The appendices footnotes to the essay have been omitted, so as not to make what is put on the website too long.

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WSET Diploma D6 Essay July 2022
J T Schoombee, Western Australia; 2022.

WSET Assignment D6: July 2022 submission — Sustainability

Introduction

Sustainability is now widely recognised to encompass three elements or "pillars": environmental protection/stewardship, social equity and economic feasibility.

Sustainability is seriously challenged by climate change. The effects of that include global and localised warming, drought, extreme weather events (like heatwaves), resultant fires, heavier hail and frost - also at unseasonable times - and seasonal shifts. This is compounded by the effects of the COVID pandemic and high inflation, with the treat of serious world-wide recession.

The specific essay topics raise the question how water, energy, employees and consumers in the wine industry should be treated in view of the above issues.

This calls for sustainable practices. At a minimum, they do not harm people or the environment, and at best create value for stakeholders. Such practices focus on improving environmental, social, and governance performance in the areas where enterprise operations have an environmental, social or economic impact, viewed in the context of climate change and its effects.

Wine production is one of the most significant agricultural activities in the world., It is valuable and culturally important. However, it is vulnerable, being dependent on the weather, and on the performance of the various cultivars and regional elements readily influenced by temperature and water availability. Climate change is materially shaping future viticultural *terroirs*.

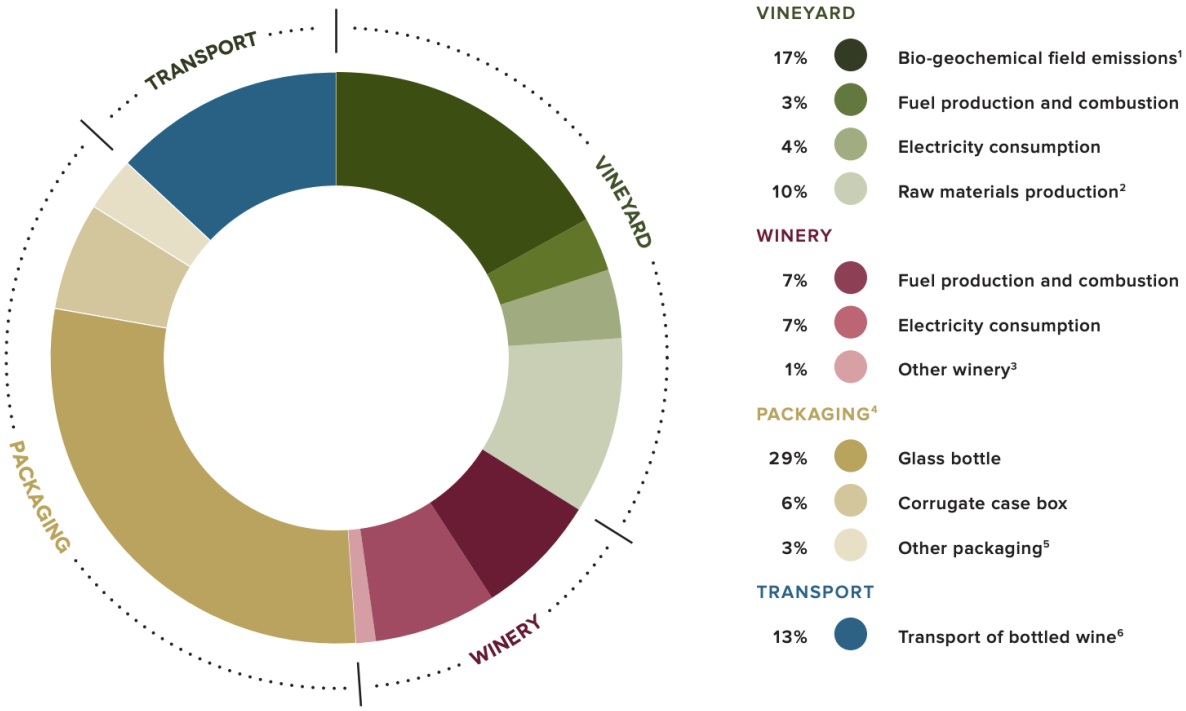
Wine producers, also as an industry, are taking steps to promote sustainable practices. But the modern industry is highly competitive, so a producer also needs to establish and communicate its own sustainability credentials.

