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Consumer demands - seizing the opportunities in the beef industry

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# Executive summary

The Australian beef industry has prospects to expand to meet growing demand from Asian export markets. The industry makes a significant contribution to state and national economies and underpin many regional and rural communities. As the same time there are pressures from consumers stemming from concerns about how beef is produced (i.e impacts on animal welfare and environment) or concerns about the impacts of the product (i.e. impacts on sustainability and health). These are termed ‘credence’ attributes because they cannot be objectively measured, but instead must be communicated alongside the product to ensure it is credible to consumers.

In the research reported here we assess whether demands and concerns about various credence aspects of meat production are growing and likely to have a significant impact on the beef industry. For the purposes of this research we have focused on the creedance attributes of: health and nutrition, ethical concerns about animal welfare, and sustainability concerns, including the environmental consequence of production on landscapes, biodiversity and greenhouse gas emissions.

A national survey was developed to better understand consumers consumption over time, expectations for future consumption, and preferences in the creedance areas of environment, health and animal welfare. We assessed the issues across demands for beef, chicken, port and lamb, because many of these issues are associated with meat consumption rather than being focused on the beef sector. We also sought to understand patterns of non-consumption, purchasing and knowledge of production systems, so we could test how these may relate to concerns about creedance factors.

The survey was collected through a market research firm. A total of 1,199 participants completed the survey, with respondents from all Australian states and territories. The survey found that 73% of participants eat most meat and fish products, 15% eat a subset of meat and fish products, 3% are vegetarian, 8% are flexitarian and 1% are vegan. Consumption of beef is lower than chicken but greater than pork, lamb and fish. Age and income are significant determinants of the type and level of meat consumed. Looking forward to the next five years, those who are younger and of a higher level of education are more likely to reduce their consumption of beef.

There was a significant relationship between changes in consumption and drivers of change with 17.5% of respondents who had stopped consuming beef concerned about health, 15% concerned about animal welfare and 10% concerned about the environment. Health and meat quality factors were significant drivers of consumption increases by more than 25-50%. Food safety and family circumstances were not identified as important drivers of changes in consumption, while prices, budgets, animal welfare and the environment had low to moderate impact.

For environmental factors participants were most concerned about the impacts of production on water quality in streams and rivers, followed by the impacts of production on native vegetation and natural habitats. There were lower concerns about emissions of greenhouse gases. In relation to animal welfare consumers were most concerned about transport stagesin the supply chain.

The results identify that meat remains at staple in most households, although consumption levels are likely to continue declining. Credence factors are important, but there is more attention on local factors than global issues, and there does not appear to any major trends to non-consumption, with small proportions of respondents identifying as vegetarian or vegan. Concerns over health are more prominent than animal welfare and environmental issues, and may underpin a larger proportion of consumers who identify as ‘flexitarian’.

# Introduction

Beef production is a major industry in Queensland, with the state holding about 42% of Australia’s cattle herd and generating more than 50% of Australia’s total beef exports by value ($4.92B) (Ernest & Young, 2018). Global demand for meat production is predicted to grow by more than 50% by 2050 (Office of the Director Agricultural Development Economics Division, 2009), which will underpin growth in exports for both meat and live cattle from Queensland, particularly to Asia due to its close proximity, high imports, increasing wealth and subsequent increased demand for protein consumption. This is particularly relevant to rural and regional Queensland, given that beef production is the major land use in most areas of the state and underpins the economy of many rural townships.

However, the future of beef is much more highly contested than in the past, with a number of challenges to both production and consumption of beef on ethical, health and environmental grounds (Greenwood, Gardner, & Ferguson, 2018). These challenges and pressures complicate the forecasts for future growth. On the production side, key challenges for producers are to:

1. maintain productivity increases required to remain commercially sustainable (Cobon et al., 2009; Hunt, McIvor, Grice, & Bray, 2014),
2. continue to adopt new technology to maximise integration in a global economy (Jie, Parton, & Mustafid, 2016; Juan Ding, 2014),
3. remain competitive against the growth of non-livestock ‘meats’ and alternative demands for inputs (Bhat & Fayaz, 2011), and
4. improve resource use efficiency and resilience to climate change (Bentley, Hegarty, & Alford, 2008; Bowen & Chudliegh, 2018; Campbell & Stafford Smith, 2000).

On the demand side, there are ongoing and emerging trends in consumption, opinion and technical advice with the potential to change the importance of underlying drivers for beef. These include trends for no meat diets (e.g. vegetarianism)(Bhat & Fayaz, 2011; Ruby, 2012), trends to low meat diets (e.g. Meatless Monday), changes in health advice towards lower meat consumption, greater consumer focus on ‘clean’ or ‘natural’ foods, concerns about greenhouse emission and sustainability from livestock herds (Kumar et al., 2017), and ethical concerns around animal welfare (Phillips, 2005), animal consumption and environmental issues (McAlpine, Etter, Fearnside, Seabrook, & Laurance, 2009). Associated with this are efforts to establish certification and labelling systems as well as a variety of technical mechanisms to communicate credence factors to consumers (Pahl & Sharp, 2007).

Analysing these demand drivers includes requirements to assess the strength of consumer concerns about:

1. the health and nutrition of meats,
2. ethical concerns about animal treatment, and
3. sustainability concerns, including the environmental consequence of production on landscapes, biodiversity and greenhouse gas emissions.

As consumer demand ultimately drives the markets for beef products, identifying the importance of these forces is needed to understand how there may be shifts in consumer preferences that production systems need to be aware of. Understanding consumer demand for meat has long been an important topic in market analysis and research, as it underpins the coordination mechanism in supply chains to link production systems to final consumers (Duarte Canever, 2008; Grunert, 2006). Beef attributes that are visible to consumers prior to the purchase and consumption are often considered to be major choice determinants (Cho & Hooker, 2002). The focus of much of this work has been on objective measures relating to meat quality, many of which correlate to physical attributes such as meat colour, fat colour and fat content (Ardeshiri & Rose, 2018; Egan, Ferguson, & Thompson, 2001; Pethick, Ball, Banks, & Hocquette, 2010). The development of systems such as Meat Standards Australia (MSA) and a variety of different branding and labelling programs has helped to identify and communicate these factors to consumers in a consistent way (Polkinghorne & Thompson, 2010). Consumer demand analysis has also identified how factors such as changing lifestyles, cultural diversity and changing diets helps to explain declining trends in meat consumption per person, and substitution effects, such as from beef to chicken (Gatfield, 2006; Grunert, 2006; Russell & Cox, 2004).

