribution costs, offering a direct sales channel, and effectively communicating the story and meaning of wine, the winemaker and the region. This paper explores the applications of these two in viniculture. A case study has been conducted on a small-scale winemaker in Urla, Izmir, comprising of interviews and participant observation. The findings exhibit real-life, synergistic examples. Applications of circular economy in small-scale viniculture are shown to increase resource efficiency, close production loops, limit waste & pollution and add value to the product. Wine tourism, while reducing costs and increasing sales, was reported to be an efficient direct communications channel with the visitor, granting a personality to wine. Due to its absolute advantages of enriching the product and the consumer and service provision, wine tourism closes the ultimate production loop. Synergistically, these tools may improve profitability, marketability and the sustainability of viniculture.

Key words: Sustainable Viniculture, Circular Economy, Wine Tourism, Agricultural Economy

JEL Code: L66, N5, Q15, Z32

1. Introduction

Nothing is wasted in nature. All matter and energy is conserved and re-used through natural cycles within an ecosystem that is in balance, creating value and new life (Çepel, 1997).

Traditional viniculture has mostly been in tune with natural cycles and has resulted in a product that has been the staple of human civilisation and its feelings

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of gratitude for all the blessings of nature. A comprehensive understanding of these cycles that do follow autonomously in the nature, and of the resulting idea of sustainability, has resulted in the circular economy model. In this view, circular economy is the imitation of the macro (the nature) in the micro (economic / establishment) environment.

The applications of circular economy model can add value to viniculture by closing the loops in production, through the re-evaluation of waste and by-products, reducing carbon emissions, while improving resource efficiency, local resource use and service and utility provision. Here, waste generated at the previous stage is re-evaluated as the input at the next. The process offers significant possibilities for cost reduction, marketability of the product and the sustainability of the production processes. Likely, wine tourism is reported to add value to viniculture in many cases and may be studied in synergy with circular economy. Through the reduction of marketing and distribution costs and offering a platform to transfer the story and meaning of the product, wine tourism enriches the product and the consumer experience alike, increases sales and closes the last loop in production.

This paper aims to increase understanding of wine tourism and circular economy applications in viniculture and explore interrelations and synergistic implementations towards sustainability. The conceptual framework studies these areas both in isolation and in relation to each other. The first section analyses vinicultural practices, with an approach of comparing traditional and conventional farming and a view to delineate more sustainable practices. The second section explores the definitions and critique of circular economy model, its exemplary applications in viniculture and its implications of sustainability. Third section explores wine tourism, its potential added value to winemaking and how it may be viewed in a circular economy context. The last section is a case study that has been conducted to explore real life applications of circular economy in synergy with wine tourism in viniculture.

2. Viniculture

Viniculture refers to viticulture for winemaking purposes and constitutes around 57% of all the fresh grape production worldwide; 36% is cultivated as table grapes and 7% turns into raisins (OIV, 2021). The term “vitiviniculture” (or viti-viniculture) has been proposed to refer to the overall cultivation, growing and harvesting of grapes, still with a special emphasis on winemaking and vineyard management.

However, viniculture differs significantly from table grape production, and most of the agricultural endeavour for that matter, where the viniculturist / winemaker systematically and consciously labours to *reduce* yield in order to concentrate the phenolic content of grapes and achieve a higher quality, rich and complex wine. Methods including spring / summer (herbaceous) and winter (dormant) pruning, as well as trellis training, thinning, girdling, topping and pinching, aim to control the growth and vigour of the vine, as well as increase exposure to sun (Winkler, 1965). Limited irrigation further adds to the (abiotic) stress applied to the vine, forcing it to extend its root system deeper and receive a

wider variety of minerals from different strata (WSET, 2012; Yıldız, 2017; Marín et al., 2021). Typical propagation starts with the selection of proper soil (and vineyard) for the variety, planting the rootstock and grafting, selection of the support system (trellis training) and irrigation. An annual cycle of budding, pruning, harvest, pruning and winter rest is monitored by the viniculturist, who conducts irrigation and yield management, fertilisation, pest and disease control and protection from elements, which include birds, rodents, frost, fungus etc. (Winkler, 1965).

