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Agribusiness and Economics Research Unit
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Consumer insights and willingness to pay for attributes: New Zealand beef products in California, USA

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Executive Summary

A theme of the Our Land and Water (OLW) National Science Challenge is to achieve "greater value in global markets". This includes "understanding our international customers' demands for products from New Zealand's land and water". This research is funded by the OLW national science challenge from the programme Integrating Value Chains and is one of a series of four reports assessing consumer behaviour and preferences in market. In addition the report examines the consumer's use of media and technology to obtain information on and/or purchase products. This report is on consumer's behaviours and attitudes towards purchasing, using and gaining information on beef in California.

Beef exports were ranked as New Zealand's fourth largest agricultural export by value, with total beef exports valued at over NZ$2.7 billion, in 2016. The USA is New Zealand's primary export destination for New Zealand beef, with New Zealand beef exports to the USA valued at approximately NZ$1.3 billion in 2017. The USA is the world's largest beef producer, as well as a net importer of beef products, with high per capita beef consumption. A review of literature has shown that sustainability and credence attributes of beef are important to USA consumers, including environmental, health, provenance and quality attributes. Further, USA consumers use a range of digital media and smart technology in relation to finding information about and purchasing beef products, which has the potential to influence consumer perceptions of beef.

To assess Californian consumer preferences and willingness-to-pay (WTP), as well as use of digital media and smart technology in relation to finding information on beef products and/or purchasing beef products, the Agribusiness & Economics Research Unit (AERU) undertook an online survey of 874 consumers. This included asking consumers about their reasons for beef consumption; where and how they purchased beef; knowledge and perceptions of Māori culture and Māori enterprise; attitudes to beef consumption and production methods; and the use of digital media and smart technology to find out more and/or purchase beef. A choice experiment was also conducted to elicit consumer WTP for a range of attributes associated with beef.

Californian consumer beef consumption and purchasing habits

The findings of this report show that ground beef was the most frequently purchased beef product (73 per cent), followed by ribeye steak (31 per cent) and beef jerky (27 per cent). When purchasing ground beef, consumers were asked did they usually purchase the product with a number of properties. The results showed that the highest percentage purchased ground beef with the properties of 'no added hormones' (40 per cent), 'no added antibiotic's (39 per cent) and '100 per cent grass fed' (34 per cent). Forty-three per cent of participants usually paid $US3/lb to $US4/lb for ground beef and 32 per cent paid $US5/lb to $US6/lb.

When purchasing top sirloin steak, consumers usually purchased products with the properties of 'no added antibiotics' (41 per cent), 'no added hormones' (39 per cent) and '100 per cent grass fed' (37 per cent). Thirty-seven per cent of consumers usual spend on top sirloin steak was $US4/lb to $US6/lb and 32 per cent paid $US7/lb to $US9/lb.

When purchasing ribeye steak, participants usually purchased products with the properties of 'non-added hormones' (40 per cent), 'no added antibiotics' (39 per cent), and then '100 per cent grass fed' (31 per cent). Thirty-seven per cent of consumers usual spend on ribeye steak was $US5/lb to $US8/lb, followed by 31 per cent of consumers usually spending $US9/lb to $US12/lb.

The most common consumption patterns are 2 meals (23 per cent) and 3 meals containing beef in a week (22 per cent). Daily consumption or higher is significant at 17 per cent of respondents. Only 7 per cent had not personally prepared a meal containing beef, while the largest group prepared 2 meals in a typical week (23 per cent). Almost a quarter of consumers personally prepared five meals or more weekly (23 per cent).

Californian consumer attitudes to beef products

The US was the most commonly identified country-of-origin for beef products (78 per cent), followed by Australia (21 per cent) and then New Zealand (20 per cent). US beef was the most frequently purchased beef (45 per cent weekly, and 21 per cent monthly), followed by New Zealand beef (4 per cent weekly, and 5 per cent monthly).

The most frequently purchased New Zealand beef product was ground beef (28 per cent), followed by ribeye steak and top sirloin steak (26 per cent each). The most important reasons in the choice to purchase New Zealand beef products are 'no added antibiotics' (75 per cent high importance/some importance) and '100 per cent grass fed' (77 per cent high importance/some importance).

Californian consumer knowledge of Māori culture and enterprise

A number of participants stated they knew about Māori culture, with 28 per cent of participants knowing a few things about Māori culture, and 35 per cent of the participants had heard of Māori culture.

The top three stated attributes associated with beef produced from a Māori enterprise were 'care of traditional cultures' (56 per cent strong association/moderate association), 'traditional' (53 per cent strong association/moderate association), and 'local knowledge' (51 per cent strong association/moderate association).

Respondents also indicated that spirituality (46 per cent strong association/moderate association), 'stewardship over land' (49 strong association/moderate association), and 'natural' (50 per cent strong association/moderate association) were also important attributes associated with beef produced from a Māori enterprise.

Californian consumer attitudes to beef consumption and production practices

Results indicate a significant portion of consumers are concerned about production practices effect on the environment, product quality, and personal health. A majority are worried about the long term effects of medicine, pesticides and additives in conventional modern production (73 per cent agree/partly agree) which is consistent only one in four consumers thinking that beef production has low human health impacts. Likewise relatively few consumers think that the environmental impact of beef production is well managed (31 per cent agree/partly agree). Almost three-quarters of consumers agree that 'the quality of a beef product is directly related to the production practices used' (74 per cent agree/partly agree).

In addition, most participants also agreed with 'It is very important that USA public authorities control all beef' (62 per cent agree/partly agree) and 'I look at the labelling information on the package when I buy beef' (64 per cent agree/partly agree).

Californian consumer WTP for selected beef attributes

The WTP results are presented separately for the three cuts of beef: ground beef, top sirloin steak and ribeye steak. The results of the report show that country-of-origin and production attributes are important attributes in consumers' beef choices. Consumers were willing to pay a premium of:

- $US1.54/lb (22 per cent) for New Zealand raised and processed ground beef, followed by $US1.52/lb (22 per cent) for the US raised and processed ground beef;
- $US1.71/lb (10 per cent) for New Zealand raised and processed top sirloin steak, followed by $US1.68/lb (9 per cent) for the US raised and processed top steak;
- $US2.54/lb (11 per cent) for New Zealand raised and processed ribeye steak, followed by $US2.51 (22 per cent) for the US raised and processed ribeye steak.

The highest premium over the three cuts are for beef produced '100% grass-fed' at $US2.50/lb. for ground beef, $US2.70/lb. for top sirloin steak and $US4.10/lb. for ribeye steak. Correspondently, consumers were

willing to pay 35 per cent, 15 per cent and 23 per cent more for ground beef, top sirloin steak and ribeye steak produced '100 per cent grass-fed'.

The second and third highest premiums were for beef produced '100 per cent pasture raised' and organic production. The results show that consumers were willing to pay for:

- 100 per cent pasture raised production at $US2.00/lb (29 per cent) more for ground beef, $US2.18/lb (12 per cent) more for top sirloin steak, and $US3.29/lb (14 per cent) more for ribeye steak.
- Organic production at $US1.82/lb (23 per cent) more for ground beef, $US1.72/lb (10 per cent) more for top sirloin steak, and $US2.60/lb (11 per cent) more for ribeye steak.

The lowest positive WTP is for traceability, and environmentally sustainable production. Consumers were willing to pay for:

- Traceability at $US0.45/lb (6 per cent) for ground beef, $US0.49/lb (3 per cent) for top sirloin steak, and $US0.74/lb (4 per cent) for ribeye steak;
- Environmentally sustainable production at $US0.52/lb (7 per cent) for ground beef, $US0.57/lb (3 per cent) for top sirloin steak, and $US0.85/lb (4 per cent) for ribeye steak.

Californian consumer's use of digital media and technology in relation to finding information about and purchasing beef

Most participants indicated that they used both home computers and mobile devices, with home computer use (92 per cent daily/weekly) more frequent than mobile device (81 per cent daily/weekly).

Overall, participants used online information sources more frequently for inspiration on preparing meals with beef rather than for finding information on beef production, with most participants using home computers for both purposes more than mobile devices. Digital media sources that had the most overall use for searching inspiration on producing meals with beef included Google search (38 per cent), food blogs (23 per cent), YouTube (20 per cent) and Facebook (18 per cent). In terms of finding information on beef production, respondents used Google search (28 per cent), YouTube (13 per cent), food blogs and Facebook (11 per cent each). Celebrity chefs (38 per cent) had the most influence on respondents' inspiration on producing meals with beef, followed by health professionals (30 per cent), and then government information (17 per cent). When finding information on how beef is produced, government information (29 per cent), health professionals (28 per cent) and non-government organizations (19 per cent) were the top three influences for respondents.

Participants used their mobile device at home most frequently to search for inspiration on producing meals with beef and information on beef production. The main reasons of using mobile device for the purpose of searching for meal inspiration and information on beef production were searching for restaurants (35 per cent currently use, 26 per cent interested in using), recipes (31 per cent currently use, 30 per cent interested in using) and obtaining discount/coupons (30 per cent currently use, 33 per cent interested in using). The most used food apps was Yelp (31 per cent), followed by retailer apps (21 per cent), and then Allrecipes (14 per cent).

Participants' usual food and beverage shopping retailers included chain supermarkets (57 per cent), wholesale supplier (21 per cent) and specialty stores (20 per cent). Online was the least used retailer type for usual food and beverage shopping (14 per cent). In addition, participants' usual beef products shopping retailers types were chain supermarkets (63 per cent), wholesale supplier (28 per cent) and then specialty stores (26 per cent). Sixteen per cent of respondents shopped for beef products online.

The most frequent online purchased beef products were steak (61 per cent often/sometimes), frozen meat products only (52 per cent often/sometimes), and hamburger (60 per cent often/sometimes). The most frequently used online suppliers for making beef product purchasing included 'only retailers that I've used before", 'only suppliers that I know and trust', 'chain supermarkets' and 'Amazon'.

Participants also stated their main reasons for shopping for beef products online, which were 'I like the convenience of having products delivered to my home', 'products are generally higher quality', and 'I have access to special offers and promotion'. In addition, the results of this report show that most online consumers purchase beef products 'at home on desktop/laptop'.

In terms of trust in searching for beef production information, participants mostly trusted product packaging/labelling (85 per cent high/medium), followed by online customer reviews (75 per cent high/medium) and then branded mobile apps (66 per cent high/medium). A number of participants indicated that they had a low level trust in generic mobile apps and/or branded mobile apps. The main reasons included 'I do not trust the provider of the information' and 'security concerns' and 'I have privacy concerns regarding the technology'.

In terms of trust in purchasing beef products online, participants mostly trusted their own personal computer (77 per cent high/medium), followed by barcodes/QR codes (71 per cent high/medium), and then online shopping (66 per cent high/medium). The main reasons that participants did not trust RFID/NFC technology, barcodes/QR codes, branded mobile apps, generic mobile apps, online shopping, personal computers and/or mobile device for purchasing beef products included 'I am not familiar with the technology involved', and 'I don't not trust the information provided'.

Finally, participants most often found out about or became aware of new beef products 'in-store (from where I did most of my food product shopping)' (62 per cent), followed by 'word-of-mouth' (36 per cent) and 'broadcast media' (20 per cent).

Chapter 1
Introduction

A theme of the Our Land and Water (OLW) National Science Challenge is to achieve "greater value in global markets". This includes "understanding our international customers' demands for products from New Zealand's land and water". This research is funded by the OLW national science challenge in the programme Integrating Value Chains and is one of a series four reports assessing consumer behaviour and preferences in market. In addition the report examines the consumer's use of media and technology to obtain information on and/or purchase products. This report is on the California consumer's behaviours and attitudes towards beef. The other reports are on kiwifruit and yogurt in Shanghai, and wine in California. These markets and products were selected in consultation with the project advisory board.

Thus, the current report details the development and application of a survey of California beef consumers. The survey is designed to examine three main areas: consumption behaviour, Willingness to Pay (WTP) for credence attributes, and the use of digital media and smart technologies.

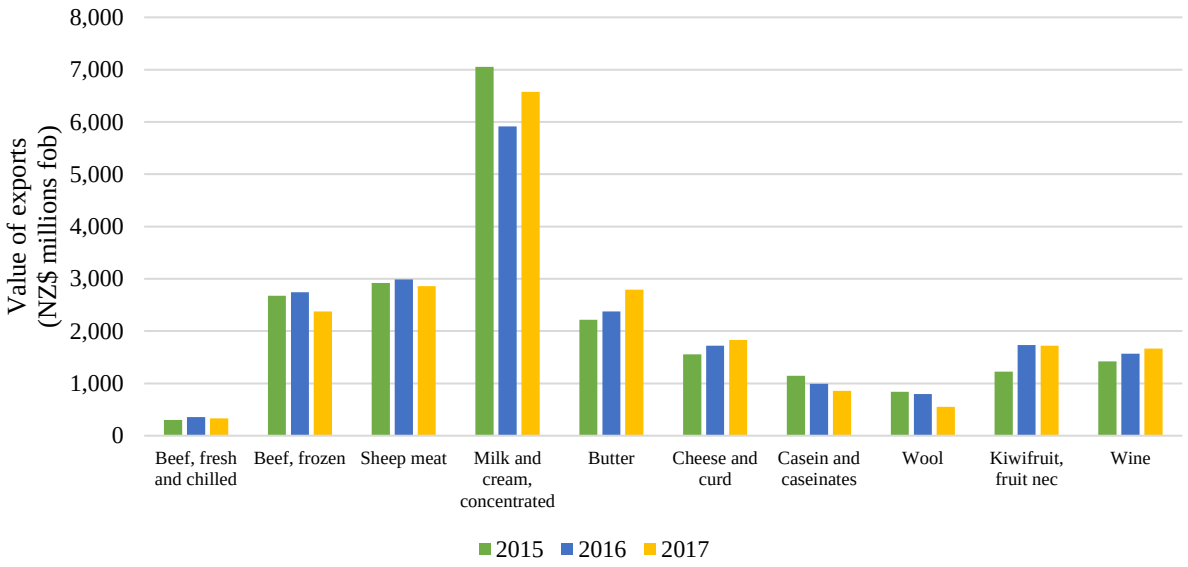
While search attributes such as price or colour can be observed directly, and experience attributes such as flavour or texture can be assessed when consumed, credence attributes such as environmental sustainability cannot be immediately seen or experienced at the point of sale (Wirth et al., 2011). For products promoting credence attributes, the role of verification including labelling is of significant importance.

Agricultural exports are an important contributor to the New Zealand (NZ) economy and it is important for NZ exporters to understand its key markets and the different cultures and preferences of those consumers. Doing so is critical for realising potential premiums (Guenther et al., 2015). It is also important to assess the use of smart media by consumers on how they may use these to find out more information on and purchase products. This covers online shopping (e-commerce), social media and mobile devices (smartphones) as well as the use of QR Codes and barcodes. These technologies provide mechanisms for the effective marketing and selling of NZ food and beverage products. It is important for exporters to both understand and consider their use in the development of effective digital marketing and sales strategies (Driver et al., 2015).

1.1 New Zealand beef market profile

Beef exports are an important NZ agricultural export, with beef (frozen) exports ranked as the fourth largest agricultural export by value in 2017 (Figure 1-1) (Statistics New Zealand, 2017).

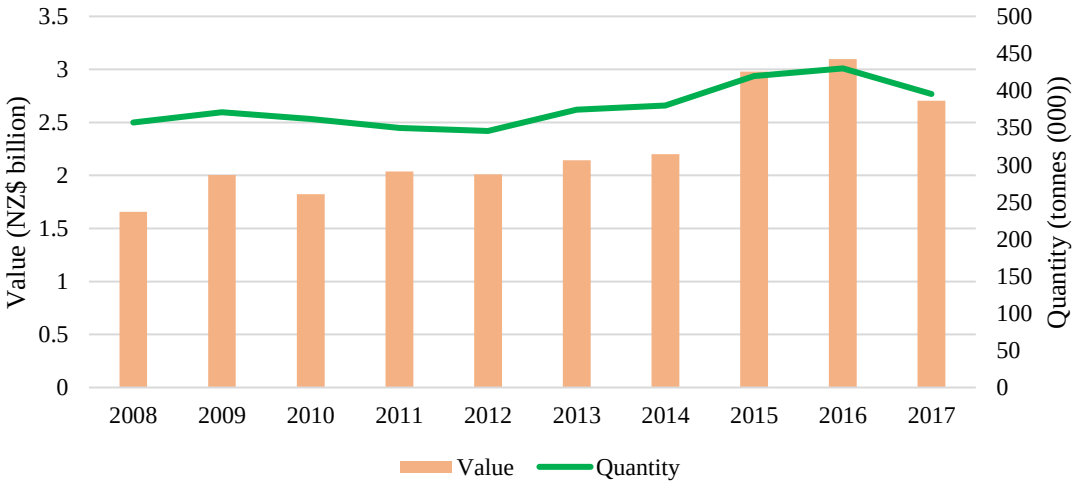
Figure 1-1: The value of key New Zealand agricultural exports, 2015-2017



Source: Statistics New Zealand, 2017

Beef is NZ's largest exported meat product by value. MBIE (2017) reported that, in 2016, beef exports accounted for 48 per cent of total NZ meat exports by value, followed by lamb (44 per cent) and all other meat products (8 per cent). In 2017, beef export valued at approximately NZ$2.7 billion, with the volume of over 395,000 tonnes (as shown in Figure 1-2) (Statistics New Zealand, 2018).

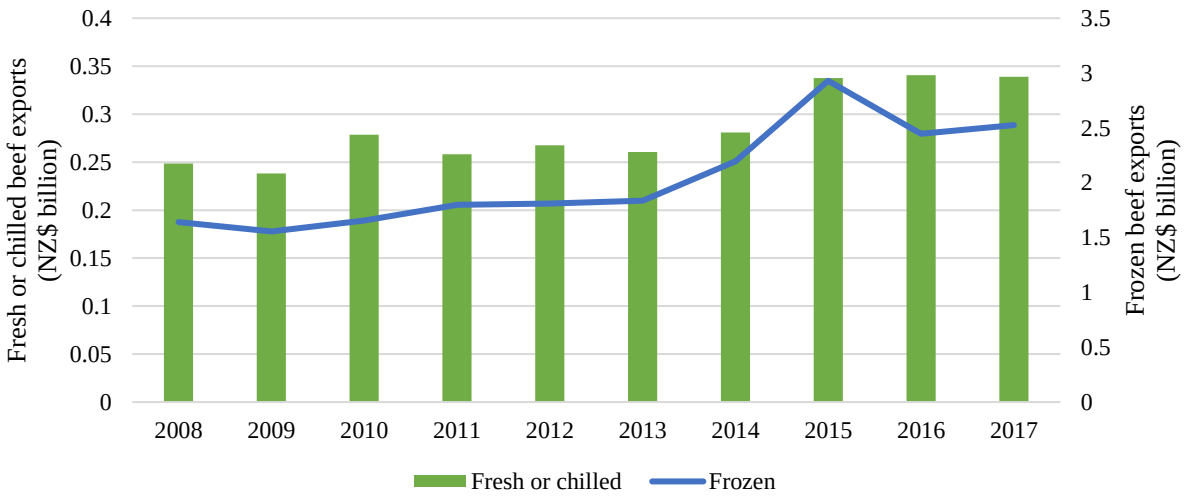
Figure 1-2: New Zealand beef exports (tonnes (000) and value (billion)), 2008 -2017



Source: Statistics New Zealand, 2017

NZ's major beef export is frozen beef. The value of frozen beef exports increased over 1.5 times between 2008 and 2017 (Statistics New Zealand, 2018) (as shown in Figure 1-3). In addition, the value of chilled beef increased steadily from NZ$0.25 billion in 2008 to NZ$0.34 billion in 2017 (MIA, 2017).

Figure 1-3: Value of fresh and chilled and frozen beef export, 2008-2017



Source: Statistics New Zealand, 2018

The USA was the primary export destination for NZ beef products by both value and value in 2017. NZ beef export to the USA were valued at approximately NZ$1.25 billion, accounting for 44 per cent of total NZ beef exports in 2017 (as shown in Table 1-1) (MIA, 2017). The volume of NZ's beef exports to the USA was 191,075 tonnes, which accounted for almost half of the volume of NZ's total beef exports in 2017 (as shown in Table 1-2) (MIA, 2017).

Table 1-1: Top 3 beef markets by value, year ended December 2017 (NZ$ million)

Rank	Country	Value	% of total	% change 2016- 2017
1	United States	1,250.60	44%	2%
2	China	560.2	20%	22%
3	Taiwan	168.3	6%	-18%

Source: MIA, 2017

Table 1-2: Top 3 beef markets by volume, year ended December 2017 (tonnes)

Rank	Country	Volume	% of total	% change 2016- 2017
1	United States	191,075	47%	-1%
2	China	84,506	21%	19%
3	Taiwan	21,281	5%	-18%

Source: MIA, 2017

1.2 USA beef market: background

The United States Department of Agriculture (USDA) (2018) reported that the United States is the world's largest beef producer, mainly high-quality, grain-fed beef for its domestic and export use. Over 11.4 million tonnes of beef was produced in the US in 2017 (Euromonitor, 2018). The USA is also the largest beef importer (USDA, 2018), with in 2017, the USA importing approximately 1.78 million tonnes of beef, with mostly from Australia, Canada and NZ.

OECD (2018) data showed that the USA was ranked as the world's fourth largest country for beef consumption by per capita in 2017, although US beef consumption dropped from 28.87 kilograms/capita to 25.82 kilograms/capita between 2008 and 2017 (OECD, 2018). Retail prices, growing health concerns about red meat intake, and increased availability of convenience chicken products are considered as major factors affecting beef consumption in the US (Badau, 2016). However, US beef consumption is forecasted to increase in the next ten years as the production of beef grows and retail prices decline (Badau, 2016).

Changes in international trade are also likely to impact on NZ beef exports to the US in the future. From March 2nd 2018, the US government proposed the application of duties on a selection of Chinese made products. In response, on April 5th, the Chinese government released a list of 106 additional products subject to tariffs on the US products, including US beef (Quilty, 2018). This could potentially have influence on NZ's beef exports to the US.

1.3 USA beef consumer sustainability preferences

Previous work undertaken by the AERU has examined consumer preferences for credence attributes of food and beverage products including sustainability attributes, in several international markets relevant to NZ exporters (Guenther et al., 2015; Miller et al., 2014, 2017; Saunders et al., 2015). In particular, Saunders et al. (2015) identified a range of sustainability attributes important to consumers in their selected countries (China, India, Indonesia, Japan, Korea and the UK) in relation to food and beverage products. The authors identified seven key attributes, including quality, price, fair trade, animal welfare, environmental quality, health food and food safety. Results in their study showed that in relation to quality and price, most respondents in all countries stated that the seven attributes were either very important or important. In relation to animal welfare, environmental quality, health food and food safety, developing countries indicated an overall higher rating of importance than developed countries (Saunders et al., 2015). The results of that research provided important information in developing the survey.