An emerging trend of interest are consumer demands for non-objective and non-visible factors, such as those that might be related to health aspects (Henchion, McCarthy, & Resconi, 2017; Van Wezemael, 2010). For convenience, we term these as credence factors to communicate that they cannot be objectively measured, but instead must be communicated alongside the product to ensure it is credible to consumers. A number of credence factors relevant to beef consumption demands have been identified, including greater awareness of aspects around issues such as quality (Watson, Gee, Polkinghorne, & Porter, 2008), production systems, health issues (Umberger, Boxall, & Lacy, 2009), food safety (Lewis, Grebitus, Colson, & Hu, 2017; Loureiro & Umberger, 2007), country of origin (Chung, Boyer, & Han, 2009), packaging (Ardeshiri & Rose, 2018), farm animal welfare (Schröder & McEachern, 2004) and environmental considerations (Tobler, Visschers, & Siegrist, 2011).

While there is widespread understanding that credence factors are important to meat production and consumer demand in Australia, there has been no systematic analysis of these factors. This study addresses that research gap by conducting a consumer analysis of meat demands in Australia, focusing on issues relevant to consumption of beef, chicken, lamb and pork. We assessed the issues across the four meat types because many credence issues are associated with meat consumption rather than being focused on the beef sector. A survey was conducted across Australian consumers to identify trends in meat consumption and preferences regarding health, ethics and sustainability factors. The report is structured in the following way. Global trends in meat demands are reviewed in the next section. The design and methods of the study are presented in section three, followed by the results in section four. The final section includes a discussion about the implications of the findings on the beef industry in Queensland.

## Global trends

Global beef consumption is expected to continue to increase by 21% in developing countries by 2027 (OECD/FAO, 2019). World meat production increased by 1.0% to 327 Mt in 2018, reflecting increases in the production of beef, pork and poultry meats, with very modest gains in sheep meat. There is a direct relationship between increased income of countries and the consumption of all meats, including beef, as increased affluence underpins increased consumption of proteins from animal sources in diets (OECD, 2019).

In per capita terms, beef consumption in the developing world remains low relative to developed countries, at about one-third in volume terms. Apart from the United States, Asia now drives global meat imports with Japan, China, South Korea and Indonesia being key markets for Australian beef (Figure 1) (Meat and Livestock Australia, 2020). There is expected to be a 24% increase in beef consumed in Asia over the next decade (OECD/FAO, 2019). Given the close proximity of Asia, it is expected that exports from Australia to meet this growing demand will expand.

Figure 1. Beef importing countries (Source: Meat and Livestock Australia Limited 2020)

Although export markets are critical for the Australian beef industry, the conditions for production and handling of animals depends on the social license of the beef industry, as perceived by Australian residents. Thus the concerns and approvals of Australians are likely to underpin the standards that the industry will expected to meet, rather than the views of overseas consumers.

# Methods

In this study an online survey of Australian households was conducted to better understand the consumption habits and credence factors of Australian consumers. All aspects of survey design and implementation adopted social research best practice and adopted the five ethical responsibilities towards survey participants, namely voluntary participation, informed consent, no harm, confidentiality and privacy (Vaus., 2002). The study was conducted under a Human Ethics approval through CQUniversity (Approval: 0000021996).

In the surveys each of the participants were asked a combination of open ended and closed ended questions. These questions targeted information relating to participants' past, current and future consumption habits, preferences for credence attributes, meat alternatives and production knowledge, along with standard demographic questions. The aim of these questions was to assess consumers' consumption and preferences for meat and subsequent credence and non-credence attributes.

To enable descriptive and analytical statistics to be performed on the survey data, many questions involved closed formats, which typically required binary (yes/no) or scaling responses (Zar, 1984). The timing of the surveys coincided with the COVID-19 pandemic restrictions in June 2020, therefore the survey asked respondents about their habits prior to the restriction, what their current consumption habits were, and what they intended to consume post COVID-19.

Data were inspected for normality, and parametric and nonparametric tests were used accordingly. Differences between groups on categorical variables were compared using chi-square tests, whereas between-group differences on continuous variables were compared using Kruskal-Wallis tests. Data analysis was performed using SPSS 12.0.1 for Windows.

## Survey participants

A total of 1,199 surveys were collected in June 2020 from across Australia (n=1,199). Participants were selected via an internet panel by a third party provider. The participants sampled were from all Australian states and territories, allowing analysis of representation to be conducted (Table 1). Participant numbers were low for Tasmania (25), South Australia (12) and ACT (20), and incomes were slightly lower than the median reported by the Australian Bureau of Statistics (ABS) census data in WA, NSW, ACT, and Victoria. However, the sample was generally an accurate approximation of national population characteristics.

Table 1. Survey sample relative to the state population as described by the ABS census in 2016.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| % respon-dents | ACT ABS 2016 | ACT | NSW ABS 2016 | NSW | QLD ABS 2016 | QLD | VIC ABS 2016 | VIC | WA ABS 2016 | WA | NT ABS 2016 | NT | SA ABS 2016 | SA | TAS ABS 2016 | TAS |
| Total Respondents | | 20 |  | 383 |  | 240 |  | 312 |  | 124 |  | 83 |  | 12 |  | 25 |
| Gender |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| % male | 49 |  | 49 |  | 49 |  | 49 |  | 50 |  | 52 |  | 49 |  | 48 |  |
| Age category | | | | | | | | | | | | | | | | |
| 18-24 yrs | 13 | 25 | 11 | 11 | 11 | 10 | 12 | 12 | 11 | 13 | 12 | 18 | 11 | 0 | 10 | 16 |
| 25-29 yrs | 10 | 15 | 9 | 10 | 8 | 7 | 9 | 12 | 9 | 7 | 12 | 8 | 8 | 17 | 7 | 8 |
| 30-39 yrs | 20 | 20 | 17 | 23 | 17 | 15 | 18 | 20 | 18 | 15 | 22 | 10 | 15 | 8 | 14 | 16 |
| 40-49 yrs | 17 | 15 | 16 | 16 | 17 | 20 | 17 | 17 | 17 | 17 | 18 | 11 | 16 | 25 | 16 | 16 |
| 50-59 yrs | 14 | 15 | 16 | 17 | 16 | 15 | 15 | 14 | 16 | 18 | 15 | 19 | 16 | 8 | 17 | 16 |
| 60-69 yrs | 11 | 10 | 13 | 11 | 13 | 14 | 13 | 13 | 12 | 15 | 10 | 23 | 14 | 33 | 16 | 12 |
| Over 70 | 10 | 0 | 14 | 13 | 13 | 20 | 13 | 13 | 11 | 15 | 5 | 11 | 15 | 8 | 16 | 16 |
| Income \* | 2070 | 1678 | 1486 | 1678 | 1271 | 1346 | 1419 | 1346 | 1595 | 1346 | 1983 | 961 | 1206 | 1346 | 1100 | 1346 |
| Education | | | | | | | | | | | | | | | | |
| Post school qual. % | 20 | 20 | 23 | 28 | 28 | 42 | 24 | 31 | 26 | 34 | 24 | 30 | 25 | 8 | 25 | 48 |
| Tertiary level % | 37 | 50 | 23 | 32 | 14 | 21 | 24 | 29 | 21 | 27 | 17 | 17 | 19 | 25 | 16 | 28 |