Wineries across the world differ considerably in size, financial means and location.

Like most of the research studies available, this essay tends to focus on those towards the "higher end." So a number of measures discussed, may not apply to smaller wineries, notably in say Eastern Europe and the Middle East.

How can the environmental sustainability in a winery be improved in relation to water and energy use?

The carbon footprint of a typical winery is reflected in Diagram 2 below showing the importance of addressing energy use. Water security and availability are also increasingly of the highest priority for wine makers.



[1] Footprint associated with greenhouse gas emissions that are a result of natural bio-geochemical processes and impacted by local climate, soil conditions, and management practices like the application of nitrogen fertilizers.

[2] Footprint associated with the manufacture and shipment of materials used at a vineyard such as fertilizers and pesticides.

[3] Footprint associated with the transport of grapes from vineyard to winery, raw material production, refrigerant losses, and manufacturing waste treatment.

[4] Footprint associated with the manufacture and shipment of materials used for packaging wine.

[5] Footprint associated with the natural cork closure with aluminum foil and treatment of waste at packaging manufacture.

[6] Footprint associated with fuel production and combustion in trucks and trains based on typical distances for the industry when shipping in the United States to retail facilities.

The situation calls for *regenerative* practices to be pursued on a holistic basis, through the "5 R" principles:

- Reduce the amounts (water, energy) used;
- Re-use water in a fit for purpose perspective;
- Recycle waste materials as nutrients or organic matter;
- Recover thermal energy, organic energy or hydraulic energy;
- Replenish the environment, discharging only what can be absorbed by the natural environment.

Fresh Water

Water scarcity and water stress are now common phenomena in viticultural areas.

As a minimum, a winery should pursue Water Use Efficiency (WUE) and a proper water management plan. That should provide information about current and projected (5-10 years) water use and water security (availability, quality and costs) and information about efficiency improvements. It should typically identify targets for yield and grape quality, and include a water budget preferably for irrigation on a “when needed” basis. The plan should be reviewed and updated at least annually.

Evaporation by vines can be reduced through vineyard row orientation, and even by spraying the vines with "sunscreen."

Evaporation losses from the soil and storage dams can be reduced by:

- Irrigating at night (by some 10%).
- Applying mulch under vines (reducing losses by 10-30% when using above-ground drip irrigation systems).
- Applying protective films to storage dams and/or establishing windbreaks close by (reduction by 20-30%).

Accurate and up-to-date information about the water needs of vines is important. So internet-enabled sensors for vineyards that can improve water efficiency by 30-50% and make nutrient and water information available to growers instantly through their smartphones, have been developed in New Zealand.

Planting less "thirsty" and more heat and drought resistant rootstocks or cultivars (suited to the region), can reduce water dependence. But this is best suited to a situation where the average temperature increase through climate change would be within a range of 2° C. Even then, a loss of 24% of the vineyards affected is anticipated.

In 2021, six new grape cultivars were approved by France's national appellation body, INAO, for Bordeaux, to assist wine producers there to adapt to climate change. These included Touriga Nacional, a heat tolerant cultivar.

The meaning of a "Bordeaux blend" may thus change over time but consumer acceptance is an issue. Cultivars are commonly seen as fundamental to style and quality but also to acceptance in the market – and the price to be obtained for the grapes or wine. So there are generally legal, cultural and consumer issues in seeking to interchange cultivars."

Wastewater

Wastewater is a major component of viticultural waste, and its management a key element of environmental sustainability – to save (fresh) water and to prevent pollution of the environment by the discharge of untreated wastewater.