Several studies have examined beef consumers preferences and behaviour in the US, including demand for credence and sustainability attributes. For example, Najar et al. (2017) showed that product flavour impacted on US beef consumer preferences, while Wilfong et al. (2016) found that brand knowledge impacted on US consumers' perception of beef product quality. Lim et al. (2013) examined US consumer WTP for food safety, traceability, natural production and quality attributes for beef products from the USA, Canada and Australia. The authors found that the US consumers preferred domestic beef over the imported products. On average, US consumers were willing to pay (WTP) $5.7 for bovine spongiform encephalopathy (BSE)-tested, $5.85 for traceability-enabled and $4.08 tenderness-assured beef products, respectively. These findings are similar to the findings of Abidoye et al. (2011), who found that US consumers were WTP for traceability to birth at $3.77 and grass-fed at $3.44 for standard rib-eye steak products (Abidoye et al., 2011).

Yu et al. (2016) conducted a meta-analysis of 20 studies examining WTP for country-of-origin (COO) in relation to purchasing US beef products. The meta-analysis yielded 57 total observations, including 27 observations relating to US consumers, 15 to European consumers, 13 to Asian consumers and 2 relating to Mexico and Canada respectively. The authors found that consumers generally prefer their own country's beef products over foreign beef products. In addition, consumers in Asian and European countries had a lower WTP for US beef products, while US consumers had a higher WTP for US beef products (Yu et al., 2016).

An older study from Loureiro and Umberger (2007) analyse US consumer preferences for credence attributes, including food safety, country-of origin labelling and traceability, in relation to beef products consumption and purchasing. Participants indicated that the USDA certification for food safety inspection was more important than all other selected attributes, including country-of-origin labelling, traceability and tenderness (Loureiro and Umberger, 2007).

Other research has examined consumer sustainability preferences for beef products in countries other than the US. For example, Spence et al. (2018) investigated consumer attitudes and purchase intentions towards traceable minced beef or beef steak products in England. Results showed that, compared to the conventional beef product, participants indicated that buying traceable beef products would be wise/beneficial and make them feel good/pleased. Moreover, the results show that 70 per cent of the participants were WTP 5 per cent to 30 per cent more for traceable beef steak, while 57 per cent of the participants were WTP a 5-30 per cent premium for traceable minced beef products.

Colella and Ortega (2017) examined Argentinian consumer preferences and WTP for beef product attributes. The authors the interrelationship between consumers' choice of retail outlet and beef product preferences, segmenting participants into two groups - Service and Convenience Oriented customers. The results of the study showed that Convenience Oriented consumers were WTP for a premium of organic, origin, and family farm certification, which was not found for Service Oriented consumers (Colella and Ortega, 2017).

Risius and Hamm (2017) analysed the effects of information provision on Germany beef consumer preferences and willingness to pay for animal husbandry, organic or conventional production and prices. Results showed that the attributes of enhanced husbandry conditions and organic production were preferred, with information on beef husbandry systems also influencing consumer preferences. For example, without further information about husbandry conditions, organic and pasture-based production labelling attributes had the strongest impact on purchasing decisions. Consumers' WTP for extensive suckler cow husbandry was €2.07. However, when consumers were given the information about conditions for extensive suckler cow husbandry, consumers switched their preference to extensive suckler cow husbandry, as well as indicating a willingness to pay €4.65 for this husbandry type (Risius and Hamm, 2017).

1.4 USA digital media and smart technology use for beef product information and purchasing

One such channel for communication about products and their attributes and for purchasing these are new technologies, particularly digital media and smart technologies. These include online shopping (e-commerce), social media and mobile devices (such as smartphones). These technologies provide mechanisms for the effective marketing and selling of NZ primary products. It will be important for agribusiness supply chain managers to both understand and consider their use in the development of effective digital marketing and sales strategies.

Previous work conducted by the Agribusiness and Economics Research Unit (AERU) has examined the use of digital media and smart technologies in finding out about and/or purchasing food and beverage products in international markets relevant to NZ exporters. This work has shown that the use of digital media and smart technologies in finding out about and/or purchasing food and beverage products is important for consumers in international markets, with its use being particularly pronounced in developing over developed countries (Driver et al., 2015; Miller et al., 2017). In the context of the current report, studies specifically referring to beef have been included.

Charanza and Naile (2012) noted that understanding the importance of media benefited to the beef industry in the USA, as media coverage of food safety had the potential to influence on the US consumers' perception of and attitudes toward to beef industry in the USA. The authors suggested agricultural communicators should post messages through the Internet, television news channels, and radio, about beef product safety to consumers in order to effectively inform the public about food safety issues related to the beef industry.

Several researchers have examined the relationship between consumer use of technology and preferences and behaviour in relation to find out about and/or purchase beef products in the countries other than the

US. For example, Liang et al. (2015) examined the use of radio frequency identification (RFID) technology and the EPCglobal network on beef supply chain traceability in China. The authors demonstrated the use of such traceability systems present major advantages to those involved in the beef supply chain, including the effective sharing of information among business and the gapless traceability of across the whole chain. Similarly, Feng et al. (2013) showed that the use of RFID technology for beef products would be beneficial to beef manufacturers, food supervision agencies and consumers in China, as the RFID-enabled traceability system are the real-time and accurate data acquisition and transmission, and the high efficiency of information tracking and tracing across the cattle/beef supply chain.

Singh et al. (2017) examined the feasibility of analysing Twitter data for the purpose of improving beef supply chain management practices, employing text mining and sentiment analysis to determine broad consumer response to beef products from different geographical locations (the rest of world, UK, Australia, and the US). The authors identified a number of consumer dissatisfaction issues in the international beef supply chain, including bad flavour and unpleasant smell, traceability issues, extra fat, discolouration of beef products, hard texture and presence of a foreign body in beef products. The authors were then able to identify at which stages of the supply chain it was likely that these issues could occur, thereby effectively demonstrating the use of Twitter data as a means of improving beef supply chain management practice (Singh et al., 2017).

Chapter 2
Methodology

The method included a structured and self-administered online survey that included a Choice Experiment, conducted in California, U.S.A. in January 2018. The surveys were administered through Qualtrics™, a web-based survey system, and had a sample size of 874 beef consumers.

The survey was developed by the research team drawing from a literature review on U.S.A. consumer trends for beef products (see Chapter 1), results from previous surveys examining consumer attitudes in overseas markets (Guenther et al., 2015; Miller et al., 2014; Saunders et al., 2015), a pilot survey of 100 Californian beef consumers (November 2017) and consultation with industry partners and stakeholders.

Sampling involved the recruitment of participants from an online panel database of consumers provided by an international market research company. These panels are profiled, broadly recruited and frequently refreshed by the company. The respondents for each survey are recruited by online marketing. The company holds a participation history of each panel member. Each respondent who completes the survey is compensated with a retail voucher. Potential respondents were recruited by e-mail and screened out if they consumed beef less than monthly, or new nothing about NZ. The email included a short description of the study, a link to start the online survey and instructions to run the survey.

Potential respondents who received an invitation to complete the survey were screened out if they purchased beef less than monthly (Figure 2-1) or knew nothing about NZ (Figure 2-2).

Figure 2-1: Beef purchase frequency (screen-out rate)

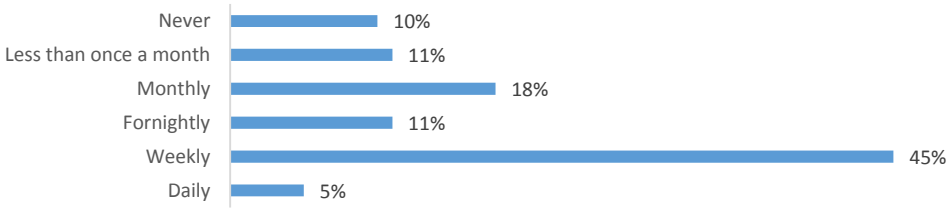
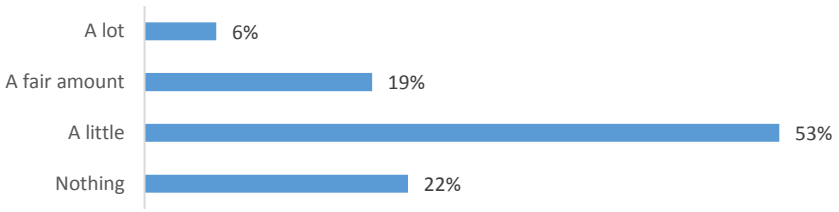


Figure 2-2: Knowledge of New Zealand (scree-out rate)



In order to ensure data quality some respondents were removed from the sample for analysis. Respondents were considered as careless or inattentive, and therefore removed, if they had completed the survey in a time considered insufficient to allow for adequate consideration of questions. Timing thresholds were determined within an evaluation of the distribution of survey completion times across the sample. The validity of responses was also checked with respondents removed who: constantly selected ‘don’t know’ options; provided non-varying responses over multiple questions; provided gibberish in open-ended question answers. Final sample demographics are presented in Appendix 1 Demographics.

2.1 Choice experiments

This study employs the stated preference method of choice experiments to estimate consumer WTP for credence attributes of beef. Choice experiments have been extensively used to value consumer preferences for food product attributes (Tait et al., 2015; 2016; 2016b; Miller et al., 2017). As opposed to revealed preference methods such as using direct or indirect market prices, this survey based approach facilitates valuation of attributes that may not be directly 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 marginal WTP for these attributes, has seen this approach to valuation become increasingly favoured by researchers.

The method involves simulating the context in which consumers would normally make choices among a set of competing beef alternatives. This is achieved by designing an experiment in which attributes are systematically and independently varied to produce multiple choice scenarios. In this study, alternative beef products presented to consumers are described by the beef type, production practices, country of origin and price. Consumers are then asked to indicate their preferred beef alternative in each scenario, with the observed levels of attributes in the chosen and non-chosen alternatives modelled in a probabilistic econometric framework. The resulting model outputs can then be used to estimate consumer WTP for the beef attributes of interest. A fuller presentation of theoretical foundation and statistical procedure can be found in Appendix 2 Statistical Method.

2.2 Selection of beef attributes

The central objective of the Choice Experiment is motivated by the following hypothesis:

> *"It is possible to use original research in key international markets to determine credence attributes matched to NZ production systems that are valued by international consumers of all agri-food products sourced from NZ, especially from Maori enterprises"*

While *search* attributes such as price or colour can be observed directly, and *experience* attributes such as flavour or texture can be assessed following consumption, *credence* attributes are not able to be directly observed or verified by consumers' consumption of the product. For products promoting credence attributes, the role of labelling is of significant importance. Relevant credence attributes to be included in the choice experiment were identified through in market scoping (Figure 2-3), literature review combined with results of the scoping survey (Table 2-1). Social responsibility attributes have been defined in many diverse ways, with no clear dominant definition (Miller et al., 2017). The description used here was formed on the basis of being a central defining characteristic of Maori enterprises. This view was formed by reviewing of Māori enterprise definitions available online used in current products. These reflected an important Māori enterprise characteristic concerning collective ownership structures. The review also revealed a second major defining characteristic, stewardship over relevant natural resources including land. We consider that the environmental sustainability attributes already included are sufficient to meet this criteria and so do not specify a stewardship specific attribute.

Figure 2-3: Beef product in-market exemplars

Table 2-1: Beef attributes included in the choice experiment

Animal Feed	100% Grass-fed beef is lower in calories, contains more healthy omega-3 fats, vitamins A and E, beta-carotene and antioxidants. Grain fed beef have higher fat content and marbling which can produce a richer taste.
Environmentally Sustainable	Environmentally sustainable farms actively minimise the environmental effects of beef production.
Antibiotics & Hormones	Beef may be raised with or without added antibiotics and/or hormones.
Traceability	The animal can be traced back to the farm where the animal was born.
Social Responsibility	Collective community ownership of farms can enhance social responsibility. Socially responsible farms actively include public interest into decision making.
Product Origin and Processing	Beef consumed in the USA comes from cattle raised in the USA as well as other countries and are processed either in the USA or in the country where cattle were raised.
GMO-Free	Animals are not genetically modified, and do not consume genetically modified feed.
Animal Housing	Animals can be raised mainly in feedlots, or mainly in pastures.
Organic	Use no synthetic fertilisers, hormones, antibiotics or animal by-product supplementation during the entire life of the beef cattle including in or on the food they eat.
Animal Welfare	Animal welfare practices can be enhanced above the minimum legal standards.
Price	$US/pound

2.3 Beef attribute levels

The levels that each beef attribute can take are presented in Table 2-2. Price levels were determined by the distribution of observed market prices in California for beef (as at December 2017). Countries of origin were selected based on volumes of sales in the USA for 2017.

Table 2-2: Beef attribute levels used in the choice experiment

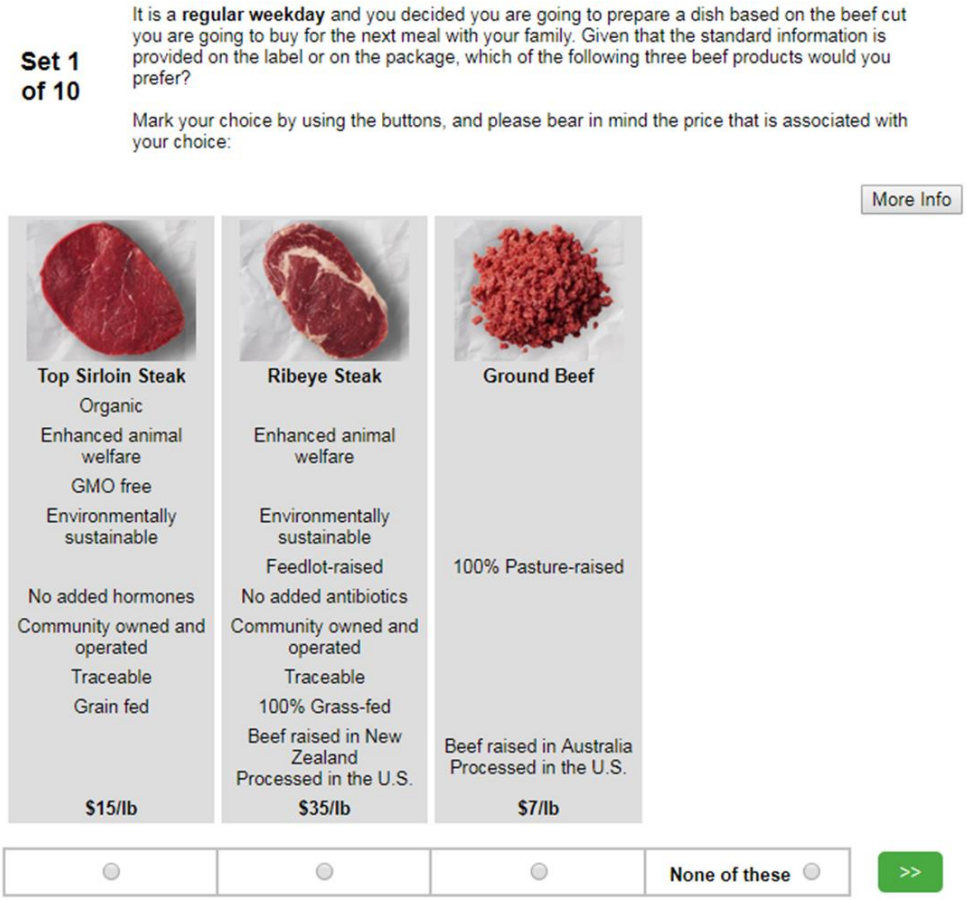
Beef attributes	Attribute levels				
Animal Feed	No Label	100% Grass-fed		Grain-fed	
Environmentally Sustainable	No Label	Environmentally Sustainable			
Antibiotics & Hormones	No Label	No Added Antibiotics		No Added Hormones	
Traceability	No Label	Traceable			
Social Responsibility	No Label	Community owned and operated			
GMO-Free	No Label	GMO-Free			
Animal Housing	No Label	Feed-lot Raised		100% Pasture Raised	
Organic	No Label	No Label		Organic	
Animal Welfare	No Label	Enhanced Animal Welfare			
Product Type	Ground Beef	Top Sirloin Steak		Ribeye Steak	
Product Origin and Processing	No Label	Beef raised in the U.S. Processed in the U.S.	Beef raised in New Zealand. Processed in the U.S.	Beef raised in New Zealand. Processed in New Zealand.	Beef raised in Australia. Processed in the U.S.
Price US$/lb 2017	3,6,7,12,15,25,35				

2.4 Experimental design

It is not possible to present respondents with all possible combinations of attribute levels in Table 2-.2. Instead, Experimental Design methodology is used to create combinations of attribute levels, which represent a subset of the total combinations possible, and maximise the amount of statistical information available. These combinations are formed into choice sets. Figure 2-4 presents an example of a choice set shown to respondents. Each choice set comprises four options, of which respondents chose their preferred option. Three options present alternative beef, while the fourth is a 'none of these' option.

The study employs NGene™ software to apply a D-efficient fractional factorial design approach. Providing information on the likely values of model coefficient estimates improves this process. For the initial experimental design, we looked at similar studies for design parameters, then updated these with coefficient estimates from a model fitted to pilot survey data (n=100). The resulting updated experimental design is applied to the remaining number of respondents with each respondent answering ten choice sets.

Figure 2-4: Example beef choice set shown to respondents



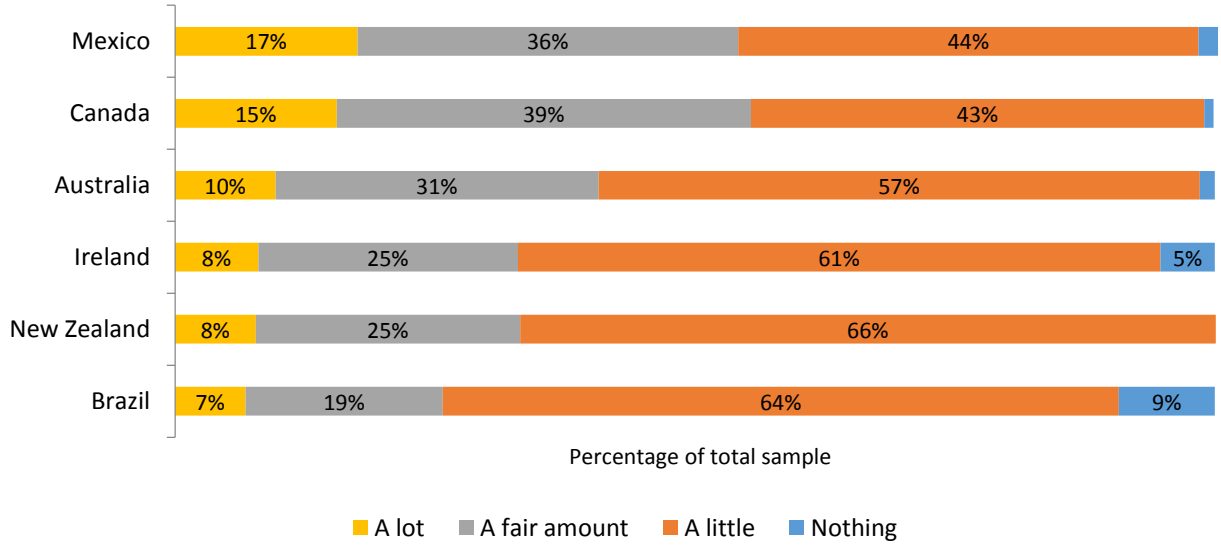
Chapter 3
Results

This chapter presents the results of the survey examining California consumer's preferences for beef products, including their knowledge of particular countries (3.1), beef purchasing habits (3.2), knowledge of Māori culture and enterprise (3.3), attitudes to beef consumption and production practices (3.4), as well as their use of digital media and smart technology in relation to finding out about and/or purchasing beef products (3.5). The results of a choice experiment are presented in Chapter 4.

3.1 Knowledge of countries

Participants were asked to indicate how much they knew about a series of countries using a four-point Likert scale, including the points A lot (1), A fair amount (2), A little (3) and Nothing (4). For the purposes of this research, these countries were selected based on their status as significant beef exporting countries, including Mexico, Canada, Australia, Ireland and Brazil, as well as NZ. Results are shown in Figure 3-1. All participants indicated some level of knowledge of NZ, with more than 30 per cent of the participant had known a lot/a fair amount about NZ. Sixty-six per cent of the participants had known a little of NZ. This is perhaps not surprising given knowledge of NZ was a screening factor for completing the survey.

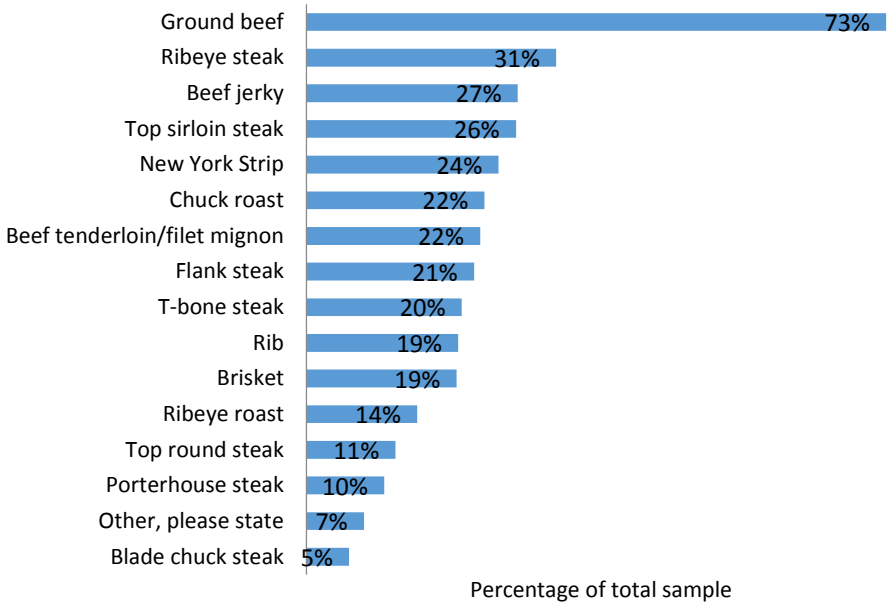
Figure 3-1: Knowledge of countries



3.2 Beef purchasing behaviour

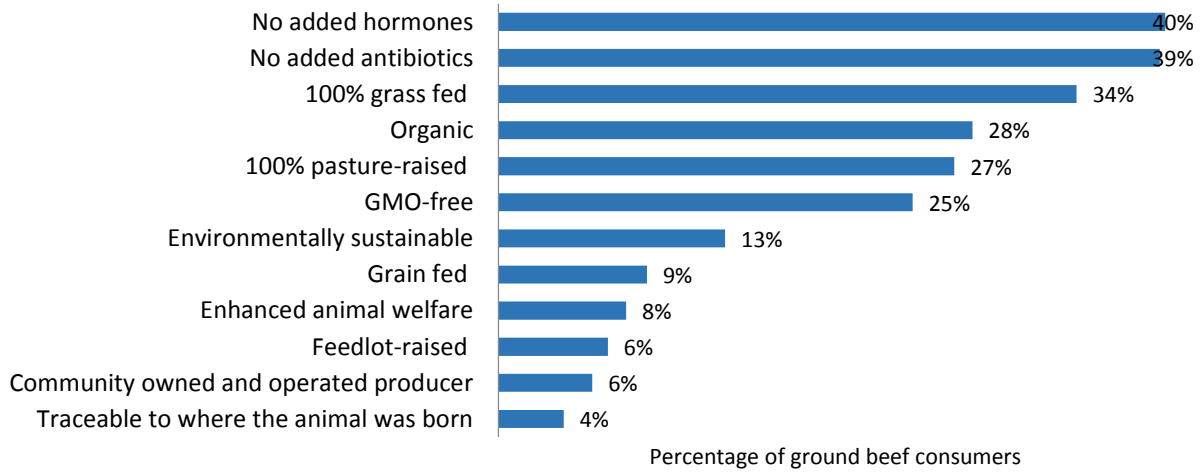
Participants were then asked if they had purchased any of a number of listed beef products in the last month, selecting all that applied to them. Results are presented in Figure 3-2. The most frequently purchased beef product was ground beef (73 per cent), followed by ribeye steak (31 per cent), and then beef jerky (27 per cent).

