Values in layer hen welfare 2.0: The application of community values to key layer hen welfare issues

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by Prof R.A. Ankeny and R. Paxton

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Researcher/Author Contact Details

Name: Rachel A. Ankeny
Address: School of Humanities
Napier Building
The University of Adelaide
Adelaide SA 5005
Phone: +61 8 8313 5570
Fax: +61 8 8313 3443
Email: rachel.ankeny@adelaide.edu.au

In submitting this report, the researcher has agreed to Australian Eggs Limited publishing this material in its edited form.

Australian Eggs Limited Contact Details:

Australian Eggs Limited
A.B.N: 66 102 859 585
Suite 6.02, Level 6, 132 Arthur St
North Sydney NSW 2060

Phone: 02 9409 6999
Email: research@australianeggs.org.au
Website: www.australianeggs.org.au

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Foreword

This project was conducted to better understand how members of the Australian community apply values to consideration of key animal welfare issues in commercial egg production. In particular, the project aimed to assess the application of values to situations involving trade-offs between layer hen welfare, environmental concerns, and human health. The goal of the project was to gain a deeper understanding of the relative acceptability or unacceptability of various practices and developments in commercial egg production in Australia in relation to underlying values amongst members of the general public. To do so, the study addressed the following research questions:

- What values issues related to animal welfare, environment and human health in commercial egg production are most relevant to people within the Australian community, including to particular sections or sectors of the public?
- How do various types of people within the Australian community apply values and express, explain and justify such applications of values in situations where trade-offs between animal welfare, environmental, and human health outcomes exist?
- What are the impacts of these value applications on preferences for, or acceptability of, practices and developments in commercial egg production in Australia?

This project was funded from industry revenue which is matched by funds provided by the Australian Government.

This report is an addition to Australian Eggs Limited's range of peer-reviewed research publications and an output of our R&D program, which aims to support improved efficiency, sustainability, product quality, education, and technology transfer in the Australian egg industry.

Most of our publications are available for viewing or downloading through our website:

www.australianeggs.org.au

Printed copies of this report are available for a nominal postage and handling fee and can be requested by phoning (02) 9409 6999 or emailing research@australianeggs.org.au.

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Australian Eggs Limited provided the funds that supported this project.

About the Authors

Professor Rachel Ankeny is a senior academic in history and philosophy at the University of Adelaide where she leads the Food Values Research Group. Her research interests cross several areas and fields, and include the ethics and philosophy of science, particularly biomedical/biological sciences, bioethics and science policy, and food and agricultural studies.

Rebecca Paxton is a research assistant working on projects within the Food Values Research group and a PhD student at the University of Adelaide.

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Executive Summary

Most Australian households consume large numbers of eggs on an annual basis, but we know very little about what members of the broader community think about the practices associated with commercial egg production and the underlying values that they bring to these considerations. Such community values have important implications for what practices and outcomes are considered acceptable in the context of commercial egg production. In particular, increased community concerns about animal welfare issues in food production systems are shifting the landscape of what is acceptable and creating demands for new approaches to commercial egg production.

Animal welfare science and industry research, both in Australia and internationally, highlight that numerous trade-offs occur between desired outcomes in commercial egg production, including trade-offs between different aspects of layer hen welfare (Gale 2015; Nicol et al. 2017). In addition, community views on broader considerations associated with commercial egg production, including human health and environmental concerns, are rarely considered in the context of or in relation to animal welfare (Thompson et al. 2011). Most studies that seek to understand how people value animal welfare focus on consumers' contingent valuation of isolated outcomes (Bray & Ankeny 2017). Limited empirical research addresses how community members apply values about preferred or acceptable outcomes of commercial egg production in situations where such outcomes are traded off against each other.

To address animal welfare issues, the egg industry must make difficult decisions that balance factors including not only the best available scientific data but also diverse community expectations and values. It is therefore critical to understand how values associated with layer hen welfare compare to and are weighed up against other valued outcomes, for instance the potential effects of egg production on human health and environmental sustainability, particularly where values may be in conflict and where there is no objectively or scientifically correct answer. Such potentially conflicting values are a key challenge for the Australian egg industry as it continues to strive to meet community expectations regarding what is acceptable animal welfare.

The current research explores community values underlying animal welfare in commercial egg production, with a particular focus on where values might be in tension with current practices in the industry. The study focused on the following questions:

- What values issues related to animal welfare, environment, and human health in commercial egg production are most relevant to various types of people within the Australian community?
- How do various types of people within the Australian community apply values and express, explain and justify such application of values in situations where trade-offs between animal welfare, environmental, and human health outcomes exist?
- What are the impacts of these value applications on preferences for, or acceptability of, developments in commercial egg production in Australia?

To answer these questions, we conducted a mixed qualitative and quantitative study of how community values are applied to difficult decisions (i.e. trade-offs) involving outcomes for animal welfare, human health, and environmental sustainability. This report summarises findings from a nationally representative community survey, which was bookended by a series of preliminary and confirmatory focus groups. The community survey was analysed quantitatively in order to identify key values and preferences and their associations with various demographic and psychological characteristics of respondents. In-depth focus group discussions provided rich and detailed knowledge

about why community members think and feel the way that they do about various outcomes of commercial egg production, and particularly how these attitudes relate to their underlying values. As part of both the survey and focus groups, research participants were asked to indicate their preferences in a series of trade-off scenarios involving conflicting outcomes for animal welfare, human health, and environmental sustainability.

Our findings from both the community survey and focus groups revealed that members of the Australian community hold diverse views about animal welfare, which are reflected in varied prioritisation of animal welfare goals and expectations about how these are best achieved. Community members expected layer hens' basic needs to be fulfilled as a minimal welfare requirement. Some research participants considered access to an outdoor range to be a basic need and right for layer hens, and resisted the idea that good welfare could be achieved without such access. However, among community members who held more moderate views, it was important that hens have the freedom to choose how and where they spend their time. Overall, meeting basic needs, permitting freedom to choose, and providing the hens with care and protection represented the highest welfare priorities for the majority of research participants. Notably in both the survey and focus groups, research participants nearly always prioritised animal welfare ahead of environmental outcomes, in part because egg production was perceived as being relatively sustainable compared with other industries.

The community survey revealed patterns in respondents' preferences for different major categories of animal welfare outcomes. In particular, respondents who tended to anthropomorphise layer hens were significantly more likely to prefer outcomes that they viewed as providing hens with more natural living conditions and improved emotional wellbeing. While the tendency to anthropomorphise layer hens was also associated with greater knowledge of commercial egg production, increased knowledge was not strongly associated with a preference for outcomes affecting particular categories of animal welfare. Research participants also tended not to revise their preferences in light of new knowledge or information, although this did more frequently occur in the deliberative focus group setting. Somewhat surprisingly, there were also no consistent differences in the trade-off preferences of survey respondents living in urban and rural areas, or according to most demographic indicators, with the exception of age and gender.

Several notable issues emerged during discussions in the focus groups, which affected how we interpret these results and highlight the need for further in-depth research to understand how members of the Australian community draw on both knowledge and values to interpret information and make decisions about animal welfare. First, research participants tended to express their values differently when stating abstract preferences as compared with how they described their values when presented with concrete trade-off situations. In particular, research participants tended to prefer improving hens' affective states as an outcome in trade-off situations, while this was not prioritised in exercises that ranked preferences or when respondents were asked directly about affective states. Focus group discussions indicated that participants empathised with the hens' situations in more concrete situations but found it difficult to imagine a hen having abstract mental and emotional needs and experiences. This finding indicates that there may be a tension between how members of the Australian community think and reason about animal welfare and their 'gut feeling' when making value judgements related to animal welfare. It also suggests that care needs to be taken when designing research tools in order to be able to explore both of these aspects of participants' reasoning. Second, research participants tended to have different understandings of key terms related to animal welfare in comparison to how they are typically used in animal welfare science. Terms such as 'choice,' 'light,' and 'space,' which may be understood by animal scientists and those in the egg industry as objective and measurable, tended to be value-based for study respondents. This finding suggests that such terms may have considerable impact when used in social science research or other communications with members of the Australian community, and have considerable potential to result in miscommunication and misunderstandings as a result.

Overall Conclusions

Decision-making associated with commercial egg production requires consideration and prioritisation of a range of factors including not only the best available scientific data but also community expectations and values. Community values can help to inform such decisions by identifying what are viewed as acceptable or unacceptable animal welfare outcomes arising from commercial egg production practices. The current study provides a comprehensive picture of the values held by members of the Australian community in relation to layer hen welfare in commercial egg production, as well as how these values are weighted by them in the context of multiple competing desirable outcomes. The research findings are therefore highly relevant for guiding the development of Australian commercial egg production in ways that reflect the values of the community regarding layer hen welfare.

In summary, this study found that members of the Australian community hold diverse views about animal welfare, which are reflected in varied prioritisation of animal welfare goals and expectations about how these can best be achieved. Community members expected layer hens' basic needs to be fulfilled as a minimal welfare requirement. Some research participants considered access to an outdoor range to be a basic need and right for layer hens, and resisted the idea that good welfare could be achieved without such access. However, among community members who held more moderate views, it was thought to be important that hens have the freedom to choose how and where they spend their time. Overall, meeting basic needs, permitting freedom to choose, and providing the hens with care and protection represented the highest welfare priorities for the majority of research participants. Notably in both the survey and focus groups, research participants nearly always prioritised animal welfare ahead of environmental outcomes, in part because egg production was perceived as being relatively sustainable compared with other industries.

1 Introduction

Most Australian households consume large numbers of eggs on an annual basis, but we know very little about what members of the broader community think about the practices associated with commercial egg production and the underlying values that they bring to these considerations. A previous study for Australian Eggs Limited (Fisher et al. 2019) examined the values-based elements underlying the consensus in animal science across key areas related to laying hen welfare, and suggested how these values-based elements could be better exposed and examined to open the way for additional and new ways of researching key areas of hen welfare. This work revealed that there are numerous decisions associated with commercial egg production that require consideration of a balance of factors including not only the best available scientific data but also community expectations and values. The current study also complements ongoing studies done by CSIRO researchers for Australian Eggs Limited, focused on its Sustainability Framework (2018) and its implementation, which provide data on community attitudes about commercial egg production (Moffat et al. 2019).

The current research project sought to explore community values underlying animal welfare in commercial egg production, and particularly where values might be in tension with current practices in the industry. This study explored how members of the Australian community weighed up different desirable (or undesirable) animal welfare outcomes and investigated the values that underlie public expectations regarding such outcomes. It is critical to understand how values associated with layer hen welfare compare to and are weighed up against other valued outcomes, for instance the potential effects of egg production on human health and environmental sustainability, particularly where values may be in conflict and where there is no objectively or scientifically correct answer (see Box 1). Such potentially conflicting values are a key challenge for the Australian egg industry as it continues to strive to meet community expectations regarding what is acceptable animal welfare.

Box 1 What are value trade-offs?

Decisions that involve trade-offs occur frequently in the day-to-day lives of most people. These decisions require a choice between two options, whereby the benefits gained by choosing one of the options necessarily means that the benefits of the other are reduced. The choice between the options reveals their relative value to a decision-maker (Brase et al. 2018), and we therefore refer to them as *value trade-offs* (Hadari 1988). While more information may help the decision-maker to choose between the available options, there is no objectively right choice. Because many conflicts in society arise from differing values, exploring value trade-offs can help us understand and hopefully preempt such conflicts.

Most people are familiar with making decisions based on trade-offs in their day-to-day lives but may find it difficult to articulate the processes that they use when doing so. Trade-offs that involve moral choices are particularly difficult to make, and are even more tricky to consider in contexts where most people are not likely to have deep knowledge about the underlying practices, or may have never thought about the issues at stake in any detail, as in the case of weighing up and trading off different animal welfare outcomes in relation to their underlying values.

This project used two primary approaches to explore these questions, qualitative and quantitative methods. **Qualitative methods** are used to gain rich or detailed knowledge about people's thoughts, attitudes, or opinions, and allow a deeper dive into the problems or questions of interest. They can be used as exploratory research, and hence provide hypotheses that can be used as the basis of future quantitative research, but also can be used to better understand quantitative results. Qualitative methods are particularly useful when seeking to understand not just what people think, but what the

reasons are underlying opinions or views, and the relations between various parts of people's worldviews and values.

Qualitative data collection methods vary, but common approaches include using focus group discussions, individual interviews, or observational methodologies, with a small sample size often selected to be diverse and broadly representative of the population of interest. The data generated are often textual, and these are analysed by coding in terms of themes or other categories of information and focusing not on the number of occurrences or similar, but on the diversity of information collected (attitudes, views, or values, for instance). Although statistical methods cannot be utilised to determine the validity or reliability of qualitative research, there are well-established methods for making certain that qualitative results are high-quality and rigorous (e.g. see Lincoln & Guba 1999). These include, but are not limited to, making certain to control for researcher or other biases, engaging in ongoing critical reflection on methods as data are collected and analysed, coding of data including comparison by multiple researchers to ensure consistency, and clear and consistent decision-making throughout the processes of collection and analysis. They also incorporate repetition of data collection in order to ensure that different perspectives are represented until saturation occurs (namely no new themes emerge in subsequent research).

In this study, qualitative methods were used at two stages in the process. First, community-level focus groups were carried out at the start of the project to establish an overview of community priorities for layer hen welfare, including the diverse range of views held by members of the public. Focus groups were also used as a final stage in the overall research in order to deepen understandings of quantitative survey results, with a particular focus on how different sectors within the community make value trade-offs and how they respond to making difficult decisions between valued animal welfare outcomes.

Quantitative research is typically used to generate data that can be transformed into usable statistics, particularly to be able to generalise results from a sample to a larger group or even the general population. Questions tend to be close ended, and data generated can include attitudes, opinions, behaviours, or other defined variables, from which patterns or correlations are sought. Quantitative data collection methods include surveys, polls, and interviews, which typically use rating scales, checklists, and other types of more standardised instruments. The quality of quantitative research results can be measured using a range of statistical techniques, but the main goal is to assess how well the methods used measured whatever was of interest. Most quantitative research is assessed in terms of reliability (the consistency of a measure, in other words the extent to which the results can be reproduced if the research were to be repeated under the same conditions), and validity (the extent to which the results really measure what they are supposed to measure). In this project, we performed a large-scale representative survey of Australian community values and value trade-offs between different potential animal welfare outcomes, and analysed the data to determine patterns in animal welfare priorities within members of the Australian community, as well as whether consistent underlying values can be identified that are drivers of these priorities.

When performed correctly, combining qualitative and quantitative techniques permits better understanding of the research questions and the data generated than any one method on its own, and this approach is known as 'mixed methods research.' Such an approach allows researchers to gain more depth and breadth in their understanding of the data, as well as corroboration of findings across various methods used. Most importantly, mixed methods allow the weaknesses inherent in each approach performed on its own to be offset, for instance via triangulation (use of several means or methods to explore the same phenomenon or question of interest) together with careful and reflective analysis about the types of data produced using each method, and the strengths and limitations of each method. This project relied on this type of mixed methods approach in order to

produce both a much richer context for understanding what might sometimes appear to be contradictory community responses to various types of egg production practices, as well as actionable findings pointing to areas that require more research, improved communication and transparency, and more public and industry consideration and debate. Thus this study provides important data for future policy and practice decisions both by producers and at an industry-wide level, and has implications not only for the egg industry, but for animal-based production more generally.

2 Research findings

This report provides a summary of key findings of a research project that examined Australian community values about layer hen welfare in Australian egg production. A particular aim of this research was to gain insights into the application of community values in situations where choices must be made between different desirable or undesirable outcomes (i.e. trade-offs). The focus of the research was not on if, how, or why people choose to buy or eat eggs, but rather on how they think and feel as members of the Australian community. The centrepiece of the research is a nationally representative community survey, which was preceded and followed by community focus groups that informed the survey design and allowed deeper understanding and analysis of its results.

2.1 Preliminary community focus groups

At the outset of the research project, three community focus groups (Box 2) were conducted in urban and rural locations, namely in Adelaide (SA), Murray Bridge (SA), and Sydney (NSW). These focus groups provided insights into how members of the Australian community make sense of, talk about, and evaluate the goal of improving layer hen welfare in commercial egg production. Between ten and twelve participants were recruited by a professional recruitment company for each focus group. All the participants were 18 years or older and represented a mixture of demographic, socio-economic, and cultural groups.

Focus group participants were asked to rate and discuss the importance of various issues related to layer hen welfare, human health, and environmental sustainability in the context of commercial egg production in Australia. The issues selected for this exercise were identified following a desktop literature review. By conducting this focus group research at the beginning of the research process, we were able to uncover different ways in which animal welfare is conceptualised, and identify key concepts and ideas that were important to examine in the nationally representative survey.

Box 2 What is a focus group?

The focus group is a frequently used method in social science research that involves in-depth discussions on a particular issue or topic within a group setting. These discussions are facilitated by a researcher who typically has a set of questions or exercises that they wish to cover in the discussion. Unlike more structured research methods such as surveys, focus group participants are able to draw upon, question, and add to others' responses; introduce new perspectives; or refine and revise their stance on an issue in the course of the discussion. A benefit of using the focus group approach in the exploratory phase of a research project is that it can bring to light perspectives and considerations that the researchers might otherwise not have considered including in a more close-ended interview or survey. Focus groups can also help researchers to gain deeper understandings of survey findings by generating insights into what a particular topic means to participants, and why they think or feel the way that they do about an issue. Focus groups are usually audiorecorded and transcribed, and the transcript is analysed to look for themes or answer specific research questions.

2.2 Nationwide community survey

In order to gain a comprehensive overview of how community values are applied to layer hen welfare in commercial egg production in Australia, we conducted a survey that collected respondents' value judgements regarding a range of animal welfare outcomes. The survey was distributed online between the 14th and 29th of January 2020 by a professional recruitment company using a research panel to ensure that the survey sample was nationally representative of the Australian population in accordance with Australian Bureau of Statistics (ABS) data on age, gender, and rural and urban population distributions across Australia. We also ensured that no more than 3% of the sample consisted of respondents who do not eat eggs, in proportion with an Australian Eggs' estimate of egg consumption nationally (N. Powell 2020, personal communication, 17 July).

The main purpose of this survey was to present community members with situations that require difficult choices to be made between desirable or undesirable outcomes (i.e. trade-offs) in commercial egg production in Australia. To do so, we developed a set of fifteen brief scenarios, each of which involved a trade-off between two outcomes affecting layer hen welfare, human health, or environmental sustainability (see Table 2-1). Survey respondents were asked to mark their preference for either of the paired outcomes on a five-point scale where 1= Strong preference for option A and 5 = Strong preference for option B. The order in which the scenarios were presented, as well as the order in which the outcomes were displayed, were randomised in order to avoid order bias.

The layer hen welfare outcomes that were used in the scenarios reflect major categories of animal welfare that are central to animal welfare science, namely biological function, affective state, and natural living (see Box 3)[1]. In addition to pairings between animal welfare outcomes, each animal welfare category was also paired with an outcome affecting human health and environmental sustainability. Although these scenarios were hypothetical, the trade-offs they present are ones that could occur in Australian egg production and were developed based on existing Australian literature on layer hen welfare and in consultation with Australian Eggs. A full list of trade-off scenarios can be found in Appendix 1.

On the basis of the preceding focus groups, we included survey questions to assess people's tendencies to anthropomorphise layer hens, that is, their tendencies to believe that layer hens possess qualities such as a humanlike mind, free will, intentions, consciousness, and emotions, which are traditionally associated with human beings (Waytz et al. 2010). Previous research has found that people's tendencies to anthropomorphise non-human animals and even inanimate objects affect their levels of empathy and their moral judgements (Waytz et al. 2010). In the context of commercial egg production, anthropomorphism and its potential to affect people's preferences towards animal welfare outcomes were particularly relevant because of our limited abilities to understand how hens experience their environments and day-to-day lives, and thereby the difficulties we face with taking these sorts of experiences into account when making decisions that affect their welfare. Anthropomorphism scores were calculated for each respondent on the basis of five questions, each of which asked survey respondents to rate their agreement with a statement about layer hens (see Appendix 2).

Additionally, the preliminary focus groups highlighted community members' varying levels of knowledge of layer hen welfare and commercial egg production, which may influence their beliefs

[1] Although these terms are defined in the animal welfare literature, there is likely some controversy over their meaning, and use by scientists, industry, and lay people is likely to vary: see VIGORS, B. 2019. Citizens' and farmers' framing of 'positive animal welfare' and the implications for framing positive welfare in communication. *Animals,* 9. We draw on typical definitions of these categories in animal welfare science, but also rely on the more extended definitions provided during the preliminary focus groups.

about how animal welfare ought to be achieved. Prior research shows that increasing awareness and concern for animal welfare are not necessarily coupled with greater knowledge about production practices or welfare issues (Miele et al. 2013; Healy 2018). Furthermore, community members' lack of knowledge about animal welfare and commercial egg production may contribute to the expression of preferences that are counter to their underlying values. In order to assess the potential effects of different levels of knowledge on values and trade-off preferences, we asked survey respondents to answer whether they thought each of a series of five statements was true or false, or if they were uncertain, based on their understanding of commercial egg production in Australia (see Figure 5-2). A 'knowledge score' was calculated for each respondent by summing the number of correct responses.

