

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

A Characterisation of Farmed Animal Accreditation Schemes in Aotearoa New Zealand and a Comparison to Minimum Animal Welfare Legislation

A thesis presented in partial fulfilment of the requirements for the degree of

Master of Science
in
Animal Science

At Massey University, Manawatu,
New Zealand

Lauralee Ruth Bramley

2023

Abstract

Farmed animal welfare represents the subjective, mental experiences of animals farmed to produce animal-derived products. Welfare considerations for farmed animals exist from birth until the point of slaughter. Animal welfare is a legal priority in New Zealand through the Animal Welfare Act 1999 and its legislative instruments, the Codes of Welfare and the Animal Welfare Regulations. Animal welfare is also important for maintaining social license to operate, international export, animal productivity, and human wellbeing within the primary industries. An increased interest in animal welfare has emerged among consumers in recent years, with a particular focus on farmed animals. This increased concern has influenced the industry's social license to operate.

Accreditation schemes are frameworks that outline specific requirements for producers or individuals to obtain certification. They have been created to safeguard an industries' social license and enhance consumer assurance. Over the past decade, there has been a noticeable increase in the number of New Zealand farmed animal accreditation schemes that incorporate animal welfare assurances. Unfortunately, there have been questions about the transparency of such schemes and the credibility of their claims, especially schemes whose standards may not comply with minimum legislation.

To date, there has been little research on New Zealand farmed animal accreditation schemes. My research aimed to investigate and characterise the farmed animal accreditation schemes operating in New Zealand and determine how many of these are publicly accessible. I also aimed to evaluate publicly accessible schemes against minimum legal requirements of New Zealand's animal welfare legislation found within relevant Codes of Welfare. A novel methodology was developed to compare scheme standards to relevant Codes of Welfare.

In this study, I identified 20 New Zealand farmed animal accreditation schemes. Seventy percent (n: 14) of these schemes had standards that were publicly accessible. Twelve schemes comprised of 13 unique standards were eligible for comparison to respective Codes of Welfare. Overall, six (46%) of New Zealand's farmed animal accreditation scheme standards

that include animal welfare requirements exceeded minimum legislation, while three (23%) aligned with minimum legislation. Likewise, three (23%) did not address their respective Codes of Welfare. This research could be used to start discussions about how New Zealand's farmed animal accreditation schemes are being utilised to ensure animal welfare, promote more transparency within schemes, and how the claims of these schemes are being evidenced.

*This thesis is dedicated to the loving Mavis Evelynne Stone.
May you continue to be with us on our journeys and guide us in all we think and do.
Thank you, Nana, for everything.*

Acknowledgements

I would first like to thank my amazing supervisors: Dr Nikki Kells, Izabella Norris, and Dr Kat Littlewood. I could not have been luckier than to have you all on my team. Thank you for introducing me to the wonderful yet bizarre world of animal welfare. The level of dedication and expertise that you all have for your field has been truly inspiring. I am so grateful to have had you all facilitate my both academic and personal growth.

To Dr Nikki Kells – The support and dedication you provide for not only me but to all your students never ceases to amaze. I am extremely privileged to have had you as a mentor. From the first lecture you taught, you helped me fall in love with the crazy world of animal welfare. Anytime I walked into your office feeling stressed, you would stop whatever task you were doing, and I would leave feeling calm. You have put just as much effort into this thesis as I have, and for that, I am very thankful.

To Izabella Norris – Thank you for your constant support not only as a supervisor but also as a friend. You have pushed me to be a better person as well as a better researcher. From the extensive whiteboard sessions to the answering of my menial questions, I appreciated it all. You have been, and will continue to be, a huge inspiration for me.

To Dr Kat Littlewood – Your positive and bubbly personality is always a delight to be around. Thank you for constantly challenging me and throwing your iconic spanners into nearly all of my work. Your expertise and creativity have provided a fresh perspective on both this thesis and who I am as a researcher. Thank you for your valuable contributions.

To my wonderful parents and my beautiful sisters – I cannot possibly put into words the appreciation I have for my family. There is absolutely no way I would be where I am today without their support. Thank you all for being my biggest inspiration and cheerleaders. Whether we're laughing together or crying together, your constant love and support have shaped me into who I am.

To Becs – Thank you for all your support and for being crazy enough to also go through this process. Without fail, you have been there to help me hash out any dilemma or problem I have had, vent with me, laugh with me, and bounce ideas with me. I cannot wait to see what you and your incredible brain go on to do next.

To Floyd, Kirsten, and Tamara – A special thank you to all of you for being part of my life. I'm so grateful for all the love and friendship over the years. My achievements would not have been possible without you wonderful people supporting me.

To the flat of 2023 – Thank you, girls, for putting up with me and my dog at the best and worst of times. I am so thankful to have some awesome memories with you all.

To the AWSBC – I could not imagine a better group of people to be surrounded by throughout this journey. You are all intellectual, supportive, and welcoming people. Thank you for allowing me to be a part of this group and for your continuous encouragement.

Table of Contents

Abstract	ii
Acknowledgements	v
List of Figures	x
List of Tables	xi
1. Introduction	1
1.1. Farmed Animal Welfare.....	1
1.1.1. Brief Overview of Animal Welfare	1
1.1.2. Importance of Farmed Animal Welfare.....	3
1.1.3. Assessment of Farmed Animal Welfare	5
1.2. Characterisation of Farmed Animal Accreditation Schemes in Aotearoa, New Zealand.....	9
1.2.1. Purpose of Accreditation Schemes	10
1.2.2. Goals and Scope of Accreditation Schemes	10
1.2.3. Scheme Standards and Auditing	10
1.2.4. Public Accessibility	11
1.2.5. Scheme Claims and Labelling.....	11
1.3. Accreditation Schemes and Farmed Animal Welfare	13
1.3.1. Benchmarking	13
1.3.2. Accreditation Schemes and Animal Welfare Legislation.....	13
1.4. Current Legislative Structure for Animal Welfare in Aotearoa, New Zealand	14
1.5. The Need for an Evaluation of Farmed Animal Accreditation Schemes in Aotearoa, New Zealand	16
1.6. Research Aims and Thesis Structure	17
2. Methods	18
2.1. Human Ethics and Risk Evaluation.....	18
2.2. Characterisation of AoNZ Farmed Animal Accreditation Schemes	20
2.2.1. Search engine methods.....	20
2.2.2. Tabulation of Scheme Information.....	21
2.2.3. Public Accessibility	21
2.3. Selection of Schemes for Standard Analysis	22
2.4. Comparing Schemes to Codes of Welfare.....	23
2.4.1. System of Categorisations.....	23

2.4.3. Quality Assurance	27
2.4.4. Mental Experiences.....	27
2.5. Data Analysis.....	27
2.5.1. Codes of Welfare	27
3. Results.....	29
3.1. Characterisation of All Identified AoNZ Farmed Animal Accreditation Schemes	29
3.1.1. Search Results and Scheme Selection.....	29
3.1.2. Farmed Animals Represented	34
3.1.3. Industries Represented	34
3.1.4. Public Accessibility of Standards and Audit Sheets	35
3.1.5. Main Goals.....	36
3.2. Comparison to Codes of Welfare	37
3.2.1. Comparison with Minimum Standards.....	37
3.2.2. Comparison with Recommended Best Practice.....	39
3.2.3. Prevalence and Valence of Mental Experiences in AoNZ Farmed Animal Accreditation Schemes...	41
4. Discussion	42
4.1. Animals and Industries Represented by the Schemes.....	42
4.2. Public Accessibility.....	44
4.3. Main Goals	46
4.4. How Do AoNZ Farmed Animal Accreditation Schemes Compare Against Codes of Welfare?	47
4.4.1. References to Mental Experiences in Schemes.....	50
4.5. Practical Implications.....	50
4.6. Potential Methodological Limitations.....	51
4.7. Conclusion.....	52
4.8. Future Research.....	53
References.....	56
Appendix A. Table showing the mental experiences mentioned in the eligible 13 unique scheme standards, the frequency of the mental experiences, the number of scheme standards the mental experience was mentioned in, and the mental experiences associated valence.....	67

Commonly Used Abbreviations

AW	Aligns with
AWED	Aligns with Explicit Detail
EHL	Exceeds at a Higher Level
EAR	Exceeds with Additional Requirements
MPI	Ministry for Primary Industries
AoNZ	Aotearoa, New Zealand
NZFAP	New Zealand Farm Assurance Programme
NZ Pork	New Zealand Pork
RNZSPCA	Royal New Zealand Society for the Prevention of Cruelty to Animals
SLO	Social License to Operate

List of Figures

Figure 1. Flow chart summarising the methodological steps taken to conduct this research.	19
Figure 2. Figure showing the decision-making chart used when comparing farmed animal accreditation schemes in AoNZ to minimum legislative requirements.	26
Figure 3. Flow chart summarising the number of schemes that were excluded after each step as well as the total number of scheme standards that were eligible for comparison to legislation.	30
Figure 4. Bar graph showing which species of farmed animals were covered by the 20 AoNZ farmed animal accreditation schemes identified through web searches that addressed aspects of animal welfare.	34
Figure 5. Bar graph showing the different primary industries represented by the 20 AoNZ farmed animal accreditation schemes identified through web searches.....	35
Figure 6. Pie graph showing the proportion of 20 AoNZ farmed animal accreditation schemes identified through web searches with publicly accessible standards and audit sheets.	36
Figure 7. Bar graph showing the main goals stated among the 20 AoNZ farmed animal accreditation schemes identified through web searches.	37
Figure 8. Figure showing which 13 eligible AoNZ farmed animal accreditations scheme standards exceeds, aligns with, or did not address relevant minimum legislative requirements and recommended best practice.	40
Figure 9. Venn diagram showing the different mental experiences used in 13 eligible AoNZ farmed animal accreditation scheme standards and their associated valence.....	41

List of Tables

Table 1. The Five Freedoms and Five Provisions for promoting animal welfare (Webster, 2016).	7
Table 2. Search string showing the searches used to discover farmed animal accreditation schemes in AoNZ.....	20
Table 3. Table outlining the categories' names, abbreviations, and definitions in the system of categorisations used to compare AoNZ farmed animal accreditation schemes with Codes of Welfare.....	23
Table 4. Example of information recorded when comparing farmed animal accreditation schemes in AoNZ to minimum legislative requirements.	27
Table 5. Table displaying the overall categories schemes could fall into when comparing farmed animal accreditation schemes in AoNZ to minimum legislative requirements and their criteria.	28
Table 6. Table showing all eligible (white) and ineligible (grey) AoNZ farmed animal accreditation schemes found in this study as well as their corresponding organisational body, the farmed animals covered, the respective industry, public accessibility of scheme standards and auditing sheets, and the main goals of the schemes.	31
Table 7. Table showing the percentage of relevant minimum standards that the eligible 13 unique scheme standards identified through web searches either exceeds, aligns with, or not addressed and the overall category the schemes fall into when compared to AoNZ Codes of Welfare.....	38
Table 8. Table showing the percentage of recommended best practice that the eligible 13 unique scheme standards identified through web searches either exceeds, aligns with, or not addressed and the overall category the schemes fall into when compared to AoNZ Codes of Welfare.....	39

1. Introduction

1.1. Farmed Animal Welfare

Ensuring good, farmed animal welfare is an essential aspect of sustainable farming practices. In recent years, consumers have become increasingly concerned with the welfare of farmed animals, significantly increasing attention towards this issue (Alonso et al., 2020). As a result, there is a growing demand for more humane farming practices and industry-wide improvements. The idea of animals having welfare is not new. Animals have always had welfare, and farmed animals are no exception. However, humans' perception of what animal welfare means has changed over time (Fraser, 2008).

1.1.1. Brief Overview of Animal Welfare

There is no single accepted definition of animal welfare. This is because animal welfare continuously evolves, with many people holding different views on its characterisation. Animal welfare is both an academic discipline and a property of sentient animals. Animal welfare broadly draws influence from animal ethics, law and policy, and animal welfare science. Those making decisions regarding the care of animals use these interrelated disciplines to inform their decisions. Welfare state results from the sensations or mental experiences an animal is subjectively feeling (Hemsworth et al., 2015; Mellor et al., 2009). An animal's overall welfare will fluctuate from poor to good (Beausoleil & Mellor, 2017).

Characterisations, or definitions, of animal welfare, particularly "good" welfare, vary depending on an individual's perspectives and values. Good animal welfare can be defined using three orientations: biological functioning, natural living, and affective state. This thesis takes an affective state approach to conceptualising animal welfare. Affective state is a term used in animal welfare science to describe an animal's subjective experience and is often used synonymously with feelings or emotions. Affective states can be valenced. Valence is an inherent aspect of experiences, indicating their potential to be perceived as positive or negative (Beausoleil et al., 2022; Mendl & Paul, 2020). The affective state orientation aims to

minimise unpleasant mental experiences (e.g., pain) and to provide opportunities for positive mental experiences and everyday pleasures (Fraser, 2009; Webster et al., 2015). This thesis utilises the affective state orientation because its theory incorporates aspects of biological functioning and natural living orientations. The biological functioning orientation focuses on the physical health of animals as the foundation for assessing and improving animal welfare (Fraser et al., 1997). This means an animal is considered to have good welfare if it is in good health (i.e., free from disease and physiologically functioning appropriately) (Green & Mellor, 2011; Mellor et al., 2009). The natural living orientation emphasises an animal's ability to carry out its natural behaviours in a natural environment. From this orientation, welfare is determined by how closely an animal's living conditions match those in which the species evolved and whether the animal can express a full range of natural behaviour (Fraser, 2009; Webster et al., 2015). There is a widely accepted understanding that biological function and affective states are interconnected and can influence each other (Fraser et al., 1997). Similarly, expressing natural behaviours in a natural environment is proposed to influence affective states through the generation of positive experiences (Learmonth, 2019). Thus, the affective state orientation is utilised in this thesis for its holistic approach to animal welfare.

For an animal to have affective experiences (i.e., valenced mental experiences), the animal must be sentient. Sentience refers to the ability to process sensory inputs and consciously perceive them as good or bad (Browning & Birch, 2022). This requires a sufficiently complex neural system to transduce sensory inputs into cognitive or emotional states that can be interpreted as positive or negative (Mellor et al., 2009). In Aotearoa, New Zealand (AoNZ), an animal must be considered sentient and conscious (i.e., in a state where they can consciously sense and respond to external stimuli) in order to be afforded legal welfare consideration (Stafford, 2013). It is well established that domesticated farmed species (e.g., cattle, sheep, pigs) are considered sentient in the scientific literature (e.g., see Duncan (2006) and Rowan et al. (2021)) and legislation (e.g., Animal Welfare Act, 1999). As such, most farmed animals are protected by legislation in AoNZ. This thesis is concerned with the subjective, mental experiences of animals farmed to produce animal-derived products. Farmed animal welfare can be influenced by farming practices across the production chain - from the moment an animal is born up until the point of slaughter. It is across this timeline that farm animals are considered sentient and therefore have a welfare to be considered.

1.1.2. Importance of Farmed Animal Welfare

The state of farmed animal welfare in AoNZ has social, legal, and economic implications for New Zealand's primary industries. It plays a crucial role in social license, international export, productivity, and human wellbeing.

Farmed Animal Welfare Can Impact Social License to Operate

A 2017 survey showed that since 2008, positive public perceptions of AoNZ pastoral and dairy farming have decreased, on average, by 25% in both urban and rural respondents (Ministry for Primary Industries & UMR Research, 2017). Part of this decrease was due to concerns over animal welfare. The same survey showed respondents were strongly interested in ensuring AoNZ maintains high farmed animal welfare standards. Almost all urban (95%) and rural (96%) respondents agreed that it is important that the welfare of farmed animals in AoNZ is protected. The increased concern among consumers about the welfare of farmed animals influences the social license to operate (SLO) in the farmed animal industry. While no clear definition exists for social license, it has been described as a social contract between sectors and social groups and the public acceptability of commercial practices (Vince & Haward, 2019). Social license allows communities to challenge an industry or organisation, potentially creating change to retain social acceptance (Edwards & Trafford, 2016). When SLO is lost, it can lead to the loss of market access, legislative approval, or public approval (Hampton et al., 2020). An example of this was seen in Australia with kangaroo harvesting. Public concern over several welfare issues, such as non-fatal woundings and the euthanasia of dependant juveniles, led to a ban on exporting kangaroo products to some countries (Hampton et al., 2020). Maintenance of social license requires industries to be aware of and address negative consumer perceptions of their practices.

