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Texas Sauvignon blanc wine consumer consumption behaviours and product preferences: A Latent Class Analysis

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Key Points

- The Agribusiness and Economics Research Unit (AERU) at Lincoln University with the support of research partners under the *Unlocking Export Prosperity from the Agri-food Values of Aotearoa New Zealand* research programme has estimated willingness-to-pay (WTP) values for selected credence attributes of Sauvignon blanc wine by Texan consumers, with a focus on identifying preferences for attributes considered *distinctively New Zealand.*

- Preferences for many of the credence attributes considered here are not readily observable from market prices and so the non-market valuation method of Choice Experiments was used. This involved an online survey of Texan residents in December 2019, using a research panel. The survey process achieved 490 responses with suitable representation of key population demographics.

- As well as WTP values, this survey reports on:

    - Purchase frequency overall, and by country-of origin
    - Consumption frequency
    - Prices paid
    - Country-of-origin quality ranking
    - Wine experience and engagement
    - Sustainability reporting perceptions and preferences
    - Sustainability labelled wine purchasing
    - Familiarity with Sustainable Wine NZ
    - Attributes perceived as associated with Sustainable Wine NZ
    - Perceptions of sustainability meaning
    - Reasons for purchasing sustainability labelled wine
    - Acceptance of new grape growing techniques
    - Use of digital media and smart technologies for wine shopping

- New Zealand Sauvignon blanc was the most purchased by country of origin followed by the US. New Zealand was ranked first for quality followed by the US then France, with 27 per cent of respondents ranking New Zealand Sauvignon blanc first followed by 26 per cent the US and 21 per cent for French.

- A third of the sample had recently purchased USDA certified Organic wine. SWNZ was the fourth on the list of those purchasing wine with sustainability labels at 17 per cent. Around 17 per cent of Sauvignon blanc wine drinkers were familiar or moderately familiar with SWNZ.

- A high proportion of Sauvignon blanc wine drinkers used the internet to select wines at 70 per cent. Most respondents purchase wine from a grocery store, at 93 percent, with 9 per cent purchased on line from overseas. Overall 41 per cent of expenditure was at grocery stores.

- Group one has the highest use of the internet and smartphones for finding information about wine and wine purchases.

- The survey included a choice experiment to assess the Willingness to Pay by consumers for different attributes associated with Sauvignon blanc. The consumers were then segmented, using a latent class model, into 3 classes each with different characteristics and preferences.

- The results showed that consumer group three (35 per cent of the sample) were willing to pay the most for Sauvignon blanc from New Zealand, with a premium of 133 per cent and 166 per cent for Sauvignon blanc sourced from Māori enterprises. This group was also willing to pay 134 per cent for US sourced Sauvignon blanc, and a premium of 133 per cent for Australian and 124 per cent for French Sauvignon blancs. This group was also willing to pay highest premium at 21 per cent for greenhouse gas management and 16 per cent for enhanced biodiversity management.
- Group one (40 percent of the sample) had the lowest willingness to pay for country of origin Sauvignon blanc wine but still were prepared to pay the highest for New Zealand Sauvignon blanc wine at 74 per cent. This group tended to be female, younger than the other groups, more likely to have children, and were more familiar with SWNZ. The group were also willing to pay for other attributes ranging from 13 per cent for social responsibility and organic to 5 per cent for energy management.
- Group two (25 per cent of the sample) were older and are also willing to pay the higher premium for New Zealand Sauvignon blanc wine at 60 per cent and 84 per cent for that sourced from Māori enterprises. They were also willing to pay a premium of 14 per cent for enhanced biodiversity management, social responsibility and organic Sauvignon blanc wines with a 17 per cent premium for greenhouse gas management.

- The respondents average percentage willingness-to-pay (WTP) was:

Wine attributes	Group One (40% of consumers)	Group Two (25% of consumers)	Group Three (35% of consumers)
Biodiversity Management	7	14	16
Water Management	0	0	12
By-product Management	11	0	0
Energy Management	5	0	0
Pest & Disease Management	12	0	14
Social Responsibility	13	14	7
GHG Management	11	17	21
Made with Organic grapes	0	0	0
100% Organic	13	14	0
Critic rating (per point >80)	0	3	4
Made in New Zealand	74	60	133
Made in NZ by Māori enterprise	71	84	166
Made in USA	54	49	134
Made in France	66	28	124
Made in Australia	72	46	133
Made in Italy	40	28	112

Chapter 1
Introduction

This study is part of a research programme entitled *Unlocking Export Prosperity from the Agri-food Values of Aotearoa New Zealand*. It is funded by the Ministry of Business, Innovation and Employment (MBIE) Endeavour Fund for science research programmes.

The research aims to provide new knowledge on how local enterprises can achieve higher returns by ensuring global consumers understand the distinctive qualities of the physical, credence and cultural attributes of agri-food products that are "Made in New Zealand".

Agricultural exports are an important contributor to the New Zealand (NZ) economy. While NZ historically relied on key markets such as the United Kingdom for export trade, NZ has more recently significantly expanded its export markets and the United States of America has become established as an important wine product destination. It is critically important for NZ exporters to understand export markets and the different cultures and preferences of those consumers to safeguard market access, and for realising potential premiums.

This report describes the application of a survey of Texas Sauvignon blanc consumers that is designed to examine consumption behaviour and consumer Willingness-to-Pay (WTP) for credence attributes. While search attributes such as price or colour can be observed directly, and experience attributes such as flavour can be assessed when consumed, credence attributes such as environmental sustainability cannot be immediately seen or experienced at the point of sale. For products promoting credence attributes, the role of verification including labelling is of significant importance.

Our approach is to apply a Choice Experiment economic valuation method, analysed using a statistical approach called Latent Class Modelling that describes profiles for different consumer segments identified in the data and provides estimates of attribute WTP across these segments.

Chapter 2
Wine Survey Method

To understand how consumers value NZ credence attributes this study used a structured self-administered online survey that included the Choice Experiment, conducted in Texas in December 2019. The survey was administered through Qualtrics™, a web-based survey system, and had a sample size of 490 Sauvignon blanc wine consumers.

The survey was developed by the research team drawing from a literature review on consumer trends for wine products, results from previous surveys examining consumer attitudes in overseas markets, a scoping survey of 200 Texas Sauvignon blanc wine consumers (November 2019) and consultation with industry partners and stakeholders, especially those on the advisory board.

Sampling involved recruiting participants from an online consumer panel database provided by an international market research company (dynata.com). Panel members are recruited by online marketing across a range of channels and panels are profiled to ensure adequate representativeness. Panels are frequently refreshed, with the participation history of members reviewed regularly. Respondents for each survey are compensated with a retail voucher for completing a survey. Potential respondents were recruited by e-mail and were screened out if they purchased Sauvignon blanc wine less than monthly.

2.1 Using Choice Experiments to examine consumer preferences

Choice Experiments are a survey based valuation approach that have been widely used to value consumer preferences for food and beverage product attributes. They are particularly useful for examining the role of new attributes, and attributes that that are not easily observable in market prices such as the attributes explored in the current report. The ability of this method to identify which individual attributes are more important in consumer choices, and to estimate consumers' WTP for these, has seen this approach to valuation become increasingly favoured by researchers.

Designing a Choice Experiment survey involves deciding which product attributes are of interest, combining these into different product offerings, and asking consumers to pick which offering they prefer from a range of alternatives. In this study, alternative Sauvignon blanc wine products are described by production practices, country of origin and price (Table 2.1). Attribute selection was primarily informed by the scoping survey that used a combination of open text and structured questions to identify which attributes Texas consumers considered distinctive of NZ wine.

Table 2.1 Sauvignon blanc wine attribute descriptions used in the choice experiment

Sauvignon blanc wine attributes	Attribute descriptions
Biodiversity Management	The wine may be labelled showing that the winery or grower has set aside area for biodiversity restoration or enhancement on the same property as the vineyard, or off site.
Water Management	The wine may be labelled showing that monitoring, measurement and limitation of water resources is undertaken.
By-product Management	The wine may be labelled showing that production by-products are diverted from landfill and turned to beneficial use.
Energy Management	The wine may be labelled showing that monitoring, measurement and limitation of energy resources is undertaken.
Pest & Disease Management	The wine may be labelled showing that integrated control strategies are used to optimize control and fruit quality and prioritize minimization of the impact on the receiving environment.
GHG Management	The wine may be labelled showing that monitoring, measurement and limitation of GHG emissions is undertaken.
Organic Production	The wine may be labelled as *100% Organic*: Both growing and processing are Organic. No GMOs. No added sulfites. No synthetic fertilizers or agrichemicals.
	The wine may be labelled as *Made with Organic grapes*: Grapes are Organic but some ingredients are not. Sulfites may be added. No GMOs. No synthetic fertilizers or agrichemicals in grape growing.
Social Responsibility	The wine may be labelled as being from socially responsible vineyards and wineries that actively include public interest into their decision making.
Origin	The wine is labelled showing where the wine is made.
Māori Production	The wine may be labeled as being produced by Māori wineries. Māori are New Zealand's indigenous people, they see themselves as belonging to the land. Māori seek to maintain and protect the health of their land for the welfare of current and future generations, and so to produce food that supports the health and wellbeing of their customers.
Critic rating	The wine may be labelled showing a score out of 100, from a well-known critic. A wine score is a simple way for a wine critic to communicate their opinion about the quality of a wine.
Price	The wine is labeled with the price for a 750ml bottle of Sauvignon Blanc.

Changes in wine attributes are described using the labels in Table 2.3. Price levels were determined by market prices, and from what scoping survey respondents said that they usually paid. Countries of origin were selected based on volumes of sales in Texas for 2019.

An example of alternative product offerings presented to respondents is shown in Figure 2.1. Each set of offerings comprises three options, of which respondents chose their preferred one. Two options present alternative Sauvignon blanc products, while the third is a 'none of these' option. Each respondent answered ten choice sets, generating 4,900 completed choice sets over the total sample.

Table 2.2 Sauvignon blanc wine attribute levels used in the choice experiment

Sauvignon blanc wine attributes	Attribute levels					
Biodiversity Management	No Label	Certified				
Water Management	No Label	Certified				
By-product Management	No Label	Certified				
Energy Management	No label	Certified				
Pest & Disease Management	No label	Certified				
GHG Management	No label	Certified				
Social Responsibility	No label	Certified				
Organic Production	No Label	Made with organic grapes		100% organic		
Critic rating	No Label	80-84		85-89	90-94	95-100
Origin	France	Italy	USA	Māori winery in NZ	NZ	Australia
Price US$/750ml	$8.95	$13.55		$17.85	$23.15	

