

Conventional versus Environmentally-Sensitive Wines: The Status of Wine Production Strategies in California North Coast Counties

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Abstract

Contrary to “command and control” regulation, the California Environmental Protection Agency (Cal/EPA), in collaboration with the California Wine Institute and the California Association of Winegrowers (CAWG), has developed a voluntary self-assessment code for the wine industries to achieve more efficient Environmental Management Systems (EMS). The purpose of this study is to compare and contrast the wineries in the three California north coast counties of Mendocino, Napa, and Sonoma. This study examines whether they meet or exceed the goals of the self-assessment regulatory policies, whether they have redesigned their wine strategies, and whether they produce environmentally sensitive wine as defined by the California Sustainable Winegrowing Codebook. Additionally, it will examine whether the vineyards and wineries in these counties adhere to the voluntary self-assessment procedures proposed by the California Code of Sustainable Winegrowing Practices when growing and producing organic wine. Finally, this study will discuss what lessons these three counties can learn from each other about sustainable wine production. They are assessed in terms of their management of 1) the ecosystem, 2) energy efficiency, 3) winery water conservation, 4) materials handling, 5) solid waste reduction, 6) environmentally-preferred purchasing methods, 7) human resources, 8) neighbors and community relations, and 9) controlling and auditing vineyard inputs. Findings show that of the wineries in these three counties, Mendocino and Napa County have gone beyond the requirements of the California Code of Sustainable Winegrowing Practices, while Sonoma County appears to be lagging behind. Given this, the present study will map out how the three wine counties could collaborate to design a better future with sustainable, environmentally friendly wines.

Key words: conventional wines, environmental-sensitive wines, strategic production, California Code of Sustainable Winegrowing Practices, Environmental Management Systems (EMS)

Introduction

The first commercial wine venture in the United States started in Pennsylvania in 1793 but the majority of modern American wineries are now located in California. About 90 percent of the US wine production and more than 70 percent of all wine sold in the United States originate in California. If viewed as a nation, California would rank fourth in worldwide wine production (Gale, T., 2006).

In the United States, the commercialization era of California wine production began in 1830. However, environmental awareness in the wine industry was initiated around the 1980s after the United States Department of Agriculture (USDA) released a landmark report on Organic Farming. The USDA operationally defines organic farming as:

...a production system which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators, livestock feed additives. To the maximum extent feasible, organic farming systems rely upon crop rotations, crop residues, animal manures, legumes, green manures, off-farm organic

wastes, mechanical cultivation, mineral-bearing rocks, and aspects of biological pest control to maintain soil productivity and tilts to supply plant nutrients, and to control insects, weeds, and other pests (USDA, 1980, p. 94).

However, the growth in organic food is driven, on the one hand, by consumers' concerns about conventional agricultural production methods that are dependent on non-renewable resources, chemical fertilizers, and pesticides; and on the other by their demand for safe, healthy food grown with care for the environment. Thus, "...a number of wineries began to practice organic farming (organic viticulture), eliminating their reliance on herbicides, insecticides and fungicides" (Silverman et al., 2005, p.153). Nonetheless, a wide transformation in the agricultural sector and food-processing sector took place after the United Nations' Rio Earth Summit in 1992. Responding to public pressure, legislative attitudes, global environmental movements, environmental regulations, and the wine industry's commitment to social responsibility; around 2002 grape growers and wine producers in California became conscious and started playing an active role to develop a comprehensive blueprint to chart future actions for organic viticulture and winemaking development (Dillon and Fischer, 1992; Lawrence and Morell, 1995; Davidson and Morrell, 2001; Silverman et al., 2005). As defined by the wine industry, sustainability "...means growing grapes and making wine in ways that don't deplete resources or pollute the environment. Its practices would ensure that vineyards and wineries exist harmoniously with people both in and outside the industry" (Paulish, October 2004, p. 2). More specifically, the term organic as it applies to grape growing and wine production refers to using superior inputs to produce grapes of esteemed quality:

with an emphasis on nurturing and maintaining the land for future generations without the use of synthetic chemicals. There is an emphasis on the use of renewable resources, pest control through integrated pest management techniques, the need for conservation of energy, soil and water resources, and the maintenance of environmental quality, with the utmost restrictions on external inputs, especially fertilizers and chemicals (Ward 1997).