Consumer perceptions and knowledge of animal welfare vary according to factors such as age, experience with animals, and personal values (Cornish et al., 2016). Some consumers are willing to pay a premium for animal products that ensure improved farmed animal welfare (Clark et al., 2017). Consumers are the ultimate end users of animal products, so their

satisfaction is an important market driver. Consumers can improve farmed animal welfare standards by effectively communicating their preferences and concerns through market drivers and signals (Cornish et al., 2016). In the current era of social media dominance, even if a business or industry complies with all legal obligations, adverse public perceptions may lead to consumer boycotts that can undermine investor confidence and drive significant change (Sinner et al., 2020). Therefore, industries and organisations must prioritise and maintain farmed animal welfare to uphold the sector's SLO.

International Export

Animal welfare has recently become a strong driver for international export. The growth and development of AoNZ's economy relies heavily on its food and fibre industries. In 2022, the dairy industry alone generated export revenue of \$21.9 billion (24.6% of total export GDP), while the meat and wool industries contributed \$12.3 billion (13.6%) (Ministry for Primary Industries, 2023). As AoNZ relies so heavily on exports of its animal-based products, it is crucial to maintain animal welfare standards that meet the requirements of the customers importing these products (Stafford, 2013). Exporters who fail to provide evidence that their products meet their customer's standards may face export barriers or restrictions. Limiting international export through inadequate animal welfare standards would negatively affect AoNZ's economy.

Productivity

Animal welfare also has direct links to production efficiency. Many studies have shown that providing opportunities for animals to have some control over their lives and engage in rewarding behaviours can improve production (Bolt & George, 2019). For example, adding mechanical brushes on dairy farms improves welfare by providing sensory enrichment while simultaneously increasing milk yield and dry matter intake (Keeling et al., 2016). Likewise, allowing cows to enter automatic milking systems at their discretion through free traffic systems has been associated with an increase in milk production (Tremblay et al., 2016).

Animal welfare not only impacts productivity, but also positively influences the quality of animal products. For example, pigs reared in enriched environments had a noticeable improvement in meat quality, with increased tenderness and reduced cooking losses (Beattie

et al., 2000). Additionally, they demonstrated better growth rates and heavier carcass weights than those raised in barren environments. By prioritising the welfare of farmed animals, we can ensure that animals maintain positive mental experiences while enhancing productivity and sustainable farming practices.

Human Wellbeing

Good animal welfare can positively influence human wellbeing. Taking care of farmed animals and ensuring their welfare is positive can instil a sense of responsibility, usefulness, and satisfaction for a farmer (McBride & Baugh, 2022). Conversely, low productivity can result in feelings of inadequacy and financial pressure. It is postulated that there is a link between farmer wellbeing and stress, and how well farmers care for their animals. Evidence from Hansen and Østerås (2019) shows that farmers must thrive in their work, and poor animal welfare may indicate poor mental health in farmers. This concept also manifested during the COVID-19 pandemic. Further research is needed, but the emotional impact of the virus on farmers and its effect on farm animal welfare is evident (Pinillos, 2021). The One Welfare concept recognises this link between animal welfare and human wellbeing (Pinillos et al., 2016).

1.1.3. Assessment of Farmed Animal Welfare

Animal welfare is an internal subjective state and cannot be measured. Therefore, a science-based framework is required to evaluate how internal and external experiences may positively or negatively impact farmed animal welfare (Beausoleil & Mellor, 2017). Animal welfare indicators are used within assessment frameworks to achieve this understanding.

Animal Welfare Indicators

Farmed animal welfare can be assessed using indicators. Welfare indicators are observations or measures that reflect an animal's biological functioning, physical environment, or behavioural interactions (Paul et al., 2022). They provide information that can be used to infer the animal's mental experiences and, therefore, welfare. There are two broad categories of indicators: non-animal-based indicators and animal-based indicators. Non-animal-based

indicators are indirect measures as they are not taken from the animal. Instead, for example, they may be taken from the animal's physical environment (Hristov et al., 2014). There are two types of non-animal-based indicators: resource-based indicators and management-based indicators. Resource-based indicators are measures of the physical environment and the resources available to the animal, such as the amount of feed, temperature and space allowance. Management-based indicators are measures of the management applied to the animal, such as handling, husbandry procedures and antibiotic use.

Animal-based indicators are measures taken directly from the animal (Louton et al., 2019). They are often referred to as output-based measures as they are the animals behavioural and physiological responses to the inputs (resources and management) provided. Animal-based indicators can be external measures (e.g., body condition score, behaviour, etc.), internal measures (e.g., blood pressure and heart rate), or record-based measures (e.g., health records and growth rates) and can be recorded from live animals or at post mortem (e.g., liver damage and evidence of disease). Animal-based indicators more directly reflect an animal's experiences when compared to non-animal based indicators (Harvey et al., 2023). They also have the advantage of allowing for comparisons across husbandry systems, where the physical environment or management might differ. However, practical considerations such as time, resource availability, and the number of animals to be assessed may mean that non-animal-based indicators are a more suitable type of indicator to select (Beausoleil & Mellor, 2017). Species-appropriate welfare indicators can be incorporated into frameworks to facilitate animal welfare assessment. The two most common conceptual farmed animal welfare frameworks in AoNZ are The Five Freedoms and The Five Domains Model.

The Five Freedoms

The concept of The Five Freedoms (Table 1) was initially introduced in the 1960s and has been instrumental in establishing evidence-based animal welfare standards worldwide. The Five Freedoms were formally recognised by the UK Farm Animal Welfare Council in 1993 and were accompanied by five provisions (Table 1). They were the first framework in animal welfare to incorporate subjective experiences, health status, and behaviour (Mellor, 2016). The Five Freedoms are still referenced and used today as a foundation for policies, legislation, and animal welfare non-government organisations (NGOs) (McCulloch, 2013). The concept of The

Five Freedoms is appealing because it is easy to understand, highlights the importance of mitigating negative mental experiences, and demonstrates how to recognise and prevent negative mental experiences (Mellor, 2016). The Five Freedoms serve as an outcome-based approach to measure and assess the effectiveness of actions that promote animal well-being (Webster, 2016). Incorporating these provisions into farming practices and ensuring the freedoms are being met as a welfare assessment tool could prevent negative welfare in farmed animals, leading to an overall neutral welfare state. Indicative by the term “*Freedom from*”, the Five Freedoms prioritise preventing negative welfare states but do not specifically promote positive welfare, thus limiting their use in modern animal welfare assessment tools (McCulloch, 2013). It could be argued that The Five Freedoms are merely a set of rights (McCausland, 2014). Whilst easy to understand, the simplicity of The Five Freedoms also allows for much ambiguity. The framework has also not been updated since 1993 and fails to incorporate the latest developments in animal welfare science, e.g., provisions for positive animal welfare. Studies have shown discrepancies between The Five Freedoms and actual conditions when using this framework as an on-farm assessment tool (Popescu et al., 2010). For these reasons, The Five Domains Model has superseded The Five Freedoms.

Table 1. The Five Freedoms and Five Provisions for promoting animal welfare (Webster, 2016).

Freedom	Provisions
1. Freedom from thirst, hunger, and malnutrition.	By ready access to a diet to maintain full health and vigour.
2. Freedom from thermal and physical discomfort.	By providing a suitable environment including shelter and a comfortable resting area.
3. Freedom from pain, injury, and disease.	By prevention or rapid diagnosis and treatment.
4. Freedom from fear and distress.	By providing sufficient space, proper facilities, and the company of the animal’s own kind.
5. Freedom to express normal behaviour.	By ensuring conditions which avoid mental suffering.

The Five Domains Model

Originally formulated in 1994, The Five Domains Model can be used as a practical, context-specific framework to assess animal welfare and is regularly updated to incorporate advances in animal welfare science (Mellor et al., 2020). The framework's five domains are Nutrition,

Physical Environment, Health, Behavioural Interactions, and Mental Experiences, thus including all three welfare orientations. Within the first four domains, appropriate welfare indicators are used to infer the animal's likely mental experience in the fifth domain. The inferred mental experiences in Domain 5 determine an animal's welfare status. The first three domains are survival-related factors associated with internally generated sensations. The inferred mental experiences are often essential to the animal's survival and are frequently associated with negative valences (Littlewood & Mellor, 2016). This negative valence acts as a stimulus to the animal to engage in behaviours to correct the internal imbalance, e.g., thirst promotes water-seeking and drinking behaviour. When resolved (e.g., animal is provided water), they generally only give rise to neutral welfare at best.

On the other hand, Domain 4 (Behavioural Interactions) focuses on situation-related factors that influence an animal's mental experiences based on their perception of the interactions they have with their external physical or social environment (Mellor, 2016). For example, captive animals may display repetitive behaviours caused by their negative perception of confinement and can experience frustration (Mason, 1991). This all depends on the interactions the animal has with its environment. These interactions are based on opportunities for animals to engage in voluntary, self-generated, and/or goal-directed behaviours. These are otherwise known as agency-related behaviours (Mellor et al., 2020). An animal's ability to exercise agency can be impeded through restrictions or promoted via opportunities to interact with their surrounding environment, other non-human animals, and people (Mellor et al., 2020). Unlike the first three domains, interventions in Domain 4 may give rise to positive experiences that can enhance welfare, e.g., joy associated with play or maternal nurturing and care of young (Mellor & Beausoleil, 2015).

Studies regarding the on-farm application of The Five Domains Model conclude that this framework has great potential to promote positive farmed animal welfare (Fletcher et al., 2021; Johnson et al., 2022; Kells, 2022). Therefore, due to its regular updates, incorporation of positive welfare states, and successful application of on-farm animal welfare assessment, The Five Domains Model can be used as an informative framework to assess farmed animal welfare.

1.2. Characterisation of Farmed Animal Accreditation Schemes in Aotearoa, New Zealand

Accreditation schemes, synonymous with other titles such as quality assurance schemes, assurance programs, assurance standards, and certification schemes, are frameworks that establish sets of requirements for producers or individuals to follow to obtain some form of certification. These certifications may allow those who are accredited, access to specific markets or to increase their market share by providing consumers with assurances about the product itself or the production process.

Accreditation schemes are believed to have been developed in the 1990s in response to the enactment of strict legislation worldwide and consumer demands to ensure that producers have complied with food quality standards during production (Rowe et al., 2021). As AoNZ's economic base broadened, there was a need to improve and ensure the quality of agricultural goods and services to compete in the world market (IANZ, 2021). Accreditation schemes come in various types (e.g., public vs private) and operate at different levels of the food supply chain (e.g., farm-level vs supermarket-level). Recently, there has been an increase in the development and number of private (non-government) and industry-driven accreditation schemes specifically targeted towards individual farms that address specific societal concerns. Regarding the farmed animal industry, it is up to the individual farms to meet requirements while raising the animal until the point of slaughter for accreditation to be gained. In some cases, accreditation may be accompanied by an increased economic return (Farm Animal Welfare Council UK, 2005). Therefore, a production animal industry, or farmed animal, accreditation scheme is a framework that ensures consumers that specific characteristics of the scheme have been met throughout the raising and processing of the animal and its products. Most farmed animal accreditation schemes in AoNZ are operated by private farm industry organisations. These organisations design scheme standards specifically to cater to farmers who raise animals, meeting the scheme's certification criteria.

1.2.1. Purpose of Accreditation Schemes

The purpose of many farmed animal accreditation schemes relates to consumer assurance. Schemes provide a trusted framework that establishes best practice standards for farming and allows farmers to demonstrate their compliance with the standards through auditing. Accreditation schemes are vital in maintaining and improving the agriculture industry's reputation, as schemes can also provide assurances about food quality and traceability (Bailey & Garforth, 2014). These assurances help build the relationship between farmers and consumers, resulting in a trusted food system. Becoming a member presents a multitude of advantages for farmers too. Certification can lead to improved access to high-value customers, a larger market share, and improved profit margins for product sales (More et al., 2017). In contrast, there are some drawbacks to accreditation schemes. Stakeholders have questions about the transparency of these schemes and the credibility of their claims, especially those whose standards may not comply with minimum legislation, creating the potential to mislead consumers (EU Commission, 2010).

1.2.2. Goals and Scope of Accreditation Schemes

Every farmed animal accreditation scheme has one or more goals. The goals of accreditation schemes define what is being assessed in the scheme (or certification requirements) and provide consumers with assurances regarding specific aspects of the production system or product. Many farmed animal accreditation schemes include goals such as origin, traceability, safety, environmental health and sustainability, health, and welfare of the animals. In this thesis, I will only evaluate and characterise AoNZ farmed animal schemes with animal welfare as a primary goal or that specifically implement animal welfare requirements.

1.2.3. Scheme Standards and Auditing

Most accreditation schemes will provide members with a formal set of written requirements, called standards, that have been tailored to meet the goals and values of the scheme (Main et al., 2001). Members must meet these standards to be accredited and pass an audit. An audit

reviews a farm against scheme standards, primarily focusing on accountability and evaluating compliance with the scheme's aims and objectives. The auditing process requires the use of an audit sheet or checklist to review and assess the standards' requirements. These checklists typically include measurable questions, tasks, or criteria that must be met so auditors can determine compliance. Scheme standards should be auditable, meaning that standards should contain metrics easily translated into an audit sheet allowing consistent auditing. Auditing is a key part of the accreditation process. However, due to time and accessibility constraints, auditing processes are not included in the scope of this thesis. This thesis will focus specifically on scheme standards.

1.2.4. Public Accessibility

As previously noted, a large concern around schemes that claim high animal welfare assurance (above minimum legislative requirements) is their credibility. More specifically, whether the schemes have objective data or supporting documents to sustain these claims (More et al., 2017). Schemes may assure compliance with minimum animal welfare legislation or add requirements that ensure consumers that the animals have had welfare that exceeds legislation (EU Commission, 2010). Consumers can only be fully assured about a company's claims if their scheme standards are publicly accessible (More et al., 2017). A scheme's standards can be considered publicly accessible if they are hosted on, or available through the scheme's website. By making standards publicly accessible, consumers can investigate the substantial value behind labels or any other accreditation information they see on product packaging.

1.2.5. Scheme Claims and Labelling

Accreditation scheme labelling pertains to information regarding animal welfare or accreditation goals that are included on product packaging (Ingenbleek & Krampe, 2022). It is important to note that not all schemes are consumer-facing (i.e., present on product labelling). Some farming industries have internal requirements for individual farms and suppliers that

must be met to be accepted and represented by the industry body. Accreditation schemes provide a chance for product differentiation and create market opportunities. They offer a competitive edge by clearly labelling certified products, making it easier for consumers to make informed choices (More et al., 2017). Accreditation schemes are generally reflected in packaging by displaying the scheme logo or certification mark.

Labelling requirements in AoNZ come under the Fair Trading Act 1986. Under this Act, making an unsubstantiated representation about a good or service without any reasonable basis is illegal. Simply put, traders cannot make claims about their products without reasonable grounds to believe they are true (Epps & Wheeler, 2020). The Food Act 2014 also prohibits misleading packaging and labelling. This law protects consumers and allows them to accept a claim without taking the time to establish whether the claims are valid. The 2018 New Zealand Organic Market Report showed that nearly 80% of New Zealanders reported buying organic foods regularly, yet only 7% could identify all aspects of an organic product. The report also showed that consumers were unsure which assurances were reliable, and 46% read the label or packaging to determine organic products (Organic Aotearoa New Zealand, 2018).