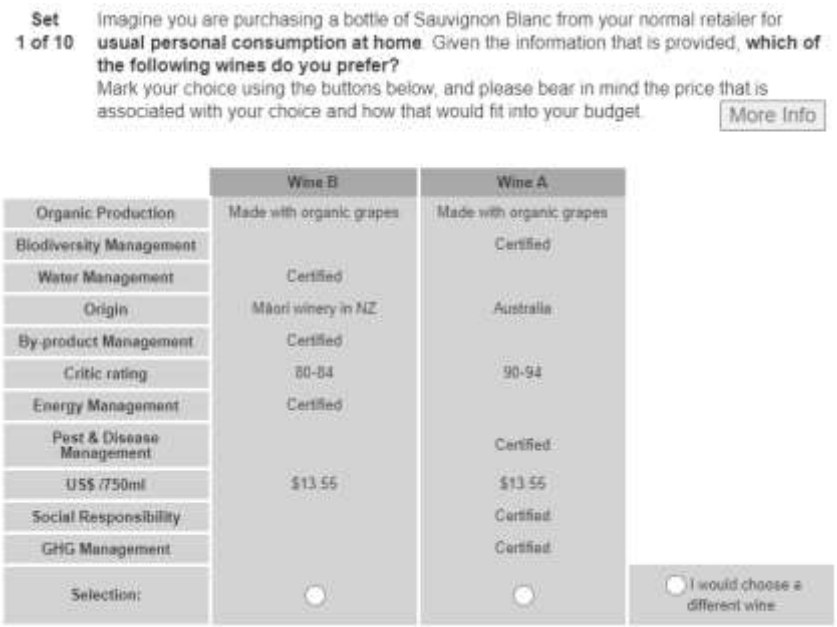


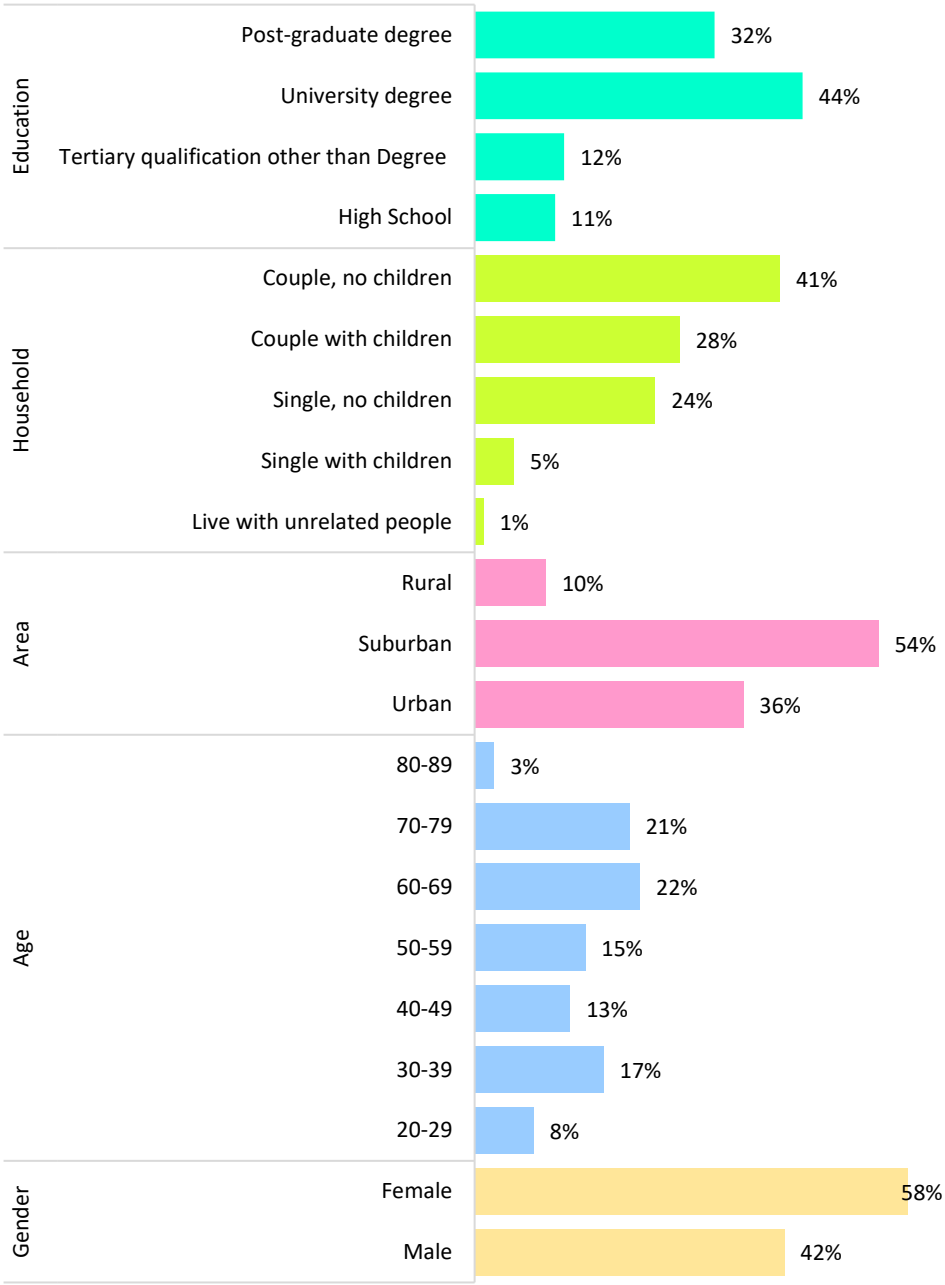
Figure 2.1 Example of a choice experiment question shown to respondents

Product choices are statistically analysed, and consumers' WTP for each attribute is estimated. A more detailed presentation of theoretical foundation and statistical procedure can be found in Appendix A.

Chapter 3
Survey Results

3.1 Sample demographic description

- The sample comprised a wide range of demographics, which is important to ensure that the sampling process has broadly canvased the relevant population (Figure 3.1).
- It is important to note that we are not attempting to represent the overall Texas population, but rather those that purchase Sauvignon blanc wine at least monthly.



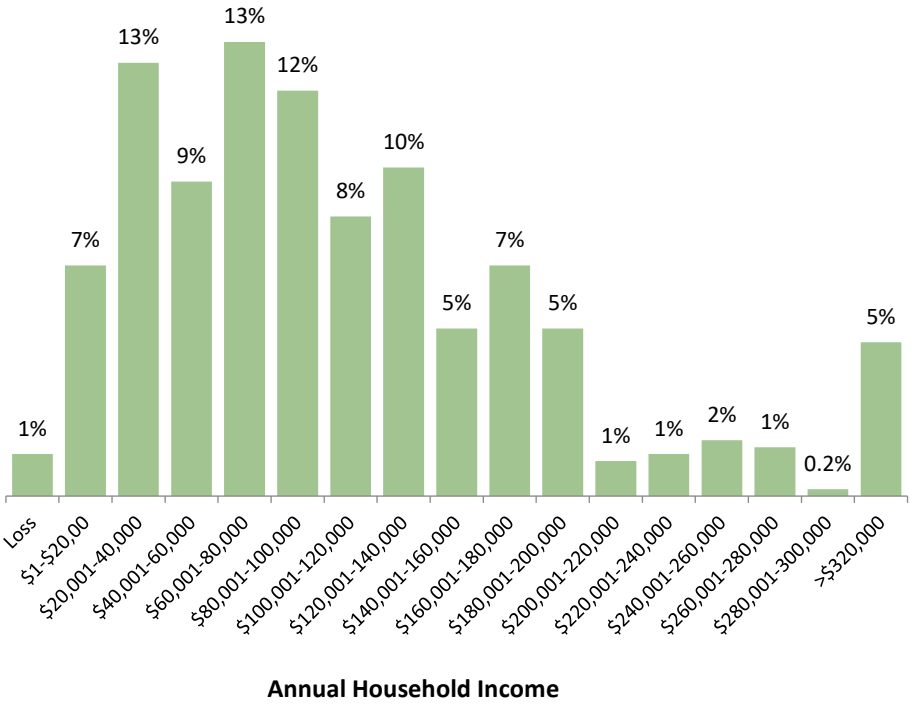


Figure 3.1 Sample demographics

3.2 Purchase and consumption behaviour

- Almost half of respondents purchase Sauvignon blanc at least fortnightly (Figure 3.2).

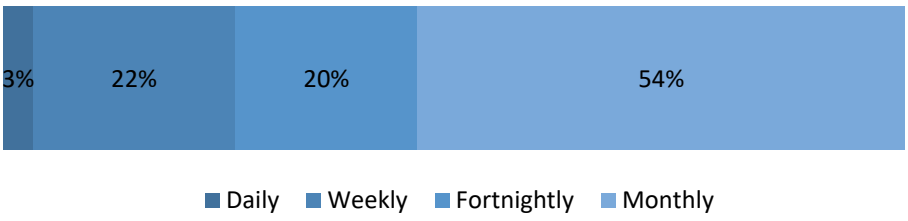


Figure 3.2 Sauvignon blanc purchase frequency

- Just over half of respondents consume Sauvignon blanc at least once a week (Figure 3.3).

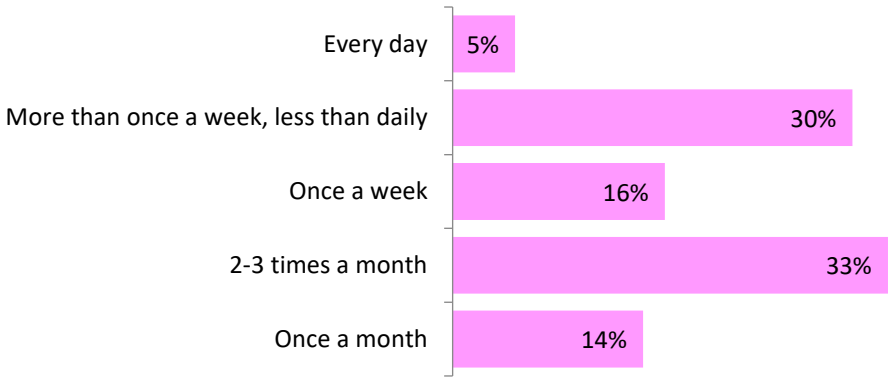


Figure 3.3 Sauvignon blanc Consumption frequency

- The most common price point usually paid is $10-15/bottle (Figure 3.4).

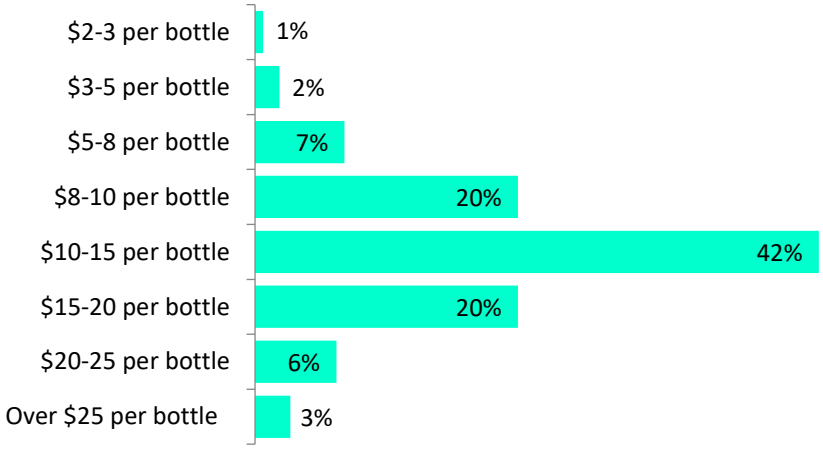


Figure 3.4 Usual price paid for personal consumption

- NZ has the second highest country-of-origin purchase frequency overall (Figure 3.5).

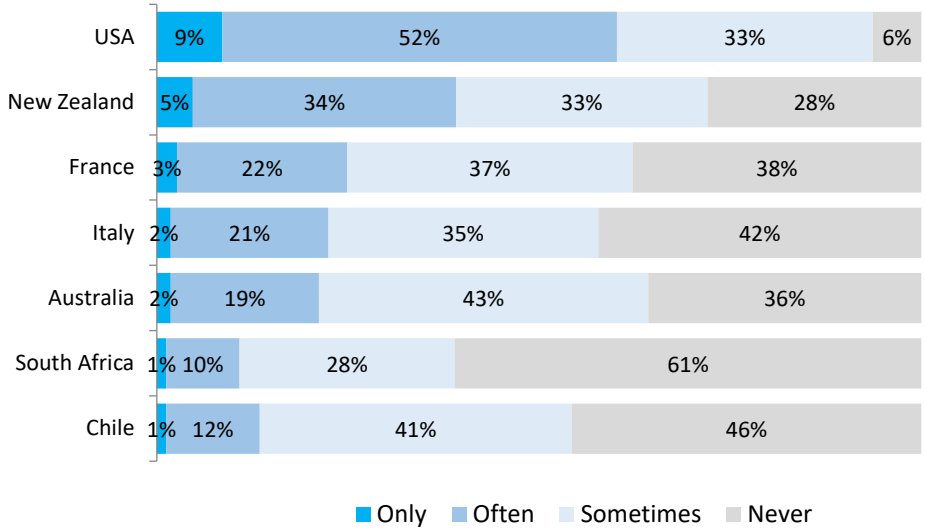


Figure 3.5 Country-of-origin purchase frequency

- There are about 15-20 per cent of respondents who have relatively high engagement in wine-related activities such as reading wine journals and attending tasting courses (Figure 3.6).

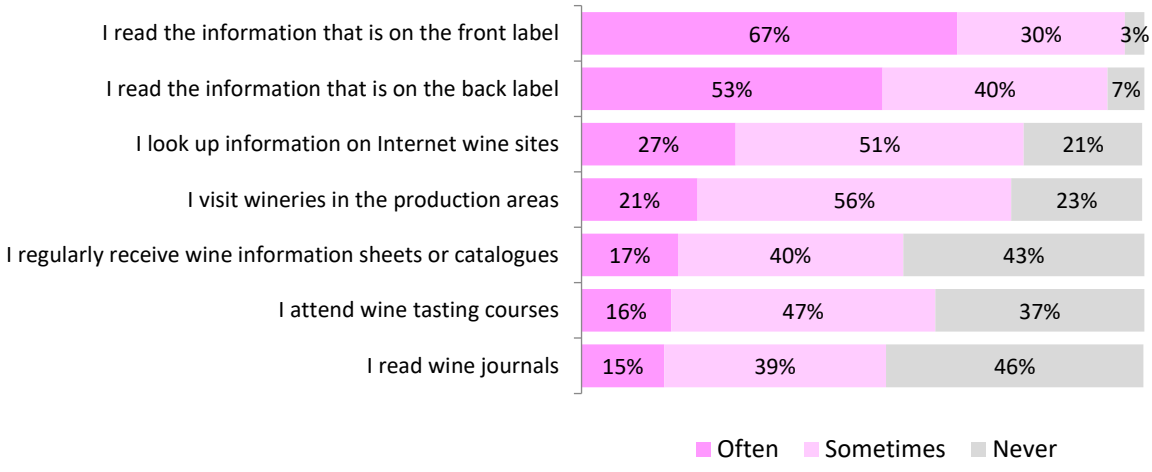


Figure 3.6 Wine experience and engagement

3.3 Perceptions, preferences and attitudes

- Considering how respondents rank the quality of Sauvignon blanc from each country, we see that NZ is ranked first most often, and in the top three by 53 per cent of respondents (Figure 3.7).