The following figure reflects a cogent sequential and overall strategy:

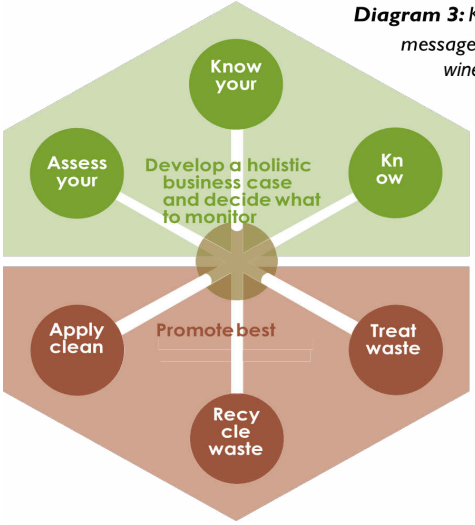


Diagram 3: *Key messages – winery*

It is important to “know your waste” (using for instance a COD test), as part of developing the most cost-effective and sustainable treatment and end-use, like for vineyard irrigation. Regular monitoring is required. Preventing domestic sewage, stormwater and lees from entering winery wastewater in the first place is recommended.

Simple measures can help to reduce wastewater, like dry sweep and shovel use instead of wet cleaning, using a squeegee instead of hosing down, and fitting automatic shut-off nozzles.

Some water can also be re-used without treatment. Water can be used to test for barrel leaks more than once.

COD can be minimized by screening out larger solids with basket screens. The contact time between solids and wastewater should be reduced, and cleaning agents used which would reduce the sodium absorption ratio.

In an early initiative, the CC in Champagne prescribed treatment of waste water. Cleaning of equipment must take place in an *aire de remplissage*. All waste water must be collected and disposed of either in a *lit biologique* which traps pollutants and breaks them down, or sent to a recycling plant for filtration.

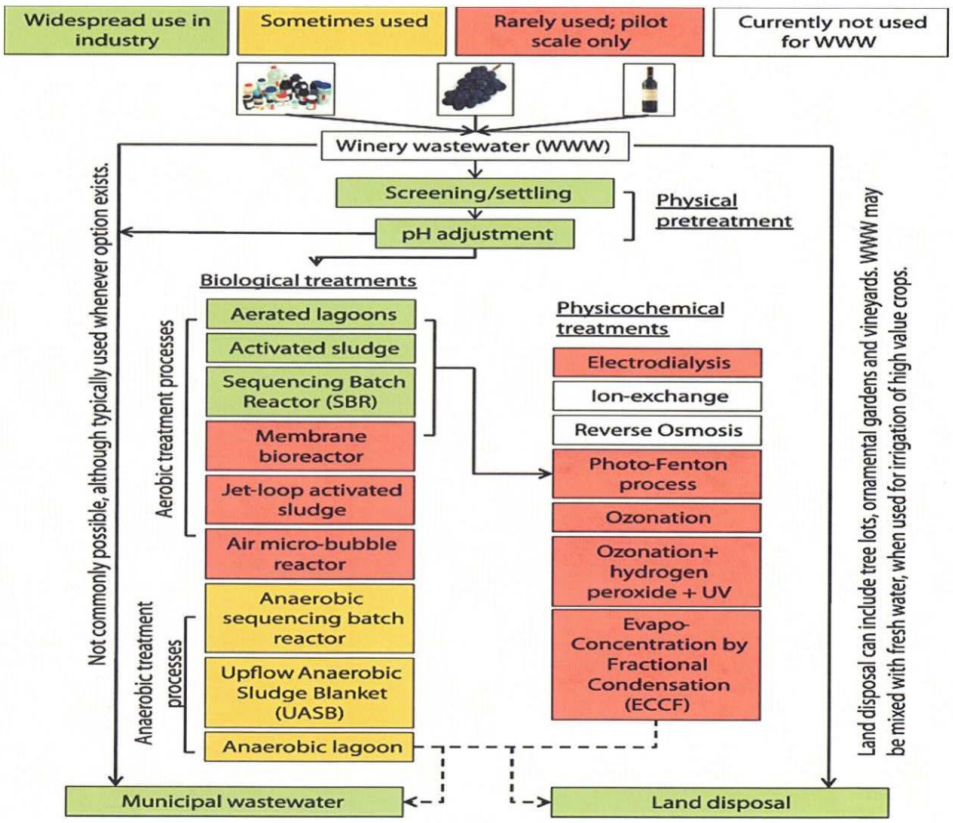
At the final (tertiary) stage of wastewater treatment, there are various options like the use of constructed wetlands, filtration, reverse osmosis and disinfection – as well as evaporation ponds. (48) An Australian study in 2011 showed that not all available options were utilised - see Diagram 4 below:

Candidate ID 14009669

Mosse et al 2011, p 115

Figure 1

Schematic of processes used in the treatment of winery wastewater (WWW).