All farmed animal schemes in AoNZ are voluntary (i.e., no legal obligation to join). This means regulating the accuracy of accreditation scheme claims is limited under the Fair Trading Act. Producer deception has been widely seen in the case of free-range eggs and organic claims. For example, Forest Hill Farms produced and sold over 200,000 eggs between 2010 and 2011, whereby the egg packaging claimed the product was free range or barn laid when they were not. This resulted in the company's director being convicted (Commerce Commission, 2014). The lack of definition for the term 'organic' in AoNZ regulations has also seen the misuse of the term on packaging (Epps & Wheeler, 2020). Similarly, there is no regulation for animal welfare claims on products. Scheme logos do not explicitly state or claim "this animal has had good welfare". However, these claims can be made on a scheme's website. The lack of regulation surrounding accreditation scheme labelling means that these schemes must be transparent about their assurances and how their standards validate these claims (More et al., 2017).

1.3. Accreditation Schemes and Farmed Animal Welfare

1.3.1. Benchmarking

Benchmarking animal welfare indicators against or within accreditation schemes is a method that can be used to improve farmed animal welfare. Benchmarking is a method of collecting and reporting data that allows comparisons of different farms and programmes to improve animal welfare. Measuring performance through specific indicators will enable individuals or companies to see where they sit relative to others (Sumner et al., 2018).

Benchmarking is also linked to farmer self-improvement and changes in motivation (Magd & Curry, 2003). By benchmarking welfare measures, farmers can be motivated to improve welfare as well as increase awareness around animal welfare issues (Pandolfi et al., 2017) as it provides motivation for change (Sumner et al., 2018). For example, a scheme assessing on-farm pig welfare saw a significant decrease in the prevalence of pig welfare issues (previously identified in on-farm audits) three years after the implementation of nationwide benchmarking welfare outcomes (Pandolfi et al., 2017). Likewise, one organisation accrediting 99 businesses across 17 countries used benchmarking between the farms to improve farmed animal welfare. The scheme raised awareness around animal welfare and motivated 73% of registered businesses to formalise overarching farmed animal welfare policies and 65% to set objectives and targets related to increasing farmed animal welfare within farm plans (Amos & Sullivan, 2017). Schemes engaged in benchmarking often adopt incremental improvement as an approach to improve animal welfare. This focuses on implementing smaller-scale solutions, which ultimately guide farm operations toward the goals set out by the scheme (Gilmore, 1990; More et al., 2021). Accreditation schemes that use benchmarking of animal welfare indicators can improve farmed animal welfare and increase motivation amongst farmers to achieve a higher level of animal welfare.

1.3.2. Accreditation Schemes and Animal Welfare Legislation

One crucial issue regarding farmed animal accreditation schemes is whether the requirements set out in their specific standards are higher than the minimum legal requirements of their respective jurisdictions (More et al., 2017). Accreditation schemes can potentially improve

animal welfare by setting standards that exceed legal minimum standards. Evidence shows that farms associated with accreditation schemes that aim to enhance animal welfare are much more likely to comply with national animal welfare legislation than farms that are not associated with accreditation schemes (Kilbride et al., 2012). This creates a power capacity for the industry to ensure animal welfare legislation compliance.

1.4. Current Legislative Structure for Animal Welfare in Aotearoa, New Zealand

Farmed animal accreditation scheme standards essentially incorporate or aim to exceed animal welfare legislation (Lundmark et al., 2018). AoNZ's legal framework for animal welfare includes the Animal Welfare Act 1999 and its legislative instruments, the Codes of Welfare, and the Animal Welfare Regulations.

The Animal Welfare Act 1999 (hereafter 'the Act') is the principal legislative framework governing all sentient non-human animals, including farmed animals in AoNZ (Schmidt et al., 2021). Above all else, the Act aims to reform the law to protect animal welfare and set high-level standards for animal owners and carers to meet their animal's physical, health, and behavioural needs (Mellor & Bayvel, 2008). The Act is administered by the Ministry for Primary Industries (MPI) and enforced, policed, and regulated by MPI and the Royal New Zealand Society for the Prevention of Cruelty to Animals (RNZSPCA). MPI and relevant ministers (i.e., members of Parliament) receive advice on animal welfare in AoNZ from the National Animal Welfare Advisory Committee (NAWAC) and the National Animal Ethics Advisory Committee. Although the Act sets out high-level standards, it is not detailed enough to guide owners or persons in charge on how to care for their specific animals. To address this issue, the Codes of Welfare were established alongside the passing of the Act.

Codes of Welfare (hereafter 'the Codes') lay out standards for animal care and management. The Codes sit separately from the Act due to their sheer number, but also so that they can be easily updated or amended to incorporate new knowledge. Each Code specifies minimum

standards and recommended best practices for a specific species or situation. There are 19 species/industry-specific Codes of Welfare, eight relevant to farmed animals. The minimum standards and recommended best practices in the Codes expand in more detail the obligations stated in the Act. The minimum standards provide basic actions that animal owners or carers should comply with to adhere with the Act. They are expressed in terms of health and welfare outcomes (Ministry for Primary Industries, 2019). Recommended best practice guidelines provide owners and carers with more specific guidance based on scientific information. They are designed to promote better care for animals above minimum standards (Ministry for Primary Industries, 2019). This means that minimum standards refer to the basic requirements that animal carers should fulfil, while recommended best practices are higher standards animal carers are encouraged to implement. Despite the Codes of Welfare detailing the basic requirements stated in the Act, there is one evident flaw; they are not legally binding. Individuals who breach a minimum standard stated in one of the Codes are not directly breaching the Act. As a result, relatively minor infringements are not frequently pursued due to the high cost of court proceedings unless they are certain to result in a successful prosecution (Rodriguez Ferrere, 2018). Therefore, the Codes lack the ability to promote compliance because they can only be used as supporting evidence in prosecutions.

Given that the Codes of Welfare are not directly enforceable, in 2015, amendments to the Act saw the authorisation of Animal Welfare Regulations (hereafter 'the Regulations'). The Regulations were introduced to enhance animal welfare and protect AONZ's national and international reputation (Ministry for Primary Industries, 2017). Clear standards that must be met were set out, and the prosecutable and infringement offences were established for an individual or corporate body that breaches a regulation. The Regulations also allowed for the penalisation of offences of lower severity. The Regulations are all partially or fully relevant to farmed animals. The Animal Welfare (Calves) Regulations 2016 and the Animal Welfare (Export of Livestock for Slaughter) Regulations 2016 set high animal welfare standards for treating bobby calves and exporting live farmed animals. The Animal Welfare (Care and Procedures) Regulations 2018 were promulgated two years later, which incorporated the aforementioned regulations into one. This saw restrictions on the procedures used on farmed animals, notably improving pig welfare by banning sow stalls (World Animal Protection,

2020). Although the Regulations are legally enforceable, they are outside this study's scope as they do not contain animal welfare indicators.

1.5. The Need for an Evaluation of Farmed Animal Accreditation Schemes in Aotearoa, New Zealand

There is a genuine need for farmed animal accreditation schemes to show absolute transparency with their claims (EU Commission, 2010; Lundmark et al., 2018; More et al., 2021). Schemes should be able to back these claims up with standards that put them into action. A previous example of unsupported claims was the New Zealand Pork (NZ Pork) accreditation scheme PigCare™. An investigation into the scheme in 2017 highlighted that the impression consumers were getting from the logo was that these pigs were ethically farmed and received care above minimum welfare legislation (Consumer NZ, 2017). However, this was inconsistent with some farming practices that were being certified by the scheme. Following this, PigCare™ received a new logo and has since updated its standards. The scheme still claims on its website: *“PigCare™ includes New Zealand’s already high animal welfare standards as well as other aspects important for animal welfare that go beyond these requirements.”* (NZ Pork, 2020). Consumers have the right to know whether the scheme's standards support the claims made by the scheme and any associated labelling. This notion is fundamental due to the lack of regulation of labelling and claims on packaging.

Despite many studies on international farmed animal welfare schemes, there is currently little specific research on AONZ farmed animal accreditation schemes and how animal welfare is incorporated into the programmes. Some programmes highlight and prioritise animal welfare, but whether they have publicly accessible information to support these claims is unknown. AONZ accreditation schemes must be rigorously evaluated for transparency to determine whether animal welfare is a substantive priority within the scheme and whether any welfare requirements exceed current legal standards (More et al., 2021). The findings of such a study will aid in retaining the social license for farmed animal-derived products and alleviate consumer concerns. Research shows farmed animal accreditation schemes can be a powerful

tool to increase welfare above minimum legislative requirements (Main et al., 2014; Pandolfi et al., 2017; Sumner et al., 2018), but only if the scheme standards allow it.

1.6. Research Aims and Thesis Structure

The overarching aim of this study was to provide information as to whether farmed animal accreditation schemes operating in AoNZ provide evidence of meeting or exceeding AoNZ's Codes of Welfare. This study focused only on accreditation schemes for the farmed animal industry that included animal welfare requirements in their standards.

To help achieve the overarching aim, I have first; investigated and characterised what farmed animal accreditation schemes with animal welfare requirements are operating in AoNZ and how many of these schemes' standards are publicly accessible (i.e., assess transparency). Secondly, for those schemes that were publicly accessible, I have evaluated the schemes against minimum AoNZ legal standards.

The present study helps enhance our understanding of the current landscape of industry-driven animal welfare standards. This new information regarding which industries and schemes focus on welfare improvement will help us understand what is driving the industry and assist the public and consumers in understanding the substantive value of any accreditation information they see on packaging.

The following chapters will contain the Methods (Chapter 2) and Results (Chapter 3). The Discussion (Chapter 4) will address the study's aims and explain what this study's results may infer about farmed animal accreditation schemes operating in AoNZ.

2. Methods

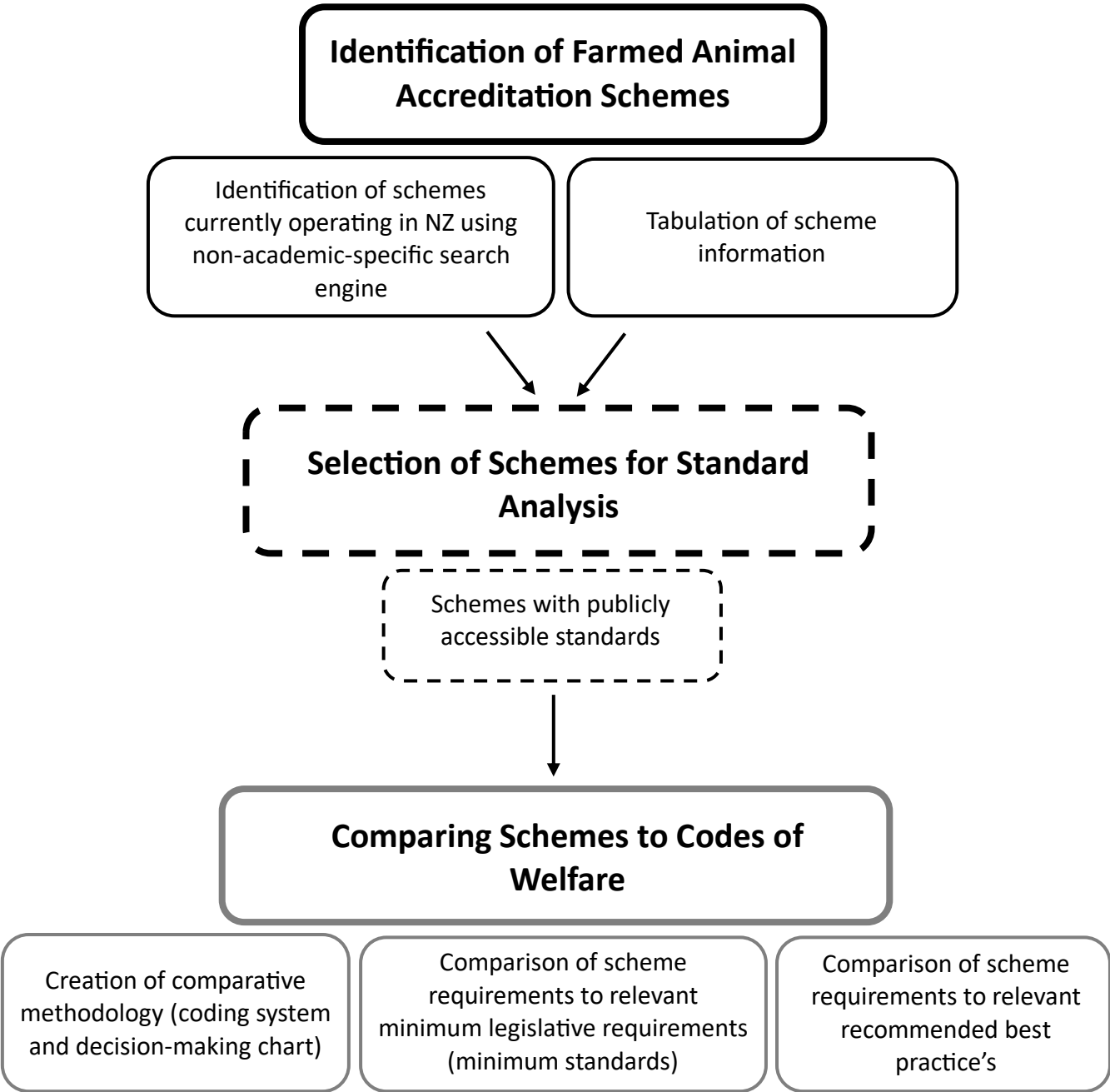
2.1. Human Ethics and Risk Evaluation

This research involved performing qualitative evaluations of organisational data (Figure 1). The study needed to be designed in a way that allowed for the collection of necessary data whilst balancing any potential ethical impacts on the accreditation organisations. A consultation was had with field experts in animal welfare, human psychology, and research ethics around the most appropriate methodology for data collection. Because not all scheme standards are publicly available online, organisations whose standards are not published were contacted to ask whether they would provide these. Given that transparency (i.e., public accessibility to standards underlying such schemes) was one of the factors being assessed, email contact was established with an employee of the schemes, and in-person discussions to persuade organisations to share this information were not used. The decision (whether to provide the requested information) was entirely at the discretion of the organisation.

During the consultation, the potential reputational risks to the accreditation scheme providers being contacted were discussed. The organisations that were asked to share information were those that did not have scheme standards publicly accessible online. This may pose a reputational risk. For example, if an analysis of a scheme's standards identifies that they are falling short of minimum legal requirements or are simply meeting minimum standards when claiming to enhance welfare. It was noted that such reputational risk is no greater than that faced by those scheme providers whose standards are already in the public domain. This risk was avoided through optional involvement. If an organisation felt that sharing its unpublished standards posed an unacceptable reputational risk, they were free to decline the request.

A Massey University human ethics application was completed. This project (Ethics Notification Number: 4000026561) was evaluated by peer review and judged to be low risk. Consequently, it has not been formally reviewed by one of the University's Human Ethics Committees.

Figure 1. Flow chart summarising the methodological steps taken to conduct this research.



2.2. Characterisation of AoNZ Farmed Animal Accreditation Schemes

2.2.1. Search engine methods

A non-academic-specific search engine (Google) was used to retrieve farmed animal accreditation schemes currently operating in AoNZ (Figure 1). In this research, I aimed to explore accreditation scheme standards, which are not likely to be documented/provided in academic literature. A set of search commands were utilised in Google to produce relevant and reliable results. The leading search command used was “Site:.nz” to ensure that standards operating in AoNZ were being retrieved in the searches.

A search string was developed to retrieve relevant results from Google. The different synonyms for accreditation schemes were used, and ‘New Zealand’ was placed at the end of every search to identify relevant programmes (Table 2). An example search string is provided in Table 2. In some Google searches, an industry was also specified, and the search string was run multiple times with different industries. The first five pages of each separate Google search were scanned for AoNZ farmed animal accreditation schemes that have animal welfare standards in their scheme’s requirements. News articles about farmed animal schemes were also used to discover schemes. This methodology may not have identified all farmed animal accreditation schemes operating in AoNZ.

