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# **PERCEPTION OF ECO-LABELS: ORGANIC AND BIODYNAMIC WINES**

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## Abstract

While the goal of eco-labels is to reduce information asymmetry between the producer and the consumer regarding the environmental attributes of a product, the lack of understanding of some eco-labels might lead to negative reactions towards eco-labels. In this paper, we seek to understand how organic wine labels are perceived by consumers and the factors that influence their perception. Our data is derived from a survey of 400 U.S. respondents who expressed their opinion about organic and biodynamic eco-labels. Our results indicate that respondents unfamiliar with organic and biodynamic wines tended to view these negatively. We found that the perception of a wine eco-label improved not only with the familiarity with the specific eco-label but also with the awareness of other eco-labels within the industry. In addition, our study suggests that consumers are more likely to improve their perception of eco-labels when introduced to the potential private benefits associated with sustainable products through eco-labels.

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## INTRODUCTION

Eco-labels signal the environmental attributes of a product to consumers. The goal of eco-labels is to elicit increased demand for products perceived as environmentally favorable. Examples of eco-labels include the organic label for agricultural products, the Energy Star label for energy appliances, and the Forest Sustainable Stewardship label for lumber. The number of eco-label programs has grown from a mere dozen worldwide in the 1990s to more than 415 programs estimated today.<sup>2</sup>

However, with so many competing eco-labels available today, questions arise about how well they are understood by consumers. Recent research showed that only 20 percent of coffee consumers had a good understanding of the organic coffee eco-label and much less of the other competing coffee-eco labels including the Rainforest Alliance, Bird Friendly, Fair Trade and UTZ eco-labels (Delmas, 2009). Does the burgeoning of so many eco-labels create confusion in the mind of consumers? Or does an increased number of eco-labels help consumers understand better their value? It is unclear whether competition among eco-labels hampers their acceptance and understanding or enhances it. In this paper, we seek to understand the factors that explain the perception of competing eco-labels by consumers in the wine industry.

Eco-labels in the wine industry, such as the organic and biodynamic labels, constitute a fascinating empirical setting to study consumers' perceptions of competing eco-labels. First, there are at least two wine eco-labels, allowing us to analyze interactions between eco-labels. Furthermore, some members of the wine industry seem reluctant to promote their sustainable practices to consumers, fearing a negative response from their customers. Frog's Leap Winery in Rutherford, California is such an example. The winery has adopted organic certification but does not want to be known as such by consumers. As the founder of Frog's Leap Winery put it: "We don't want to be known as the organic winery of the Napa Valley."<sup>3</sup> It is therefore interesting to test empirically whether winemakers' intuition is true. Our objective is to examine whether some wine eco-labels are perceived negatively by consumers and to understand the factors that explain individual's perceptions of wine eco-labels.

In this study we compare the perception of organic and biodynamic wine eco-labels on several dimensions. Our results based on an online survey show that the perception of a wine eco-label increases not only with the familiarity with the specific eco-label but also with awareness of other eco-labels within the industry. Respondents unfamiliar with organic and biodynamic wines tended to view these negatively. However, respondents with a positive perception of organic wine certification tended to also have a more positive perception of biodynamic certification. In that sense, it seems that the reputation of an eco-label can build on the reputation of other eco-labels. We also found that male

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<sup>2</sup> See [www.ecolabels.com](http://www.ecolabels.com)

<sup>3</sup> Inc. com. 2006. The Integrators. Bringing fundamental change to everyday life. And, for that matter, death. November. [http://www.inc.com/magazine/20061101/green50\\_integrators.html](http://www.inc.com/magazine/20061101/green50_integrators.html)

and more educated populations were more inclined to be skeptical about eco-labels. In addition, our study suggests that consumers are more likely to improve their perception of eco-labels when introduced to the potential private benefits associated with sustainable products through eco-labels.

In the following section we develop hypotheses on the factors explaining the perception of wine eco-labels. In section 3, we describe the main competing eco-labels in the U.S. wine industry. Section 4 describes our survey methodology and the results. In section 5, we provide a concluding discussion.

## **LITERATURE AND HYPOTHESES**

The objective of eco-labels is to reduce information asymmetry between the producer of green products and consumers by providing credible information related to the environmental attributes of the product and to signal that the product is superior in this regard to a non-labeled product (Crespi and Maret, 2005). Information asymmetry between producers and consumers of green products arise because green products are credence goods; consumers therefore cannot ascertain their environmental qualities during purchase or use. Consumers are not present during the production process of the product and therefore cannot observe environmental friendliness of production.

The assumption behind eco-labels is that environmentally responsible consumers can make informed purchasing choices based on product-related environmental information (Leire and Thidell, 2005:1062). However, research shows that consumer awareness as well as consumer acceptance (credibility/comprehension) of eco-labels are key factors for an effective eco-label (Winters Lynch, 1994; Leire, 2004).

First, consumers need awareness and understanding of the information provided on eco-labels. Although the objective of eco-labels is to reduce information asymmetry between the producer of green products and consumers, if eco-labels fail to communicate adequately they will not diminish the information gap between seller and buyer. For example, studies have shown that the presence of competing eco-labels has led to consumer confusion (Leire and Thidell, 2005). In addition, if the cost of accessing this information is too high then consumers will be less likely to purchase green products.