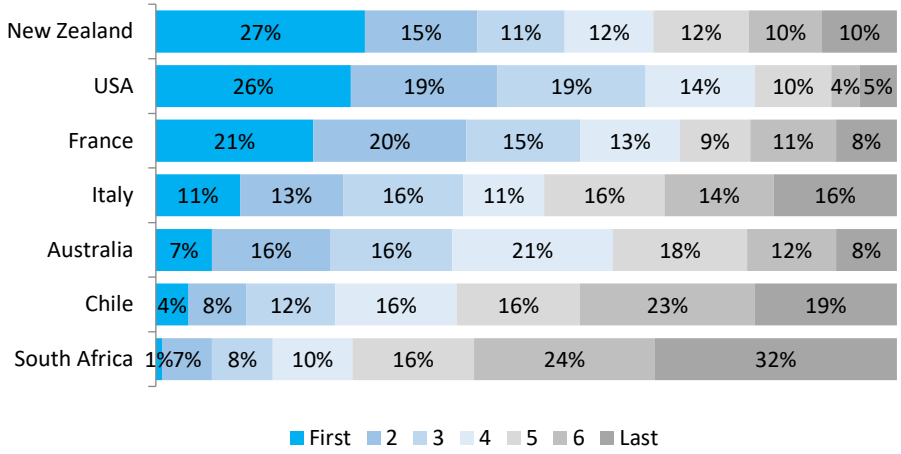


Figure 3.7 Country-of-origin quality ranking

- Most respondents are concerned about pesticides and additives, and are interested in improved sustainability reporting. However, a substantial number find that reporting is not easy to understand, and can't access the information that they want (Figure 3.8).

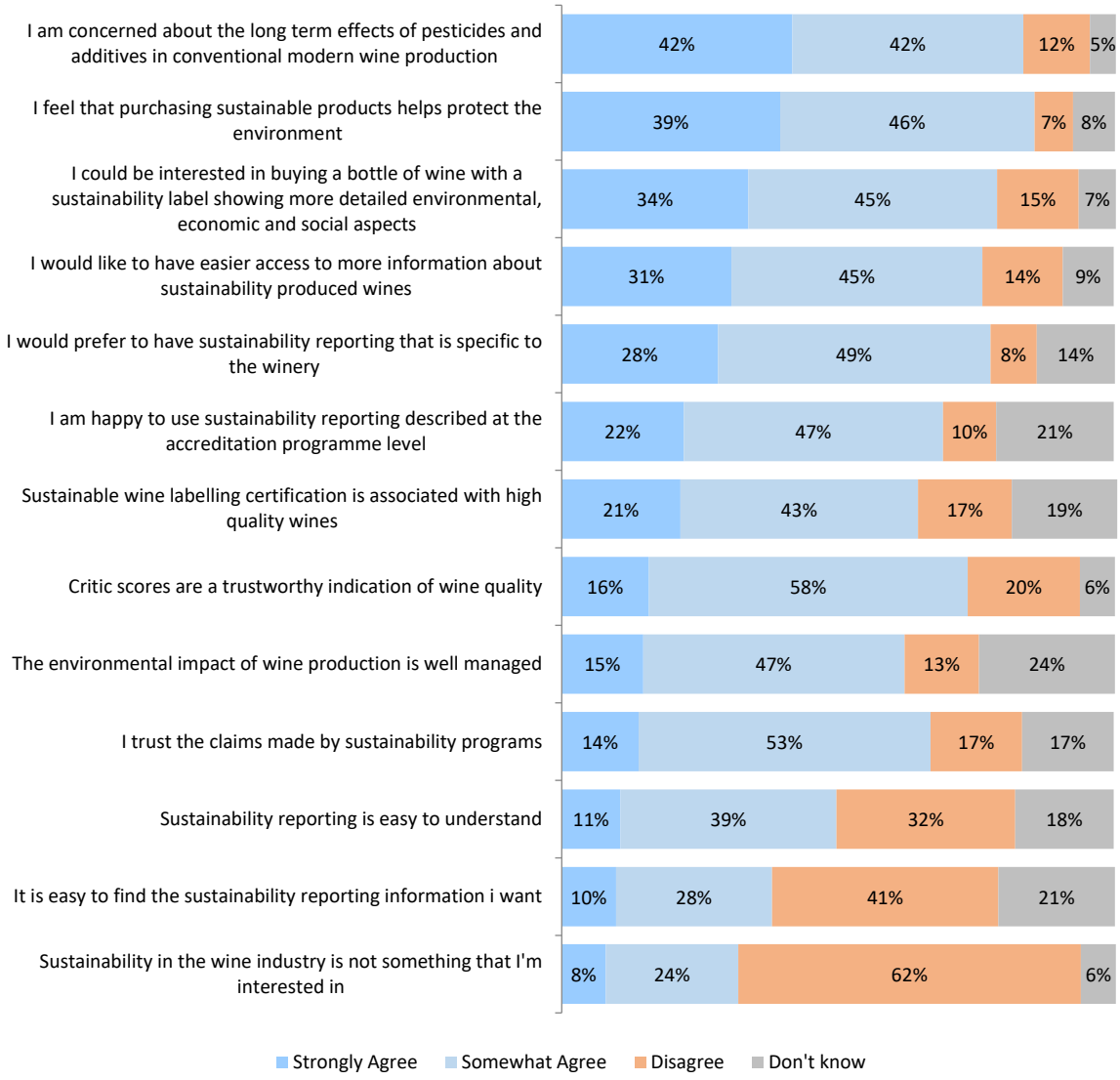


Figure 3.8 Sustainability reporting perceptions and preferences

- A third of respondents had purchased a USDA Organic labelled wine in the previous month (Figure 3.9).
- 17 per cent of respondents had purchased a SWNZ labelled wine in the previous month.

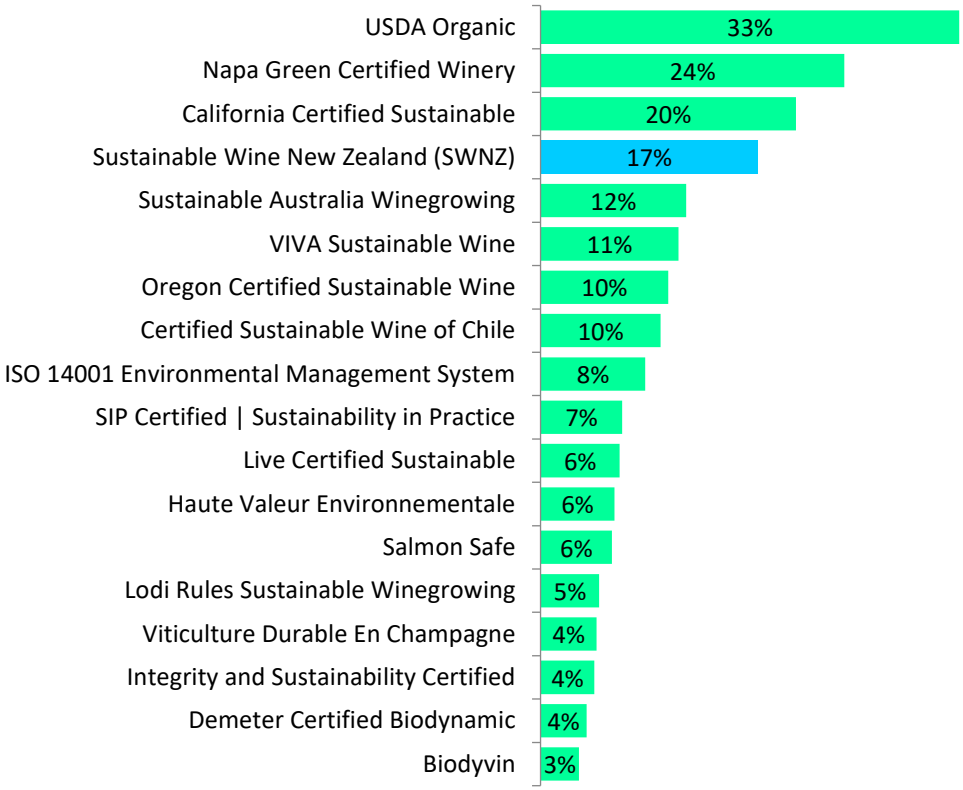


Figure 3.9 Sustainability labels purchased in previous month

- Just over a third of respondents have some level of knowledge about what SWNZ involves (Figure 3.10).

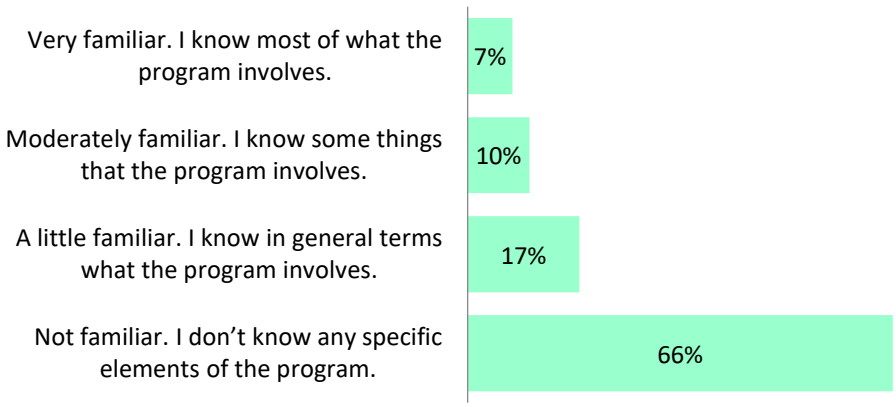


Figure 3.10 Familiarity with Sustainable Wine New Zealand

- Awareness of which attributes are associated with SWNZ is low for about half of respondents, while about 15 per cent have a more precise assessment (Figure 3.11).

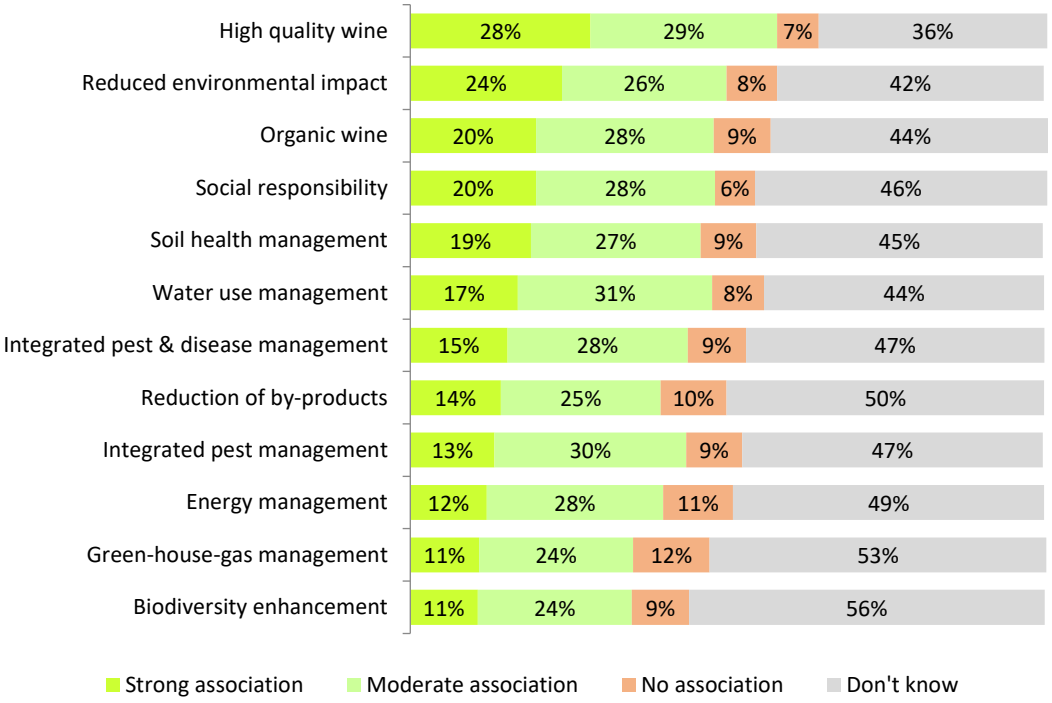


Figure 3.11 Attributes associated with SWNZ

- In an open-ended text response, all respondents were asked to describe what sustainability means to them - 914 individual descriptors were provided, summarized below (Figure 3.12, Figure 3.13).
- The majority of responses reflect specific environmental aspects - however economic sustainability is also a significant factor.
- For many respondents, descriptors reflecting higher quality including taste are significant sustainability factors.