Table 2. Search string showing the searches used to discover farmed animal accreditation schemes in AoNZ.

“Farm accreditation schemes New Zealand” OR “Farm quality assurance schemes New Zealand” OR “Farm assurance schemes New Zealand” OR “Farm assurance standards New Zealand” OR “Farm certification schemes New Zealand” OR “Farm assurance programs New Zealand” OR “Farm animal welfare schemes New Zealand” OR “Production animal welfare schemes New Zealand” OR “[Specific industry] farm accreditation scheme in NZ”

Note: “[Specific industry]” encompassed aquaculture, dairy, organic, poultry, pig, red meat, and wool. This search was run multiple times, each time inserting a different primary industry.

2.2.2. Tabulation of Scheme Information

All schemes identified in the search were tabulated to get an overview of AoNZ farmed animal accreditation schemes that prioritise animal welfare (Figure 1). Tabulation aided in enhancing our understanding of how the schemes work and the key differences between them. Only schemes highlighting animal welfare as a main goal or that have animal welfare requirements in their standards were selected for this study. The data tabulated from retrieved schemes included:

1. The name of the scheme.
2. The scheme's organisational body.
3. The farmed animals that are covered by the scheme.
4. Which industry the scheme belonged to.
5. Whether the scheme's standards and auditing sheets were publicly accessible.
6. The main goals of the scheme.
7. Legislative claims regarding animal welfare.

This data provided information regarding the functioning and purpose of schemes operating in AoNZ.

2.2.3. Public Accessibility

A scheme's standards were considered publicly accessible if they were published on the scheme's website or were available via email by clicking a link on the website. Some schemes requested an email address to be provided to access their standards through their website. These were deemed accessible as no additional information was required to receive a copy of the standards. Whether or not email addresses are screened prior to responding is not known. Requests for scheme standards were sent/received via a Massey University email address. A pie chart was then created displaying the proportion of schemes whose standards were publicly accessible.

2.3. Selection of Schemes for Standard Analysis

A significant component of this research was transparency and public accessibility (Figure 1). Although much time was spent searching and collating schemes, programmes were only included if they were discoverable within the first five pages of the search.

Scheme standards were then downloaded for further analysis. Organisations with schemes that did not have publicly accessible standards were contacted. An email was sent to an employee of the organisational body explaining the research and asking for the scheme's standards. Audit information was not requested. If an organisation did not respond when asked to provide the scheme's standards, the scheme was deemed not to be publicly accessible and was not included in the analysis.

Some schemes that were tabulated were not eligible for evaluation as they did not have standards but required farms to create animal health/wellbeing plans to ensure a level of animal welfare was maintained. These animal health plans were primarily developed with local veterinarians and veterinary clinics and catered to individual farms and their needs. Additionally, these animal health plans were not published to the public. Therefore, as there were no animal welfare standards to be evaluated, they were consequently excluded from the pool of schemes to be compared with legislation.

Any schemes that were produced for farmed animals that did not have a corresponding Code of Welfare were also excluded. For example, schemes that included fish could not be evaluated as there is not yet a Code of Welfare for this species. For this reason, programmes that accredit farms and their products as organic were also excluded, as organic systems/animals do not have a dedicated Code of Welfare.

It should also be noted that only the animal welfare portion of an eligible scheme's standards was evaluated. Schemes may have many requirements in different areas, such as environmental sustainability, social sustainability, or food safety. Furthermore, items relating to Pre-Transport Selection in each Code of Welfare were not assessed due to time constraints.

Only scheme standards published before December 2022 were used in the evaluation. Some schemes update their standards periodically and change their requirements for certification. However, the version of standards used in the evaluation were those available at the time of scheme retrieval.

2.4. Comparing Schemes to Codes of Welfare

The eligible scheme standards were compared to AoNZ’s Codes of Welfare. Due to this type of study not being conducted before, a methodology was created to ensure each scheme was assessed fairly and consistently (Figure 1). To ensure this, a categorisation system and a decision-making chart were designed and used together to assess each scheme. The schemes were compared to the relevant Codes of Welfare in two ways. Firstly, by comparing the scheme’s standards to the minimum standards set out in the Code, and secondly, by comparing them to the recommended best practices also stated in the Code.

2.4.1. System of Categorisations

For each minimum standard in the relevant Codes of Welfare the alignment with the schemes was assigned to one of five categories, as shown in Table 3.

Table 3. Table outlining the categories' names, abbreviations, and definitions in the system of categorisations used to compare AoNZ farmed animal accreditation schemes with Codes of Welfare.

Category	Abbr.	Definition
Not Addressed Mutually exclusive with: AW, AWED, EAR, EHL	NA	Scheme does not mention the subject of a minimum standard. <u>OR</u> Less than half of the subsections of the minimum standards are addressed within the scheme standards.
Aligns With Mutually exclusive with: NA, AWED, EAR, EHL	AW	The scheme does mention the subject of a minimum standard and at least half of the minimum standards subsection has been addressed. <u>OR</u> Scheme read the same and/or word for word as the minimum standard.
Aligns with Explicit Detail Mutually exclusive with: NA, AW, EAR, EHL	AWED	Has the same information that is provided in the minimum standards but is written in a way that is easier to read or outlines examples that meet the minimum standard. May use different wording than the codes of welfare but the information is at the same level as the minimum standard.

<p>Exceeds, with Addition Requirements Mutually exclusive with: NA, AW, AWED</p>	<p>EAR</p>	<p>The scheme has additional requirements or extra information in the corresponding section that improves animal welfare and is <u>not mentioned</u> in the minimum standards.</p> <ul style="list-style-type: none"> - All subsections of a minimum standard must be addressed. <p>If all subsections are not addressed, then it will be marked as NA or AW depending on how many subsections have been addressed.</p>
<p>Exceeds at a Higher Level Mutually exclusive with: NA, AW, AWED</p>	<p>EHL</p>	<p>The threshold for meeting a requirement is higher than what is stated in the minimum standards. This means that the scheme's requirements in the corresponding section are stricter than what is stated in the minimum standard.</p> <p>All subsections of a minimum standard must be addressed.</p> <p>If all subsections are not addressed, then it will be marked as NA or AW depending on how many subsections have been addressed.</p>

Schemes were categorised as not addressing, aligning with, or exceeding each minimum standard outlined in the relevant Code of Welfare. A scheme could be categorised as 'Not Addressed (NA)' when its standards did not address the minimum standard at all, or if less than half of the subsections within the minimum standard were addressed by the scheme.

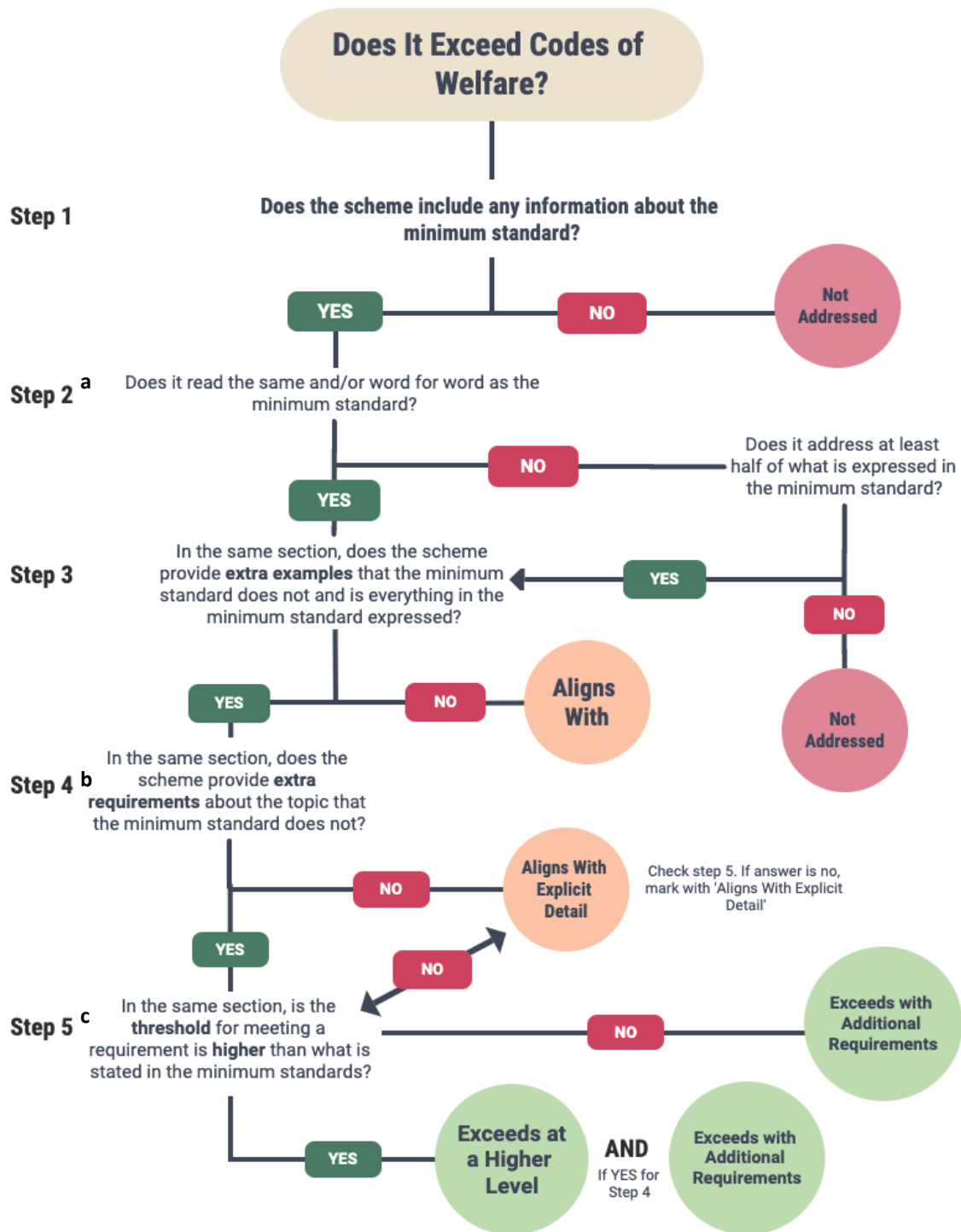
The categories 'Aligns With (AW)' or 'Aligns with Explicit Detail (AWED)' were used if the scheme did not include any more information or requirements than that stated in the minimum standard. The AW category was also assigned if at least half of the minimum standard subsections were addressed, or the scheme's standards read word for word or very similar to the minimum standard. For schemes to be categorised AWED, the scheme standards had to outline additional examples not expressed in the minimum standard. This may be describing the signs of heat stress but goes into no further detail as to how to prevent it. For example, a minimum standard may state that remedial action must be taken when an animal develops problems associated with exposure to adverse weather conditions. A scheme could be categorised AWED if it explicitly states these associated problems (i.e., heat or cold stress) and provides extra details about what the signs of this problem could be (i.e., shivering). Overall, the requirements are still at the same level as the minimum standard. If a scheme has used the example indicators laid out in the Codes of Welfare in their scheme's standard, this would be marked as AWED. This is because example indicators only express how the minimum standard can be achieved.

Schemes could also exceed minimum standards in one of two ways. The first was 'Exceeds, with Additional Requirements (EAR)'. This was achieved when all subsections of the minimum standard were addressed in the scheme's standards and they had extra requirements not seen in minimum legislation. For example, a scheme may prohibit the feeding of palm kernel extract or fodder beet to cattle. This is not mentioned nor prohibited in the Codes of Welfare but can potentially improve cattle welfare. The second approach was 'Exceeds at a Higher Level (EHL)'. This is when the threshold for meeting a minimum standard requirement is higher in the scheme's standards than in the corresponding Code. This category allows for the recognition of surpassing quantitative minimum standards. For example, a scheme can attain an EHL mark if a requirement for the scheme is that body condition score cannot drop below three, whereas the minimum standard states body condition score cannot drop below one. These approaches are not mutually exclusive; a scheme can be categorised as both EAR and EHL.

Each scheme was also compared to the corresponding recommended best practice (RBP) for each minimum standard in the Code of Welfare. Schemes could Align With (AW) the RBP by meeting at least half of its subsections. Meeting less than half of the RBP's subsections would result in the scheme falling into the NA, or Not Addressed, category. Schemes could also exceed (E) RBP if all RBP subsections were addressed and at least one subsection was exceeded at a higher level.

A decision-making chart was created and followed when comparing schemes to minimum legislation and assigning a category (Figure 2). Following the chart ensured internal consistency while comparing schemes and guaranteed that all schemes were evaluated equally. Having a decision-making chart also assisted in reducing bias when evaluating the schemes and allowed for ease of repetition. There are five steps to the chart.

Figure 2. Figure showing the decision-making chart used when comparing farmed animal accreditation schemes in AoNZ to minimum legislative requirements.



a. Step two examined the language used in the scheme’s requirements and the minimum standards. If the answer is no to this step, it is necessary to know if at least half of the subsections in the minimum standard are expressed in the scheme’s standard.

b. If the scheme does not provide extra requirements not stated in the minimum standard, it will be categorised as AWED. However, step five should still be consulted to see if the scheme is eligible for an EHL mark.

c. Exceeds at a higher level and exceeds with additional requirements are not mutually exclusive.

2.4.3. Quality Assurance

All information was recorded on a spreadsheet (see example in Table 4). Any mental experiences mentioned in the scheme's standards were also recorded to understand better how the schemes incorporate the animals' mental experiences. The reference number for the requirement in the scheme's standards and the name of that section were recorded for referral purposes.

Once all schemes were evaluated, three were chosen to be re-evaluated as part of an ad hoc quality control check. Nothing was changed, and the categories given to each minimum standard for that scheme stayed the same.

Table 4. Example of information recorded when comparing farmed animal accreditation schemes in AoNZ to minimum legislative requirements.

Code of Welfare Section	NA, AW, AWED, EAR, EHL	Standards No.	Standard Section Name	Mental Experiences	RBP
Part 2: Stockmanship and Animal Handling					
Minimum Standard No. 1 - Stockmanship	EAR	4.1-4.8	Stockmanship	Pain	No RBP

2.4.4. Mental Experiences

A list was compiled of all mental experience terms used in every scheme. Their frequency in and across all schemes and the number of schemes that used the terms were recorded. Their associated valence was also recorded. A Venn diagram was constructed to illustrate all negative, neutral, and positive mental experiences used across the schemes.

2.5. Data Analysis

2.5.1. Codes of Welfare

The data were collated so that each scheme fell into an overall category for comparison to the minimum standards and recommended best practices. This allowed us to see which schemes

exceeded, aligned with, or did not address their respective Codes of Welfare. The overall categories and criteria for assigning these are set out in Table 5.

Table 5. Table displaying the overall categories schemes could fall into when comparing farmed animal accreditation schemes in AoNZ to minimum legislative requirements and their criteria.

Overall Category	Criteria
Exceeds	The proportion of relevant minimum standards or recommended best practices that were exceeded at a higher level or with additional requirements by the scheme's standards is greater than 50%.
Aligns With	The proportion of relevant minimum standards or recommended best practices that the scheme standards aligns with (or aligns with explicit detail) is at least 50%. In the circumstance where none of the proportions as at least 50%, the proportion of exceeds and aligns with are added. The resultant overall category will be aligns with.
Not Addressed	The proportion of minimum standards or recommended best practices that were not addressed by the scheme's standards is at least 50%.

3. Results

3.1. Characterisation of All Identified AoNZ Farmed Animal Accreditation Schemes

3.1.1. Search Results and Scheme Selection

A total of 20 schemes were retrieved. Table 6 displays all AoNZ farmed animal accreditation schemes discovered during this research. Ineligible schemes were those that did not meet the inclusion criteria laid out in section 2.3 (Figure 3). Twelve schemes comprising 13 unique standards were eligible for comparison to the Codes of Welfare. The schemes highlighted in grey (Table 6) were not eligible for evaluation. Two schemes required farms to obtain animal health/wellbeing plans that encompass animal welfare requirements and thus are considered not eligible. Those schemes have public accessibility of standards marked as 'N/A'.