Credibility of the eco-labeling process is also important to facilitate consumer choices of green products. Eco-labels represent different realities. In some cases, eco-labels are issued by independent organizations that have developed transparent environmental criteria and are third-party verified. In other cases, eco-labels just represent claims made by manufacturers related to some environmental friendliness (Ibanez and Grolleau, 2007).<sup>4</sup> The presence of the second type of eco-label may produce some confusion in the mind of consumers over the credibility of eco-labels. These unsubstantiated claims can result in adverse selection if some producers provide false or misleading labeling about environmental attributes and underlying production practices, causing consumers to choose products that do not in fact have the attributes implied by the label (Grodsky, 1993; Ibanez and Grolleau, 2007).

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<sup>4</sup> Ibanez and Grolleau (2007) suggested three dimensions that distinguish eco-labels: (i) the way the standard underlying the eco-label is defined, (ii) the way the claim is verified, and (iii) the way it is signaled to consumers.

In this paper, we argue that the presence of competing eco-labels can enhance consumer awareness regarding eco-labels rather than leading to consumer confusion. In other words, the reputation of eco-labels builds on the reputation of other labels. We therefore hypothesize that:

*H1: The greater the consumer awareness to eco-labels the more positive the perception of eco-labels.*

Not only do consumers need to recognize eco-labels and trust the claim of the label, but they also need to see potential advantages to the eco-label. Green products have been defined as “impure public good” because they yield both public and private benefits (Cornes and Sandler 1996; Ferraro et al., 2005; Kotchen, 2006). They consist of a private good, such as the pleasure of drinking wine, jointly produced with a public good, like biodiversity protection due to organic farming. Emerging research indicates that consumers are more likely to perceive organic products positively and to purchase them if the certified practices provide them additional private benefits. For example, Magnusson et al. (2001) found that the most important purchase criteria for organic products were related to quality rather than the environmental attribute. These include criteria such as “taste better,” “healthier” and “longer shelf-life.” Miles and Frewer (2001) reported that organic foods were viewed as safer than conventional products. Several other studies showed that health concerns were a major reason, along with environmental concerns, why people choose organic food products (Davies, Titterington, and Cochrane, 1995; Tregear, Dent, and McGregor, 1994; Wandel and Bugge, 1997). If labels are not associated with private benefits, consumers might not be willing to pay a price premium for the eco-labeled product. Therefore providing private benefits attributes will help individuals improve their perception of eco-labels. Hence, we hypothesize that”

*H2: The more the private benefits associated with eco-labels, the more positive the perception of eco-labels.*

In conclusion we hypothesize that increased consumer awareness of eco-labels and increased private benefits associated with eco-labeled products will improve the perception of eco-labels . We describe below our empirical setting in the wine industry.

## **ECO-LABELS IN THE WINE INDUSTRY**

There are two main eco-labels in the U.S. wine industry. The first one relates to organic certification and the second one to biodynamic certification.

***Organic certification*** follows the U.S. National Organic farming standard which defines a farming method prohibiting the use of additives or alterations to the natural seed, plant, or animal including, but not limited to, pesticides, chemicals, or genetic modification. The U.S. National Organic Standards law was passed in 2001.

Regulations require organic products and operations to be certified by a U.S. Department of Agriculture (USDA) accredited entity to assure consumers that products marketed as organic meet consistent, uniform minimum standards. Organic certifying agencies can be either State Departments of Agriculture or private certifying agencies. Regulations also prohibit practices such as genetic engineering, ionizing radiation, and using sewage sludge. Production and handling standards address crop production and livestock management requirements.

Additionally, labeling standards were created based on the percentage of organic ingredients in the product:

- “Organic” labeled products must consist of at least 95% organically produced ingredients and may display the USDA Organic seal.
- “Made with organic ingredients” labeled products are those that contain at least 70% organic ingredients. The principal display panel can list up to three organic ingredients or food groups, however the USDA seal cannot be used anywhere on the package.

Wine made from organic grapes is wine made from grapes that have been grown without pesticides. Organic wine is also made with organic grapes but prohibits sulfite use in the wine-making process.<sup>5</sup> This distinction is important because sulfites affect the quality of the wine. Sulfites act as a preservative. Eliminating sulfites can reduce the quality of the wine because the wine is not as stable and cannot be kept very long. There is no such problem for wine made from organic grapes because sulfites are used in the wine-making process.

***Biodynamic agriculture*** is a method made popular by Austrian scientist and philosopher Rudolf Steiner in the early 1920s. Often compared to organic agriculture, biodynamic farming is different in a few distinct ways. Biodynamic farming prohibits synthetic pesticides and fertilizers in the same manner as certified organic farming. However, while organic farming methods focus on eliminating pesticides, growth hormones, and other additives for the benefit of human health, biodynamic farming emphasizes creating a self-sufficient and healthy ecosystem. A biodynamic farm is managed as a living organism and farming practices are guided by the following six principles: plant diversity, crop rotation, composting, homeopathic fertilizers, animal life, and seasonal and planetary cycles.

In 1928, the Demeter Association was founded in Europe to support and promote biodynamic agriculture. The United States Demeter Association certified its first biodynamic farm in 1982.<sup>6</sup> To achieve Demeter certification, a vineyard must adhere to requirements concerning agronomic guidelines, greenhouse management, structural components, livestock guidelines, and post-harvest handling and processing procedures. In addition to the vineyard agricultural requirements, Demeter provides a separate set of wine-making standards with two certification alternatives for biodynamic wine:

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<sup>5</sup> Because wine harvesting and production requires specific handling and processing methods, the USDA developed explicit regulations regarding sulfite use for organic wine and other alcoholic beverages. Sulfites are a natural byproduct of fermentation and are often added to wine for preservation purposes. Added sulfites are prohibited in 100% organic wines and in organic wines (95% organic), and are regulated by 7 CFR 205.605 in wines made with organic ingredients. According to the U.S. Department of Agriculture's National Organic Program, an organic wine has been defined as "a wine made from organically grown grapes and without any added sulfites."