In other words, organic wine production emphasizes the optimum production of wine using renewable resources; conserving energy, soil, and water; and maintaining and enhancing the environment without the use of artificial fertilizers (ammonium nitrate, urea, super phosphate and other conventional fertilizers are not used) or synthetic chemicals. All of this together creates a more sustainable, superior product that future generations can enjoy.

Organic vineyards are different from conventional vineyards because organic viticulture predominately uses green manure. Organic wine farming heavily uses living soil (humus). In order to enrich the soil, the compost is prepared annually by mixing horse manure with straw and ground-up branches. The organic matter is worked into the soil by grinding up and mixing in the vine shoots left on the ground after pruning. Instead of using synthetic fertilizers, the soil, rich in humus, is primarily used to feed the vine. If the soil is rich in humus, the grapes will have the proper nutrition. Clover, barely, oats, corn, and rye are cultivated between the rows of vines. As narrated by Dutel, the cultivation of cereals and leguminous plants between rows can have the following four advantages.

First, vine growing ceases to be a monoculture. Intensive farming and monoculture favour the development of diseases, and force the farmer to enter into the infernal cycle of chemical treatments. The use of companion crops avoids adverse effects. Secondly, the cereals and leguminous plants attract numerous useful animals and insects such as birds, ladybirds and other predators. Ladybirds, for example, are needed to kill greenfly. In contrast, the use of pesticides kills these very useful creatures. Thirdly, the leguminous plants collect the nitrogen needed for the growing of the vine itself. This is a benefit from the avoidance of using chemical fertilizers. Last, but nevertheless of great

importance, leguminous plants and cereals can be ground and mixed into soil to increase the level organic matter, when they are sufficiently rich (1990, p. 2.)

On October 31, 2002, the California Wine Institute and the California Association of Winegrowers (CAWG) launched a voluntary self-assessment tool for the Code of Sustainable Winegrowing Practices (SWP). The California Environmental Protection Agency (Cal/EPA) jointly with the California Wine Institute and the California Association of Winegrowers launched a regulatory pilot program for the wine industry to assist wineries in the development of formal Environmental Management Systems (EMS) (Dlott et al., 2002, p. 1-1). As narrated by Silverman and Lanphar:

On the basis of its experiences in working with the two pilot wineries (Benziger Family Winery and Davis Bynum Winery), Cal/EPA [developed] a template in the form of a manual that any winery could use in developing an EMS. [The] EMS [was seen] as a logical next step in organizing their existing environmental programs into a comprehensive system that would provide (1) better understanding of their environmental impacts, (2) systematic planning for meeting their environmental responsibilities, and (3) monitoring and follow-up. The potential for cost-saving initiatives and improvements in wine quality further motivated them. And they hoped to use the EMS as an educational tool for their employees and suppliers (2003, p. C673).

Since the Sustainable Winegrowing Practices are designed to be easily adapted to international environmental management systems such as the International Organization for Standardization: ISO 9000 (quality) + ISO14000 (environment) families, its goals are succinctly articulated to minimize harmful effects on the environment and improve the quality in the wine production sector beyond acquiring a mere “green and clean” logo. Using environmentally sensitive projects, Cal/EPA is now in the process of developing a template very similar to ISO 14001—the internationally recognized standard for environmental management systems.

The agreed vision of the Sustainable Winegrowing Practice (SWP) project is:

To place the concept of sustainability into the context of winegrowing, the project defines sustainable winegrowing as growing and winemaking practices that are sensitive to the environment (Environmentally Sound), responsive to the needs and interest of society-at-large (Socially Equitable) and are economically feasible to implement and maintain (Economically Feasible) (Dlott et al., 2002, p. 1-2).

In partnership with farmers, consumers, and the community, the Sustainable Winegrowing Practice is guided by the following set of values:

1. Produce the best quality wine and/or grapes possible.
2. Provide leadership in protecting the environment and conserving natural resources.
3. Maintain the long-term viability of agricultural lands.
4. Support the economies and social wellbeing of farm winery employees.
5. Respect and communicate with neighbors and community members; respond to their concerns in a considerate manner.
6. Enhance local communities through job creation, supporting local business and actively working on important community issues.
7. Honor the California wine community’s entrepreneurial spirit.
8. Support research and education as well as monitor and evaluate existing practices to expedite continual improvements (Dlott et al., 2002, p. 1-3).

As mentioned above, the voluntary self-assessment tool was not linked to any outside certification system but was rather intended to be used to develop an action plan for vineyard and/or winery operations. Furthermore, the voluntary evaluation tool was used to show which

areas of each vineyard and/or winery operation need environmental performance training and outreach efforts that would include monthly member forums, newsletters, and online publications (Wine Institute and California Association of Wine Grape Growers, 2002, p. 1).