Two scheme organisations were contacted and their scheme standards were sent privately for the purposes of this study. At the time of submission, permission was not obtained to use the schemes name in this thesis. These two schemes have therefore been labelled as 'Scheme A' and 'Scheme B'. Any references to these organisations web sites or other material have been excluded from in text citations and the reference list to protect anonymity.

Figure 3. Flow chart summarising the number of schemes that were excluded after each step as well as the total number of scheme standards that were eligible for comparison to legislation.

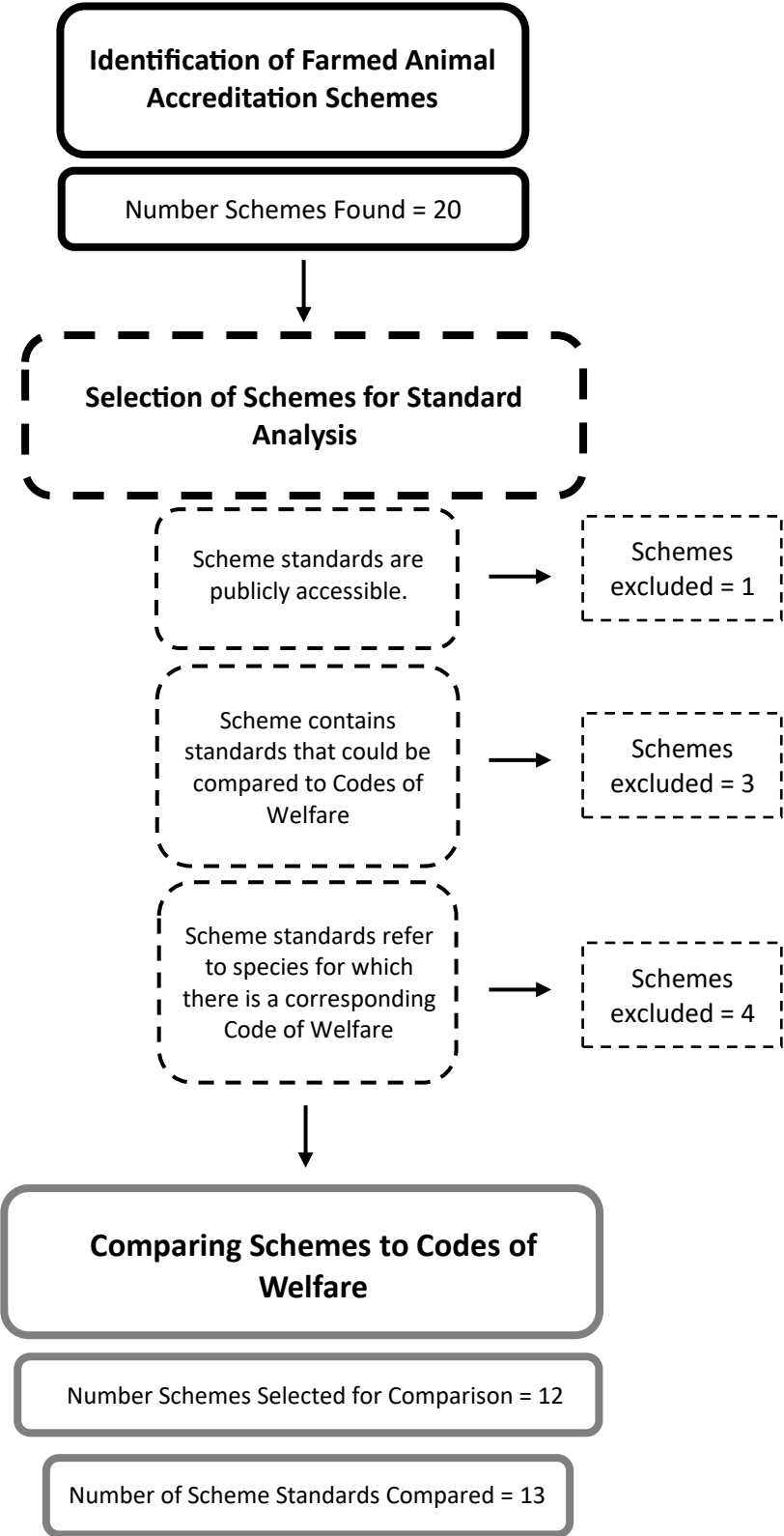


Table 6. Table showing all eligible (white) and ineligible (grey) AoNZ farmed animal accreditation schemes found in this study as well as their corresponding organisational body, the farmed animals covered, the respective industry, public accessibility of scheme standards and auditing sheets, and the main goals of the schemes.

N/A = Not Applicable

Name	Organisation Body	Farmed Animals Covered	Industry	Corresponding Code of Welfare	Public Accessibility	Main Goals
Scheme A	Undisclosed	Meat Chicken and Turkey	Poultry	Meat Chickens ²	Standards - No Auditing - No	Robust, rigorous and independent animal welfare certification programme to encourage and support improvements in animal welfare practices in New Zealand. †
Scheme B	Undisclosed	Dairy Cattle	Dairy Industry	Dairy Cattle ¹	Standards - No Auditing - No	To recognise and financially rewards suppliers who achieve dairy farming best practice. Uses the four pillars are Environment, Animal Health and Welfare, Milk Quality, and Social Responsibility. †
A2 Animal Welfare Programme	The A2 Milk Company	Dairy Cattle	Dairy Industry	Dairy Cattle ¹	Standards - No Auditing - No	To drive improvement, reduce risk and ensure farmers are welfare centric. This is achieved using increased audits, wider audit scope, milk monitoring, on-farm technology and training (The A2 Milk Company, 2023).
Aquaculture Factory Certification	Best Aquaculture Practices	Farms (fish, crustaceans, aquatic invertebrates), salmon farms, and mollusk farms	Aquaculture Industry	N/A	Standards - Yes Auditing - No	To assure the sustainability in four key areas: environmental, social, food safety, and animal health & welfare - at each step of the food chain (Best Aquaculture Practices, 2023).
Authentico Integrity Scheme	The Schneider Group	Sheep	Wool Industry	Sheep and Beef Cattle ³	Standards - Yes Auditing - No	The Authentico Integrity Scheme ensures brands and consumers that wool, cashmere and other animal hair fibres are sourced from farms applying best practices following the Authentico Integrity Scheme and relevant international standards (The Schneider Group, 2022).
Better Chicken Commitment	Better Chicken Commitment AUS/NZ	Meat Chickens	Poultry	Meat Chickens ²	Policy - Yes Auditing - No	That the minimum need for chickens bred for meat to have good welfare outcomes are being met by participating organisations (Better Chicken Commitment, 2023).

Name	Organisation Body	Farmed Animals Covered	Industry	Corresponding Code of Welfare	Public Accessibility	Main Goals
BioGrow Livestock Certification	BioGro NZ	Cattle, Dairy, Sheep, Poultry, Deer, Goats, Horses, Pigs, Ratites, i.e., ostrich and emu	Organic Industry	N/A	Standards - Yes Auditing - No	Purpose is for the certification and licensing by BioGro of producers of organic livestock and livestock products to use the BioGro trademarks and logo and to produce food of optimum quality and quantity, by holistic management of productive ecosystems (BioGro, 2009).
New Zealand Farm Assurance Programme (NZFAP)	New Zealand Farm Assured	Sheep, Beef, and Deer	Red Meat Industry	Sheep and Beef Cattle ³ , Deer ⁴	Standards - Yes Auditing - No	Assurances in terms of integrity, origin, traceability, biosecurity, environmental sustainability and animal health and welfare to maximise product returns and meeting the expectations international consumers (New Zealand Farm Assured, 2023).
PigCare™	NZ Pork	Pigs	Pork Industry	Pigs ⁵	Standards - Yes Auditing - No	Provides assurance that commercial pig farmers certified under PigCare™ meet a high standard of animal welfare (NZ Pork, 2020). †
SPCA Certified Beef Cattle	NZRSPCA	Beef Cattle	Red Meat Industry	Sheep and Beef Cattle ³	Standards - Yes Auditing - Yes	To allow participants to demonstrate that they apply a high level of animal welfare to their farming operations (SPCA New Zealand, 2020c). †
SPCA Certified Chinook (King) Salmon (Hāmana)	NZRSPCA	Salmon	Aquaculture Industry	N/A	Standards - Yes Auditing - Yes	To allow participants to demonstrate that they apply a high level of animal welfare to their farming operations (SPCA New Zealand, 2020c). †
SPCA Certified Dairy Cattle	NZRSPCA	Dairy Cattle	Dairy Industry	Dairy Cattle ¹	Standards - Yes Auditing - Yes	To allow participants to demonstrate that they apply a high level of animal welfare to their farming operations (SPCA New Zealand, 2020c). †
SPCA Certified Dairy Sheep	NZRSPCA	Sheep	Dairy Industry	N/A	Standards - Yes Auditing - Yes	To allow participants to demonstrate that they apply a high level of animal welfare to their farming operations (SPCA New Zealand, 2020c). †

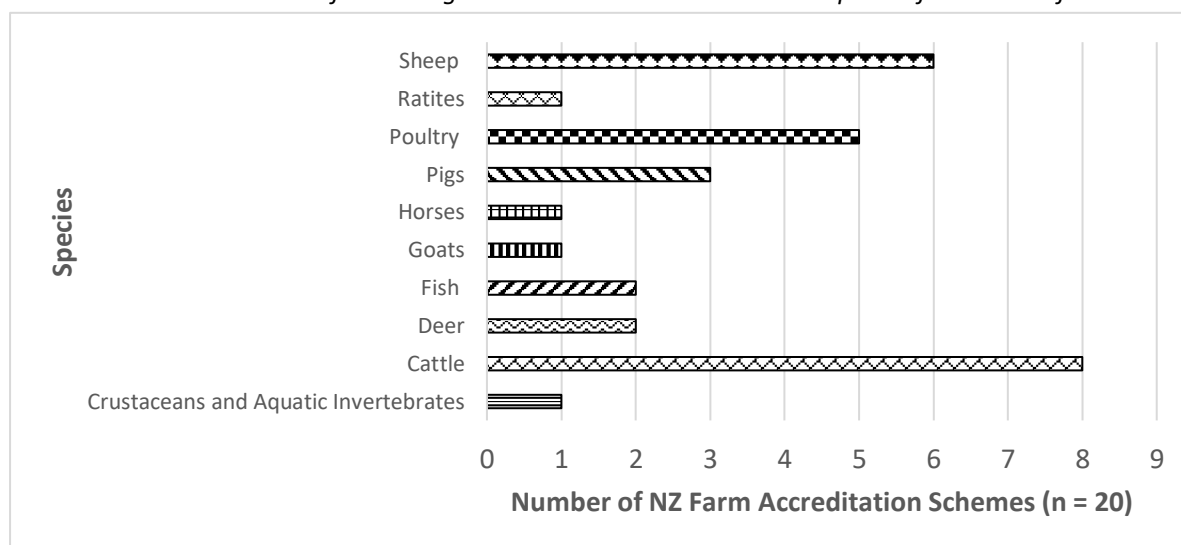
Name	Organisation Body	Farmed Animals Covered	Industry	Corresponding Code of Welfare	Public Accessibility	Main Goals
SPCA Certified Free Range and Barn Layer Hens	NZRSPCA	Layer Hens	Poultry Industry	Layer Hens ⁶	Standards - Yes Auditing - Yes	To allow participants to demonstrate that they apply a high level of animal welfare to their farming operations (SPCA New Zealand, 2020c). †
SPCA Certified Free Range Chickens	NZRSPCA	Meat Chickens	Poultry Industry	Meat Chickens ²	Standards - Yes Auditing - Yes	To allow participants to demonstrate that they apply a high level of animal welfare to their farming operations (SPCA New Zealand, 2020c). †
SPCA Certified Free Range and Free Farmed Pigs	NZRSPCA	Pigs	Pork Industry	Pigs ⁵	Standards - Yes Auditing - Yes	To allow participants to demonstrate that they apply a high level of animal welfare to their farming operations (SPCA New Zealand, 2020c). †
SPCA Certified Sheep Farmed for Meat	NZRSPCA	Sheep	Red Meat Industry	Sheep and Beef Cattle ³	Standards - Yes Auditing - Yes	To allow participants to demonstrate that they apply a high level of animal welfare to their farming operations (SPCA New Zealand, 2020c). †
The Co-Operative Difference Payment	Fonterra NZ	Dairy Cattle	Dairy Industry	Dairy Cattle ¹	Standards - N/A Auditing - No	To work together as a strong Co-operative to protect and grow the value of our sustainable, nutritious, New Zealand milk. Focus is on: Animals, Co-Op and Prosperity, Environment, Milk, People and Community (Fonterra, n.d.).
WelFarm	WelFarm	Dairy Cattle	Dairy Industry	Dairy Cattle ¹	Standards - N/A Auditing - No	To help dairy farmers better understand key animal health markers and how they impact on the optimisation of on-farm production performance (WelFarm, 2023).
ZQ Certification Programme *	New Zealand Merino Company Limited (NZM)	Sheep	Wool Industry	Sheep and Beef Cattle ³	Standards - Yes Auditing - No	To assure brands and consumers that production systems meet standards for the stewardship of livestock, management of the environment and social responsibility, and that the resulting fibre and products are of the highest quality (The New Zealand Merino Company, 2021).

Note: * Standards available on request. † Scheme claims to exceed minimum animal welfare legislation. 1- (National Animal Welfare Advisory Committee, 2019), 2- (National Animal Welfare Advisory Committee, 2018c), 3- (National Animal Welfare Advisory Committee, 2018d), 4- (National Animal Welfare Advisory Committee, 2018a), 5- (National Animal Welfare Advisory Committee, 2018e), 6- (National Animal Welfare Advisory Committee, 2018b).

3.1.2. Farmed Animals Represented

Across all AoNZ farmed animal accreditation schemes, a wide range of farmed animals were covered (Figure 4). For refinement purposes, species from a similar genus were characterised together. For example, sheep covers both sheep farmed for meat and wool. Beef cattle and dairy cattle were also amalgamated. Poultry includes all farmed avian species (meat chickens, layer hens, turkey, and duck). Ratites (ostrich and emu) were separated from poultry as they differ in physiology. Although fish farming in AoNZ mainly comprises King Salmon, other finfish such as trout are included. Crustaceans and aquatic invertebrates included bivalve molluscs, crayfish, scallops, oysters, etc. The most represented species were cattle, ($n = 8$, 40%). Six schemes (46%) were designed for dairy cattle, and three schemes (23%) were designed for beef cattle. This was closely followed by sheep ($n = 6$, 30%). It should be noted that some schemes had requirements for more than one species.

Figure 4. Bar graph showing which species of farmed animals were covered by the 20 AoNZ farmed animal accreditation schemes identified through web searches that addressed aspects of animal welfare.

