

Sustainable small-scale winery establishment and management

The study of sustainability programs in the wine production chain and their value to the Australian wine industry.

A report for:



By Matthew Pooley
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Executive Summary

Australian wine production faces challenges of strong global market competition. It has a strong global position but needs to maintain its presence in the new wine making world. Pricing pressures, scales of economies, strong competition and the fluctuating Australian dollar make it extremely difficult to meet market expectations. The intention of this study was to explore the use of sustainability programs within the global wine sector and other relevant primary and secondary production industries, and to determine the effectiveness of these approaches as well as their suitability and success in comparison to Australian programs.

This has been achieved by observing producers actively using these programs, and by observing the application of sustainability philosophies in other sectors of the supply chain. Case studies and examples will be presented from other sectors to identify successful adoption strategies that are applicable to Australian wine production. Wineries with production levels ranging from 2,000, to 100,000 cases were studied. Cool climate regions in the Northern Hemisphere and Southern Hemisphere were visited.

Sustainable programs work well environmentally, financially and socially as long as all these aspects are clearly outlined, that compliance is not too tedious, that it is well-integrated and executed effectively. The methods of extension and adoption must be addressed carefully for the success of the programs. Program selection should be carefully considered, based on the state / national / international requirements that fit in with the business direction.

To achieve greater awareness, Australian wine producers should consider adopting the national Freshcare / Entwine Sustainability program. Programs like this are used widely and successfully across the globe and in many wine regions as they provide social, business, environmental, and economic sustainability. If the Australian sector does not embrace change, and confront the need for change, the survival of the whole wine sector will be challenging.

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Foreword

Pooley Wines is a multi-generation family wine business operating in southern Tasmania. The first vines were planted in 1985, with the first wines produced in 1989. Today, the third generation manages the business, which has grown to produce 6,500 cases of wine from 14 hectares (Ha) of vineyards. As the business has matured, and demand and recognition for Pooley Wines has grown, it is a logical step for the business to plan for the establishment and management of a winery, affording the family complete control of production.

The core values of Pooley Wines include establishing a strong family business that can be passed on to the next generation. With this in mind, it follows that the Pooley Wines winery would need to be a model of efficiency to ensure it is a sustainable part of a thriving family business.

There are a multitude of issues to be considered in establishing and managing a small-scale winery. This study sought to identify the priority issues to be considered as they relate to environmental and overall business sustainability, what drives these priorities, and how other producers have met them. On a practical level, it was anticipated that current recommended practices and innovative technologies would be identified that could be transferred to the operating context of Pooley Wines.

Any study that seeks to address sustainability as a core concept is quickly confronted by the nebulous array of definitions, interpretations and inter-related issues. Distractions and tangents are numerous and tempting. Some of these were pursued in recognition of the existence of alternative frameworks and experiences that may be relevant to sustainability in the wine industry. It became necessary, however, to revisit the scope of this research to maintain focus. In doing so, this focus was further defined to be the co-existence of environmental sustainability and overall business sustainability.

A focus on emerging technologies was also anticipated, but these were found to be developing at such a rapid rate that new items or processes reported would likely be obsolete by publication.

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Abbreviations

AGWA	Australian Grape and Wine Authority
AVA	American Viticulture Area
AWBR	Academy of Wine Business Research
EMS	Environmental Management Systems
EPA	Environmental Planning Authority
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GHG	Greenhouse Gas
GHGEP	Greenhouse Gas Emission Protocol
GVA	Gross Value Added
GWSESP	Global Wine Sector Environmental Sustainability Principals
IPW	Integrated Production of Wine
LEED	Leadership in Energy & Engineering Design
LIVE	Low Input Viticulture & Enology
SEDEX	Supplier Ethical Data Design
SIP	Sustainable in Viticulture
SWNZ	Sustainable Winegrowing New Zealand
TRA	Tourism Research Australia
TSA	Tourism Satellite Account
US	United States
WBCSD	World Business Council for Sustainable Development
WFA	Winemakers Federation Australia
WO	Wine of Origin
WRI	World Research Institute

Objectives

The objectives of this report are to:

- Canvas environmental sustainability programs relevant to wine production.
- Assess the value of environmental sustainability and environmental assurance to small wine producers.
- Identify currently recommended practices and emerging technologies in small-scale wineries that could be applied to the establishment and management of a winery in southern Tasmania.

Chapter 1- The business case for sustainable wine production

The incentives for winery owners to adopt environmental sustainability measures stem from a stewardship ethic that also incorporates social responsibility and economic advantages.

Sustainable wine production is the practice that keep vineyards healthy and productive while minimizing negative environmental impacts; at the same time staying in business, providing jobs, income for employees, owners and a career option for younger generations

Potoski and Prakash (2005) reported, after examining over 3,000 United States (US) companies, those who had implemented ISO 14001, the international standard for environmental management systems (EMS), had lowered their pollution emissions and thus had improved their overall environmental performance. US companies also reported significant advantages when implementing a formal certified EMS including:

- reduced overall costs.
- reduced lead times.
- improved position in the marketplace.
- enhanced company reputation.
- better product design/development.
- improved opportunities for selling products in international markets.

Overall, the benefits of EMS implementation were found to significantly outweigh the costs incurred (Melnyk et al., 2003).

A paper presented at the 6th Academy of Wine Business Research (AWBR) International Conference 2011, at the Bordeaux Management School, provided results of a survey of 98 wine producers, 80% of whom were family-owned, and managed small wine businesses not dissimilar to Pooley Wines. The study found that wine producers with a clear EMS derived significantly

greater supply chain optimization and operational efficiencies than those without a clear EMS. Those with a clear EMS also felt that they gained an enhanced ability to enter new markets to a much greater extent than those without. Results of this study demonstrated a significantly higher level of commitment by those respondents with a clear EMS when addressing sustainability initiatives during a current economic downturn, over those who did not. Respondents who had a clear EMS indicated that they had somewhat increased their sustainability commitments (rather than conducting business as usual with no change or experiencing a decreasing sustainability commitment) as those who did not have clear EMS (Atkin et al, 2011).

True sustainability requires finding a balance among three main objectives:

- Social progress that takes into account the broader needs of society.
- Careful and considered use of natural resources.
- Steady and increasing levels of economic growth and employment.

The translation of these high level concepts to the context of establishing and managing a small-scale winery requires careful consideration early in the winery-planning phase. Wine is becoming increasingly expensive to produce due to increasing energy and other input costs. The adoption of sustainable principles in winery design and operations is expected to return greater profit as inputs and outputs are optimized and operating costs are reduced.

1.1 The international scene

The international wine industry is informally divided into old and new world wine producers. The old world wine industry is Euro-centric, whereas new world producers include the USA, Australia, South Africa, South America and New Zealand. Sustainability program developers intended to canvas producers in both the old and new wine world. However, focus locations were revised when initial research revealed that hotspots in sustainability program activity and the emergence of industry innovations appeared confined to new world producers. Further, there was evidence of evolutionary development of vineyard and winery sustainability programs in new world wine countries. In contrast, there were no wine industry sustainability programs identified in old world

wine countries that offered the opportunity for research.

On first review, sustainability programs identified in new world wine countries were appealing to the outside observer because they offer an impression of a cohesive and unified industry committed to a common path towards sustainability. There are a plethora of such environmental sustainability and assurance schemes to be found across the international wine industry. Samples of these are listed in Table 1, and Table 2 provides examples beyond the wine industry.