<sup>6</sup> Demeter USA Web Site. (2006). [www.demeter-usa.org](http://www.demeter-usa.org)

- “Biodynamic wine,” “Demeter wine,” or “Demeter certified wine.”
- “Wine made from Biodynamic Grapes” or “Wine made from Demeter certified grapes.”

## **METHODOLOGY**

Consumers’ perceptions of organic and biodynamic wines were assessed through an online survey.<sup>7</sup> The survey comprised four sections. In the first section, respondents were asked about their familiarity with organic and biodynamic wines. In the second section respondents were asked about their opinion of the quality of these wines on three dimensions (taste, health benefits and environmental impact). Then respondents were exposed to two different definitions about biodynamic wine (a “scientific” definition of biodynamic wine, and a “holistic” definition) and were asked to disclose their perception of biodynamic wine after the definitions. Finally respondents were asked demographics information (gender, age, income, education, country of residence, and zip-code).

The survey was distributed in May of 2006 by email to 700 individuals residing in the United States. In total, 404 responses to the survey were collected, this corresponds to a 58% response rate. The respondents were on average more educated, younger and wealthier than the average U.S. population.<sup>8</sup> There was also an over representation of women. The sample is therefore not representative of the general US population, but may be more representative of the type of consumer we are interested in- the environmentally aware population (Gilg et al., 2005).

## **FAMILIARITY AND PERCEPTION OF ORGANIC AND BIODYNAMIC WINES**

A large percentage of the sample (68.5%) had heard of organic wine, while a smaller portion of the sample had actually tasted it (41%). Only 19.3% of the respondents stated that they understood the difference between organically grown grapes and organic wine.<sup>9</sup> Turning to biodynamic wine, only a small percentage of the respondents had heard of “wine from biodynamically grown grapes” (17.8%) and only 8.4% had tasted biodynamic wine. Among the respondents who were familiar with organic wine, the vast majority (75%) had not heard of biodynamic wine.

Respondents were asked to rate their perception of organic wine and biodynamic wine on three main dimensions: wine taste, health benefits and environmental impact. They could choose to answer with: very negative, negative, no opinion, neutral, positive, or very positive. Table 1 below shows the distribution of respondents responses categorized into three main categories (negative, no opinion or neutral and positive). Overall the results show that there is a more positive perception of organic wine (65.9%) as compared to biodynamic wine (18.9%). While 10.6% of the respondents had a negative perception of

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<sup>7</sup> In the remainder of this paper, we use the term organic and biodynamic wines to describe both wines that are certified organic or biodynamic and those who are certified made out of organic or biodynamic grapes.

<sup>8</sup> Details about the characteristics of the population are available from the author upon request.

<sup>9</sup> 44% of the respondents stated that they did not know the difference between organic wine and wine from organically grown grapes and the remaining 36.6% were not sure.

biodynamic wine only 0.3% had a negative perception of organic wine. We also find that there is a better perception of the environmental impact of organic wine, followed by its health impact and the quality of the taste of organic wine. While 70.1% of the respondents had a positive perception of the environmental impact of organic wine, 59.9% had a positive opinion of its health benefits and only 36.3% of its taste.

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[Insert table 1 Perception of organic and biodynamic wines about here]

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Before being presented with any information about biodynamic farming practices, individuals were asked to provide one word to describe “wine from biodynamically grown grapes.” Many individuals’ also associated biodynamic grapes with science and futuristic terms, as well as large and fast growing grapes (see Appendix A). The words were categorized into the following eight categories: 1. Artificial/ /science fiction; 2. Bio-engineered; 3. Nonsense; 4. Confusing; 5. Sustainability; 6. New age/wine-related 7. Taste; and 8. Other. Table 2 below, shows that only 17% of the respondents associated biodynamic wine with sustainable practices. Overall, 76% of the respondents who had not heard about biodynamic wine associated it with a negative connotation (categories 1-4), while only 23.1 % of the respondents who had heard about biodynamic wine associated it with these categories.

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[Insert table 2. Word categories for biodynamic wine]

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## **FACTORS EXPLAINING THE PERCEPTION OF ORGANIC AND BIODYNAMIC WINES**

In order to understand the factors that explain the perception of organic and biodynamic wines, we ran regressions with dependent variables representing the perception of organic and biodynamic wines and independent variables representing several characteristics of respondents and their familiarity with wine and wine eco-labels.

### **Dependent variables**

The variables representing the average perception of organic and biodynamic wines were the average of the perception on taste, health and the environment.<sup>10</sup> The second set of models makes use of the word categories for biodynamic wine as dependent variables to represent perception of biodynamic wine.

### ***Independent variables***

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<sup>10</sup> Each respondent who had not tasted biodynamic wine was asked to give their general perception of biodynamic wine (recorded as variable q9bio). The respondents who had tasted biodynamic wine were asked to give their perception of biodynamic wine with regards to taste, health, and environment. Their responses were recorded as variables q8taste, q8health, and q8envi respectively. To gauge these respondents average perception of biodynamic wine, a new variable was created by averaging their responses to these three categories, recorded as variable q8\_average. Q8\_average and q9bio were added together to create one variable – q8\_q9\_combined.