In order to further analyse the application of values among members of the Australian community, the survey data were also segmented according to different dietary habits, demographic differences, and attitudes towards the Australian egg industry.

The community survey was analysed quantitatively using a variety of statistical techniques, including multinomial logit, ordinal least square (OLS), and ordinal regression analyses, which identify patterns in responses across different survey questions or groups of respondents. Survey findings were triangulated with qualitative findings from the preliminary and confirmatory focus groups in order to verify and inform their interpretation.

Table 2-1 Trade-off pairs using animal welfare, human health, and environmental sustainability outcomes

Pairs of trade-offs used in scenarios	Biological function (BF)	Affective state (AS)	Natural living (NL)	Human health (HH)
Biological function	BF vs BF	BF vs AS	BF vs NL	BF vs HH
Affective state	AS vs BF	AS vs AS	AS vs NL	AS vs HH
Natural living	NL vs BF	NL vs AS	NL vs NL	NL vs HH
Environmental sustainability (ES)	ES vs BF	ES vs AS	ES vs NL	-

Box 3 Major categories of animal welfare

Animal welfare science is a dynamic area of research that evolves as new methods of measurement become available and as societal expectations regarding welfare standards shift. Current animal welfare science is composed of three main foci, which have their origins in different worldviews and reflect different priorities and values regarding animal welfare assessment and management:

- *Biological function* includes aspects of animal welfare that are related to the animal's physical health, including its physiological development and performance. Examples of evidence used to assess biological function in layer hens are the presence or absence of disease or physical stress, size and weight, rates of lay, and the condition of their feathers or feet.
- *Affective state* refers to the hen's mental state and experiences of positive or negative emotions. Examples of positive emotional experiences that are sometimes attributed to layer hens include pleasure, contentment, and enjoyment, while negative emotions include fear, pain, boredom, and frustration. Because we cannot directly assess what hens are thinking or feeling, such assessments are necessarily indirect, often emphasising behavioural expressions of preferences or responses to positive or negative stimuli.
- *Natural living* associates animal welfare with the animals' natural or wild state, and through their ability to express natural behaviours. In the context of egg production, natural living is often equated with the hens having access to outdoor ranges and being able to perform behaviours such as dustbathing, pecking, and foraging.

Although these three approaches to animal welfare draw on different scientific traditions and worldviews, there is considerable overlap between them, and they are not necessarily incompatible. However, they tend to rely on different forms of evidence and can therefore result in considerable disagreement (Green and Mellor, 2011, Gale, 2015).

2.3 Confirmatory focus groups

As a final step in the data collection process, we conducted three qualitative focus groups, which encouraged members of the Australian community to think more deeply about layer hen welfare in order to provide further insights into the reasoning behind their preferences and to relate survey findings to broader community values. These focus groups took place in urban and rural locations (in Adelaide SA, Murray Bridge SA, and Melbourne VIC) with between ten and twelve participants each who were recruited by a professional recruitment company. All the participants were 18 years or older and represented a mixture of demographic, socio-economic and cultural groups (see Section 3).

The main aim of these focus groups was to uncover why members of the Australian community think and feel in the ways that they do about layer hen welfare, and how and why they express particular trade-off preferences. To do so, in-depth discussions were structured around two scenarios that described farmers who prioritised different aspects of animal welfare, human health, and environmental sustainability when making decisions about how to produce eggs (see Appendix 4 for the scenario texts). Focus group participants were asked how they think and feel about the farmers' decisions, and why. Follow-up questions introduced stepwise increases in the complexity of the decision-making, which were used to prompt discussions that unpacked fine-grained distinctions in participants' applications of values. More general questions, for example about how participants make difficult decisions in their own lives, were used as prompts for broader discussions about values. Some variations to the scenarios were made for each group in order to deepen the discussion about certain

issues or explore particular value applications, but the scenarios were always presented from the point of view of the producers.

The focus groups were analysed qualitatively using thematic analysis (following Braun & Clarke 2006, 2012, and Clarke & Braun 2013). This method involves iterative stages coding of the focus group transcripts and the organisation of codes in order to build themes, which represent patterns of shared meaning among the participants.

3 Study participants

The following section provides an overview of key characteristics of research participants. Further information on study participants can be found in Appendix 5.

3.1 Participants in the preliminary focus group

Participants for the preliminary focus groups were recruited by a professional recruitment company from among its research panels in the Adelaide and Sydney metropolitan areas, and rural South Australia. The sampling strategy aimed to achieve a broad mix of participants representing various cultural demographic backgrounds, and attitudes towards egg production and consumption. Four focus group participants followed a deliberate diet, of which two were flexitarians, one a pescatarian, and one a lacto-ovo vegetarian. Although the focus group did not aim to exclude people who did not eat eggs, all focus group participants consumed eggs.

A summary of the key characteristics of the focus group participants are shown in Figures 3-1 to 3-3:

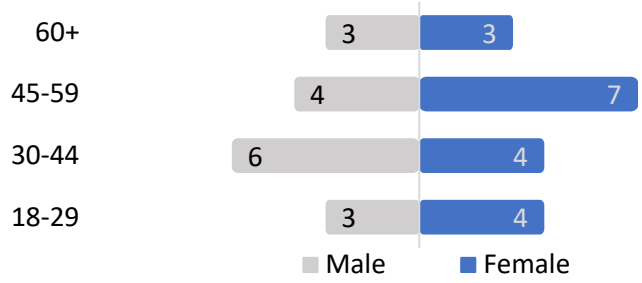

Figure 3-1 Age and gender of preliminary focus group participants (n=34)

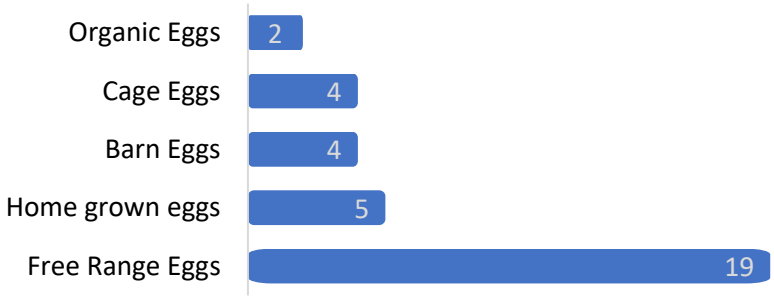

Figure 3-2 Type of egg most frequently consumed in household (n=34)

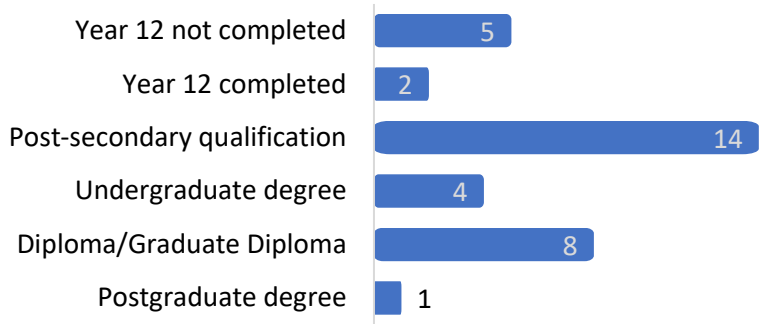

Figure 3-3 Highest level of education attained by focus group participants (n=34)

3.2 Participants in the community survey

In total, 3125 completed surveys were returned. The demographic make-up of the survey sample was representative of the Australian population, in accordance with ABS population statistics relating to age and gender (Figure 3-4), and national and state-wide populations, including metropolitan and regional areas (see Figure 3-5). For further information on survey participants see Figures 14-2 to 14-6 in Appendix 5.

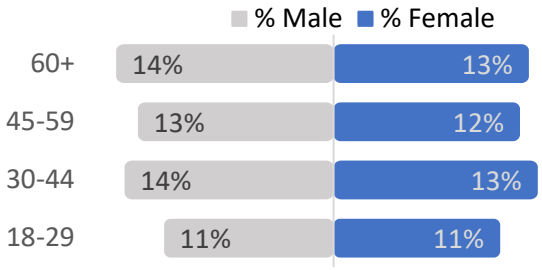

Figure 3-4 Percent (%) of survey respondents by age and gender (n=3124, one respondent non-binary)

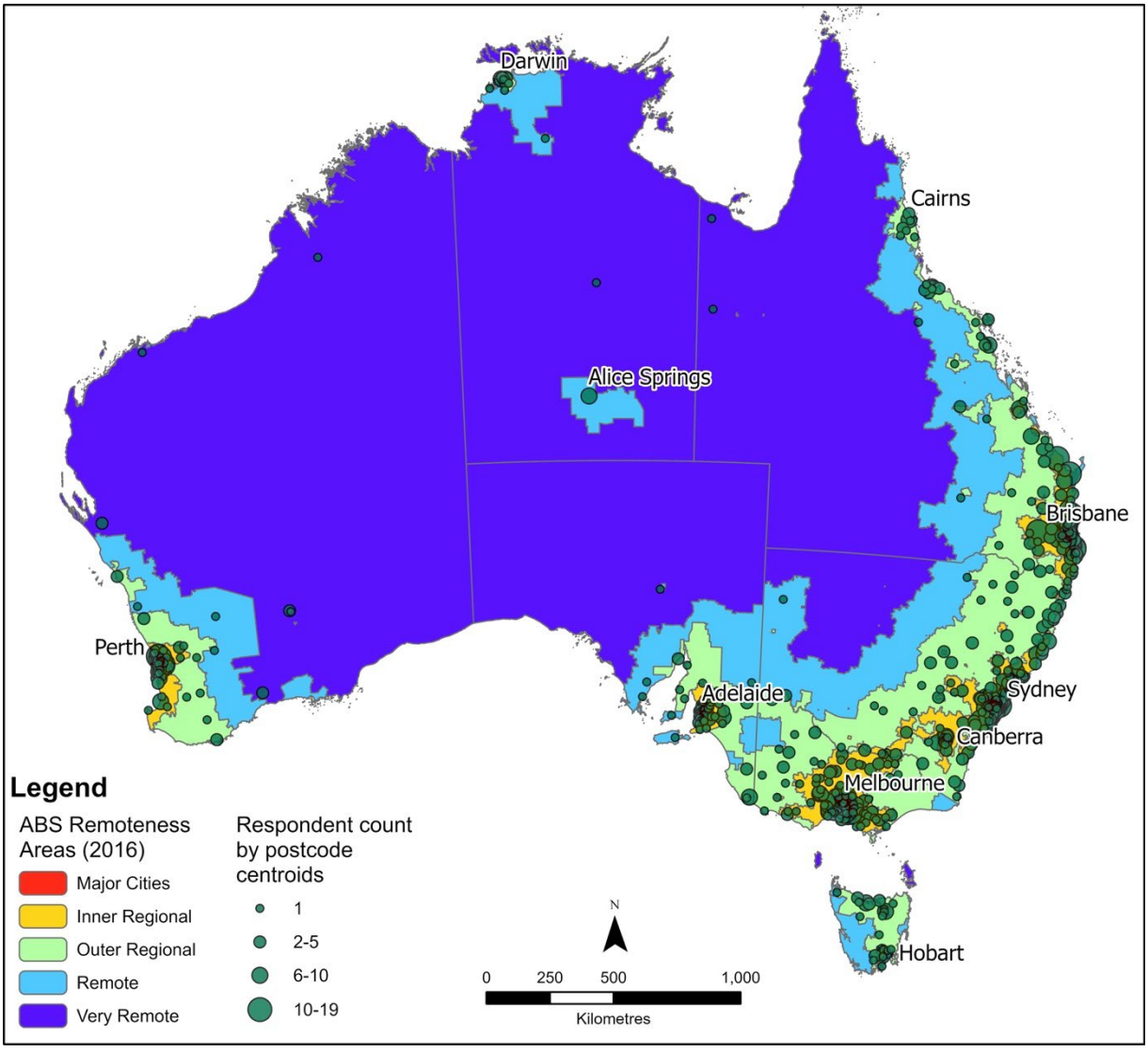

Figure 3-5 Distribution of survey respondents across very remote (n=14), remote (n=24), outer regional (n=244), and inner regional (n=601) areas, and major cities (n=2242), based on Postcodes and ABS Remoteness Areas

Australia Post postcode areas as at 2018.
Australian Bureau of Statistics (ABS) Remoteness Areas 2016.
The boundaries of inner regional and major city areas are partially obscured due to the number of respondents.
Source: Lange, J. (2020) prepared for this report.

82% of survey respondents were omnivores. 4% of survey respondents explicitly followed diets that excluded eggs, i.e. vegan and lactovegetarian (Figure 3-6). Of respondents whose households did not consume eggs, animal welfare and health were the primary reasons not to do so (Figure 3-7). Among households where eggs were consumed, the overwhelming majority stated that they most frequently consumed free-range eggs (Figure 3-8).

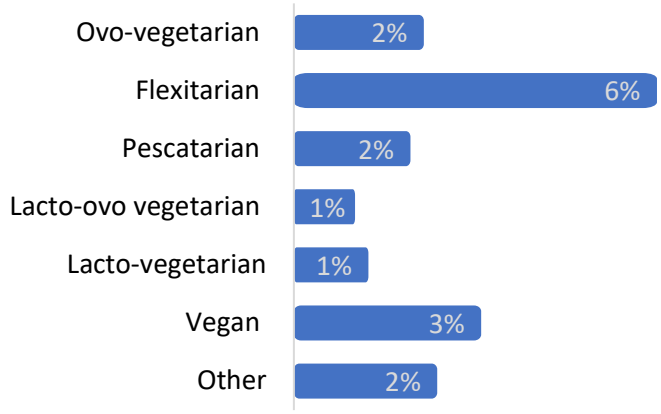

Figure 3-6 Percentage of survey respondents following deliberate diets (percent of n=3125)

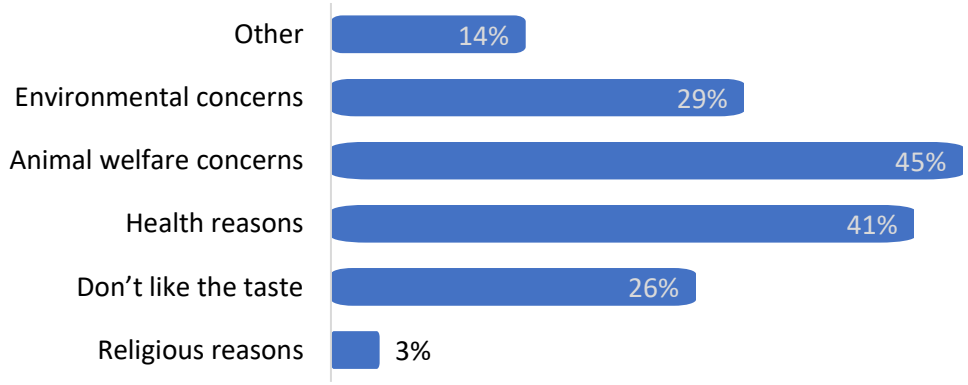

Figure 3-7 Reasons for not consuming eggs (percentage of respondents whose households do not consume eggs, n=58)

Respondents could select multiple options.

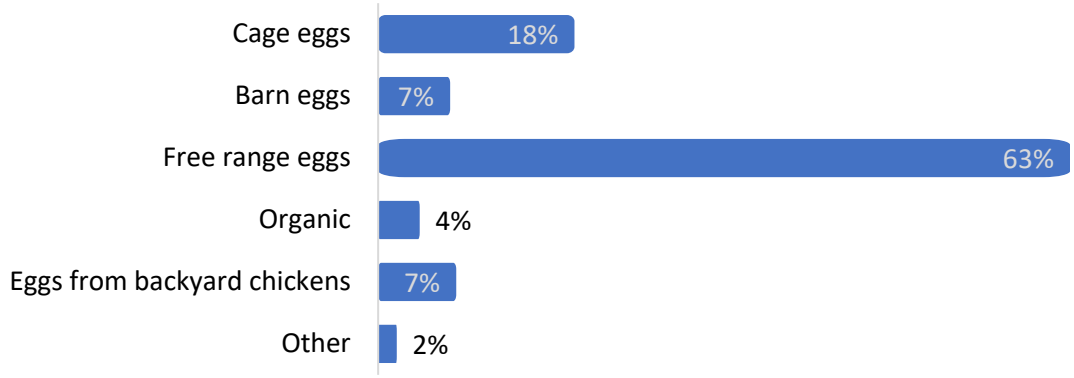

Figure 3-8 Egg types most frequently consumed by survey respondents' households (percentage of respondents whose households do consume eggs, n=3067)

3.3 Participants in the confirmatory focus groups

Participants for the confirmatory focus groups were recruited by a professional recruitment company from among its research panels in the Adelaide and Melbourne metropolitan areas, and rural South Australia. The sampling strategy aimed to achieve a broad mix of participants representing various cultural demographic backgrounds (Figures 3-9 to 3-11) and values related to egg production and consumption (Figures 3-12 to 3-13).

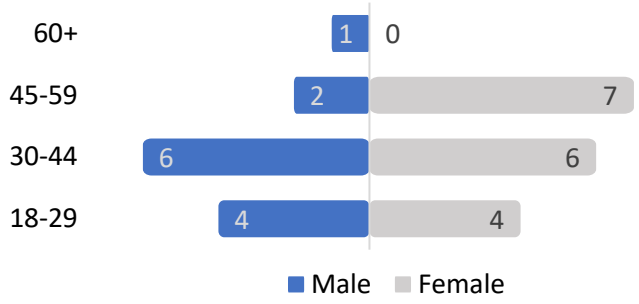

Figure 3-9 Number of focus group participants by age and gender (n=30)

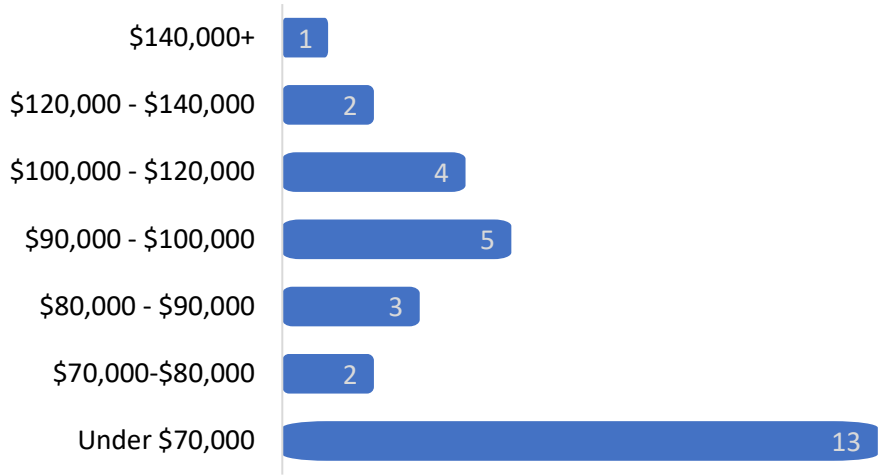

Figure 3-10 Number of focus group participants by household income (n=30)

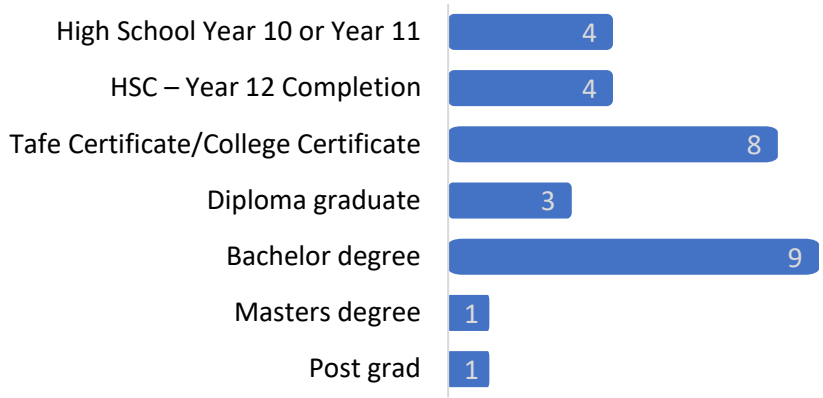

Figure 3-11 Highest education of participants in confirmatory focus groups (by number of respondents, n=30)

Only one focus group participant followed a deliberate diet, which was lacto-ovo vegetarianism and therefore included eggs. The majority of focus group participants stated that they mainly ate free-range eggs (Figure 3-12).

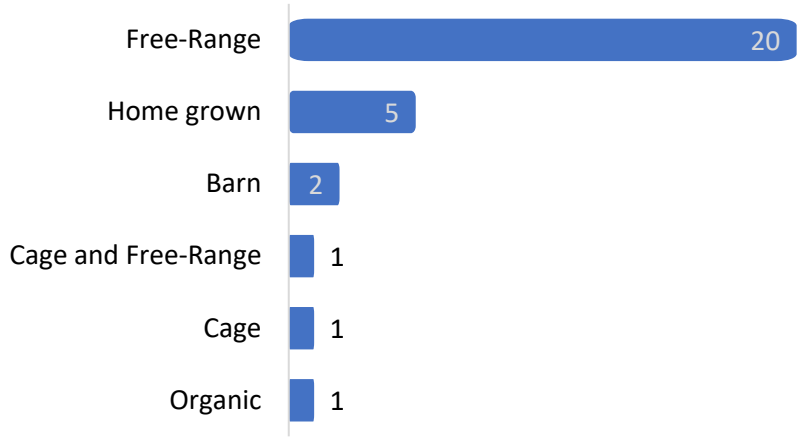

Figure 3-12 Egg types most frequently consumed by focus group participants (by number, n=30)

Participants in the confirmatory focus groups were asked to rate to what extent it is morally wrong to negatively affect layer hen welfare in order to produce affordable eggs. Only one participant across all the confirmatory focus groups felt that it was somewhat morally right to negatively affect layer hen welfare in order to produce reasonably priced eggs, while the majority considered this to be either somewhat or absolutely morally wrong (Figure 3-13).