Table 1: Environmental sustainability programs - Viticulture specific

Country/State	Industry	Name	Overview
USA (Washington and Oregon)	Wine	LIVE (Low Input Viti and Oenology)	Widely evident
USA California	Wine	Lodi Rules	Very district orientated
USA California	Wine	CSWA (California Sustainable Winegrowing Alliance)	Very extensively adopted across California
New Zealand	Wine	Sustainable Winegrowing NZ	The predominant program
South Africa	Wine	IPW (Integrated Production of Wine)	Encompasses viticulture, winemaking & bottling
Australia	Wine	Ent Wine Australia	Nationally recognized
UK	Wine	Wineskills Sustainability Initiative	National wine production chain
World	Wine	OIV (International Organisation of Vine and Wine)	Sustainability initiative building on the GWSESP (Global Wine Sector Environmental Sustainability Principals) that seeks to establish an international standard
USA West Coast & Southern California	Wine	LEED (Leadership in Energy & Engineering Design)	Focus on building and community design, constructed, maintained and operated across the globe.
Australia	Wine	Freshcare / EntWine	New revamped program

	Wine	WO (wine of origin)	Old program, incorporated into IPW
South Africa	Wine		New scheme encompassing both WO & IPW

Table 2: Environmental sustainability programs - Industries other than viticulture

Country/State	Industry	Name	Overview
World	Agriculture	Demeter	Biodynamic certification
World	Any Business	ISO 14000/1 (International Organization for Standardization) Environmental management	For any business wanting to establish, implement, maintain, improve an environmental management system
World	FIVS	GWSESP (Global Wine Sector Environmental Sustainable Principles)	A set of environmental principles proposed as an equivalence standard for wine industry schemes
EU	Multi	SEDEX (Supplier Ethical Data Exchange)	International multi-level supply chain assurance scheme
New Zealand	Any Business	CarboNZero	Enviro-Mark Solutions certification and service delivery to NZ government
New Zealand	All agriculture production	BioGro NZBPCS (New Zealand Biological Producers & Consumer Society)	NZ organic certifier
USA West Coast	Salmon/wine partnership	SalmonSafe	Focused on the West Coast and river systems

Of the programs identified above, the SalmonSafe program, on the west coast of the USA, was unique. This was an example of the coexistence of wine production in very close proximity to

sensitive salmon production areas. SalmonSafe represents an agreement between landholders and the salmon industry regarding the conduct of primary production and land management so as not to adversely impact environmental conditions necessary for salmon production. It offers a possible model for the coexistence of sensitive industries in the same region, and could be extended to include the presence of industry alongside areas of high conservation value.

Research within the New Zealand wine industry has provided evidence that wineries that have implemented the Sustainable Winegrowing New Zealand (SWNZ) system have not experienced marketing benefits as yet, perhaps due to a lack of eco-labeling to distinguish their products (Hughey et al., 2005). A similar study of Australian wineries also reported the marketing benefits typically associated with implementation of an EMS program had proved to be elusive (Tee et al., 2007). In contrast, some previous studies have determined that consumers would be willing to pay some level of premium for an 'environmentally friendly' wine.

South Africa's Integrated Production of Wine program contained a unique feature, with the program being incorporated into oenology and viticulture tertiary courses. As a result, new industry entrants emerge from their studies with the skills needed to participate in the scheme. Further, it also establishes the IPW program as the norm within the industry, breaking down attitudinal barriers that may otherwise limit adoption. As an added benefit, employers do not have to provide additional training for IPW to new staff, instead graduates may teach employers about the latest versions of IPW material, learned through their studies.

1.2 The issue of scale

As investigations progressed, scale emerged unexpectedly as a key concept in the project scope, which had a significant influence on findings. The scale of an operation was seen to influence the business's capacity to adopt environmental sustainability programs, to gain the maximum leverage from these programs, and to realize the full suite of benefits that such programs can offer. Scale has also played a key role in the development and implementation of environmental sustainability programs, as is evidenced by the emergence and co-existence of different schemes

at the company, regional, state, national, and even international, levels. It raises the questions, what is the value afforded by these different types of programs and how are potential duplications in membership, administration and marketing are managed?

One of the key areas where scale is of significance is the scale of the environmental sustainability program itself. Company-specific, regional, state and national schemes offer challenges in how individual producers can best leverage participation. Individual companies imposing their own environmental sustainability programs may be driven by internal efficiencies but may still need to meet externally imposed requirements.

Regional schemes offer participants some protection against naysayers – a safety-in-numbers position. Programs are more readily defended when they represent a consensus position developed by the regional industry. A regional program with widespread uptake also positions environmental assurance as a pre-competitive factor in the region.

1.3 Examples from other industries

There is value to be found in examples and case studies from other industries that offer an early warning of requirements that may be imposed on wine producers in the future, or that highlight potential risks that could be encountered along the wine industry's road to environmental sustainability. Food safety and animal welfare issues faced by the dairy and poultry industries respectively provided examples of issue-specific communication campaigns undertaken that might provide a template for the wine industry. Pertinent risks identified include:

- making claims that cannot be substantiated.
- programs that fail to deliver their full value due to lack of attention focused on building awareness and recognition by parties downstream in the supply chain.
- confusion in market messages, including mixing the environmental message with other broader sustainability aspects such as health and social welfare.
- dealing with vocal and publicity-savvy detractors and lobby groups.

- ‘reinventing the wheel’ by investing resources in developing programs, practices and/or content that already exists.
- use of appropriate language and messaging in communications with markets, consumers and regulators.

In Western Australia, for example, a small free-range poultry producer, Katie Joy, is under constant pressure from international animal welfare advocacy group PETA over their method of chicken-raising and free range egg production. The small family-run business uses social media and word-of-mouth to offer information about their environmental position and the conditions in which their chickens are kept. Being challenged by a high profile international organisation with comparatively significant resources at their disposal would be confronting for any small family business. Professionally, and morally, the Joys are abiding by the industry code and beyond (K.Mason, pers. comm. July 2014).

The Nuffield Australia Global Focus Program also afforded an insight into the overwhelming hunger of the Chinese market for protein. The ability of the NZ dairy industry to capitalize on Chinese consumer concerns, following food safety issues and deaths arising from contaminated milk powder, has proven to be invaluable for NZ dairy producers. Demand for NZ powdered milk in China is very high, whilst demand for the local Chinese product has plummeted. The social and economic knock-on effect of such a significant food safety incident echoed internationally for years and demand still remains strong. This is a great example of how a standard controlling program allowed an industry to unite and put a system through such rigors and still maintain strength in a competitive market place.

1.4 Evolution of environmental systems

A stocktake of existing environmental sustainability programs was interesting for a number of reasons. The sheer number of schemes already in existence was revealing, especially in light of the fact that new environmental sustainability programs continue to be developed at the regional and state level in the Australian wine industry. Further, there were linkages between programs

emerging from the same geographic areas, and these were often evolutionary steps towards increasingly sophisticated sustainability programs. Despite the linkages, there was often also a tension between the proponents of the different programs. Tensions seem to arise from issues around ownership and branding of schemes that recommend the same fundamental practices in wine production. There is also an undercurrent of competition as to which scheme will be the easiest, or the first, to scale up, or be adopted at the next level. For example, which regional scheme will serve as the foundation for a state scheme, or which state scheme will be taken up and rolled out as a national scheme? There would appear to be bragging rights associated with this, as well as potential benefits for early movers who adopted the scheme before it was adopted more broadly. Judging by the administrative fees associated with some programs, there is likely to also be a financial benefit to the owners of the scheme that emerges as the preferred option for broader roll out.