\* Median Weekly Household Income ($)

The survey initially asked the participants about their role in their household regarding shopping, cooking and kitchen cleaning (Figure 2). The majority were either the primary shopper (34%) or all the above (36%), indicating that the participants had a strong knowledge base for answering the survey questions.

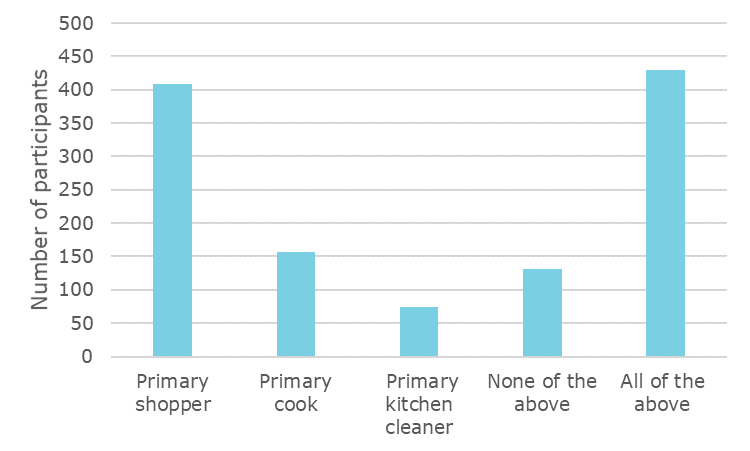


Figure 2. Role of survey participants in their household

# Results

The results are presented in four key sections:

* Trends in consumption of different types of meats as well as perceptions of credence factors
* Analysis of non-consumption patterns of meat or animal products
* Consumer preferences for the credence factors of animal welfare, health and environment
* Analysis of consumption patterns of meat alternatives and motivations.

## Trends in meat consumption

Meat consumption was assessed in terms of how many meals per week involved meat. As the survey was conducted in the early stages of the COVID-19 pandemic consumers were asked what their eating habits were before and during the crisis along with their expected habits afterwards. The survey also sought to understand how their consumption habits have changed in the past five years and what had been the motivations or drivers of this change.

Participants reported that prior to the pandemic chicken and beef were the most consumed meats, with these two categories having the highest share of participants eating three or more meals over the week (Figure 3). 225 and 190 participants respectively consumed chicken and beef as the main component of their meal three times per week. The most frequent responses were eating lamb for less than one meal per week (332 participants) and consuming seafood once a week (321 participants). Chicken was consumed most frequently with 287 participants having two meals per week, 225 having three meals per week, 145 having four meals per week and 97 participants having five meals per week. It was estimated that the 1199 survey participants consumed 3,551 meals per week containing chicken and 2,888 meals containing beef as the main component (Figure 4).

Figure 3. Response to “Prior to COVID-19, but in the last 12 months, how many meals per week (over 7 days) would you eat the following meats as the main component of your meal?”

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Figure 4. Total number of meals per week (calculated as the number of full meals and maximum of 9) of each of the separate meats

## Drivers of current consumption

To understand if any key demographics such as age, income, and education explained differences in meat consumption, consumption patterns were tested against these variables with the Kruskal-Wallis test (Figures 5 and 6). The results identified a significant difference between age groups for the consumption frequency of beef (p=0.000), chicken (p=0.000), and pork (p=0.000) but not for lamb (p=0.088) and seafood (p=0.016) at the 95% level. For beef, the major differences were that those over 70 years of age consumed less frequently compared to those between 18-49 years old. For chicken, there were no significant differences within the 18-49 age categories. However, there was a significant difference between the older age categories and this younger cohort. Pork had significant differences between those in each of the older age brackets (40-49, 50-59, 60-69, over 70 years of age) and the youngest bracket (18-24 years old). The testing also found that there was no significant difference between income levels and consumption levels for beef, pork and lamb. However, there was a difference between the levels of consumption of chicken and fish and different levels of income (Beef: p=0.53, Chicken: p=0.011, Pork: p=0.084, Lamb: p=0.361, Seafood: p=0.018).

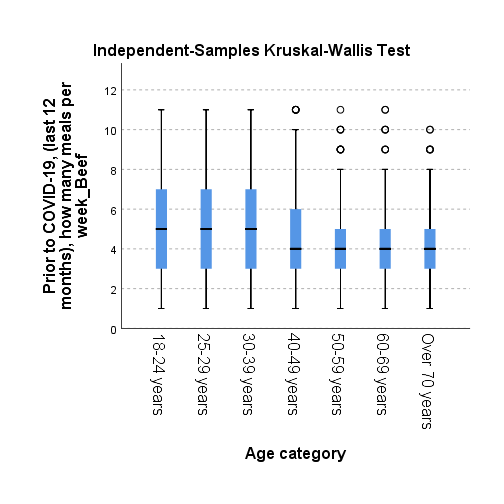
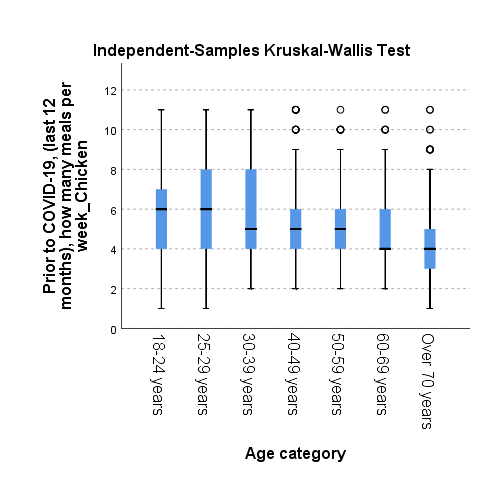
 