Figure 3.12 What does sustainability mean to you: word cloud

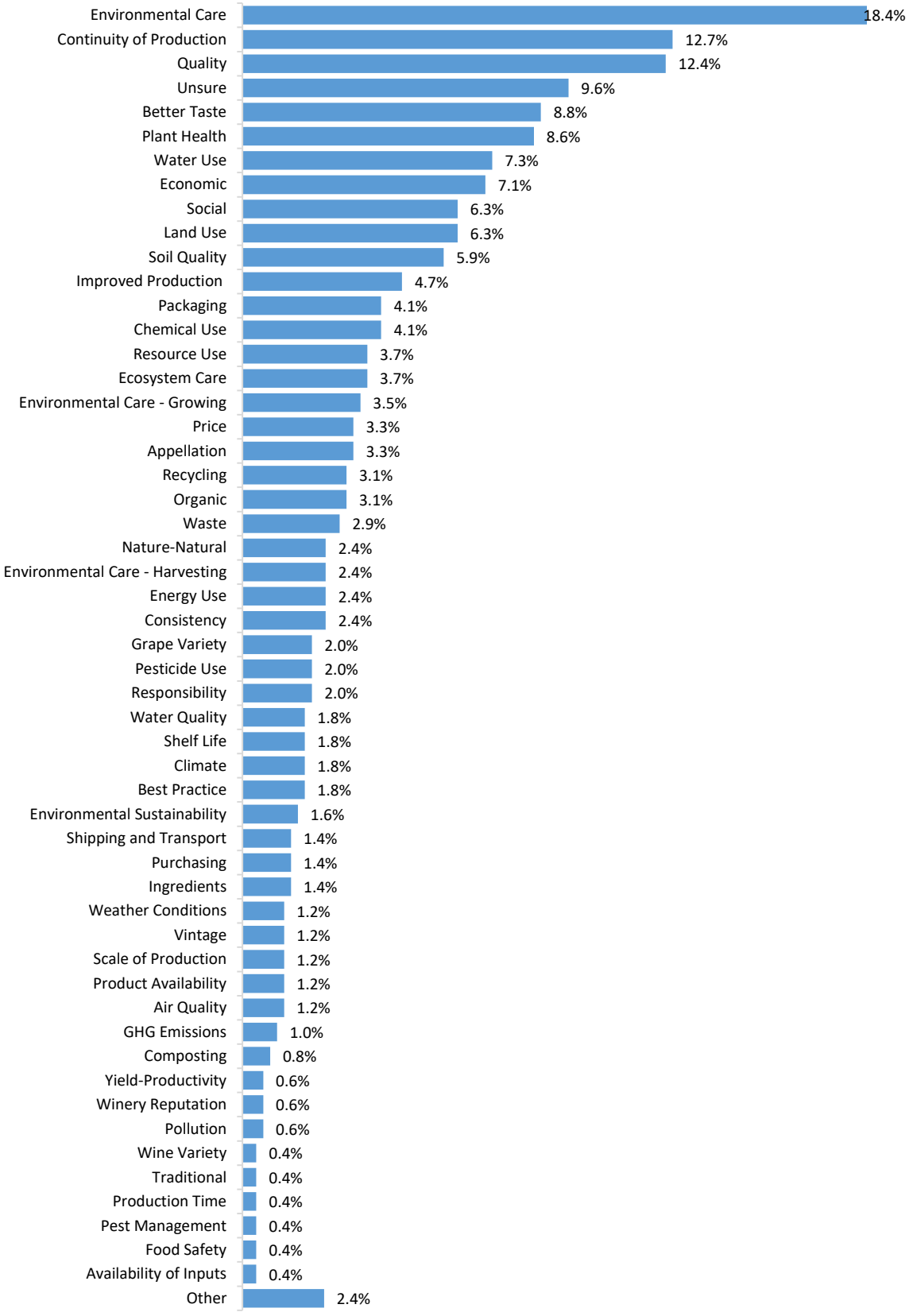


Figure 3.13 Descriptors of sustainability in the wine sector: open text responses

- For those respondents who had purchased a sustainability labelled wine (64 per cent) (Figure 3.9), they were asked to describe in an open-text response why they purchased these wines - 362 individual descriptors were provided by respondents, summarised below (Figure 3.14, Figure 3.15).
- Environmental concern was the main reason, with trust, taste and quality also being significant reasons. However, many indicated that they there was no particular reason.

Figure 3.14 Why do you buy sustainability labelled wine: word cloud

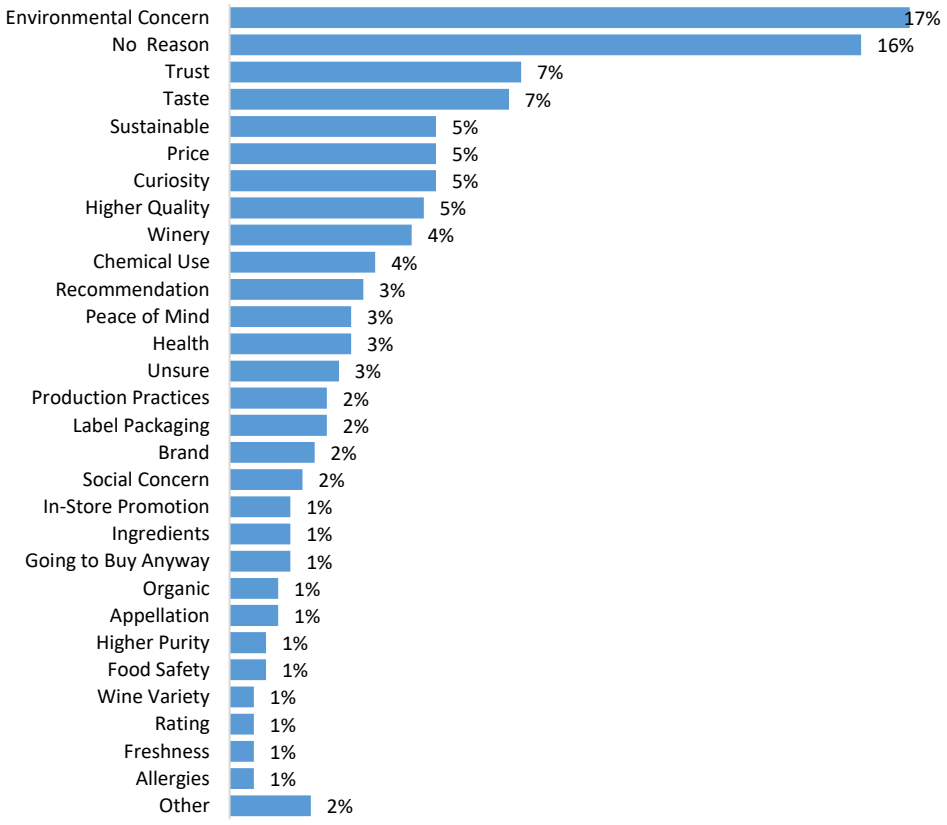


Figure 3.15 Reasons for purchasing sustainability labelled wine: open text responses

- Respondents who had not purchased a sustainability labelled wine in the previous month (36 per cent) were asked to describe in an open text response why they had not - 172 individual descriptors were provided, summarised below (Figure 3.16, Figure 3.17).
- While many were not interested in sustainability, most respondents indicated that they were simply not aware that such schemes existed.

Figure 3.16 Why don't you buy sustainability labelled wine: word cloud

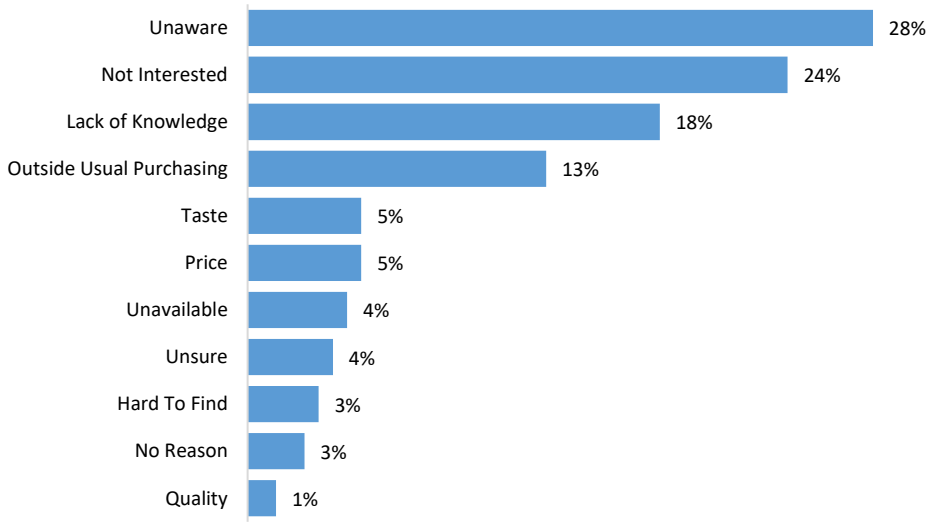


Figure 3.17 Reasons for not purchasing sustainability labelled wine: open text responses

3.4 Acceptance of new grape growing techniques

Grape growers can explore the potential for using new techniques to help in achieving some aspects of sustainability. Two non-GMO techniques that could potentially provide benefits are:

- Tissue-culture Based Techniques (techniques that involve growing plant cells in the lab, which can increase genetic diversity via the plant's own natural systems).
- New Breeding Techniques (lab-based techniques that artificially alter the plant's genetic information in a specific way, but do not introduce any foreign DNA).

Respondents were asked about their willingness to try wine made with grapes grown using these new techniques. Almost half of respondents unconditionally accepted tissue culture technique, while a further 17 per cent were accepting of this when purchasing from familiar brands (Figure 3.18).

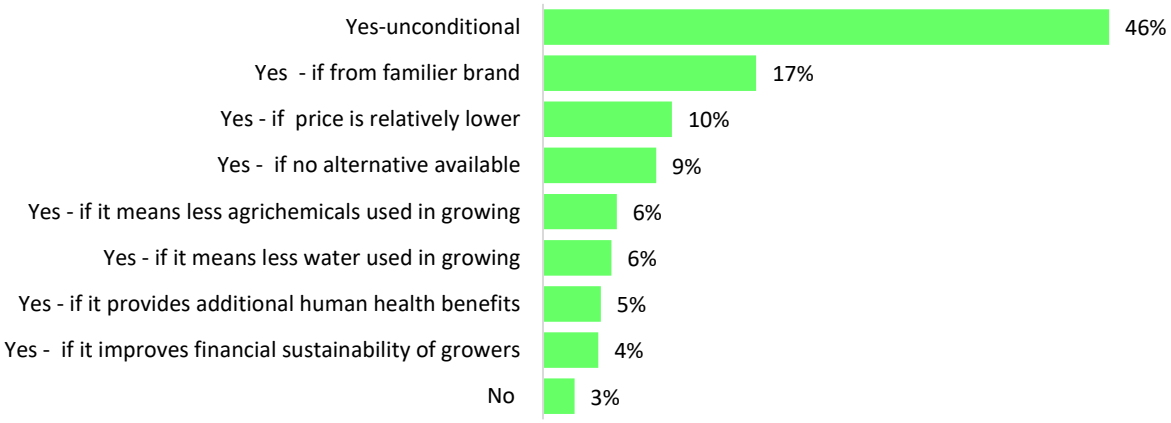


Figure 3.18 Willingness to try wine made using tissue-culture based techniques

- Of the 3 per cent that were not willing to try a wine using tissue-based techniques (n=15), most had no particular reason - however moral and ethical concerns were important (Figure 3.19).

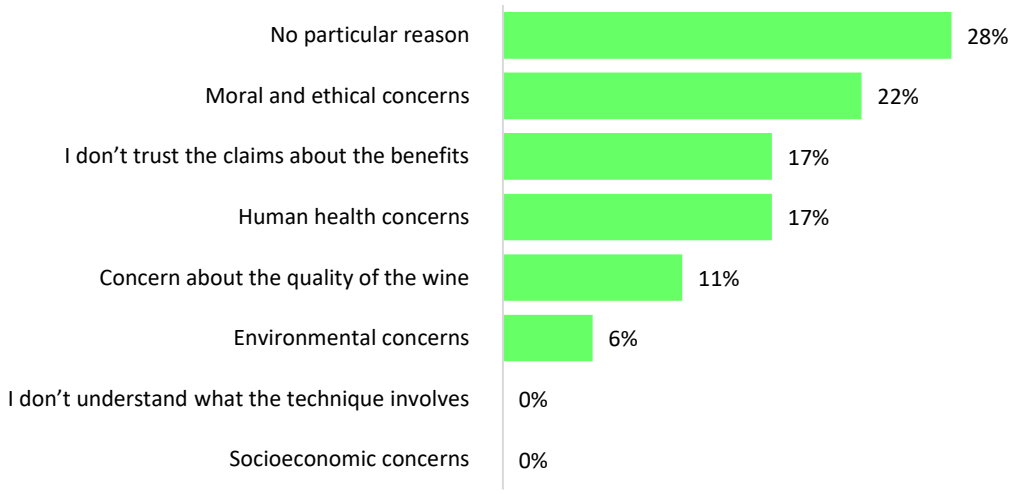


Figure 3.19 Reasons for non-acceptance of tissue-based techniques

- Respondents were slightly less likely to unconditionally accept new breeding techniques than they were for tissue culture ones, while brand-associated acceptance was similar (Figure 3.20).