One of the most systematically designed research surveys undertaken to evaluate the environmental practices among California wineries and wine managers' perception of the pressure to improve environmental performance found that wineries in the sample were becoming environmentally friendly. The California wineries are "...driven by the commitment of winery managers who are highly receptive to the non-regulatory approaches to promoting sustainable practices then occurring in California" (Silverman et al., p. 151). In short, the Silverman et al. study fully ascertained that the wine producers in California are well qualified in all aspects of the guidelines' quest for sustainability in the wine industry. Thus, the policy implications that could be drawn from the Silverman et al. study is that the self-regulatory method is better than the command-and-control regulatory approach for constituting environmentally sustainable systems of management in the wine industry.

For instance, relating to the three California north coast counties of Napa, Sonoma, and Mendocino, Cox argued "the days of applying routine applications of pesticides, herbicides, and fungicides to vineyards...are gone. As stated by Cox, it's hard to find a winery that isn't committed to some form of natural farming these days" (2000). Similarly, Robin argued that "...the wine industry is looking hard at the merits and feasibility of adopting certified organic practices. The key question is whether the adoption of organic practices or ingredients adds value to the product, market, and community" (April 2006).

Starting from a small base, organic wine production in the US seems to be growing at a reasonable rate (the Organic Trade Association predicts that organic market grows at about 25 percent a year) in order to meet continuing consumer concerns related to the environment and the chemicals used in wine production. Therefore, in this study an attempt is made to empirically test the status of these three counties in terms of producing organic wine.

The three Northern California counties are chosen because:

1. Sonoma County is regarded as a model for the Bay Area Green Business Program and is the recipient of a prestigious national award from the Joint Center for Sustainable Communities (Sonoma County, 2006).
2. The Napa Sustainable Winegrowing Group (NSWG) works with other industry group and the environmental community. It is trying to develop standards for vineyard planting and operations, which would qualify it for the certification by the Napa Green program. "The program uses voluntary, incentives-based efforts to encourage growers to use sustainable farming techniques, conserve soil and water, repair erosion sites, reduce chemical use, and restore habitat" (www.napavintners.com).
3. Mendocino County "has more certified organic wineries, making home to more than a third of all certified organic vineyards in California (Geniella, M., November 2006).

Since the three counties are members of the California Certified Organic Farmers (CCOF) and also claim to grow environmentally sensitive wines, the sole purpose of the study is to empirically test which of the three counties significantly adhere to producing environmentally sensitive wine. Stated differently, since Mendocino, Napa Valley, and Sonoma counties are part and parcel of the Bay Area Green Business Program and there are plenty of long term successful organic wine producers, the specific purpose of the study is to compare and contrast which of the three wine growing and producing counties voluntarily meet (or exceed) the goals of self-assessment regulatory policies and which ones redesigned their wine strategies to finally achieve environmentally-sensitive wine as listed in the California Sustainable Winegrowing Codebook. In

addition, based on analysis of these three counties, this study points out the lessons that can be learned from each other and pin points future research challenges in organically produced wine.

The specific central questions of the study are:

1. Do the wineries in Mendocino, Napa Valley, and Sonoma counties adhere to the principles of the voluntary environmental self-assessment procedures proposed by the California Code of Sustainable Winegrowing Practices when producing organic wine?
2. What lessons can the three counties learn from each other about sustainable wine production?

Review of the Literature

When wine goes through the supply chain (i.e., when wine-grapes are produced, crushed, fermented, clarified, stabilized, aged, and then sold to customers by either wholesalers or retailers), conventionally produced wine can create serious impacts on public health and the environment. As narrated by Silverman and Lanphar, the most significant potential environmental impacts associated with the winery operations include:

Winery inputs included energy (cooling during the fermentation process, maintaining storage temperature, pumping, running equipment, etc.); water (barrels and vats needed to be constantly cleaned and rinsed, as did all other equipment, to ensure a minimum level of bacteria that might interfere with the controlled processes in the winery); chemicals (cleansers, diatomaceous earth, sulfur gas, refrigerants, etc.); and packaging materials (including glass, corks, wood pallets, glues, cardboard, metal, and plastic foil). ...operational water issues [were] related to the treatment of wastewater containing organic matter, nitrates, and phosphorous. Chemical issues varied according to the chemical but could include spills and various air, soil, and water quality impacts. Packaging materials impacted natural resource stocks and posed landfill issues (2003, p. C669).