Likewise, wine also differs from other alcoholic beverages, since characteristics (and perceived quality) of wine depend directly on those of the raw material, grape. This makes winemaking predominantly an agricultural endeavour and viniculture the principal activity in winemaking. Owing to its remarkable resilience and ability to adapt, the characteristic of the cultivated grape depends very much on climate and terroir, making the grape growing region a primary determinant of the characteristic and identity of wine (WSET, 2012; Santos et al., 2020). *"Climate plays a vital role in the terroir of a given wine region, as it strongly controls canopy microclimate, vine growth, vine physiology, yield, and berry composition, which together determine wine attributes and typicity"* (Santos et al., 2020, p. 3092). All these make wine a product of geography and a local agricultural specialty.

Viniculture has long been, and continues to be, a major area of human activity. Humans have domesticated vitis (particularly vitis vinifera) some ten thousand years ago. Since then, production, trade and consumption of wine (and beer) have shaped the human civilisation (Civitello, 2011). Wine, therefore, is not a mere beverage, but an icon of symbolic significance, shaping human civilisation's mythology, culture, rituals, arts, approach to and relationship with nature, gastronomy, technology and commerce (Charters, 2006).

As of 2020, a total of around 7.3 million hectares (73,000 km^2) of land is under vines on earth. Of the 75 million tonnes of fresh grape cultivated, a total of 262 million hectolitres (26.2 billion litres) of wine is produced, accounting for 30 billion euros in exports. It should also be noted that 2020 and following years saw slight but consistent drops in volume (due to the pandemic).

Türkiye ranks 5^{th} in the world in terms of vineyard surface area with a total of 4300 km^2, however, of the 4 million tonnes of fresh grapes produced, only 3% is reserved for winemaking. Vineyard area in Türkiye has seen a consistent annual decline in the last decade (OIV, 2021; OIV, 2023). Türkiye was once a major wine producer and exporter, especially after the phylloxera outbreak in France around the middle of the 19th century. Vines were planted also in Tunisia, Algeria and Morocco around that time period and especially Algeria is a major exporter today. Turkish wine production today amounts to around 80 million litres (personal correspondence).

The continuing growth of wine business, along with threats to viniculture necessitates wineries to develop strategies to stay competitive and sustainable. This is even more crucial for the New World winemakers, as their Old-World counterparts enjoy the benefits of an established market share, centuries old proven traditional methods, older vines and strong brands in the form of geographical

indicators (Thach & Matz, 2004). Those challenges include not only following the ever-changing trends of wine consumers, who at times may be too quick jump on a random bandwagon; but also, global threats to viniculture and wine business, including climate change (drought, soil erosion and salinity), limited land use, economic fluctuations and plagues (Marín et al., 2021; Cataldo et al., 2021). While the vine is robust and a certain degree of warm and dry climate favours quality grapes, extreme and inconsistent weather surely damages wine production and may even endanger the grapevine. Climate change has been shown to affect phenology timing, product quality and yield, shift suitable vineyard areas and alter grape composition. It is also associated with an increase of weather events catastrophic to the vine, including harsh frosts and hailstorms (Droulia & Charalampopoulos, 2021).

Climate change has been forcing the viniculturist to modify their terroir and rootstock / variety selection *(in favour of late-ripening and drought resistant varieties)*, floor management, pruning and training methods, increase trunk height and even delay dates of harvest (Santos et al., 2020). These may be cited as environmentally friendly and cost-effective examples for adaptation. Partly due to climate change, grapes in the world overall have increased their sugar accumulation, making wines to be higher in alcohol content and less acidic, in the last three decades (Leeuwen et al., 2019).

A relevant market trend is towards a demand for more sustainable methods of production, necessitating viniculture to be more respectful to natural cycles (Santos et al., 2020). In contrast, increasing demand and limited vineyard land also puts the traditional "maximising quality while controlling yields" approach into question (Marín et al., 2021). The resulting (and conflicting) necessity to increase both the quantity and the sustainability of the product challenges the viniculturists to explore new strategies for competitiveness. On the agricultural side a better understanding of the rootstock in relation to the soil *(including genetic engineering, more environmentally friendly methods of pest control, climate studies etc.)* is needed (Marín et al., 2021), and on the business side, tools towards minimising costs and long-term profitability, such as circular economy, and towards increasing revenues and direct sales, such as wine tourism, may offer notable alternatives.