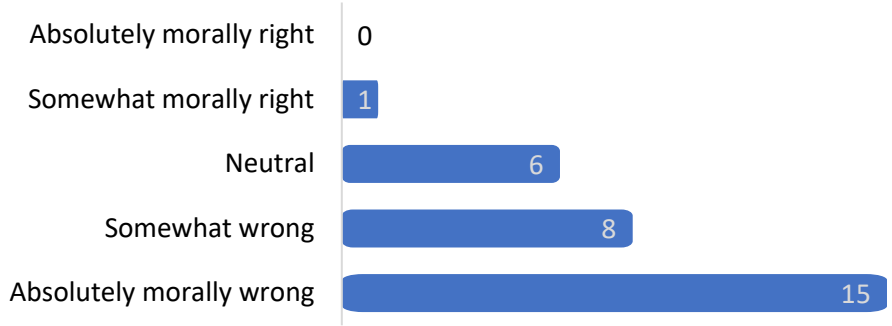

Figure 3-13 Responses to the question "To what extent is it morally wrong to create negative effects on layer hens' quality of life in order to produce reasonably priced eggs?" (n=30)

4 Attitudes towards the Australian egg industry and production systems

In order to differentiate between Australian community values related to animal welfare and broader attitudes towards commercial egg production and consumption, we asked survey participants about what factors affect their choices when buying and consuming eggs, or their decisions not to purchase eggs.

Overall, survey respondents agreed that Australian eggs are safe to eat (Figure 4-1). Although over half of the respondents expressed agreement that Australian egg producers are environmentally responsible, a considerable number appear uncertain, neither agreeing nor disagreeing with this statement (Figure 4-2).

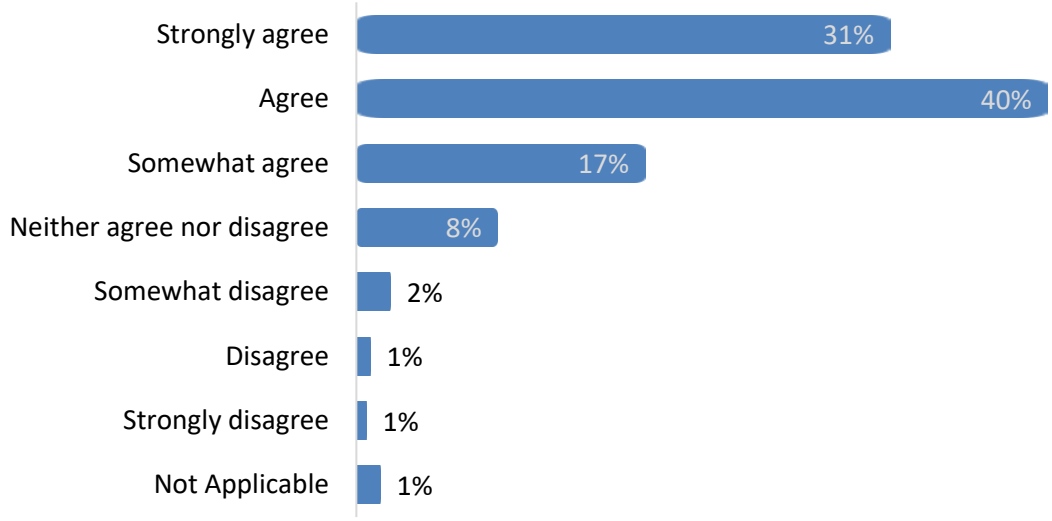

Figure 4-1 Level of agreement with the statement "In my opinion, Australian eggs are safe to eat"

Showing percentage of respondents at each level out of n=3125.

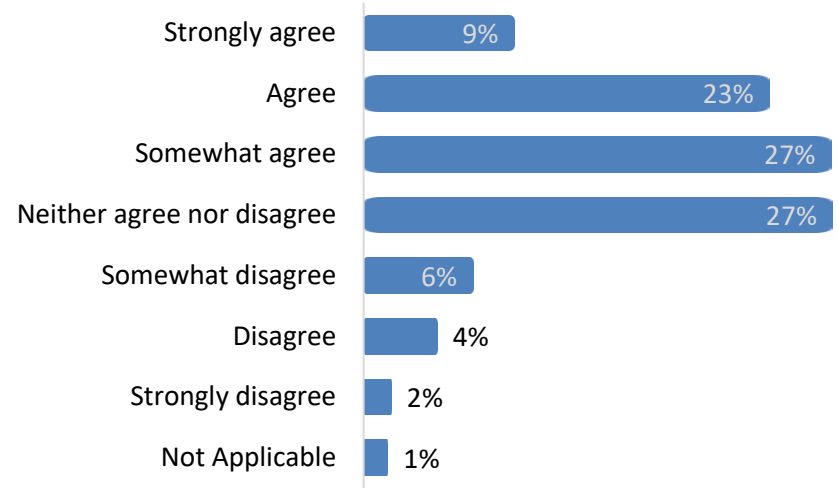

Figure 4-2 Level of agreement with the statement "In my opinion, Australian egg producers are environmentally responsible"

Showing percentage of respondents at each level out of n=3125.

The overwhelming majority of survey respondents reported only purchasing eggs from a particular farming system (see Figure 4-3). Based on the purchasing habits expressed in Section 3, it is likely that eggs from free-range systems make up a large proportion of these purchases. A similarly large majority of respondents agreed with the claim that farming method affect the taste and nutritional quality of the egg (Figures 4-4 and 4-5, respectively).

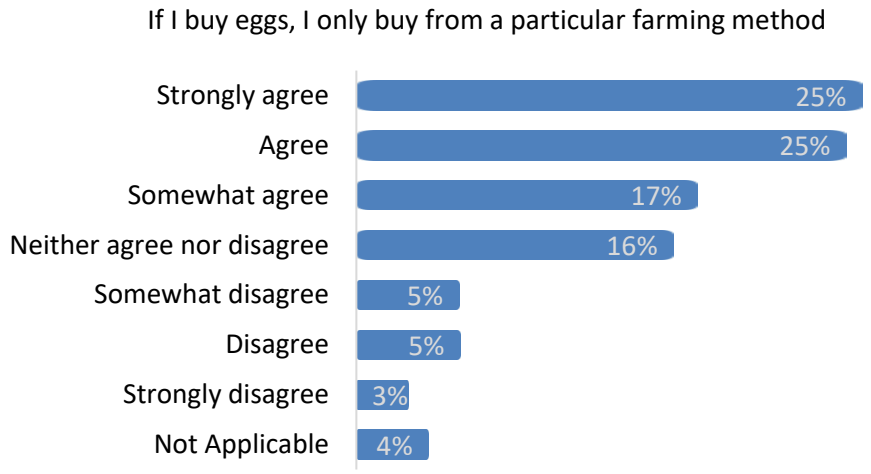

Figure 4-3 Level of agreement with the statement "If I buy eggs, I only buy from a particular farming method"

Showing percentage of respondents at each level out of n=3125.

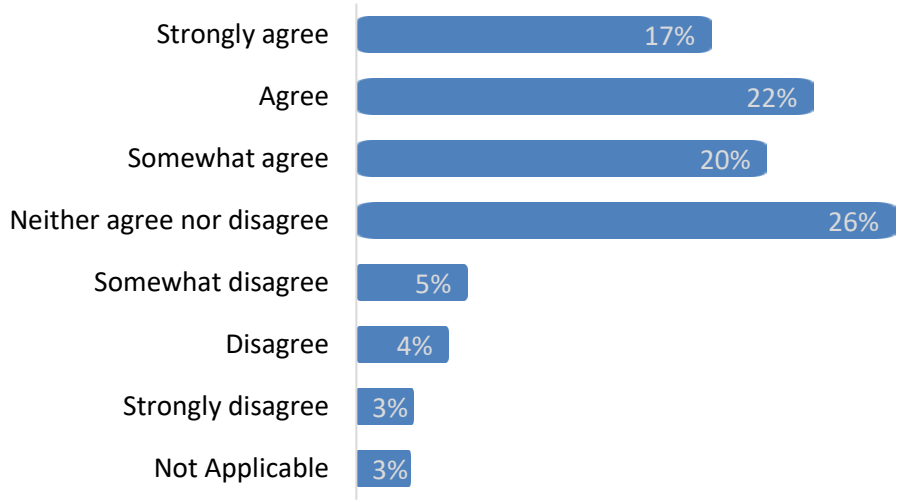

Figure 4-4 Level of agreement with the statement "In my opinion, farming method affects the taste of the egg"

Showing percentage of respondents at each level out of n=3125.

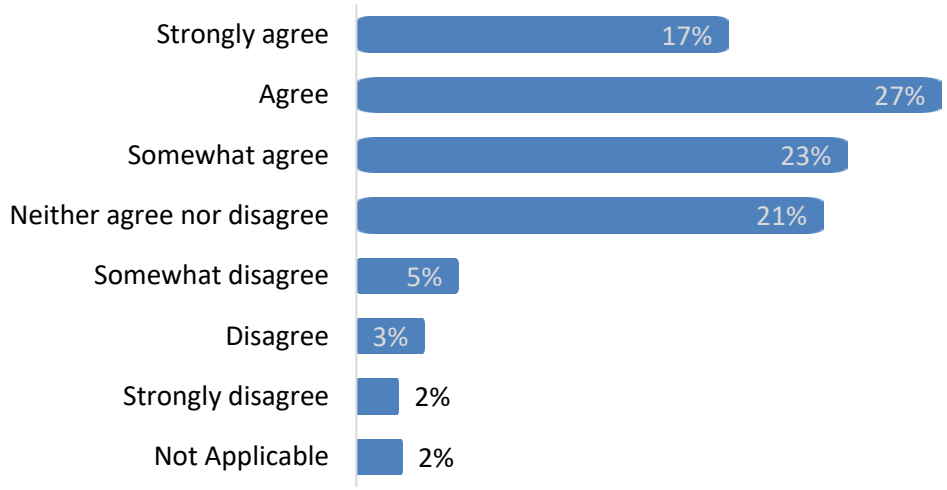

Figure 4-5 Level of agreement with the statement "In my opinion, the way that eggs are produced affects their nutritional quality"

Showing percentage of respondents at each level out of n=3125.

5 Knowledge of Australian egg production and animal welfare issues

In order to better understand whether differing trade-off decisions reflect diverging value judgements, varied levels of community knowledge, or a mixture of both, we asked survey respondents to answer a set of true/false questions about animal welfare issues in commercial egg production in Australia. In addition, survey respondents indicated their self-perceived knowledge of animal welfare issues associated with commercial egg production.

5.1 Self-rated and measured knowledge

Survey respondents' knowledge of commercial egg production was mixed, according to both their self-rated and measured knowledge. There is a strong positive correlation between respondents' self-rated and measured knowledge of Australian egg production on a five-point scale. Almost half of the survey respondents rated their own knowledge as basic, i.e. the middle category in Figure 5-1. Measured knowledge showed that respondents had inconsistent knowledge about commercial egg production in Australia (Figure 5-2). Respondents were particularly uncertain about the process of beak trimming and whether male chicks are used for meat production.

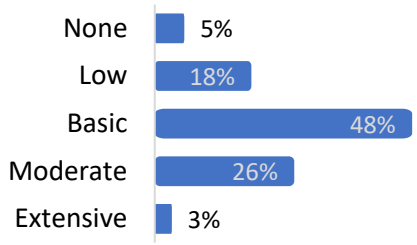

Figure 5-1 Self-rated knowledge of animal welfare issues associated with commercial egg production, rated on a 5-point scale from none to extensive (n=3125)

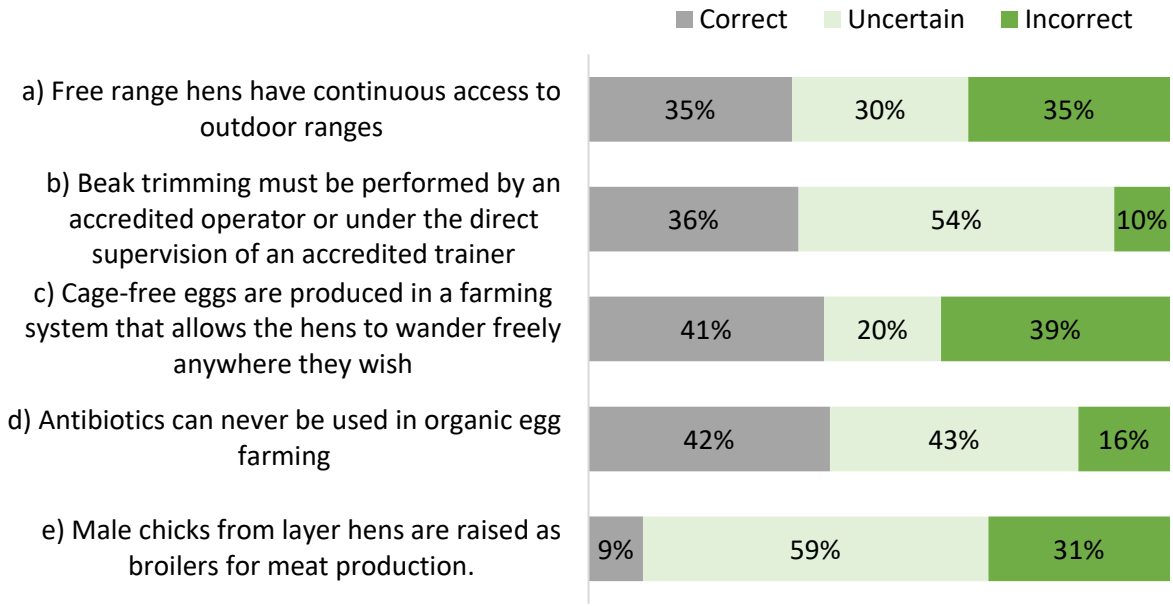

Figure 5-2 Percentage of survey respondents who answered correctly, incorrectly, or were uncertain for each question, which measured their knowledge of commercial egg production in Australia (n=3125)

6 Is animal welfare in egg production an important moral issue?

In order to understand how members of the Australian community feel about animal welfare in commercial egg production, we asked survey respondents to rate the importance of animal welfare and whether it is morally acceptable to negatively affect animal welfare in order to produce affordable eggs, on two seven-point scales.

6.1 Importance of animal welfare

Members of the Australian community overwhelmingly considered protecting the welfare of chickens in commercial egg production in Australia to be an important issue (mean score = 5.84 on a seven-point scale, where 1 = not important and 7 = very important). Over half (58%) of survey respondents also agreed that animal welfare is a main influence on their choice of whether or not to buy eggs, or of which eggs to buy. A similar number (56%) of respondents believed that most people make an effort to buy eggs produced under high animal welfare conditions.

6.2 Morality of egg production

Overall, the majority of survey respondents signalled that layer hen welfare is a moral issue, although they were mixed in their perceptions of whether it is morally right or wrong to negatively affect the quality of life for layer hens in order to produce reasonably priced eggs. Although the majority of respondents (57%) rated this issue as being between somewhat morally wrong and absolutely morally wrong (positions three, two, and one in Figure 6-1), responses ranged across the full scale. A considerable number of respondents viewed the issue of layer hen welfare in the production of reasonably priced eggs to be morally neutral (20%).

While there were no clear tendencies for different demographic or consumer groups to rate the issue as either morally right or morally wrong, there was a clear tendency for some groups to treat the issue as morally significant versus morally neutral. Women, younger respondents, and politically engaged respondents were significantly more likely to consider the issue as morally relevant than as morally neutral, while this tended not to be the case for their male, older, or less politically engaged counterparts (see Table 14-2 in Appendix 6). Respondents who reported purchasing cage eggs were significantly more likely to hold moderate or neutral views about the morality of this issue.

Further, there was a strong linear relationship between respondents' perceptions of the importance of animal welfare and their morality score. As the importance of animal welfare increased, so did the perception that it is absolutely morally wrong to create negative effects on layer hens' quality of life in order to produce affordable eggs (see Table 14-3 in Appendix 6). The belief that negatively affecting animal welfare in order to produce reasonably priced eggs is absolutely morally wrong was also significantly correlated with lower levels of measured knowledge about commercial egg production in Australia (see Table 14-4 in Appendix 6).

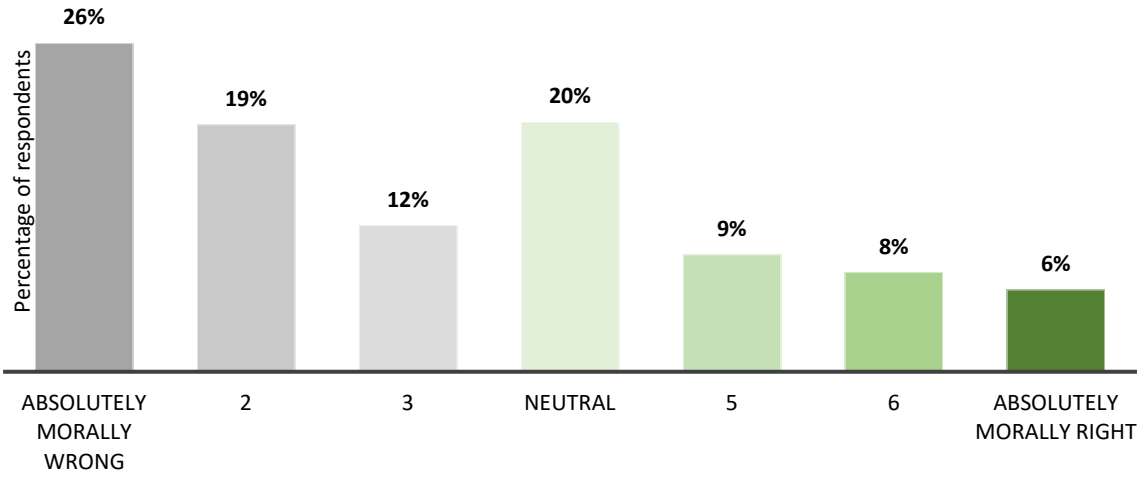

Figure 6-1 Respondents' perceptions of whether it is morally right or wrong to negatively affect the quality of life for layer hens in order to produce reasonably priced eggs (n=3125)

6.3 Support for animal welfare organisations

We also asked survey respondents whether they have ever supported animal welfare or animal rights organisations and, if so, by what means. Over half (56%) of survey respondents reported having supported at least one animal welfare or animal rights organisation at some time. Of the eight organisations listed,[2] the Royal Society for the Prevention of Cruelty to Animals (RSPCA) had the greatest number of supporters (nearly 59% of those who had supported at least one animal welfare or animal rights organisation supported the RSPCA). The most frequent support was in the form of donations (over 60%), followed by social media engagement (nearly 16%), and volunteer work (nearly 10%).

[2] The listed animal welfare or animal rights organisations included: Animals Australia, Animal Welfare League (AWL), Aussie Farms, People for the Ethical Treatment of Animals (PETA), Royal Society for the Prevention of Cruelty to Animals (RSPCA), Voiceless, WIRES Wildlife Rescue, and World Wildlife Fund (WWF).

7 Anthropomorphism

In order to examine why different animal welfare, human health, and environmental sustainability preferences may exist within the Australian community, we assessed the tendencies among survey respondents to anthropomorphise layer hens, that is, their tendencies to believe that layer hens possess qualities traditionally associated with human beings such as a humanlike mind, free will, intentions, consciousness, and emotions.[3]

7.1 Tendency to anthropomorphise layer hens

Overall, survey respondents tended to agree that hens possessed anthropomorphic qualities, although they disagreed about the extent to which they possessed these qualities. Across all anthropomorphism questions, survey respondents scored on average 30.38 out of a possible 50 on the anthropomorphism scale, with only a small percentage of respondents located at either extreme of the scale (see Figure 7-1). Respondents were somewhat more likely to believe that hens have consciousness and experience emotions than they were to attribute free will to hens (see Figure 14-1 in Appendix 2).