In order to assess the familiarity of respondents with both wines, we asked several questions to our respondents. We asked respondents whether they had heard and/or tasted organic and biodynamic wines.

In addition, we asked respondents about their wine purchasing behavior. We asked about the frequency of respondents wine purchase and how much they would spend on average on a bottle of wine. We also asked respondents to state the importance of the following factors in their purchasing decision on a five point Likert scale: wine review in *Wine Spectator*, wine price or organic certification.

We also controlled for the respondent demographic characteristics including age, level of income; and level of education. Historically, the typical green consumer was assumed to be female, well-educated, liberal, and fairly wealthy (Gilg et al. 2005). Most studies found that females are more concerned about environmental problems and they appear more likely to participate in green activities (Blaikie, 1992; Blocker and Eckberg, 1997; Bord and O'Connor, 1997; Davidson and Freudenburg, 1996). However, some researchers have pointed out that males tend to have a higher and better knowledge about environmental issues than females (Diamantopoulos et al., 2003).

The level of education of consumers proved to have a strong relation with responsible green behavior in several studies. For example, Roberts (1996) found a positive relationship between level of studies and ecologically conscious consumer behavior (ECCB). People with a higher level of education would be more knowledgeable about environmental issues and more concerned about environmental performance of products. For this reason, better educated persons would be more willing to participate in environmentally responsible activities (Arcury & Christianson, 1990; Dunlap et al., 2000; Howell & Laska, 1992; Van Liere & Dunlap, 1980).

Higher levels of income have also been related to green purchasing behavior. Individuals with more disposable income appear to be more willing to engage in green purchases due to their inelasticity of demand for environmentally friendly products which usually sell at a premium price. Wealthier persons appear to be more knowledgeable about environmental issues and they also tend to be involved in green activities (Davies et al., 1995).

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[Insert Table 3 and 4 regressions of organic wine and biodynamic perceptions about here]

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Descriptive statistics are reported in Table 3 and results are reported in Table 4. The results of Model A using the perception of organic wine as a dependent variable show that those who have heard of organic wine tend to have a more positive perception of the taste, health and environmental benefits of organic wine. Likewise, those who rank organic certification as an important factor in their decision to purchase wine are also more likely to have a positive perception. Men are less likely than women to have a positive perception of the taste and health benefits of organic wine. Older people were less likely to have a positive perception of the environmental impact of organic wine.

The results of Model B using the perception of biodynamic wine as a dependent variable show that those who have tasted organic wine, who have heard of biodynamic wine,

those who have a higher income, and those who have a more positive perception of organic wine tend to have a more positive average perception of biodynamic wine. However, those who have heard of organic wine tend to have a more negative average perception of biodynamic wine. This surprising result requires further investigation.

The results of the perception of organic and biodynamic are therefore quite similar. Enhanced exposure improves perception, even when controlling for the initial preference of the individual towards organic products.

In addition, we present in Table 5. a Logit model using two categories of words to describe biodynamic wine as dependent variables. The first dependent variable is a dummy that represents the category “Sustainability” (Model A). The second dependent variable is a dummy that represents the category “Nonsense” (Model B). We chose these two categories because we wanted to understand the characteristics of the respondents who associated biodynamic wine with sustainable practices and of those who had a more negative reaction to biodynamic wine.<sup>11</sup>

In Model A, the Hosmer and Lemeshow test indicate this model is a good fit (p-value = 0.308). The classification table shows that 79.1% of the total observations are correctly predicted with this model (92.5% of the non-positive observations and 47.8% of the positive observations). The results show that those who have tasted organic wine, who have heard of biodynamic wine, and those who have a more positive perception of organic wine are more likely to think of words associated with environment, sustainability, wine practices, and taste quality.

Regarding Model B, The Hosmer and Lemeshow test indicate this model is a good fit (p-value = 0.658). The classification table shows that 90.7% of the total observations are correctly predicted with this model (100% of the non-negative observations and 15.2% of the negative observations). In this model, Men and those with more education are more likely to think of words associated with BS. Although the variables representing those who had heard of organic and biodynamic wine were negative, these variables were not significant. No other variable regarding individual characteristics or knowledge about wine eco-labels is significant.

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[Insert table 5 Regression analysis words about here]

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Overall, our findings show that there is a positive relationship between perception of organic wine and perception of biodynamic wine. However, there is a negative but non significant relationship between familiarity with organic wine and perception of biodynamic wine.

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<sup>11</sup> The issue of negative perception was less prominent in the case of organic wine so we have too few observations to study it.

## FACTORS THAT IMPROVE PERCEPTION

We exposed respondents to two different definitions of biodynamic wine. The first definition was “practice” oriented. It described management practices and included references to ‘highest quality grapes’ and the ‘non-use of pesticides.’ The second definition was more “holistic” oriented and included references to ‘life forces’ and ‘energy.’ These two definitions are provided in Appendix B.

After reading one of the two definitions of biodynamic wine, respondents were asked again to give their general perception of biodynamic wine. They were also asked what components of the description of biodynamic agriculture were the most appealing to them. The choices offered were: environmental sustainability, use of traditional farming practices; animal welfare; quality of products; personal health; and tradition.