Managing the soil in a non-destructive, conservative and sustainable manner is expected to offer positive consequences for the yield and quality of the grapes, as well as the ecosystem in the long term (Cataldo et al., 2021). Moreover, a shift away from conventional agriculture would result in the reduction of agriculture – related emissions of greenhouse gasses that exacerbate climate change, soil pollution, depletion and erosion, and consequently reduce precipitation (Cataldo et al., 2021).

Innovative agricultural technologies have also found grounds for application in viniculture, such as "precision agriculture" that utilises remote sensing platforms, including satellites, airplanes and UAVs (unmanned aerial vehicles). The resulting precision viniculture can easily supply relevant information on vegetation indices including *"chlorophyll concentration on leaves, nitrogen content and water content*

regarding the canopy, (...) Brix and pH", vegetation greenness (NDVI - Normalized difference vegetation index), water stress, yield and vine disease (Giovos et al., 2021, p. 457). Robert Mondavi Winery utilises an aerial vegetation map of the Napa Valley, California vineyard, where colour codes exhibit stressed and vigorous wines, to help in production decisions of premium wines. This collaboration with NASA is reported to improve the competitiveness of US wines, which struggle to increase their market share against the Old-World producers (mainly Italy, France and Spain) (earth observatory, 2000). NASA's remote sensing technology detected GLRaV-3 (grapevine leafroll-associated virus complex 3) on cabernet sauvignon grapes, before it showed visible symptoms, saving Californian producers "billions of dollars" (SciTechDaily, 2023).

3. Circular Economy

Defined (very broadly) as the imitation of the macro environment in the micro stage, circular economy model is ever more frequently offered as a new sustainability paradigm (Geissdoerfer et al., 2017), through the ongoing search for sustainability, its many meanings and dimensions and how to achieve it. Putting any eventual agreement on definitions aside, it is crystal clear that human development needs to reach a consensus between progress and conservation. The planet itself is a closed and circular system, therefore economy and environment need to coexist in balance (Boulding, 1966).

Definitions of the model vary, but almost always include the ideas of closed loops, 3R waste hierarchy through reduce / reuse / recycle (+recover) as well as resource and energy efficiency and local resource use (including employment) (Stahel, 2016). Traditional (pre-industrial) methods of production offer a vast number of examples of good practices for circular economy (Kirchherr et al., 2017). Definitions place strong emphases on service and utility provision, internalisation of costs, restoration and regeneration: *"a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops."* (Geissdoerfer et al., 2017, p. 759).

Circular economy model proposes increasing the circularity of production through smarter product use and manufacture. While (indirectly) proposed as a condition for, or a subset of sustainability, circular economy primarily relates to economic prosperity and cost efficiency, while environmental quality, social equity or future generations are secondary issues (Kirchherr et al., 2017):

"A circular economy describes an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations." (Kirchherr et al., 2017, pp. 224-225).

The model has also been at the receiving end of criticism, claimed to be a refurbishing of ongoing search for the consensus or reconciliation of economy & nature compatibility, lacking in theoretical grounds, definition and methods of

implementation (Corvellec et al., 2022). However, such models themselves do not need (or claim) to save the world but serve a specific purpose. That purpose is to increase resource efficiency through smarter decisions from manufacturers and consumers, innovative methods of resource & waste extraction, ultimately closing the loops and cutting down emissions and waste (Stahel, 2016). Since there are no clear-cut formulas or rules of implementation, applications must largely be situational.

Application of the circular economy model in wine production may offer significant benefits. Wine, as a consumer product has been receiving wider interest, as well as scrutiny, based on the sustainability of its production on top of its recreational and gastronomical value. Traditional viniculture has always been associated with respect for and adaptation to natural cycles, the absence of intensive farming, utilisation of natural ingredients and a preservation of soil, mostly due to the extensive vine root system. Sustainable vineyard management does include management, treatment and recovery of the large amounts of biomass waste (Berardi & Dias, 2019). Viniculture practices including producing and utilisation of compost, vermicompost (earthworm induced compost), biochar (soil enhancer through thermal processing of organic waste), plant bio-stimulants (including Ascophyllum Nodosum), beneficial fungi (AMF, Trichoderma spp.), zeolites, also partial root drying, cover cropping and mulching are all within the context of a circular agricultural economy, preserving ecological balance and offering health benefits for consumers (Cataldo et al., 2021).