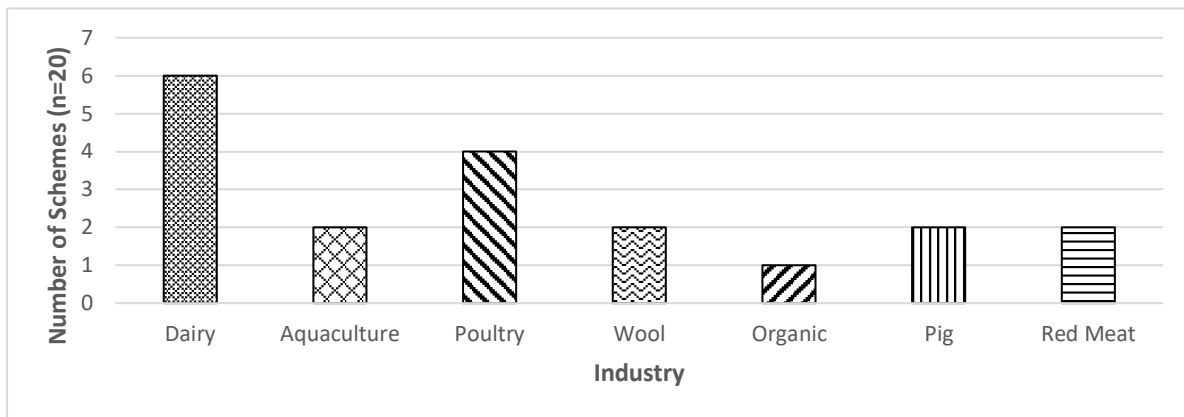


3.1.3. Industries Represented

The dairy industry was the most represented amongst the 20 schemes ($n = 6$, 30%) (Figure 5). The organic ($n = 1$, 0.5%) and pig ($n = 1$, 0.5%) industries were the least represented. It is

important to note that although BioGro represents an extensive range of animal industries, it was classified as organic per their standards' goal.

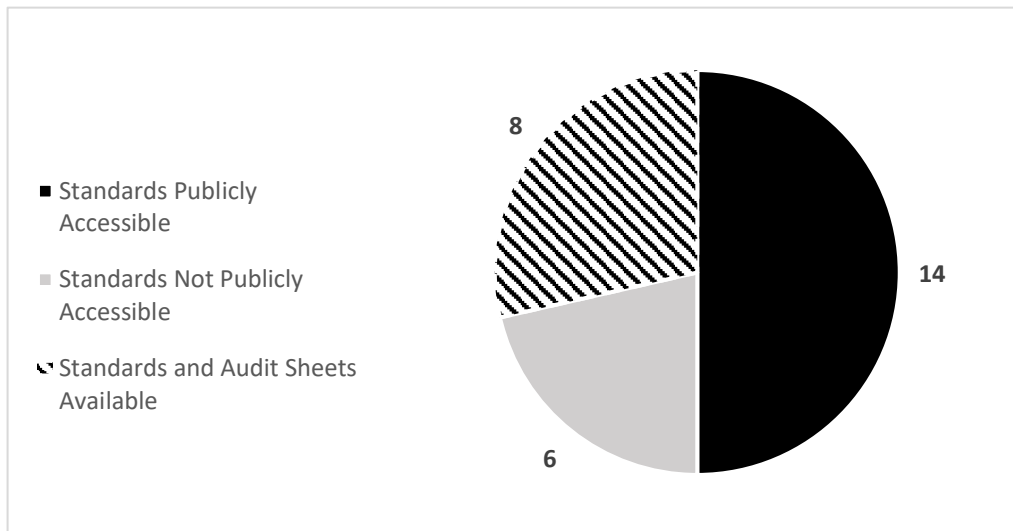
Figure 5. Bar graph showing the different primary industries represented by the 20 AoNZ farmed animal accreditation schemes identified through web searches.



3.1.4. Public Accessibility of Standards and Audit Sheets

Fourteen schemes (70%) had publicly accessible standards (Figure 6). Those schemes with animal health plans or a short policy were counted as 'not publicly accessible' as there is nothing available for consumers or potential participating farms to examine. Although audit sheets were not evaluated, whether they were publicly available was still recorded for transparency. The striped area of the pie chart symbolises those schemes that had both their standards and audit sheets publicly available, which included all eight SPCA Certified schemes. Fourteen other schemes had only their standards available on their website.

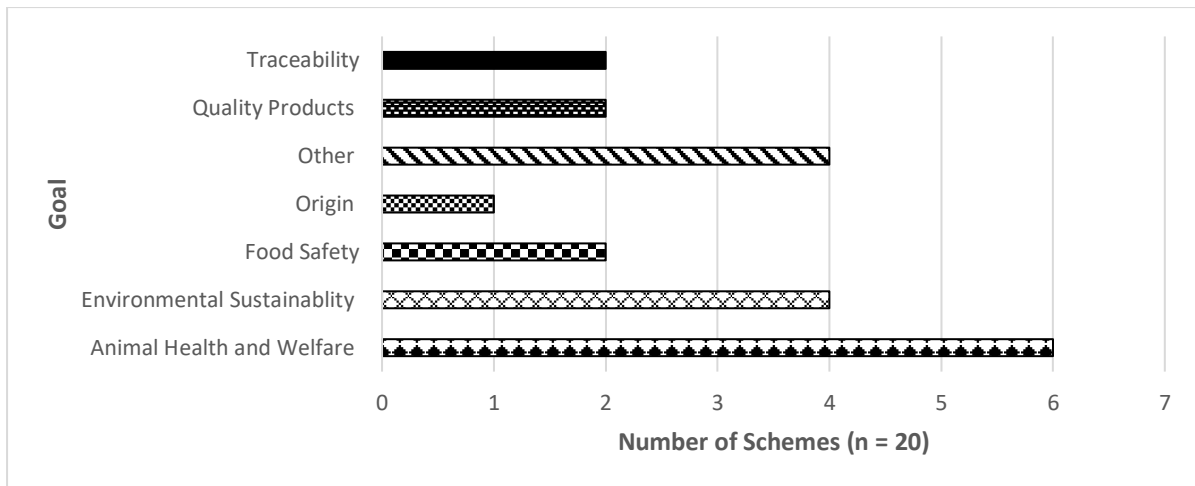
Figure 6. Pie graph showing the proportion of 20 AoNZ farmed animal accreditation schemes identified through web searches with publicly accessible standards and audit sheets.



3.1.5. Main Goals

An extensive range of goals were listed among the identified schemes (Figure 7). The most common goal identified was animal health and welfare (n: 11, 85%). This outcome may be because schemes needed to have animal welfare requirements in their standards to be included in this study. Other common goals included environmental sustainability (n: 5; 25%), social responsibility (n: 4; 20%), and quality products (n: 3; 15%). The 'other' section includes goals specific to one scheme or sector, including organic production, biosecurity, traceability, origin, and integrity. Eleven schemes (55%) also claimed to exceed AoNZ minimum animal welfare standards on their websites. For example, Scheme A states that their animal welfare standard "shows that producers have exceeded the minimum requirements of the Ministry of Primary Industries Code of Welfare".

Figure 7. Bar graph showing the main goals stated among the 20 AoNZ farmed animal accreditation schemes identified through web searches.



3.2. Comparison to Codes of Welfare

Out of 20 identified farmed animal accreditation schemes operating in AoNZ, twelve schemes met the inclusion criteria to undergo standard analysis outlined in section 2.3. Thirteen unique standards from the twelve schemes were compared to relevant Codes of Welfare.

3.2.1. Comparison with Minimum Standards

A total of six (46%) of the thirteen standards were categorised as exceeding ('Exceeds') the minimum standards outlined in the Codes of Welfare. These were five of the six SPCA Certified schemes as well as Scheme B (dairy cattle). Scheme B's standard exceeded eighty-four percent of relevant minimum standards. Additionally, the SPCA Certified standards for dairy cattle (63%), beef cattle (53%), layer hens (75%), meat chickens (93%), and pigs (56%) exceeded their respective minimum standards (Table 7). It should be noted that both SPCA Certified Layer Hens, Meat Chickens, and Scheme A (meat chickens and turkeys) were the only three scheme's whose standards addressed 100% of relevant minimum standards. This means that these three schemes aligned with or exceeded every relevant minimum standard in their respective Codes of Welfare.

Table 7. Table showing the percentage of relevant minimum standards that the eligible 13 unique scheme standards identified through web searches either exceeds, aligns with, or not addressed and the overall category the schemes fall into when compared to AoNZ Codes of Welfare.

Standard Name	Exceeds	Aligns With	Not Addressed	# Relevant Minimum Standards	Overall Category
Scheme A	50%	50%	0%	14	
Scheme B	84%	0%	16%	19	
Authentico Integrity Scheme	16%	16%	63%	19	
NZFAP Deer	7%	21%	71%	14	
NZFAP Sheep & Beef Cattle	26%	11%	63%	19	
PigCare™	0%	61%	39%	18	
SPCA Certified Dairy Cattle	63%	26%	11%	19	
SPCA Certified Beef Cattle	53%	24%	24%	17	
SPCA Certified Sheep	37%	37%	26%	19	
SPCA Certified Layer Hens	75%	25%	0%	16	
SPCA Certified Meat Chickens	93%	7%	0%	14	
SPCA Certified Pigs	56%	39%	6%	18	
ZQ Certification Programme	11%	26%	63%	19	

 = Exceeds
  = Aligns With
  = Not Addressed

Three schemes, Scheme A, NZ Pork’s PigCare™, and SPCA Certified Sheep, were categorised as ‘Aligns With’ minimum legislation. Scheme A aligned with fifty per cent of relevant minimum standards, whereas NZ Pork’s PigCare™ standards aligned with 61% (Table 5).

The only anomaly was the SPCA’s Certified Sheep scheme. In this case, the scheme’s standards were found to align with 37%, or 7 of 19, of the relevant minimum standards and to exceed 37% minimum standards (Table 7). Furthermore, 26%, or 5 out of 19 relevant minimum standards, were not addressed by the scheme. This scheme was categorised as ‘Aligns With’ despite not meeting the 50% or more criteria. This was because these standards did not meet the requirements for either ‘Exceeds’ (requires more than 50% of minimum standards to be exceeded) or ‘Not Addressed’ (requires 50% or more of the minimum standards to not be

addressed). Therefore, the proportion of ‘Exceeds’ and ‘Aligns With’ were added to be marked as AW.




The remaining three schemes failed to address 50% or more of the minimum standards of their respective Codes of Welfare and were therefore categorised as ‘Not Addressed’ (Table 7). These schemes were: Authentico Integrity Scheme, New Zealand Farm Assurance Programme (NZFAP), and ZQ Certification Programme.

3.2.2. Comparison with Recommended Best Practice

A total of five schemes ‘Aligns With’ the recommended best practices laid out in their respective codes of welfare. These were four SPCA Certified schemes and Scheme B. SPCA Certified Dairy Cattle (67%), Layer Hens (54%), Meat Chickens, (64%) and Pigs (50%) standards aligned with relevant recommended best practices (Table 8). Scheme B’s standards aligned with 78% of the relevant best practice recommendations. The remaining eight schemes did not address recommended best practices in their standards.

Table 8. Table showing the percentage of recommended best practice that the eligible 13 unique scheme standards identified through web searches either exceeds, aligns with, or not addressed and the overall category the schemes fall into when compared to AoNZ Codes of Welfare.

Standard Name	Exceeds	Aligns With	Not Addressed	Number of Relevant RBP	Overall Category
Scheme A	0%	15%	85%	13	
Scheme B	6%	78%	17%	18	
Authentico Integrity Scheme	0%	6%	94%	16	
NZFAP Deer	0%	0%	100%	13	
NZFAP Sheep & Beef Cattle	0%	0%	100%	16	
PigCare™	0%	0%	100%	14	
SPCA Certified Dairy Cattle	0%	67%	33%	18	
SPCA Certified Beef Cattle	0%	29%	71%	14	
SPCA Certified Sheep	0%	40%	60%	15	
SPCA Certified Layer Hens	8%	54%	38%	13	
SPCA Certified Meat Chickens	0%	64%	36%	11	
SPCA Certified Pigs	7%	50%	43%	14	
ZQ Certification Programme	0%	0%	100%	16	

 = Exceeds  = Aligns With  = Not Addressed

An overall snapshot of the results is provided in Figure 8.

Figure 8. Figure showing which 13 eligible AoNZ farmed animal accreditations scheme standards exceeds, aligns with, or did not address relevant minimum legislative requirements and recommended best practice.

New Zealand Farmed Animal Accreditation Schemes VS Codes of Welfare and Recommended Best Practice

Standard Name	Minimum Standards	Recommended Best Practice
Scheme A	Aligned With	Did Not Address
Authentico Integrity Scheme	Did Not Address	Did Not Address
NZFAP Deer	Did Not Address	Did Not Address
NZFAP Sheep and Beef	Did Not Address	Did Not Address
PigCare™	Aligned With	Did Not Address
SPCA Certified Beef Cattle	Exceeded	Did Not Address
SPCA Certified Dairy Cattle	Exceeded	Aligned With
SPCA Certified Layer Hens	Exceeded	Aligned With
SPCA Certified Meat Chickens	Exceeded	Aligned With
SPCA Certified Pigs	Exceeded	Aligned With
SPCA Certified Sheep	Aligned With	Did Not Address
Scheme B	Exceeded	Aligned With
ZQ Certification Programme	Did Not Address	Did Not Address

■ = Exceeded
 ■ = Aligned With
 ■ = Did Not Address

■ The proportion of relevant minimum standards or recommended best practices that were exceeded at a higher level or with additional requirements by the scheme's standards is greater than 50%.

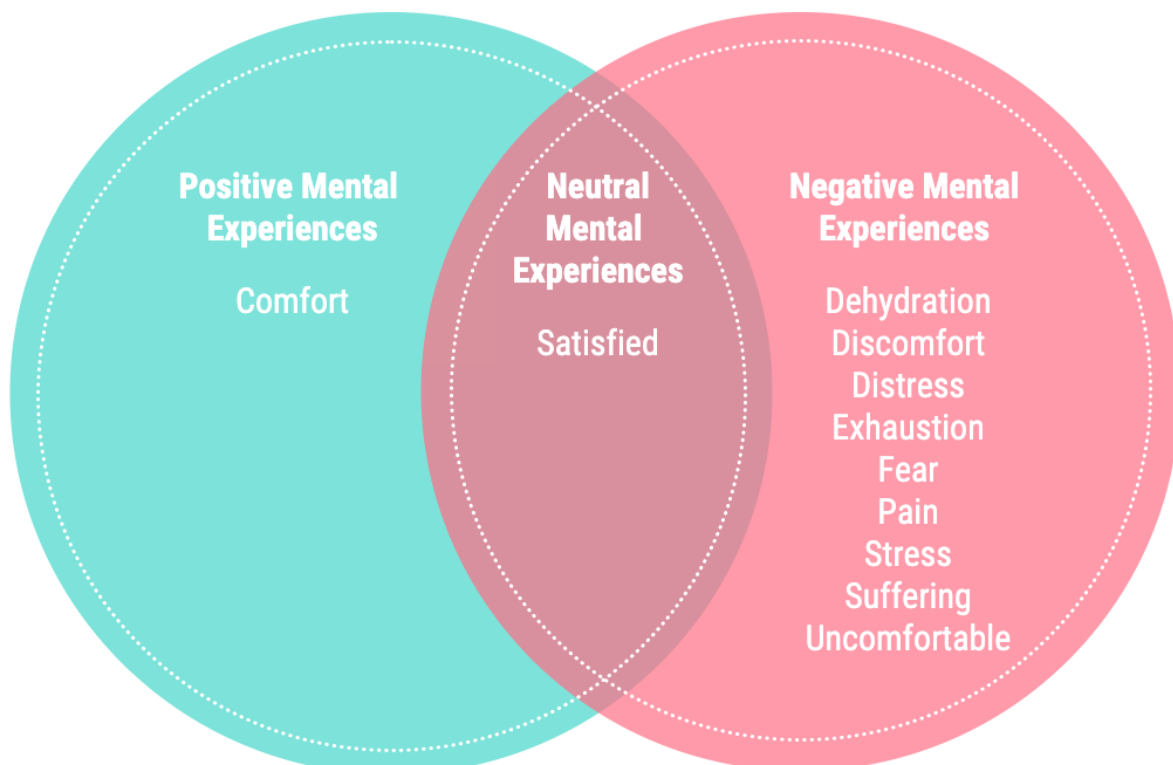
■ The proportion of relevant minimum standards or recommended best practices that the scheme standards aligns with (or aligns with explicit detail) is at least 50%.

■ The proportion of minimum standards or recommended best practices that were not addressed by the scheme's standards is at least 50%.