Figure 3-2: Types of beef products purchased in the last month



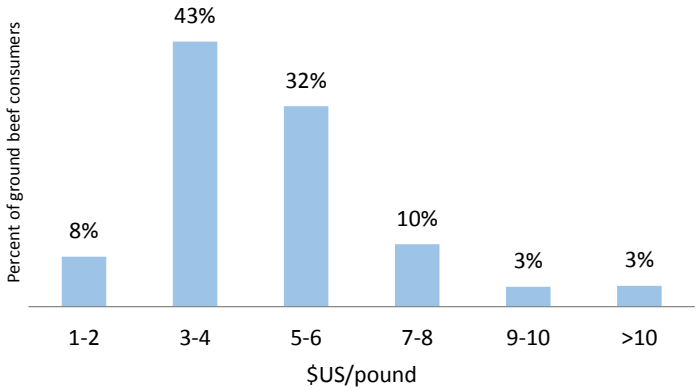
Participants who had purchased ground beef were asked if their usual ground beef purchases contained a number of attributes (Figure 3-3). The most frequent attributes include 'no add hormones' (40 per cent), 'no added antibiotics' (39 per cent) and '100 per cent grass fed' (34 per cent).

Figure 3-3: Attributes of usual ground beef purchases



Participants average price paid for ground beef is $US5.06/lb (Figure 3-4). 70 per cent consumers usually paid less than $US5/lb while 10 per cent paid at least $US8/lb for ground beef.

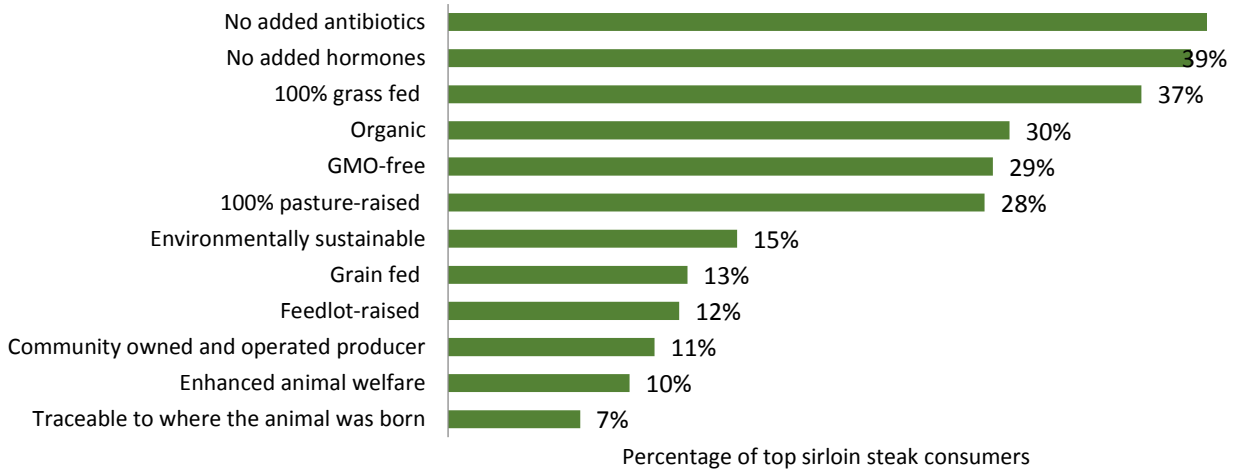
Figure 3-4: Consumers' usual price paid for ground beef



Participants who had purchased top sirloin steak were asked if their usual top sirloin steak purchases contained a number of attributes (The most frequent attributes include 'no added antibiotics' (41 per cent), 'no added hormones' (39 per cent) and '100 per cent grass fed' (37 per cent).

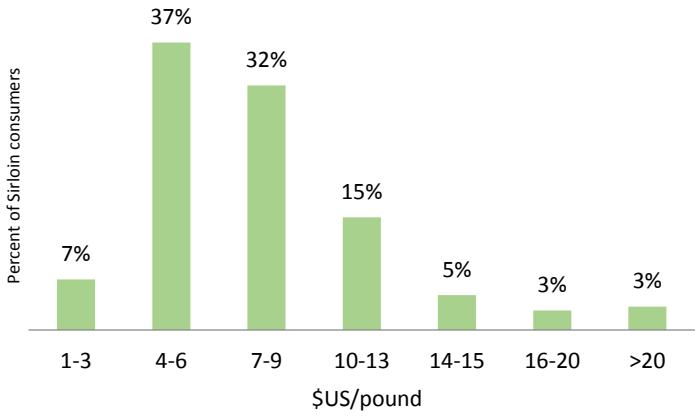
Figure 3-5). The most frequent attributes include 'no added antibiotics' (41 per cent), 'no added hormones' (39 per cent) and '100 per cent grass fed' (37 per cent).

Figure 3-5: Attributes of usual top sirloin steak purchases



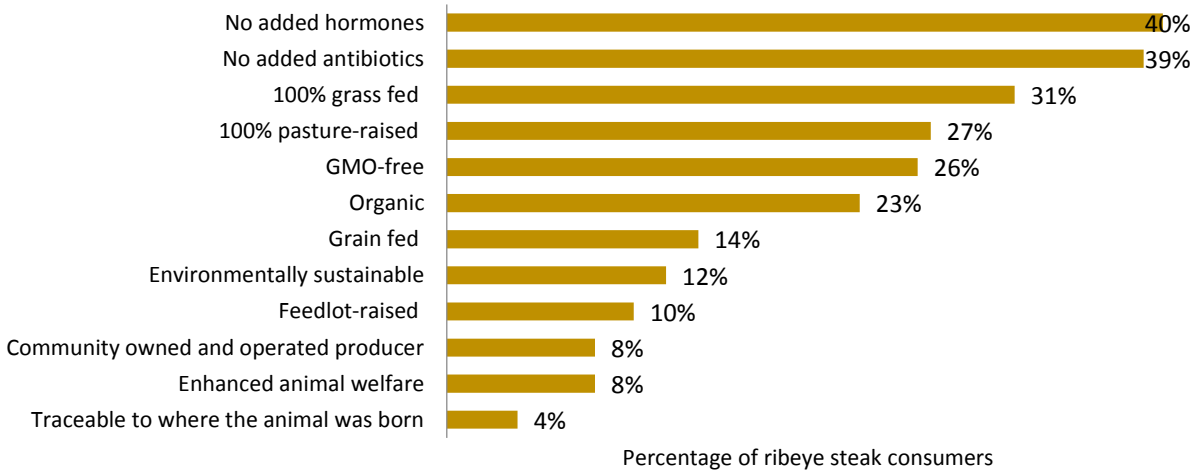
Participants paid on average $US8.32/lb for top sirloin steak Figure 3-6. 42 per cent of consumers usually paid less than $US6/lb, while 11 per cent paid at least $US14.00/lb

Figure 3-6: Consumers usual price paid for top sirloin steak



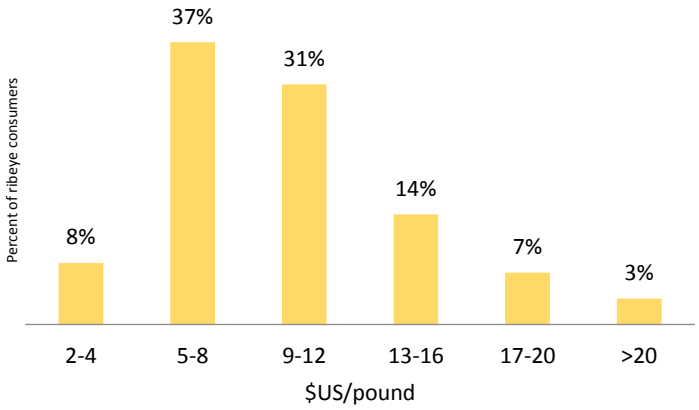
Participants who had purchased ribeye steak were asked if their usual ribeye purchases contained a number of attributes (Figure 3-7). The most frequent attributes include 'no added hormones' (40 per cent), 'no added antibiotics' (39 per cent) and '100 per cent grass fed' (31per cent).

Figure 3-7: Attributes of usual ribeye steak purchases



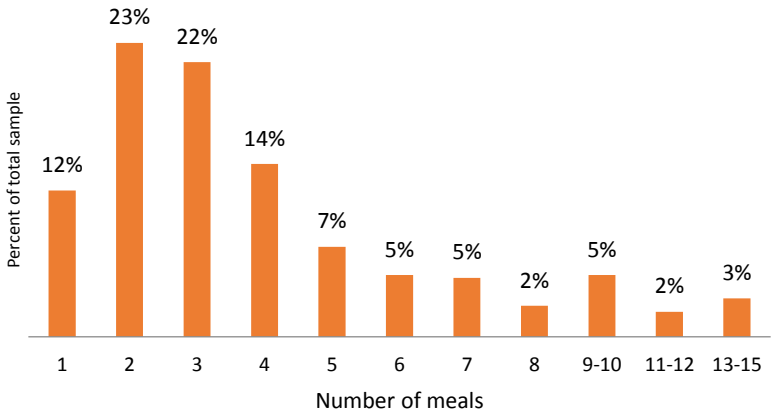
Ribeye consumers paid on average $US10.20/lb. Figure 3.8 shows that over a third consumers usually paid between $US5/lb and $US10/lb for ribeye steak, while 10 per cent of consumers paid at least $US17.00/lb.

Figure 3-8: Consumers usual price paid for ribeye steak



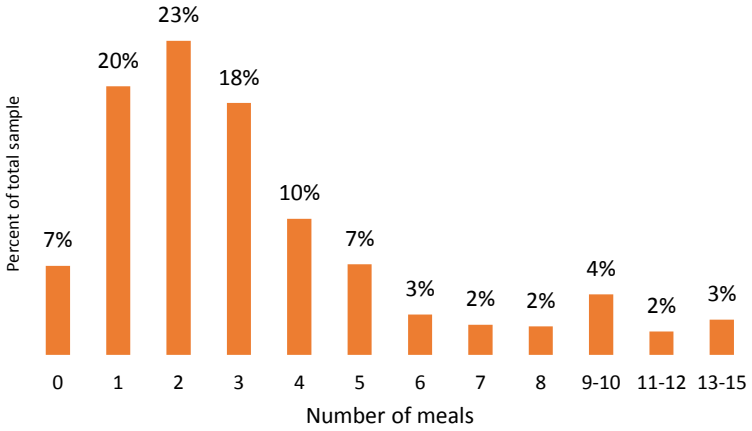
Participants were asked how many meals do they usually consume that containing beef over a typical week. Figure 3-9 shows the most common consumption patterns are 2 meals (23 per cent) and 3 meals containing beef in a week (22 per cent). Daily consumption or higher is significant at 17 per cent of respondents.

Figure 3-9: Number of meals consumed containing beef in a typical week



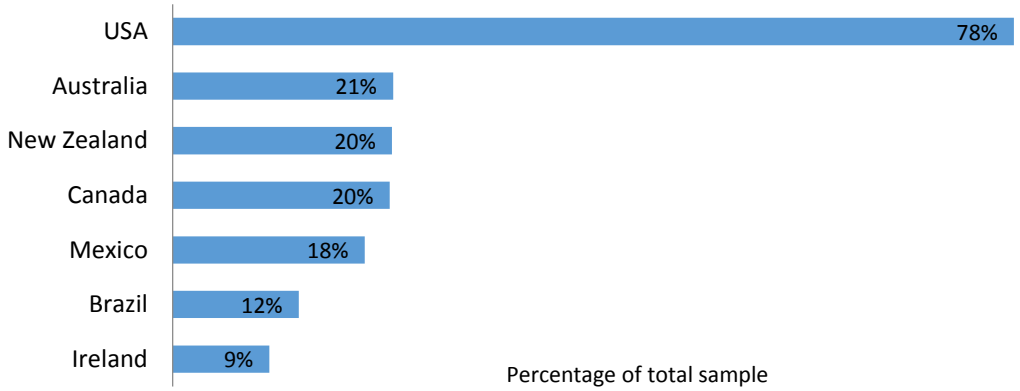
Following this, participants were asked the number those meals that they personally prepared. Figure 3-10 shows that only 7 per cent had not personally prepared a meal containing beef, while the largest group prepared 2 meals in a typical week (23 per cent). Almost a quarter of consumers personally prepared five meals or more (23 per cent).

Figure 3-10: Number of personally prepared meals containing beef in a typical week



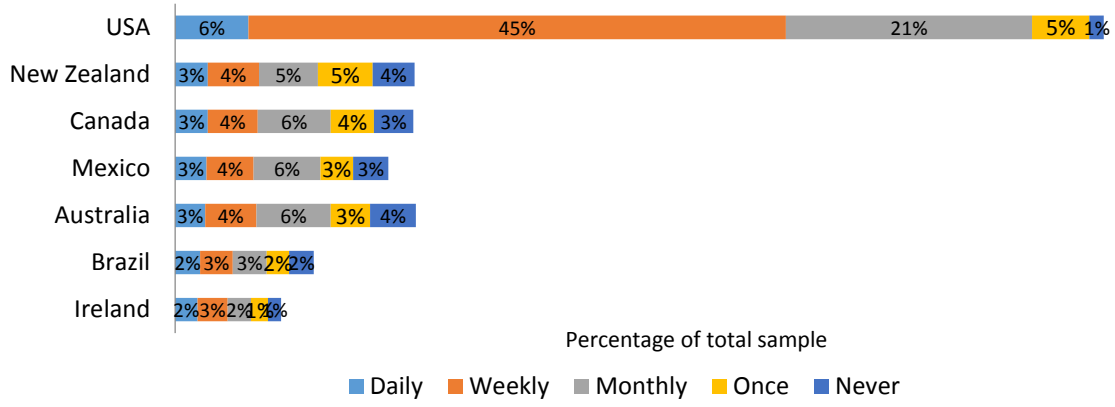
Participants were then asked if they had seen beef products being sold from particular countries over the last month. These countries were Australia, Brazil, Canada, Ireland, Mexico, NZ and the USA. Results are presented in Figure 3-11 and show the USA was the most commonly identified country-of-origin for beef products (78 per cent), followed by Australia (21 per cent) and then NZ (20 per cent).

Figure 3-11: Country-of-origin seen on beef products sold



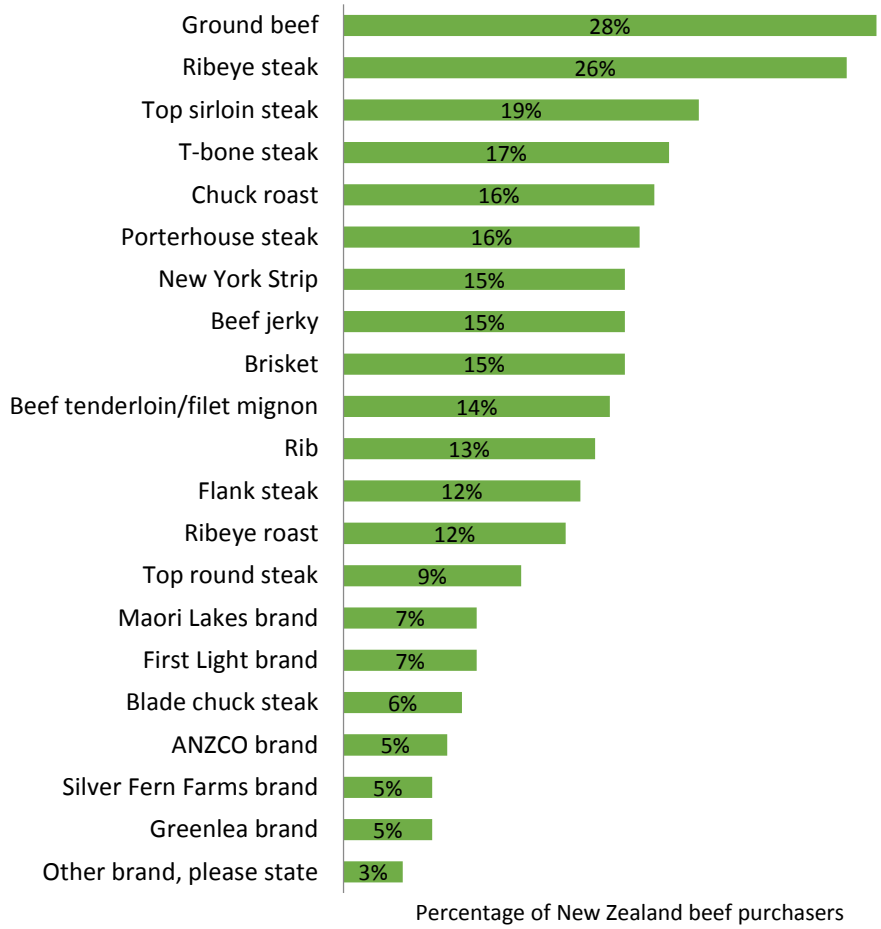
Following this, participants were asked the frequency at which they had purchased beef products from the country-of-origin(s) that they had seen, in the last month. Results are presented in Figure 3-12 and show participants had purchased beef products from the USA (51 per cent Daily/Weekly) most frequently in the previous month, followed by NZ and then Canada (7 per cent Daily/Weekly).

Figure 3-12: Purchase frequency of beef by country of origin



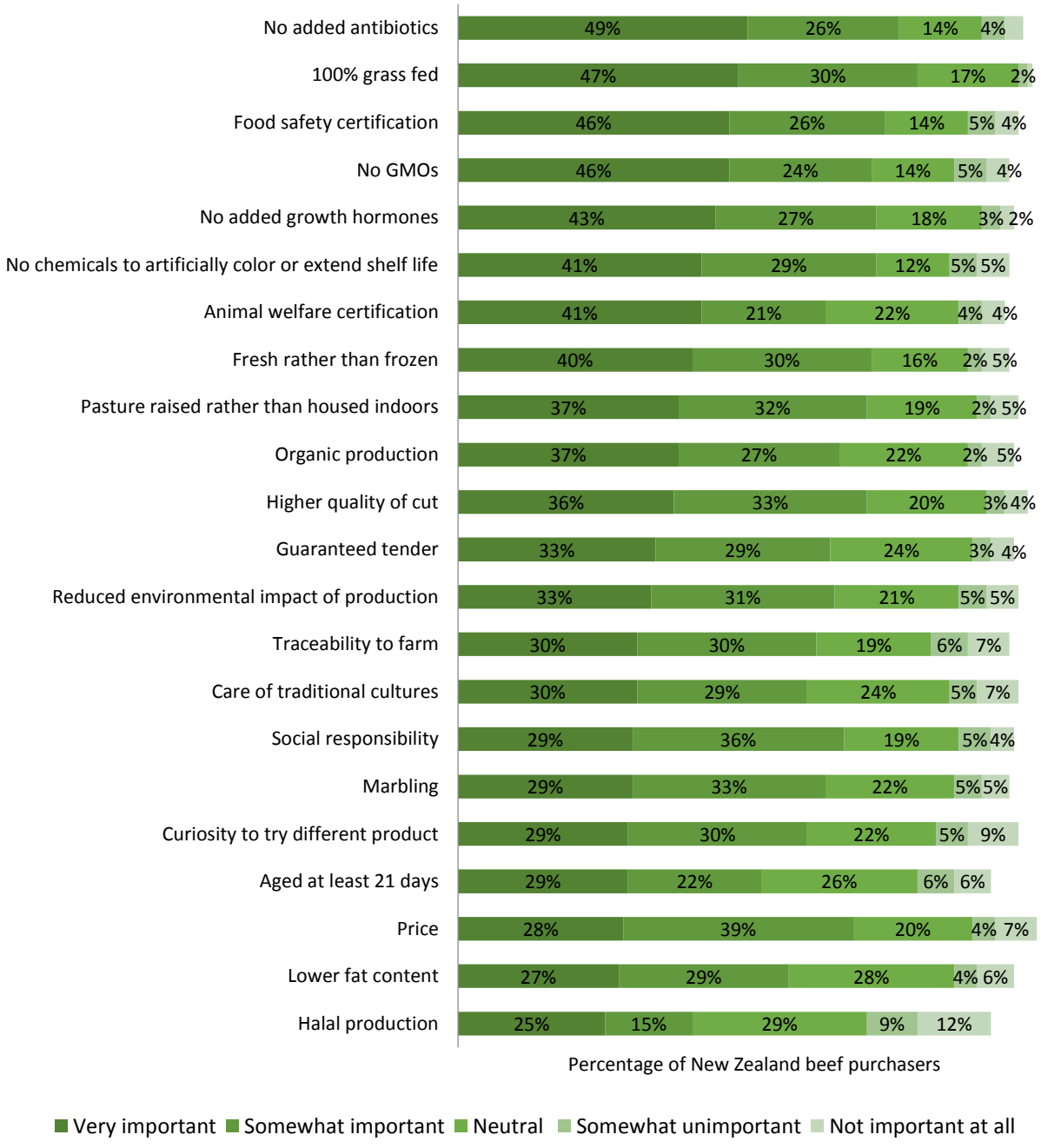
Participants who had purchased NZ products (n = 129, 15 per cent) were then asked to indicate which NZ beef products they purchased. These included various beef cuts (e.g. ground beef, ribeye steak, etc) as well as particular brands (e.g. Māori Lakes, Silver Fern Farms, etc). Results are presented in Figure 3-13. Ground beef was the most frequent NZ beef product purchased (28 per cent), followed by ribeye steak (26 per cent) and then top sirloin steak (19 per cent). Of the NZ brands, Māori Lakes and First Light waere the most frequently purchased NZ beef brands (7 per cent each).