Fortunately, things have progressed. There is now support for the approach that dealing with wastewater should strive to be part of a circular economy: by means of mechanical, chemical or biological processes, waste should be used as raw material for new products and applications.

As at 2022, the following diagram lists important treatment systems:

Diagram 5: Treatment Systems

WWTS	**Winery dimension**			
	Small	Small/Medium	Medium	Large
Activated sludge	X	X	X	X
Membrane bioreactor (MBR)		X	X	X
Up-flow anaerobic blanket (UASB)		X	X	X
Sequencing batch reactor (SBR)				
Aerated lagoons	X	X		
Constructed wetlands (CWs)	X	X		
Integrative systems	X	X	X	X

Legend: WWTS - winery wastewater treatment system; winery dimensions: Small <2000 hL/year; Small/Medium 2000-5000 hL/year; Medium 5000-10000 hL/year; Large > 10,000 hl/year; Integrative systems - combination of different treatment systems.

Energy use

To promote environmental sustainability, wineries face pressure to utilize renewable energy sources (RES) and to cut down on the use of electricity and gas generated by fossil based fuels like oil and gas (“traditional energy”), to reduce greenhouse gas emissions. Wineries also face sharply rising energy costs and the threats to traditional energy supply. Wineries are highly energy-intensive. Future competitiveness and sustainability of the sector depends on more efficient energy use.

On the positive side, RES can be cheaper, notably over the long run. So clean technologies such as wind and solar PV (photovoltaic cells), notably combined with suitable insulation, remain the cheapest option for new power generation in many countries.

Diagram 6: Typical energy profile and audit table for a winery

Technology Area	Applicable area of the Winery Process	Typical Proportion of Energy Consumption
1. Refrigeration and tank storage	• Must chilling • Fermentation • Cold stabilisation • Wine storage	50%-70% (electricity)
2. Pumping	• Wine transfers and pump overs • Cleaning	10%-20% (electricity)
	• Wastewater treatment	
3. Compressed air	• Tank presses • Cleaning	5%-10% (electricity)
4. Hot water and Steam	• Cleaning and sterilisation	5%-10% (electricity) 70%-80% (gas)
5. Heating, ventilation and air conditioning (HVAC)	• Barrel stores • Warehouses • Offices	5%-15% (electricity)
6. Lighting	• Warehouses • Barrel stores • Processing shed and plant room • Offices • Security and floodlights	5%-10% (electricity)

There appears to be strong support for an energy audit as a starting point.

After such audit, a winery can optimise the efficiency of equipment driven by conventional energy, or resort to RES – or a combination of the two. RES are important components of a more environmentally friendly process which may also be cheaper and offer independence from conventional power grids which may be unreliable notably during heatwaves. However, a reluctance on the part of some wineries to resort to RES has been found.

A reduction in energy use can be achieved by optimising building characteristics, with features such as solar powered cooling, a solar co-generation system combining photovoltaic (PV) panels and heat collection systems to deliver electricity and hot water, and a hydrogen-gas generator and hydrogen fuel cell for energy production.

Closed systems based on recycling waste and effluents can save energy. Costs can be reduced by using off-peak power,

Wind energy is a fast-growing RES (notably in places like California), and wineries can use wind turbines to supplant or supplement other energy sources, depending on location, wind profile and the like.

The time-honoured use of underground facilities, like for wine maturing, can also significantly reduce energy costs.

Organic waste like grape pomace, pulp and skins, can be recycled and through an anaerobic digestion process, produce biogas. Biogas can be used to generate electricity and heat in combined heat and power (CHP) units, or even be upgraded to biomethane which can replace fossil-derived natural gas.

The European TESLA study has shown that even outside the context of RES, considerable energy savings can be made by updating and upgrading equipment like chillers. This is supported by the comprehensive list drawn in SAusWI (2014).

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How can a wine producer improve their social sustainability through their employee relationship?

A proper relationship with employees is really an essential for social sustainability on the part of wineries. The wine industry relies heavily on manual labour inputs notably during harvesting, so the social component of sustainability is highly relevant. Generally, the well-being and quality of life, education and work conditions, social benefits, and ethical treatment of staff are material components of social sustainability in this context, and should be prioritised.