Whereas the apparent evolution of environmental sustainability programs may be a sign of maturity in industry-based environmental assurance, it is a contrast to the Tasmanian experience, where the national wine industry environmental sustainability program is believed by many to be too onerous and detailed, so a pared-down scheme is being prepared as a state-based alternative.

Early uptake of an environmental sustainability scheme appears dependent on the simplicity of the scheme, as evidenced by the evolution of both the Australian and Californian programs. Further, adoption and refinement also appears more successful when this is driven by the industry, instead of, for example, regulators. The fastest uptake of a scheme, however, occurs when it is demanded by a customer, such as the demand for adoption of the detailed SEDEX program by European retailers. This raises two issues that need to be considered by wine producers:

- Which scheme is most valuable? The scheme developed by industry, or the scheme demanded by a customer?
- Is there a trade-off between scheme simplicity and credibility?

Industries other than wine are already adhering to more rigorous sustainability schemes so the value of simplified schemes need to be weighed up against the validity of claims that can be made.

The second observation arising from the stocktake was that all environmental sustainability programs for the international wine industry require the implementation of essentially the same suite of management practices, and differences between programs stem more from the administrative and/or branding aspects. With limited points of difference between programs in terms of what the wine producer is actually doing to maintain their environmental sustainability, the use of environmental performance as a point of difference in a competitive marketplace becomes less valuable. It also points to the emergence of environmental sustainability as a pre-competitive attribute of wine – something that all wine producers could be assumed to have, leaving competition in the marketplace to other product attributes such as wine quality or label attractiveness. The underlying uniformity in the schemes is also an emerging standard in itself; a minimum level of detail and rigour is required of new programs so that they can achieve equivalence with a wine producer implementing another scheme. As soon as a wine producer applying System A can claim that they are more environmentally sustainable than a wine producer applying System B, then System B becomes, essentially, worthless. The continuing proliferation of new industry environmental sustainability programs, however, would indicate that this is not understood in some sectors of the industry. In Australia, this is particularly evident at the regional industry scale, with different regions seeking to have their own separate environmental sustainability program.

The notion of environmental assurance implies that there is a party within the supply chain that requires assurance. The existence of this party and their position within the supply chain varies across the industry. Depending on the audience for environmental assurances, the message and mode of delivery appears to require modification. All of the NZ, Californian and Oregon wine industry environmental assurance schemes target consumers through farm gate signage at cellar door, and direct product labeling on the wine bottle. Currently, there is no communication in place for the EntWine Australia program beyond limited communication within the industry itself.

This is a significant weakness for Australian wine producers seeking to leverage benefits from the scheme.

Farm gate and cellar door signage is uniquely important to the wine industry due to the significant crossover with regional tourism. Few industries have such a direct route to market, where consumers are invited into the production area to sample and purchase the product. For small wine producers, this is also a significant sales avenue.

Overall, the evolution of environmental sustainability programs in the wine industry has led to a greater awareness of the wine industry and the relatively low impact that wine production has on the environment. Program information is readily available online, creating a positive image of openness and transparency.

1.5 Business sustainability

Business sustainability is not a destination but a journey requiring ongoing adaptation and change to continuously improve the business. Business sustainability is managing the triple bottom line, the financial, social and environmental risks, obligations and opportunities for the ongoing success of the business. For Pooley Wines, the journey is an inter-generational one and relies on flexibility across all aspects of the business. The triple bottom line of environmental, social and economic sustainability is a fundamental objective. Achieving the triple bottom line demands that a company's responsibility is to stakeholders rather than shareholders. The stakeholders are anyone who might be affected by a company or industry's practices, from workers to surrounding communities and beyond. It encompasses people, planet and profit.

One of the most notable observations arising from other producers encountered was the value adding being done by primary producers and the business sustainability benefits of this. Business resilience is improved through diversification. From an environmental sustainability perspective, the business retains control of a larger section of the supply chain and is able to develop and impose protocols across that part of the supply chain to ensure that the business's standards are

maintained. Conversely, value adding that involves additional production steps and potentially additional production sites also increases the number of environmental risks and issues to be addressed, increasing the environmental assurance burden to be borne by the business.

1.5.1 Business Sustainability in Focus: Boeing

During my personal travel a visit to the Boeing factory in Seattle, WS, was recommended. It was a timely visit due to the imminent release of the new Boeing 787 from the assembly line. Boeing is the world's largest aerospace company. A company of this size and scope doesn't succeed by resting on its laurels. They are constantly re-examining their capabilities and processes to ensure that the company is strong and vital. Driven by the company's core culture, principles of diversity, culture, people, advocacy, professionalism and focus towards environmental responsibility are delivering improvements year-on-year. The company continues to expand but still maintains a strong adherence to its environmental position statement. Boeing is committed to maintaining Greenhouse gas (GHG), water use and solid waste to landfill through to 2017 at previous 2012 levels. Boeing is seeking opportunities to incorporate energy conservation technologies and sustainable materials into new building design. The company relies on carbon-free hydroelectric and renewable energy sources. The company has been awarded Energy Star and Partner of the Year Sustainable Excellence award from the US EPA (Environmental Planning Authority) for leadership in energy conservation.

Chapter 2 – Challenges in establishing and managing small wineries

2.1 Issues faced

The overarching challenge facing small business seeking to implement environmental sustainability programs is access to resources and guidance, which is often limited due to expense, time constraints and complex methodologies. Issues faced are extensive, time consuming, tedious and costly. However, auditing technology and services have come a long way and a common adage at Pooley Wines is “If you can measure it you can manage it”.

2.1.1 Establishment

Consideration of the adoption of environmental sustainability practices in a new winery needs to address the competitive advantage or otherwise that the adoption of such practices will afford. The NZ and South African wine industries offer an interesting case study. Both countries impose their own mandatory requirement to participate in the industry sustainability program as a requirement for export. Therefore, environmental assurance has become a pre-competitive feature because all wine leaving the country offers the assurance. Wine producers, however, who do not export and only supply the domestic market do not have the mandatory participation requirement, and may decide not to take on the cost of compliance with an environmental scheme. This may impart a benefit to the non-participant in the local market, especially where there may be confusion in the marketplace as to whether all the country’s wine producers have had to participate in the environmental program instead of just those who export. Regardless of possible confusion in the marketplace, for small producers in particular, it may well be that cost savings arising from non-participation exceed cost-efficiencies derived from environmental assurance programs.

The physical activity of building a winery, in addition to planning for the technology to be constructed for use within, it is recognised as having environmental implications. In the US, the environmental toll of building, construction and operation of buildings, according to the US Green

Building Council, accounts for:

- 65% of electricity consumption.
- 30% of GHG emissions.
- 30% of raw materials use.
- 30% of waste output (136 million tonnes).
- 12% of potable water consumption.

Chauncey, J. (Oct. 2006)

Clearly, opportunities exist to minimize the impact of the winery construction through the careful selection of materials and technologies and the scheduling of building activities.