Figure 5. Beef (left) and chicken Kruskal-Wallis test results (right)

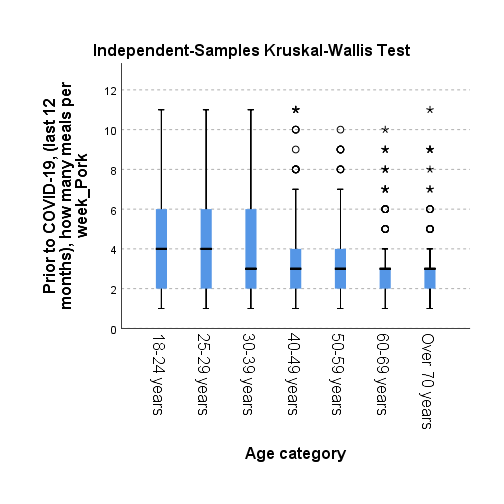
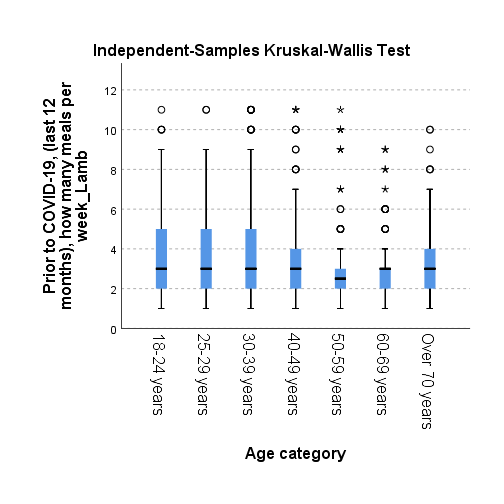


Figure 6. Pork (left) and lamb Kruskal-Wallis test results (right).

## Changes in consumption

ABARES (2018 ) reported that there has been a gradual decline in Australia’s per capita consumption of beef, from approximately 38kg per capita in 2001 to around 26kg of beef per capita in 2017 (Figure 7). This reduction in the consumption of beef appears to be replaced by chicken, with annual consumption of the latter meat rising by around 10kg per capita over the same time period (ABARES, 2018 ). The results from this survey closely match the findings of the ABARES study, with chicken becoming the dominant meat consumed.



Figure 7. Australian per capita meat consumption from 2000-2017

To better understand the changes that consumers have made in the past five years, participants were asked how their consumption of meats have changed. On average 52% of participants noted a decrease in consumption across all meats, with on average only 14% of participants increasing consumption of beef, lamb and pork compared with 29% of participants increasing consumption of chicken (Figure 8). For future consumption participants generally thought it would remain about the same, however there were more participants expecting to increase their consumption of chicken while reducing beef, pork and lamb (Figure 8).

Figure 8. Changes in consumption of meats in the past five years, and future consumption in the next 5 years.

Chi-square tests were conducted to identify if demographic factors explained changes in meat consumption over time. Age was a significant factor (at 95% level of significance), with those aged between 25-29 years more likely to have stopped consuming meat in the past five years, as were those with a tertiary education (Table 2). The geographic location of participants was also significant at the 90% percentile with those in urban populations more likely to have stopped consuming meat in the past five years than regional participants.

Table 2 Results of Chi-square test identify if demographic factors explained changes in meat consumption over time

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Stopped Consuming | More than 50% less | About 25-50% Decrease | About 10-25% Decrease | About the same, within 10% | About 10-25% more | More than 25-50% | More than 50% increase | Don’t Know | Value | Significance |
|  | Beef | | | | | | | | |  |  |
| Age (years) 0.000\* |  |  |  |  |  |  |  |  |  | 142.09 | 0.000\* |
| 18-24 | 3.1 | 2.3 | 6.2 | 13.2 | 41.9 | 13.2 | 7.0 | 0.8 | 12.4 |  |  |
| 25-29 | 7.8 | 2.9 | 8.8 | 13.7 | 39.2 | 13.7 | 6.9 | 3.9 | 2.9 |  |  |
| 30-39 | 3.4 | 6.3 | 9.1 | 9.1 | 43.8 | 13.9 | 7.2 | 4.3 | 2.9 |  |  |
| 40-49 | 2.1 | 6.4 | 7.4 | 8.0 | 60.6 | 10.1 | 3.2 | 1.1 | 1.1 |  |  |
| 50-59 | 3.3 | 5.5 | 8.8 | 17.6 | 52.2 | 4.9 | 2.7 | 0.5 | 4.4 |  |  |
| 60-69 | 3.8 | 5.7 | 11.5 | 21.0 | 48.4 | 5.5 | 0.6 | 0.0 | 3.2 |  |  |
| Over 70 | 2.9 | 5.8 | 11.7 | 15.8 | 58.5 | 2.9 | 1.2 | 0.0 | 1.2 |  |  |
| Education |  |  |  |  |  |  |  |  |  | 42.08 | 0.000\* |
| High School | 1.3 | 5.4 | 8.9 | 13.3 | 57.1 | 4.4 | 4.1 | 1.0 | 4.4 |  |  |
| Diploma | 2.4 | 5.3 | 9.0 | 13.3 | 52.9 | 9.6 | 2.1 | 1.3 | 4.0 |  |  |
| Tertiary | 6.1 | 5.2 | 9.4 | 14.6 | 42.8 | 11.7 | 5.4 | 2.0 | 2.9 |  |  |
| Income |  |  |  |  |  |  |  |  |  | 86.66 | 0.286 |
| Under $20,000 | 0.0 | 6.2 | 7.7 | 6.2 | 61.5 | 6.2 | 1.5 | 4.6 | 6.2 |  |  |
| $20,000-$39,999 | 5.2 | 5.7 | 7.3 | 16.1 | 49.5 | 6.3 | 2.6 | 0.0 | 7.3 |  |  |
| $40,000-$59,999 | 3.2 | 5.9 | 9.1 | 13.4 | 51.6 | 10.2 | 4.3 | 0.5 | 1.6 |  |  |
| $60,000-$79,999 | 1.3 | 3.9 | 11.0 | 14.2 | 49.7 | 9.0 | 7.1 | 2.6 | 1.3 |  |  |
| $80,000-$99,999 | 4.0 | 4.8 | 8.7 | 15.9 | 47.6 | 11.1 | 1.6 | 1.6 | 4.8 |  |  |
| $100,000-$119,999 | 7.7 | 7.7 | 10.3 | 6.4 | 47.4 | 9.0 | 6.4 | 2.6 | 2.6 |  |  |
| $120,000-$139,999 | 1.9 | 3.8 | 9.6 | 9.6 | 53.8 | 11.5 | 5.8 | 0.0 | 3.8 |  |  |
| $140,000-$159,999 | 3.1 | 4.7 | 14.1 | 12.5 | 50.0 | 7.8 | 4.7 | 1.6 | 1.6 |  |  |
| $160,000-$179,999 | 0.0 | 6.5 | 12.9 | 12.9 | 58.1 | 9.7 | 0.0 | 0.0 | 0.0 |  |  |
| Over $180,000 | 5.3 | 3.9 | 6.6 | 22.4 | 38.2 | 15.8 | 5.3 | 1.3 | 1.3 |  |  |
| Locations |  |  |  |  |  |  |  |  |  |  |  |
| Urban | 4.0 | 5.2 | 9.2 | 14.5 | 48.0 | 9.8 | 3.7 | 1.4 | 4.2 | 19.21 | 0.014 |
| Rural | 1 | 5.6 | 9.1 | 10.6 | 60.1 | 5.1 | 5.1 | 2.0 | 1.5 |  |  |