Nowadays employees are in a complex stakeholder relationship with their employer, as reflected in diagram 7 below. This points to the various avenues that should be considered for positive interaction with employees.

COVID has contributed to serious labour shortages in the wine industry – so to recruit, train and retain good staff are vital for wine producers – and for their reputation and image.

A winery can only successfully pursue sustainability objectives if its employees are properly informed, trained and inspired to support those. Staff also need to exhibit reasonable levels of job satisfaction as they interact with winery customers in various contexts, like cellar tours and when communicating over the internet. The 2022 Deloitte report stressed that successful businesses have an explicated, positive *purpose* and organisational *ethos*, shared by management and employees.

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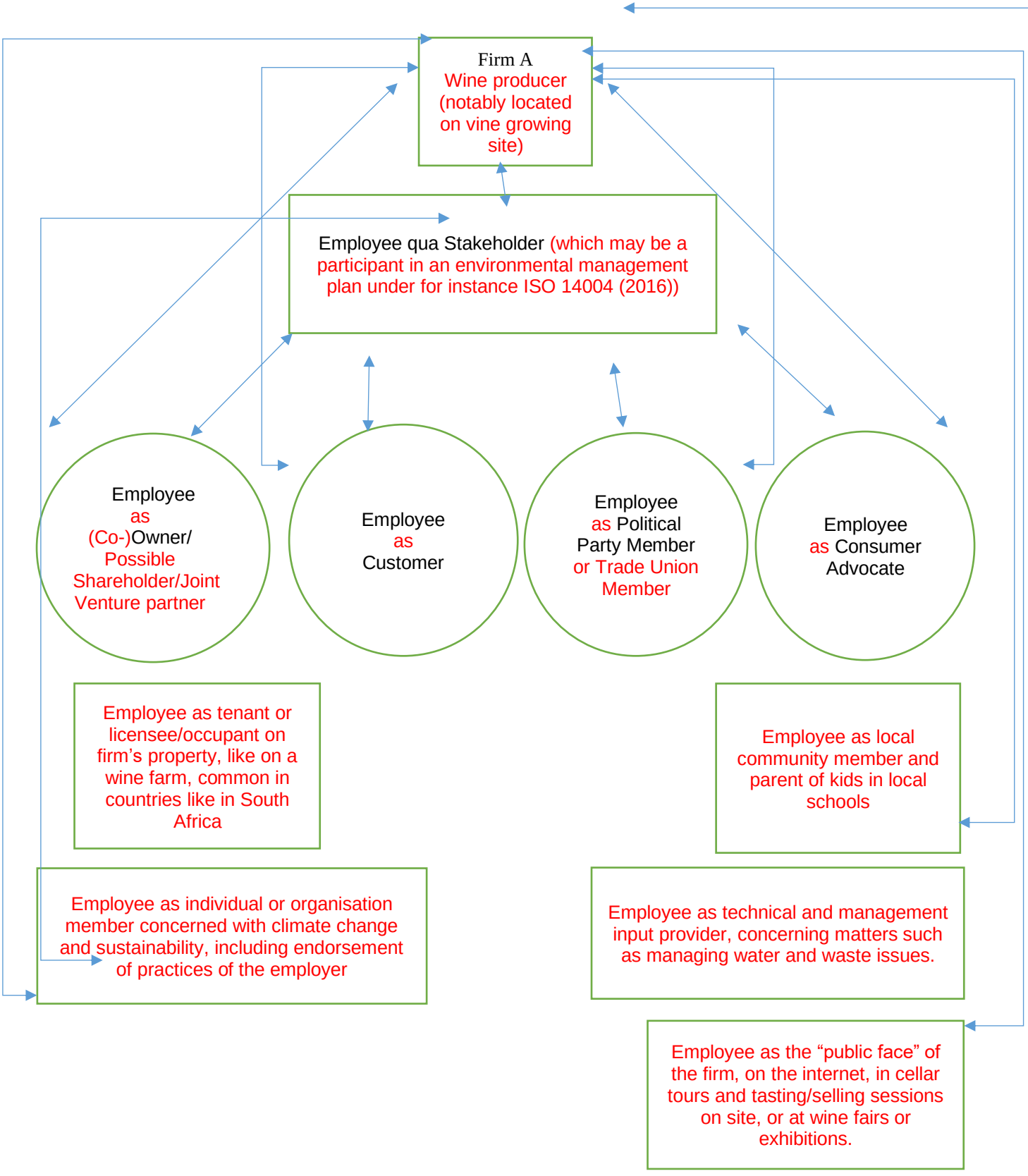
Diagram 7: Freeman (2010) p.59: Possible Stakeholder role of Employees.