2.1.2 Management

Continual record keeping of both owners and contract wine making operations, of winery consumables, services used (water, gas, electricity, freight), waste generated and the cost of handling waste are all areas that need close monitoring. These aspects are common to almost all winery sustainability programs identified in the international wine industry. This can be onerous, especially during peak production periods. This is further exacerbated in small family businesses with the monitoring and record keeping becoming a lower priority activity during peak production, with the consequence that overall focus is then lost.

With such a large selection of environmental sustainability programs in existence, selection of the best program to apply is also challenging. The table below represents a study undertaken in NZ that asked whether the current EMSs were suitable or extra programs were required.

Table 3: Number of EMSs implemented in SWNZ accredited wineries

	Number	Percent
SWNZ only	20	52
SWNZ + one other EMS	8	21
SWNZ + two other EMSs	9	24
SWNZ + three other EMSs	1	3

Table 4: EMSs implemented in SWNZ accredited wineries

	Number	Percent
Biogro	12	41
ISO 14001	9	31
CarboNZero	3	10.5
Demeter	1	3.5
CertNZ	1	3.5
Other	3	10.5

This table shows the number of producers in the New Zealand wine industry adopting some form of EMS, both by number and by percentage (rounded) of all respondents, and supports prior research findings that the high cost of EMS implementation and compliance is an inhibitor to wine companies (Hughey et al., 2005; Tee et al., 2007), that such a high number of wineries have invested in additional EMSs. This study also found indications that NZ wineries were concerned by the costs associated with EMSs, with twenty of the surveyed wineries (53 percent) stating that time and financial costs were both disadvantages associated with their EMSs. Despite the costs, almost half of the responding SWNZ wineries had implemented at least one additional EMS. Fourteen of the respondents (37 percent) stated they were currently working towards membership in another EMS. This result suggests that the SWNZ programme, developed and promoted by New Zealand Winegrowers, may not be seen as a sufficient EMS option for wineries and hence they are seeking additional environmental performance guidance elsewhere. Specific comments have been made by the respondents suggest that the SWNZ programme was not understood or widely recognised internationally and this was their primary reason for implementing additional EMSs to the SWNZ programme. If improvements were made to SWNZ, wineries may be able to address all their environmental issues through the use of a single EMS and therefore reduce the costs and time involved with implementing and maintaining accreditation in additional EMSs. A more comprehensive SWNZ programme could help to improve the financial viability of New Zealand wineries at what is a particularly difficult time for producers in the wine industry. This result gives a valuable insight into the implementation of multiple EMSs, an area that has seldom been explored in previous literature.

The World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) joined with governments and ecological groups to develop a Green House Gas Emissions Protocol (GHG Protocol), which has become the world's most recognized and used instrument for governments and companies to understand, quantify and manage GHG emissions. This tool offers companies transparency as to how they are managing emissions, with the objective of offering a product with more added value.

Figure 1: International wine industry GHG accounting calculator (challenge in focus: GHG accounting)





Welcome to the International Wine Industry Greenhouse Gas Accounting Calculator Move To Next Page

In order to select the familiar units and region specific emission factors, please select a region from the coloured maps below. Insert Example Entries
Delete Example Entries

You have selected the following country and region: **United States** You have selected the following electrical grid: **SPP North**

Units Used Within the Model

	Volume	Energy	Mass	Mileage	Gas Units	Distance	Crush	Power	Sugar	Land Area
Australia	L	GJ	Kg	L/100Km	scM	Km	Tonnes	kWh	Brix	ha
New Zealand	L	GJ	Kg	L/100Km	scM	Km	Tonnes	kWh	Brix	ha
United States	Gal (US)	Therm	lb	mpg	scf	mil	ton (short)	kWh	Brix	Acre
South Africa	L	Btu	Kg	L/100Km	scM	Km	Tonnes	kWh	Brix	ha
United Kingdom	Gal (imp)	Btu	lb	L/100Km	scf	mil	ton (long)	Therm	Brix	ha

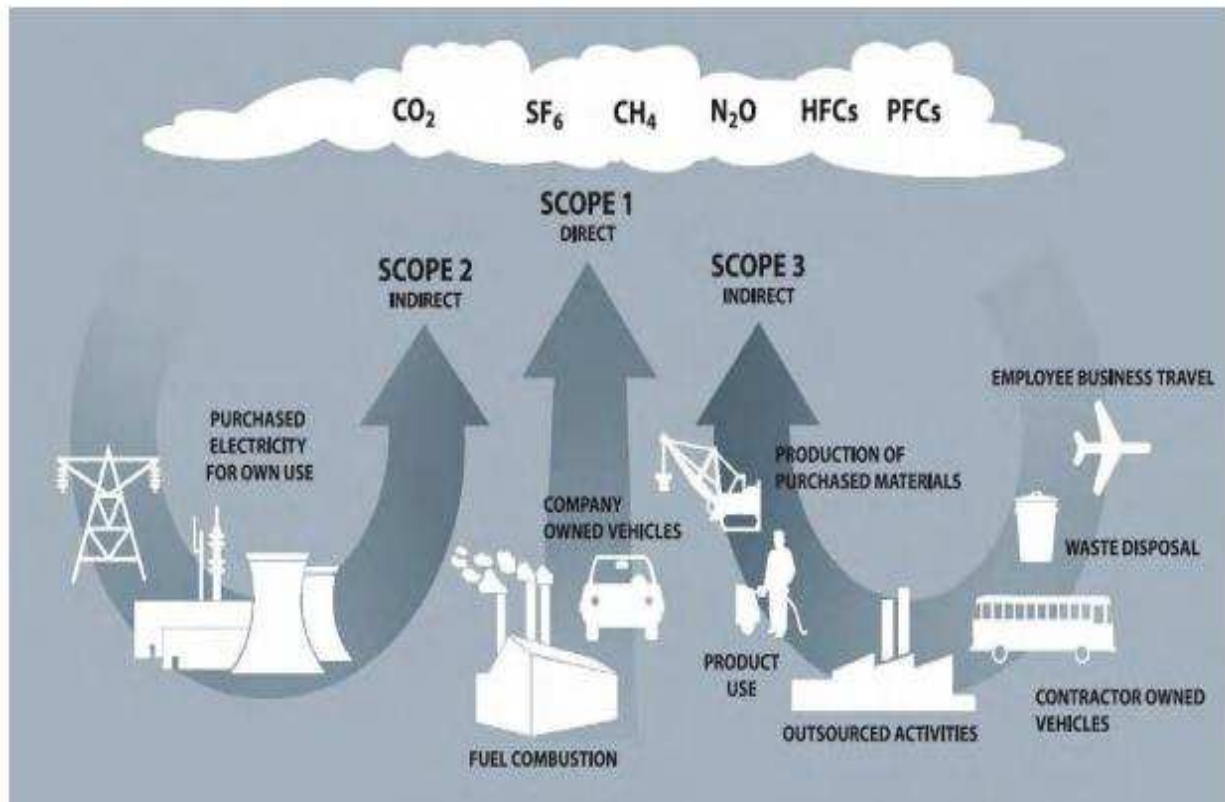





This group continues to work towards more effective and credible programs to face climate change. In the same way, the International Protocol for Carbon Emission Calculation in the Wine Industry, created in 2008, represents a project of the Wine Institute of California, New Zealand Winegrowers, South Africa's Integrated Production of Wine Program, and the Winemakers Federation of Australia to adapt this instrument to the wine sector. Its objective, as well as its annex document, "Greenhouse Gases Calculation" (see Figure 2 above), is to measure the carbon footprint of wine companies of all sizes. Companies can use the Protocol and calculator to:

- perform mandatory and voluntary reports.
- calculate their own carbon footprint.
- supply information to clients regarding company carbon emission impact.
- create a management tool to obtain the company's climate neutralization (which is obtained by calculating the GHG emissions generated with the objective of offsetting them by some method).
- respond to mandatory requirements regarding carbon emissions.