Participants were asked to identify the extent to which the following factors may have been drivers for changes in their meat consumption over the past five years:

* changes in prices
* constraints on budget
* more focus on quality food
* family circumstances
* increased concern about health
* increased concern about food safety
* increased concern about animal welfare
* increased concern about the environment.

Chi-square tests were performed to identify significant differences (Table 3). There was a significant relationship between changes in consumption and drivers of change (p-value=0.000) with 17.5% who stopped consuming beef concerned about health, 15% concerned about animal welfare and 10% concerned about the environment. Health and meat quality factors were significant drivers of consumption increases by more than 25-50%. Food safety and family circumstances were not identified as important drivers of changes in consumption, while prices, budgets, animal welfare and the environment had low to moderate impact.

Table 3. Proportional differences between consumption and drivers of change.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| χ2 =142.95  p-value= 0.000\* *n=1137* | Change in Prices | Constraints on your budget | More focus on quality food | Family circumstances | Increased concern about my health | Increased concern about food safety | Increased concern about animal welfare | Increased concern about the environment |
| Stopped Consuming | 5.0% | 5.0% | 0.0% | 7.5% | 17.5% | 2.5% | 15.0% | 10.0% |
| More than 50% reduction | 25.0% | 10.0% | 8.3% | 3.3% | 25.0% | 5.0% | 6.7% | 13.3% |
| About 25-50% less | 33.7% | 15.4% | 5.8% | 4.8% | 15.4% | 1.9% | 5.8% | 8.7% |
| About 10-25% less | 29.3% | 17.8% | 8.3% | 5.7% | 12.7% | 1.3% | 5.7% | 6.4% |
| About the same within 10% | 22.6% | 10.9% | 9.3% | 5.1% | 4.6% | 2.1% | 3.2% | 1.9% |
| About 10-25% more | 24.5% | 16.7% | 24.5% | 9.8% | 6.9% | 2.9% | 3.9% | 2.0% |
| More than 25-50% increase | 33.3% | 6.7% | 20.0% | 4.4% | 20.0% | 0.0% | 4.4% | 4.4% |
| More than 50% increase | 35.3% | 11.8% | 17.6% | 5.9% | 17.6% | 0.0% | 5.9% | 0.0% |

## Consumption of no meat or animal products

Participants were asked about their dietary preferences to improve understanding about broad trends in meat consumption (Figure 9). The survey found that 73% of participants eat most meat and fish products, with 3% indicating that they are vegetarian (41 participants), 8% indicating that they are flexitarian (99 participants) and 1% indicating that they are vegan (17 participants). By implication, there are 15% of respondents who eat some but not all meats and fish products. There is limited data published in Australia to corroborate these results. Ruby (2012) found similar rates of vegetarianism at 3%, however another study by Roy Morgan (2015) noted that the level of vegetarians has increased to 11.2% in 2016. In the Roy Morgan (2015) study the question was framed “The food I eat is all or almost all vegetarian” which may take into account those in this survey who identified themselves as flexitarian or vegetarian.

Figure 9. Survey participants food preferences.

Previous research has found that the majority of vegetarians were based in urban areas rather than in rural or regional areas. Roy Morgan (2015) described the largest cohort of vegetarians to be highly educated, socially aware, hard-working, ambitious and culturally diverse young singles typically renting apartments in the inner city and suburbs. Ruby (2012) also found that vegetarianism is more prevalent with women than men.

To better understand if there were any significant differences across groups, chi-square testing was conducted between those who identified as not consuming animal products (vegetarian and vegan total n=62) and all other consumption preferences (Table 4). The results found no significant differences between consumption groups for gender, relationship status, income, state or location. Age was the only variable where there was a significant difference between groups of meat consumption (p=0.000) at the 95% percentile and education was significant at the 90% percentile, with younger people and more educated participants more likely to be non-consumers.