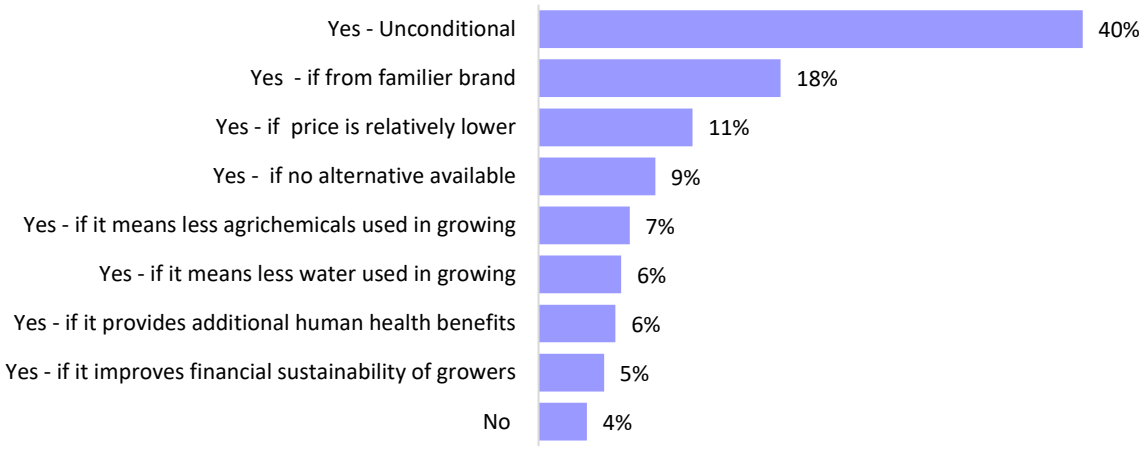


Figure 3.20 Willingness to try wine made using breeding techniques

- Of the 4 per cent that were not willing to try a wine using tissue-based techniques (n=20), human health concerns were important (Figure 3.21).

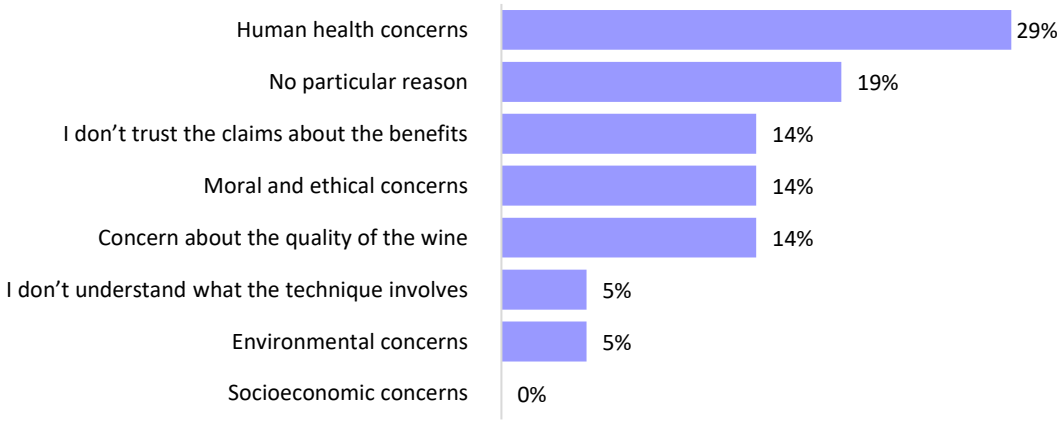


Figure 3.21 Reasons for non-acceptance of breeding techniques

3.5 Use of digital media and smart technology for wine shopping

- Over 80 per cent of respondents access the internet daily, with mobile device use slightly higher than home computer use (Figure 3.22).

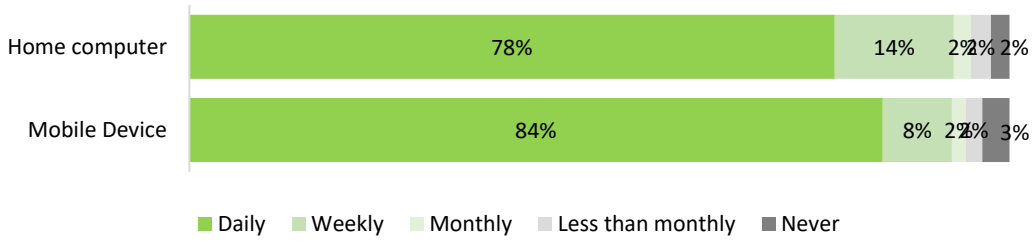


Figure 3.22 Frequency of internet access

- Use of the internet for *selecting* which wines to purchase is significant at around 70 per cent of respondents (Figure 3.23).

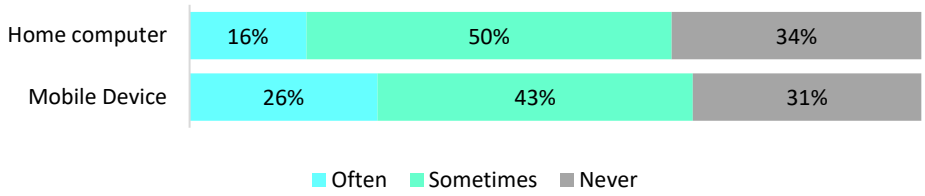


Figure 3.23 Use of internet for wine purchase selection

- Many consumers use their smartphones and associated technologies to search for wine information and to a lesser degree to make purchases (Figure 3.24).

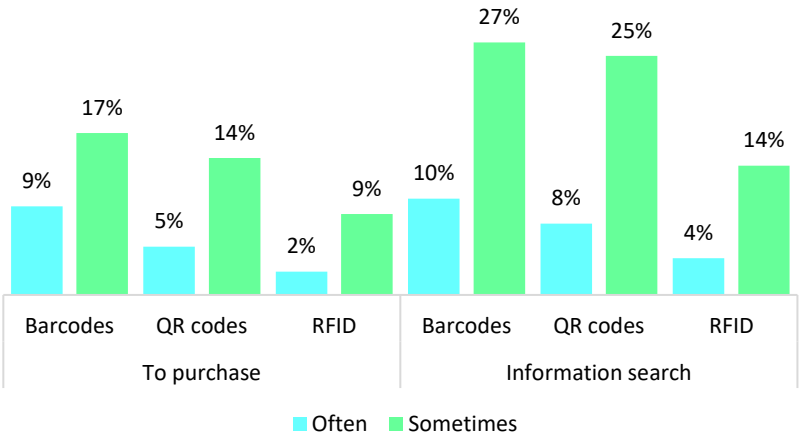


Figure 3.24 Use of smart technologies for information searching and purchase

- The most common use of a smartphone app is to access product reviews. While about one in five consumers use their smartphone to make wine purchases, and another 48 per cent are interested in this use (Figure 3.25).

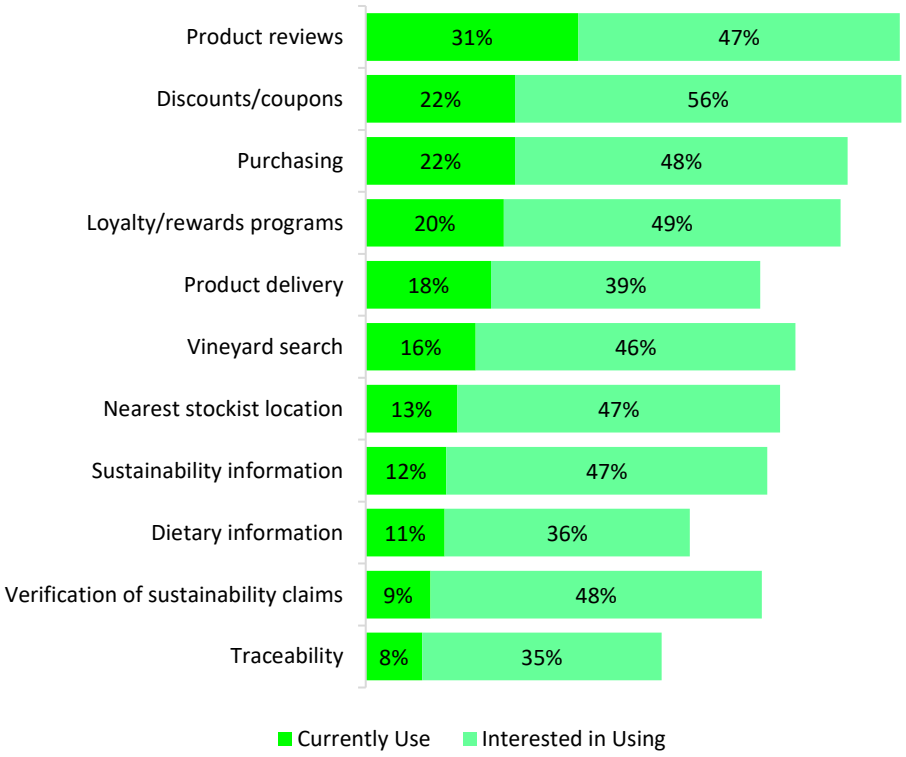


Figure 3.25 Current and potential uses of mobile applications

- Almost all respondents use grocery stores for wine purchasing (Figure 3.26). While about one in five respondents purchase wine online domestically.

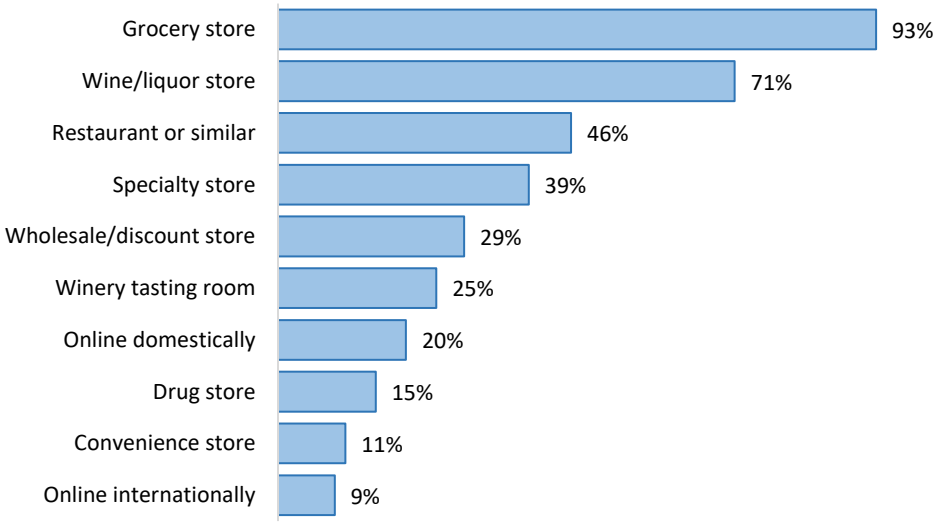


Figure 3.26 Retail channel use for wine purchasing

- Over the whole sample, an average of 41 per cent of wine expenditure occurs at supermarkets (Figure 3.27).

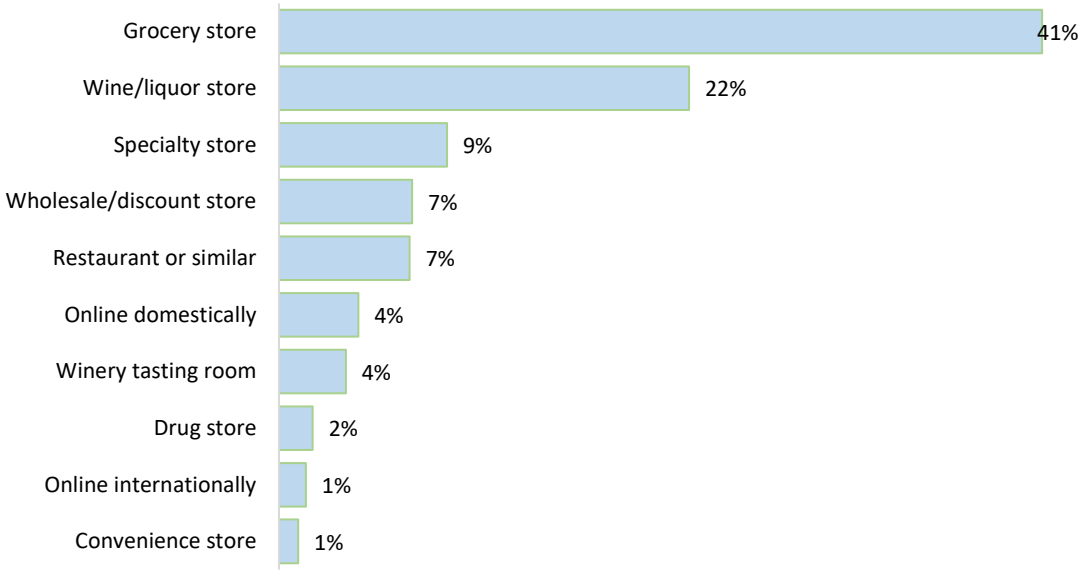


Figure 3.27 Percentage of wine expenditure by retail channel

- Focusing on those respondents who use particular channels, we see for example that respondents who use online domestic retailers, spend on average 22 per cent of their wine expenditure via this channel, while those that use convenience stores only spend 10 per cent of their wine expenditure in this way (Figure 3.28).