Sustainable viniculture enables the re-usage of by-products and biomass waste to produce functional foods, health products, biofuels, fertilisers, feedstuff etc. that would benefit the soil: *"the use or re-use of vines parts for so-called nutraceuticals, or cosmeceuticals, or other consumer-goods applications, are basically centred on phytochemical and microbiological characterisation"* (Nicolescu et al., 2022, p. 108).

Health benefits of (moderate) wine consumption is also widely discussed, however it's prudent to concede that threats of alcohol consumption would outweigh any benefits. While any potential health benefit of wine consumption is debatable, phytochemicals obtained from the re-usage of waste, including flavonoids (mainly anthocyanins and tannins) and other polyphenolic compounds, such as isoflavones, resveratrol etc. are widely regarded to be beneficial. Those ingredients are added to other consumer products, mainly to increase antioxidant content, prolong shelf life, and improve their marketability (Nicolescu et al., 2022).

Recovery / extraction of compounds from vinicultural waste should also be conducted in an eco-friendly and cost-effective process. Vine shoot waste can be transformed into biofuels (pellets, briquettes and ethanol) in a value added, low impact process (Kovacs et al., 2022). Such examples close the loops of production in the circular economy model. Each winery should adopt and develop situational circular economy practices that better suit the characteristics of their terroir, varieties, wine styles, local resource base, market and own production processes.

While it is not feasible to suggest all viniculture is conducted sustainably, due to growing consumer preference for organic products, more conventional winemakers are inclined to prefer natural ingredients with active functions and to re-use vines and recover valuable compounds from by-products and waste (including stalks, seeds, pomace and liquid waste). Incentives for organic agriculture has also been a staple of the EU agricultural policy, to improve natural, cultural and economic environment. Such practices, while improving the marketability of the product, are also expected to generate higher economic, social and natural benefits (Nicolescu et al., 2022). Elimination of synthetic / potentially harmful pesticides, fungicides, fertilisers (containing heavy metals) would improve product safety for human consumption and conserve biodiversity in the long term (Radulescu et al., 2020).

4. Wine Tourism

Wine tourism is a specific type of (special interest) tourism product where the main motivation to travel is visiting vineyards & wineries, wine growing regions and wine related events, for recreation, self-improvement or self-realisation purposes (Yıldız, 2009). Activities and services include winery tours, trails, tasting events, courses, festivals and harvest participation. Wine tourism is largely studied in the context of special interest tourism, serving the specialised needs and motivations of a niche market (Kruja & Gjyrezi, 2011). Tourism service does not discriminate on the rationale of travel purposes; if the market is economically viable, there will be service provision.

While conventional / mass tourism is widely (and readily) associated with ideas of consumption, extravagance, wastefulness, pollution and degeneration, it should be argued that tourism itself is not to blame, but a lack of careful, long term and proactive planning is. Scale, level of congestion, type of attraction and destination, behaviours of establishments, visitors and locals are some of the determinants of sustainability (Yıldız, 2022). Tourism travel is frequently blamed for disproportionate carbon emissions, however there is little causality and there are even tourism related opportunities for decarbonisation (Sun et al., 2022).

Types of products that are frequently studied under the scope of special interest tourism, including wine tourism, are largely, but not exclusively, associated with small-scale, active recreation, co-creation and a more immersive, respectful tourist behaviour that is friendlier to nature and culture (Kruja & Gjyrezi, 2011; Hamilton & Alexander, 2013). Further, wine tourism (in concert with similar types of rural tourism products) offers alternatives of economic diversification to the producer and a direct marketing and sales channel to revitalise rural economy (Dunn & Wickham, 2016). While offering a direct sales channel for the producer, wine tourism helps reduce costs associated with sales and marketing, including transportation (Yıldız, 2009). However, as the winery, or any agricultural endeavour, ventures into tourism service provision, the priorities of different and potentially conflicting activities, as well as stages of agricultural production and tourism service and authenticity of these activities will come into question (Domenico & Miller, 2012).