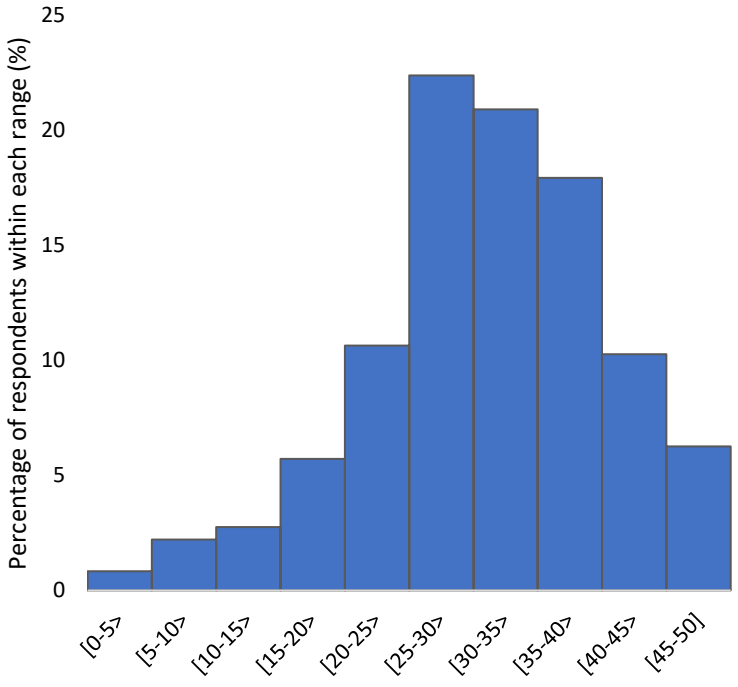

Figure 7-1 Percentage of survey respondents who scored in each anthropomorphism score range (n=3125)

[3] This description of anthropomorphism, its constituent categories, and the method for assessing individual tendencies to anthropomorphise, are derived from work by Waytz et al. 2010.

7.2 Associations between anthropomorphism and moral values

A particular area of interest for this research was whether the tendency and degree to which members of the Australian community anthropomorphise layer hens influenced or are correlated with their preferences for particular outcomes in trade-off situations. One way in which anthropomorphism may be a factor in trade-off situations is that greater tendencies to anthropomorphise among respondents may result in according higher moral value to layer hens than would lower tendencies to anthropomorphise. Looking at the relationship between survey respondents' anthropomorphism scores and their judgements that it is morally right or wrong to negatively affect animal welfare in order to produce reasonably priced eggs (see Section 6), we identified a strong association between respondents' increasing anthropomorphism scores and increasing agreement with the view that negative impacts on layer hen welfare are morally wrong ($p < 0.01$, see Table 14-5 in Appendix 6). Notably, however, the tendency to view negatively affecting layer hens' quality of life in order to produce reasonably priced eggs as absolutely morally right was also significantly positively associated with respondents' anthropomorphism scores.

8 Layer hen welfare goals and key influences

Looking specifically at community values in relation to the welfare of layer hens in commercial egg production, we examined survey respondents' priorities for achieving welfare goals and the factors in egg production that they consider to be most important for welfare outcomes.

8.1 Goals of layer hen welfare

While there was no one clear majority preference in the survey data, the rankings show clear patterns in survey respondents' prioritisation of welfare goals (see Figure 8-1). The most frequently highest ranked goals for animal welfare were to meet the hens' basic needs (ranked first by 27% of respondents) and to permit the expression of natural behaviours (ranked first by 20% of respondents), while the lowest ranked goals were to improve the quality and safety of eggs (ranked ninth by 17% of respondents), and encouraging positive emotional experiences (ranked ninth by 13% of respondents). Considered together, providing the hens with positive emotional experiences and avoiding negative emotional experiences were ranked lowest by 23% of respondents.

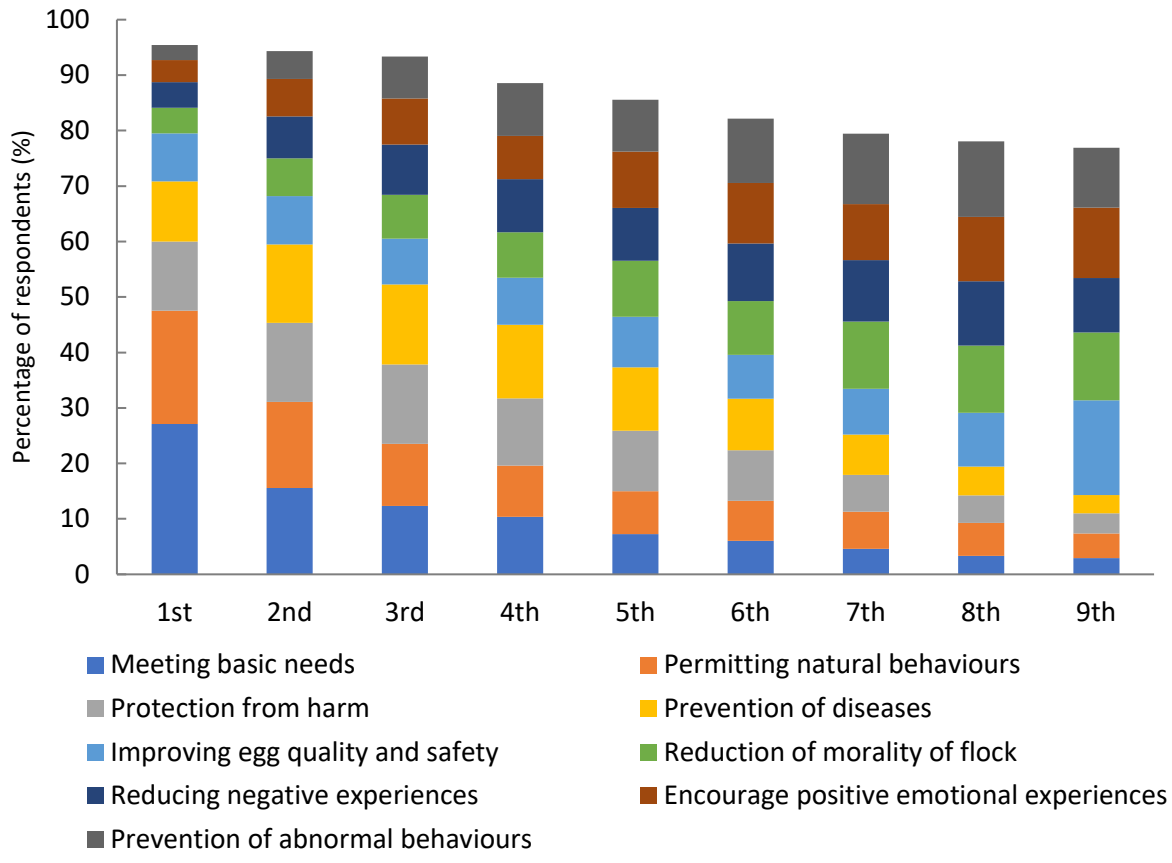

Figure 8-1 Percentage of respondents who ranked each of the animal welfare goals in each of the 9 ranks according to their importance

1st = most important, 9th = least important.

Because survey participants selected only goals they perceived relevant for layer hen welfare, all columns do not sum to 100% (n=3125).

8.2 Influences on layer hen welfare

A similarly clear pattern emerged regarding the importance of various factors that can influence animal welfare (see Figure 8-2). Participants ranked access to the outdoors and flock size as the first or second most important factors and rarely ranked these as least important (access to outdoors was ranked first by 23% and second by 14.5% of respondents, while flock size was ranked first and second by 19% and 15% respectively). Conversely, predation, smothering, and euthanasia accounted for half of the lowest rankings and were rarely ranked most important. Predation and smothering were also selected as factors that were considered relevant for animal welfare by the fewest number of respondents (both by 77% of respondents).

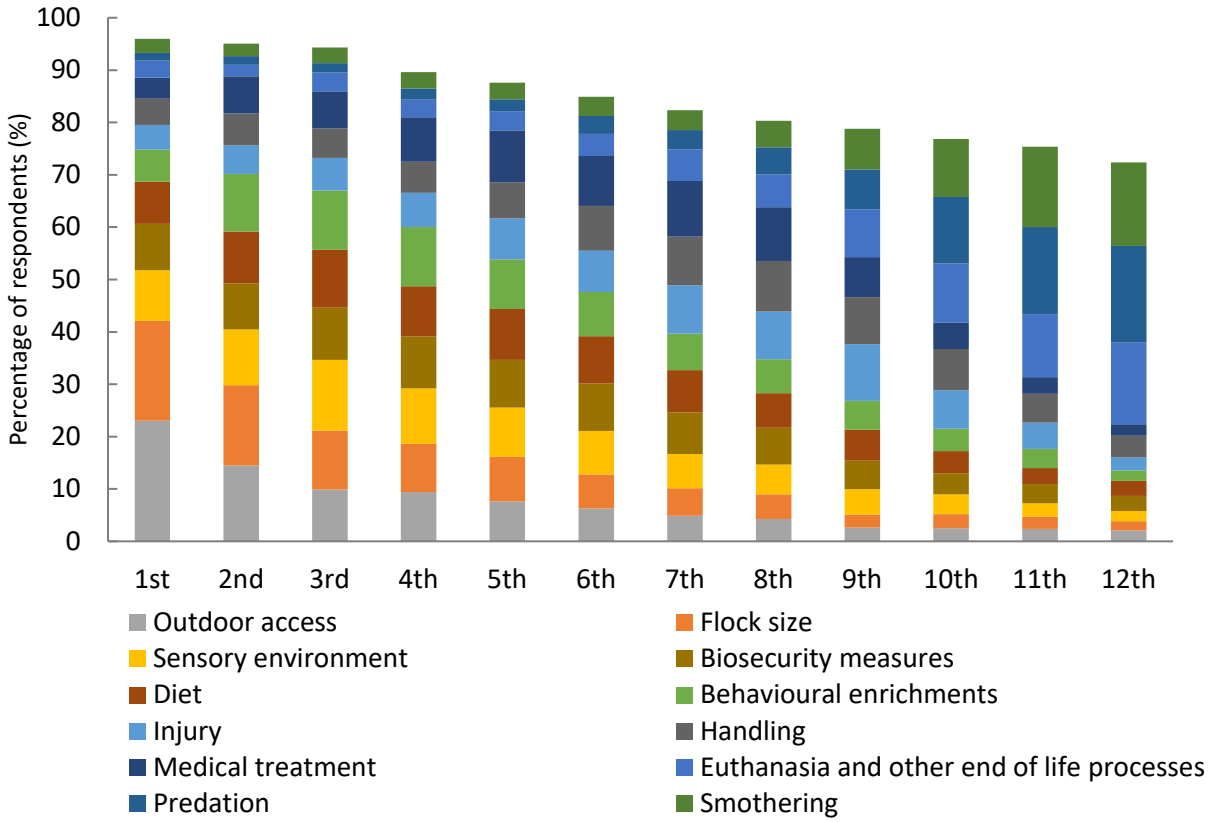

Figure 8-2 Percentage of respondents who ranked the importance of factors influencing layer hen welfare in each of the 12 possible ranks

1st = most important, 12th = least important.

Because survey participants selected only those factors they perceived as influences on layer hen welfare, all columns do not sum to 100% (n=3125).

9 Trade-offs in layer hen welfare

A core purpose of this research was to investigate how members of the Australian community decide between conflicting animal welfare outcomes in trade-off situations. Trade-offs occur in situations where the benefits gained by choosing one outcome necessarily mean that the benefits of another outcome are reduced. In the online survey, we asked survey respondents to indicate their degree of preference in a range of trade-off scenarios (using a scale from 1 = Strong preference for option A to 7 = Strong preference for option B)[4]. Each scenario described a trade-off situation between two outcomes related to animal welfare, human health, or environmental sustainability (see the survey's range of scenarios a)–o) reported collectively in Figures 9-1 and 9-2 below).

9.1 Layer hen welfare preferences

Overall, survey respondents' preferences for the major categories of layer hen welfare (i.e. biological function, affective state, and natural living) were relatively mixed (see Figure 9-1, which shows overall preferences for the different trade-off outcomes, labelled A and B). Nevertheless, members of the Australian community tended to have moderate or strong preferences for welfare outcomes that provided layer hens with what they viewed as more natural living conditions or improved their emotional experiences over physical health outcomes. One trade-off decision that clearly shows this preference is scenario i), in which providing layer hens with access to an outdoor range was clearly preferred (58%) ahead of reducing the risk of hens contracting infectious diseases from wildlife (26%).

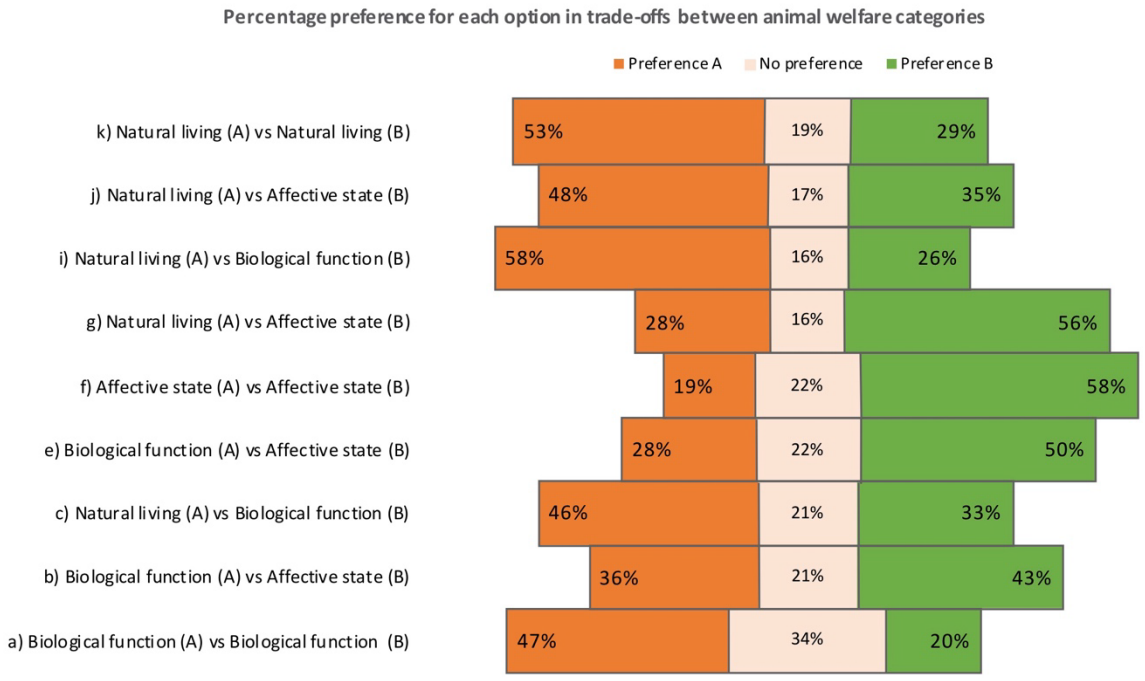

Figure 9-1 Preferences in trade-offs between aspects of animal welfare (percentage of respondents %) (n=3125)

Note that the order of some trade-offs and trade-off outcomes have been changed to improve clarity.

[4] The full list and wording of the trade-off scenarios can be found in the appendices.

9.2 Trade-offs involving human health or environmental sustainability

While members of the Australian community also expressed mixed preferences in trade-offs between animal welfare, human health, and environmental sustainability, a critical finding is that animal welfare was always prioritised ahead of environmental outcomes in our survey data (see Figure 9-2). The most notable example of this preference involves a trade-off between improving hens' affective states by providing enough space for them to relax without interruption and limiting the use of land and energy resources (see Scenario n). In this trade-off scenario, nearly three quarters of respondents preferred to improve animal welfare, while relatively few had no preference or prioritised potential environmental outcomes. Considering the mix of responses as to whether Australian egg producers are perceived as environmentally responsible (see Figure 4-2 in Section 4), it is unclear whether the low priority accorded to environmental outcomes is due to a belief that egg production does not (overly) impact environmental sustainability or to some other set of beliefs.

For trade-offs between layer hen welfare and human health, survey respondents tended to accept risks to hens' biological function and forgo opportunities to improve their affective states in order to protect human health. However, providing the hens with a natural living environment in which they have space to move around was a clear priority for respondents as compared with reducing risks to stockperson health (see Scenario o).

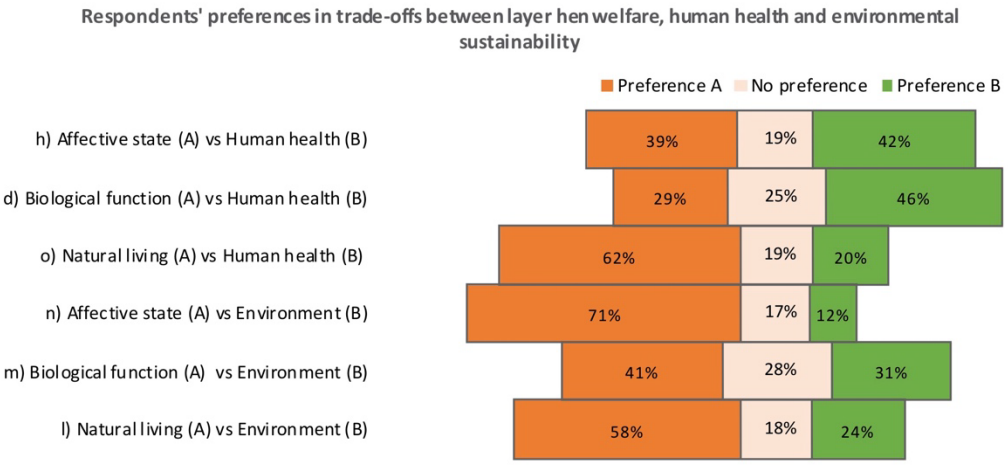

Figure 9-2 Respondents' preferences in scenarios where animal welfare is traded off against environmental sustainability or human health outcomes (percentage of respondents %) (n=3125)

Note that the order of some trade-offs and trade-off outcomes have been changed to improve clarity.

9.3 Strength of preferences

Overall, survey respondents tended to express only moderate preferences for either outcome in a trade-off scenario (see Figure 9-3). Trade-off scenarios involving two animal welfare categories generated similar ratios of no preferences, moderate preferences, and strong preferences. In contrast, strong preferences were rarely expressed in favour of environmental sustainability outcomes but tended to be relatively frequently expressed in trade-off situations where an animal welfare category was traded off against environmental outcomes.

Female respondents were more likely to express strong preferences than were male respondents, as were respondents who considered themselves to be highly politically engaged (see Table 14-9 in Appendix 7).

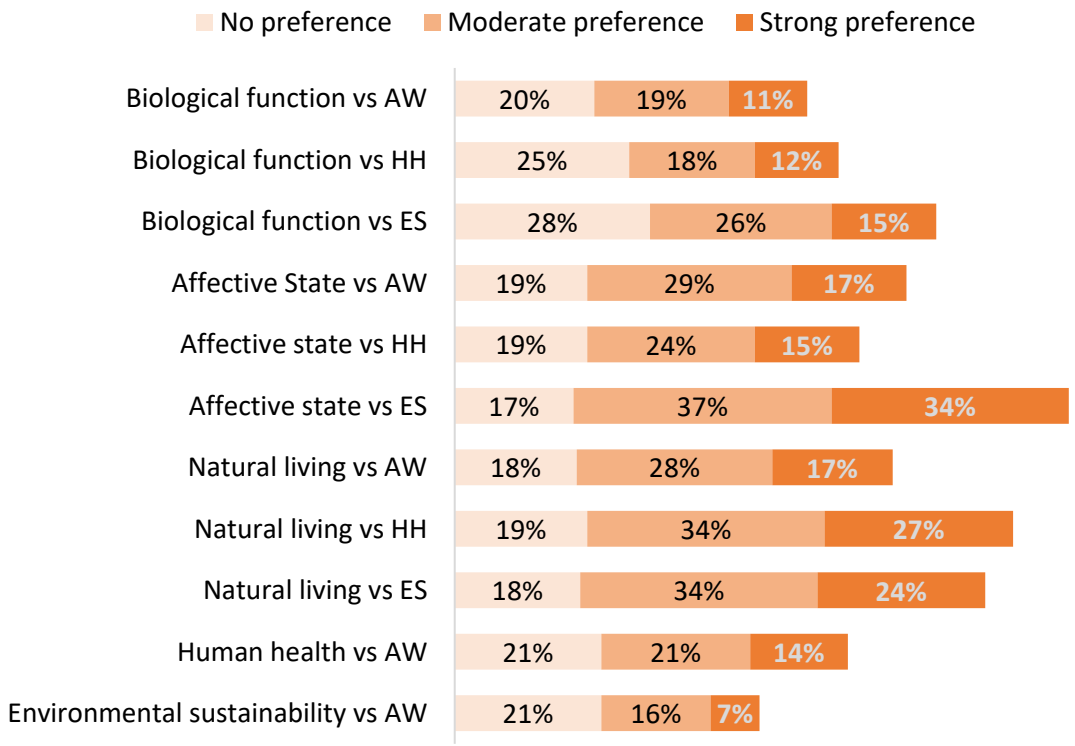

Figure 9-3 Average strength of preferences for the named category (listed first) in trade-off scenarios involving animal welfare categories (AW), human health (HH), or environmental sustainability (ES)

Includes average percentage of respondents with no preferences in trade-off scenarios involving the named category (n=3125).

9.4 Relationships between trade-off preferences

In order to determine whether survey respondents consistently prioritised particular types of animal welfare outcomes over others, we compared their responses across trade-off scenarios. Survey respondents tended not to consistently select any one category of animal welfare over others, suggesting that their preferences were related to the specific outcomes in each trade-off scenario (see Tables 14-6 to 14-8 in Appendix 7).

Nevertheless, there were strong pairwise patterns in respondents' preferences across trade-off scenarios, which are not explained by a consistent preference for any of the major categories of animal welfare, i.e. biological function (BF), affective state (AS), or natural living (NL). Trade-off scenarios involving outcomes associated with outdoor access were treated similarly by survey respondents, while others, notably those involving feather pecking, nest boxes, diet, injury, pollution, metabolic disease, and human health, tended to be treated differently and in different ways (Figure 9-4).