Figure 3-13: New Zealand beef products purchased



Participants who had purchased NZ beef at least monthly were asked to indicate which reasons were important to them in their choice to purchase NZ beef. Results are shown in Figure 3-14. The three most important reasons were 'no added antibiotics' (75 per cent high importance/some importance), followed by '100% grass fed' (77 per cent high importance/some importance) and 'food safety' (72 per cent).

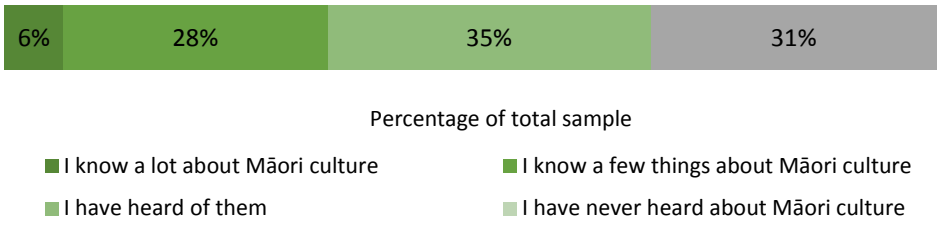
Figure 3-14: Reasons for purchasing New Zealand beef products



3.3 Māori culture and enterprise

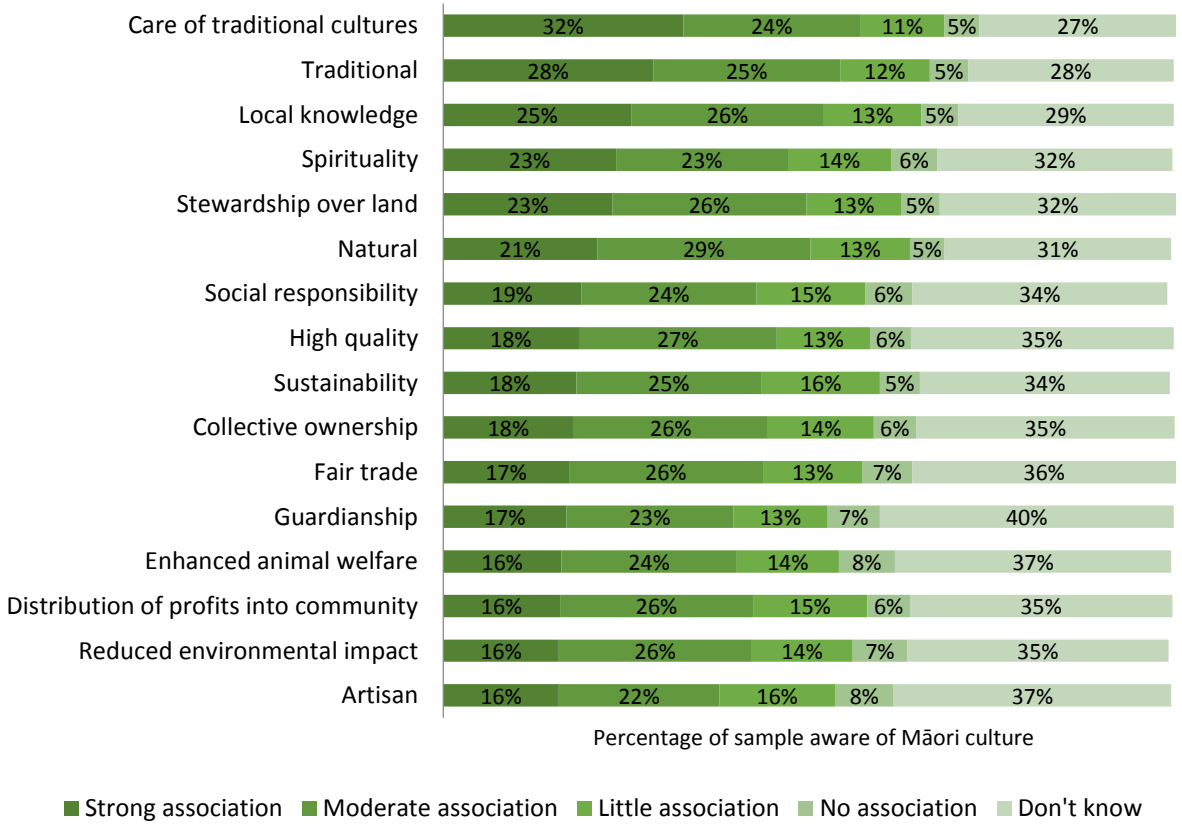
The survey examined participants' knowledge of Māori culture and what they associated with Māori enterprises. As shown in Figure 3-15 the majority of respondents had at least heard of Māori culture (69 per cent) and 28 per cent knew a few things about Māori culture.

Figure 3-15: Knowledge of Māori culture



Participants who knew at least a few things about Māori culture were asked to indicate which attributes that they associated with beef produced from a Māori enterprise (Figure 3-16) Results show that the most commonly frequently associated attributes include 'care of traditional cultures' (56 per cent strong association/ moderate association), 'traditional' (73 per cent strong association/moderate association), and 'local knowledge' (51 per cent strong association/moderate association).

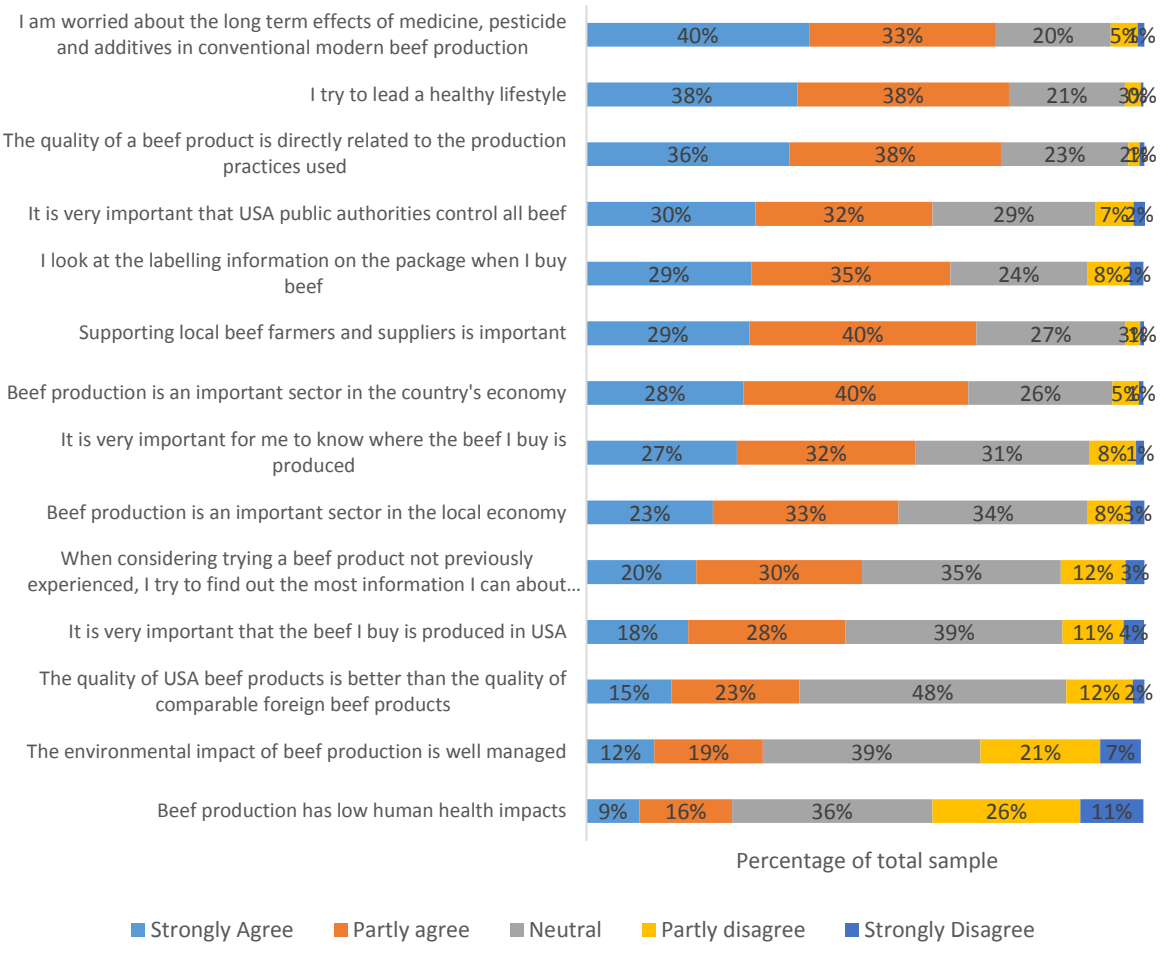
Figure 3-16: Attributes associated with beef produced from a Māori enterprise



3.4 Attitudes to beef production practices

Participants were asked to indicate their level of agreement with a series of statements concerning production practices, and associated personal health. These included statements regarding participants' views on the economic, environmental and social impact of production, availability of product information, and the relationship between beef consumption and health benefits (Figure 3-17). Results indicate a significant portion of consumers are concerned about production practices effect on the environment, product quality, and personal health. A majority are worried about the long term effects of medicine, pesticides and additives in conventional modern production (73 per cent agree/partly agree) which is consistent only one in four consumers thinking that beef production has low human health impacts. Likewise relatively few consumers think that the environmental impact of beef production is well managed (31 per cent agree/partly agree). Almost three-quarters of consumers agree that 'the quality of a beef product is directly related to the production practices used' (74 per cent agree/partly agree).

Figure 3-17: Agreement with statements relating to beef consumption and production practices

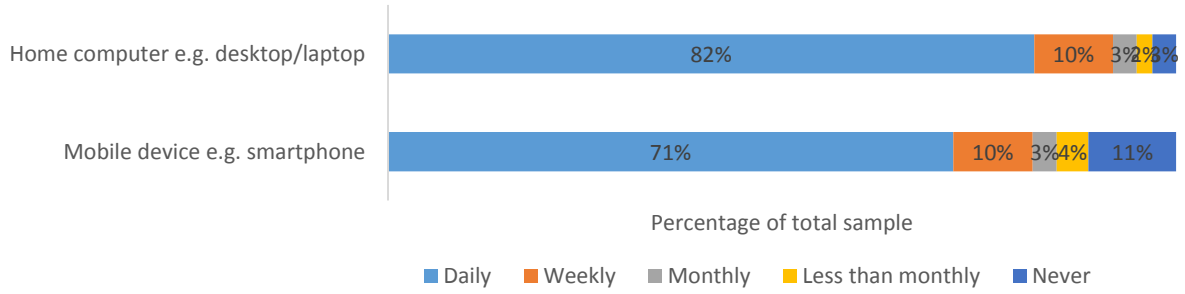


3.5 Digital media and smart technology use for beef

The survey also asked participants to describe the ways in which they used various forms of digital media and smart technology for finding information about and/or purchase beef products.

Participants were asked how often they access the Internet using mobile devices (e.g. smartphone) or home computers (e.g. desktop/laptop) (Figure 3-18). Most participants indicated that they used both home computers and mobile devices, with home computer use (92 per cent daily/weekly) more frequent than mobile device (81 per cent daily/weekly)

Figure 3-18: Internet access frequency



Following this, participants were asked to if they use particular digital media sources via home computer or mobile device for the purposes of finding inspiration on how to make meals with beef or to find out how a beef product is produced. Table 3-1 shows that, overall, digital media was used more for inspiration than for production information, and home computers used more frequently for both purposes.

In addition, digital media sources which were used the most in relation to finding inspiration included Google search (38 per cent), Food blogs (23 per cent), YouTube (20 per cent) and Facebook (18 per cent). In addition, respondents used Google search (28 per cent), YouTube (13 per cent), food blogs and Facebook (11 per cent each) more frequently for finding information on beef production.

Table 3-1: Use of online digital media or beef meal inspiration and production information

	Inspiration		How Produced	
	Home Computer	**Mobile Device**	**Home Computer**	**Mobile Device**
Google search	38%	22%	28%	16%
Food blogs	23%	12%	11%	7%
YouTube	20%	16%	13%	11%
Facebook	18%	15%	11%	8%
Food company web pages	16%	10%	12%	7%
Pinterest	15%	11%	7%	5%
Online retailer	14%	8%	10%	5%
Wikipedia	13%	8%	12%	7%
Instagram	10%	12%	6%	6%
Forums	9%	5%	7%	5%
Reddit	8%	6%	7%	4%
Twitter	8%	8%	6%	5%

Percentage of total sample

Participants were also asked, selecting all that applied, if a range of sources influenced them when searching for meal inspiration or production information. Results in Table 3-2 show that celebrity chefs (38 per cent) had the most influence on respondents' beef meal inspiration, followed by health professionals (30 per cent). Government information (29 per cent) and health professionals (28 per cent) have the greatest influence on respondents production information.

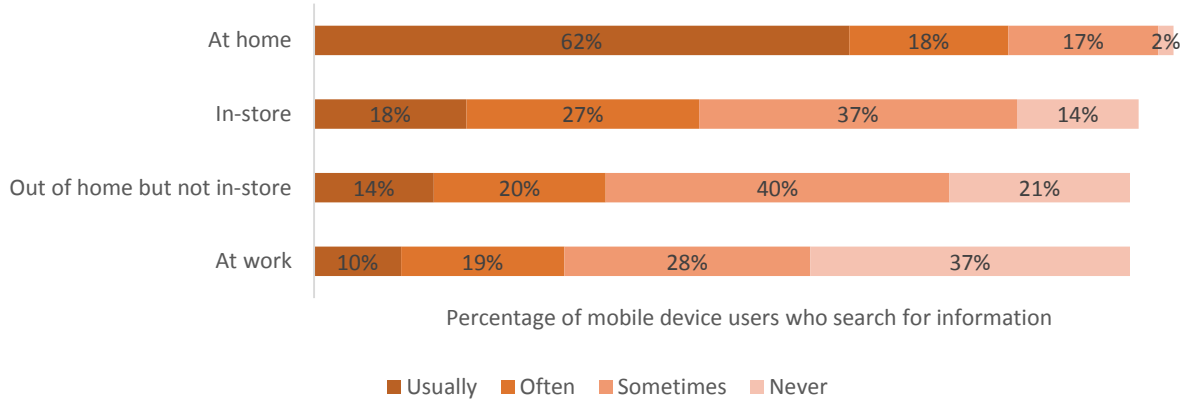
Table 3-2: Influences on beef meal inspiration and knowledge of production processes when searching for information about beef products

	Inspiration	How Produced
Celebrity chefs	38%	17%
Health professionals	30%	28%
Government information	17%	29%
International bodies (e.g. World Health Organization)	16%	22%
Non-government organizations (e.g. Greenpeace)	14%	19%
Industry marketing boards	13%	14%
Other celebrities	13%	8%
Sports celebrities	11%	8%

Percentage of total sample

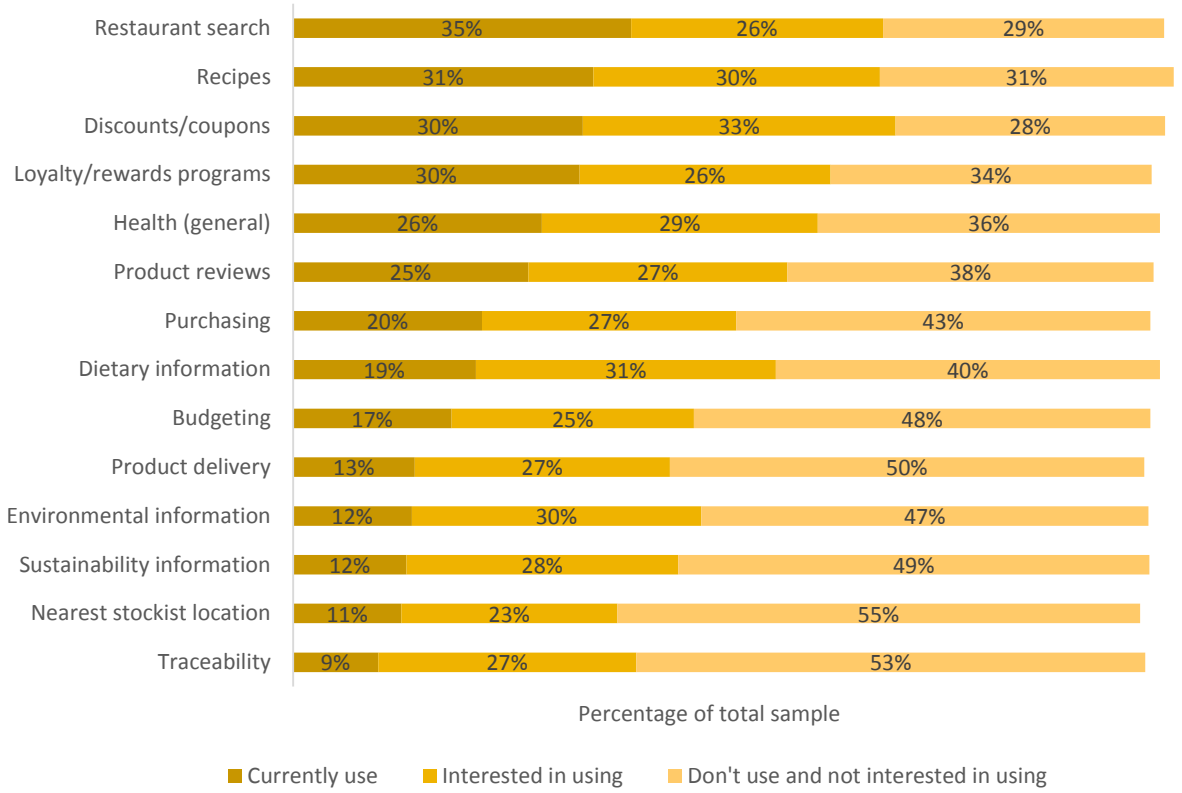
Participants who used mobile devices to search for inspiration or product information (Table 3-1, n = 421) were asked to indicate where they usually did this (Figure 3-19). Most mobile device use is happening at home (80 per cent usually/often) and there is a significant level in-store information searching (45 per cent usually/often).

Figure 3-19: Frequency and place of mobile device use to search for beef information or meal inspiration



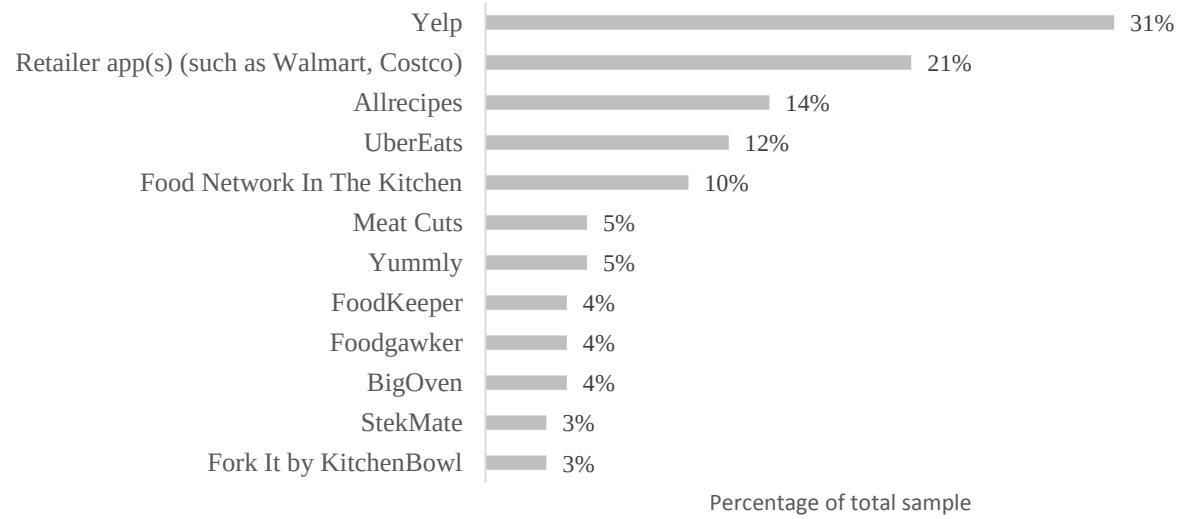
Participants were asked to indicate to what extent they had used mobile apps in relation to searching for beef information and purchasing reasons, stating whether they currently use these apps, are interested in using them, or don't use them and are not interested (Figure 3-20). Using apps to search for restaurants was the most commonly identified reason (35per cent currently use, 26 per cent interested in using). Followed by recipes (31 per cent currently use, 30 per cent interested in using) and then obtaining discounts/coupons (30 per cent currently use, 33 per cent interested in using). Overall, there appears to be a significant gap between interest and actual use.

Figure 3-20: Use of mobile apps beef information and purchasing



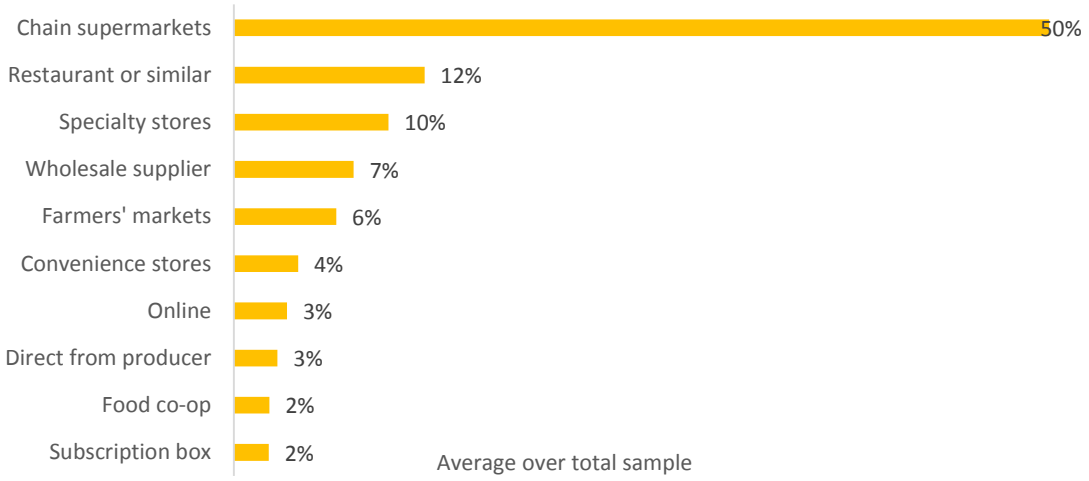
Participants were then asked which apps they used on their mobile device (Figure 3-21). The listed apps allow consumers to find information on products, purchase products and/or write product reviews. The most used app was Yelp (31 per cent), followed by retailer apps (21 per cent) and Allrecipes (14 per cent).