Wine tourism and similar types of (creative) tourism products offer instances of co-creation of tourism experience, co-presence and co-performance for the individual within a small group of like-minded people sharing a specialist area of interest, which elevate, fulfil and even transform the self, ultimately resulting in more memorable experiences, repeat / referral visits and loyalty (Kim & Fesenmaier, 2015; Santos et al., 2019).

Surroundings and situations in wine tourism and similar types of tourism products are better suited to transfer the geography and cultural capital of the destination (Mitchell et al., 2012; Arroyo et al., 2021), offering a tangible sense of place (Tuan, 1974). Experiences that fundamentally transform the consumer behaviour (Pine & Gilmore, 1999) are significant in studying tourism in a circular economy context. Mutual modifications in the approaches and behaviour of visitors and service providers will improve the sustainability of tourism development in destinations (Sørensen & Bærenholdt, 2020; Sørensen & Grindsted, 2021). Sustainability of wine tourism development necessitates careful and inclusive destination management methods that take carrying capacity / limits of acceptable change into consideration, enable collaboration of local stakeholders (possibly to form wine trails), implement sustainability regulations, measures and certificates (including regenerative agriculture and nature-based solutions) and ultimately create business as well as environmental and cultural awareness (Festa et al., 2020; Trigo & Silva, 2022).

Ultimately, wine tourism, through its provision of service and utility, enriches the product by transferring the story and meaning of the grape, wine, history, tradition and culture, creates consumer awareness, reduces marketing and distribution costs, energy, resources and waste, creates local employment, ultimately closing production loops in a circular economy setting.

5. The Case Study of a Small – Scale Winery: Methodology

The paper set out to increase understanding of circular economy and wine tourism applications in, and how (if) they benefit, viniculture. Since the research necessitates an in-depth exploration and an intensive study of a situation in the natural setting, which includes the application of broad and complex phenomena, a methodology based on a case study has been designed (Heale & Twycross, 2018).

Defining the single case was the first step, and after conducting the preliminary research through media, literature and interviews, MMG Winery in Urla, Izmir in Türkiye has been selected. The producer is a small-scale, family owned and run winery that claims to fully adopt natural and traditional wine production methods and ingredients. The establishment also serves basic wine tourism provisions. The selection was due to both their willingness to integrate traditional and sustainable approaches to viniculture, and their willingness to communicate transparently and with an apparent interest.

Unstructured interviews and (participant) observation were conducted during the one-week field study. All three owners have been interviewed, accompanied by tours of the vineyard, service area and production facilities. The

purpose of the data collected was clearly stated and permissions to use the propriety name, as well as vinicultural methods were taken and signed. The main points of the research have been outlined, and defined if necessary, and the owners were asked to express their knowledge, experience and unbiased opinions around them. The key findings are reported in the following segment.

6. Findings

MMG Winery is a single location, small-scale establishment that bottles at the property and cultivates all their grapes (and other ingredients, where possible), in a French château style, which ensures complete control of the production decisions, process and quality. This hands-on approach also means that the winery is a full-time commitment for the owners. This is reflected by the idealist approach of the owners, who wish to reflect their vision through the product, instead of adapting to short-term consumption trends. The owners express an aspiration towards a dry and zero waste viniculture and adoption of traditional methods of production and conservation.

The maximum capacity of the total vineyard area is around 50,000 litres per annum, however actual production is limited to around 20,000 bottles (15,000 litres). This decision is both towards ensuring higher quality wines, and out of prudence; the owners still wish to remain capable of harvest should there be a lack of seasonal agricultural labour. The shortage of labour has been noted as their first and foremost concern. Although they express a preference to employ locally, the shortage means the workers arrive from outside the region. They note that supply of agricultural labour is both diminishing and aging, since few youngsters prefer manual labour.

At the planting stage, soil analysis at three levels (30-60-90 cm) was conducted to determine the mineral and water content and overall fertility of the patches of the vineyard. This was followed by the planting of actual rootstocks of phylloxera resistant, American rootstocks *(vitis aestivalis, vitis berlandieri, vitis riparia, vitis rupestris etc.)*. On these rootstocks, the owners have selected to graft different varieties of vitis vinifera that better suit the soil, wind, sun exposure, latitude, altitude and other terroir criteria. The varieties include most noble grapes, as well as local ones: Syrah, Cabernet Sauvignon, Merlot, Mourvedre, Bornova Misketi (Muscat), Kara Misket (Black Muscat), Chardonnay and Viognier. South African variety Pinotage was also tentatively grafted 10 years ago, as the vineyard is a close match to those in its native ground in terms of latitude, soil and wind. The first vintage has been bottled and sales have begun.