Updated with additions in red by current author, concerning particularly social sustainability



Thach et al (2005) concluded that the following measures promote sustainability in the context of employees which appear commendable if somewhat aspirational and with limited relevance for small or unsophisticated wineries:

Diagram 8: from Thach et al (2005), Table 1: 33 Positive Practices in the Wine Industry	
Category	**Name of Practice**
Staffing & Recruiting Practices	1. Use multiple recruiting methods – but start internally 2. Hiring for culture fit 3. Innovative orientation process 4. Job sharing at multiple companies 5. Use a bilingual recruiter for seasonal workers 6. Friends and family – romance of wine 7. High tech recruiting strategies* 8. Promote company culture and reputation
Training & Development Practices	1. Bilingual training 2. ESL/SSL – Bilingual buddy 3. ROI for safety training 4. Cross training – learning the business of wine 5. Link career and performance 6. Encourage development 7. Teambuilding for productivity 8. Skill-based pay*
Management Communication & Employee Relations Practices	1. Multiple employee communication and feedback methods 2. Bilingual HR 3. HR by “Wandering around” 4. Business goals communication and linkage 5. Planning for celebrations of the vine 6. Aligned performance management system 7. Leadership role-modelling 8. Recognition and “family” culture
Compensation & Benefits Practices	1. Unique wine industry bonus and perk systems 2. Housing support for seasonal workers 3. Competitive pay, benefits and salary surveys 4. Communicating the “benefits” of your benefits 5. Saving plans and profit sharing 6. Health insurance for seasonal workers* 7. Time as a treat
Record Keeping & Legal Practices	1. Linking arms with your lawyer 2. Clear, consistent policies and practices
* Practice used in large wineries and vineyards only	

Unsustainable employment practices can lead to the loss of supply contracts.

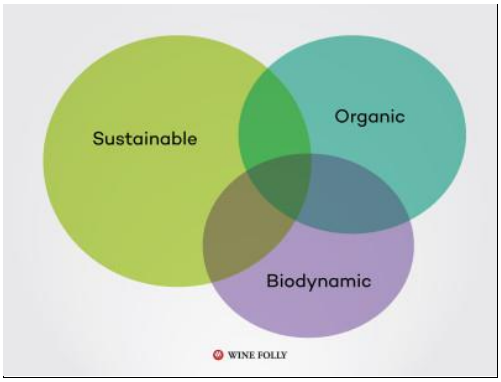
New Zealand wineries have produced a number of admirable employment initiatives, like involving local senior schools in job training and work experience, and encouraging and supporting employees to undertake *professional* training as appropriate to their roles and personal career goals. This achieved the positive result that some 79% of people working in the New Zealand wine industry want to continue doing so.

South Africa is a major producer and exporter of wine. However, it bears much historical baggage, given the dire position of “non-white” farm workers under the *apartheid* regime in matters such as living conditions and wages. It has recently been criticised because such conditions are largely persisting. There have been calls for Dutch supermarkets to disengage with their South African suppliers or at least to act to improve workers’ conditions – to pay fair prices for wine and to put pressure on South African wine farmers (still mostly “white”).

In South Africa, organisations like WOSA are working to redress imbalances. For South African wineries, improvement in employee relationships is really essential for any credibility in the context of social sustainability, and they are assisted by organisations like Fairtrade. But there appears to be a long way to go.

Does sustainability benefit the consumer, and to what extent does it influence their behaviour?

There are, confusingly, a number of interrelated and overlapping concepts and classifications under the very broad banner of “sustainability” – see Appendix 3 and a diagram 9 below for *a* view of the interrelationship.