3.2.3. Prevalence and Valence of Mental Experiences in AoNZ Farmed Animal Accreditation Schemes

The schemes compared against minimum standards (n: 12) were also analysed to identify any references to specific mental experiences. A total of 12 mental experiences were referred to across all eligible schemes (Figure 9). Ten terms were attributed a negative valence, one a neutral valence, and one a positive valence. The mental experience with the highest frequency of usage was 'distress'. This term was mentioned 30 times across nine schemes (Appendix A). The term 'distress' is not a mental experience per se but rather a catchall phrase that refers to unpleasant affective experiences and is therefore included. The only term mentioned in all 12 schemes was 'Pain' which mentioned 20 times across all standards. The mental experience with the third highest frequency was 'Fear', which was stated 13 times across six schemes. All other mental experiences were mentioned less than ten times. The only neutral mental experience was 'Satisfied', mentioned once in one scheme. The only positive mental experience mentioned was 'Comfort', which was stated five times across four scheme standards.

Figure 9. Venn diagram showing the different mental experiences used in 13 eligible AoNZ farmed animal accreditation scheme standards and their associated valence.



4. Discussion

The first aim of this study was to investigate and characterise farmed animal accreditation schemes with animal welfare requirements are operating in AoNZ and to assess their public accessibility. For schemes that were publicly accessible, a second aim was to evaluate these against minimum AoNZ legal standards.

A characterisation of AoNZ farmed animal accreditation schemes and an evaluation of their animal welfare requirements against minimum AoNZ standards has not previously been conducted. Studies of international farmed animal accreditation schemes identified that some programmes lacked transparency and credibility (EU Commission, 2010; More et al., 2017; More et al., 2021). For example, are schemes that claim enhanced animal welfare standards actually exceeding minimal legal requirements. In addressing the study aims, the following sections will discuss the results and what they mean for the current state of industry-driven animal welfare standards in AoNZ.

A total of 20 AoNZ farmed animal accreditation schemes that incorporated animal welfare factors were identified during this study. This study reported on four primary characteristics: farmed animals represented, industries represented, public accessibility of standards and audit information, and main goals of the schemes.

4.1. Animals and Industries Represented by the Schemes

Across all schemes, a wide range of farmed animal species and industries were covered. Dairy cattle were the most represented species and the most represented industry. The organisations with accreditation schemes in this industry include The A2 Milk Company, BioGro, Scheme B, NZRSPCA, Fonterra NZ, and WelFarm. Three of these had standards that were not publicly accessible or were not eligible for comparison against minimum legislation.

The dairy industry is AoNZ's most significant contributor to primary industry-derived export revenue, which could be a driver for this industry having the most schemes. In June 2022/June

2023, the dairy sector and its products had the highest export value of all primary industries, with a total value of \$21.9 billion, and expected growth of 14 per cent in the following year (Ministry for Primary Industries, 2023). Sustaining this revenue is a priority both for the primary industries' and country's economy. Having accreditation schemes that provide assurances about milk production and, consequently, dairy products, as well as ensuring the livelihood of farmers in the sector, may aid in continuing the acquisition of export revenue. However, the dairy industry in AonZ has recently been under scrutiny, which may threaten the industry's social license to operate (SLO). The industry has been criticised for its environmental impact and multiple animal welfare issues (Stone, 2022).

Assurance schemes may have a role in ensuring an industry maintains its SLO. The dairy industry may have more schemes because they have been the subject of threats to their SLO. One significant social license risk for the dairy industry is the issue of surplus dairy calves. Bobby calves are young calves that are not needed as replacements for the milking herd (Bolton & von Keyserlingk, 2021). Bobby calves face various outcomes such as on-farm euthanasia soon after birth, being raised for a minimum of four days before being processed for hides and pet food, rearing for veal, or being raised for beef if suitable (Edwards et al., 2021; Haskell, 2020). Unfortunately, all these options result in the calf being separated from the dam at a young age (Buchli et al., 2017; Johnsen et al., 2016). On-farm euthanasia of bobby calves quickly after birth is not perceived favourably by the public (Vicic et al., 2022). Another risk to SLO is wintering systems, especially in New Zealand's South Island, where off-paddock systems using indoor wintering pads are utilised. Although this approach offers benefits such as reduced soil damage, increased pasture growth, and better stock condition, it exposes cattle to smaller lying spaces generally constructed of concrete with bedding (Longhurst et al., 2006). Concerns have also been raised regarding the lack of shelter for dairy cattle across the country (Mee & Boyle, 2020). Each of these management issues has the potential to promote negative mental experiences for the farmed animals and effectively threatens the industry's SLO. Therefore, the retention of their social license due to the rising concerns around the sector could also be a significant driver for the high number of schemes for the dairy industry.

Sheep farmed for meat, wool, and milk were also well represented by AonZ farmed animal accreditation schemes. Schemes included The Authentico Integrity Scheme, BioGro, Livestock

Certification, NZFAP, SPCA Certified Dairy Sheep, SPCA Certified Sheep Farmed for Meat, and ZQ Certification Programme. The red meat and wool industries were each represented by four schemes and, in 2022, was the second-largest primary industry export market in AONZ, generating a revenue of \$12.3 billion (Ministry for Primary Industries, 2023). Alternatively, species and industries that were the least represented (i.e., aquaculture, ratites, goats) have only started to be farmed recently or tend to be farmed in smaller numbers. This suggests that the number of accreditation schemes for a particular species is indicative of the industry size and revenue. For example, in 2022, aquaculture, represented by two schemes, produced an export revenue of \$1 billion, 20 times less than the dairy sector (Ministry for Primary Industries, 2023). Figures around revenue from goats and ratites, apart from live export, are not reported by MPI, suggesting these are not significant.

4.2. Public Accessibility

Fourteen of the 20 identified farmed animal accreditation schemes had standards that were publicly accessible. Eight of these were from a single accrediting organisation which provided both standards and audit sheets publicly available (RNZSPCA). Schemes with publicly accessible standards included: Aquaculture Factory Certification, Authentico Integrity Scheme, BioGro Livestock Certification, New Zealand Farm Assurance Programme, SPCA Certified standards for Beef Cattle, Chinook Salmon, Dairy Cattle, Dairy Sheep, Free Range and Barn Layer Hens, Free Range Chickens, Free Range and Free farmed Pigs, and Sheep Farmed for Meat, and ZQ Certification Programme. At the time of data collection, the A2 Animal Welfare Programme, Scheme A, Scheme B, and PigCare™ schemes had standards that were not publicly accessible. Despite being the most represented species and industry, of the five schemes representing dairy cattle, only one had standards that were publicly accessible and eligible for comparison to legislation.

Non-governmental organisations developed all AONZ schemes discovered in this study. This means private companies administer them, and there is no input from the government. Public policies, such as legislation, have more credibility because citizens have a say in their development through elected representatives. However, private standards are not

safeguarded by this system and do not have the same requirement for transparency (Fuchs & Kalfagianni, 2010; Lundmark et al., 2016). As previously mentioned, private animal welfare standards have the power to improve animal welfare by setting standards that exceed minimum legislative requirements. Nevertheless, this cannot be claimed without transparency, such as allowing scheme standards to be accessed by members of the public.

It was encouraging to see that over half of the schemes had publicly accessible standards. However, for those schemes that do not, consumers cannot make informed purchasing decisions regarding products that claim high animal welfare without sufficient transparency and provision of supporting information (More et al., 2017). Previous research has shown that consumers are more likely to accept uncertainty and potential risks surrounding products if they are given honest and transparent information. However, if consumers perceive that the system is dishonest or has vested interests that could put them at risk, they will quickly lose their trust (Barnett et al., 2016; Frewer, 2004). This loss of trust could cause an industry's SLO to be challenged. Some schemes may choose not to have their standards accessible to the public for fear of backlash from anti-farming communities. In this case, increasing transparency could potentially give these communities more information to promote a negative image of farming (Castka et al., 2023). Non-experts may also interpret scheme standards differently than they are intended to be understood. Schemes can improve transparency and strengthen SLO by engaging with consumers and stakeholders to listen to their concerns (Farm Animal Welfare Council UK, 2005). These concerns can then be incorporated into updated versions of scheme standards.

Another potential reason scheme standards may not be accessible to the public may be due to copyright reasons. If standards are considered intellectual property to the scheme organisations, they may have concerns about copyright infringements.

Some schemes use animal health plans to assure farmed animal welfare. However, even if an animal is in good health, this does not necessarily mean that the animal is experiencing positive mental experiences and has an overall positive welfare state (Mellor et al., 2009). Collaborating with veterinarians to create animal health plans can increase farmer buy-in, as the trust invested in the veterinarian-farmer relationship increases the adoption of advice

(Bard et al., 2019). AoNZ schemes such as WelFarm and The Co-Operative Difference Payment use animal well-being plans which, at a minimum, address topics such as nutrition, health, environment, and behaviour. Closely following the themes in the Five Domains Model, farmers are encouraged to create these plans with their veterinarians. Although well-being plans propose greater advances towards better farmed animal welfare than an animal health plan, without publicly accessible information, there is no evidence to support this proposition. In comparison, third-party audited assurance schemes rely on different forms of compliance to create behaviour change. Scheme B requires farms to have an animal health plan whilst also adhering to other welfare requirements laid out in the scheme standards. This is a good example of utilising animal health plans whilst providing assurance for other areas of welfare.

4.3. Main Goals

A wide range of main goals were included across all identified schemes. The variety of goals identified indicates that programmes are being implemented to address various concerns of consumers regarding the farming industry. Examples of these goals include environmental sustainability, social responsibility/sustainability, and quality products, which were identified in two or more schemes. This range suggests that schemes are not just being used to address animal welfare concerns and that animal welfare is not the sole concern of consumers. There were few 'welfare-only' schemes that had standards expressing only animal welfare requirements. These included Scheme A, Better Chicken Commitment, PigCare™, all SPCA Certified schemes, and WelFarm. It is important to note that the methodology for this research only allowed for the inclusion of schemes that have an animal welfare component. If this was not a part of the inclusion criteria, then it is probable that the list of goals would have been more extensive.

Many goals used 'animal health and welfare' rather than 'animal welfare' alone. The definition of animal health often revolves around the absence of illness or disease and is not indissociable from animal welfare (Nicks & Vandenheede, 2014). To some people, animal health influences an animal's welfare (Arndt et al., 2022). This term may limit the scheme's goal to domain three (health conditions) of the Five Domains Model or give the scheme a

biological function orientation towards animal welfare. In a holistic sense, animal welfare is much more than an animal's health. Without deeper research, it cannot be assumed that the schemes that have animal health and welfare as a goal are only focusing on the animals' biological functioning. However, this allows the opportunity to delve deeper into this common goal of accreditation schemes and better understand the orientation underlying the schemes when defining and assessing the welfare of farmed animals.

This study produced a list of AoNZ farmed animal accreditation schemes containing animal welfare factors. However, due to the methodology used, this may not include all AoNZ farmed animal accreditation schemes. As previously mentioned, Google was used to discover schemes and their websites. Only the first five pages of the Google search results were analysed for appropriate schemes. The decision to only examine the first five pages of the search results was to align with the aim of characterising public accessibility. Any consumers wanting to find these schemes would also utilise Google (or an equivalent search engine) but perhaps not scan past the first page of results. Any existing schemes that were not found during this research may indicate the scheme's lack of discoverability. This term refers to the probability of a website being discovered by a consumer who requires it. The discoverability of a scheme should be easy for consumers. Their websites and associated information should be easily found to promote the scheme and influence consumers to buy products assured by them.

4.4. How Do AoNZ Farmed Animal Accreditation Schemes Compare Against Codes of Welfare?

Overall, 46% of AoNZ's farmed animal accreditation schemes that included animal welfare requirements exceed minimum legislation, while 54% were simply aligning with it or not addressing it at all. If a scheme claimed to exceed legislation, it should provide evidence to consumers to support this claim. The schemes that claim 'high animal welfare' but did not exceed minimum legislative requirements risk undercutting public trust in the scheme and a loss of confidence in the agricultural sector itself (Thompson et al., 2007). For example, nine of the thirteen eligible schemes claimed to exceed AoNZ's Codes of Welfare. Six of these were

SPCA Certified schemes, and the remaining two were Scheme A and PigCare™. The SPCA Certified schemes implied that their standards exceeded legislation as they have a table on their website showing which specific requirements were exceeded (see SPCA New Zealand (2020b)). Scheme A and NZ Pork explicitly stated on their websites that their schemes exceeded minimum standards laid out in the Codes (NZ Pork, 2020). Unfortunately, despite these claims, three schemes (Scheme A, PigCare™, and SPCA Certified Sheep Farmed for Meat) were judged to have only aligned with their respective Codes of Welfare. There is already much apprehension around the credibility of private animal welfare standards (EU Commission, 2010; Lundmark et al., 2018; More et al., 2017). Any differences between a scheme's claims, which inform consumer expectations, and the animal welfare requirements laid out in standards could increase the conflicts between consumers and the food industry (Algers, 2011). To increase consumer transparency and trust, these schemes should align their claims with their standards and ensure intentions are reflected in their standards (Lundmark et al., 2014). Likewise, AoNZ schemes that do not meet minimum legislation may need to consider updating their standards to incorporate up-to-date scientific information seen in the Codes.

It can appear discouraging that some schemes did not address some aspects of minimum legislation, although it may be that these schemes were using incremental improvement and may have been in a risk mitigation stage. In other words, schemes may be simply trying to address animal welfare concerns that consumers and stakeholders have raised rather than trying to work on all areas of welfare. This may have allowed for schemes to mitigate the risk of the financial and social impacts that may arise if they do not address the issues. By adopting an incremental improvement approach (commonly seen when schemes use benchmarking), schemes can help farms concentrate on implementing smaller solutions that gradually enhance the welfare of their animals (More et al., 2021). This approach generally makes it easier for farmers to adopt a scheme and comes at a lower cost, especially when compared to schemes that exceed legislation (i.e., gold standard animal welfare schemes). However, AoNZ farmed animal accreditation schemes, at a minimum, should at least be ensuring that participating members are complying with the minimum standards laid out in the Codes of Welfare. It could be possible that schemes did not engage with animal welfare science experts

or consultants when developing their standards. The resultant standards may therefore lack an understanding of animal welfare and animal welfare legislation.

The results show that the minimum standards in the Codes were much more inscribed in scheme standards than the recommended best practices. Many schemes claimed they were exceeding minimum standards, and some do. However, results indicate that none exceeded recommended best practices. This may indicate that the recommended best practices were too open ended and are not easily transcribed into measurable and precise standards. Nevertheless, two schemes aligned with the recommended best practices, which suggests that integrating these into the schemes is possible.

It should be noted that just because a scheme's standards exceed minimum animal welfare legislation, it does not mean that these standards are practical for all farmers. For example, despite all but one of their schemes exceeding legislation, in their 2022 annual report, RNZSPCA had no members accredited under their dairy cattle or salmon schemes (SPCA New Zealand, 2022). Likewise, at the time of writing, no SPCA Certified dairy cattle, pork, beef, lamb, or salmon products were available in Aotearoa New Zealand, according to information published on their website (SPCA New Zealand, 2020a). It may take some time for a farm to obtain certification and produce SPCA Certified products. However, the dairy cattle and salmon standards were launched in 2021, while the others were launched in 2020. The lack of publicly available information surrounding farms that have adopted certain SPCA Certified schemes may indicate that although their standards promote animal welfare above minimum legislation, it may be challenging for farmers to adopt them. RNZSPCA discuss many reasons as to why farmers should buy into their schemes such as access to the trusted SPCA Certified brand on products, and access to animal welfare expertise, however, farmers pay fees to be certified. Perceptions of farmers willingness to partake in voluntary schemes may vary, but if a scheme has attributes that are not easy to implement on the farm or are too costly to apply, then farmers may have been less willing to partake in farmed animal welfare schemes (Heise & Theuvsen, 2017; Latacz-Lohmann & Schreiner, 2019; Schreiner & Hess, 2017). Therefore, it appears that there is a delicate balance when creating standards that go beyond animal welfare laws while still being practical for farmers to implement.