Since the winery industry is capital intensive and financially risky, asking the owners of wineries and vineyards to change their operating strategies in line with suggestions outlined in the Sustainable Winegrowing Practices (SWP) workbook is not likely to be accepted as desired (September 2002, p. 2). Also, since forecasting the outcome in the wine industry is not likely to produce the desired outcome, a number of winegrowers and producers have been reluctant to be innovative in bringing changes in new management styles. That is the reason why the wine producers would like to keep their options open and are not jumping to make their wineries be 100% organic.

Nonetheless, more than ever, there are many pressures on wine firms to improve their environmental performance. The California winegrowing and producing community is not only committed to social responsibility but it has recognized the importance of the environment in and around vineyards and wineries. To carve out a niche in the fiercely competitive global wine market, wine growers in California, with the development of Sustainable Winegrowing Practices (SWP) project, have made a wide transformation in the operations of the wine industry. In other words, an attempt has been made by a number of wine growing and winemaking companies to voluntarily apply the self-assessment tools to redesign their wine strategies. As stated by the Florida Grape Growers Association, "sustainable farming is no longer just a nice concept. California is in the forefront of an ambitious program to have 100% participation of growers and winemakers in sustainable winegrowing practices. This program will affect all of the states. As the word gets out pressure will be exerted for compliance by all grape growers." (Paulish, October 2004, p. 2).

Thus the environmental performance measures put in place by the wine industry are mainly tailored to:

1. meet the desire of managers for better control of the environment of their businesses in order to avoid risks and capture value,
2. fulfill the desire among policymakers and regulators for a richer set of information about company performance,
3. achieve the desire of many customers and stakeholders of business for better knowledge about how ethically they are behaving,
4. meet a widespread belief that the availability of information will stimulate greater awareness, self-reflection, and innovation in business,
5. compare the performance of a firm against the others in the same industry so that future strategies could be initiated, and
6. compare suppliers and adhere to their own policies of green purchasing (Berkhout, 2002; Watkins, A. and Warhurst, A.).

Generally, the wine industry is vertical integrated (i.e., a number of the wine producers also own their vineyards). The organic wine movement is tailored to converting more and more vineyard owners into producing organic wine. For example, if the wine bottles are labeled "100% organic," it means that all the ingredients of wine are organic. Or it can be labeled "organic," if only 95 percent of its ingredients are organic. On the other hand, if the ingredients are from 70% to 94% organic, producers can still label their wine bottles as organic so that the product can be identified by consumers and guarantees recognition by certificatory authorities (Chappman, 2006). However, wines with less than 70 percent organic ingredients may not adopt a logo of organic on the backside of their wine bottles. In short, in order to be labeled organic, more than 70 percent of the ingredients of the wine have to be produced mainly from organically grown grapes and the producers have to adhere to standards set by the National Organic Program, United States Department of Agriculture (USDA).

The initial operating costs of organic wines are more expensive than conventional wines because they are labor intensive and the supplies are more limited. Thus, organically produced wine costs more than conventionally produced wine because organic wine takes a minimum of a three-year transition period to achieve organic certification. It needs to be underlined that "...while some California winegrowers are espousing the Code's principles as eagerly as if they'd invented them, most European ventures have never strayed from them" (Bouchard, 2002). Under pressure from organic farmers and consumer organizations in France, a legal definition of "farming known as Organic" was given under decree of 10 March 1981 as: "farming that uses no synthetic chemical products" (Rousseau, 1992). Therefore, being different from European Union wines, to qualify for organic status in California:

...it's mandatory that the grapes used originate in organically farmed vineyards, but the key supplementary requirement is that no sulfites can be added to the juice at crush or afterwards. The use of sulfur dioxide as a general preservative, anti-bacterial and anti-oxidant agent is almost universal in the wine industry. It stabilizes wine, keeps its colors bright and flavors clean. In the EU it is permitted to add a minimum amount of sulfites to a wine and have it maintain organic status, but in the US none may be added and the concentration must be less than 10 parts per million. [P]erhaps most confusingly, the American rules are not harmonized with European Union regulations, which entitle wines made with organically grown grapes to be called "organic" even if there are sulfite additions. Wine made from organically grown grapes, or made from organic grapes as long as the wines contained less than 100 parts per million of sulfites...a subsequent December 2000 ruling clarified the issue, ensuring that all wines produced from certified organically grown grapes would be entitled to use the term (Bloc, retrieved, Dec. 16, 2006, pp. 2-4).