Table 4. Test for significant difference between groups. \*Denotes Significance in 95%percentile.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Consumes animal products n=1137 | Do not consume meat of animal products n=62 | Chi-square | Df | P-value |
| Gender |  |  | 0.279 | 1 | 0.597 |
| Male | 50.2 | 46.8 |  |  |  |
| Female | 49.8 | 53.2 |  |  |  |
| Relationship Status |  |  | 3.131 | 3 | 0.372 |
| Single | 28.7 | 33.9 |  |  |  |
| Married/De facto | 58.8 | 59.7 |  |  |  |
| Separated/ Divorced | 9.1 | 6.5 |  |  |  |
| Widowed | 3.4 | 0 |  |  |  |
| Age (years) |  |  | 35.053 | 6 | 0.000\* |
| 18-24 | 11.3 | 22.6 |  |  |  |
| 25-29 | 9 | 22.6 |  |  |  |
| 30-39 | 18.3 | 25.8 |  |  |  |
| 40-49 | 16.5 | 16.1 |  |  |  |
| 50-59 | 16 | 9.7 |  |  |  |
| 60-69 | 13.8 | 3.2 |  |  |  |
| Over 70 | 15 | 0 |  |  |  |
| Education |  |  | 7.07 | 2 | 0.029 |
| High School | 95.2 | 4.8 |  |  |  |
| Diploma | 96.9 | 3.1 |  |  |  |
| Tertiary | 92.9 | 7.1 |  |  |  |
| Income |  |  | 10.25 | 10 | 0.423 |
| Under $20,000 | 5.7 | 11.3 |  |  |  |
| $20,000-$39,999 | 16.9 | 16.1 |  |  |  |
| $40,000-$59,999 | 16.4 | 12.9 |  |  |  |
| $60,000-$79,999 | 13.6 | 16.1 |  |  |  |
| $80,000-$99,999 | 11.1 | 4.8 |  |  |  |
| $100,000-$119,999 | 6.9 | 8.1 |  |  |  |
| $120,000-$139,999 | 4.6 | 4.8 |  |  |  |
| $140,000-$159,999 | 5.6 | 9.7 |  |  |  |
| $160,000-$179,999 | 2.7 | 3.2 |  |  |  |
| Over $180,000 | 6.7 | 1.6 |  |  |  |
| Locations |  |  | 0.153 | 1 | 0.695 |
| Urban | 82.6 | 80.6 |  |  |  |
| Rural | 17.4 | 19.4 |  |  |  |
| State |  |  | 3.4 | 7 | 0.838 |
| NSW | 31.8 | 33.9 |  |  |  |
| ACT | 1.7 | 1.6 |  |  |  |
| VIC | 25.7 | 32.3 |  |  |  |
| QLD | 20.4 | 12.9 |  |  |  |
| NT | 6.9 | 8.1 |  |  |  |
| WA | 10.5 | 8.1 |  |  |  |
| SA | 1 | 1.6 |  |  |  |
| TAS | 2.1 | 1.6 |  |  |  |

To better understand the change in the rates of consumption, participants were asked in what time period they had stopped consuming the different types of meats (Figure 10). Interestingly, beef and chicken had the highest number of participants who had stopped consuming it in the last year, 19% and 18% respectively. Although lamb had the lowest amount of consumers in the last year, it also had the highest amount of participants who never consumed meat (31%). The rates over time for participants not consuming meat appears stable with no recent large increases across any of the meat types.

Figure 10. Time frames when participants who do not consume meat stopped consuming (n=62).

The participants who identified as either vegetarian or vegan were then asked what the most important reason was why they do not eat meat. For this sub-group, 27% identified animal welfare concerns, health was identified by 24%, texture and taste was identified by 19% and environmental sustainability concerns were identified by 11% (Figure 11). This reflects findings internationally, where health reasons and ethical considerations relating to environmental and animal welfare issues are the two major motivations for vegetarianism (Ruby, 2012). These issues are explored further in the following sections for all participants.

Figure 11. Reasons for vegetarians and vegans not eating animal products.

## Consumer preferences for animal welfare

Consumer concerns about animal welfare issues have been increasing over time (Petherick, 2005). Animal welfare focused vegetarians have been found to hold stronger convictions about their diet, to exhibit greater dietary restrictions, and to remain vegetarian longer than do health vegetarians (Hayley, Zinkiewicz, & Hardiman, 2015). To better understand where in the supply chain consumers are concerned about animal welfare impacts, participants in this study were asked *“How concerned are you that there might be animal welfare risks at the following steps from the paddock to your plate?”.* Response categories included in the paddock, in the feedlot, in transportation, in abattoir and in live exports. Results (Figure 12) show that transportation was the category that had the highest level of “very concerned participants”, followed by abattoirs and live export trade.

Figure 12. How concerned are you that there might be animal welfare risks at the following steps from the paddock to your plate? (1 = Very concerned, 2=Highly concerned, 3=Moderately Concerned, 4=Slightly Concerned, 5 = Not at all concerned)

Buddle et al. (2018) found that participants’ perceptions of poor animal welfare were focused on transportation, as it was viewed as a distinct stage in the production of red meat that was beyond the ‘care’ of farmers. Transporters were viewed as ‘middle men’, and were considered to include those working in the parts of the value chain between farmers and consumers and those involved in the sale of livestock in saleyards.

There are clear standards that guide transport, for example, Meat and Livestock Australia’s (2019) “Is the animal fit to load?”, although these guidelines have no regulatory power, their use is strongly encouraged. The animal welfare legislation in Queensland ("Animal Care and Protection Act. ," 2001) imposes a “duty of care” on those who are legally in charge of, or responsible for, animals. Under this legislation, the welfare codes can be used as a benchmark to demonstrate compliance with, or breaching of the duty of care.

Despite these regulatory frameworks, an Australian study by Coleman et al. (2015) found that 24% of the general public indicated low trust in workers involved in livestock transport on land and 41% indicated low trust in workers involved in livestock transport by sea. This latter figure may reflect a number of adverse events that had been reported in the Australian media in regard to live sheep export and strong criticism by the Australian animal rights group, Animals Australia (2013) at the time of their survey.

The higher levels of concern that were registered for animal welfare in abattoirs and live trade correspond to issues that have received media attention in Australia. Live exports received considerable media attention in 2011, after a 7:30 Program on the Australian Broadcasting Commission which showed very poor animal welfare standards towards cattle in Indonesian abattoirs (Trewin, 2014). Domestic abattoirs have also received media attention regarding the animal welfare in their facilities.

Participants in this study had lower concerns about animal welfare at the paddock scale or in feedlots (Figure 12). How concerned are you that there might be animal welfare risks at the following steps from the paddock to your plate? (1 = *Very concerned, 2=Highly concerned, 3=Moderately Concerned, 4=Slightly Concerned*, 5 = *Not at all concerned*)). Interestingly this has been an area of recent focus where there have been a number of protests on farm in Australia by animal rights activists (<https://www.farmonline.com.au/story/6008846/you-have-won-gippy-goat-cafe-closes-down-following-activist-attacks/>). In response the federal government proposed amendments to the Criminal Code Act 1995 to introduce two new offences in relation to the incitement of trespass or property offences on agricultural land. The results of this study confirm that there are low levels of community concern about animal welfare in these domains.

## Consumer health preferences

A key focus of this study was to identify how health concerns may be a driver of meat consumption. Participants were asked ‘*On a scale from 1 (Very important) to 5 (Not at all important), how important are each of the following factors to you when you consider the health impacts of meat you purchase*?’ A summary of responses across the different categories is shown in (Figure 13).

Figure 13. Proportion of participants who considered how important each of the following factors were to them when they considered the health impacts of their meat purchases (n=1137).