Overall, 69.8% of the respondents had a positive change in their perception of biodynamic wine after reading a definition of biodynamic wine.<sup>12</sup> Only 4.6% of respondents had a more negative perception of biodynamic wine after reading the definition.

We run regression models using a new dependent variable ‘Change in perception of biodynamic wine’ that represents the change in score after exposure to one of the two definitions.<sup>13</sup>

The results of the regression are presented in Table 6. We observe that a difference in change of perception according to which survey the respondents were introduced. Those who were exposed to definition A (practices) were more likely to have a positive change in perception of biodynamic wine after reading the definition. The dummy variable representing exposure to definition A is positive and significant. Respondents exposed to definition A had 47% more chances to improve their perception than those exposed to definition B.

Those with affinity with organic wine were also more likely to change their perception positively. The variable representing the average perception of organic wine is positive and significant ( $P < 0.001$ ).

However, those who had heard of biodynamic wine and those who were highly educated were less likely to have a positive change in perception. The variable representing heard of biodynamic wine is negative and significant ( $p < 0.001$ ). This might be explained by the fact that those who had heard of biodynamic wine had already a positive perception of biodynamic wine. More educated respondents were less likely to be convinced by either definition. The variable representing education is negative and significant in Model B and C ( $p < 0.10$  but insignificant in Model A that included variables representing what respondent liked in the definition).

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<sup>12</sup> 25.6% of respondents had no change in their perception. 25.8% had a slightly more positive perception (1-2 unit increase), while 44% had a much more positive perception (2-4 unit increase).

<sup>13</sup> The change in their perception of biodynamic wine was obtained by subtracting q8\_q9\_combined from q10bio, recorded as the variable q10\_diff.

In addition, those who ranked personal health as the most appealing components of the description of biodynamic agriculture were most likely to have changed their perception of biodynamic wine. These individuals were 34% more likely to improve their perception of biodynamic wine. The other variables representing preferences did not show significant coefficient and were not included in the regression.

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[Insert table 6 regressions with change in perception tables. about here]

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In summary, our results show that exposure to definition of biodynamic wine helps improve the perception of biodynamic wine. However, the wording of the definition matters. We found that exposure to definition A was more likely to improve the perception of biodynamic wine. We also found that those who liked the component of personal health in the definition were more likely to improve their perception of biodynamic wine. Finally those who had a positive perception of organic wine were likely to improve their perception while those who had heard of biodynamic wine were less likely to improve their perception.

## **DISCUSSION AND CONCLUSION**

Our main objective was to understand how organic and biodynamic wines are perceived by consumers and the factors that might explain differences in such perceptions. We hypothesized that familiarity with one wine eco-label should improve the perception of another eco-label. We also hypothesized that exposure to additional information and to potential private benefits associated with the eco-labels would improve the perception of a specific eco-label.

Our results, based on the responses from 400 respondents to an online survey confirm our hypotheses. We found that a high percentage has a negative perception of organic and biodynamic wine. Indeed, those with no exposure to organic and biodynamic wines tended to be more negative about such eco-labels. Among those without any knowledge of biodynamic wine, 76 percent had a negative opinion of the eco-label. In that case, it is possible that the term “biodynamic” might not be the most appropriate to convey sustainable wine practices to a U.S. audience since more respondent associated the term with science, bio engineered products. While the root word “bio” means life, the addition of “dynamic” does not seem to convey natural practices but rather engineered practices. The root word dynamo means power.

Our results indicate that eco-labels can build on each other. Consumers with knowledge of organic wine tended to have a more positive attitude towards biodynamic wine. However, the reverse was not true. There was no significant relationship between biodynamic exposure and organic liking. This might be explained because there are only very few people who had heard about biodynamic wine.

We showed that exposure to information mattered to improve perception of biodynamic wine but that the content of that information mattered too. The definition of biodynamic

wine with terms related to the quality of the grapes was better received than the more traditional definition describing the crop growing approach.

Our research is not without limitations. We relied on data gathered through a survey and we know that perception is not equivalent to purchase. So further studies should run experiments where we can observe consumers preferences about specific eco-labels through their purchase. Yet our findings are consistent with other research highlighting the negative connotation that eco-labeled wine might incur (Delmas and Grant, 2010).

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**Table 1 Perception of organic and biodynamic wines**

<i>Perception of</i>	<i>Taste</i>		<i>Health</i>		<i>Environmental impact</i>		<i>Average</i>	
	Organic	Biodynamic	Organic	Biodynamic	Organic	Biodynamic	Organic	Biodynamic
Negative	14 5.5%	2 6.5%	3 1.2%	1 3.2%	0 0%	0 0%	1 0.3%	39 10.3%
No Opinion or Neutral	126 49.4%	6 19.4%	78 31.0%	7 22.6%	49 19.5%	1 3.2%	126 33.9%	269 70.8%
Positive	115 45.1%	23 74.2%	171 67.9%	23 74.2%	202 80.5%	31 96.8%	245 65.9%	72 18.9%
<b>Total</b>	255 100%	31 100%	252 100%	31 100%	251 100%	32 100%	372 100%	380 100%