Benefit

In this context "benefit" must relevantly be something beyond or above benefits attributable to non-sustainable wines (like anti-oxidants in red wine) - and reasonably attributable to sustainability practices.

One does not “taste” the *terroir* in any sense directly, so it cannot be said legitimately: “I can taste the *biodynamic soil cultivation* reflected in this wine”.

Claims have however been made that grapes produced organically or biodynamically result in *better tasting* wines. Thus an article in 2021 declared: “Wines produced from organic or biodynamically produced grapes do taste better". It relied on analysis of the scores of 200,000 wines given by independent critics in California and France. The starting point was however how the wines had been rated by the critics (like Robert Parker) and they may have been positively influenced by the wine’s organic or biodynamic credentials in the first place.

If taste influences in wine are claimed to be attributable to viticultural practices like organic farming, such influences would be very subtle and subjective, and readily influenced by preconceived preferences (liking “organic” or not). In 2006 the co-owner of the famed Domaine de la Romanée-Conti, which is organic and biodynamic, Aubert de Villaine, declared that organic farming is “a plus to quality – it brings finesse.” A proper test would however involve a blind tasting of wines made from respectively organic and non-organic farmed grapes from the same location in that Domaine.

Sustainable practices seek to limit or even prohibit the use of pesticides and herbicides. Consumers see this as a benefit but the World Health Organisation (WHO) does not see their use as posing a risk to wine *drinkers*.

Isabelle Legeron MW claims natural wines gives less headaches but accepts that has not been studied or tested.

A significant part of the enjoyment of wine lies in the mind, and knowingly buying and then drinking wine made with sustainable practices, comforts the mind, certainly of believers in sustainability – a benefit.

Engaging with sustainability also offers the opportunity to support worthwhile causes. This has been put well by the Australian organisation Sustainable Wine Growing. Wine consumers through their purchases get the chance to support the growers and makers committed to producing wine sustainably, presenting opportunities to:

- Get behind programs working hard to shape the wine industry for the better;
- Make a stand and demand a certain level of sustainability in everyday wine choices;
- Support a trustworthy, sustainable certification program (if available) backed by research.

Such actions may also benefit consumers in the wider sense of being citizens of a world in need of actions addressing climate change.

To what extent does sustainability influence consumers?

Despite much research, this topic is beset with contradictory tendencies and considerable uncertainty. Bearing that in mind, the following propositions are advanced.

Consumers can only be influenced if they have relevant knowledge. So conveying the sustainability credentials to consumers is important. This can be done by what is on the label (emphasised by many), by social media like Facebook, Instagram and Snapchat, advertisements on the internet, through direct marketing and even by invoking the aid of “influencers”.

While producers can benefit from country or zone wide classifications of sustainability they are then in a sense co-operating with their competitors, so individual identification and marketing still has an important role to play.

This ties in with the value in marketing of “telling a story” about your wine brand, referencing matters (like family history) and sustainable practices which speak to the emotions.

Studies have sought to identify the group or groups of the elusive “green consumer”. Research suggests that purchasers of sustainable foods including wine have distinct personality characteristics and that a preference for environmental characteristics of wine is largely based on consumer knowledge.

Demographic variables describing consumers more likely to buy such wines or who

place a higher value on them, are not consistent but and have been found to include older female Millennials, married consumers, and the well- educated. Moscovici et al (2021) confirm these categories but also name, conversely, unmarried individuals.

Wine consumers often have a limited knowledge of what “sustainability” entails and there is much confusion. They appear more familiar with a “made from organic grapes” designation but even this term is fluid.

Given this, the wine trade would benefit from clarification in this regard.

Consumers do take positive notice of the presence of sustainability credentials of wine notably where that is conveyed on the bottle.

Studies show that consumers are willing to pay a premium for sustainably-produced wine but overall, the retail price has the greatest impact on purchasing decisions.

Which specific attributes of sustainability speak most strongly to consumers are particularly uncertain. Kelley et al (2022) found that where the use of cover crops in the vineyard was a known factor, this had a positive influence on would be consumers. Moscovici et al (2021) found “organic” wine certification to be the best known quality to cause consumers to be willing to pay more for sustainable wine.