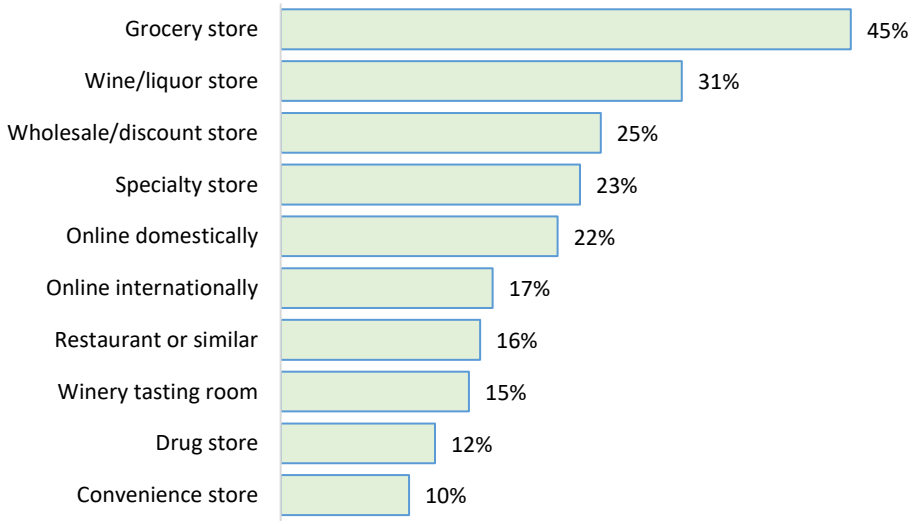


Figure 3.28 Expenditure for retail channel users

- For those consumers purchasing wine online, the convenience of home delivery is the main reason given for shopping online for wine (Figure 3.29).

Figure 3.29 Main reason for shopping online for wine

3.6 Choice Experiment analysis of Sauvignon blanc wine choices

In this section we present findings of the Choice Experiment. Our aim is to identify which Sauvignon blanc attributes drive product choices, by how much, and by who. We do this by segmenting the sample of consumers into groups based on which product offerings they preferred (Appendix B). Choice Experiments can be somewhat more difficult to answer compared with the usual question formats that people have typically seen before, so it is important to check whether respondents have been able to complete the exercise reliably. Overall, task and attribute understanding was high, and most respondents felt certain that their responses reflected real-world choices if these Sauvignon blanc wines were available (Figure 3.30).

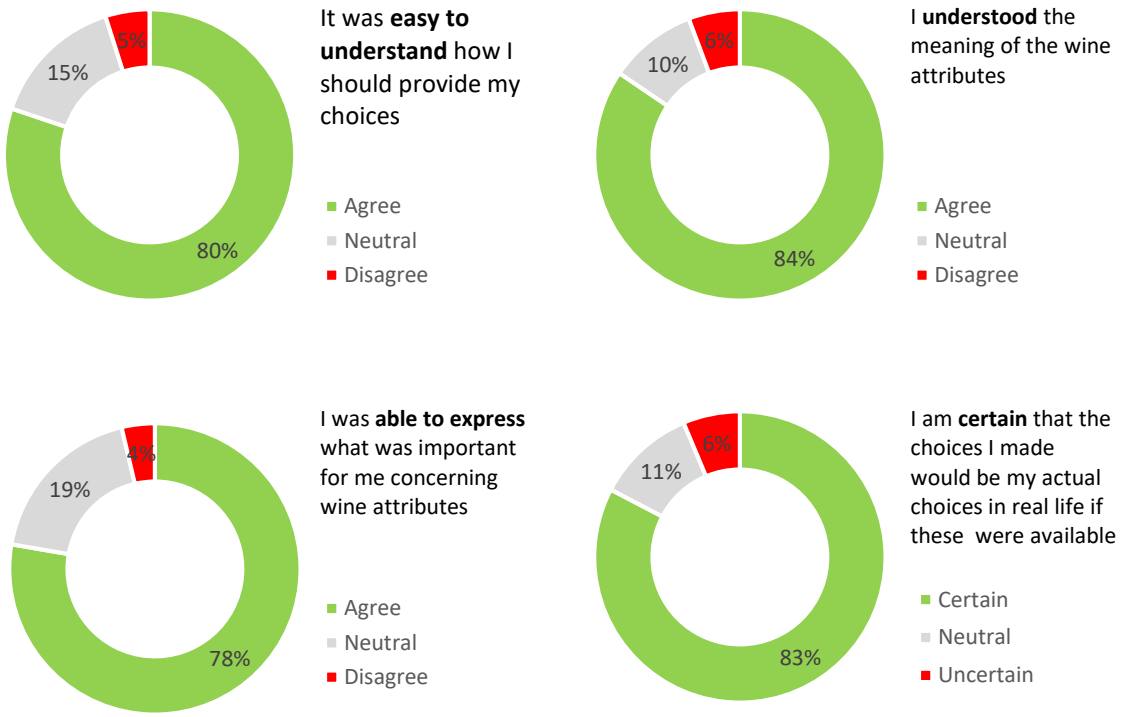


Figure 3.30 Choice experiment debriefing questions: task understanding, attribute understanding, ability to express preferences, certainty of choices made

Estimates of WTP tell us how much more the average consumer is willing to pay for a 750ml bottle of Sauvignon blanc with a particular attribute, over one that does not have this attribute (Table 3.1), (Figure 3.31). For example, members of Group One are willing to pay, on average, $0.93 more for wine that is produced with biodiversity management practices over one that is not. There is some uncertainty in WTP estimates, and the Confidence Intervals reported in Table 3.1 indicate that we can be 95 per cent sure that the true WTP falls within this interval.

As regards country of origin group three are willing to pay the most for New Zealand Sauvignon blanc wine at 133 percent and 166 per cent for a Sauvignon blanc wine from a Māori enterprise. This group also willing to pay premiums for Sauvignon blanc wines fromother countries including 134 per cent from

the US, 130 from Australia and from France 124 per cent. This group was also willing to pay highest premium at 21 per cent for greenhouse gas management and 16 per cent for enhanced biodiversity management.

Group one also preferred New Zealand Sauvignon blanc wines paying highest premium if 74 per cent followed closely by Australia at 72 per cent, wine produced on Māori enterprises at 71 per cent and 66 per cent for French Sauvignon blanc. The group were willing to pay for other attributes ranging from 13 per cent for social responsibility and organic, to 5 per cent for energy management.

Group two had the greatest range willingness to pay for country of origin Sauvignon blanc wines ranging from between 28 for French and Italian wines, to 60 per cent for New Zealand wines and 84 for Sauvignon blanc wine sourced from Māori enterprises. This group were willing to pay a 14 per cent premium for enhanced biodiversity management, social responsibility and organic Sauvignon blanc wines with a 17 per cent premium for greenhouse gas management.

Table 3.1 presents the results for the three distinct consumer groups - the first group has an estimated size of 40 per cent, the second group's size is 25 per cent and the third is 35 per cent. These group sizes tell us the probability that a randomly selected Texas Sauvignon blanc purchaser belongs to that consumer group.

Table 3.1 Sauvignon blanc wine attribute willingness-to-pay (WTP) by consumer group

Wine attributes	Group One (40%)	Group Two (25%)	Group Three (35%)
Biodiversity Management	$0.93 (0.11, 1.74)	$1.78 (0.16, 3.39)	$2.05 (0.89, 3.21)
Water Management			$1.47 (0.32, 2.62)
By-product Management	$1.32 (-0.18, 1.37)		
Energy Management	$0.60 (-0.11, 1.31)		
Pest & Disease Management	$1.45 (0.72, 2.19)		$1.81 (0.92, 2.97)
Social Responsibility	$1.57 (0.72, 2.41)	$1.75 (0.27, 3.22)	$0.92 (-0.11, 1.95)
GHG Management	$1.41 (0.71, 2.12)	$2.10 (1.03, 3.16)	$2.57 (1.82, 3.33)
Made with Organic grapes			
100% Organic	$1.62 (0.70, 2.54)	$1.81 (0.15, 3.47)	
Critic rating (per point above 80)		$0.41 (0.02, 0.06)	$0.52 (0.03, 0.08)
Made in New Zealand	$9.21 (5.10, 13.31)	$7.49 (3.59, 11.38)	$16.59 (11.57, 21.60)
Made in NZ by Māori enterprise	$8.88 (5.66, 12.11)	$10.44 (7.57, 13.32)	$20.75 (16.96, 24.53)
Made in USA	$6.80 (3.73, 9.86)	$6.14 (2.98, 9.30)	$16.71 (12.59, 20.83)
Made in France	$8.19 (3.74, 12.64)	$3.55 (-0.81, 7.91)	$15.50 (9.54, 21.46)
Made in Australia	$8.99 (5.33, 12.65)	$5.69 (2.01, 9.29)	$16.57 (12.26, 20.88)
Made in Italy	$4.99 (1.91, 8.06)	$3.46 (0.76, 6.17)	$14.04 (10.31, 17.75)

Mean WTP per 750ml bottle (95 % Confidence Interval). $US 2019.

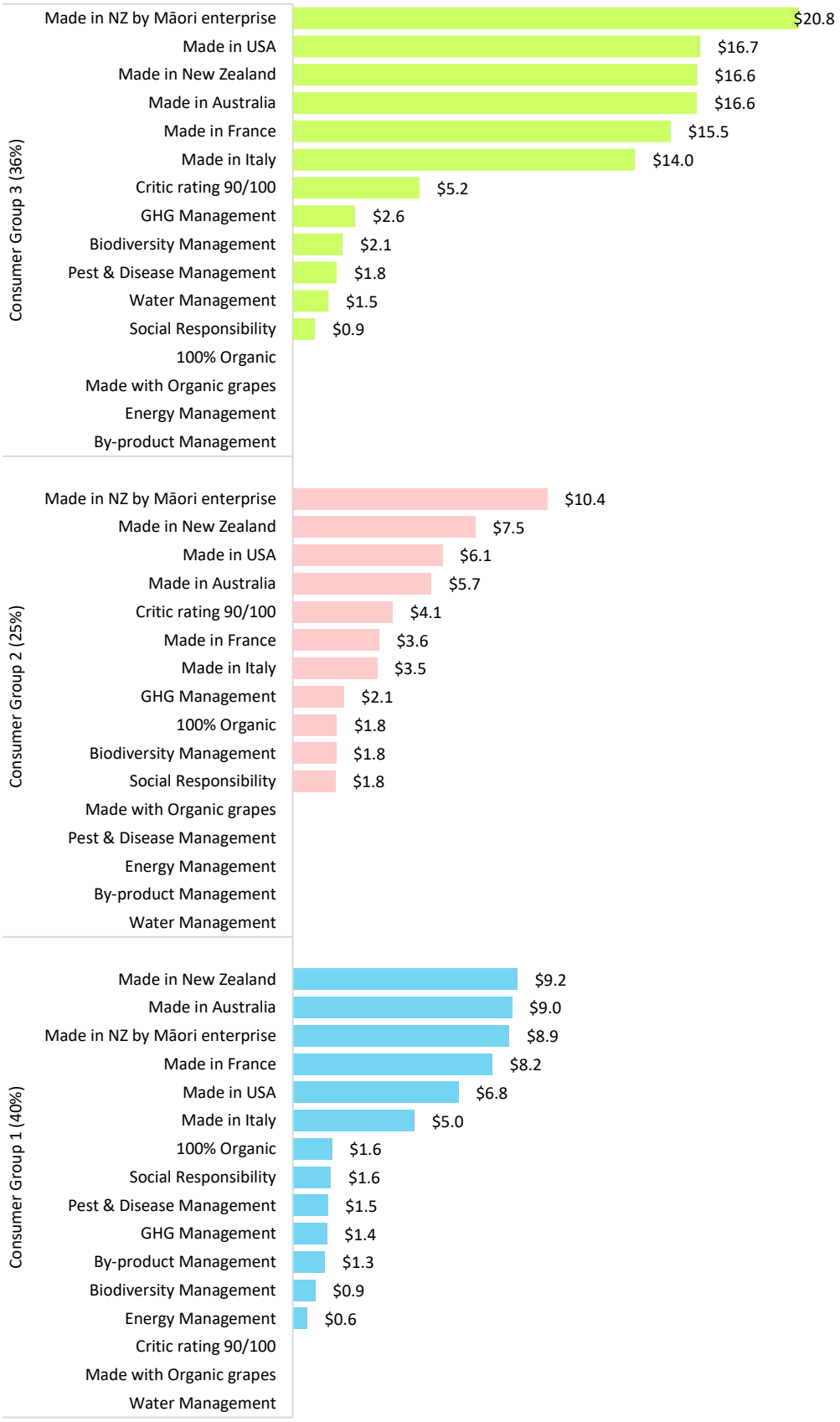


Figure 3.31 Sauvignon blanc attribute willingness-to-pay by consumer group

Consumer groups value county-of-origin the highest of the attributes considered overall. Preferences for NZ wine are generally strong in Groups One and Two.