Figure 3-21: Use of food apps on mobile device



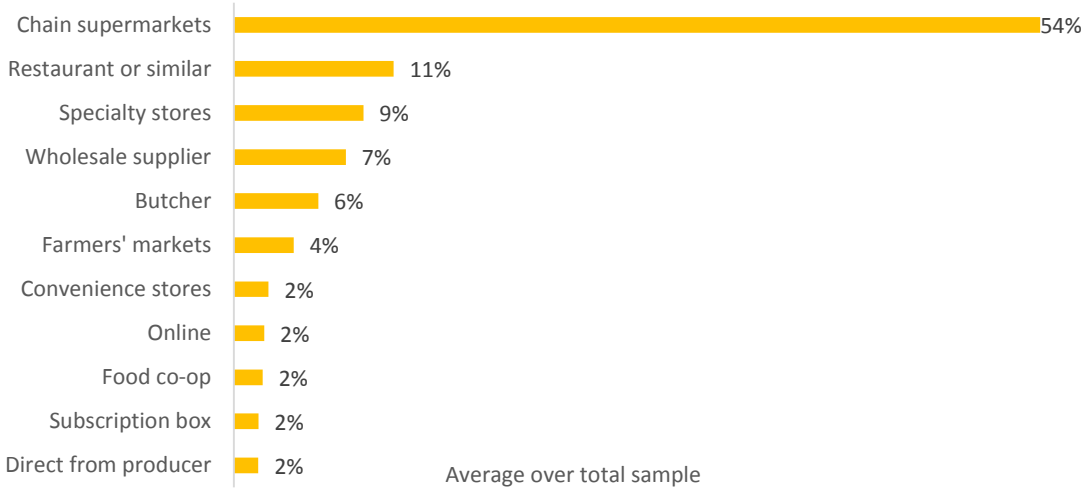
The survey also contained a series of questions designed to find out about participants' use of online shopping for food and beverage, and beef products. Firstly, participants were asked to indicate their percentage of expenditure across a series of retailer types for their usual food and beverage shopping (Figure 3-22). Chain supermarkets had the highest average expenditure (57 per cent), followed by restaurants or similar (12 per cent), specialty stores (12 per cent) and wholesale suppliers (7 per cent). Fourteen per cent of respondents shopped for food and beverage online, allocating on average 3 per cent of expenditure.

Figure 3-22: Use of retailer types for usual food and beverage shopping



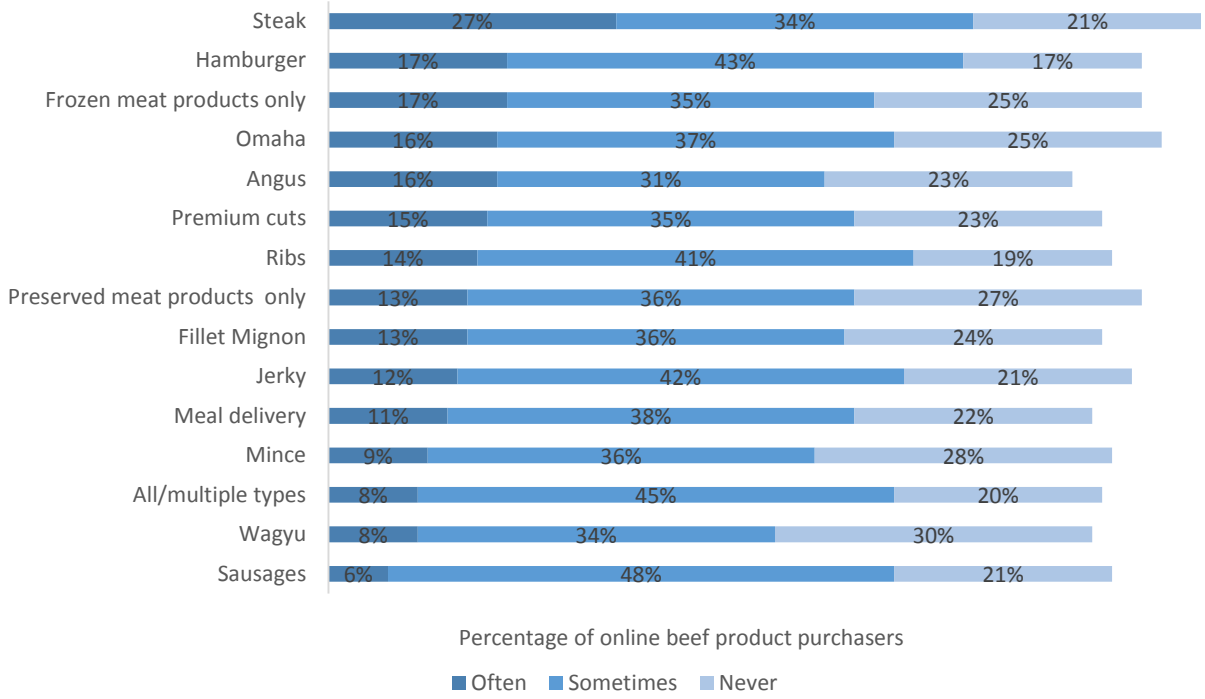
Following this, participants were asked to indicate the percentage of their usual beef expenditure across a series of retailer types. Results are presented in (Figure 3-23) with chain supermarkets also shown to have the highest average expenditure (54 per cent), followed by restaurants or similar (11 per cent), and specialty stores (9 per cent). An average of 2 per cent of expenditure was made online, with sixteen per cent of participants making some beef product purchases online.

Figure 3-23: Use of retailer types for usual beef products shopping



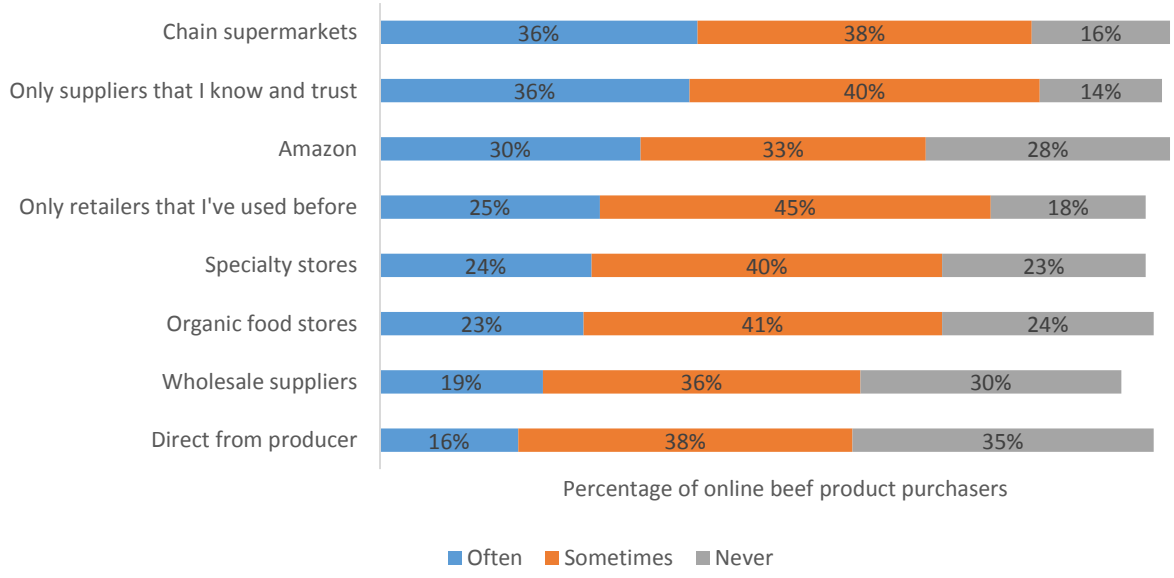
Participants who purchased beef online (n = 140) were asked to indicate what kind of beef they purchased online. Figure 3-24 shows that steak has the highest purchase frequency (61 per cent often/sometimes) followed by hamburger (60 per cent often/sometimes).

Figure 3-24: Frequency of online purchase of types of beef products



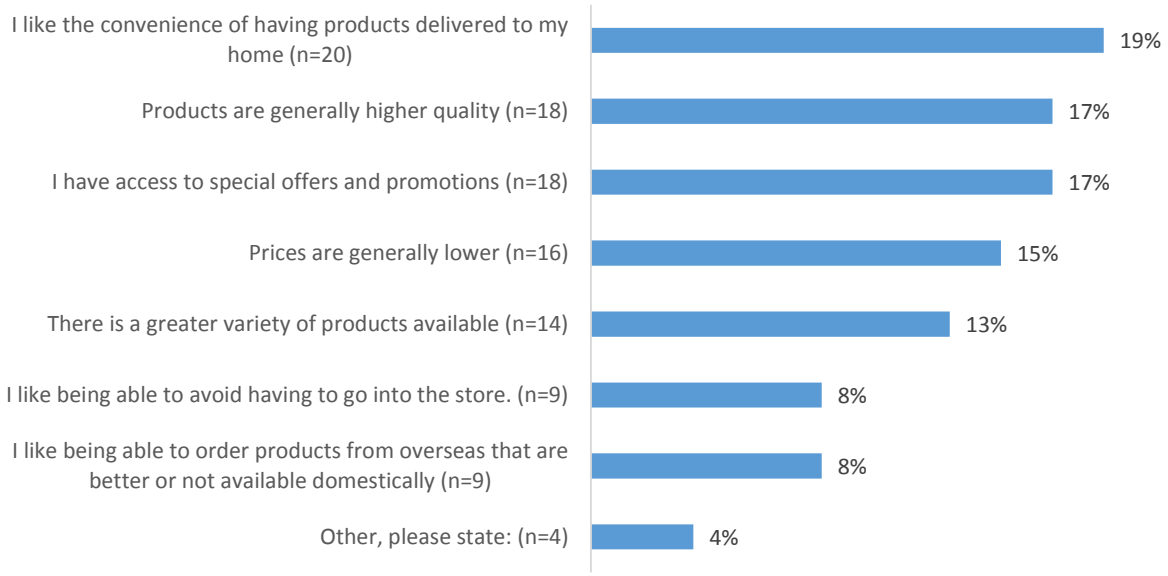
Participants who purchased beef online were asked to indicate which online retailers they used. As shown in Figure 3-25 chain supermarkets are the most popular online channel choice (74 per cent often/sometimes). Most participants used 'only suppliers that I know and trust' indicating that trust is an important consideration for online channels.

Figure 3-25: Types of suppliers used for making beef purchases online



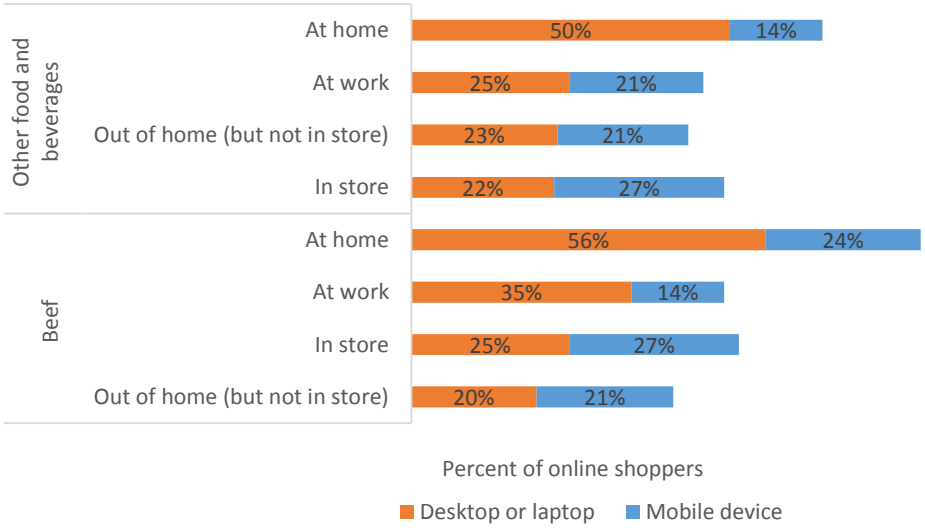
Participants who had purchased beef products online, were asked to indicate their main reason for shopping for beef products online. Results are presented in Figure 3-26. The most commonly stated reason was 'I like the convenience of having products delivered to my home' (19 per cent), followed by 'products are generally higher quality' (17 per cent), and 'I have access to special offers and promotions' (17 per cent).

Figure 3-26: Main reasons for shopping online for beef products



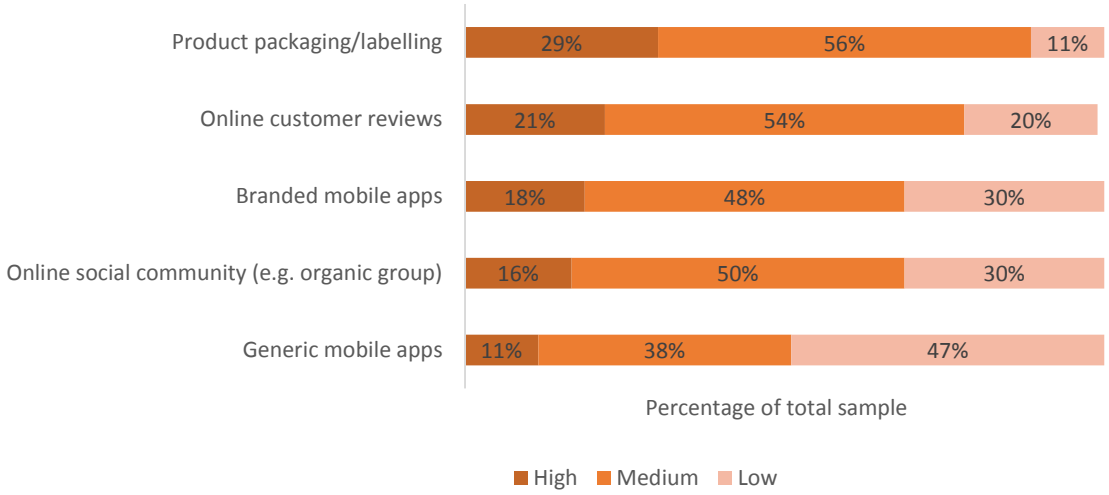
Participants who purchased beef and other food and beverages online were asked to indicate which devices they used, and in which locations, for the purpose of making purchases online. Results are presented in Figure 3-27 and show most online beef purchases were from home on desktop/laptop (56 per cent). Similarly, most online food and beverage purchases also occurred at home on desktop/laptop (50 per cent).

Figure 3-27: Online purchasing device and location



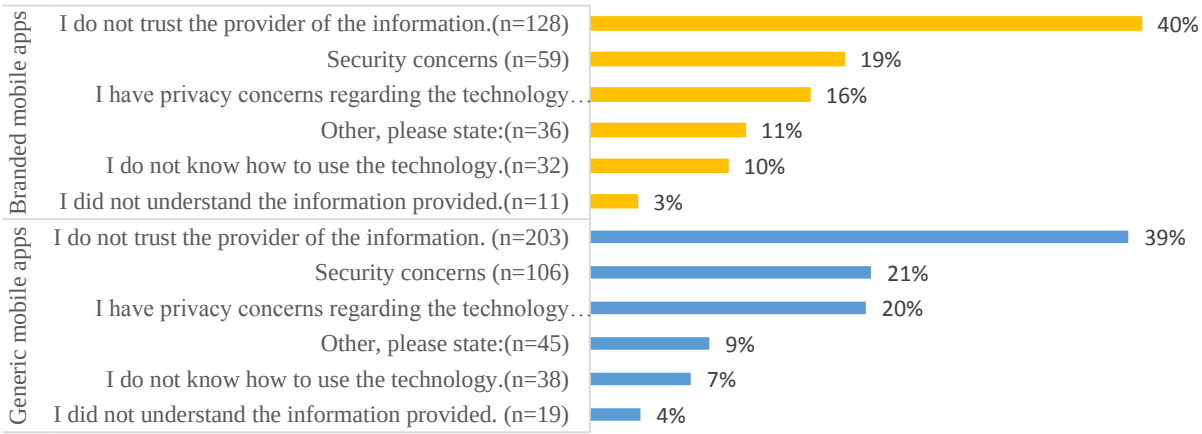
The next set of questions asked participants to consider trusted sources for either searching for information on or purchasing beef. Firstly, participants were asked the extent to which they trusted a series of sources when looking for information regarding beef products. Figure 3-28 shows that the most trusted source of beef product information was product packaging/labelling (85 per cent high/medium), followed by online customer reviews (75 per cent high/medium), and then branded mobile apps (66 per cent high/medium). Thirty-eight per cent of the participants had medium level of trust in generic mobile apps, whereas, forty-seven per cent of the participants had a low level trust in generic mobile apps.

Figure 3-28: Level of trust in sources of beef product information searching



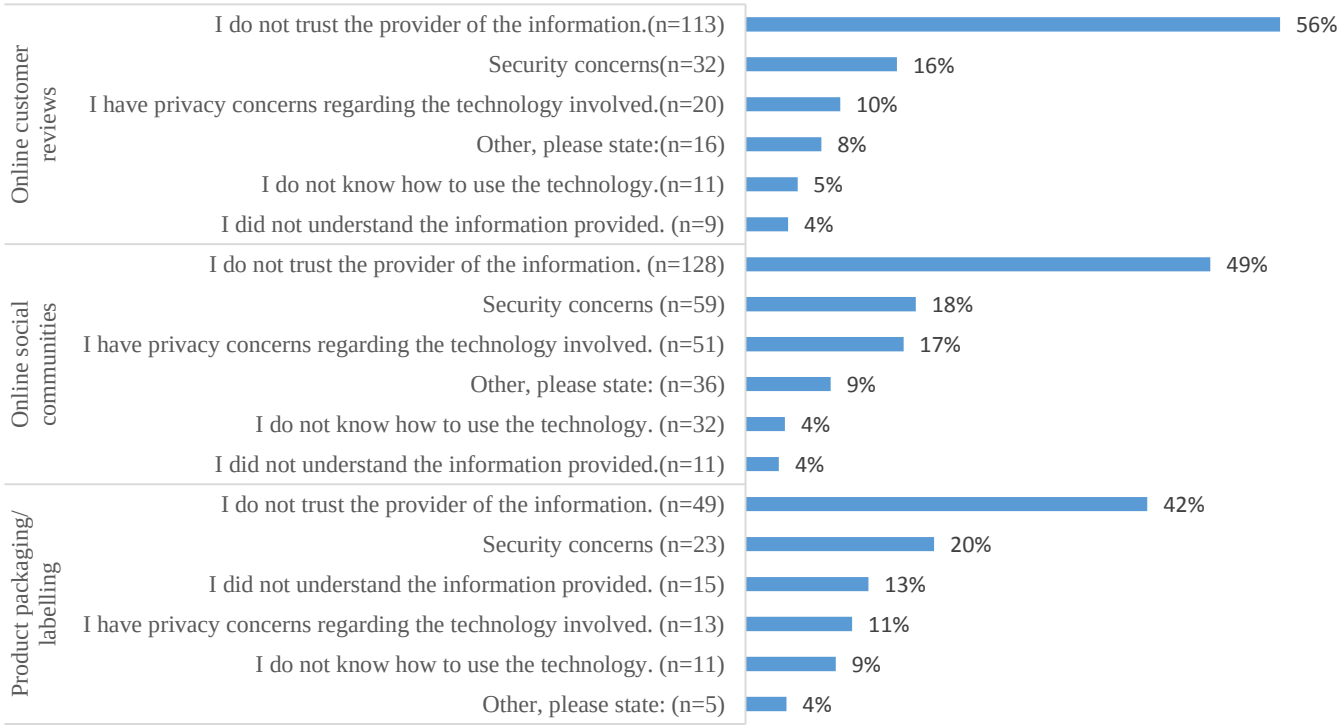
For participants, who had a low level of trust in generic mobile apps/branded mobile apps they were then asked the reasons why. Figure 3-29 shows that the most common stated reason for both sources was 'I do not trust the provider of the information', followed by 'security concerns' and 'I have privacy concerns regarding the technology'.

Figure 3-29: Main reasons for low trust in generic mobile apps/branded mobile apps in relation to searching beef product information



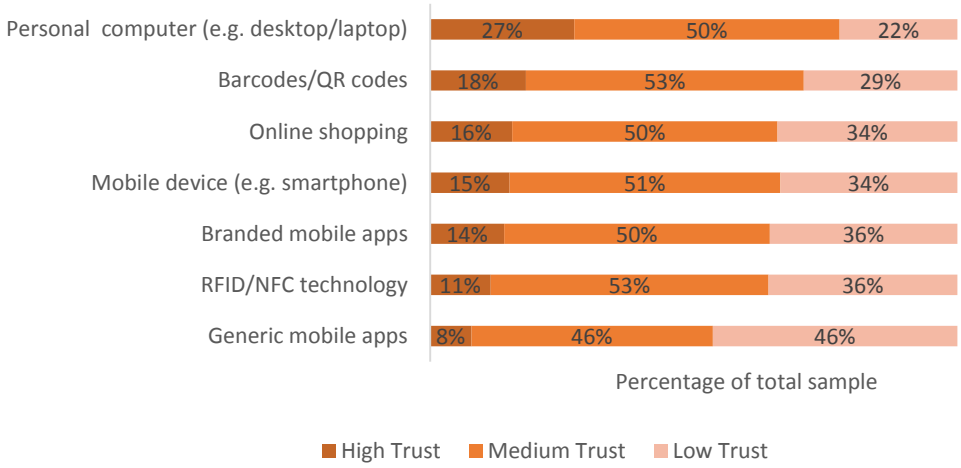
For participants, who a low level of trust in online social communities/online customer reviews/product packaging/labelling, were then asked why. Figure 3-30 shows that the most common reason for this was 'I do not trust the provider of the information', followed by 'security concerns', and then 'I have privacy concerns regarding the technology involved'.