One of the most common misconception about organic wine production is that the wine itself is organic. However, strictly speaking, it is the grapes that are organic, not the wine itself. Organic grapes may be produced using organic farming methods. However, to be considered organic, both grape cultivation and wine production need to follow environmentally friendly methods. One of the cornerstones of organic farming is maintaining healthy and biologically sound soil. The vineyard-growing environment needs to be diversified by planting hedges against soil erosion. As discussed by Rousseau, “the soil is at all the center of all organic farmers’ preoccupations. It is a living environment, complex and poorly understood, which interacts closely with the plants and animals [that] colonise it. One could almost speak of symbiosis, or to use a more vivid expression, say that the soil is its plants’ intestine” (1992, p. 1).

In order to encourage and maintain the naturalistic character of the surrounding area, farmers use natural fertilizers such as animal manure instead of chemical fertilizers, they apply natural predators of insects pests instead of using poisonous chemicals, and they promote biodiversity. Insects, spiders, and predatory mites are allowed around the flowers, so they can feed on insects that damage grapes and deteriorate the health of the soil.

Unlike conventional methods of making wine, organic wine production pays special attention to three very important factors. These are the use of yeast, the use of sulfur dioxide, and the method of filtration.

Red grapes are crushed with the skins and seeds to help deliver the desired color, while white grapes are pressed more gently to remove the juice from the skins and the seed to minimize the bitterness of the white wines. During the fermentation process, an organic winemaker refrains from using artificial yeasts—“unicellular fungi important for fermenting grape juice to wine” (Goode, 2005). Thus, “since in organic viticulture chemicals are not used, the population and vigour of natural yeasts is very significant and this makes starting and finishing the fermentation very easy” (Dutel, 1990).

Unlike in white wines, it is possible to minimize the use of sulfur dioxide in red wines (Huinac and Timmins, November 29, 2006). Nonetheless, it is possible that sulfur dioxide can be found in wine even if none is added because the yeasts naturally create small quantities of sulfur dioxide during fermentation. Thus, the use of limited sulfur dioxide may be tolerated. Reduced sulfur compounds that occur during winemaking are called Sulfides (Goode, 2005). But “excess use of sulfur dioxide can be avoided by heating the grapes as soon as they arrive in the vat-room before vatting and fermentation, in order to destroy the diastasis responsible for the oxidation (Dutel, 1990, p. 4).

In filtration, organic wine is different from the conventional method of producing or keeping wine. “Filtering is a very delicate process, mainly because it not only takes away useless elements, but also thins out the wine and eliminates elements important to proper conservation and ageing in bottle” (Dutel, 1990, p. 4).

In the wine cropping system, improving weed control, increasing organic matter (such as manure), improving soil structure, reducing soil erosion (since the vines are planted on sloping land highly susceptible to erosion) using cover crop, and enhancing water penetration and retention are heavily used (Borderlon, October 1997). In the vineyards, bat houses have been constructed along with owl houses. Bats consume millions of small bugs, while the owls are likely to take care of rodents, like rats and gophers (Huinac and Timmins, 2006).

Organic wine is healthy and is as tasty as standard wine. For example, when Goodie, a wine critic “did a tasting of 30 organic and standard wines in which he correctly guessed if the wine was organic 90% of the time. Although he was able to decipher organic from non-organic, he concluded that his preference was 50:50, deciding that neither wine was necessarily ‘better’” (Riegler et al., 2006, Wine Anorak, October 10, 2006). However, organic wine is still a small market niche in the US when compared with the EU market. While the EU market is more than 30

percent (Crescimanno, et al., 2002), Rubin forecasts that the growth potential of organic wine in the US is likely to be very strong in the future (April 2006).

However, it needs to be underlined that being “organic” is not the only motivating factor for consumers. Consumers of organic wine appreciate the “naturalness” of the product, which is free of processing residues and which respects the environment (Crescimanno, et al., 2002). For example, in Sicily, Italy, the average consumer of organic wine is within the age bracket of 30 to 45 years, and consumers of wine mostly live in big cities. The average consumer belongs to the medium-high income bracket. Most of the consumers of organic wine seem to be aware of the more aspects that differentiate organic from conventional (traditional) wine producing methods, and are more than willing to pay premium prices (Crescimanno, et al., 2002, p. 280).