**Table 2. Word categories for biodynamic wine**

			Heard of biodynamic wine			
			Yes		No	
What word comes to mind for biodynamic-coded	Frequency	Percent	Frequency	Percent	Frequency	Percent
Science/accelerated/artificial/unnatural, Science fiction	81	23.3%	6	9.2%	75	26.5%
Bio-engineered, genetic engineering	59	17.0%	2	3.1%	57	20.1%
Crap, BS, cheesy	35	10.1%	4	6.2%	31	11.0%
Confusing, complicated, strange, don't know	56	16.1%	3	4.6%	53	18.7%
Environment, sustainability, eco-friendly	59	17.0%	22	33.8%	37	13.1%
Definition, new age, wine-related practices	32	9.2%	21	32.3%	11	3.9%
Taste, quality	8	2.3%	1	1.5%	7	2.5%
Other	18	5.2%	6	9.2%	12	4.2%
Total	348	100.0	65	100.0	283	100.0

Table 3. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Heard of organic wine	404	1.00	2.00	1.3441	.47565
Tasted organic wine-	404	1.00	2.00	1.6114	.48804
Heard of biodynamic wine	383	1.00	2.00	1.8225	.38263
How important is “ price” in your decision to purchase wine	346	1.00	5.00	3.9104	.94213
How important is “review in wine spectator or similar” in your decision to purchase wine	342	1.00	5.00	2.1550	1.13694
How often do you purchase wine at the following locations: specialty wine store	342	1.00	5.00	2.5877	1.18503
How much would you typically spend on a bottle of wine	352	1.00	5.00	1.9943	.75105
Gender	348	1.00	2.00	1.6236	.48519
Age	348	1.00	9.00	2.5316	1.36089
Household annual income	348	1.00	6.00	3.5287	1.72681
Education	348	1.00	8.00	5.3592	1.28626
California resident	386	.00	1.00	.5311	.49968
Change in perception bio	371	-2.00	4.00	1.1141	1.04860
Component of description: quality of products	404	.00	3.00	1.2748	1.19812
Component of description: personal health	404	.00	3.00	1.2550	1.21277
Components of description: environment	404	.00	3.00	1.2723	1.00130
How often do you purchase wine	352	1.00	5.00	3.2926	.92274
How important are the following factors in your decision to purchase wine: organic certification	347	1.00	5.00	2.4063	1.15517
Valid N (listwise)	330				

Table 3 Descriptive Statistics

		Mean	Sd.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.	survey	1.54	.499	1																			
2.	q1 heard	1.3441	.47565	.017	1																		
3.	q2taste_combined	1.6114	.48804	.032	.577 <sup>ns</sup>	1																	
4.	q3_ave	3.8656	.71385	-.077	-.291 <sup>**</sup>	-.237 <sup>**</sup>	1																
5.	q4orga	1.8066	.39546	.062	.219 <sup>ns</sup>	.372 <sup>**</sup>	-.109 <sup>*</sup>	1															
6.	q5biod	1.8225	.38263	.103 <sup>*</sup>	.259 <sup>**</sup>	.352 <sup>**</sup>	-.196 <sup>**</sup>	.366 <sup>**</sup>	1														
7.	q11quali	1.2748	1.19812	.045	-.092	-.080	.022	.019	-.015	1													
8.	q11envi	1.2723	1.00130	.071	-.025	-.103 <sup>*</sup>	.016	.048	.071	.196 <sup>**</sup>	1												
9.	q11healt	1.2550	1.21277	-.131 <sup>ns</sup>	-.002	-.025	.138 <sup>**</sup>	-.010	.040	.061	.125 <sup>*</sup>	1											
10.	q13purch	3.2926	.92274	-.077	-.315 <sup>**</sup>	-.283 <sup>**</sup>	.057	-.180 <sup>**</sup>	-.202 <sup>**</sup>	-.079	-.004	-.035	1										
11.	q14spec	2.5877	1.18503	-.080	-.215 <sup>**</sup>	-.174 <sup>**</sup>	.036	-.147 <sup>**</sup>	-.127 <sup>*</sup>	.080	.007	-.050	.554 <sup>ns</sup>	1									
12.	q15price	3.9104	.94213	-.043	-.080	-.104	.010	.016	-.037	.012	-.061	.054	-.030	-.176 <sup>ns</sup>	1								
13.	q15spect	2.1550	1.13694	.045	-.054	-.097	.022	.015	-.035	.097	.010	-.022	.162 <sup>ns</sup>	.196 <sup>ns</sup>	.059	1							
14.	q15org	2.4063	1.15517	-.118 <sup>*</sup>	-.299 <sup>**</sup>	-.362 <sup>**</sup>	.441 <sup>**</sup>	-.188 <sup>**</sup>	-.242 <sup>**</sup>	.066	-.039	-.032	.048	.027	-.046	.073	1						
15.	q17money	1.9943	.75105	-.022	.079	.071	-.042	-.052	-.082	.019	-.029	-.045	-.026	.212 <sup>ns</sup>	-.394 <sup>**</sup>	.047	-.089	1					
16.	q18gender	1.6236	.48519	-.024	-.008	.031	.213 <sup>**</sup>	.078	.088	-.079	.038	.084	.064	-.081	.023	.069	.041	-.001	1				
17.	q19age	2.5316	1.36089	-.073	-.007	.028	-.039	-.043	-.055	.008	-.016	-.033	.022	.140 <sup>*</sup>	-.169 <sup>**</sup>	-.022	.098	.082	-.172 <sup>**</sup>	1			
18.	q20income	3.5287	1.72681	-.062	-.011	-.088	-.026	-.064	-.031	.009	.050	-.017	.193 <sup>**</sup>	.236 <sup>**</sup>	-.144 <sup>**</sup>	-.021	.010	.149 <sup>**</sup>	-.119 <sup>*</sup>	.274 <sup>**</sup>	1		
19.	q20educ	5.3592	1.28626	.092	-.027	-.077	-.089	.004	.025	.077	.035	-.064	-.083	-.092	.033	-.040	-.036	-.076	-.074	.164 <sup>**</sup>	.171 <sup>**</sup>	1	
20.	california	.5311	.49968	.093	-.176 <sup>**</sup>	-.299 <sup>**</sup>	.039	-.055	-.194 <sup>**</sup>	.011	.005	-.001	.071	-.170 <sup>**</sup>	.098	.135 <sup>*</sup>	.091	-.129 <sup>*</sup>	-.058	-.095	.017	.014	1