This tool is presently in its start up phase, and is already in use in wineries of the countries that participated in its development, and also in wineries from other countries.

Figure 2: Pictorial representation of Scope (World Resources Institute, 2004)



2.1.3 Communication

Discussion of environmental sustainability often employs a variety of terms that present environmental activities as being outside the scope of normal day-to-day business operations. In short, environmental sustainability is positioned as being an optional, additional activity beyond the normal course of operations contributing to business sustainability. However, environmental sustainability is readily discussed in more conventional, and potentially more palatable, terms that resonate with producers for whom environmental altruism does not figure highly in decision making. Such conventional terms include efficiency, optimisation of resource use, reduced inputs, reduction and re-use of wastes and marketability. Communication as a barrier to the adoption of environmental programs is not a new concept.

Figure 3: Bottle certification labels and certified public signage



For environmental assurance communications with consumers to be of benefit, consumers must use environmental criteria in their purchasing decisions. Market research findings are mixed, and become more unclear when the prospect of consumers paying a premium for environmentally assured products is also considered. Most recently, the Natural Marketing Institute, sponsored by the Californian Wine Institute, surveyed 4,000 American consumers and found significant opportunities for wineries to drive home messages about sustainable practices (Parker Wong, D, 2014). One third of all consumers were found to consider environmental performance when buying wine. Sixty-six percent of respondents took their cue from labeling on the bottle. Further, third party certification was cited as most helpful in helping consumers choose sustainable products. The ultimate market leverage for the producer is achieved when consumers preferentially select the product and are willing to pay a premium in recognition of the environmental assurance effort.

Consumer communication relies on the consumer being able to correctly interpret a logo, and increasingly the nature of the logo, and the terms used to describe environmental sustainability are coming under scrutiny from fair trading regulators.

2.1.4 Performance Metrics

An important step in sustainable wine growing operations is the selection of performance metrics that will inform the measurement and communication of continuous improvements.

Metrics should seek to:

- provide growers and vintners with tools to measure, manage and track their use of natural resources to optimize operations, decrease costs, and increase sustainability.
- enhance the wine community's leadership position in sustainable production by being on the leading edge of sustainability.
- enable participating winegrowers to confidentially benchmark their performance against their peers to drive innovation and adoption of sustainable practices.
- expand the means of communicating the improvements in performance to stakeholders.
- improve credibility of the sustainability programs with regulators and policy makers, retailers, and consumers by tying measurable performance outcomes to practices.
- provide industry targets, tools and resources to improve sustainable practices and innovation.

The performance metrics are the measurable outcomes of the business practices. Sustainability initiatives in all industry sectors are increasingly based on performance metrics.

In any program development, the initial set of winegrowing metrics used should be:

- Water use (vineyards & wineries).

- Energy use (vineyards & wineries).
- Greenhouse Gas Emissions (vineyards & wineries).
- Nitrogen use (vineyards).

Understanding the interdependence of practices and performance metrics is crucial to making and validating improvements in sustainable agriculture. Practices impact metrics and metrics inform practices. Understanding and quantifying this relationship is important for continuous improvement.

The following tables present a model-in-use for Sustainable Wine Production in California. Whilst it is presented in imperial measurements; it is indicative of an approach used, and can be viewed as a model for conversion into the Australian setting.

Figure 4: Example of performance metrics from Californian SWP for vineyard and winery

Vineyard Metrics

Metrics Area	Metrics	Metric Usage Benefits	Data Elements	Data Sources
Vineyard – Water Use	$\text{Water Use Efficiency} = \frac{\text{Acre-inches Applied}}{\text{Acre}}$ $= \frac{\text{Acre-inches Applied}}{\text{Ton of Grapes}}$	Environmental and societal benefits: reducing water use can reduce GHG emissions and enhance water availability for multiple uses. Economic benefits: reducing water use can save money and potentially reduce future regulatory compliance costs.	<ul style="list-style-type: none"> •Applied water (including for frost protection) •Acreage •Yield (total tons) 	Utility records; Flow meter readings
Vineyard – Energy Use	$\text{Energy Use Intensity} = \frac{\text{Kilowatt Hours}}{\text{Acre}}$ $= \frac{\text{Kilowatt Hours}}{\text{Ton of Grapes}}$	Environmental and societal benefits: reducing energy use can decrease GHG and criteria pollutant emissions. Economic benefits: reducing energy use can save money, while reducing risks from price variability and energy availability, and potentially reduce future regulatory compliance costs.	<ul style="list-style-type: none"> •Fuel usage •Electricity usage •Acreage •Yield (total tons) 	Utility records; Fuel receipts; Meter & equipment readings
Vineyard – Greenhouse Gas (GHG) Emissions* *from energy use	$\text{GHG Intensity} = \frac{\text{Pounds of Carbon Dioxide Equivalents}}{\text{Acre}}$ $= \frac{\text{Pounds of Carbon Dioxide Equivalents}}{\text{Ton of Grapes}}$	Environmental and societal benefits: reducing GHG emissions can reduce GHG impacts and often-associated emissions of criteria pollutants. Economic benefits: reducing GHG emissions can save money and potentially reduce future regulatory compliance costs.	<ul style="list-style-type: none"> •Fuel usage •Electricity usage •Acreage •Yield (total tons) <p>* additional data elements will be added as GHG calculation models evolve</p>	Utility records; Fuel receipts; Meter & equipment readings
Vineyard – Nitrogen Use	$\text{Nitrogen Applied Efficiency} = \frac{\text{Pounds Applied}}{\text{Acre}}$ $= \frac{\text{Pounds Applied}}{\text{Ton of Grapes}}$	Environmental and societal benefits: reducing nitrogen use can reduce GHG emissions and improve water quality. Economic benefits: measuring and reducing nitrogen use can save money and potentially reduce future regulatory compliance costs.	<ul style="list-style-type: none"> • Synthetic & organic fertilizer • Compost • Manure • Irrigation water N 	Fertilizer application records; compost & manure applications; irrigation N content; Vineyard management company