- Consumers in Group One are the only ones willing to pay for by-product and energy management.
- They value NZ and Australian origin similarly and rank them highest.
- They are the only group to not value critic scores.

- Consumer Group Two have the strongest preferences for wine made from a Māori enterprise of the three groups.
- These consumers also value Organic highest of the groups.

- Consumers in Group Three generally have stronger preferences and WTP overall of the three groups.
- They value critic scores and USA origin the most of the three groups.
- They have the highest value for wine made from a Māori enterprise of the three groups.

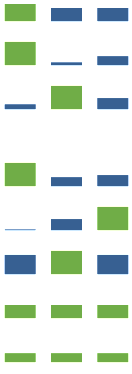
3.7 Consumer group descriptions

This section describes each of the three consumer groups identified in the statistical analysis, using the same questions we presented above. The objective is to highlight the differences and similarities between groups that can be useful in identifying the types of consumers who are willing-to-pay for attributes relevant to an organisation's objectives. As we go through the comparisons, the small bar charts on the right hand side will highlight the group with the largest values with a green bar.

- Group One consumers are more likely to be female, younger, live with children and from an urban location, while Group Two consumers have higher income (Table 3.2).

Table 3.2 Describing consumer groups: Demographics

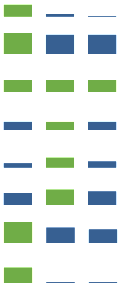
Demographics	Group One	Group Two	Group Three
Female	64%	53%	55%
< 44 years old	50%	15%	27%
> 65 years old	19%	51%	30%
Rural	9%	10%	11%
Have children	46%	23%	26%
University degree	75%	77%	78%
Income of Upper quartile	$140,000	$160,000	$140,000
Median income	$100,000	$100,000	$100,000
Income of lower quartile	$60,000	$60,000	$60,000



- Group One consumers have significantly higher weekly purchase frequency and higher familiarity with SWNZ, while Group Two are more likely to rank NZ wine higher than members of other groups (Table 3.3).

Table 3.3 Describing consumer groups: Purchase behaviour

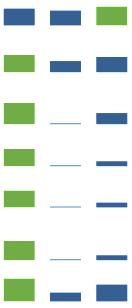
:	Group One	Group Two	Group Three
Purchase weekly or more	36%	23%	19%
Consume weekly or more	47%	44%	46%
Most frequent spend/750ml bottle	$10-15	$10-15	$10-15
Purchase NZ SB wine often	34%	36%	34%
Rank NZ SB wine first	19%	39%	29%
Rank NZ SB wine in top three	47%	65%	53%
Purchase SWNZ in previous month	22%	16%	15%
Very familiar with SWNZ	17%	1%	1%



- Group One consumers are more experienced and engaged with wine overall, while Group Two has the lowest level of experience and engagement (Table 3.4).

Table 3.4 Describing consumer groups: Wine experience and engagement

I often:	Group One	Group Two	Group Three
read the information that is on the front label	66%	58%	73%
read the information that is on the back label	63%	40%	52%
visit wineries in the production areas	33%	7%	18%
attend wine tasting courses	27%	6%	11%
read wine journals	26%	4%	10%
receive wine information sheets or catalogues	29%	7%	12%
look up information on Internet wine sites	34%	17%	26%



- Group One consumers are more likely to want access to greater sustainability reporting, while Group Two consumers have very low levels of trust in sustainability claims (Table 3.5).

Table 3.5 Describing consumer groups: Sustainability reporting perceptions and preferences

Strongly agree	Group One	Group Two	Group Three
I would like to have easier access to more information about sustainability produced wines	44%	14%	27%
The environmental impact of wine production is well managed	24%	10%	9%
I trust the claims made by sustainability programs	25%	3%	10%
Sustainable wine labelling certification is associated with high quality wines	37%	10%	13%
I am concerned about the long term effects of pesticides and additives in conventional modern wine production	47%	29%	43%
I feel that purchasing sustainable products helps protect the environment	48%	27%	38%
I could be interested in buying a bottle of wine with a sustainability label showing more detailed environmental, economic and social aspects	46%	19%	30%
Critic scores are a trustworthy indication of wine quality	23%	8%	13%
I would prefer to have sustainability reporting that is specific to the winery	37%	16%	26%
I am happy to use sustainability reporting described at the accreditation programme level	33%	11%	18%
It is easy to find the sustainability reporting information i want	20%	2%	4%
Sustainability reporting is easy to understand	19%	3%	6%

- Group Three has moderately higher daily internet access compared to the other groups (Table 3.6).

Table 3.6 Describing consumer groups: frequency of internet access

Daily Access	Group One	Group Two	Group Three
Mobile device e.g. smartphone	83%	80%	87%
Home computer e.g. desktop	74%	81%	81%

- Group One consumers are significantly more likely to use the internet when selecting wines to purchase (Table 3.7).

Table 3.7 Describing consumer groups: Use of internet for deciding wine purchase

Often use	Group One	Group Two	Group Three
Mobile device e.g. smartphone	43%	10%	18%
Home computer e.g. desktop	26%	3%	15%

- Group One consumers are also significantly more likely to use smartphone technologies for either information searching or product purchasing (Table 3.8).

Table 3.8 Describing consumer groups: Use of smart technologies for information searching and purchase

Use Often	Group One	Group Two	Group Three
Information Searching			
Barcodes	20%	2%	6%
QR Codes	13%	2%	6%
RFID/NFC	9%	1%	1%
Product Purchasing			
Barcodes	13%	3%	10%
QR Codes	9%	2%	4%
RFID/NFC	5%	1%	2%

- While accessing product reviews is the highest use of apps on smartphones across all groups, Group One consumers are also significantly more likely to use their smartphone to use apps in relation to wine Table 3.9).

Table 3.9 Describing consumer groups: Use of phone applications

Currently use	Group One	Group Two	Group Three
Dietary information	22%	2%	7%
Sustainability information	24%	2%	5%
Environmental information	19%	2%	6%
Purchasing	29%	14%	18%
Nearest stockist location	19%	10%	10%
Product reviews	40%	21%	28%
Verification of sustainability claims	19%	3%	4%
Traceability	19%	0%	3%
Loyalty/rewards programs	29%	15%	14%
Discounts/coupons	29%	15%	18%
Product delivery	30%	8%	12%
Vineyard search	30%	7%	8%

- Group One consumers are more likely to spend more of their wine expenditure at specialty stores or online, while Group Two spend more at discount stores compared to the other groups, and Group Three spend the most at grocery stores (Table 3.10).

Table 3.10 Describing consumer groups: Percentage of wine expenditure by retail channel

Average percent	Group One	Group Two	Group Three
Grocery store	37%	42%	45%
Specialty store	13%	7%	6%
Drug store	3%	1%	2%
Online domestically	5%	4%	4%
Online internationally	3%	0%	1%
Restaurant or similar	9%	6%	6%
Wholesale/discount store	5%	10%	8%
Winery tasting room	5%	3%	3%
Convenience store	2%	0%	1%
Wine/liquor store	17%	26%	24%

Chapter 4
Conclusions

This report presents the results of a survey of Sauvignon blanc consumption in Texas. The survey was of just under 500 respondents who were selected as purchasing Sauvignon blanc at least once a month.

The survey assessed purchase behaviour and the reasons for purchasing Sauvignon blanc by country of Origin. New Zealand Sauvignon blanc was the most purchased by country of origin followed by the US. New Zealand first for quality followed by the US then France, with 27 per cent of respondents ranking New Zealand Sauvignon blanc first followed by 26 per cent the US and 21 per cent for French.

The survey also elicited responses to knowledge and purchase of wines with sustainability labels. A third of the sample had recently purchased USDA certified Organic wine. SWNZ was the fourth on the list of those purchasing wine with sustainability labels at 17 per cent. Around 17 per cent of Sauvignon blanc wine drinkers were familiar or moderately familiar with SWNZ.

A high proportion of Sauvignon blanc wine drinkers used the internet to select wines at 70 per cent. Most respondents purchase wine from a grocery store, at 93 percent, with 9 per cent purchased on line from overseas. Overall 41 per cent of expenditure was at grocery stores. Group one has the highest use of the internet and smartphones for finding information about wine and wine purchases.

The survey included a choice experiment to assess the Willingness to Pay by consumers for different attributes associated with Sauvignon blanc. The consumers were then segmented, using a latent class model, into 3 classes each with different characteristics and preferences.

The results showed that consumer group three (35 per cent of the sample) were willing to pay the most for Sauvignon blanc from New Zealand, with a premium of 133 per cent and 166 per cent for Sauvignon blanc sourced from Māori enterprises. This group was also willing to pay 134 per cent for US sourced Sauvignon blanc, and a premium of 133 per cent for Australian and 124 per cent for French Sauvignon blancs. This group was also willing to pay highest premium at 21 per cent for greenhouse gas management and 16 per cent for enhanced biodiversity management.

Group one (40 percent of the sample) had the lowest willingness to pay for country of origin Sauvignon blanc wine but still were prepared to pay the highest for New Zealand Sauvignon blanc wine at 74 per cent. This group tended to be female, younger than the other groups, more likely to have children, and were more familiar with SWNZ. The group were also willing to pay for other attributes ranging from 13 per cent for social responsibility and organic, to 5 per cent for energy management.

Group two (25 per cent of the sample) were older and are also willing to pay the higher premium for New Zealand Sauvignon blanc wine at 60 per cent and 84 per cent for that sourced from Māori enterprises. They were also willing to pay a premium of 14 per cent for enhanced biodiversity management, social responsibility and organic Sauvignon blanc wines with a 17 per cent premium for greenhouse gas management.

Appendix A
Statistical Method

This appendix provides technical details of statistical analysis of choice data. The appendix includes a brief description of the theoretical foundations of choice analysis followed by statistical probability estimation approaches, focusing on contemporary models applied in this report. Lastly, the method used in generating monetary estimates is described.

A.1 Conceptual Framework

In Choice Experiments (CEs), researchers are interested of what influences, on average, the survey respondents' decisions to choose one alternative over others. These influences are driven by people's preferences towards the attributes but also the individual circumstances such as their demographics or perceptions of the choice task (e.g., the level of difficulty or understanding) (Hensher et al. 2015).

Each alternative in a choice set is described by attributes that differ in their levels, both across the alternatives and across the choice sets. The levels can be measured either qualitatively (e.g., poor and good) or quantitatively (e.g., kilometres). This concept is based on the characteristics theory of value (Lancaster 1966) stating that these attributes, when combined, provide people a level of utility[1] *U* hence providing a starting point for measuring preferences in CE (Hanley et al. 2013; Hensher et al. 2015). The alternative chosen, by assumption, is the one that maximises people's utility[2] providing the behavioural rule underlying choice analysis:

$$U_j > U_i \tag{0.1}$$

where the individual *n* chooses the alternative *j* if this provides higher utility than alternative *i*. A cornerstone of this framework is Random Utility Theory, dated back to early research on choice making (e.g., Thurstone 1927) and related probability estimation. This theory postulates that utility can be decomposed into systematic (explainable or observed) utility *V* and a stochastic (unobserved) utility ε (Hensher et al. 2015; Lancsar and Savage 2004).

$$U_{nj} = V_{nj} + \varepsilon_{nj} \tag{0.2}$$

where *j* belongs to a set of J alternatives. The importance of this decomposition is the concept of utility only partly being observable to the researcher, and remaining unobserved sources of utility can be treated as random (Hensher et al. 2015). The observed component includes information of the attributes as a linear function of them and their preference weights (coefficient estimates).

$$V_{nsj} = \sum_{k=1}^{K} \beta_k x_{nsjk} \tag{0.3}$$

with *k* attributes in vector x for a choice set s. Essentially, the estimated parameter β shows "the effect on utility of a change in the level of each attribute" (Hanley et al. 2013, p. 65). This change can be specified as linear across the attribute levels, or as non-linear using either dummy coding or effect coding

[1]Related terminology used in psychology discipline is *the level of satisfaction* (Hensher et al. 2015).
[2]In choice analysis, utility is considered as *ordinal utility* where the relative values of utility are measured (Hensher et al. 2015).

approaches. The latter coding approach has a benefit of not confounding with an alternative specific constant (ASC) when included in the model (Hensher et al. 2015).