Figure 3-30: Main reasons for low trust in product packaging/ labelling, online social communities and online customer reviews in relation to searching beef product information



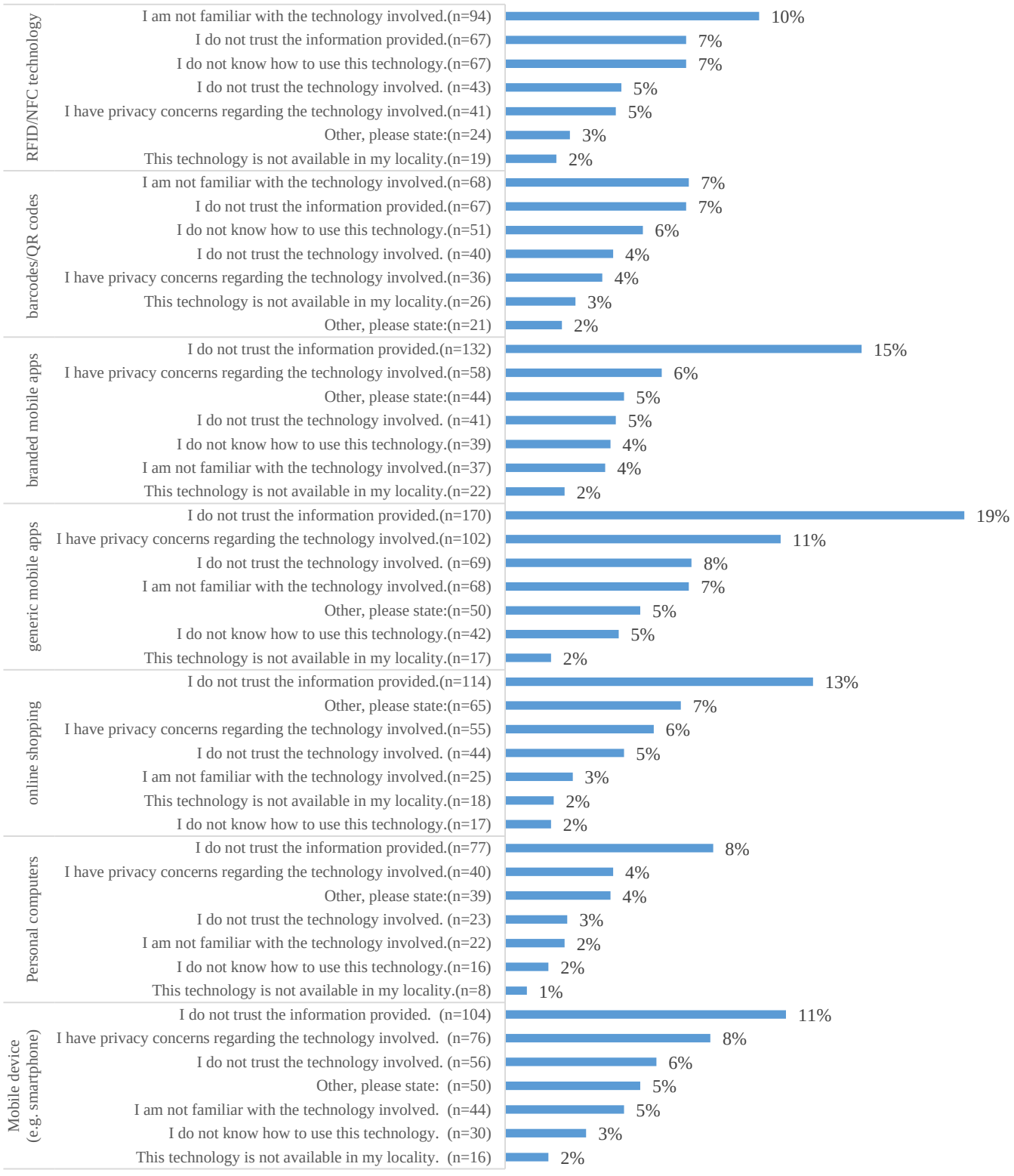
Participants were also asked the extent to which they trusted a provided range of sources for purchasing beef. Results are presented in Figure 3-31 and show participants top three trusted sources for beef product purchasing were personal computers (77 per cent high/medium), barcodes/QR codes (71 per cent high/medium) and then online shopping (66 per cent high/medium).

Figure 3-31: Level of trust for beef product purchasing



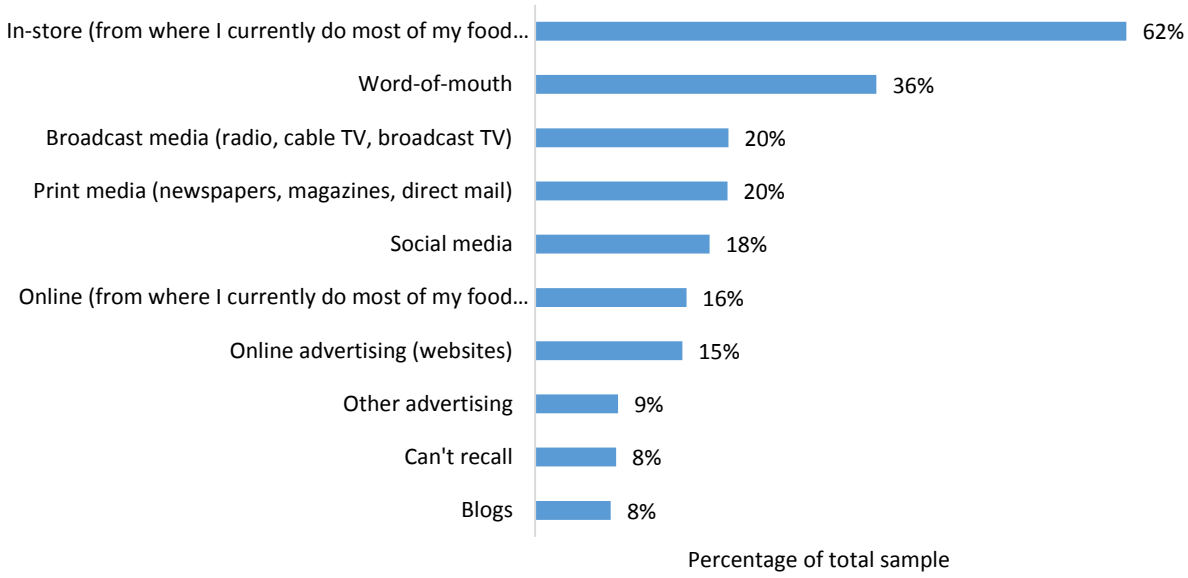
For participants, who had a low level of trust in the provided ranges of sources for beef product purchasing, they were asked why. Figure 3-32 shows that the most commonly stated reason relating to RFID/NFC technology and barcodes/QR codes was 'I am not familiar with the technology involved', followed by 'I do not trust the information provided'. In the case of low trust in branded mobile apps, online shopping, generic mobile apps, personal computers and mobile device, most participants' reason was because 'I do not trust the information provided'.

Figure 3-32: Main reasons for low trust in the ranges of sources for beef products purchasing



Finally, participants were asked how they usually found out or became aware of new beef products. Results are presented in Figure 3-33 and show ‘in-store (from where I currently do most of my food product shopping)’ was the most commonly identified source of information about or awareness of new beef products (62 per cent), followed by ‘word-of-mouth’ (36 per cent), and ‘broadcast media (radio, cable TV, broadcast TV)’ (20 per cent).

Figure 3-33: Sources of information about or awareness of new beef products



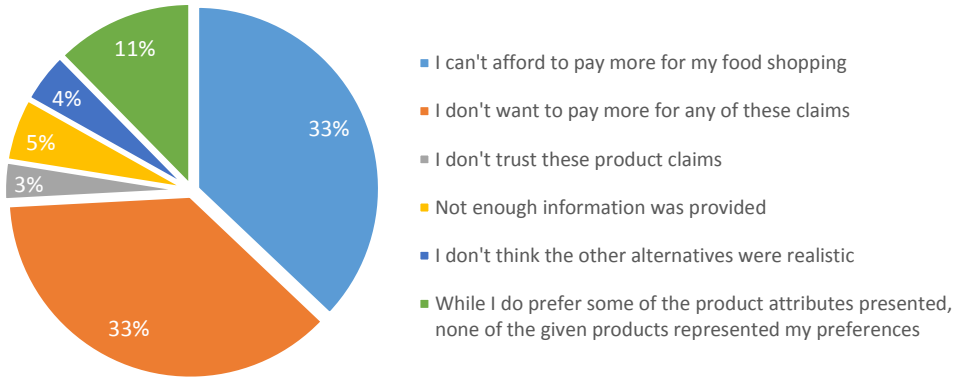
Chapter 4
Choice Experiment Analysis

This chapter presents the results of the choice experiment described in Chapter 2 designed to examine which selected credence attributes may influence consumers beef product choices. The attributes included in the choice experiment used to describe beef products were mainly focused around production practices and included:

- Animal feed
- Environmental sustainability
- Use of Antibiotics and hormones
- Traceability
- Social responsibility
- Product origin and processing location
- Use of GMO
- Animal housing
- Organic production
- Animal welfare
- Type of beef product
- Price per kg

Alternative beef products described by differing combinations of these attributes were presented to consumers who then indicated their preferred beef alternative in each scenario. The attributes associated with a respondents chosen beef alternative, and those from the non-chosen alternatives, were analysed using a Mixed Logit Error Components (MXLEC) model (see Appendix 2 for technical details). This type of model constitutes a standard contemporary methodology. When making choices, respondents may select the 'none of these' option in a choice set. This is usually a truthful indication of their *unwillingness to pay* for the beef and associated attributes presented to them in a particular choice set. One in four respondents chose the 'none of these' option in at least one choice set, with this option chosen 1,470 times in total (17 per cent of all choices (8,650) across the sample). Respondents who chose this option were asked a follow up question to ascertain their reasons (Figure 4-1).

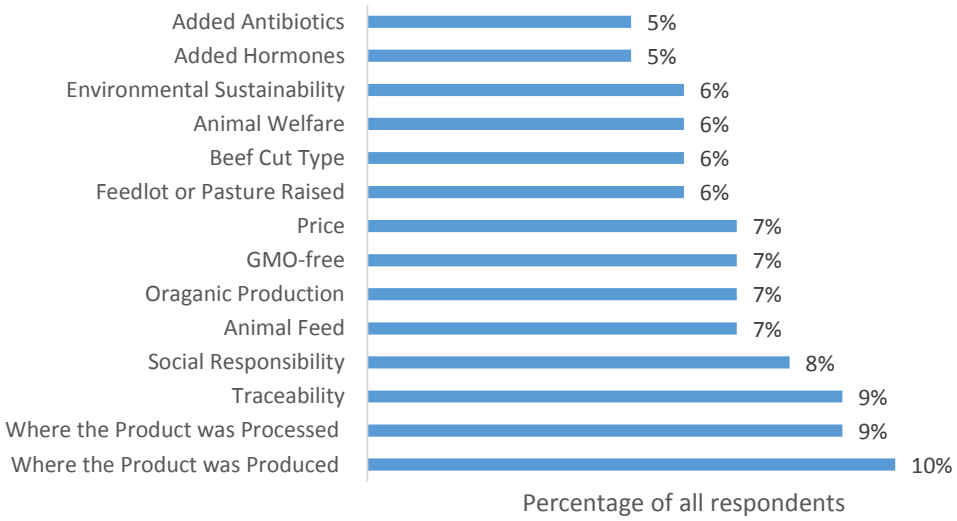
Figure 4-1: Reasons for choosing the "none of these' option in a beef choice set



An underpinning statistical assumption is that all the information that a respondent sees in a choice set has a role to play in determining their choice of beef option. If respondents ignore some of the attributes when

they select their preferred option, this assumption is weakened and requires further examination. Following each choice task, respondents were asked to indicate which, if any, of the beef attributes being considered did they ignore (Figure 4-2). We can see that each outcome is ignored to some degree. We test for any effect of this behavioral information analytically and find no improvement over the current model specification (Table 4-1).

Figure 4-2: Beef attributes ignored when selecting preferred beef options



By conventional econometric standards the model performs well (Table 4-1). All beef attributes are statistically significant, meaning that they are important factors in consumers choice of beef option. The model predicts how respondents choose a particular beef option based on the outcomes and costs associated with that option. The parameter estimates tell us how an attribute relates to the overall utility of consumers from the benefits they perceive from each attribute. The model generates a distribution for each random parameter (normal) with the mean and standard deviation of the distribution reported. A larger magnitude of the standard deviation of the distribution indicates a relatively larger degree of preference differences across respondents for that beef attribute outcome. For example, respondents have the most diverse preferences for selecting a beef option that is NZ raised and US processed (s.d. =0.605), meaning that some respondents will not want a NZ raised US processed beef while others have strong positive preference for this beef. Estimated parameters indicate that respondents are more likely to choose a beef option that is produced in the US, while they are less likely to choose beef options imposing greater prices. Overall, consumers in the sample preferred beef that that contained the attributes on offer, and lower priced options, and on average did not prefer grain fed, feed lot raised, Australian beef. Other findings include that consumers are more likely to select one of the beef options presented than the 'opt-out' option. Older, or female respondents were more likely to select the opt-out alternative, while those who eat more meals containing beef, purchased beef more frequently, or purchased several different cuts of beef, were less likely to choose the opt-out alternative.

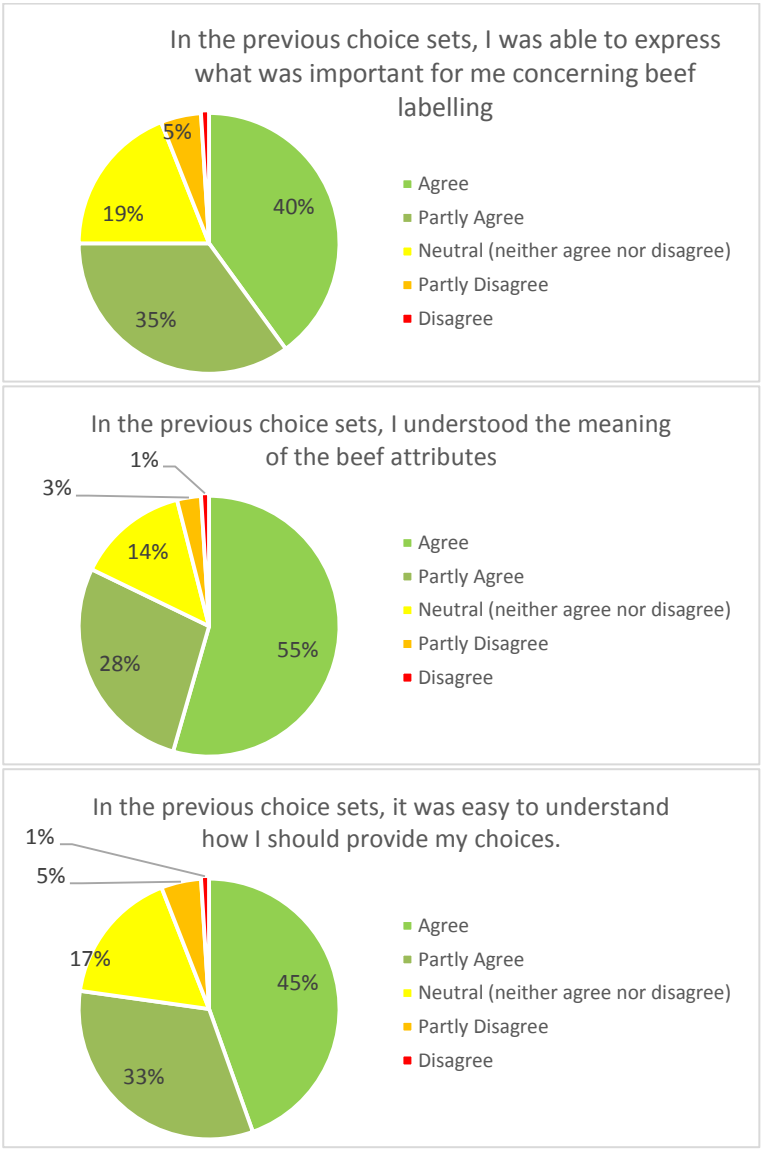
Table 4-1: Mixed Logic Error Component model of beef choices

	Parameter mean estimates[1]		Standard deviation of random parameters	
Random parameters in utility function				
100% Grass-fed	0.2843***	(0.06)	0.537***	(0.05)
Grain-fed	-0.0582*	(0.03)	0.058**	(0.03)
No added Antibiotics	0.0767*	(0.04)	0.413***	(0.05)
No Added Hormones	0.1265***	(0.02)	0.077	(0.06)
Traceability	0.0515**	(0.02)	0.032	(0.07)
Social Responsibility	0.1153***	(0.02)	0.115***	(0.02)
GMO-Free	0.1164***	(0.02)	0.071	(0.05)
Feed-lot Raised	-0.1290***	(0.05)	0.385***	(0.06)
100% Pasture Raised	0.2309***	(0.03)	0.231***	(0.03)
Organic	0.1833***	(0.03)	0.397***	(0.03)
Enhanced Animal Welfare	0.1193***	(0.02)	0.022	(0.06)
Environmentally Sustainable	0.0595***	(0.02)	0.056	(0.06)
U.S. Raised and Processed	0.1757***	(0.04)	0.195**	(0.09)
N.Z. Raised, U.S. Processed	0.1599**	(0.08)	0.605***	(0.08)
N.Z. Raised and Processed	0.1783***	(0.06)	0.457***	(0.06)
Australian Raised, U.S. Processed	-0.2067***	(0.05)	0.271***	(0.07)
Price/kg of Ground Beef	-0.2395***	(0.01)	0.103***	(0.01)
Price/kg of Top Sirloin Steak	-0.2183***	(0.00)	0.058***	(0.00)
Price/kg of Ribeye Steak	-0.1498***	(0.00)	0.048***	(0.00)
Opt-out 'none of these'	-3.5339***	(0.51)	0.566**	(0.23)
Ground beef alternative	1.8508***	(0.07)	1.851***	(0.07)
Ribeye beef alternative	1.0282***	(0.11)	1.028***	(0.11)
Age	-0.5093***	(0.08)	0.134**	(0.05)
Gender	-0.7475**	(0.29)	2.199***	(0.31)
Meals eaten	0.2809***	(0.06)	0.211***	(0.05)
Purchase frequency	0.3381**	(0.16)	0.226***	(0.08)
Purchase count	0.2049***	(0.07)	0.168***	(0.05)
Latent Random Effects of non-opt-out alternatives				
Standard Deviation	2.5901***	(0.19)		
Model Fit Statistics				
Log Likelihood function	8,634			
Log Likelihood chi^2 stat (25 df)	6,713***			
McFadden Pseudo R^2	0.278			
Number of observations	8,650			

***, **,* denote statistical significance at the 1 per cent, 5 per cent and 10 per cent levels respectively for the null hypothesis that a parameter estimate is not significantly different from zero.
Standard errors in brackets.
[1] Parameter mean estimates indicate the estimated average value in the model, for each different parameter.

Debriefing questions following the choice tasks demonstrate that, overall, respondents were able to express what was important to them in beef labelling, that they understood the meaning of the beef attributes, and were able to complete the choice task (Figure 4-3).

Figure 4-3: Beef choice task debriefing: ability to express importance, understanding of attributes meaning, understanding of choice task exercise



4.1 Consumer willingness-to-pay for credence attributes

Applying model estimates (Table 4-1) and equation 1.10 (Appendix 2 Statistical Method) generates estimates of respondents WTP for attributes of beef products (Table 4-2;

Figure 4-4;

Figure 4-5). WTP is an estimate of how much money a respondent would be willing to give up for a change in the relevant beef attribute, and is calculated using the ratio of an attribute parameter and the cost parameter. The estimates of WTP are presented as median values, this means that half of the survey respondents are WTP at least this amount, while the other half are WTP less than this amount.

These are estimated separately for the three cuts of beef used in the CE (ground beef, top sirloin steak, and ribeye steak). We can see that the highest premiums over the three cuts are for beef produced '100% grass-fed' ($US2.46/lb., $US2.72/lb. and $US4.05/lb. respectively) followed by '100% pasture raised' ($US2.00/lb., $US2.18/lb. and $US3.29/lb. respectively) and organically produced beef ($US1.70/lb., $US1.80/lb. and $US2.60/lb. respectively). While overall, consumers did not prefer beef options that were grain-fed, the loss of value is relatively small (($US-0.51/lb., $US-0.53/lb. and $US-0.83/lb. respectively). However the loss to the average consumer of feed-lot raised beef is significantly larger ($US-1.13/lb., $US-1.22/lb. and $US-1.65/lb. respectively). Compared to the average price of a pound of beef used in the choice experiment, consumers are WTP a 35 per cent premium for '100 per cent pasture raised' ground beef, 15 per cent more for top sirloin steak, and 23 per cent more for ribeye steak (Figure 4-5).

Country-of-origin also plays an important role in beef consumer choices. The results show that consumers are WTP a premium for NZ raised and processed ground beef ($US1.54/lb., $US1.71/lb. and $US2.54/lb. for each of the three cuts respectively). These are the same, or marginally higher, than values for USA produced beef products. The estimates of WTP for Australian raised and the US processed beef products were negative suggesting that consumers preferred the USA and NZ country-of-origin options over an Australian product. However, the results may obscure segments of the sample that have positive WTP for Australian beef that could be identified with further analysis. Compared to the average price of a pound of beef, respondents were WTP 22 per cent more for NZ raised and processed ground beef, 10 per cent more for NZ raised and processed top sirloin steak, and 11 per cent more for NZ raised and processed ribeye steak, respectively.

The lowest positive WTP is for traceability, and environmentally sustainable production. The results show that consumers were WTP a premium for traceability of $0.45 (6 per cent) for ground beef, $0.49 (3 per cent) for top sirloin steak, and $0.74 (4 per cent) for ribeye steak. And a premium for environmentally sustainable production of $0.52 (7 per cent) for ground beef, $0.57(per cent) for top sirloin steak, and $0.85 (4 per cent) for ribeye steak.