Unlike other parts of the world where food safety concerns are more prevalent due to recent health scares such as with Bovine Spongiform Encephalopathy (BSE) and Escherichia coli (Bernués, Olaizola, & Corcoran, 2003; Röhr, Lüddecke, Drusch, Müller, & Alvensleben, 2005), the central health concerns in Australia regarding red meat intake are based around cholesterol, heart disease, colorectal, and renal cancers (Council, 2013a; Sharon. Friel, 2010; McAfee et al., 2010). The Australian Dietary guidelines (2013b) recommend a minimum serve of on average 2 serves per day for women and 3 serves per day for men of lean red meats and poultry, fish, eggs, tofu, nuts and seeds, and legumes/beans (where a serve of a lean red meat is 65g). The guidelines strike a balance between nutritional benefits and risks such as colorectal, and renal cancers (Council, 2013a; McAfee et al., 2010). However there have been more recent reports, such as the 2019 EAT – Lancet Commission report (Willett et al., 2019) that suggest that red meat is not essential, creates substantial disease risk, and that optimal intake might be 0 grams per day .

In this study 27% of those who did not consume meat identified health concerns as the key reason. Within the group consuming red meat, 44% viewed import status as highly important, which may be treated as a proxy for food safety. Australia has a mandatory labelling declaration and The Australia New Zealand Food Standards Code prescribes a minimum standard for the necessary information for meat products. Participants may trust this regulatory process in Australia but are less sure about the standards in other countries.

There were very similar concerns about the ‘limited use of hormones’ (38%), ‘limited use of anti-biotics’ (38%), and ‘chemicals’ (37%). Similar support was registered for ‘high nutritional benefits’ (38%) and ‘animals raised outdoors in a natural environment’ (36%). Low fat content, which is associated with lower cholesterol and other health benefits, was only considered very important by 25% of participants. Other studies have found that Australian consumers tend to avoid more marbled or high fat content cuts of meat when they are health conscious (Ardeshiri & Rose, 2018; Morales et al., 2013).

## Consumer environmental concerns

Another focus of this study was identifying the extent to which environmental concerns, such as greenhouse gas emissions in meat production, is influencing consumption. This relates to potential impacts that red meat production may be having on the natural environment (Gerber, Mottet, Opio, Falcucci, & Teillard, 2015) and in creating spillover effects such as greenhouse gas emissions (e.g. (Sharon Friel, 2010; Lea & Worsley, 2008; McAlpine et al., 2009; McMichael, Powles, Butler, & Uauy, 2007). Participants were asked: “*On a scale from 1 (Very important) to 5 (Not at all important), how important are each of the following factors to you when you consider the environmental impacts of meat you purchase?*”. The factors included monoculture, impacts on waterways, vegetation, and greenhouse emissions from both transport and production.

The results show a fairly even distribution of concerns across issues (Figure 14). The impacts on water quality in streams and rivers was rated highest with 23% and 26% of participants considering to be very important or highly important, followed by the impacts of production on native vegetation and natural habitats. Monoculture in agriculture was the least important issue for participants, while greenhouse gas emissions from transport and production fell between other groups.

This finding provides interesting insights as beef emerges as the commodity receiving most attention for its environmental impacts. Globally, beef supply chains are estimated to emit about 2.9 gigatonnes of CO2-eq using a life-cycle assessment approach, about 40% of all livestock emissions (Gerber, Mottet et al. 2015). Hendrie et al (2014) modelled the greenhouse gas emissions (GHGe) from the Australian diet and compared these to emissions from the recommended dietary patterns. The average Australian diet as assessed in 1995 had the highest GHGe at 14.5 kg CO2e per person per day and was also highest in kilojoules (~9400 kJ). The food groups that made the greatest contribution to the diet-related GHGe in the 1995 average Australian diet were red meat (8.0 kg CO2e per person per day) and non-core foods (3.9 kg CO2e per person per day).

Figure 14. Proportion of participants who consider the following factors important to them when they purchase meat.

## Meat alternatives

There has been an increase in the supply of meat alternatives and an important research issue is to predict the extent to which consumers may transition their diet across to alternatives such as cultured meat (MLA 2019). To better understand this, participants were asked: “*If you were to stop or eat less meat in the future, what kind of alternatives would you be most inclined to choose?”* The results indicate that although thereis growing commercial interest in meat alternatives there was only a small group of participants who are currently inclined to consume them. The majority of participants would consider fish or seafood (43%), eggs (21%) or plant-based proteins (18%) before considering imitation meat (5%) or lab-grown meat (3%) (Figure 15).

Figure 15. Proportion of participants selecting meat alternatives.

## Production knowledge and information

Because consumers cannot see credence attributes directly in a product, they must have an understanding of the production system, and environment to better assess claims of improvement or status quo. Labelling is often used as product information however the usefulness is dependent on the consumer having knowledge about the system. Worsley et al. (2015) found that consumers knowledge of the agricultural sector was generally low in Australia. Malek, Umberger et al. (2018) found that few consumers felt sufficiently informed about farm animal welfare, and that environmentally concerned consumers were more likely to purchase meat labelled with an animal welfare credence claim.

To understand consumer perceptions towards red meat and agricultural issues, their level of agreement with a range of statements was assessed (Figure 16). There was strong support for current standards of food safety (62%) and eating quality (61%), and very low concerns about health risks (17%). The majority of respondents agreed that red meat was a staple of their diet (57%), with 20% disagreeing. Concerns about the environmental impacts were relatively consistent across the different issues, with 24% agreeing and 46% disagreeing that meat production harms the environment. There were also more respondents agreeing (32%) than disagreeing (24%) that livestock producers were protecting native species and native vegetation on their properties. There was a strong preference to purchase meat which had been produced locally (59%).

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Figure 16. Proportion of participants who agree or disagree with the statements about red meat production.

To better understand how demographic factors may relate to different concerns, chi-square tests were applied between the statements and the demographics of age, income, education and geographical location (Table 4). The results indicate that there were significant differences between age groups for the majority of statements. The age groups of 50-59 years (27%) and over 70 years (43%) disagreed more with statements relating to environmental impacts such as “I am concerned that meat production harms the environment” and “I think that plant-based meats are better for the environments” For the statement “Livestock producers protect native species and native vegetation on their properties” 25.5% of participants who were 25-29 years of age did not agree with the statement compared to 9.9% of participants between 50-59 years of age. Generally, the older age groups had a more positive view of the livestock industry than the younger age categories. For quality aspects such as food safety (“I am satisfied with the food safety of meat products”), and quality (“I am satisfied with the eating quality of meats”) the older age categories (60-69 years) had higher satisfaction (36.9%) compared to those in the 18-24 years age category (16.3%).