Trickle irrigation is done through the first 3 years of planting the vine, using water pumps. After that period, dry agriculture is conducted, and irrigation is restricted for all but the drought emergencies. This practice is a stressor on the vine, causing it to extend its roots deeper and incidentally protecting the soil from eroding. Superficial roots are also terminated, further extending the roots downwards, enriching the berries with a wider variety of nutrients, resulting in more complex wines.

While any remnant plant matter from pruning / drying is directly transformed into natural fertilisers, almost all the pomace is fed to the property's

goats, who in turn provide the milk that is fermented to cheese, which is finally served alongside the wine at tastings. The goats in turn provide (some of the) fertiliser used in the soil. Remainder of the fertiliser stock is supplied by local goat and sheep herders.

As a new practice, macerated seeds are collected and shade dried, separately packaged, to be consumed as snacks. These are naturally high in antioxidants (particularly resveratrol), both by themselves and as a result of maceration in must. This is one example of a re-use of waste as a phytochemical / nutraceutical. Seed oil is also extracted by larger producers, for cosmeceutical / medicinal use *(the health benefits of grape seeds are assumed to be discovered by wine producing women in Roman times)*.

Used bottles are collected by the general directorate for environmental management within the recovery programme. Oak barrels are extensively used at the winery for the aging process of suitable wines. These barrels diminish in utility after each use and serve no benefits to the wine after a certain period of use. While used oak barrels are still suitable for whisky aging, the scale of the winery prohibits exporting these. These then are re-used as tables for the service area.

While little to no water is used at the vineyard, stainless steel tanks (for fermentation and aging) are sterilised with sulphur dioxide and pressurised steam, and this process produces no grey water. Use of diesel tractors is compulsory given the dimensions and terrain of the vineyard.

As for pest and disease control, main pests include phytophthora / downy mildew, grape moth (eudemis botrana) and powdery mildew spores. There have been no rodent sightings. Sulphur dioxide is applied on soil surface several times during spring. This application eliminates the need to add sulphites to harvested grapes. Sulphur is mostly volatile and washed away by rain, if used in correct doses, leaving no residue on soil. However, it is ineffectual against forms of mildew, which makes pesticide applications compulsory. 2022 saw a mildew endemic, which has been destructive to Turkish wine. The mildew, which attacked the leaves to diminish chlorophyll and photosynthesis, mutated in 2023 to be able to directly attack the berries. Ministry of agriculture approved pesticides are utilised, mainly against mildew and other harmful bacteria. While these contain no harmful / synthetic ingredients, correct dosing is extremely important in order to avoid any residue on soil. Traditional bird nets are used, but this application is very labour-intensive. Shots of blank cartridge are increasingly less effective since the birds get accustomed to the noise.

Weed coverage is allowed during spring as these protect and humidify the soil surface. Vine receives little superficial water; therefore, these are ineffectual for water intake. Weed is mown, by hand, towards summer, to allow soil and the vines to breathe. Trellis training further increases vines' ability to receive air.

Yield is limited to around 7 tons of fresh grapes per hectare. Herbaceous pruning is carried out in June. Frost is a non-issue at the vineyard due to consistent currents of air. Hail is also rarely seen. The establishment made some use of

precision agriculture, utilising drone and satellite photography to estimate yield amounts. However, owners stressed the point of a hands-on approach and intuition. They strongly argue the merits of traditional, against conventional and mechanised farming:

"I need to know, by instinct, that the grape is right. Physical contact, intuition, tasting and such are millennia-old, proven methods of viniculture. Technology at this level cannot be in tune with natural cycles, but human experience can."

The owners emphasise that no ingredient or method that is not natural is used at the winery. Egg whites and shells are used as clarification agents. Intuition is also preferred over certificates as the producer expressed disinterest in cool authentication (Cohen & Cohen, 2012).

As wine tourism is concerned, the vineyard receives daily guests for single vineyard tours, wine tastings, direct sales and events where wine tasting, and food pairing are provided. MMG is one of 9 vineyards on the "Urla Vineyard Route" as well and thus is a point of attraction and a stop for guided tours. The vineyards collaborate mainly on joint promotion (during exhibitions) and sharing of technical knowledge.