Table 4-2: Beef consumers' willingness-to-pay for selected beef attributes

Attributes	Ground Beef	Top Sirloin	Ribeye Steak
100% Grass-fed	2.46 [35] (1.12,4.17)	2.72 [15] (1.31,4.35)	4.05 [23] (1.90,6.67)
Grain-fed	-0.51 [7] (-0.57,-0.42)	-0.55 [3] (-0.65,-0.44)	-0.83 [5] (-0.96,-0.67)
No added Antibiotics	0.71 [9] -0.24,1.82	0.88 [4] (-0.28,1.86)	1.08 [5] (-0.42,2.87)
No Added Hormones	1.13 [16] (0.99,1.25)	1.20 [7] (1.12,1.29)	1.80 [8] (1.66,1.98)
Traceability	0.45 [6] (0.40,0.51)	0.49 [3] (0.46,0.53)	0.74 [4] (0.68,0.81)
Social Responsibility	1.00 [14] (0.66,1.43)	1.09 [6] (0.75,1.48)	1.64 [7] (1.11,2.27)
GMO-Free	1.01 [14] (0.91,1.15)	1.11 [6] (1.04,1.19)	1.67 [7] (1.53,1.83)
Feed-lot Raised	-1.13 [16] (-1.79,-0.27)	-1.22 [7] (-2.05,-0.32)	-1.65 [8] (-3.02,-0.47)
100% Pasture Raised	2.00 [29] (1.33,2.87)	2.18 [12] (1.51,2.96)	3.29 [14] (2.23,4.55)
Organic	1.72 [23] (0.64,2.81)	1.82 [10] (0.72,2.89)	2.60 [11] (1.04,4.44)
Enhanced Animal Welfare	1.04 [15] (0.93,1.18)	1.13 [6] (1.06,1.22)	1.70 [7] (1.56,1.87)
Environmentally Sustainable	0.52 [7] (0.46,0.59)	0.57 [3] (0.53,0.61)	0.85 [4] (0.78,0.93)
U.S. Raised and Processed	1.52 [22] (0.97,2.23)	1.68 [9] (1.12,2.32)	2.51 [11] (1.64,3.56)
N.Z. Raised, U.S. Processed	1.38 [20] (0.01,3.12)	1.54 [9] (0.04,3.26)	2.28 [10] (0.04,5.00)
N.Z. Raised and Processed	1.54 [22] (0.46,2.92)	1.71 [10] (0.55,3.05)	2.54 [11] (0.79,4.68)
Australian Raised, U.S. Processed	-1.80 [26] (-2.16,-1.34)	-1.96 [11] (-2.46,-1.40)	-2.96 [12] (-3.63,-2.13)

Note: $US 2017 Median WTP/lb (25th and 75th percentiles in round brackets)
WTP as per cent of average price used in choice experiment in square brackets

Figure 4-4: Willingness-to-pay for selected beef attributes

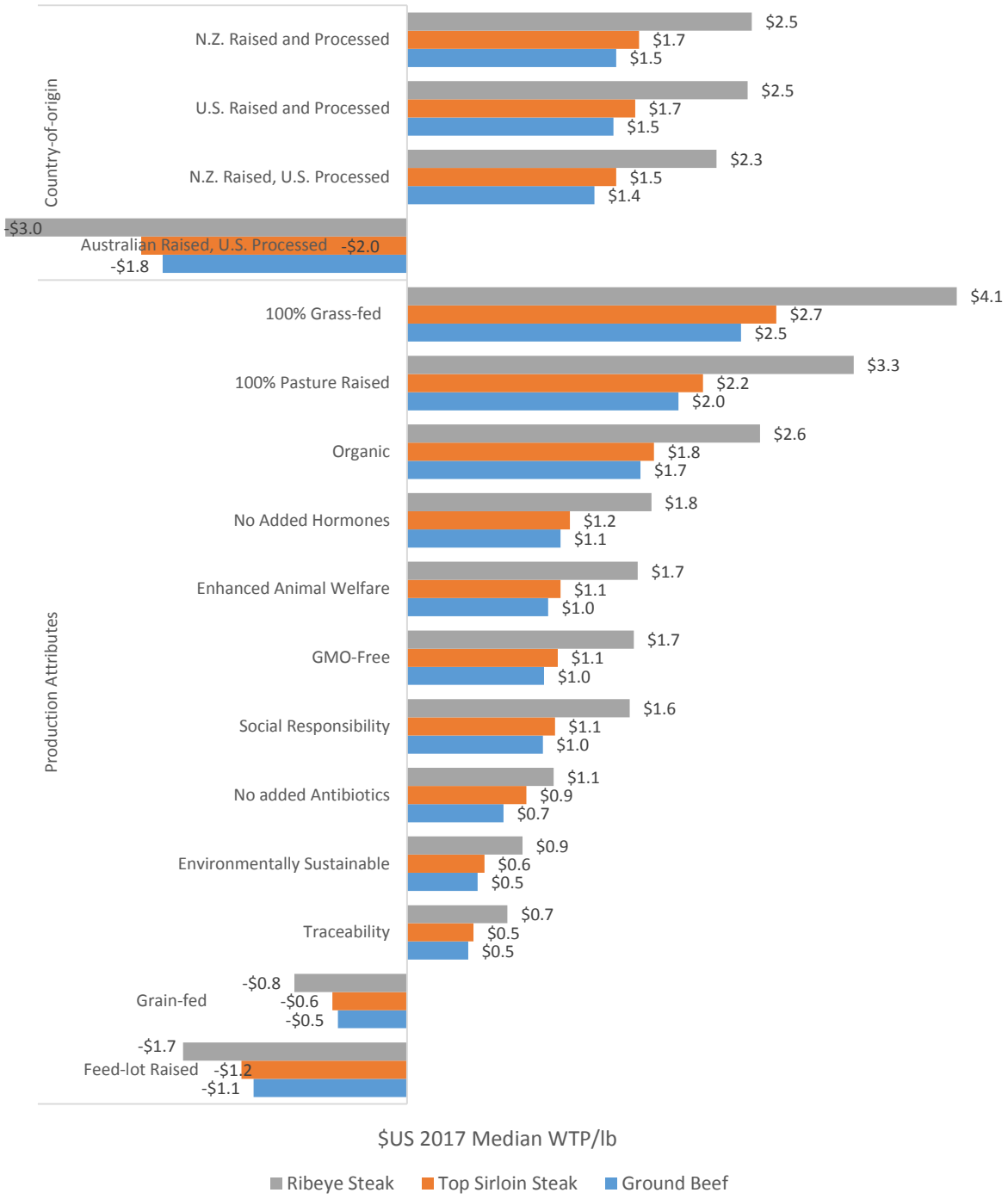
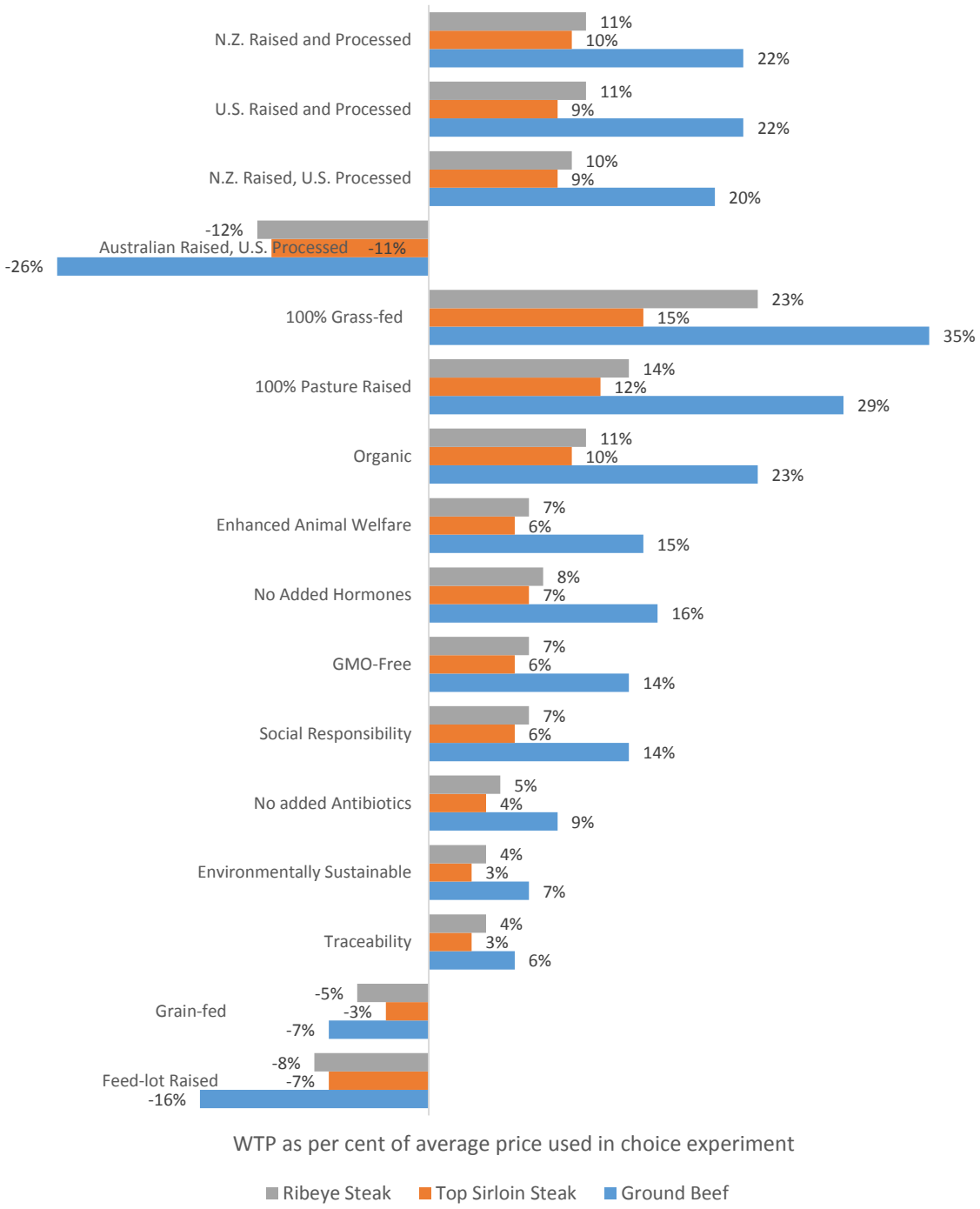


Figure 4-5: Willingness-to-pay as percentage of average beef price



Chapter 5
Conclusion

Beef exports are an important export New Zealand. The USA has been the main destination for New Zealand beef exports with approximately 50 per cent of New Zealand's beef exported to the USA. The value of New Zealand's beef exported to the USA was NZ$468 million in 2018 (year ended February).

This research presents the results from a survey of 874 California beef consumers to examine consumer preferences and behaviour in purchasing and consumption beef and their knowledge of New Zealand and its Māori culture, and use of digital media and technologies especially relating to finding information about beef products and production, as well as purchasing beef. The research also estimates consumer WTP for attributes associated with beef.

Californian consumer beef consumption and purchasing habits

The findings of this report show that ground beef was the most frequently purchased beef product (73 per cent), followed by ribeye steak (31 per cent) and beef jerky (27 per cent). When purchasing ground beef, consumers were asked did they usually purchase the product with a number of properties. The results showed that the highest percentage purchased ground beef with the properties of 'no added hormones' (40 per cent), 'no added antibiotic's (39 per cent) and '100 per cent grass fed' (34 per cent). Forty-three per cent of participants usually paid $US3/lb to $US4/lb for ground beef and 32 per cent paid $US5/lb to $US6/lb.

When purchasing top sirloin steak, consumers usually purchased products with the properties of 'no added antibiotics' (41 per cent), 'no added hormones' (39 per cent) and '100 per cent grass fed' (37 per cent). Thirty-seven per cent of consumers usual spend on top sirloin steak was $US4/lb to $US6/lb and 32 per cent paid $US7/lb to $US9/lb.

When purchasing ribeye steak, participants usually purchased products with the properties of 'non-added hormones' (40 per cent), 'no added antibiotics' (39 per cent), and then '100 per cent grass fed' (31 per cent). Thirty-seven per cent of consumers usual spend on ribeye steak was $US5/lb to $US8/lb, followed by 31 per cent of consumers usually spending $US9/lb to $US12/lb.

The most common consumption patterns are 2 meals (23 per cent) and 3 meals containing beef in a week (22 per cent). Daily consumption or higher is significant at 17 per cent of respondents. Only 7 per cent had not personally prepared a meal containing beef, while the largest group prepared 2 meals in a typical week (23 per cent). Almost a quarter of consumers personally prepared five meals or more weekly (23 per cent).

Californian consumer attitudes to beef products

The US was the most commonly identified country-of-origin for beef products (78 per cent), followed by Australia (21 per cent) and then New Zealand (20 per cent). US beef was the most frequently purchased beef (45 per cent weekly, and 21 per cent monthly), followed by New Zealand beef (4 per cent weekly, and 5 per cent monthly).

The most frequently purchased New Zealand beef product was ground beef (28 per cent), followed by ribeye steak and top sirloin steak (26 per cent each). The most important reasons in the choice to purchase New Zealand beef products are 'no added antibiotics' (75 per cent high importance/some importance) and '100 per cent grass fed' (77 per cent high importance/some importance).

Californian consumer knowledge of Māori culture and enterprise

The results of this report show that many of the respondents had heard or knew about Māori culture, with 35 per cent of the respondents had heard of Māori culture, and 28 per cent of the respondents knew a few things about Māori culture.

Respondents stated the most associated attributes with beef produced from a Māori enterprise included 'care of traditional cultures' (56 per cent strong association/moderate association), 'traditional' (53 per cent strong association/moderate association), and 'local knowledge' (51 per cent strong association/moderate association).Respondents also indicated that 'spirituality' (46 per cent strong association/moderate association), 'stewardship over land' (49 strong association/moderate association), and 'natural' (50 per cent strong association/moderate association) were also important attributes associated with beef produced from a Māori enterprise.

Californian consumer attitudes to beef consumption and production practices

Results indicate a significant portion of consumers are concerned about production practices effect on the environment, product quality, and personal health. A majority are worried about the long term effects of medicine, pesticides and additives in conventional modern production (73 per cent agree/partly agree) which is consistent only one in four consumers thinking that beef production has low human health impacts. Likewise relatively few consumers think that the environmental impact of beef production is well managed (31 per cent agree/partly agree). Almost three-quarters of consumers agree that 'the quality of a beef product is directly related to the production practices used' (74 per cent agree/partly agree).

In addition, most participants also agreed with 'It is very important that USA public authorities control all beef' (62 per cent agree/partly agree) and 'I look at the labelling information on the package when I buy beef'.

Californian consumer WTP for selected beef attributes

The WTP results are presented separately for the three cuts of beef: ground beef, top sirloin steak and ribeye steak. The results of the report show that country-of-origin and production attributes are important attributes in consumers' beef choices. Consumers were willing to pay a premium of:

- $US1.54/lb (22 per cent) for New Zealand raised and processed ground beef, followed by $US1.52/lb (22 per cent) for the US raised and processed ground beef;
- $US1.71/lb (10 per cent) for New Zealand raised and processed top sirloin steak, followed by $US1.68/lb (9 per cent) for the US raised and processed top steak;
- $US2.54/lb (11 per cent) for New Zealand raised and processed ribeye steak, followed by $US2.51 (22 per cent) for the US raised and processed ribeye steak.

The highest premium over the three cuts are for beef produced '100% grass-fed' at $US2.50/lb. for ground beef, $US2.70/lb. for top sirloin steak and $US4.10/lb. for ribeye steak. Correspondently, consumers were willing to pay 35 per cent, 15 per cent and 23 per cent more for ground beef, top sirloin steak and ribeye steak produced '100% grass-fed'.

The second and third highest premiums were for beef produced '100% pasture raised' and organic production. The results show that consumers were willing to pay for:

- 100% pasture raised production at $US2.00/lb (29 per cent) more for ground beef, $US2.18/lb (12 per cent) more for top sirloin steak, and $US3.29/lb (14 per cent) more for ribeye steak.
- Organic production at $US1.82/lb (23 per cent) more for ground beef, $US1.72/lb (10 per cent) more for top sirloin steak, and $US2.60/lb (11 per cent) more for ribeye steak.

The lowest positive WTP is for traceability, and environmentally sustainable production. Consumers were willing to pay for:

- Traceability at $US0.45/lb (6 per cent) for ground beef, $US0.49/lb (3 per cent) for top sirloin steak, and $US0.74/lb (4 per cent) for ribeye steak;
- Environmentally sustainable production at $US0.52/lb (7 per cent) for ground beef, $US0.57/lb (3 per cent) for top sirloin steak, and $US0.85/lb (4 per cent) for ribeye steak.

Californian consumer's use of digital media and technology in relation to finding information about and/or purchasing beef

Most participants indicated that they used both home computers and mobile devices, with home computer use (92 per cent daily/weekly) more frequent than mobile device (81 per cent daily/weekly).

Respondents used digital media sources (either home computers or mobile devices) more frequently for inspiration for meals with beef than for finding beef production information and more of the respondents used home computers for both purposes.

In terms of searching for inspiration on meals with beef**,** Google search (38 per cent), Food blogs (23 per cent), YouTube (20 per cent) and Facebook (18 per cent) were used more frequently for this purpose. Respondents used Google search (28 per cent), YouTube (13 per cent), food blogs and Facebook (11 per cent each) more frequently for finding information on beef production. In addition, celebrity chefs (38 per cent) had the most influence on respondents' inspiration for beef meals, followed by health professionals (30 per cent), and then government information (17 per cent).

When finding the information on how beef product is produced, government information (29 per cent), health professionals (28 per cent) and non-government organizations (19 per cent) were the top three influences for respondents.

Respondents most frequently used their mobile device at home to search for inspiration on beef meals and beef production information. The main reasons of using mobile device for beef product information or inspiration on beef meals were restaurant searching (35 per cent currently use, 26 per cent interested in using), recipes (31 per cent currently use, 30 per cent interested in using) and obtaining discount/coupons (30 per cent currently use, 33 per cent interested in using). The most used food apps on participants mobile devices was Yelp (31 per cent), followed by retailer apps (21 per cent), and then Allrecipes (14 per cent).

Respondents indicated their usual food and beverage shopping retailers were chain supermarkets (57 per cent), wholesale supplier (21 per cent) and then specialty stores (20 per cent). Online was the least used retailer type for usual food and beverage shopping (14 per cent). Chain supermarkets (63 per cent), wholesale suppliers (28 per cent) and then specialty stores (26 per cent) were usually used for respondents' beef products shopping. Sixteen per cent of the participants shopped for beef products online.

The most frequent online purchased beef products were steak (61 per cent often/sometimes), frozen meat products only (52 per cent often/sometimes), and hamburger (60 per cent often/sometimes). The frequently used online suppliers for making beef product purchasing included 'only retailers that I've used before", 'only suppliers that I know and trust', 'chain supermarkets' and 'Amazon'.

The main reasons for respondents shopping online included 'I like the convenience of having products delivered to my home', 'products are generally higher quality', and 'I have access to special offers and promotion'. In addition, the results of this report show that most participants purchase beef products at home on desktop/laptop.

When searching for information on beef production, respondents trusted product packaging/labelling (85 per cent high/medium) most, followed by online customer reviews (75 per cent high/medium) and then branded mobile apps (66 per cent high/medium). A number of participants indicated that they had a low level trust in generic mobile apps and/or branded mobile apps. The main reasons included 'I do not trust the provider of the information' and 'security concerns' and 'I have privacy concerns regarding the technology'.

When purchasing beef products online, participants trusted personal computer (77 per cent high/medium) most, followed by barcodes/QR codes (71 per cent high/medium), and then online shopping (66 per cent high/medium). The main reasons that participants did not trust RFID/NFC technology, barcodes/QR codes, branded mobile apps, generic mobile apps, online shopping, personal computers and/or mobile device for purchasing beef products included 'I am not familiar with the technology involved', and 'I don't not trust the information provided'.

Finally, participants most often found out about or became aware of new beef products 'in-store (from where I did most of my food product shopping)' (62 per cent), followed by 'word-of-mouth' (36 per cent) and 'broadcast media' (20 per cent).

While the findings reported here are helpful in describing the overall characteristics of the average Californian beef consumer, greater depth of understanding will be possible with further analysis of responses to allow better scrutiny across potential segments of the market. Possible consumer segments include high vs. low consumption, high vs. low expenditure, online purchasers, NZ beef purchasers, and high digital and technology engagement amongst others.

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Appendix 1
Demographics

Figure A.1. Gender

Figure A.2. Age

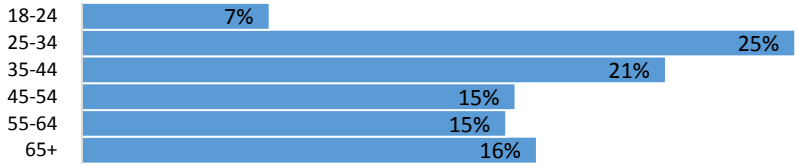


Figure A.3. Type of Area

Figure A.4. Household Make-up

Figure A.5. Highest level of education

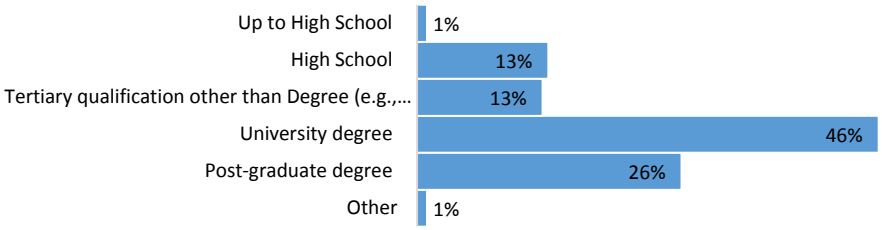
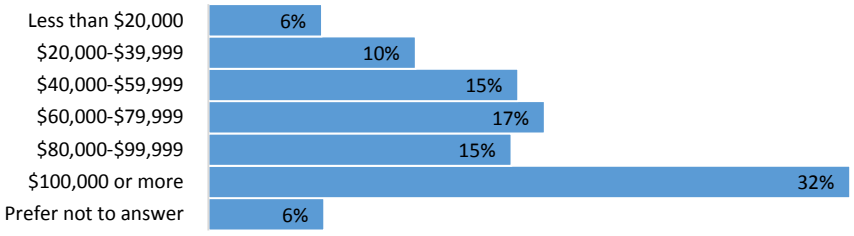


Figure A.6. Gross annual household income (US$)



Appendix 2
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.

B.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:

$$U_j > U_i \qquad (0.1)$$

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).

$$U_{nj} = V_{nj} + \varepsilon_{nj} \qquad (0.2)$$

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).

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

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 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).

[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).

B.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:

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

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:

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

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:

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

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:

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

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).

B.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:

$$\beta_n = \sigma_n \beta + \gamma \eta_n + (1-\gamma)\sigma_n \eta_n \qquad (0.8)$$

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):

$$\sigma_n = \exp\{\overline{\sigma} + \tau\omega_n\} \qquad (0.9)$$

where $\overline{\sigma}$ 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.

B.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:

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

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):

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

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 3
Questionnaire

OLW California Beef - Update

Start of Block: Intro and Screening Questions

BEEF FOOD ATTRIBUTES SURVEY

Welcome to this survey about consumer preferences for beef food product attributes.

The survey is an on-line questionnaire that takes about 10 – 15 minutes. You do not have to participate. You have the right to decline to answer any question or stop the survey at any time. If you do stop the survey before the end, the information you have provided will be destroyed.

The Agribusiness and Economics Research Unit at Lincoln University in New Zealand are conducting this survey. Data will be held on a secure server on the University campus. The survey does not collect identifying information, and your responses cannot be linked to you. The survey has been reviewed and approved by the Lincoln University Human Ethics Committee. The lead researcher is Dr Peter Tait, and his manager is Prof Caroline Saunders. If you have any questions or concerns about the research, you may contact them at:

Associate Professor ---------- Professor
Peter Tait ----------Caroline Saunders
+64 3 423 0384 ----------+64 3 423 0382
peter.tait@lincoln.ac.nz ----------caroline.saunders@lincoln.ac.nz

Completion of the survey will be taken as your consent to participate in this research. If you complete the survey, you will not be able to withdraw your information at a later date. If at any time you wish to withdraw from the survey simply close your browser window.

To begin the survey, begin by clicking on the >> button below.

Yours sincerely
Dr. Peter Tait

Which state do you live in?

- ❍ Arizona
- ❍ California
- ❍ Nevada
- ❍ Oregon
- ❍ Washington
- ❍ Other, please specify _____

Skip To: End of Block If Which state do you live in? != California

How often do you purchase beef products?

- ❍ Daily
- ❍ Weekly
- ❍ Fortnightly
- ❍ Monthly
- ❍ Less than once a month
- ❍ Never

Skip To: End of Block If How often do you purchase beef products? = Less than once a month

Skip To: End of Block If How often do you purchase beef products? = Never

How much do you know about the following countries?

	Nothing	A little	A fair amount	A lot
Australia	❍	❍	❍	❍
New Zealand	❍	❍	❍	❍
Ireland	❍	❍	❍	❍
Brazil	❍	❍	❍	❍
Canada	❍	❍	❍	❍
Mexico	❍	❍	❍	❍

What beef products have you purchased in the last month?