A.2 Statistical Modelling of Choice Probabilities

The statistical analysis aims to explain as much as possible of the observed utility using the data obtained from the CE and other relevant survey data. In order to do so, the behavioural rule (eq. 1.1) and the utility function (eq. 1.2) are combined (Hensher et al. 2015; Lancsar and Savage 2004) to estimate the probability of selecting an alternative *j*:

$$\Pr_{nsj} = \Pr\left(U_{nsj} > U_{nsi}\right) = \Pr\left(V_{nsj} + \varepsilon_{nsj} > V_{nsi} + \varepsilon_{nsi}\right) = \Pr\left(\varepsilon_{nsi} - \varepsilon_{nsj} < V_{nsj} - V_{nsi}\right) \forall j \neq i \quad (0.4)$$

where the probability of selecting alternative *j* states that differences in the random part of utility are smaller than differences in the observed part. A standard approach to estimate this probability is a conditional logit, or multinomial logit (MNL) model (McFadden 1974). This model can be derived from the above equations (1.2 and 1.3) by assuming that the unobserved component is independently and identically distributed (IID) following the Extreme Value type 1 distribution (see e.g. Hensher et al. 2015; Train, 2003). Although the MNL model provides a "workhorse" approach in CE, it includes a range of major limitations (see e.g. Fiebig et al. 2010; Greene and Hensher 2007; Hensher et al. 2015):

- Restrictive assumption of the IID error components
- Systematic, or homogenous, preferences allowing no heterogeneity across the sample
- Restrictive substitution patterns, namely the existence of independence of irrelevant alternatives property where introduction (or reduction) of a new alternative would not impact on the relativity of the other alternatives
- The fixed scale parameter obscures potential source of variation

Some or all of these assumptions are often not realised in collected data. These restrictive limitations can be relaxed in contemporary choice models. In particular, the random parameter logit (RPL) model (aka, the mixed logit model) has emerged in empirical application allowing preference estimates to vary across respondents (Fiebig, et al. 2010; Hensher et al. 2015; Revelt and Train, 1998). This is done by specifying a known distribution of variation to be parameter means. The RPL model probability of choosing alternative *j* can be written as:

$$\Pr_{nsj} = \frac{\exp(\beta_n' x_{nsj})}{\sum_J \exp(\beta_n' x_{nsj})} \quad (0.5)$$

where, in the basic specification, $\beta_n = \beta + \eta_n$ with η being a specific variation around the mean for *k* attributes in vector *x* (Fiebig, et al. 2010; Hensher et al. 2015). Typical distributional assumptions for the random parameters include normal, triangular and lognormal distributions, amongst others. The normal distribution captures both positive and negative preferences (i.e., *utility* and *disutility*) (Revelt and Train, 1998). The lognormal function can be used in cases where the researcher wants to ensure the parameter has a certain sign (positive or negative), a disadvantage is the resultant long tail of estimate distributions (Hensher et al. 2015). The triangular distribution provides an alternative functional form, where the spread can be constrained (i.e., the mean parameter is free whereas spread is fixed equal to mean) to ensure behaviourally plausible signs in estimation (Hensher et al. 2015). Further specifications used in modelling include parameters associated with individual specific characteristics (e.g, income) that can

influence the heterogeneity around the mean, or allowing correlation across the random parameters. The heterogeneity in mean, for example, captures whether individual specific characteristics influence the location of an observation on the random distribution (Hensher et al. 2015). In this study, the frequency of visits to rivers, streams and lakes was used to explain such variance.

Another way to write this probability function (in eq. 1.4) (Hensher et al. 2015) involves an integral of the estimated likelihood over the population:

$$L_{njs} = \int_{\beta} \Pr_{nsj}(\beta) f(\beta|\theta) d\beta \tag{0.6}$$

In this specification, the parameter θ is now the probability density function conditional to the distributional assumption of β. As this integral has no closed form solution, the approximation of the probabilities requires a simulation process (Hensher et al. 2015; Train, 2003). In this process for data *X*, *R* number of draws are taken from the random distributions (i.e. the assumption made by the researcher) followed by averaging probabilities from these draws; furthermore these simulated draws are used to compute the expected likelihood functions:

$$L_{nsj} = E(\Pr_{nsj}) \approx \frac{1}{R} \sum_{R} f(\beta^{(r)}|X) \tag{0.7}$$

where the $E(\Pr_{nsj})$ is maximised through Maximum Likelihood Estimation. This specification (in eq. 1.6) can be found in Hensher et al. (2015). In practice, a popular simulation method is the Halton sequence which is considered a systematic method to draw parameters from distributions compared to for example, pseudo-random type approaches (Hensher et al. 2015).

A.3 Econometric Extensions

Common variations of the RPL model include specification of an additional error component (EC) in the unobserved part of the model. This EC extension captures the unobserved variance that is alternative-specific (Greene and Hensher 2007) hence relating to substitution patterns between the alternatives (Hensher et al. 2015). Empirically, one way to explain significant EC in a model is SQ-bias depicted in the stochastic part of utility if the EC is defined to capture correlation between the non-SQ alternatives (Scarpa et al., 2005).

Another extension which has gained increasing attention in recent CE literature, is the Generalized Mixed Logit (GMXL) model (Czajkowski et al. 2014; Hensher et al. 2015; Juutinen et al. 2012; Kragt 2013; Phillips 2014). This model aims to capture remaining unobserved components in utility as a source of choice variability by allowing estimation of the scale heterogeneity alongside the preference heterogeneity (Fiebig et al. 2010; Hensher et al. 2015). This scale parameter is (inversely) related to the error variance, and in convenient applications such as MNL or RPL, this is normalised to one to allow identification (Fiebig et al. 2010; Louviere and Eagle 2006). However, it is possible that the level of error variance differs between or within individuals, due to reasons such as behavioural outcomes, individual characteristics or contextual factors (Louviere and Eagle 2006).

Recent GMXL application builds on model specifications presented in Fiebig et al. (2010), stating that β_n (in eq. 1.4) becomes:

$$\beta_n = \sigma_n \beta + \gamma \eta_n + (1-\gamma)\sigma_n \eta_n \tag{0.8}$$

where σ is the scale factor (typically = 1) and $\gamma \in \{0,1\}$ is a weighting parameter indicating variance in the residual component. In the case the scale factor equals 1, this reduces to the RPL model. The importance of the weighting parameter is the impact on the scaling effect on the overall utility function (population means) versus the individual preference weights (individual means): when *γ* parameter approaches zero the scale heterogeneity affects both means, whereas when this approaches one the scale heterogeneity affects only the population means (Hensher et al. 2015; Juutinen et al. 2015). Interpretation of these parameters includes

- If *γ* is close to zero, and statistically significant, this supports the model specification with the variance of residual taste heterogeneity increases with scale (Juutinen et al. 2012); and
- If *γ* is not statistically significant from one, this suggests that the unobserved residual taste heterogeneity is independent of the scale effect, that is the individual-level parameter estimates differ in means but not variances around the mean (Kragt, 2013)

The scale factor specification (eq. 1.7) can also be extended to respondent specific characteristics associated with the unobserved scale heterogeneity (Hensher et al. 2015; Juutinen et al. 2015):

$$\sigma_n = \exp\{\bar{\sigma} + \tau\omega_n\} \tag{0.9}$$

where $\bar{\sigma}$ *is* the mean parameter in the error variance; and ω is unobserved scale heterogeneity (normally distributed) captured with coefficient *τ* (Hensher et al. 2015; Juutinen et al. 2015; Kragt, 2013). Juutinen et al. (2012), for example, in context of natural park management found that respondents' education level and the time spent in the park explained the scale heterogeneity ($\tau > 0$, p-value < 0.01). In this study, the respondents indicated levels of choice task understanding and difficulty were used to explain scale heterogeneity.

A.4 Estimation of Monetary Values

Typically the final step of interest in the CE application is the estimation of monetary values of respondent preferences for the attributes considered in utility functions. These are commonly referred to as marginal willingness-to-pay (WTP). WTP estimation is based on the marginal rate of substitution expressed in dollar terms providing a trade-off between some attribute k and the cost involved (Hensher et al. 2015) and is calculated using the ratio of an attribute parameter and the cost parameter. WTP can take into account interaction effects, if statistically significant, such as with the respondent demographics. WTP of attribute *j* by respondent *i* is calculated as the ratio of the estimated model parameters accommodating the influence of the random component (Cicia et al. 2013) as:

$$WTP_i^j = -\left(\frac{\beta_j + \varepsilon_{ij}}{\beta_{price} + \varepsilon_{ip}}\right) \tag{0.10}$$

The estimated mode parameters can also be used to estimate compensating surplus (CS) as a result of policy or quality change in a combination of attributes, using (Hanemann, 1984):

$$\mathbf{CS} = \frac{-1}{\beta cost}\left[\ln\sum_{j=1}^{J}\exp\left\{V_j^0\right\} - \ln\sum_{j=1}^{J}\exp\left\{V_j^1\right\}\right] \tag{0.11}$$

which calculates the difference in utilities before the policy or quality change (V_0) and after the policy or quality change (V_1) (Hanley et al. 2013; Lancsar and Savage 2004). Similar to WTP, the monetary estimation of this change is possible by using the estimate for the monetary attribute $\beta_{cost.}$. Lastly, there are some challenges associated with the empirical estimation of the WTP in the RPL based models. One approach is to use a fixed cost, which simplifies the WTP estimation (Daly et al. 2012) but which may not be as behaviourally a plausible consideration as allowing heterogeneous preferences towards the cost attribute (Bliemer and Rose, 2013; Daziano and Achtnicht, 2014). Conceptually, the estimated cost parameter is a proxy for the marginal utility of income for respondents and economic theory suggests individuals will respondent differently to varying income levels. The use of a random cost parameter however, presents complications in deriving population distribution moments from the ratio of two random parameters.

Appendix B
Latent Class Model of Sauvignon Blanc Wine Choices

Table B.1 Texas Sauvignon blanc wine choice Latent Class model

Utility parameters[1]	Class 1	Class 2	Class 3
Biodiversity Management	0.17** (0.08)	0.33** (0.15)	0.52***(0.16)
Water Management	0.11 (0.07)	0.12 (0.14)	0.37** (0.16)
By-product Management	0.25***(0.06)	0.09 (0.14)	0.01 (0.13)
Energy Management	0.11** (0.07)	- 0.03 (0.13)	- 0.11 (0.12)
Pest & Disease Management	0.27***(0.06)	0.11 (0.17)	0.46***(0.13)
Social Responsibility	0.29***(0.08)	0.33** (0.14)	0.23* (0.12)
GHG Management	0.26***(0.07)	0.39***(0.11)	0.65***(0.09)
Made with Organic grapes	- 0.37 (0.32)	- 0.04 (0.06)	0.24 (0.45)
100% Organic	0.31***(0.09)	0.34***(0.15)	0.19 (0.16)
Critic rating	0.01 (0.00)	0.15***(0.00)	0.23***(0.00)
Made in New Zealand	1.72***(0.36)	1.40***(0.35)	4.17***(0.53)
Made in NZ by Māori enterprise	1.66***(0.28)	1.96***(0.28)	5.22***(0.36)
Made in USA	1.27***(0.27)	1.15***(0.29)	4.21***(0.35)
Made in France	1.53***(0.41)	0.66* (0.40)	3.90***(0.57)
Made in Australia	1.68***(0.32)	1.07***(0.32)	4.17***(0.40)
Made in Italy	0.93***(0.28)	0.65***(0.25)	3.53***(0.34)
Price/750ml bottle	- 0.16* (0.01)	- 0.19***(0.01)	- 0.26***(0.02)
Class Membership			
Buy sustainable wines	0.40 (0.33)	- 0.58* (0.29)	
Age	- 0.03***(0.01)	0.02** (0.01)	
Usual price paid	0.23***(0.04)	0.05 (0.05)	
No Children	- 0.66** (0.29)	0.16 (0.34)	
Average class probability	0.40	0.25	0.35
Model Fit Statistics			
Log Likelihood function	- 3,827		
Log Likelihood chi^2 stat (70 d.f.)	3,112***		
McFadden Pseudo R^2	0.29		
Number of observations	4,900		
Number of respondents	490		

***, **,* denote statistical significance at the 1%, 5% and 10% levels respectively for the null hypothesis that a parameter estimate is not significantly different from zero.

Standard errors in brackets.

[1] Parameter mean estimates indicates the estimated average value in the model for each different parameter