Winery Metrics

Metrics Area	Metrics	Metric Usage Benefits	Data Elements	Data Sources
Winery – Water Use	$\text{Water Use Efficiency} = \frac{\text{Gallons Used}}{\text{Gallon of Wine}}$ $= \frac{\text{Gallons Used}}{\text{Case of Wine}}$	<p>Environmental and societal benefits: reducing water use can reduce GHG emissions and enhance water availability for multiple uses.</p> <p>Economic benefits: reducing water use can save money and potentially reduce future regulatory compliance costs.</p>	<ul style="list-style-type: none"> •Water usage •Gallons and cases produced 	<p>Utility records;</p> <p>Flow meter readings</p>
Winery – Energy Use	$\text{Energy Use Intensity} = \frac{\text{Kilowatt Hours}}{\text{Gallon of Wine}}$ $= \frac{\text{Kilowatt Hours}}{\text{Case of Wine}}$	<p>Environmental and societal benefits: reducing energy use can decrease GHG and criteria pollutant emissions. Economic benefits: reducing energy use can save money, while reducing risks from price variability and energy availability, and potentially reduce future regulatory compliance costs.</p>	<ul style="list-style-type: none"> •Fuel usage •Electricity usage •Gallons and cases produced 	<p>Utility records; Fuel receipts;</p> <p>Meter & equipment readings</p>
<p>Winery – Greenhouse Gas (GHG) Emissions*</p> <p>*from energy use and refrigerant loss</p>	$\text{GHG Intensity} = \frac{\text{Pounds of Carbon Dioxide Equivalents}}{\text{Gallon of Wine}}$ $= \frac{\text{Pounds of Carbon Dioxide Equivalents}}{\text{Case of Wine}}$	<p>Environmental and societal benefits: reducing GHG emissions can reduce GHG impacts and often associated emissions of criteria pollutants. Economic benefits: measuring and reducing GHG emissions can save money and potentially reduce future regulatory compliance costs.</p>	<ul style="list-style-type: none"> •Fuel usage •Electricity usage •Refrigerant usage •Gallons and cases produced 	<p>Utility records; Fuel receipts; Meter & equipment readings, refrigerant purchase receipts</p>

Source: <https://metrics.sustainablewinegrowing.org>

2.1.5 Benefit achieved

Environmental performance amongst SWNZ participants has been measured using a series of scaled items (ranging from 1–strongly agree to 5–strongly disagree and the mean being 2.5). Analysis of the means assigned to the various items of environmental performance evaluated by the responding wineries indicated that environmental performance had improved across several areas, including:

- reduced packaging waste.
- improved waste water disposal.
- improved management of cleaning product wastes.
- increased recycling of wastes.
- reduced materials sent to landfill.
- increased awareness of a winery's carbon footprint (see Table 5 below).

This finding provides support for previous research suggesting that EMS implementation does improve environmental performance in organisations (e.g. Darnall et al., 2008; Potoski and Prakash, 2005; Stapleton et al., 2001). The wineries noted that one environmental aspect, which did not improve with the implementation of an EMS or EMSs, was that of increasing the use of energy generated from renewable sources. The costs of implementing alternative and renewable energy sources, such as wind or solar power, are high and are likely to be prohibitive to many smaller wine companies.

Table 5: The effect of EMSs on environmental performance in wineries

Environmental Performance Item	Mean
Resulted in few non-compliances with regional/district councils	2.82
Improved the disposal and management of organic winery waste	2.26
Increased the number and variety of native plants growing near the winery	2.89
Reduced the amount of packaging waste sent to landfills	1.97 *
Improved the quality of water in waterways near the winery	2.53
Improved waste water disposal methods	2.18 *
Reduced the amount of waste water to be disposed of	2.47
Improved management of cleaning products, including waste disposal	2.11 *
Resulted in a change in cleaning products used	2.34
Decreased the amount of cleaning products used	2.42
Decreased overall water use	2.37
Increased the level of waste material that is recycled	2.03 *
Increased the use of energy generated from renewable sources	3.00
Resulted in a change in the processing aids that are used	2.68
Decreased the amount of processing aids that are used	2.92
Decreased electricity use	2.45
Increased the level of waste material that is reused on site	2.61
Reduced the level of material sent to landfill	2.16 *
Reduced the thickness of glass in bottles	2.47

As can be noted from Table 5, several areas of the SWNZ EMS were highlighted, with the amount of packaging waste to landfill being reduced, improved waste water methods, improved management of cleaning products, including waste disposal, increased level of waste material that is recycled, and reduced level of material sent to landfill.

Through this research, the responding wineries indicated that implementation of an EMS did not result in benefits such as increased access to international markets, increased sales in the

domestic market, improved profitability, reduced overall costs, or improved wine quality. Four wineries (10 percent) did note in their comments that the morale and attitude of their staff had improved as a result of implementing an EMS, providing support for prior research (Andrews et al., 1999; Hillary, 2004). Research has suggested that EMS implementation does not result in any associated marketing benefits (Hughey et al., 2005; Tee et al., 2007; Welch et al., 2003). Previous research has also identified that wine quality is one of the important drivers for wineries implementing EMSs (Gabzdylova et al., 2009; Marshall et al., 2005), but findings indicate that EMS implementation in wineries has not resulted in improved wine quality.

The environmental performance of wineries that had implemented multiple EMSs was found to be significantly better than the environmental performance of wineries that had solely implemented SWNZ. Wineries with additional EMSs indicated they had improved their environmental practices as a result of their EMSs and that these practices were continually improving due to their implemented EMSs. There were several environmental items rated significantly better by wineries with additional EMSs than by those with SWNZ only (significant items are shown in Table 6). Welch, Rana and Mori (2003) suggested that voluntary implementation of an EMS was more likely amongst those organizations which are already focused on the environment. Thus, it is also likely that wineries, which implement multiple EMSs, are more focused on their environmental impacts than those who only implement a single EMS and hence their environmental performance could be expected to be better.

Table 6: Performance of SWNZ-only vs multiple EMSs

	Mean Rank SWNZ only	Mean Rank Mult. EMSs	Sig.
Environmental practices have improved as a result of EMS/s	25.00	15.50	.002
Environmental practices are continually improving	23.44	16.64	.030
Our EMS/s has enhanced the reputation of our winery	23.84	16.34	.012
Improved the disposal and mgmt of organic winery waste	26.63	14.32	.000
Reduced the amount of packaging waste sent to landfills	23.25	16.77	.046
Improved the quality of water in waterways near the winery	23.75	16.41	.034
Improved waste water disposal methods	23.56	16.55	.022
Reduced the amount of waste water to be disposed of	23.66	16.48	.030
Improved mgmt of cleaning products, incl. waste disposal	22.94	17.00	.047
Improved wine quality	23.00	16.95	.049
Increased the level of waste material that is recycled	22.94	17.00	.042
Decreased electricity use	24.56	15.82	.009
Reduced the thickness of glass in bottles	23.56	16.55	.042
Raised awareness of our carbon footprint	27.25	13.86	.000

2.1.6 Scale

Discussions with participants in environmental assurance schemes in the USA, combined with the experience of Pooley Wines, have raised questions of the value of environmental certification.

A winemaker with an annual production of 1,500 cases was interviewed (Howells Mountain Vineyard, Nappa Valley CA. 2014). The producer had worked through all requirements and attained environmental certification under the Lodi Rules program. However, because of limited resources and competing priorities in the everyday running of the business, the producer had insufficient time to gain proper leverage from the scheme in terms of communications and marketing of the achievement. Although there are efficiency gains and cost savings that may arise from improving environmental sustainability within the winery, these could be realized without the additional cost and effort required to achieve certification. Despite being a supporter of the sustainability program and dedicating years to achieving certification, the producer decided not to renew certification after the first year as there were limited benefits and the time taken to complete continual record-keeping was detracting from more pressing daily operational matters.

Environmental sustainability can offer market leverage but only if it is driven the right way.