Please select all that apply

- ❑ Ground beef
- ❑ Porterhouse steak
- ❑ Blade chuck steak
- ❑ Ribeye steak
- ❑ Ribeye roast
- ❑ T-bone steak
- ❑ Brisket
- ❑ Rib
- ❑ Beef tenderloin/filet mignon
- ❑ Flank steak
- ❑ Top sirloin steak
- ❑ Top round steak
- ❑ Chuck roast
- ❑ Beef jerky
- ❑ New York Strip
- ❑ Other, please state _____

Do you usually purchase **ground beef** with any of these properties?

- ❑ Organic
- ❑ Enhanced animal welfare
- ❑ GMO-free
- ❑ Environmentally sustainable
- ❑ No added antibiotics
- ❑ No added hormones
- ❑ Community owned and operated producer
- ❑ Traceable to where the animal was born

Do you usually purchase ground beef with animals that have been

- ❍ Feedlot-raised
- ❍ 100**%** pasture-raised
- ❍ I don't know

Do you usually purchase ground beef with animals that have been

- ❍ 100% grass fed
- ❍ Grain fed
- ❍ I don't know

How much would you usually pay per pound for this ground beef? ($/lb)

_____

Over a typical week, how many meals do you usually consume that contain beef?

–

Of those meals containing beef, how many would you personally prepare?

–

In the last month, have you **seen** beef products being sold with the following country of origin?

Please select all that apply

	Seen	Not seen
Australia	❍	❍
New Zealand	❍	❍
Ireland	❍	❍
Brazil	❍	❍
Canada	❍	❍
USA	❍	❍
Mexico	❍	❍

In the last month, how often have you **purchased** beef products with the following country of origin?

	Daily	Weekly	Monthly	Once	Never
Australia	❍	❍	❍	❍	❍
New Zealand	❍	❍	❍	❍	❍
Ireland	❍	❍	❍	❍	❍
Brazil	❍	❍	❍	❍	❍
Canada	❍	❍	❍	❍	❍
USA	❍	❍	❍	❍	❍
Mexico	❍	❍	❍	❍	❍

Which New Zealand beef products do you buy?

- ❑ Ground beef
- ❑ Porterhouse steak
- ❑ Blade chuck steak
- ❑ Ribeye steak
- ❑ Ribeye roast
- ❑ T-bone steak
- ❑ Brisket
- ❑ Rib
- ❑ Beef tenderloin/filet mignon
- ❑ Flank steak
- ❑ Top sirloin steak
- ❑ Top round steak
- ❑ Chuck roast
- ❑ Beef jerky
- ❑ New York Strip
- ❑ First Light brand
- ❑ Greenlea brand
- ❑ ANZCO brand
- ❑ Silver Fern Farms brand
- ❑ Maori Lakes brand

Why did you purchase New Zealand beef?
Please indicate what level of importance the following **reasons** have in your choice to purchase **New Zealand beef**?

	High importance	Some importance	Neutral	Little importance	No importance	Don't know
100% grass fed	❍	❍	❍	❍	❍	❍
Animal welfare certification	❍	❍	❍	❍	❍	❍
Price	❍	❍	❍	❍	❍	❍
Curiosity to try different product	❍	❍	❍	❍	❍	❍
Reduced environmental impact of production	❍	❍	❍	❍	❍	❍
Food safety certification	❍	❍	❍	❍	❍	❍
Social responsibility	❍	❍	❍	❍	❍	❍
Lower fat content	❍	❍	❍	❍	❍	❍
Higher quality of cut	❍	❍	❍	❍	❍	❍
No added antibiotics	❍	❍	❍	❍	❍	❍
No GMOs	❍	❍	❍	❍	❍	❍
No added growth hormones	❍	❍	❍	❍	❍	❍
Traceability to farm	❍	❍	❍	❍	❍	❍
Guaranteed tender	❍	❍	❍	❍	❍	❍
Pasture raised rather than housed indoors	❍	❍	❍	❍	❍	❍
Fresh rather than frozen	❍	❍	❍	❍	❍	❍
Organic production	❍	❍	❍	❍	❍	❍
No chemicals to artificially color or extend shelf life	❍	❍	❍	❍	❍	❍
Halal production	❍	❍	❍	❍	❍	❍
Aged at least 21 days	❍	❍	❍	❍	❍	❍

Care of traditional cultures	❍	❍	❍	❍	❍	❍
Marbling	❍	❍	❍	❍	❍	❍
Grass fed	❍	❍	❍	❍	❍	❍
Other, please state	❍	❍	❍	❍	❍	❍

How much do you know about New Zealand's indigenous culture, Māori?

- ❍ I know a lot about Māori culture
- ❍ I know a few things about Māori culture
- ❍ I have heard of them
- ❍ I have never heard about Māori culture

If it were available, what would you associate with beef produced from a **Māori enterprise**?

	Strong association	Moderate association	Little association	No association	Don't know
Enhanced animal welfare	❍	❍	❍	❍	❍
Reduced environmental impact	❍	❍	❍	❍	❍
Social responsibility	❍	❍	❍	❍	❍
High quality	❍	❍	❍	❍	❍
Collective ownership	❍	❍	❍	❍	❍
Spirituality	❍	❍	❍	❍	❍
Traditional	❍	❍	❍	❍	❍
Stewardship over land	❍	❍	❍	❍	❍
Distribution of profits into community	❍	❍	❍	❍	❍
Sustainability	❍	❍	❍	❍	❍
Local knowledge	❍	❍	❍	❍	❍
Guardianship	❍	❍	❍	❍	❍
Artisan	❍	❍	❍	❍	❍
Care of traditional cultures	❍	❍	❍	❍	❍
Fair trade	❍	❍	❍	❍	❍
Natural	❍	❍	❍	❍	❍
Other, please state	❍	❍	❍	❍	❍

	Strongly Agree	Partly agree	Neutral (neither agree nor disagree)	Partly disagree	Strongly Disagree
Beef production is an important sector in the local economy	❍	❍	❍	❍	
Beef production is an important sector in the country's economy	❍	❍	❍	❍	
Supporting local beef farmers and suppliers is important	❍	❍	❍	❍	
The environmental impact of beef production is well managed	❍	❍	❍	❍	
Beef production has low human health impacts	❍	❍	❍	❍	
The quality of USA beef products is better than the quality of comparable foreign beef products	❍	❍	❍	❍	
It is very important for me to know where the beef I buy is produced	❍	❍	❍	❍	
It is very important that the beef I buy is produced in USA	❍	❍	❍	❍	
It is very important that USA public authorities control all beef	❍	❍	❍	❍	
I am worried about the long term effects of medicine, pesticide and additives in conventional modern beef production	❍	❍	❍	❍	
When considering trying a beef product not previously experienced, I try to find out the most information I can about the product before I try it	❍	❍	❍	❍	
I look at the labelling information on the package when I buy beef	❍	❍	❍	❍	
The quality of a beef product is directly related to the production practices used	❍	❍	❍	❍	
I try to lead a healthy lifestyle	❍	❍	❍	❍	

End of Block: Product Questions

Start of Block: Choice Experiment: Regular Weekday

Comparing Beef Products

In the next set of questions, please imagine you need to purchase a beef product at your local shop (supermarket, butcher, meat producer etc.). It is a **regular weekday** and you decided you are going to prepare a dish based on the beef cut you are going to buy for the next meal with your family.

You will be shown a series of product choice sets, each displaying three different beef products.

Each beef product is labelled with information that describes **how the beef was produced** and the price per pound. The products differ based on the information presented otherwise they are the same. All products presented are the same weight and freshness of USDA Choice grade Angus, and meet USDA standards for animal welfare and food safety.

Beef production attributes for you to consider in the next questions

Animal Feed 100% Grass-fed beef is lower in calories, contains more healthy omega-3 fats, vitamins A and E, beta-carotene and antioxidants. Grain fed beef has higher fat content and marbling which can produce a richer taste.

Environmentally Sustainable Environmentally sustainable farms actively minimise the environmental effects of beef production.

Antibiotics & Hormones Beef may be raised with or without added antibiotics and/or hormones.

Traceability The animal can be traced back to the farm where the animal was born.

Social Responsibility Collective community ownership of farms can enhance social responsibility. Socially responsible farms actively include public interest in decision making.

Product Origin Beef consumed in the USA comes from cattle raised in the USA as well as other countries, and are processed either in the USA or in the country where cattle were raised.

GMO-Free Animals are not genetically modified and do not consume genetically modified feed.

Animal Housing Animals are raised in feedlots or in pastures.

Organic Use no synthetic fertilizers, hormones, antibiotics or animal by-product supplementation during the entire life of the beef cattle including in or on the food they eat.

Animal Welfare Animal welfare practices can be enhanced above the minimum legal standards.

For each question, please choose which product you would most likely purchase. This includes keeping in mind how the price of the selected product would fit into your normal grocery budget.
Please click the >> button to continue.

Practice Set

It is a **regular weekday** and you decided you are going to prepare a dish based on the beef cut you are going to buy for the next meal with your family. Given that the standard information is provided on the label or on the package, which of the following three beef products would you prefer?

Mark your choice by using the buttons, and please bear in mind the price that is associated with your choice:

More Info

			
Ribeye Steak	**Ground Beef**	**Top Sirloin Steak**	
		GMO free	
Environmental management		Environmental management	
Barn housed in poor weather		Pasture raised year round	
	No added antibiotics		
	No artificial colors		
No added hormones	No added hormones		
Community owned and operated		Family owned and operated	
Traceable to birth farm	Traceable to processing plant	Traceable to processing plant	
Grass raised, grain finished		100% Grain fed	
Beef raised in Australia Processed in the U.S.	Beef raised in New Zealand Processed in the U.S.	Beef raised in Canada Processed in the U.S.	
$35/lb	**$3/lb**	**$15/lb**	
○	○	○	**None of these** ○

>>

Start of Block: Post-CE Questions

In the previous choice sets which, if any, of the beef product attributes did you ignore when making your choices?

- ❑ I used all the available information and didn't intentionally ignore any product attributes

OR

Please select all the product attributes that you didn't consider at all when making your choices

- ❑ Animal feed
- ❑ Added hormones
- ❑ Added antibiotics
- ❑ Where the product was produced
- ❑ Where the product was processed
- ❑ Feedlot or pasture rasied
- ❑ Traceability
- ❑ Beef cut type (ground beef, top sirloin steak or ribeye steak)
- ❑ Animal welfare
- ❑ Organic
- ❑ GMO-free
- ❑ Environmental sustainability
- ❑ Social responsibility
- ❑ Price

In the previous choice sets, it was easy to **understand** how I should provide my choices.

- ❍ Agree
- ❍ Partly agree
- ❍ Neutral (neither agree nor disagree)
- ❍ Partly disagree
- ❍ Disagree

In the previous choice sets, I was able to **express what was important for me** concerning beef labelling.

- ❍ Agree
- ❍ Partly agree
- ❍ Neutral (neither agree nor disagree)
- ❍ Partly disagree
- ❍ Disagree

In the previous choice sets, I **understood the meaning** of the labelling alternatives.

- ❍ Agree
- ❍ Partly agree
- ❍ Neutral (neither agree nor disagree)
- ❍ Partly disagree
- ❍ Disagree

In the previous choice sets, how did you find **expressing which type of beef labelling information** was important to you?

- ❍ Very easy
- ❍ Fairly easy
- ❍ Neither easy nor difficult
- ❍ Partly difficult
- ❍ Very difficult

In the previous beef choice sets, did you chose the "**None of these**" option in most or all the choice sets?

- ❍ No
- ❍ Yes

Please indicate the main reason for doing so

- ❍ I can't afford to pay more for my grocery shopping
- ❍ I don't want to pay more for any of these claims
- ❍ I don't trust these product claims
- ❍ Not enough information was provided
- ❍ I don't think the other alternatives were realistic
- ❍ I do not buy any of the given beef cut alternatives
- ❍ While I do prefer some of the product attributes presented, none of the given products represented my preferences
- ❍ Other reason, please specify _____

End of Block: Post-CE Questions

Start of Block: Technology Questions

The next set of questions are about the use of technology for beef food product shopping.

How often do you access the Internet using the following devices?

	Daily	Weekly	Monthly	Less than monthly	Never
Mobile device e.g. smartphone	❍	❍	❍	❍	❍
Home computer e.g. desktop/laptop	❍	❍	❍	❍	❍

Do you use any of the following to search for **beef meal inspiration** or to find out **how a beef product is produced**?

Please select all that apply.

	Inspiration		**How Produced**	
	Mobile device	Home computer	Mobile device	Home computer
Twitter	❑	❑	❑	❑
Pinterest	❑	❑	❑	❑
Instagram	❑	❑	❑	❑
Facebook	❑	❑	❑	❑
YouTube	❑	❑	❑	❑
Reddit	❑	❑	❑	❑
Food company web pages	❑	❑	❑	❑
Food blogs	❑	❑	❑	❑
Wikipedia	❑	❑	❑	❑
Forums	❑	❑	❑	❑
Google search	❑	❑	❑	❑
Online retailer	❑	❑	❑	❑

When searching for **beef meal inspiration** or **how a beef product is produced**, are you influenced by any of the following?

Please select all that apply.

	Inspiration	**How Produced**
Celebrity chefs	❑	❑
Sports celebrities	❑	❑
Other celebrities	❑	❑
Health professionals	❑	❑
Government information	❑	❑
Industry marketing boards	❑	❑
Non-government organizations (e.g. Greenpeace)	❑	❑
International bodies (e.g. World Health Organization)	❑	❑

When **using your mobile device** to search for inspiration or product information about beef, where do you usually do this?

	Usually	**Often**	**Sometimes**	**Never**
At home	❍	❍	❍	❍
In-store	❍	❍	❍	❍
Out of home but not in-store	❍	❍	❍	❍
At work	❍	❍	❍	❍

Have you ever used any of the following technologies in conjunction with your **smartphone** to search for beef-related **information** and/or make beef product **purchases**?

	Information search			**To purchase products**		
	Often	Sometimes	Never	Often	Sometimes	Never
Barcodes	❍	❍	❍	❍	❍	❍
QR codes	❍	❍	❍	❍	❍	❍
RFID/NFC	❍	❍	❍	❍	❍	❍

In relation to beef products, do you currently use, or would be interested in **using mobile apps** for the following reasons?

	Currently use	**Interested in using**	**Don't use and not interested in using**
Health (general)	❍	❍	❍
Dietary information	❍	❍	❍
Sustainability information	❍	❍	❍
Environmental information	❍	❍	❍
Budgeting	❍	❍	❍
Recipes	❍	❍	❍
Nearest stockist location	❍	❍	❍
Product reviews	❍	❍	❍
Traceability	❍	❍	❍
Loyalty/rewards programs	❍	❍	❍
Discounts/coupons	❍	❍	❍
Product delivery	❍	❍	❍
Restaurant search	❍	❍	❍
Purchasing	❍	❍	❍
Other, please state	❍	❍	❍

Do you currently use any of the following food apps on your mobile device?

Please select all that apply.

	Yes
Yelp	❑
UberEats	❑
Fork It by KitchenBowl	❑
BigOven	❑
Food Network In The Kitchen	❑
Foodgawker	❑
Allrecipes	❑
Yummly	❑
FoodKeeper	❑
Meat Cuts	❑
SteakMate	❑
Retailer app(s) (such as Walmart, Costco)	❑

What percentage of your usual **food and beverage** purchases are made at the following retailers:

Please move each relevant slider.

_____ Chain supermarkets
_____ Specialty stores
_____ Farmers' markets
_____ Online
_____ Restaurant or similar
_____ Subscription box
_____ Direct from producer
_____ Wholesale supplier
_____ Food co-op
_____ Convenience stores

When making food and beverage purchases online, which of the following do you use?

Please select all that apply

	Often	Sometimes	Never
Wholesale suppliers	❍	❍	❍
Direct from producer	❍	❍	❍
Chain supermarkets	❍	❍	❍
Specialty stores	❍	❍	❍
Organic food stores	❍	❍	❍
Amazon	❍	❍	❍
Only suppliers that I know and trust	❍	❍	❍
Only retailers that I've used before	❍	❍	❍
Other, please state	❍	❍	❍

What percentage of your usual **beef** purchases are made at the following retailers:

Please move each relevant slider.

_____ Chain supermarkets
_____ Specialty stores
_____ Farmers' markets
_____ Online
_____ Restaurant or similar
_____ Subscription box
_____ Direct from producer
_____ Wholesale supplier
_____ Food co-op
_____ Butcher
_____ Convenience stores

What kinds of beef products do you buy online?

Please select all that apply.

	Any country of origin			**New Zealand raised**		
	Often	Sometimes	Never	Often	Sometime	Never
Jerky	❍	❍	❍	❍	❍	❍
Steak	❍	❍	❍	❍	❍	❍
Hamburger	❍	❍	❍	❍	❍	❍
Premium cuts	❍	❍	❍	❍	❍	❍
Mince	❍	❍	❍	❍	❍	❍
Omaha	❍	❍	❍	❍	❍	❍
Angus	❍	❍	❍	❍	❍	❍
Ribs	❍	❍	❍	❍	❍	❍
Fillet Mignon	❍	❍	❍	❍	❍	❍
Wagyu	❍	❍	❍	❍	❍	❍
Sausages	❍	❍	❍	❍	❍	❍
Meal delivery	❍	❍	❍	❍	❍	❍
All/multiple types	❍	❍	❍	❍	❍	❍
Frozen meat products only	❍	❍	❍	❍	❍	❍
Preserved meat products only	❍	❍	❍	❍	❍	❍
	❍	❍	❍	❍	❍	❍

What is your **main reason** for shopping online for beef products?

- ❍ Prices are generally lower
- ❍ I have access to special offers and promotions
- ❍ Products are generally higher quality
- ❍ There is a greater variety of products available
- ❍ I like the convenience of having products delivered to my home
- ❍ I like being able to order products from overseas that are better or not available domestically
- ❍ I like being able to avoid having to go into the store.
- ❍ Other, please state: _____

When making beef purchases online, which of the following do you use?

Please select all that apply.

	Often	**Sometimes**	**Never**
Wholesale suppliers	❍	❍	❍
Direct from producer	❍	❍	❍
Chain supermarkets	❍	❍	❍
Specialty stores	❍	❍	❍
Organic food stores	❍	❍	❍
Amazon	❍	❍	❍
Only suppliers that I know and trust	❍	❍	❍
Only retailers that I've used before	❍	❍	❍
Other, please state:	❍	❍	❍

When making grocery purchases online, **which devices** do you use and **where**?

Please select all that apply.

	Beef		**Other food and beverages**	
	Mobile Device	Desktop or Laptop	Mobile Device	Desktop or Laptop
At home	❍	❍	❍	❍
At work	❍	❍	❍	❍
In store	❍	❍	❍	❍
Out of home (but not in store)	❍	❍	❍	❍

When looking for **information regarding beef products**, what level of **trust** do you have in the following:

	High Trust	**Medium Trust**	**Low Trust**
Generic mobile apps	❍	❍	❍
Branded mobile apps	❍	❍	❍
Online social community (e.g. organic group)	❍	❍	❍
Online customer reviews	❍	❍	❍
Product packaging/labelling	❍	❍	❍

Why do you not trust _____for beef product information searching?

Please select all that apply.

- ❑ I do not trust the provider of the information.
- ❑ I have privacy concerns regarding the technology involved.
- ❑ I do not know how to use the technology.
- ❑ I did not understand the information provided.
- ❑ Security concerns
- ❑ Other, please state: _____

What level of **trust** do you have in the following for **purchasing beef** products:

	High Trust	**Medium Trust**	**Low Trust**
Mobile device (e.g. smartphone)	❍	❍	❍
Home computer (e.g. desktop/laptop)	❍	❍	❍
Online shopping	❍	❍	❍
Generic mobile apps	❍	❍	❍
Branded mobile apps	❍	❍	❍
Barcodes/QR codes	❍	❍	❍
RFID/NFC technology	❍	❍	❍

Why do you not trust _____for beef product purchasing?

Please select all that apply.

- ❑ I do not trust the technology involved.
- ❑ I have privacy concerns regarding the technology involved.
- ❑ I do not know how to use this technology.
- ❑ This technology is not available in my locality.
- ❑ I am not familiar with the technology involved.
- ❑ I do not trust the information provided.
- ❑ I do not trust the technology involved.
- ❑ I have privacy concerns regarding the technology involved.
- ❑ I do not know how to use this technology.
- ❑ This technology is not available in my locality.
- ❑ I am not familiar with the technology involved.
- ❑ I do not trust the information provided.
- ❑ Other, please state: _____

How do you usually find out or become aware of new beef products?

- ❑ In-store (from where I currently do most of my food product shopping)
- ❑ Online (from where I currently do most of my food product shopping)
- ❑ Word-of-mouth
- ❑ Online advertising (websites)
- ❑ Social media
- ❑ Blogs
- ❑ Print media (newspapers, magazines, direct mail)
- ❑ Broadcast media (radio, cable TV, broadcast TV)
- ❑ Other advertising
- ❑ Can't recall
- ❑ Other, please state: _____

End of Block: Technology Questions

Start of Block: Demographics

Demographics

The following questions will help us to compare our survey with the general population. Please remember that this is an anonymous survey, and that you cannot be identified from any information you provide.

Which of these cities do you live in, or closest to?

Please select one option.

- ❍ Bakersfield
- ❍ Chico
- ❍ El Centro
- ❍ Fresno
- ❍ Hanford
- ❍ Los Angeles
- ❍ …

Gender

- ❍ Male
- ❍ Female
- ❍ Diverse

Age

- ❍ 18-24
- ❍ 25-34
- ❍ 35-44
- ❍ 45-54
- ❍ 55-64
- ❍ 65+

What type of area do you live in?

- ❍ Urban
- ❍ Suburban
- ❍ Rural

Please indicate which of the following best describes your household make-up:

- ❍ Single, no children
- ❍ Single with children
- ❍ Couple, no children
- ❍ Couple with children
- ❍ Live with unrelated people (e.g. flatting)
- ❍ Other _____

Please indicate how many of your children fall into the following age groups. Please select from the drop-down box.

0-4 years old	▼ 0 ... 3+
5-12 years old	▼ 0 ... 3+
13-17 years old	▼ 0 ... 3+
18+ years old	▼ 0 ... 3+

What is your highest level of education?

- ❍ Up to High School
- ❍ High School
- ❍ Tertiary qualification other than Degree (e.g., diploma, vocational etc.)
- ❍ University degree
- ❍ Post-graduate degree
- ❍ Other _____

Please indicate your total household income before taxes over the past 12 months:

- ❍ Less than $20,000
- ❍ $20,000-$39,999
- ❍ $40,000-$59,999
- ❍ $60,000-$79,999
- ❍ $80,000-$99,999
- ❍ $100,000 or more
- ❍ Prefer not to answer

That was the last question of the survey! Thank you very much for your participation. Click >> to be returned to the research company website (this may take a few moments).

End of Block: Demographic

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