There were also differences between groups by education, with those who had a diploma level of education strongly agreeing that meat was a staple part of their diet (42.3%) as opposed to 25% of those who have a tertiary education. Tertiary educated participants (26.9%) also did not agree strongly that they had a preference for purchasing locally produced meat as opposed to 42% of those with a diploma and 32% of participants with a high school degree. Those participants with a tertiary degree were more likely to strongly agree with statements regarding the environment, with 12.8% of participants with a tertiary degree strongly agreeing with the statement “Livestock production is causing environmental issues” as opposed to 8.6% of high school educated participants.

Geographical location was also significant with those based in regional and rural communities having 37.4% of participants strongly disagreeing with the statement “I think plant based ‘meats’ are healthier to consume than beef” as opposed to 25.7% in urban areas. Participants who were regionally or rurally based also has a larger proportion of participants (32.8%) who did not agree that “Livestock produce too much greenhouse gases, impacting on climate change’ compared to urban participants (17.5%) (Table 5).

Table 5. Differences between participant categories and production statements. \*Denotes significance at the 95th percentile

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Age | Education | Income | Location |
| Meat is a staple of my diet | Chi-square p-value | 81.79  0.000\* | 36.68 0.000\* | 38.96 0.517 | 7.85 0.097 |
| I prefer to buy meat that has been produced locally/regionally |  | 91.24 0.000\* | 28.45 0.000\* | 48.20 0.175 | 7.08 0.131 |
| I prefer to buy meat that is labelled by a major producer or region |  | 41.63 0.014 | 15.16 0.056 | 41.56 0.403 | 5.69 0.223 |
| Eating meat products is risky to my health |  | 115.98 0.000\* | 36.94 0.000\* | 60.65 0.019 | 11.95 0.018 |
| I am satisfied with the eating quality of meat products |  | 87.34 0.000\* | 15.202 0.055 | 36.39 0.633 | 8.823 0.066 |
| I am satisfied with the food safety of meat products |  | 82.94 0.000\* | 11.52 0.174 | 35.81 0.659 | 1.259 0.901 |
| I am concerned that meat production harms the environment |  | 95.84 0.000\* | 20.00 0.010 | 50.21 0.129 | 15.32 0.004\* |
| I think that plant-based ‘meats’ are better for the environment than beef |  | 113 0.000\* | 37.40 0.000\* | 55.87 0.049 | 10.71 0.030 |
| I think that plant-based ‘meats’ are healthier to consume than beef |  | 128.94 0.000\* | 26.34 0.001\* | 57.92 0.033 | 13.76 0.008\* |
| Livestock produce too much greenhouse gases, impacting on climate change. |  | 78.72 0.000\* | 37.18 0.000\* | 52.12 0.095 | 34.33 0.000\* |
| Livestock production is causing environmental issues. |  | 87.32 0.000\* | 24.31 0.002\* | 58.71 0.028 | 26.60 0.000\* |
| There are large amounts of soil carbon that grazing protects. |  | 41.10 0.016 | 7.06 0.530 | 37.84 0.568 | 2.71 0.607 |
| Livestock producers protect native species and native vegetation on their properties. |  | 46.84 0.000 | 9.90 0.272 | 42.82 0.373 | 12.12 0.017 |

When asked about purchase patterns, 75% of participants purchased their meat from the supermarket, with a further 20% using an independent butcher or meat shop (Figure 17). There was a small proportion of respondents (4%) sourcing meat from ethic markets, farmers markets or specialty retailers.

Another related issue was to identify where people source information about red meat production and consumption issues. Past studies have identified that sources of health information, such as mass media, have strong effects on health behaviours and attitudes. However, Lea and Worsely (2001) found that vegetarians or occasional consumers rarely use or trust the mass media, advertising or orthodox health sources. The results of this study show that the majority of participants were not able to identify their sources of information regarding quality and food safety, health, animal welfare and environment (Figure 18.) There were smaller cohorts of participants who sourced information from professionals, scientists and farmers along with traditional media outlets.

Figure 17. Where participants purchased meat from.

Figure 18. Participants’ main sources of information about issues relevant to meat production and consumption.

# Implications for the beef sector

Changing environmental and social conditions have resulted in consumers demanding more than only quality standards of their beef produced. Health concerns in Australia have tended to reduce consumption of beef, while concerns about animal welfare and environmental standards have also been negative influences on consumption. The findings from this survey identify that these concerns are important, although limited in extent. There appears to be three key areas of opportunity for industry. One is to improve communications to all consumers, the second is to understand where in the supply chain consumers have concerns regarding animal welfare, health and environment, and the third is to understand consumer perceptions and concerns in international markets.

Concerns over credence factors are important in the supply chain. There has been considerable attention on animal welfare issues on farm. However, this study indicates that consumers are more concerned about animal welfare in the transport stages. Concerns about the environment are more focused on localised environmental issues such as water quality and biodiversity than issues such as greenhouse gas emissions. These insights allow the industry to better consider where to allocate resources. In 2018, the Australian beef industry launched ‘The Australian Beef Sustainability’ framework which was established as a whole-of-industry reporting tool, to define sustainable beef production and track the industry’s performance. Companies can use the framework to inform their own sustainability activities outside of the Framework process. In the Australian Beef Sustainability framework its annual update identified six key priorities: (i) animal husbandry techniques, (ii) profitability across the value chain , (iii) balance of tree and grass cover (iv) antimicrobial stewardship, (v) managing climate change and risk (vi) health and safety of people in the industry.

The sustainability framework covers the credence values of the environmental and ethical preference of consumers, however to date there is no certification or labelling regarding the framework such as the heart tick or engagement with consumers. Meat and Livestock Australia, the Red Meat Council and Industry have spent considerable time partnering to develop this process. Addressing the key priorities in the relevant components of the supply chain that consumers are concerned about will be critical to the success of the program.

While domestic consumption accounts for a small portion of the beef industry output, consumer demands indicate that the societal pressures and importance of credence factors are likely to also be relevant to export market consumers. It is expected that as export markets further develop it will be important to address these consumer concerns and communicate production and quality assurance standards. Understanding the similarity of consumer demands for credence goods between domestic and overseas consumers is an important topic for future research.

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