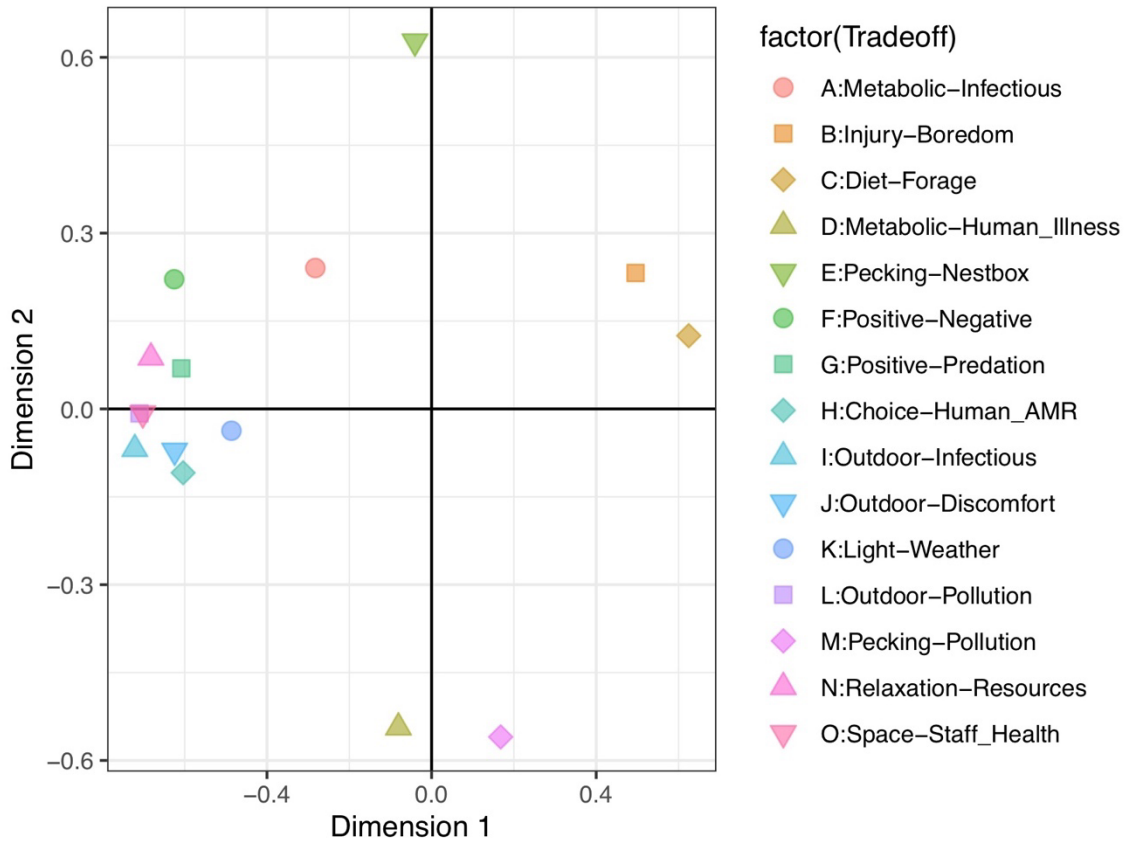

Figure 9-4 Multiple correspondence analysis summarising the pairwise relationships between trade-off preferences across trade-off scenarios

Points that are closer in space are also more similar in terms of respondents' preferences than are distant points. Note that the order of some trade-offs and trade-off outcomes have been changed to improve clarity.

10 Factors affecting trade-off preferences

By analysing how values are expressed in the shared and conflicting trade-off preferences among groups of survey respondents, we were able to identify points of consensus and tension that may affect community perceptions of animal welfare in commercial egg production in Australia. To do so, we compared survey participants' preferences for animal welfare, human health, and environmental outcomes with their demographic, socio-economic, and geographic characteristics; their stated egg purchasing and consumption habits; their anthropomorphism scores; and their attitudes towards egg production and consumption.

10.1 Demographic factors associated with trade-off preferences

Different demographic groups within the Australian community expressed distinctive preferences in individual trade-off scenarios (see Tables 14-9 and 14-10 in Appendix 7). However, only a small number of consistent patterns was identified in the preferences of particular groups when compared across animal welfare categories or between animal welfare, human health, or environmental outcomes. Nevertheless, significant differences in trade-off preferences were found for respondents within different age groups, and between male and female respondents:[5]

- *Age:* Older survey respondents were significantly more likely than younger respondents to prefer that hens are provided with opportunities for what they viewed as natural living over other types of animal welfare and to prioritise human health over animal welfare. Meanwhile, younger respondents were more likely to prefer to improve environmental outcomes than were older respondents.
- *Gender:* Female respondents were significantly more likely to prefer animal welfare outcomes related to the hens' affective state than were male respondents, and significantly less likely to select physical health, human health, and environmental outcomes than male respondents.

Despite few clear patterns in their preferences for animal welfare, human health, and environmental outcomes, the strength with which different demographic groups expressed their preferences varied significantly. For example, female respondents were significantly more likely than men to report strong preferences across all types of animal welfare, human health, and environmental sustainability trade-offs, as were respondents with a self-assessed high level of political engagement.

Notably, there were no strong patterns indicating different trade-off preferences among respondents living in urban or rural locations (based on ABS remoteness categories) or residing in different states (see Figure 10-1, and Table 14-11 in Appendix 7, respectively).

[5] Only one survey respondent was of non-binary gender and we were therefore unable to identify patterns of trade-off preferences for this population.

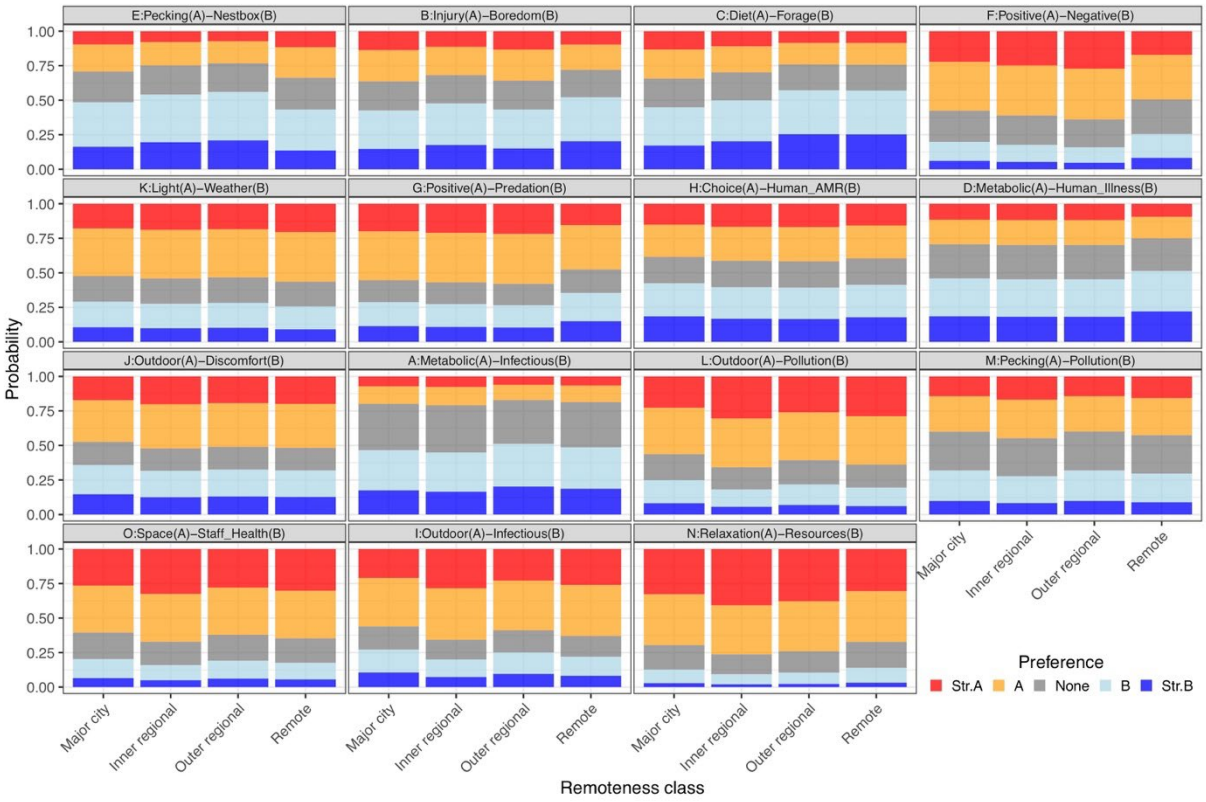

Figure 10-1 Results of ordinal regression comparing preferred outcomes for each trade-off scenario

Str.A = Strong preference A; A = Moderate preference A; None = No preference; B = Moderate preference B; Str.B = Strong preference B.
Remoteness regions based on ABS remoteness categories.
The y-axis represents the probability distribution for each ABS remoteness class.
Note that the order of the outcomes has been reversed in some scenarios in order to improve clarity.

10.2 Anthropomorphism and morality

Survey respondents' tendencies to anthropomorphise layer hens was a strong indicator of their preferences in certain trade-off scenarios. In particular, respondents with higher anthropomorphism scores were significantly more likely to prefer outcomes that provided hens with what they considered to be more natural living conditions and improved emotional wellbeing (see Table 14-12 and Figure 14-7 in Appendix 7). A trade-off scenario that particularly exemplifies this relationship described a living environment that provided layer hens with opportunities to choose where and how they spend their time, but also required an increased use of antibiotics that could contribute to anti-microbial resistance and increase risks to human health (Figure 10-2). In this trade-off, respondents with higher anthropomorphism scores were significantly more likely to prefer benefits to the hens' emotional wellbeing over reducing risks to human health, while the opposite was true for respondents with low anthropomorphism scores (OLS with robust errors, $p < 0.01$).

In contrast, respondents' anthropomorphism scores were not associated with their preferences in trade-off scenarios that did not include considerations relating to natural living or affective states, and were only weakly related to their preferences in trade-off scenarios where two outcomes in the same category of animal welfare were traded against each other.

Survey respondents' anthropomorphism scores were positively correlated with their perceptions of layer hen welfare as a moral issue (see Table 14-14 in Appendix 7), which had a similar, but weaker, association with respondents' trade-off preferences.

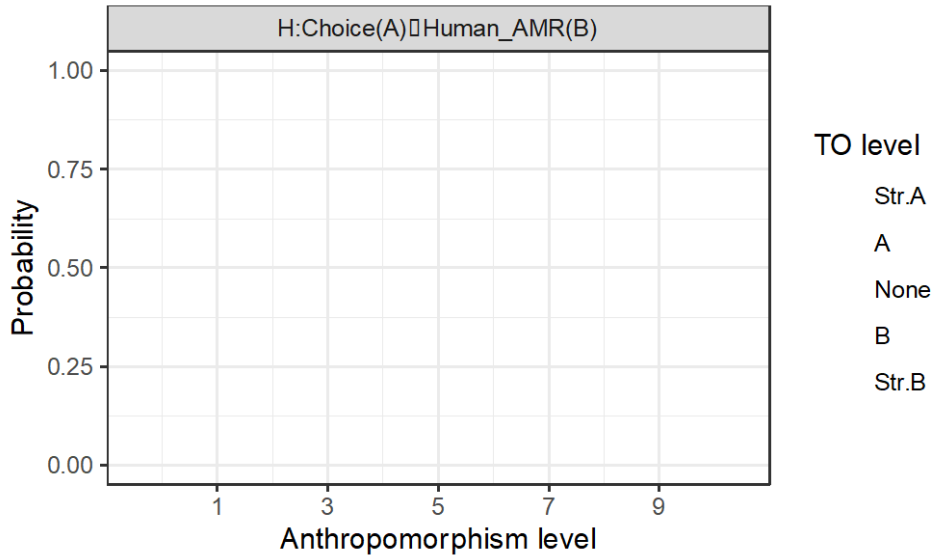

Figure 10-2 Results of ordinal regression analysis showing the relationship between mean anthropomorphism score (x-axis) and probability to select outcomes

The graph shows Str.A = strong preference for A to Str.B = strong preference for B (y-axis) in trade-off scenario h), which involves a choice between allowing layer hens to choose where and how they spend their time (option A) and reducing risks to human health, for example due to anti-microbial resistant bacteria (AMR) (option B). Anthropomorphism level is calculated as a mean score across the anthropomorphism questions, where 1 = lowest anthropomorphism score and 11 = highest anthropomorphism score.

10.3 Associations between levels of knowledge and trade-off preferences

Although there were associations between levels of measured knowledge and particular trade-off preferences, there were no strong patterns indicating that higher levels of knowledge were associated with preferences of a particular category of animal welfare (see Table 14-13 in Appendix 7).

In addition, providing new information about a trade-off situation did not tend to alter respondents' preferences. Scenario d) described a situation in which there is a trade-off between active hens having a lower risk of metabolic disease, but which presents an increased risk that eggs are contaminated by bacteria from the ground that can cause illness in humans. After respondents marked their initial preferences, they were provided further information that scientists are uncertain about what factors in egg production may affect the risk of foodborne illness affecting humans, and were asked if this changed their preferences. 74% of respondents maintained their initial preferences, while 7% strengthened their original preferences, i.e. moved from no to moderate preference, or from moderate to strong preference; 12% weakened their preferences, i.e. moved from strong to moderate or moderate to no preference; and 7% changed their preferences, i.e. from option A to option B, or from option B to option A.

Similarly, scenario m) described a hypothetical situation in which a particular living environment reduces the incidence of harmful feather pecking, while also increasing the amount of air, water, or soil pollution. After asking respondents to mark their initial preferences for either outcomes, we provided information that feather pecking is a complex issue caused by many different factors, while pollution can be managed more directly through the choice of production system and asked

respondents if this changed their preferences. 67% of respondents maintained their initial preferences, while 10% strengthened their original preferences; 6% weakened their original preferences, and 17% changed their preferences.

10.4 Associations between trade-off preferences and attitudes towards egg purchases and consumption

Overall, we identified no strong patterns in respondents' preferences for particular animal welfare categories, human health, or environmental sustainability outcomes when comparing respondents who eat eggs with those who do not eat eggs, or among respondents with different dietary preferences.

Consistent patterns in terms of preferences were identified among respondents whose households consume eggs from particular production systems, i.e. cage, barn, free-range, organic, or backyard systems.[6] Consumers of cage eggs tended not to prefer outcomes that improved hens' affective states (AS) or natural living (NL) (compared with no preference), while as a group, consumers of backyard eggs showed no particular preference for or against any outcomes, with the exception of showing a strong preference for providing access to nest boxes (AS) over reducing the risk of injury (BF) in scenario e). In contrast, respondents whose households mainly consume free-range or organic eggs tended to have moderate or strong preferences in a number of trade-off scenarios. The preferences of respondents whose households mainly consumed barn-laid eggs showed more similarities with those of free-range and organic egg consumers than with cage-egg consumers.

[6] Respondents were asked about household egg consumption and may therefore not be consumers of eggs themselves.

11 Thematic discussion of key survey findings

In-depth focus groups discussions were used to encourage deeper reflection and dialogue about value trade-offs in commercial egg production among members of the Australian community. In parallel to the trade-offs used in the survey, the focus groups were structured around two scenarios that described farmers who prioritised different aspects of animal welfare, human health, and environmental sustainability when making decisions about how to produce eggs (see Appendix 4), which served as prompts for discussion of various features and issues arising in the scenarios. These focus group discussions were analysed qualitatively in order to capture patterns of shared meaning among respondents, which helped to contextualise and interpret key survey findings. These patterns of shared meaning or themes, and their implications for understanding community values and value trade-offs concerning layer hen welfare, are described in the following sections.

11.1 Providing 'care' for hens

Focus group participants clearly expressed that good layer hen welfare requires 'care,' both in terms of the proper treatment of hens and in farmers' attitudes towards their animals, but they disagreed about the precise meaning of the term 'care.' For most participants, care entailed that farmers actively work to ensure that their hens are protected and have their needs met. Most believed that care required providing hens with access to the outdoors, to sunlight, and space to move around, while others described care as treating the hens well regardless of the environment in which they live. For example, farmers were expected to make use of available preventive measures or treatments that ensure the health and safety of their hens as an aspect of proper care. Providing layer hens with such care was considered a core obligation or responsibility of egg producers.

'Care' was also used to describe farmers having appropriate attitudes and expressing affection towards their animals, which involved 'putting the hens first' and being aware of their individual personalities and preferences. Participants indicated that this was exemplified by the 'old fashioned farmer' and compared this standard of care as similar to that received by hens as pets in backyard egg production. This ideal was frequently contrasted with 'commercial' farmers who were perceived as only caring about the 'bottom line' and as making decisions that benefit the business rather than the animal, as illustrated in the following quote:

> I would prefer someone who actually cares about the chickens than not. If you don't care about them and don't like them and they're just a machinery for you to make money, then I don't think that's the right mindset to do business.

Nevertheless, focus group participants recognised that farmers must make decisions to ensure the continued viability of their farms and did not necessarily expect farmers to meet their ideal standards of care. While they did consider farming to be different from other types of businesses (in that farmers were expected to care about their livestock), they often differentiated between their ideal animal welfare outcomes and 'business' decisions in expressing their preferences in trade-off scenarios. In the case where animal welfare and business outcomes conflicted, focus group participants often sought a middle ground, in which farmers showed care by balancing animal welfare and business needs, and by 'doing their best' with the available resources.

These qualitative findings provide a broader context for the trade-off decisions made by survey respondents, by illustrating that layer hen welfare encompasses more than specific outcomes affecting the physical and emotional wellbeing of the hens or their access to what are viewed as more natural living environments. Although members of the Australian community have differing

preferences and priorities regarding these outcomes, they generally consider farmers' commitments and attitudes to care as a necessary requirement for achieving proper layer hen welfare.

11.2 Alignment of anthropomorphism, morality, and natural living

Overall, focus group participants preferred trade-off outcomes that allowed hens to access outdoor ranges over other animal welfare, human health, and environmental outcomes. When asked why spending time outdoors was important for layer hen welfare, participants emphasised the hens' freedom to choose how and where they spend their time in accordance with their individual preferences. Although spending time outdoors was also important in its own right, participants rejected the idea that farmers should force layer hens to go outside. Such freedoms were viewed as basic rights and needs of all living things, and therefore carried considerable moral weight, as exemplified in the following statements by focus group participants:

> anything that is living needs to be free
>
> [being outdoors] can cause problems, but it would just sit better with me and I'm sure a lot of other people if they have a bit of freedom
>
> to me that's not really acceptable from a farming perspective, when you restrict movement and freedom like that
>
> I think that they should have a choice (…) if I was hen I should have the option. I should have freedom to choose
>
> they shouldn't be forced to stay indoors like caged birds are. This way they've got their freedom of choice to go where they want to

The lack of freedom for the hens to express their preferences was also a key objection among participants to cage systems and, more generally, to housing hens exclusively indoors. Nevertheless, focus group participants generally accepted that temporary confinement indoors may be necessary under certain circumstances, such as during extreme weather conditions, to protect against predation, or when there is heightened risk of infectious disease. In such cases, they compared a farmer's obligation to ensure the safety of his or her hens to that of a parent who limits the freedom of their children in order to prevent them from playing on a busy road, and as being rooted in the inability of a child or hen to make informed decisions about the risks in their environments.

The finding that focus group participants value outdoor access because it seems to provide layer hens with the freedom to choose how and where they spend their time supports and contextualises the positive association between anthropomorphism, moral judgement, and preference for what is viewed as more natural living conditions in trade-off decisions that were identified by the community survey (see Section 9).

11.3 Inconsistent concern for the emotional wellbeing of hens

Focus group participants were inconsistent about the level of concern that they expressed for the emotional wellbeing of layer hens, depending on whether they were asked about it directly or it was discussed in response to a specific trade-off scenario. When asked directly, the emotional wellbeing of layer hens appeared to be of low interest to focus group participants. Some participants laughed or made jokes in response to such questions, suggesting that the idea of managing the hens' mental or emotional wellbeing was 'silly.' For example, one focus group participant noted that "it sounds funny" when the group was asked how they would feel if they were in the place of the hen. However, when presented with trade-off scenarios, respondents tended to prefer the option in which the hens were comfortable and "felt good" even if this involved increasing the risk of predation or disease, unless

the latter was temporary. These inconsistent responses about concern for layer hens support the seemingly contradictory survey finding that affective states are ranked among respondents' least important animal welfare goals, while also tending to be the preferred outcome in trade-off scenarios (compare findings in Sections 8 and 9).

This finding suggests that contextual factors are better captured by the specific trade-off situations, which in turn appear to be affecting the perceived importance of emotional wellbeing as an outcome of commercial egg production. Focus group participants tended to consider emotional wellbeing to be important in situations where they empathised with the hens' experiences, or when emotional wellbeing was believed to impact on other desired outcomes. Both of these tendencies are illustrated in the following quote by a respondent who was asked whether the perceived benefits of a natural living environment would outweigh a hypothetical drop in egg quality or production:

> Don't you think production and quality has to do with the way of they're feeling? We don't work well when we're tired and lethargic or haven't had a coffee. I just assume that they would be the same. That they've got those sorts of feelings and emotions. (…) I find that the free-range eggs are normally taste completely different and I just though the hen was happier.