Based on the review of the literature, the variance in the dependent variable, complying with Sustainable Winegrowing Practices (SWP), can be explained by collecting information from the three counties (i.e., Mendocino, Napa, and Sonoma) on the Code of Sustainable Winegrowing Practices Self-Assessment Workbook developed for the California Wine Community to achieve environmentally sustainable wine. That is, the codebook requires grapes to come from environmentally sensitive vines and wines must be produced in line with the steps set in the codebook of Sustainable Winegrowing Practices.

Research Methodology and Data Collection

1. The indicators designed for the study are a mixture of quantified and simple information gathering techniques. The questionnaire was designed to measure key characteristics of whether the wineries in the sample are by and large producing conventional (traditional) wine, or are producing organic wine (ranging with 70 to 95% organic ingredients), or are producing a combination of conventional and organic wine.

To answer the above stated research questions, a proportionally stratified sample of 171 (57 companies from each county or strata) companies were drawn from a targeted population of 623 wineries in Mendocino, Napa, and Sonoma County (Wine and Vineyard List for Sonoma, Napa, and Mendocino Counties, 2006). Over a six-month period, 61 percent (104/171) of wine makers, assistant winemakers, operations managers, general managers, and owners responded to the mail questionnaire, telephone and person-to-person interviews. Of the respondents, 31 (29.8 %) were from Mendocino, 36 (34.6%) were from Napa, and 37 (35.6%) were from Sonoma County. The inter-item consistency reliability, or the Cronbach’s alpha reliability coefficient size, of the nine items for the wineries’ adoption of environmentally sustainable winegrowing and producing practices is 0.83. Stated differently, as measured from 100 respondents in the sample, the nine items, which were combined to measure the production of environmentally sustainable winegrowing and production practices, produce very stable and dependable results.

Data analysis and results of the study

Table 1 analyzes the background of the respondents. Families own most of the wineries in the three counties. Their sales per year ranged from 1000 to 20,000 cases. Being very small operations, the wineries generally employ less than 50 permanent workers. The wineries in Mendocino County produce organic wine (mean value of 2.45 measured on a 4-point Likert Scale) or are in the process of becoming certified organic wine producers in the near future. On the other hand, the wineries in Napa (mean value 1.78) and Sonoma (mean value 1.57) counties by and large seem to be producing conventional wines (i.e., still dependent on non-renewable resources namely, chemical fertilizers and pesticides) to accommodate their customers.

Table 1: Background Characteristics of Respondents

	Mendocino	Napa	Sonoma
Winery characteristics	29.8 % (31)	34.6% (36)	35.6% (37)
Family ownership:			
Yes:	84% (26)	Yes: 92 (33)	Yes: 87% (32)
No	16 % (5)	No: 8% (3)	No: 87 (5)
Cases sold / year:			
1,000-10,000	39% (12)	61% (22)	49% (18)
10,001-20,000	19% (6)	3% (1)	8% (3)
20,001 and above	42% (13)	36% (13)	53% (16)
Permanent employee:			
1-50:	94% (29)	94% (34)	80% (30)
51-100	3% (1)	6% (2)	14% (5)
101-150			3% (1)
151-200			
Over 201	3% (1)		3% (1)
Types of wine:			
Organic and in transition	45% (14)	20% (7)	8 % (3)
to being certified:	16% (5)	36% (13)	35% (13)
Organic but not certified:	39% (12)	44% (16)	57% (21)
Conventionally wine:	2.45	1.78	1.57
Mean value			

To tighten the analysis, the responses (see Table 2) of the wineries in the sample were examined using a Pearson product-moment correlation coefficient. The correlation of the multi-item nine scales (i.e., ecosystem management; energy efficiency; water conservation practices; resource management; solid waste reduction; purchase of environmentally-sensitive supplies; management of human resources; developing environmentally-sensitive community; and controlling and auditing vineyard inputs) indicate that the correlation coefficient of any two of the nine scale independent variables is less than 0.70. Thus it can be safely concluded that the scales don't have potential problems with multicollinearity and can be used to measure different aspects of the indicators outlined in the California Sustainable Winegrowing codebook.