This experience reflects that of Pooley Wines. Pooley Wines holds an environmental certification that is independently verified through the Freshcare Environmental (Viticulture) program. This certification entitles the business to full membership of the national wine industry environmental sustainability program, EntWine Australia. Because the business was already being run efficiently and in accordance with current recommended practices, there was virtually no practice change required to achieve environmental certification. However, what was required was the completion and ongoing upkeep of extensive paperwork, plus the additional costs of program membership.

Yealand Estate, Marlborough in New Zealand was observed to be taking an alternative route to build its environmental credentials, with the large scale of the operation contributing to its success. Yealand Estate has positioned environmental sustainability as part of the corporate culture, adopting a corporate mantra of *Tread Boldly but Tread Lightly*. The business has established an interactive self-drive trail around the property, inviting cellar door visitors to view environmental initiatives for themselves. Yealand Estate has established itself as a leader in the field of environmental activities through this transparent consumer interface in addition to other activities including accepting Marc waste from other producers. As a result, Yealand Estate has become synonymous with wine industry environmental sustainability, both in the consumer marketplace and amongst wine industry peers.

Industry observation suggests a production threshold of 3-4,000 cases, above which a wine business could be expected to have sufficient resources to be able to leverage environmental activities in the marketplace. Alternatively, participation in regional programs that undertook marketing on behalf of participants may provide value to smaller producers.

Winery establishment and management are expensive operations, and financial analysis has been conducted to help determine which winery investment size would be most feasible and successful for an investor. Wineries with production levels of 2,000, 5,000, 10,000, 15,000, 20,000 cases

were studied, mainly from an economic point of view, and it has been found that wineries that have a positive Net Present Value (NPV) and the Internal Rate of Return (IRR) greater than the cost of capital were proven to have a sound financial balance. The most profitable winery in this study was 10,000 cases. It was found that wineries that had short equity payback periods were less risky because the short equity payback is around three years and it does not have to rely on long term future cash flows. (Le Ann et al.,1996)

2.2 Solutions Observed

2.2.1 Buildings

The highlights of construction in current sustainable principles in winery architecture are the incorporation of social and economic aspects. The key elements of sustainable winery architecture are reducing heat gain/loss, using more natural light and choosing suitable materials to achieve these goals.

Wineries have been slower at adopting environmentally friendly practices compared to vineyards.

Creating buildings with Mass

Thick walled buildings absorb heat all day, and release it at night with little impact on the interior temperature. Thin walled buildings with a metal skin and bat insulation allow heat and cold to penetrate more quickly than thick walls. This was seen at several wineries in Walla Walla New South Wales, at St Michelle Winery Washington State, and the barrel room at Lemelson Winery Oregon.

Use “cool” materials

Some roofing manufacturers have developed an infrared reflective paint which reduces the amount of heat that is absorbed and reduces the cost of cooling.

Gravity flow

Gravity flow designs; utilizing gravity flow through the different operations of the winemaking stages, reduces the need for electricity required for pumping or transfer of product.

Reduce heat gain/loss

Increase type or quantity of insulation; including placement of buildings partly or totally underground to take advantage of earth's constant temperature. This can eliminate the need for cooling in warmer locations. It also reduces the amount of evaporation from barrels during the maturation stage, reduces the need to humidify rooms, and run cooling fans. If one barrel (or 25 cases) is saved then that returns profit to the bottom line.

Increase shading coefficient

Blocking direct sunlight from building surfaces can dramatically reduce cooling loads. Trees planted along the north and east sides of the winery can reduce cooling costs.

Increase day lighting levels

The design that allows more natural light through sky lights, windows, or window on upper walls, being careful not to allow direct sunlight on tanks, barrels, or finished stock. This allows staff to work in areas without the need for artificial light, which in turn can reduce the electricity cost by as much as 66%. This can also improve staff attitude, efficiency and reduce sick days.

Increase views to the outdoors

The ability for staff to rest one's eyes by looking at a distance and being able to see outside throughout the day achieves the same benefits as day lighting.

Increase natural ventilation

Night time cooling, or purging, of a winery can be done without any electrical equipment. This is done by drawing cool night air that blankets the ground through louvres at or near the floor level passing through and pushing out warm air through open upper level louvers. This venting system can also be worked in reverse to vent CO₂ during fermentation.

Energy generation

Solar, Wind, Bio-Digesters, Boilers, Bio Fuel, Hydrogen power and CO₂ sequestration all have a place in the future of moving away from fossil fuels, reducing GHG, and having a positive impact on the profit margin. Onsite Nitrogen generation can generate 40 %– 80% savings after moving away from on-site delivery.

2.2.2 Costs

Environmental sustainability programs are often developed to pre-empt regulatory control. They can also be viewed as a viable alternative to regulation in regions of high uptake of an appropriately rigorous scheme. In these instances, environmental assurance program participation costs could reasonably be assumed to be in place of regulatory compliance costs, which may make the cost more tolerable for the producer. Further, this situation means that industry retains control of environmental assurance requirements rather than these being dictated by regulators with limited operational knowledge of the industry.

University of California, Davis campus has developed a sustainable winery near Sacramento CA. The USD\$12.5 million, 1,161 sq. m winery (USD\$10,700/m²) was designed to process a maximum of 120 tonnes (current 85 tonnes production) of fruit in educational small batch process/non commercial enterprise. Under the design and construction concepts the winery received LEED Platinum certification. This is the highest environmental award rating by the US Green Building Council, and the Sacramento winery was the first winery in the world to gain this award. It exceeds all levels of certification. Notably the winery is run independent of any mains services (water, electricity or waste management). The water captured from the rainfall was used within the

facility and designed to be processed and reused up to 10 times before being discarded, where it is irrigated back out into the vineyard.

Production volume and winemaking style are key factors in estimating facility costs. The largest percentage of the overall investment costs for all wineries is the building and land costs.

The cooperage accounts for the second largest percentage of total investment costs. The highest percentage of variable costs for a winery is the packaging costs. Full time labour, electricity, cooperage, and purchasing grapes are the next highest percentage of fixed costs.

Economies of scale exist at a decreasing rate among all wineries. As the winery output increases, the per-unit cost of production declines. For example, a 2,000 case production cost averages at \$154.41/case, stepping down to \$124.80/case for a 20,000-case winery. These figures are based on a 2004 study from Washington State.

As the winery size increases so too does the investment cost, however, the investment costs increase at a decreasing rate.

Some considerable capital costs can be reduced in sharing the purchase of, or using contract services, such as bottling lines, filtration equipment, labeling equipment, reverse osmosis machinery, electro dialysis and de-alcoholising equipment. Leasing opportunities exist to help free up valuable operating cash through financial facilities.

New technologies are continually being developed and, as time goes on, production costs will decrease and competition in production should increase. The only real negative that could occur is because the industry is relatively specialized and not growing at a rapid rate, prices of new technology could remain high.

2.2.3 Information Technology

The increasing use of mobile devices and applications for remote monitoring and real time updates is an exciting area of development for efficiency gains, even for fundamentals like fuel-use otherwise needed to travel between sites for conventional monitoring activities. The proliferation of smart phones and tablets, and their use by people from all demographics, increases the accessibility of sophisticated and timely monitoring software for a number of winery uses.