By requiring respondents to imagine themselves as decision-makers within concrete situations fraught with complexity, deeper discussions of the trade-off scenarios within the focus groups allowed participants to articulate a range of factors that inform their preferences. In contrast, ranking exercises and direct questions strip away such contexts and may therefore result in seemingly contradictory evaluations. These findings provide further support for the need for mixed methodologies, particularly when seeking to articulate complex values in real-life situations.

11.4 Environmental sustainability is a low priority for the community

Focus group participant discussions confirmed the survey's finding that environmental sustainability is a lower priority than layer hen welfare among members of the Australian community. On the one hand, focus group participants tended to perceive the environmental consequences of commercial egg production to be low relative to other forms of food production. Consequently, they considered any reduction in animal welfare in order to improve sustainability as being not warranted as it would be out of proportion to potential environmental gains. In addition, participants felt that farmers' obligations to provide for the welfare of their hens outweighed their obligations to reduce the environmental impacts of egg production.

11.5 Farmers' health also raised limited concerns

Although focus group participants generally considered human health to be a higher priority than layer hen welfare in commercial egg production, the health of egg farmers and stock people raised only limited concerns for participants. Participants frequently downplayed risks to farmers' health from close contact with diseased animals, as well as from work-induced stress. For example, the risk of contracting infectious diseases was considered to be avoidable by following appropriate biosecurity procedures, while stress could be alleviated by taking holidays, through their exposure to the outdoors as part of their work, or by reducing the size of their production systems.

Participants argued that farmers are responsible for ensuring that they balance their own needs without compromising the welfare of their hens. While they agreed that farmers' health and wellbeing helped to ensure that farmers could treat their animals appropriately, they questioned why farmers would continue to produce eggs if they were not happy within the scenario that they had created. One respondent summarised this position by arguing that "if you can't treat your animals humanely, and be a happy person, and have enough free time for your family, the mixture you're in is not right."

11.6 Knowledge of commercial egg production and the integration of new information

Overall, focus group participants had limited knowledge about various practices relating to egg production, and their values and preferences in trade-off scenarios often rested on misconceptions about standard practices in different types of commercial egg production in Australia. Common misconceptions can be categorised into two types:

- *Misconceptions about animal welfare outcomes in different farming systems:* Relatively little information was included in the trade-off scenarios about the welfare outcomes associated with different production systems, in accordance with best practices associated with open-ended qualitative research and because we sought to ascertain baselines for people's attitudes. Focus group participants tended to have established beliefs about welfare risks and benefits of caged, barn, and free-range production methods respectively. In particular, participants tended to believe that infectious diseases are more common and severe in caged or indoor systems because hens are 'cooped up' together in large numbers. There was also a widespread belief among participants that hens are healthier and happier in free-range systems. Reference was also repeatedly made to widespread and routine antibiotic and 'drug' use across commercial egg production systems in Australia.
- *Misconceptions about the scale of commercial egg production*: Although focus group participants were not asked to provide solutions to the trade-off situations discussed, they frequently offered potential solutions that would negate the need for compromising between trade-off outcomes. These solutions often revealed misconceptions about the number of hens commonly kept in commercial egg production systems, regulatory or best practice standards relating to various production systems, the lifespan of commercially raised hens, and the resources required to maintain such systems.

Although focus group participants were frequently aware of their limited knowledge of commercial egg production, additional information did not tend to change their judgements about what constitutes 'good' animal welfare. During the focus groups, researchers provided additional information if requested by a participant or by adding complexity to trade-off scenarios. Despite several participants acknowledging that they had gained new knowledge as a consequence of participating in the focus groups, only a small number wavered from their initial 'gut feelings' about the trade-off scenarios. While additional information was rarely contested, participants did not appear to apply or consider such information when making trade-off decisions unless in support of already established positions. This finding confirms the survey results that indicate that provision of more information on its own is unlikely to change people's preferences with regard layer hen welfare outcomes.

Despite the tendency to ignore additional information in their trade-off decisions, focus group participants tended to agree that scientific knowledge was particularly important as a basis for farmers' animal welfare decisions. They often referred to the need for experts to assist farmers in decision-making. Further, participants argued that community members and consumers required more knowledge in order to make purchasing decisions that reflect their values.

11.7 Equation of ‘better chickens’ with ‘better eggs’

Focus group participants also echoed the survey findings that members of the Australian community tend to bundle their concern for animal welfare with a desire for better quality eggs or higher rates of egg production (see also Bray & Ankeny 2017). Different aspects of egg quality were raised by focus group participants, including the flavour, colour of the yolk, and the overall ‘healthiness’ of the egg. Several respondents perceived free-range eggs to be of higher quality than eggs from caged systems, or argued that healthy and happy hens were more productive and produced higher quality eggs.

12 Additional key themes

In addition to contextualising and informing the interpretation of the results from the community survey, qualitative analysis of the focus group discussions resulted in the development of additional themes. These themes provide further insights into community understandings and values, and raise new questions for research beyond those topics addressed in the community survey.

12.1 Different understandings of key terms

Focus group discussions revealed that participants had different understandings of key terms in comparison to how they are typically used in animal welfare science, which in turn had important implications for our interpretations of values and preferences in the community survey. These findings suggest that such terms have considerable impact when used both in research or other communications with members of the Australian community and have considerable potential to result in miscommunication and misunderstandings as a result.

The meanings of terms such as 'choice,' 'light,' and 'space,' which may be understood by animal scientists and those in the egg industry as objective and measurable, tended to be value-based among respondents. For example, participants felt that hens ought to have access to what they described as 'proper' sunlight, which was often associated with the experience of freedom and contrasted with being 'cooped up' or 'stuck indoors' even if natural light was provided. Participants characterised spending time in sunlight as a basic right for living beings and its absence as a deprivation. Similarly, the term 'space' was used to refer to an abstract need, which was also associated with freedom and openness, rather than a defined and measurable area. Spaces in cages or barns were perceived as inherently 'worse' or 'less than' outdoor spaces, and farmers were believed not to care about animal welfare if they 'maximise the number of animals in the space' even if the space was strictly speaking within regulatory or agreed best practice standards.

Additionally, participants often conflated the terms 'cage' and 'barn' to mean any type of enclosure. This confusion was in part due to a lack of knowledge about current Australian egg production standards, but also served to escalate or diffuse the moral weight of certain trade-off options. For example, one respondent described barns as "still a cage," while another considered cages that house multiple birds as being "pretty close to free-range, because even though they're free-range they're still within an enclosed environment." These types of comments suggest that the meanings or understandings associated with these terms for members of the Australian community are not based on literal or formal definitions, but rather on their underlying values relating to animal welfare, and in particular their negative responses to 'cages' and positive responses to outdoor or 'free-range' living.

While we were conscious in designing the survey to avoid making explicit references to different types of production systems, the terms 'light,' 'sun-bathing,' and 'space' were used in questions that aimed to identify community values and preferences. For example, one option in a trade-off scenario involved providing "space for hens to relax without interruption." Our focus group discussions suggest that the term 'space' may have carried greater weight in the scenario than we had intended based on its literal interpretation. In other words, our focus groups revealed that what hens have space to do may be less important to members of the Australian community than the fact that they *have* the space to do it, namely whatever it is that they wish to do.

12.2 Moral absolutists

Some participants in the focus groups tended to make blanket statements about what they viewed as right and wrong in relation to layer hen welfare when asked about these issues in the abstract, stressing that there was only one right way to provide proper or humane care (and often associating this with free-range systems). However, there was a split amongst them when they were asked to face specific trade-off scenarios or production systems: some found these decisions to be easy because they could fall back on their simple and absolute moral rules, e.g. "I won't choose option A because it is clearly wrong," whereas others struggled with more complex and real-world scenarios precisely because their simplified moral calculus did not provide them with adequate guidance. Perhaps not unexpectedly, those who tended to be moral absolutists in their responses in the survey also tended to have high anthropomorphism scores.

12.3 Moral neutrality of legal and market decision frameworks

Focus group participants strongly differentiated between what they considered to be moral and what is legal with regard to animal welfare in commercial egg production. They often noted that although they thought or knew that a certain practice was strictly speaking legal according to current regulations or guidelines, they emphasised that such a practice was not right in their opinion and/or was in conflict with their underlying values.

In order to investigate this distinction, focus group participants were asked explicitly to imagine themselves as members of the community in order to discuss what they viewed as appropriate policy or other responses to egg production that fails to achieve an acceptable standard of animal welfare according to members of the community. This discussion was designed to force them not to fall back on talking about expressing their opinions or values via purchasing, but to think about broader community standards. There was strong agreement among participants that community responses should always abide by the law, so that trespassing even if to document negative or abusive treatment of animals was felt to be wrong. They also stressed that advocating for legal change and personal purchasing choices were the only wholly acceptable means for members of the community to demand higher animal welfare in commercial egg production. As long as production systems and practices complied with existing laws (often described as "all of the boxes being ticked"), such practices were considered to be acceptable by participants, despite also being described as cruel or inhumane.

For many participants, the need to accept whatever practices were legal hinged on the belief that morality reflects personal preferences, for example using such phrases as "it's not what I would do, but…" Therefore these preferences should not disrupt legal businesses or affect people's property, often negatively citing recent animal rights activism. Interestingly even those participants who generally expressed morally absolute positions (namely that certain kinds of behaviour or practices were always wrong, such as raising hens in cage settings) agreed with others that what counts as acceptable standards of animal welfare is ultimately up to the law, although infringements should be reported.

A similar distinction between morality and legality was evident with regard to market-based options for improving layer hen welfare. Although most participants believed that eggs from any legal production system should be available to consumers, they nevertheless felt that housing hens in cages was morally problematic. They emphasised that if labelling is accurate and adequate information is available, consumers can express their personal values through their purchasing decisions, and hesitated to consider other options for expressing their values, such as protests, pubic boycotts, or similar. These trends may well reflect broader Australian cultural norms about not challenging the status quo, or inconveniencing or disrupting others.

12.4 Limited concerns about protecting the Australian egg industry

Focus group participants differed in their willingness to accept any compromises to what they viewed as best animal welfare practices in order to make the Australian egg industry sustainable. Most focus group respondents did accept that some compromises were likely to be necessary. For example, if farmers did not have adequate outdoor space or were unable to prevent the risk of hens contracting diseases from local wildlife, 'proper treatment' in indoor systems was often viewed as 'the next best thing' by focus group participants. However, a minority of participants questioned why egg production should take place at all if farmers were unable to guarantee safe outdoor access and, by extension, to provide what the participants believed to be the only conditions under which the farmers could ensure adequate welfare for their hens.

Overall, participants' willingness to accept compromises to animal care that would still allow a good standard of welfare and make the egg industry more sustainable depended on the perceived intent of egg farmers. Focus group participants showed little acceptance of compromises to animal welfare that they perceived to be income maximising, such as having more hens in a particular sized space, which was legal but more than usual. They were sceptical that farmers would improve animal welfare without community pressure (despite their unwillingness to participate in such activities as noted above beyond making purchasing decisions) and tended to believe that farmers were primarily profit motivated. As a result, they emphasised the need to make and enforce layer hen welfare standards, and to strictly monitor labelling schemes to ensure accountability. Focus group participants accepted that the demand for high-welfare eggs (and implicitly their sale at a higher price point) would compensate for stricter welfare standards and increased oversight, and therefore expressed limited sympathy for farmers who were unable to meet those higher welfare criteria.

Further, focus group participants were often more forgiving of compromises to animal welfare that resulted from farmers' ignorance of potential risks or of unforeseen risks arising, rather than of compromises that were perceived by them as predictable. Statements such as "if you are getting into that industry you know that [there are risks] from day one" and "It's not like you started … and then this problem occurred" indicate that the farmers' perceived intentions to prioritise animal welfare are central to the participants' views on the acceptability of various types of welfare outcomes (see also Section 11 on 'care').

12.5 Reactions to making trade-off decisions

Focus group participants often struggled to make decisions between outcomes presented in the trade-off scenarios and used a range of strategies to avoid or defer making difficult decisions. The trade-off scenarios used in the focus groups were designed to challenge participants by introducing new information and perspectives on a situation. How focus group participants reacted to the task of making trade-off decisions is important to consider, as it allows us to better understand and even predict how and why members of the Australian community may react to similar value judgements in their day-to-day interactions with animal welfare considerations in the context of commercial egg production in Australia.

Participants' initial responses to the trade-off scenarios were often attempts to negotiate a middle ground in which the differences between the outcomes, and thereby the consequences of the trade-off, were minimised. This tended to involve suggesting alternatives to the hypothetical situation described in the scenario (see Appendix 4), for example allowing hens to spend some time indoors in cages and some time on an outdoor range. This middle ground tended to be described as a 'balance' between different valued outcomes. However, other participants frequently challenged the proposed middle ground in ways that led to relatively detailed discussions about how and why trade-offs exist.

As a result, focus group participants tended, eventually and begrudgingly, to declare a preferred outcome, albeit with a caveat specifying under which conditions the outcome was acceptable or noting that the outcome (although the preferred option in this trade-off scenario) was not ideal.

A similar strategy used by participants to avoid difficult trade-off decisions was to rehearse the scenario but overemphasise the differences between the outcomes so that their preferred option then would appear to be much better than the alternative. In doing so, participants reduced the cost of a trade-off decision, but were frequently challenged by those with opposing preferences. If such strategies to defer or avoid difficult decisions failed, focus group participants sometimes appeared to be overwhelmed and began to argue that the question of what *should* be done can and should be decided through individual consumer choice (see Section 11 on morally neutral decision frameworks). Nevertheless, the discussions surrounding trade-off scenarios showed that members of the Australian community generally were able to engage with morally complex decision-making. An interesting example occurred in the focus group discussions when researchers introduced information that there is some evidence that layer hens adjust to the spaces they are in, which challenged the value-based notion of space (discussed above) held by many participants. Providing this additional information allowed some participants to find greater confinement to be acceptable by specifying that their main concern was for the hens' comfort, while others felt there were still benefits to be had from greater space, particularly on outdoor ranges, even if the hens would become accustomed to smaller spaces.

Overall, the reactions of focus group participants show that it is difficult for many members of the Australian community to engage with the complexities and details of morally challenging decisions, particularly in relation to animal welfare, even in a relatively controlled, research setting. However, as they became more aware of the complexities involved in these decisions, some participants were able to articulate their preferences and, perhaps more importantly, to understand why others preferred the alternative outcome. Thus these types of processes hold considerable prospects for fostering values-based discussions among the general community, and finding a shared basis for moving forward in terms of practices and policies. These findings echo scholarly literature from deliberative democratic theory which emphasises that working through shared values and understandings related to contentious issues requires practice and time, particularly because many cultures do not promote such deliberative or dialogical decision-making processes but instead tend toward argumentative and combative processes (e.g. Young 1996; Gambetta et al. 1998; Sass & Dryzek 2014).

13 Implications for industry and research

Both the quantitative and qualitative findings of this research project suggest that a multi-pronged approach is necessary in order to meet diverse community expectations for layer hen welfare in commercial egg production in Australia. In addition to prioritising different layer hen welfare goals, findings from the qualitative focus group discussions indicate that even shared priorities draw on a range of values related to layer hens' needs and farmers' intentions, as well as different understandings of key terms. Further, participants' reactions to making difficult value trade-offs involving choices between animal welfare, human health, and environmental sustainability outcomes suggest that people are uncomfortable with the complexities involved with balancing different values, and may resist doing so in less structured, day-to-day settings.

Several findings from this study suggest a need to put in place processes that will allow building of the community's capabilities to take on board new information, so that they can use such information to more clearly articulate and advocate for their values related to layer hen welfare, human health, and environmental outcomes of commercial egg production. Simply providing more information is not a solution, as we have shown that information provision alone does not result in engagement with the new information. In addition, value-based understandings of key terms impact how this information is interpreted and may lead to miscommunication and misunderstandings. These findings highlight the need for further research on how scientific or industry concepts are interpreted by members of the community and how these interpretations may be shaped by different forms of media or a 'vocal few' who are active in public discourse, just to note a few examples. In addition, community members' tendencies to maintain their initial value-judgements in light of new knowledge and avoid engaging with complex issues suggest that there is a need to identify learning systems or processes that are sensitive to different value frameworks and stakeholder interests. The focus group discussions that were conducted as part of this research provide some hints as to how deliberative or dialogical approaches can help participants to begin to embed new information within their current knowledge and value frameworks, and introduce them to novel perspectives that may challenge those frameworks.

However, the finding that some members of the Australian community are moral absolutists points to the need for more research on the psychology associated with different types of moral outlooks, for instance principle-based or absolutist views as compared to care perspectives. In addition, further exploration is required about how general values associated with such outlooks play out in the domain of animal welfare, particularly in relation to understandings of the role of the farmer and his or her moral duties within a commercial production system. The need for such research is underscored by the generally negative perception among research participants that commercial egg producers do not care about the welfare of their layer hens, as well as the finding that farmer or stockperson health is considered to be less of a priority than is production animal welfare. Further, these findings raise the question as to how such negative perceptions impact opportunities and limitations to improve layer hen welfare.

Finally, in light of industry efforts to improve the sustainability of commercial egg production, a key finding of this research is that members of the Australian public tend to prioritise animal welfare ahead of environmental outcomes. This preference seems to be rooted in the perception that egg production already has a relatively low impact on the environment as well as tendencies among research participants to conflate environmental sustainability with hens' 'natural' living environments. A priority for future research may be to investigate how community members' perceptions of environmental sustainability and animal welfare are linked, and in particular how they would view more technological approaches to sustainability compared to visions of the 'old fashioned' farmer doing 'the right thing.'

14 Appendices

Appendix 1 – Trade-off scenarios

Trade-off scenarios used in the community survey. The survey was conducted online and was available in slightly different formats for computers and mobile phones. Respondents were asked to rate their degree of preference for outcome A or outcome B on a 5-point scale, where 1 = Strong preference A, 2 = Moderate preference A, 3 = No preference, 4 = Moderate preference B, and 5 = Strong preference B. The order in which the scenarios were presented to the respondents as well as the order in which the options were listed was randomised.

The next question is about how you would choose between conflicting outcomes of Australian commercial egg production (place the marker on the scale to indicate your preference).

a) Laying hens are susceptible to infectious diseases (caused by bacteria or viruses) and also metabolic diseases (due to diet, other 'lifestyle' factors, or genetic predispositions). When housed in environments that reduce exposure to infectious diseases, they may have a greater risk of metabolic diseases. To what extent do you prefer to:
   A. Reduce exposure to infectious diseases
      OR
   B. Reduce risk of metabolic diseases

b) Laying hens may injure themselves and incur bone damage by jumping off or crashing into environmental enrichments such as perches or haybales. However, environments without environmental enrichments may be boring and frustrating to the hens. To what extent do you prefer to:
   A. Reduce occurrence of injuries
      OR
   B. Prevent boredom and frustration

c) Foraging for food is a natural behaviour that hens perform. When hens are permitted to forage, their diets are less controlled compared with commercial feed and may lack the nutrients hens need. To what extent do you prefer to:
   A. Ensure a high-quality diet
      OR
   B. Provide opportunities for hens to forage

d) Hens that are active and move around have lower risk of metabolic disease. However, walking on the ground or on litter increases the risk that eggs laid will be contaminated by salmonella and other bacteria that can contaminate eggs and cause illnesses in humans. To what extent do you prefer to:
   A. Reduce the risk of metabolic diseases
      OR
   B. Reduce the risk of foodborne illnesses affecting consumers

e) Some living environments provide laying hens opportunities to choose to lay eggs in nest boxes. However, access to nest boxes may also increase the risk of injury due to smothering and aggressive behaviours between hens. To what extent do you prefer to:

   A. Allow hens to choose to lay in nest boxes

      OR

   B. Prevent harmful feather pecking

f) Laying hens sometimes have opportunities to interact with other hens in the flock. This provides opportunities for pleasurable experiences through enjoyment and play but may also increase social stress due to aggression between hens. To what extent do you prefer to:

   A. Provide opportunities for positive experiences

      OR

   B. Reduce the chance of negative experiences

g) Some living environments that offer laying hens opportunities for pleasurable experiences, such as foraging, dust- and sun-bathing, scratching and pecking at litter can also increase exposure to predators. To what extent do you prefer to:

   A. Provide opportunities for positive experiences

      OR

   B. Reduce exposure to predators

h) Some living environments provide laying hens with opportunities to choose where and how they spend their time. However, these may require increased use of antibiotics that can contribute to anti-microbial resistance and increase risks to human health. To what extent do you prefer to:

   A. Allow layer hens to choose where and how they spend their time

      OR

   B. Reduce the risks to human health

i) Outdoor ranges provide a more natural living environment for laying hens. But access to outdoor ranges increases the risk of contracting infectious diseases from wildlife. To what extent do you prefer to:

   A. Provide layer hens access to outdoor ranges

       OR

   B. Reduce the risk of hens contracting infectious diseases from wildlife

j) Spending time outdoors allows hens to experience a more natural environment. However, this environment may expose hens to predators or harsh weather conditions that cause them fear, discomfort, or pain. To what extent do you prefer to:

   A. Provide layer hens access to outdoor ranges

      OR

   B. Protect birds as much as possible from discomfort or pain

k) Some living environments that give hens access to natural light can result in exposure to harsh weather conditions, such as temperature extremes. To what extent do you prefer to:

   A. Provide layer hens with natural light

      OR

   B. Reduce exposure to harsh weather conditions

l) Manure from laying hens can cause soil and water pollution. When hens are kept indoors, manure is more easily controlled and disposed of than when hens have access to outdoor ranges. To what extent do you prefer to:

   A. Reduce the risk of soil and water pollution from chicken manure

      OR

   B. Provide layer hens with access to outdoor ranges

m) Some living environments that reduce the incidence of harmful feather pecking may also increase the amount of air, water, or soil pollution. To what extent do you prefer to:

   A. Reduce the incidence of harmful feather pecking

      OR

   B. Reduce the risk of foodborne illnesses affecting consumers

   mm) Feather pecking is difficult to manage because it is caused by many different factors that affect all types of production systems. Air, water, or soil pollution can be managed more directly through the choice of production system. Does this change your preference?