The owners emphasise wine tourism's main advantages of getting in direct contact with the consumers, with a chance to transmit the story, production and history of the vinery and the wines produced:

"Thanks to vinery visits, our wine acquires personality."

Creation of a direct sales channel is particularly important given the vineries' limited budgets for distribution and the prohibition of alcoholic beverage promotion.

Aside from a lack of willing labour and mildew endemic, shrinkage of vineyard area due to urbanisation pressures is pointed as a major threat to viniculture in the region.

7. Conclusions and Recommendations

The paper set out to explore the applications of circular economy and wine tourism in synergy, if and how they may benefit viniculture. Relevant, current literature in viniculture, circular economy and wine tourism was reviewed, and to examine the real-life implementations, a case study has been designed and conducted at a small-scale winery that adopts traditional and natural methods and ingredients. The findings of the case study verified most of the literature.

First off, it is verified distinctly in literature and practice that traditional viniculture can be, and mostly is, more sustainable, by avoiding intensive farming practices. By following natural cycles, preferring intuition, natural methods and ingredients, traditional viniculture promises broader alternatives for re-evaluation of waste and by-products, reducing carbon emissions, improving local resource use and resource efficiency, and enriching the product and the consumer experience. Such practices fall into the context of circular economy and through higher resource efficiency and the re-evaluation of waste in the next production cycle, loops are

closed effectively. One striking example in the case has been the circular use of pomace. At the first stage, the leftover of the winemaking loop is re-utilised as feedstock for the goats, who in turn provide the milk to be fermented into cheese, which is in turn served to the guests as accompaniment in wine tastings. The goats also provide some of the natural fertiliser needed, and the rest is supplied locally. While this example reduces or eliminates input costs (and waste) at every stage, it enriches the visitor experience by serving home-made accompaniments and their story.

While applications of circular economy show significant cost reductions and benefits for biodiversity, wine tourism is suggested as a synergistic practice in the research. The latter offers alternatives for economic diversification, increasing sales, reducing marketing and distribution costs and emissions, but its absolute advantage is reported to be enriching the product and the consumption experience. The case has verified that the personal contact, the direct communication of the personality of the wine and a direct sales channel are invaluable for especially small-scale producers.

When evaluated together, these two applications may serve on the agricultural and the business side, towards the competitiveness and the sustainability of winemaking; they are environmentally friendly and cost-effective tools for adaptation, and the findings parallel the literature. Moreover, these tools transfer the message of the value of sustainable agriculture and thus create higher consumer awareness, and may elicit a more immersive, respectful visitor and consumer behaviour. Modification of the consumer and producer behaviour is expected to improve sustainability of winemaking and tourism development.

The winemaker in the case study practises dry, zero waste, traditional and conservative agriculture. The water and pruning stress applied on the vine causes deeper roots, which not only result in more complex wines, but also protect the soil. The production process, modelled on human intuition and traditional methods, is designed to minimise or avoid grey water production, residue on soil, resource waste or any forms of pollution. This is achieved by favouring environmentally friendly methods and ingredients, and where additives are compulsory, adhering to correct dosage. While innovative technology is not outright dismissed, the producer prioritises human intuition and experience. The small-scale offers the absolute advantage of a full control, hands-on approach to every aspect of winemaking. The shortcomings of the scale were reported to be the infeasibility of exporting used oak barrels and further resource extracting, such as grapeseed oil.

Aside from supplying natural fertiliser, the absence of further local resources limits the inclusion of local stakeholders. Winemakers in the region join forces in the context of the Urla Vineyard Route, to exchange technical information and to collaborate in joint promotion; however, further collaboration may be recommended through established protocols, to overcome the shortcomings of scale and budgetary limitations. Moreover, through further collaboration, winemakers in the region may overcome, to a certain degree, the limitation of local labour, distribution and promotion.

Further analysis may provide beneficial insight into the possible applications of wine tourism and circular economy to overcome labour shortages and to locate local resources. The findings of analysis are evidently restricted, and applicable, to small-scale viniculture and further research may be conducted for larger, and possibly more conventional producers.

Competing interests: The author declares none.

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