Table 4 Regressions of perception of organic wine

Dependent variable	GLM Univariate Average Perception Organic	GLM Univariate Average Perception Biodynamic
Intercept	3.609*** (0.335)	2.486*** (0.409)
Gender	-0.316*** (0.072)	-0.041 (0.078)
Heard of organic wine	0.300*** (0.091)	-0.174** (0.096)
Heard of biodynamic wine	0.136 (0.102)	0.950*** (0.106)
Tasted organic wine	0.005 (0.094)	0.191* (0.098)
Live in California	0.015 (0.075)	0.018 (0.078)
Know the difference between organic grapes and organic wine	0.034 (0.098)	0.072 (0.102)
Education	-0.028 (0.028)	-0.008 (0.030)
Income	0.026 (0.022)	0.041* (0.023)
Age	-0.036 (0.028)	0.018 (0.029)
Frequency of wine purchase	-0.076 (0.048)	-0.008 (0.050)
Typical spending on wine	-0.023 (0.054)	-0.068 (0.056)
Frequency of wine purchase wine at specialty wine store	0.018 (0.038)	0.000 (0.040)
Importance of price in wine purchase	0.006 (0.040)	-0.013 (0.042)
Importance of review in wine spectator	-0.021 (0.031)	-0.033 (0.032)
Importance of organic certification	0.240*** (0.033)	0.014 (0.037)
Average perception of organic wine		0.165*** (0.059)
Observations	322	322
Pseudo R-squared	0.313	0.358

Standard errors are in parentheses. \* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Table 5 regression analysis words for biodynamic wine

Model	Binary Logit Word Analysis	
	Environment, Wine practices, Taste (categories 5, 6 and 7)	Nonsense
Intercept	-3.780** (1.698)	-3.601 (2.509)
Gender	-0.329 (0.334)	0.903** (0.444)
Heard of organic wine	0.154 (0.438)	-0.813 (0.534)
Heard of biodynamic wine	2.050*** (0.409)	-0.207 (0.688)
Tasted organic wine	1.018** (0.398)	0.067 (0.645)
Live in California	-0.079 (0.336)	0.448 (0.455)
Know the difference between organic grapes and organic wine	-0.226 (0.412)	0.098 (0.619)
Education	0.167 (0.126)	0.341* (0.178)
Income	-0.068 (0.099)	-0.028 (0.126)
Age	0.057 (0.126)	0.089 (0.160)
How often do you purchase wine	-0.305 (0.213)	0.249 (0.282)
How much would you typically spend on a bottle of wine	-0.013 (0.231)	0.118 (0.320)
How often do you purchase wine at a specialty wine store	0.010 (0.169)	-0.188 (0.232)
How important is price	-0.006 (0.177)	0.298 (0.251)
How important is a review in a wine spectator	-0.147 (0.138)	-0.083 (0.185)
How important is organic certification	-0.208 (0.152)	-0.137 (0.233)
Average perception of organic wine	0.777*** (0.254)	-0.539 (0.368)
Observations	302	302
% correctly classified	79.1%	90.7%
Pseudo R-squared	0.321	0.205

Standard errors are in parentheses. \* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 6. Changes in perception of biodynamic wine**

Dependent variable	Change in perception		
	Model A	Model B	Model C
Included in model			
Intercept	0.847** (0.099)	0.964* (0.510)	0.998* (0.531)
Survey	0.469*** 0.112	0.454*** (0.109)	
Gender	-0.120 (0.115)	-0.117 (0.116)	-0.129 (0.118)
Heard of organic wine	0.030 (0.145)	0.024 (0.145)	0.056 (0.149)
Heard of biodynamic wine	-0.773*** (0.160)	-0.769*** (0.160)	-0.694*** (0.163)
Tasted organic wine	-0.063 (0.143)	-0.076 (0.144)	-0.066 (0.147)
Live in California	0.015 (0.112)	-0.002 (0.113)	-0.026 (0.114)
Know the difference between organic grapes and organic wine	-0.159 (0.150)	-0.202 (0.151)	-0.154 (0.154)
Education	-0.073 (0.045)	-0.083* (0.044)	-0.083* (0.046)
Income	-0.040 (0.033)	-0.039 (0.034)	-0.036 (0.034)
Age	-0.019 (0.042)	-0.014 (0.043)	-0.014 (0.043)
How often do you purchase wine	-0.009 (0.065)	0.000 (0.064)	0.011 (0.066)
How much would you typically spend on a bottle of wine	-0.015 (0.074)	-0.015 (0.075)	-0.008 (0.076)
Component of description: personal health (not ranked)	0.128 (0.143)		0.025 (0.145)
Component of description: personal health (ranked first)	0.339** (0.158)		0.388** (0.162)
Component of description: personal health (ranked second)	-0.149 (0.154)		-0.102 (0.158)
Average perception of organic wine	0.223*** (0.082)	0.219*** (0.082)	0.221*** (0.084)
Observations	338	338	338
R-squared	0.205	0.180	0.313