      A. Reduce the risk of metabolic diseases

         OR

      B. Reduce the risk of foodborne illnesses affecting consumers

n) Living environments that provide laying hens opportunities to rest and relax with less interruption also require greater land and energy resources. To what extent do you prefer to:

   A. Provide space for hens to relax without interruption

      OR

   B. Lower risk to stockperson health due to poor air quality

o) Living environments that allow hens greater opportunity to move around on the ground or on litter may also decrease air quality and risk negatively affecting the health of farmers and stockpeople. To what extent do you prefer to:

   A. Provide laying hens with space to move around

      OR

   B. Lower risk to stockperson health due to poor air quality

Appendix 2 – Anthropomorphism questions

The following questions were adapted from Waytz et al. (2010) and are designed to assess different aspects of anthropomorphism – namely: humanlike mind (a); intentions (b); consciousness (c); emotions (d); and free will (e).

In addition, two non-anthropomorphism questions are included – (f) and (g) – which help to control for differences in scale use and general attitudes towards layer hens. The questions were split across two pages and randomised across and within pages. Respondents were asked to rate their agreement with each statement on an 11-point Likert scale, where 0 = Not at all, and 10 = Very much. Anthropomorphism scores were calculated for each respondent by adding their ratings for questions a–e.

✎ Please answer to what extent you think these statements are the case:

a) To what extent do you think the average layer hen has thoughts of its own?
b) To what extent do think the average layer hen has intentions?
c) To what extent do you think the average layer hen has consciousness?
d) To what extent do you think the average layer hen experiences emotions?
e) To what extent do you think the average layer hen has free will?
f) To what extent do you think do you think the average layer hen is strong?
g) To what extent do you think the average layer hen is active?

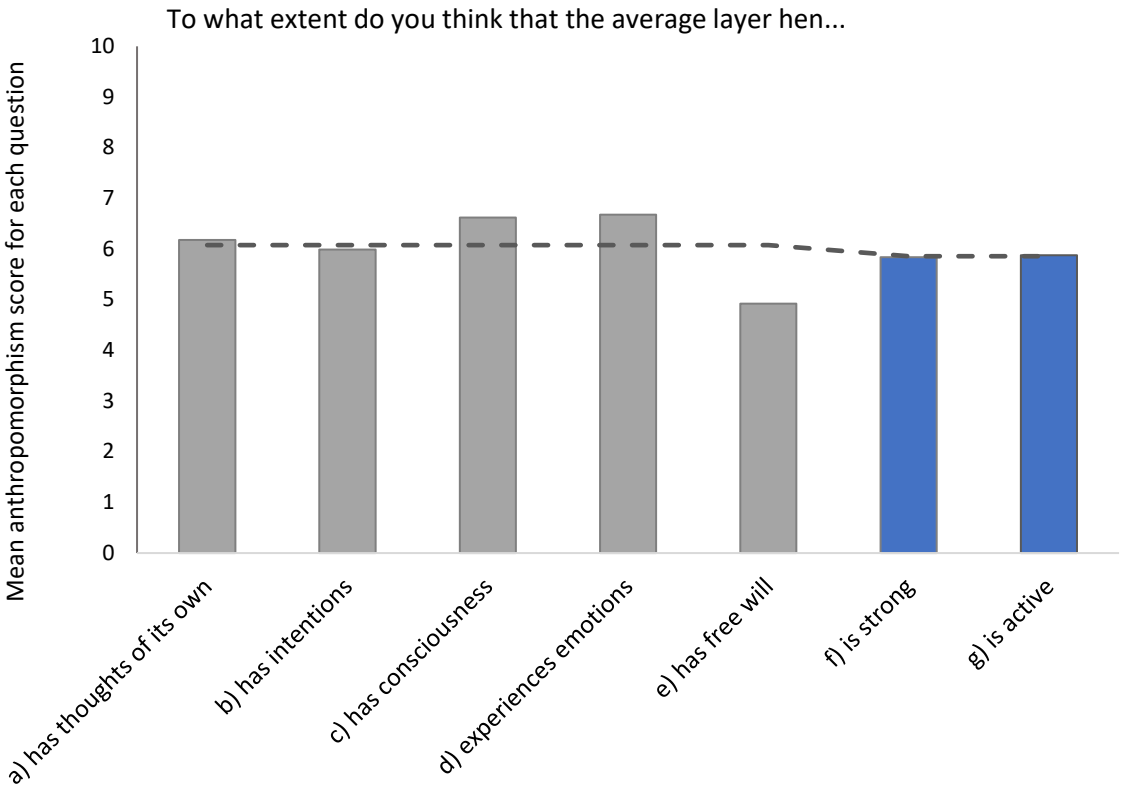

Figure 14-1 Mean anthropomorphism scores for each question, using an 11-point scale

0 = not at all and 10 = very much.
The overall mean score across all anthropomorphism questions = 6.08, while the mean score for the two control questions = 5.86 (n=3125).
Control questions help to control for differences in scale use and general attitudes towards layer hens.

Appendix 3 – Anthropomorphism X knowledge

Table 14-1 Ordinary Least Squares (OLS) with robust errors testing the association between respondents' anthropomorphism and morality scores (Moral_likert)

	Anthropomorphism score	
Variables	**coef**	**se**
2.Moral_likert	-0.52***	(0.087)
3.Moral_likert	-0.79***	(0.098)
4.Moral_likert	-0.99***	(0.091)
5.Moral_likert	-0.34***	(0.103)
6.Moral_likert	0.05	(0.118)
7.Moral_likert	0.72***	(0.151)
Observations	3,125	
R-squared	0.078	

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Appendix 4 – Scenarios for confirmatory focus groups

The scenarios used in the confirmatory focus groups depict hypothetical situations in which egg farmers were required to choose between different animal welfare, human health, and environmental outcomes on their farms. While in practice these outcomes may not necessarily conflict in commercial egg production, they are depicted as being mutually exclusive in the trade-off scenarios in order to encourage the focus group participants to make explicit value judgements.

In addition to the scenarios, the facilitators asked follow-up questions that prompted discussions that unpacked fine-grained distinctions in participants' applications of values. These follow-up questions built on the preceding discussions and were therefore specific to each focus group. The scenarios were modified between the initial focus group in Melbourne and the subsequent focus groups in Murray Bridge and Adelaide, in order to expand the scope of the discussions.

The following scenarios were used as discussion prompts in each focus group:

Melbourne group

Scenario 1: Jon and Joan are planning to start an egg farm somewhere in Australia and want to provide good welfare for their hens. They have learned that there is a disease within the local wild bird population that could spread to their flock, and there are no good ways to prevent their hens from having some contact with wild birds if they are outside during the day. They are therefore considering keeping their hens indoors, so that they can better control their exposure to the disease, but still like the idea of having an outdoor range.

Scenario 2: Kylie and Kevin have been running an award-winning egg farm for some years using a cage system and are considering changing over to a free-range system. They have highly modern sheds which include automated feeding and watering, climate control, ventilation, lighting, and manure and egg collection, which allows them to optimise conditions for the health of the birds while producing eggs at a relatively low cost and with a low carbon footprint. However, they have started to wonder whether free-range could have various advantages for the hens, such as the abilities to roam freely, interact socially with more hens, and practise a range of natural behaviours.

Murray Bridge and Adelaide metro groups

Scenario 1: For a number of years, Jon and Alex have been managing neighbouring commercial egg farms somewhere in Australia. Both Jon and Alex care about animal welfare but disagree about what is best for their hens. Jon keeps his hens in a shed at night and in the morning, he opens hatches in the sides so that the hens can easily access the outdoor range. On the range they can move around freely, peck and forage, dustbathe and socialise with other hens. Meanwhile, Alex's hens live indoors in a barn where they are also free to move around on litter so they can socialise, scratch and forage, but do not have access to the outdoors.

Scenario 2: Kylie and Kevin have been running an egg farm for some years using a cage system. They have highly modern sheds which include automated feeding and watering, climate control, ventilation, lighting, and manure and egg collection, which allows them to optimise conditions for the health of the birds while producing eggs at a relatively low cost and with a low carbon footprint. Kylie and Kevin consider this to be a good way to provide the highest welfare for their hens.

Appendix 5 – Research participants

Further characteristics of survey respondents

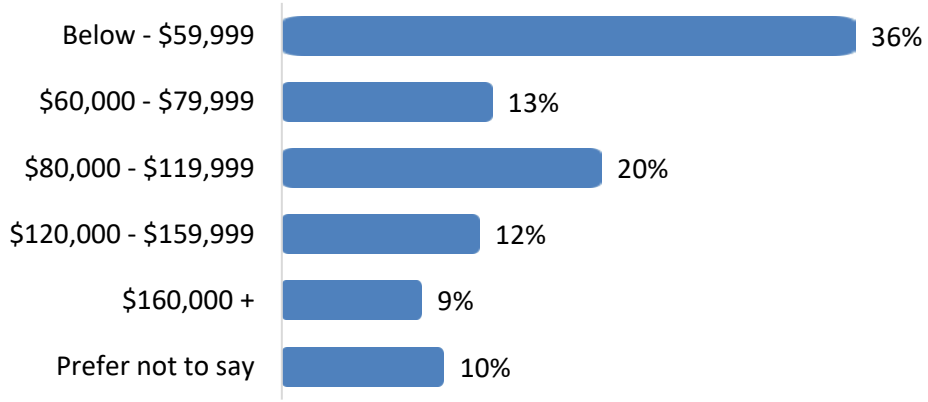

Figure 14-2 Percentage of survey respondents by household income (n=3125)

Purchasing habits

Three percent of survey respondents did not consume eggs.

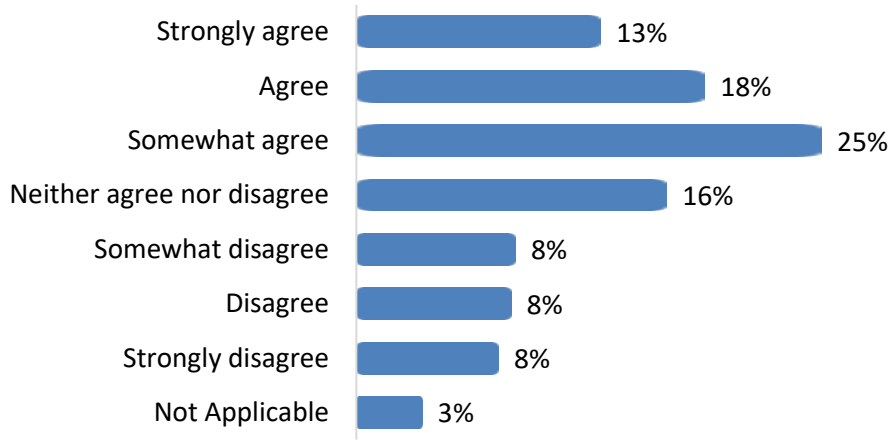

Figure 14-3 Level of agreement with the statement "If I buy eggs, I am guided by the price" (n=3125)

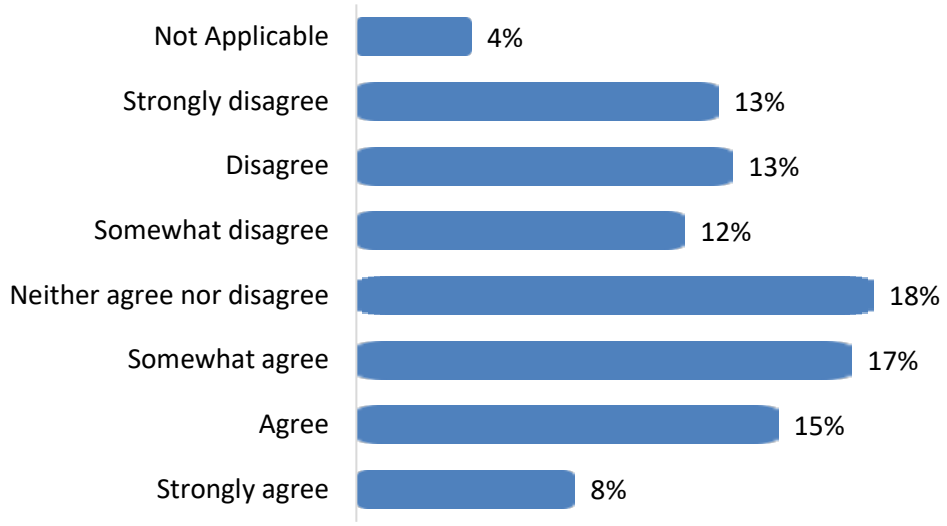

Figure 14-4 Level of agreement with the statement "If I buy eggs, I buy whatever is most convenient" (n=3125)

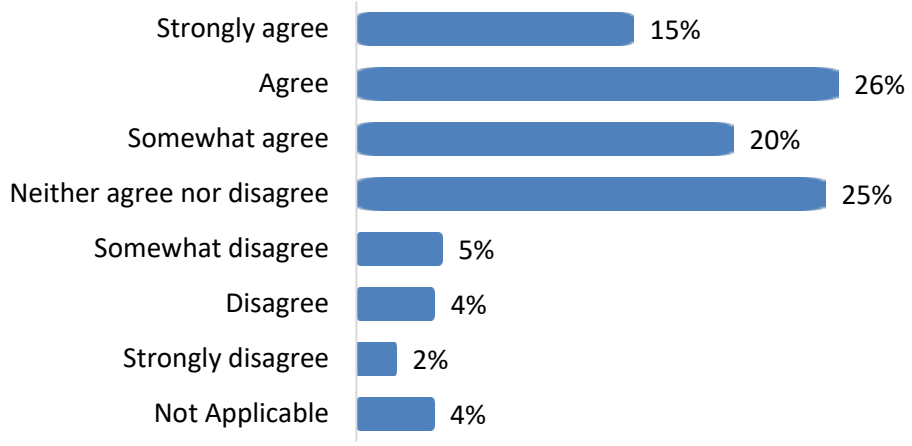

Figure 14-5 Level of agreement with the statement "If I buy eggs, I mainly buy eggs from a trusted producer/brand" (n=3125)

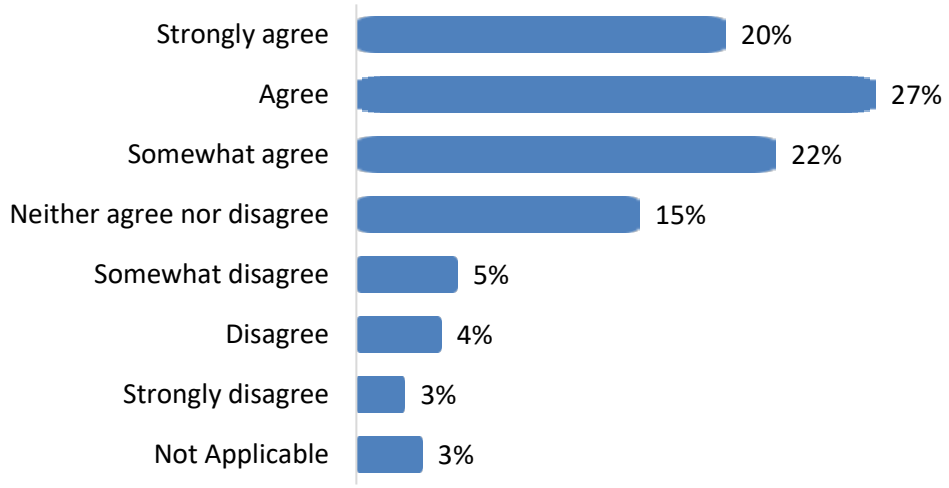

Figure 14-6 Level of agreement with the statement "If I buy eggs, I pay attention to packaging and labels" (n=3125)

Appendix 6 – Morality of affecting layer hen welfare

Table 14-2 Multinomial Logit Regression analysis to estimate associations between demographic characteristics and survey respondents' perceptions of to what extent it is morally wrong to create negative effects on layer hens' quality of life in order to produce reasonably priced eggs

	Moral Perceptions						
VARIABLES	**1. Absolutely morally wrong**	**2**	**3**	**4**	**5**	**6**	**7. Absolutely morally right**
Age	**-0.01****	**-0.01*****	**-0.01*****	**0.00****	**-0.02*****	**-0.02*****	-0.01
Gender (If Female)	**0.96*****	**0.25****	0.06	**-0.07*****	-0.23	0.10	**0.84*****
Political engagement: 2	0.06	0.35	**0.83*****	**-0.06***	0.45	0.34	0.00
3.Political_Engag	-0.03	0.06	**0.57****	-0.03	0.15	0.32	-0.53
4.Political_Engag	-0.22	-0.29	0.21	0.01	0.25	0.33	-0.09
5.Political_Engag	**0.44****	**0.52****	**0.61****	**-0.10*****	**0.84*****	**1.34*****	0.21
6.Political_Engag	**0.62****	**0.45***	**0.59***	**-0.12*****	**1.39*****	**1.49*****	**0.97*****
7.Political_Engag	**1.26*****	0.10	0.63	**-0.14*****	**-0.16**	**1.37*****	**2.28*****
Observations	**3,125**	**3,125**	**3,125**	**3,125**	**3,125**	**3,125**	**3,125**

*** p<0.01, ** p<0.05, * p<0.1

The category 'Neutral' was used as a base for the baseline comparison group.

Table 14-3 Multinomial Logit Regression analysis to estimate associations between survey respondents' perceptions of the importance of animal welfare and to what extent it is morally wrong to create negative effects on layer hens' quality of life in order to produce reasonably priced eggs

VARIABLES	**Absolutely morally wrong**	**Moral likert 2**	**Moral likert 3**	**Moral likert 4**	**Moral likert 5**	**Moral likert 6**
1. Not important	0.06	-0.04	-0.11	0.04	0.01	0.06
	(0.079)	(0.080)	(0.065)	(0.075)	(0.059)	(0.055)
2.Chic_Wel_likert	0.01	0.02	-0.04	-0.01	-0.08*	**0.13*****
	(0.064)	(0.066)	(0.053)	(0.061)	(0.048)	(0.045)
3.Chic_Wel_likert	0.02	-0.03	**0.08***	-0.05	0.01	-0.02
	(0.051)	(0.052)	(0.042)	(0.048)	(0.038)	(0.036)
5.Chic_Wel_likert	**0.04***	**0.12*****	**0.09*****	**-0.39*****	**0.09*****	**0.05****
	(0.027)	(0.027)	(0.022)	(0.026)	(0.020)	(0.019)
6.Chic_Wel_likert	**0.11*****	**0.25*****	-0.02	**-0.46*****	-0.00	**0.11*****
	(0.025)	(0.026)	(0.021)	(0.024)	(0.019)	(0.018)
7. Very important	**0.52*****	**0.04***	**-0.11*****	**-0.52*****	**-0.08*****	**0.03***
	(0.025)	(0.025)	(0.020)	(0.023)	(0.018)	(0.017)
Constant	0.02	**0.08*****	**0.15*****	**0.60*****	**0.11*****	0.02
	(0.022)	(0.022)	(0.018)	(0.021)	(0.016)	(0.015)
Observations	3,123	3,123	3,123	3,123	3,123	3,123
R-squared	0.255	0.058	0.056	0.178	0.047	0.025

Standard errors in parentheses.

Asterisks ∗∗∗, ∗∗, and ∗ indicate statistical significance at the 1%, 5%, and 10% levels, respectively (*** p<0.001, ** p<0.05, * p<0.1).

***Linear regression analysis showing the relationship between consumers' moral attitudes in commercial egg production and their perception of animal welfare.

Table 14-4 Results from ordinary least squares regression assessing the relationship between respondents' overall knowledge score (Q9) and their answer to the question "To what extent is it morally wrong to create negative effects on layer hens' quality of life in order to produce reasonably priced eggs?" (Q6) (on a 7-point Likert scale where 1= absolutely morally wrong, and 7 = absolutely morally right)

VARIABLES	Q9 (overall knowledge= correctly answered)	
Q6	***Coeff***	***se***
2. Moral_likert	-0.18***	(0.059)
3. Moral_likert	-0.24***	(0.070)
4. Moral_likert	-0.43***	(0.059)
5.Moral_likert	-0.08	(0.076)
6.Moral_likert	-0.11	(0.081)
7.Moral_likert	0.03	(0.087)
Observations	3,125	
R-squared	0.02	

Note: Base variable in Q6 is 'Neutral=4'.