Table 2: Pearson Correlation Matrix of the Nine Scales

	Energy efficiency	Eco-mgmt	Water Conservation	Resource mgmt	Solid-waste reduction	Purchase of materials	Human Resources Mgmt	Developing community Sensitive community	Auditing inputs
Energy Efficiency	1.00	0.30	0.21	0.16	0.25	0.17	0.29	0.13	0.21
Eco-mgmt	0.30	1.00	0.49	0.38	0.10	0.30	0.42	0.24	0.46
Water conservation	0.21	0.49	1.00	0.32	0.19	0.30	0.46	0.21	0.26
Resource Mgmt	0.16	0.38	0.32	1.00	0.34	0.14	0.22	0.23	0.22
Solid-waste reduction	0.25	0.10	0.19	0.34	1.00	0.18	0.31	0.16	0.02
Purchase of materials	0.17	0.30	0.30	0.14	0.18	1.00	0.41	0.22	0.21
Human Resources Mgmt	0.29	0.42	0.46	0.22	0.31	0.41	1.00	0.20	0.20
Developing community Sensitive community	0.13	0.24	0.21	0.23	0.16	0.22	0.20	1.00	0.24
Auditing inputs	0.21	0.46	0.26	0.22	0.02	0.22	0.20	0.24	1.00

After the scales were thoroughly vetted, the next step in the analysis was to explore the extent in which the three wine counties meet the voluntary environmental self-assessment requirements set by the Sustainable Winegrowing Practices (SWP). It was noticed that the three counties are greening the production of their wine beyond mere compliance. As shown in Table 3, the mean values on the nine-point scales are greater than two out of four on a 1-4 point scale continuum. Thus, the wineries in the three counties are above average concerning the greening of their wine. The scale is 1: little or no practical experience, 2: partial practical experience, 3: adequate practical experience, and 4: effective practical experience.

Table 3: Mean Value of Winegrowing Practices Indicator

County	Energy	Eco-systems	Water	Materials	Solid waste	Purchase	Human	Community	Inputs
Sonoma	2.81(37)	2.95(37)	2.68(37)	3.59(37)	3.53(37)	2.59(37)	2.76(36)	2.17(37)	3.36(35)
Napa	2.92(36)	3.34(36)	2.72(36)	3.65(36)	3.55(36)	2.81(36)	2.76(36)	2.11(36)	3.47(36)
Mendocino	2.63(31)	3.10(31)	2.83(31)	3.48(31)	3.56(31)	3.01(31)	2.88(31)	2.48(31)	3.55(31)

Though the differences are not statistically significant (see Table 4), further analysis of the value of the means for each county indicates that the three counties have shown more or less the same mean value score on the practice of solid waste reduction (glass, cardboard, paper, plastic, pallets, metals, recycling, and using natural cork).

In the categories of water recycling for winery operations (preventing water runoff, using cover crops to minimize rainfall runoff, and using low volume irrigation systems), purchasing of environmentally preferred materials (such as paper, packing materials, boxes, glasses, etc.), sustainability of human resources training and management, developing environmentally sensitive community outreach programs, and controlling vineyard inputs (reducing insecticides, fungicides, sulfur, toxic chemical uses, pesticide stewardship, etc.), Mendocino has a higher mean scores than Napa and Sonoma County.

On the other hand, Napa Valley County seems to be emerging to be more sensitive than Mendocino and Sonoma on the scales that refer to energy sensitivity (such as using efficient refrigerator, heating, ventilation, air conditioning, and alternative sources of power), ecosystem management (i.e., the water cycle, nutrient cycles, mineral cycles, and enhancing net boxes for birds), water recycling for winery operations (preventing water runoff, practicing cover crops to minimize rainfall runoff, and low volume irrigation system), and materials handling management (for example, hazardous-materials storage, hazardous waste disposal, lubricants, oils, coolants, solvents, and wastewater protection).