Standard errors are in parentheses. \* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

## Appendix A. Words describing biodynamic wine

1 UNNATURAL, SCIENCE FICTION							
technical	chemicals	high tech	mutant	artificial	NOT PURE	mutant grapes	grapes from a lab
laboratory	superman	Science fiction	laboratory	hybrid	unnatural	hydroponics	fast growing
enhanced	super strength	processed	futuristic	mutation	science	futuristic	Not natural
accelerated	big	Not Organic	Technology	ARTIFICIAL	kind of science fiction	Technology	futuristic
chemistry	Kevlar	Man made?	altered	optimization	steel	cellular	mutation
artificial	Steroids	lab	hybrid	fast growing	the bionic woman	hi-tech	scientific
sounds way to sci-fi for something as artful and delicious as wine			grapes grown in a controlled environment			grapes grown artificial	
artificially grown grapes/ hormone based			grown in controlled environment (greenhouse)			monstrous (as in large size)	
controlled variable environment			maybe the grapes were grown in a special way to accelerate growth or something			extra big grapes	
I think of grapes grown in a controlled environment			a non natural way to grow grapes			hydroponic growing set up	
2. BIO-ENGINEERED							
biomodified	GMO's	biotechnology	bioengineering	genetically altered	genetically modified grapes	genetically modified	biologically improved
altered genetics	gmo grapes	Genetic manipulation	Genetically Altered	genes	cloning	genetic modification	engineered
GMOs	biologically altered	genetics	automatically biologically	cloned	biowine	DNA	genetics
genetic engineering; franken grapes			genetically engineered grapes			genetically enhanced grapes	
some kind of genetic engineering; but it's probably grown in a biologically diverse environment.			Uhh...this isn't related to GMO, is it?			genetic engineering	
genetically modified or permaculture			wine from genetically altered grapes.			genetically engineered	
grapes that have been scientifically engineered			grown with the help of other biological organisms (not sure what)			sounds like its genetically modified	
3. NONSENSE							
so?	BS	hippies	verbiage	made up	cheap	Pauly Shore	gross
narkeing spin	Excrement	Tree-hugging	cheesy	treehugger?	Hippy	saturday night live	
bullshit	gimmick	hype	fake	wacky	gross	crap	marketing
big words for something simple			stupid buzz word easily explained in a simpler way			Rich Hippies making money	
no idea, sounds like new age jargon			a flexible globe, with grapes in a huge wreath around it			it doesn't sound good	
Weird high tech stuff - BS really							

4. CONFUSING							
huh	unsure	??	who knows	strange	n/a	Unknown	confused
?	complicated	weird	interesting	No idea	complex	no clue	ok
what is that	scary	don't know	odd	not sure	nothing	what?	huh?
none	weird	na	different	none	???	confusion	ignorance
is this healthier than regular grapes?			very difficult to grow			none in particular	
mysterious		unsure, need more info		what does that mean		Non-traditional	
5. SUSTAINABILITY							
in tune with environment	Eco-friendly	environmental sustainability	fresh	organic	environment	natural	sustainable
permaculture	natural fertilizers	Sustainable	healthy	Environmentally Friendly	sustainability	Responsible	Super Organic!
environmentally-friendly	clean	ecologically sensitive	nature	natural, holistic, healthier vines, better for environment			that their grown with no chemicals
no pesticides used for cultivating	environmental	sustainable eco system	earth	Wine which comes from grapes which are grown pesticide free.			
above organic	grown without chemicals	no pesticides	organic inputs	organic grapes	naturally grown?	safe for the environment	
6. NEW AGE, WINE-RELATED							
stars	ceago	integrated approach to farming including organic - rudolf steiner method				Symbiotic Relationships among different plants	
metaphysical	holistic	rudolf steiner	new age	compost	cow manure	coexistence	soil
balance	Vital forces	Steiner	life	yield	microbiotic	in tune with nature?	
energy	dynamic	robert sinskey	seasonal	integrated pest management		used manure to fertilize it	
Frey	lunar cycles	sun	bugs	bug predators	Integrated pest management and healthy soil		
7. TASTE, QUALITY							
new taste	good	high quality	Yum	poor taste	delicious	terroir	sweet
8. OTHER							
richness	process	grapes	safer	Health	strong	varied	lofty
greenhouse	critters	hydro	mixture	health	watery	dynamic grapes?????	
evolution	Expensive	variety	movement	Betsy Abbott			



## APPENDIX B

### SURVEY A *practice oriented- definition*

Based on a methodology defined by an Austrian scientist, biodynamic farming techniques utilize the vineyard's natural resources to cultivate highest quality grapes without the use of pesticides, fungicides, herbicides, synthetic fertilizers, growth stimulants or Genetically Modified Organisms. A vineyard that is certified biodynamic exceeds the standards and regulations for organic certified farming.

### SURVEY B *Holistic-oriented- definition*

Biodynamic farming is a holistic farming approach designed by an Austrian philosopher. In addition to traditional organic practices such as crop rotation and composting, biodynamic practices utilize special plant, animal and mineral preparations, and the rhythmic influences of the solar system to sustain a thriving agrarian ecosystem.