Standard errors in parentheses.

*** p<0.001, ** p<0.05, * p<0.1

Table 14-5 Ordinary least squares (OLS) with robust errors used to assess the relationship between respondents' overall anthropomorphism score and response to the question "To what extent is it morally wrong to create negative effects on layer hens' quality of life in order to produce reasonably priced eggs?" (on a 7-point Likert scale where 1= absolutely morally wrong, and 7 = absolutely morally right)

	(1)	(2)
	Overall anthropomorphism score	
VARIABLES	coef	se
Q6		
2.Moral_likert	-0.52***	(0.087)
3.Moral_likert	-0.79***	(0.098)
4.Moral_likert	-0.99***	(0.091)
5.Moral_likert	-0.34***	(0.103)
6.Moral_likert	0.05	(0.118)
7.Moral_likert	0.72***	(0.151)
Observations	3,125	
R-squared	0.078	

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Appendix 7 – Trade-off preferences

Table 14-6 Results from ordinary least squares analysis assessing the relationship between choice of Option A (biological function) in trade-off scenario (a) and subsequent choice of option B for each scenario in which biological function is traded against other animal welfare, human health, or environmental sustainability outcomes

		Q13a (BF: Option A)	
Trade-offs	**If respondent selects option A (BF) in scenario a, they are…:**	**coef**	**se**
Q13b	More likely to choose Option B (AS)	0.03***	(0.010)
Q13c	More likely to choose Option B (NL)	0.03**	(0.010)
Q13d	Less likely to choose Option B (HH)	-0.01	(0.013)
Q13dd2	Less likely to choose Option B (HH)	-0.00	(0.013)
Q13e	More likely to choose Option B (BF)	0.02*	(0.011)
Q13i	More likely to choose Option B (BF)	0.01	(0.011)
Q13m	More likely to choose Option B (ES)	0.03**	(0.011)
Q13mm2	More likely to choose Option B(ES)	0.00	(0.007)
Mean VIF		1.14	
Observations	1,456		
R-squared	0.021		

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1 represent level of statistical significance at 1%, 5% and 10% level, respectively.

Table 14-7 Results from ordinary least squares analysis assessing the relationship between choice of option A (affective state) in trade-off scenario (a) and subsequent choice of option B for each scenario in which affective state is traded against other animal welfare, human health, or environmental sustainability outcomes

		Q13f (AS: Option A)	
Trade-offs	**If respondent selects option A (AS) in scenario f, they are…:**	**coef**	**se**
Q13b	More likely to choose Option B (AS)	0.01	(0.009)
Q13e	More likely to choose Option B (BF)	0.02**	(0.010)
Q13g	More likely to choose Option B (NL)	0.01	(0.010)
Q13h	More likely to choose Option B (HH)	0.03***	(0.009)
Q13j	More likely to choose Option B (AS)	0.00	(0.009)
Q13n	More likely to choose Option B (ES)	0.10***	(0.014)
Mean VIF			1.14
Observations	1,825		
R-squared	0.065		

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1 represent level of statistical significance at 1%, 5% and 10% level, respectively.

Table 14-8 Results from ordinary least squares analysis assessing the relationship between choice of Option A (natural living) in trade-off scenario (a) and subsequent choice of option B for each scenario in which natural living is traded against other animal welfare, human health, or environmental sustainability outcomes

		Q13k (NL: Option A)	
Trade-offs	**If respondent selects option A (NL) in scenario k, they are…:**	**coef**	**se**
Q13c	Less likely to choose Option B (NL)	-0.01	(0.010)
Q13g	More likely to choose Option B (NL)	0.01	(0.011)
Q13i	More likely to choose Option B (BF)	0.02*	(0.012)
Q13j	Less likely to choose Option B (AS)	0.00	(0.010)
Q13l	Less likely to choose Option B (NL)	-0.04***	(0.012)
Q13o	More likely to choose Option B (HH)	0.06***	(0.012)
Mean VIF		1.19	
Observations	1,646		
R-squared	0.054		

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1 represent level of statistical significance at 1%, 5% and 10% level, respectively.

Table 14-9 Ordinary least squares regression with robust errors showing relationships between demographic characteristics of respondents and their preferences in trade-off scenarios a to h (including dd)

	(1) Q13a	(2) Q13b	(3) Q13c	(4) Q13d	(5) Q13dd2	(6) Q13f	(7) Q13g	(8) Q13h
Age	-0.00***	-0.00	0.01***	0.01***	0.01***	-0.00**	0.00***	0.00*
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
gender (if female)	0.02	0.08*	0.13***	-0.02	-0.16***	-0.20***	-0.08*	-0.12**
	(0.041)	(0.046)	(0.046)	(0.046)	(0.046)	(0.041)	(0.046)	(0.049)
Ethnicity	-0.00	-0.01*	0.00	0.00	0.00	0.00	0.01**	-0.00
	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)
Educ	-0.00	0.00	-0.01	-0.03*	-0.03**	-0.01	-0.04***	0.01
	(0.014)	(0.015)	(0.016)	(0.015)	(0.015)	(0.014)	(0.015)	(0.016)
Household size	-0.04**	-0.03*	-0.03	0.06***	0.05***	0.00	0.01	0.03
	(0.016)	(0.018)	(0.019)	(0.018)	(0.018)	(0.017)	(0.018)	(0.019)
Income	-0.00	-0.01	-0.01	-0.00	0.00	-0.01**	-0.01	0.01
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)	(0.008)
Political Engage	0.03**	0.02	0.03**	-0.01	-0.03*	-0.00	-0.01	-0.03*
	(0.013)	(0.015)	(0.015)	(0.015)	(0.014)	(0.013)	(0.015)	(0.016)
Constant	2.87***	3.17***	2.72***	2.98***	2.88***	2.76***	2.63***	2.98***
	(0.122)	(0.137)	(0.139)	(0.134)	(0.135)	(0.126)	(0.135)	(0.142)
Mean VIF	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Observations	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125
R-squared	0.006	0.005	0.023	0.008	0.016	0.011	0.010	0.005

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1 represent level of statistical significance at 1%, 5% and 10% level, respectively.

Table 14-10 Ordinary least squares regression with robust errors showing relationships between demographic characteristics of respondents and their preferences in trade-off scenarios i to o (including mm)

	(9) Q13i	(10) Q13j	(11) Q13k	(12) Q13l	(13) Q13m	(14) Q13mm2	(15) Q13n	(16) Q13o
Age	-0.01***	-0.00*	-0.00	0.00***	-0.01***	0.00	-0.01***	-0.01***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
gender (if female)	-0.16***	0.11**	-0.05	0.11**	-0.21***	-0.07	-0.29***	-0.16***
	(0.045)	(0.048)	(0.045)	(0.044)	(0.043)	(0.077)	(0.038)	(0.043)
Ethnicity	0.01	-0.00	0.00	-0.01**	0.00	-0.01	0.01	-0.00
	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.010)	(0.005)	(0.005)
Educ	-0.00	-0.07***	-0.03**	-0.01	0.02*	-0.01	0.01	-0.02
	(0.015)	(0.016)	(0.015)	(0.015)	(0.014)	(0.025)	(0.012)	(0.014)
Household size	0.02	0.02	0.00	-0.03	0.01	-0.05*	-0.00	0.05***
	(0.018)	(0.019)	(0.018)	(0.018)	(0.017)	(0.029)	(0.016)	(0.017)
Income	0.01	-0.01	-0.01*	0.00	0.01	0.01	0.00	-0.00
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.012)	(0.006)	(0.007)
Political Engag	-0.02*	0.03**	0.02	0.01	-0.01	-0.02	0.00	-0.01
	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)	(0.024)	(0.012)	(0.014)
Constant	3.00***	3.04***	2.92***	3.36***	3.18***	3.36***	2.64***	2.72***
	(0.134)	(0.141)	(0.133)	(0.132)	(0.125)	(0.228)	(0.116)	(0.124)
Mean VIF	1.11	1.11	1.11	1.11	1.11	1.09	1.11	1.11
Observations	3,125	3,125	3,125	3,125	3,125	1,032	3,125	3,125
R-squared	0.020	0.011	0.004	0.011	0.024	0.009	0.049	0.017

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1 represent level of statistical significance at 1%, 5% and 10% level, respectively.

Table 14-11 Ordinary least squares regression of associations between remoteness regions and trade-off preference

VARIABLES	Q13a	Q13b	Q13c	Q13d	Q13e	Q13f	Q13g	Q13h	Q13i	Q13j	Q13k	Q13l	Q13m	Q13n	Q13o
Inner Region Australia	-0.35***	0.20***	0.28***	-0.73***	-0.43***	-0.61***	-0.35***	0.02	-0.62***	0.78***	0.70***	-0.32***	-0.19***	-0.99***	-0.77***
	(0.038)	(0.044)	(0.045)	(0.043)	(0.041)	(0.039)	(0.045)	(0.047)	(0.043)	(0.046)	(0.044)	(0.040)	(0.042)	(0.035)	(0.040)
Major Cities Australia	-0.36***	0.06**	0.12***	-0.78***	-0.23***	-0.53***	-0.36***	0.07**	-0.37***	0.86***	0.68***	-0.56***	-0.13***	-0.87***	-0.58***
	(0.025)	(0.028)	(0.028)	(0.028)	(0.027)	(0.025)	(0.028)	(0.029)	(0.028)	(0.029)	(0.027)	(0.027)	(0.026)	(0.024)	(0.026)
Outer Region Australia	-0.52***	0.06	0.51***	-0.78***	-0.46***	-0.69***	-0.45***	-0.04	-0.45***	0.74***	0.64***	-0.45***	-0.16*	-0.95***	-0.59***
	(0.078)	(0.100)	(0.093)	(0.093)	(0.090)	(0.086)	(0.096)	(0.105)	(0.096)	(0.099)	(0.096)	(0.093)	(0.088)	(0.079)	(0.091)
Remote Australia	-0.44	0.22	0.56**	-0.56*	-0.17	-0.44**	-0.17	0.11	-0.72***	0.72**	0.67**	-0.17	-0.06	-0.94***	-0.67**
	(0.286)	(0.310)	(0.251)	(0.317)	(0.307)	(0.226)	(0.317)	(0.293)	(0.270)	(0.281)	(0.315)	(0.252)	(0.254)	(0.242)	(0.294)
Very Remote Australia	-0.40	0.80**	0.60*	-0.80*	-0.00	-0.00	-0.00	-0.20	-0.20	0.60	0.20	-0.80	-0.80**	-0.40	-0.80
	(0.358)	(0.335)	(0.358)	(0.439)	(0.400)	(0.490)	(0.490)	(0.522)	(0.522)	(0.457)	(0.335)	(0.522)	(0.335)	(0.457)	(0.522)
Observations	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125
R-squared	0.001	0.003	0.007	0.001	0.006	0.002	0.001	0.001	0.008	0.001	0.000	0.008	0.001	0.003	0.005

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 14-12 Results from ordinary least squares regression assessing the relationship between respondents' overall anthropomorphism scores and preference (for option B) in each trade-off scenario (excl. dd and mm)

	Q13a	Q13b	Q13c	Q13d	Q13e	Q13f	Q13g	Q13h	Q13i	Q13j	Q13k	Q13l	Q13m	Q13n	Q13o
Anth. scores (overall)	0.00	0.03**	0.06***	-0.07***	-0.02	-0.05***	-0.03**	-0.12***	-0.07***	-0.01	-0.02	0.07***	-0.02	-0.08***	-0.08***
	(0.012)	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)	(0.012)	(0.013)
Constant	2.61***	2.89***	2.82***	3.68***	2.83***	2.75***	2.81***	3.75***	2.96***	2.88***	2.81***	3.12***	2.96***	2.60***	2.86***
	(0.074)	(0.084)	(0.085)	(0.084)	(0.081)	(0.075)	(0.085)	(0.088)	(0.086)	(0.087)	(0.082)	(0.082)	(0.080)	(0.071)	(0.081)
Mean VIF (=1.00)															
Obs.	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125
R-squared	0.000	0.002	0.007	0.010	0.001	0.006	0.001	0.022	0.008	0.000	0.001	0.008	0.001	0.018	0.014

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1 indicate the significance of the P-values at 1%, 5% and 10% level.
*** Overall Anthro score is 6.01 for respondents on average.

Table 14-13 Results from ordinary least squares regression assessing the relationship between respondents' overall knowledge of commercial egg production in Australia and their preference (for option B) in each trade-off scenario (excl. dd and mm)

	Q13a	Q13b	Q13c	Q13d	Q13e	Q13f	Q13g	Q13h	Q13i	Q13j	Q13k	Q13l	Q13m	Q13n	Q13o
Knowledge (overall)	-0.06***	0.03	0.04**	0.03*	0.01	-0.08***	-0.01	0.01	-0.05**	-0.03	-0.02	0.07***	-0.03*	-0.08***	-0.08***
	(0.018)	(0.020)	(0.021)	(0.020)	(0.019)	(0.018)	(0.021)	(0.021)	(0.020)	(0.021)	(0.020)	(0.020)	(0.019)	(0.017)	(0.019)
Constant	2.73***	3.04***	3.12***	3.18***	2.69***	2.56***	2.66***	3.03***	2.64***	2.87***	2.72***	3.40***	2.91***	2.23***	2.49***
	(0.034)	(0.037)	(0.038)	(0.038)	(0.036)	(0.035)	(0.039)	(0.040)	(0.038)	(0.039)	(0.038)	(0.037)	(0.036)	(0.033)	(0.037)
Mean VIF (=1.00) in all regressions															
Observations	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125
R-squared	0.003	0.001	0.001	0.001	0.000	0.005	0.000	0.000	0.002	0.001	0.000	0.004	0.001	0.007	0.005

Robust standard errors in parentheses.

Table 14-14 Results from ordinary least squares regression assessing the relationship between respondents' overall anthropomorphism scores and their response to the question "To what extent is it morally wrong to create negative effects on layer hens' quality of life in order to produce reasonably priced eggs?" (on a 7-point Likert scale where 1=Absolutely morally wrong, and 7=Absolutely morally right

	(1)	(2)
	Overall anthropomorphism score	
VARIABLES	coef	se
2.Moral_likert	-0.52***	(0.087)
3.Moral_likert	-0.79***	(0.098)
4.Moral_likert	-0.99***	(0.091)
5.Moral_likert	-0.34***	(0.103)
6.Moral_likert	0.05	(0.118)
7.Moral_likert	0.72***	(0.151)
Observations	3,125	
R-squared	0.078	

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

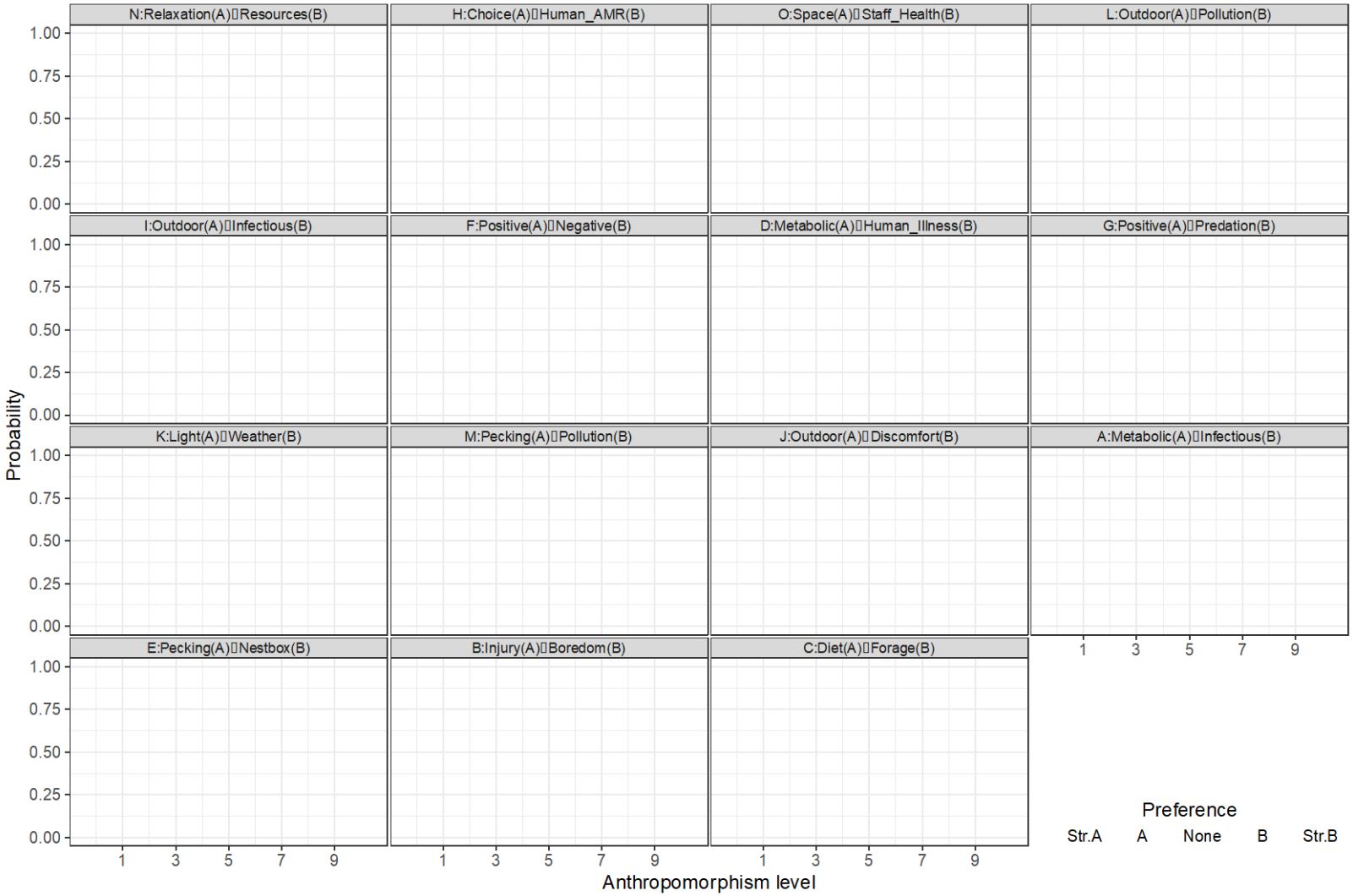

Figure 14-7 Ordinal regression analysis assessing the relationship between mean anthropomorphism score (x-axis) and probability to select outcomes from Str.A = strong preference for A to Str.B = strong preference for B (y-axis)), which involves a choice between allowing layer hens to choose where and how they spend their time (option A) and reducing risks to human health, for example due to anti-microbial resistant bacteria (AMR) (option B); anthropomorphism level is calculated as a mean score across the anthropomorphism questions, where 0 = lowest anthropomorphism score and 10 = highest anthropomorphism score)

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16 Plain English Summary

Project Title	Values in layer hen welfare 2.0: The application of community values to key layer hen welfare issues
Australian Eggs Limited Project No	1HS001UA
Researchers Involved	R.A. Ankeny, R. Paxton
Organisations Involved	School of Humanities Napier Building The University of Adelaide Adelaide SA 5005 Australia
Phone	+61 8 8313 5570
Fax	+61 8 8313 3443
Email	rachel.ankeny@adelaide.edu.au
Objectives	This study explored how members of the Australian community weighed up different desirable (or undesirable) animal welfare outcomes in layer hens, and investigated the values that underlie public expectations regarding such outcomes.
Background	Growing public concern for animal welfare means that the egg industry must make difficult decisions to balance not only the best available scientific data but also varied community expectations and values. It is therefore critical to understand how values associated with layer hen welfare compare to and are weighed up against other valued outcomes, for instance the potential effects of egg production on human health and environmental sustainability, particularly where values may be in conflict and where there is no objectively or scientifically correct answer. Such potentially conflicting values are a key challenge for the Australian egg industry as it continues to strive to meet community expectations regarding what is acceptable animal welfare.
Research	This project used two approaches to explore these questions, qualitative and quantitative methods. The research consisted of a nationally representative community survey, which was preceded and followed by community focus groups that informed the survey design, and allowed deeper understanding and analysis of its results. In both the community survey and confirmatory focus groups, participants were asked to rate their preference for pairs of outcomes in trade-off scenarios involving animal welfare, human health, and environmental sustainability.
Outcomes	The project output is comprised of a report that summarises the findings of the mixed-method analysis of community values and value trade-offs related to animal welfare, human health, and environmental sustainability in commercial egg production in Australia.
Implications	A multi-pronged approach is necessary in order to meet diverse community expectations for layer hen welfare in commercial egg production in Australia.

	The study found that members of the Australian community hold diverse views about animal welfare, which are reflected in varied prioritisation of animal welfare goals and expectations about how these are best achieved. Meeting basic needs, permitting freedom to choose, and providing the hens with care and protection represented the highest welfare priorities for the majority of research participants. Further research is needed to explore the psychology associated with different types of moral outlooks, for instance principle-based or absolutist views as compared to care perspectives. Further research is also required to explore how general values associated with such outlooks play out in the domain of animal welfare, particularly in relation to understandings of the role of the farmer and his or her moral duties within a commercial production system.
Key Words	Animal welfare, layer hen welfare, moral trade-offs, values