Auditing tools to manage are a means of compliance such as Intellex’s Sustainability Performance Indicators (SPI) software provides a centralized, web-based platform to report, track and analyze sustainability data from across the organization. It allows the identification of opportunities for improvement, increased performance and risk prevention or mitigation.

Figure 5: Measure / Manage process



Figure 6: Intelex software features

Software Features		
Every Intelex software application includes a complete set of built-in tools and features to help you effectively manage your organization's processes and data.		
► Configuration	► Reporting	► Administration
Configurable Apps	Dashboards & Scorecards	Roles & Security
Configurable Workflow	Multiple Reporting Formats	Multi Location Management
Custom Fields & Forms	Notifications	Mobile Access
Formulas & Calculations	Custom Calendars	Culture, Region & Translation
API & Integration	Data Import & Export	Task Management

2.2.4 Other areas of developments

These additional listings of features are important factors that need to be considered.

Services

Engineers, Designers, Consultants and Contractors all have a vital role in providing sound and professional services in their specified fields to optimize the use of resources.

Equipment Leasing

Opportunities to maintain quality and up-to-date equipment maximize operating cash and provide tax benefits

Winery design

From the outset with allowance for any building constraints, including retro fitting an existing building. The initial time spent in planning and design can save further expenditure later.

Flooring, drainage and wastewater design and management

Can also reduce costs and increase productivity over time. The initial capital outlay can be high but by creating a closed loop system many other benefits can be achieved.

Equipment

Portable ozone, portable steam, tank layout and correct sizing, nitrogen production, refrigeration design/reticulation/control/efficiencies, compressed air utilization, and CO₂ capturing are all areas that can offer efficiency improvements if considered during the planning/design stages.

Power

Source and quantity have seen dramatic developments and improvements of available technologies, including the increasingly mainstream availability of solar and wind generation technology.

Water

Source/quality/quantity/treatments/reuse remain a key focus for wine industry continuous improvement and opportunity.

Waste management – Organic/in-organic

Considerable developments have been seen in wastewater treatment processes. Plastics and cardboard re-cycling and reduction in landfill have been considerable. Local self-managing composting sites have increased.

Route to market

Modern media such as social media, the Internet and mobile marketplaces are dramatically reshaping how small and medium businesses think and approach their marketing strategies. For

small business, social media and web-based applications allow a direct route to market and widespread consumer engagement at an unprecedented scale. It also allows the business to control and target messages, such as those around environmental sustainability, and to develop genuine connections with consumers, building brand loyalty and leading to a level of trust that allows for an expression of environmental credentials without the need for third party verification.

Succession planning

Nearly half of the world's economy is made up of family businesses and only 10% of these survive to the third generation. Due to the fact that family businesses are comprised of both a business and a family, it becomes much more difficult to plan for the future of the business.

If the common goal of the family business is to perpetuate the family business through several generations, then it becomes 'the shared dream'. This shared dream is a collective vision of the future that inspires family members to engage in the hard work of planning and to do whatever is necessary to maintain their collaboration and achieve their goals. This is vital for the sustainability of a business such as Pooley Wines.

Chapter 4 – Conclusion

Environmental sustainability in a small-scale winery appears readily achievable because it is possible for one person to have full oversight of the establishment and operation. Further, there are direct financial benefits, in addition to environmental sustainability, for the optimization of inputs (for example, resources consumed) and outputs (for example, wastes produced). Many of the winery efficiency innovations observed overseas are not available in Australia and would have to be custom-manufactured, the cost of which is likely to outweigh any benefits derived. However, it was heartening to observe that a number of technologies could be retro-fitted to existing facilities should they be feasible to implement in the future. One, which is available for implementation immediately, is emerging smart phone and personal device applications that will lead to improved monitoring and reporting. This area is worthy of further investigation.

The sophistication and relatively high uptake of environmental sustainability programs amongst the Australian wine industry's contemporaries (NZ, South Africa, California etc) raises the question as to why widespread uptake is not evident in Australia despite the existence of a similar scheme. The complete absence of market awareness and marketing opportunities from the EntWine Australia scheme is a significant weakness and requires addressing in order to both increase uptake and maintain membership of existing participants.

The proliferation of environmental sustainability programs within both the Australian and international wine industry seems unnecessary, using resources that could otherwise be used to further improve existing schemes, or at least establish equivalence and recognition between different schemes. The potential for wine producers to cannibalise each other's environmental sustainability efforts by advocating different schemes as the best option should not be underestimated. It would be inefficient for the Australian wine industry to share the NZ experience, where producers felt that they had to adopt multiple schemes to be able to deliver the desired environmental performance outcomes. Duplications in fees, record keeping and audit requirements would be a significant impost on small producers.

Recommendations

Sustainable winegrowing and winemaking is a term that is already accepted by a large number of industry professionals and it is reasonable to assume that it will become more widespread as primary and secondary industries around the world seek to improve their efficiency.

A collaborative industry approach is required to increase consumer awareness of sustainable winegrowing and winemaking; increasing understanding of terms such as 'organic', 'biodynamic' and 'natural'. Without industry support, individual wine producers will not be able to break down these barriers alone

There are real challenges in realizing the full suite of benefits afforded by involvement in environmental sustainability programs. Challenges range from the level of commitment displayed by the business, competing priorities in the day-to-day running of the business, and inability to leverage marketing opportunities. The time required to adhere to program requirements combined with the inability to realize market benefits could lead to environmental sustainability programs being detrimental to overall business sustainability. Hence, the value of participating in one of these schemes requires careful consideration.

Regardless of whether or not a producer becomes involved in a program, there is nothing to prevent them from realizing internal efficiency benefits that can arise from the implementation of environmentally sustainable practices within the winery. The key difference is that they are paying for a third party to verify to others that they are implementing the practice. The questions remain – who requires that verification, and is there going to be a market return for incurring the costs of being verified?

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Plain English Compendium Summary

Project Title: Sustainable small-scale winery establishment and management	
Nuffield Australia Project:	1312
Scholar:	Matthew Pooley
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Objectives	To observe the use of sustainable management in the viticultural and non-primary production sectors of the economy across the globe and report on the successful use and adoption of these practices and their application to Australian wine industry.
Background	The core values of Pooley Wines include establishing a strong family business that can be passed on to the next generation. The winery needs to be a model of efficiency to ensure it is a sustainable part of a thriving family business. There are a multitude of issues to be considered in establishing and managing a small-scale winery.
Research	This study sought to identify the priority issues to be considered as they relate to environmental and overall business sustainability, what drives these priorities, and how other producers have met them. On a practical level, it was anticipated that current recommended practices and innovative technologies would be identified that could be transferred to the operating context of Pooley Wines
Outcomes	Environmental sustainability in a small-scale winery appears readily achievable because it is possible for one person to have full oversight of the establishment and operation. Further, there are direct financial benefits, in addition to environmental sustainability, for the optimization of inputs and outputs. The potential for wine producers to cannibalise each other's environmental sustainability efforts by advocating different schemes as the best option should not be underestimated. It would be inefficient for the Australian wine industry to share the NZ experience, where producers felt that they had to adopt multiple schemes to be able to deliver the desired environmental performance outcomes.
Implications	Sustainable winegrowing and winemaking is a term that is already accepted and it is reasonable to assume that it will become more widespread. A collaborative industry approach is required to increase consumer awareness of sustainable winegrowing and winemaking.