Table 4: Analysis of Variance (ANOVA) Multiple Comparisons

Dependent Variable	County(I)	County (2)	Mean Difference (i-J)	Std. Error	Sig.
Energy Efficiency	1.00	2.00	-.106	.207	1.00
	3.00		.176	.215	1.00
	2.00	1.00	.106	.207	1.00
		3.00	.282	.216	.585
	3.00	1.00	-.176	.215	1.00
		2.00	.282	.216	.585
Ecosystems MGMT	1.00	2.00	-.393	.171	.07
	3.00		-.151	.177	1.00
	2.00	1.00	.393	.171	.07
		3.00	.242	.179	.543
	3.00	1.00	.151	.177	1.00
		2.00	.242	.179	.534
Water MGMT		2.00	-.047	.207	1.00
	3.00		-.152	.215	1.00
	2.00	1.00	.047	.207	1.00
		3.00	-.106	.217	1.00
	3.00	1.00	.152	.215	1.00
		2.00	.106	.217	1.00
Materials	1.00	2.00	-.051	.126	1.00
	3.00		.111	.131	1.00
	2.00	1.00	.051	.126	1.00
		3.00	.162	.131	.666
	3.00	1.00	-.111	.131	1.00
		2.00	-.162	.131	.666
Solid waste	1.00	2.00	-.025	.099	1.00
	3.00		-.033	.104	1.00
	2.00	1.00	.025	.099	1.00
		3.00	-.008	.104	1.00
	3.00	1.00	.033	.104	1.00
		2.00	.008	.104	1.00
Purchase	1.00	2.00	-.218	.193	.783
	3.00		-.413	.200	.126
	2.00	1.00	.218	.193	.783
		3.00	-.195	.202	1.00
	3.00	1.00	.413	.200	.126
		2.00	.195	.201	1.00
Human Resources	1.00	2.00	.007	.189	1.00
	3.00		-.115	.197	1.00
	2.00	1.00	-.007	.189	1.00
		3.00	-.122	.197	1.00
	3.00	1.00	.115	.197	1.00
		2.00	.122	.197	1.00
Community Relations	1.00	2.00	.067	.200	1.00
	3.00		-.306	.208	.435
	2.00	1.00	-.067	-.067	1.00
		3.00	-.372	.372	.236
	3.00	1.00	.306	.306	.435
		2.00	.372	.372	.236

Inputs	1.00	2.00	-.105	.129	1.00
	3.00		-.188	.134	.489
	2.00	1.00	.105	.129	1.00
		3.00	-.083	.133	1.00
	3.00	1.00	.188	.134	.489
		2.00	.083	.132	1.00

Conclusions and Recommendations

This study is based on a one-shot, cross-sectional research survey to investigate whether or not the wineries voluntarily adhere to the Code of Sustainable Winegrowing Practices. It is essential to study changes in the practical experience of the wineries in the sample as they progressed over time. For those who are interested in this kind of research, it is recommended that they undertake a longitudinal study instead of a cross-sectional study such as this one. Given its limitations, it nevertheless enables the following conclusions and recommendations to be made.

When an attempt was made to benchmark the performance of the wineries in the three California North Coast counties, it was quite clear that the three counties were very much engaged in pursuing more than adequate practical experience in the production of organic wine. However, a deeper analysis shows that Mendocino has a competitive edge in: water recycling for winery operations, purchasing of environmentally preferred materials, sustainability of human resources training and management, developing environmentally sensitive community outreach programs, and controlling vineyard input. As stated by Geniella, "Because of visionary winemakers and climatic and geological formation, Mendocino County has more certified organic wineries...than any county in the nation, making it home to more than a third of all organic vineyards acreage in California" (2006).

Napa Valley County has emerged to be more sensitive than Mendocino and Sonoma on the scales that were used to assess energy sensitivity, ecosystems management, and materials handling management. On the other hand, Sonoma County seemed to lag behind in environmental compliance when compared with Mendocino and Napa Valley Counties—measured by the indicators included in the voluntary self-assessment workbook for the Code of Sustainable Winegrowing Practices (SWP).

In an age of increasing environmental awareness, consumers nowadays generally prefer organic wine (i.e., made of using the most natural ingredients and techniques) rather than conventional wine. Based on environmental and social responsibility, this study has ascertained that the production of organic wine was associated with high level of success in implementing environmental performance standards. Therefore, it is recommended that in addition to the voluntary regulations of the wine industry's Code of Sustainable Winegrowing Practices, the wineries need to be involved in various dialogues or workshops among themselves in order to articulate and design future strategy of environmental performance criteria relevant to sustain human and environmental health. In addition, a sound environmental performance strategy not only can lead to an increase in wine quality and the social well-being of the community, but also could help the wineries attain competitive edges in the global wine market.

For policy insights, and to remain highly competitive, these wineries need to reexamine and shift their operations, doing systematic research to determine whether the adoption of organic wine adds value to their product in the global market. Also, it needs to be underlined that the Code of Sustainable Winegrowing Practices is a very fruitful blueprint and can help winegrowers and vintners to assess the sustainability of current practices. But as pointed by Silverman et al., the Code of Sustainable Winegrowing Practices needs to be "...accompanied by an approach that encourages the development of an EMS

and the cultivation of a more pervasive environmentally oriented organizational culture." (2005, p. 167).

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