4.4.1. References to Mental Experiences in Schemes

The results showed that over 80% of mental experiences referred to across all scheme standards were negative. There was only one positive mental experience mentioned, which was comfort. It should be acknowledged that various types of comfort can be attributed a neutral valence as they only indicate the absence of a specific discomfort (Mellor et al., 2020). However, schemes using the term comfort were doing so in a positive sense as the requirements would likely result in positive welfare. Therefore, this research judged the term comfort as having a positive valence. Catchall phrases such as distress and suffering were commonly used across most schemes. However, these terms could have incorporated many other negative mental experiences such as nausea, weakness, sickness, and breathlessness (Mellor et al., 2020). These terms are the focus of animal welfare legislation aimed at preventing ill-treatment (i.e., unreasonable or unnecessary pain or distress) (Animal Welfare Act, 1999). Some schemes may focus only on the mental experiences mentioned in legislation. However, if a scheme aims to enhance animal welfare beyond what is required by law, organisations should consider incorporating a more comprehensive range of positive mental experiences and guidance on how farmers can achieve them. It is good that AoNZ schemes focus on preventing animals from experiencing welfare-compromising negative affects. The next step for these schemes should focus on integrating welfare-enhancing positive affects.

4.5. Practical Implications

Many studies have emphasised the need to examine private animal welfare standards closely to ensure that they are open and transparent by providing relevant information to consumers that support their claims (More et al., 2017; More et al., 2021). Moreover, it has been ascertained that stakeholders are concerned that schemes may fail to comply with minimum legislation, allowing consumers to be potentially misguided (EU Commission, 2010). The results of this study show that some farmed animal accreditation schemes operating in AoNZ effectively address these concerns and exceed the Codes of Welfare. These schemes are aiding in the improvement of farmed animal welfare and have standards publicly accessible to back

up these claims. However, some only align with, or do not address, minimum legislative requirements. Others also did not have standards publicly accessible for an evaluation to be conducted.

This type of study has not been conducted in AoNZ. The novel methodology used in this study could be utilised by accreditation scheme organisations to potentially assess their standards against minimum legislation. This will assure the organisations that their standards are, at a minimum, meeting the Codes of Welfare. This methodology could also be used to incentivise organisations to publish their standards in the public domain. By utilising a developed methodology to demonstrate that their schemes go beyond legal requirements, organisations can enhance the credibility of their schemes and increase consumer assurance.

4.6. Potential Methodological Limitations

Much care was taken when gathering information about the schemes and comparing them to legislation. It is possible that some information regarding the schemes may have been overlooked despite being publicly available. This may have affected the findings for the characterisation of schemes.

Once all schemes were compared to legislation, an *ad hoc* quality control check was carried out. Another comprehensive review of all schemes against the Codes was unable to be performed due to time constraints. The data collection was repetitive in nature and induced a sense of mental fatigue. Mental fatigue has a direct correlation with decreased decision-making abilities as well as an increased number of errors (Lorist et al., 2000). The use of a decision-making chart helped to minimise this issue (Figure 2).

Care was also taken to be as objective as possible when comparing scheme standards to legislation. Author interpretation may have been a methodological limitation. In this case, author interpretation refers to how I, as the author, have understood the scheme standards and legislation as well as the similarities or differences between them. Another person conducting the research may interpret the documents differently and assign alternative

categories for each scheme. The system of categorisations (Table 3) provides clear definitions to assign categories. It eliminates the influence of subjectivity for myself and others if this research were to be repeated. However, the differences between how I interpret what a scheme is trying to portray in their standards versus another author might vary.

Another limitation of this research was that only schemes that had publicly available standards or were willing to share their standards were included in the evaluation. Likewise, only schemes with corresponding Codes of Welfare were eligible to be compared. This resulted in only twelve of the 20 identified schemes being eligible for comparison to legislation. However, as one of the aims of this thesis was to assess public accessibility of AoNZ schemes, this was unavoidable.

4.7. Conclusion

This research is the first detailed examination of AoNZ farmed animal accreditation schemes that incorporate animal welfare requirements into their standards. This study characterised the identified schemes and evaluated eligible schemes against minimum legislation requirements laid out in the Codes of Welfare.

Overall, 20 farmed animal accreditation schemes that incorporate animal welfare assurances were identified. Cattle were the most prominent species across all schemes, with dairy being the most represented industry across all identified schemes. This could be due to dairy products representing AoNZ's highest exporter and revenue generator of primary products. It may also be due to the number of challenges the industry faces, which threaten their SLO.

Of the identified schemes, 14 had standards that were publicly accessible. A lack of transparency by failing to provide publicly accessible information to back up scheme claims is an issue widely discussed in the literature. There are reasons these schemes may not be willing to share their standards, such as backlash from certain communities and copyright issues. To retain social license and enhance consumer assurance, schemes should be transparent about what farmers are required to do to gain certification. All schemes had a wide range of goals

that outlined their objectives. This indicates that consumers are being assured of the alleviation of various concerns, not only limited to animal welfare.

Of the 20 identified schemes, only twelve schemes and their 13 unique standards were eligible for comparison to legislation. Overall, six scheme standards across two organisations exceeded minimum legislation, three standards across three organisations aligned with legislation, and the resulting four standards across three organisations did not address minimum legislation. Furthermore, five standards across two organisations aligned with recommended best practices, while the remaining schemes did not address them. These results showed that while some schemes promote animal welfare above legal requirements, some are not, and minimum standards are much more inscribed in the schemes than recommended best practices. Those schemes that aligned with or did not address minimum standards in the Codes of Welfare may just be ensuring that farmers are maintaining compliance with legislation. They may also be mitigating risks that are facing their current industry or may be working towards incremental improvements in animal welfare on farms. Discussions also highlighted the delicate balance between creating standards that exceed animal welfare laws while still being practical and acceptable to farmers. Schemes predominantly referenced negative mental experiences in their standards, suggesting a focus on reducing negative welfare rather than promoting positive welfare.

This research could be used to start discussions about how AoNZ's farmed animal accreditation schemes are utilised to ensure animal welfare, promote more transparency within schemes, and how the claims of these schemes are being evidenced. There is a clear need for more evaluation to be done on AoNZ farmed animal assurance schemes. The conclusions of this study are based on the large assumption that what is audited is the same as the requirements set out in scheme standards.

4.8. Future Research

The next step in evaluating AoNZ's farmed animal accreditation schemes is to investigate the role of auditing within identified schemes. Animal welfare is a large and complex topic that poses many challenges for translation into audit tools (Beausoleil et al., 2023). In most cases,

auditing in these schemes is delegated to independent or third-party certification bodies. Audit sheets are generally not publicly accessible alongside scheme standards and are likely to be worded differently. Schemes may use legislation and scientific findings to inform requirements set out in standards. However, converting these into auditable measures may prove challenging (Berg & Lundmark, 2020). Additional research is required to investigate how AoNZ farmed animal accreditation schemes conduct their auditing processes. Through this, we will gain a deeper comprehension of whether participating farms are truly adhering to the scheme standards that exceed animal welfare legislation.

This methodology could also be beneficial for conducting further characterisations and comparisons to minimum legislation of those AoNZ accreditation schemes that did not have standards publicly accessible. Conducting this research on schemes deemed ineligible in this study will further assist in aiding consumers in understanding the value of these accreditation schemes. This methodology could also be applied to international standards to evaluate how these private schemes align with market access requirements.

References

- Algers, B. (2011). Animal welfare - Recent developments in the field. *CABI Reviews*, 2011, 1-10.
- Alonso, M. E., González-Montaña, J. R., & Lomillos, J. M. (2020). Consumers' concerns and perceptions of farm animal welfare. *Animals*, 10(3), 385.
- Amos, N., & Sullivan, R. (2017). *The business benchmark on farm animal welfare 2016 report*. <https://dx.doi.org/10.2139/ssrn.2933184>
- Animal Welfare Act, No. 142, (1999).
<https://www.legislation.govt.nz/act/public/1999/0142/latest/DLM49664.html>
- Arndt, S. S., Goerlich, V. C., & van der Staay, F. J. (2022). A dynamic concept of animal welfare: The role of appetitive and adverse internal and external factors and the animal's ability to adapt to them. *Frontiers in Animal Science*, 3.
- Bailey, A. P., & Garforth, C. (2014). An industry viewpoint on the role of farm assurance in delivering food safety to the consumer: The case of the dairy sector of England and Wales. *Food Policy*, 45, 14-24. <https://doi.org/10.1016/j.foodpol.2013.12.006>
- Bard, A. M., Main, D., Roe, E., Haase, A., Whay, H. R., & Reyher, K. K. (2019). To change or not to change? Veterinarian and farmer perceptions of relational factors influencing the enactment of veterinary advice on dairy farms in the United Kingdom. *Journal of Dairy Science*, 102(11), 10379-10394.
<https://doi.org/https://doi.org/10.3168/jds.2019-16364>
- Barnett, J., Begen, F., Howes, S., Regan, A., McConnon, A., Marcu, A., Rowntree, S., & Verbeke, W. (2016). Consumers' confidence, reflections and response strategies following the horsemeat incident. *Food Control*, 59, 721-730.
<https://doi.org/10.1016/j.foodcont.2015.06.021>
- Beattie, V. E., O'Connell, N. E., & Moss, B. W. (2000). Influence of environmental enrichment on the behaviour, performance and meat quality of domestic pigs. *Livestock Production Science*, 65(1), 71-79. [https://doi.org/10.1016/S0301-6226\(99\)00179-7](https://doi.org/10.1016/S0301-6226(99)00179-7)
- Beausoleil, N. J., McKeegan, D. E. F., & Martin, J. E. (2022). Avian welfare: Fundamental concepts and scientific assessment. In C. G. Scanes & S. Dridi (Eds.), *Sturkie's Avian Physiology* (pp. 1079-1089). Elsevier.

- Beausoleil, N. J., & Mellor, D. J. (2017). Validating indicators of sheep welfare. In J. P. C. Greyling (Ed.), *Achieving sustainable production of sheep* (pp. 349-370). Burleigh Dodds Science Publishing.
- Beausoleil, N. J., Swanson, J. C., McKeegan, D. E. F., & Croney, C. C. (2023). Application of the Five Domains Model to food chain management of animal welfare: Opportunities and constraints. *Frontiers in Animal Science*, 4. <https://doi.org/10.3389/fanim.2023.1042733>
- Berg, C., & Lundmark, H. F. (2020). Compliance with animal welfare regulations: Drivers and consequences. *CABI Reviews*, 20(2020). <https://doi.org/10.1079/pavsnr202015025>
- Best Aquaculture Practices. (2023). *What we do*. <https://www.bapcertification.org/WhatWeDo>
- Better Chicken Commitment. (2023). *Commitments*. <https://betterchickencommitment.com/au-nz/commitments/>
- BioGro. (2009). *Module 5 livestock production standard*. [https://static1.squarespace.com/static/5f349fc8fa865066fb314de0/t/5f433a03327e111450a9464a/1598241297422/Module 5 Livestock May%2B2009.pdf](https://static1.squarespace.com/static/5f349fc8fa865066fb314de0/t/5f433a03327e111450a9464a/1598241297422/Module+5+Livestock+May%2B2009.pdf)
- Bolt, S. L., & George, A. J. (2019). The use of environmental enrichment on farms benefits animal welfare and productivity. *Livestock*, 24(4), 183-188. <https://doi.org/10.12968/live.2019.24.4.183>
- Bolton, S. E., & von Keyserlingk, M. A. G. (2021). The dispensable surplus dairy calf: Is this issue a “wicked problem” and where do we go from here? *Frontiers in Veterinary Science*, 8. <https://doi.org/10.3389/fvets.2021.660934>
- Browning, H., & Birch, J. (2022). Animal sentience. *Philosophy compass*, 17(5). <https://doi.org/10.1111/phc3.12822>
- Buchli, C., Raselli, A., Bruckmaier, R., & Hillmann, E. (2017). Contact with cows during the young age increases social competence and lowers the cardiac stress reaction in dairy calves. *Applied Animal Behaviour Science*, 187, 1-7. <https://doi.org/10.1016/j.applanim.2016.12.002>
- Castka, P., Manhire, J., Ruha, C., & Reid, J. (2023). Enhancing farm assurance – A white paper. Our Land and Water National Science Challenge. https://ourlandandwater.nz/wp-content/uploads/2023/06/CastkaManhireRuhaReid2023_WHITE_PAPER-SLO.pdf
- Clark, B., Stewart, G. B., Panzone, L. A., Kyriazakis, I., & Frewer, L. J. (2017). Citizens, consumers and farm animal welfare: A meta-analysis of willingness-to-pay studies. *Food Policy*, 68, 112-127. <https://doi.org/10.1016/j.foodpol.2017.01.006>

- Commerce Commission. (2014). Notes of Judge Duncan Harvey on Sentencing John Garnett DC Whanganui CRI-2014-088-000695
https://comcom.govt.nz/data/assets/pdf_file/0025/68470/Commerce-Commission-v-John-Garnett-Judgment-5-August-2014.pdf
- Consumer NZ. (2017). *Pigcare label risked misleading consumers*.
<https://www.consumer.org.nz/articles/pigcare-label-risks-misleading-consumers>
- Cornish, A., Raubenheimer, D., & McGreevy, P. (2016). What we know about the public's level of concern for farm animal welfare in food production in developed countries. *Animals*, 6(11), 74. <https://doi.org/10.3390/ani6110074>
- Duncan, I. J. H. (2006). The changing concept of animal sentience. *Applied Animal Behaviour Science*, 100(1), 11-19. <https://doi.org/10.1016/j.applanim.2006.04.011>
- Edwards, P., Cuthbert, S., Pinxterhuis, J., & McDermott, A. (2021). The fate of calves born on New Zealand dairy farms and dairy farmer attitudes towards producing dairy-beef calves. *New Zealand Journal of Animal Science and Production*, 81, 179-185.
- Edwards, P., & Trafford, S. (2016). Social licence in New Zealand—what is it? *Journal of the Royal Society of New Zealand*, 46(3-4), 165-180.
<https://doi.org/10.1080/03036758.2016.1186702>
- Epps, T., & Wheeler, D. (2020). Regulation of the New Zealand organics sector. In B. C. Goh & R. Price (Eds.), *Regulatory Issues in Organic Food Safety in the Asia Pacific* (pp. 229-247). Springer Singapore. https://doi.org/10.1007/978-981-15-3580-2_14
- EU Commission. (2010). Commission communication - EU best practice guidelines for voluntary certification schemes for agricultural products and foodstuffs. *Official Journal of the European Union C 341*, 5.
- Fair Trading Act, No. 121, (1986).
<https://www.legislation.govt.nz/act/public/1986/0121/latest/DLM96439.html#DLM6156604>
- Farm Animal Welfare Council UK. (2005). *Report on the welfare implications of farm assurance schemes*.
<https://www.cabdirec.org/cabdirec/FullTextPDF/2011/20113241620.pdf>
- Fletcher, K. A., Cameron, L. J., & Freeman, M. (2021). Contemplating the Five Domains Model of animal welfare assessment: UK horse owner perceptions of equine well-being. *Animal Welfare*, 30(3), 259-268. <https://doi.org/10.7120/09627286.30.3.003>
- Fonterra. (n.d.). *Together we make the difference*
<https://www.fonterra.com/nz/en/campaign/make-the-difference.html>

- Food Act, No. 32, (2014).
<https://www.legislation.govt.nz/act/public/2014/0032/75.0/DLM2995811.html>
- Fraser, D. (2008). Understanding animal welfare. *Acta Veterinaria Scandinavica*, 50(1), S1.
<https://doi.org/10.1186/1751-0147-50-S1-S1>
- Fraser, D. (2009). Assessing animal welfare: Different philosophies, different scientific approaches. *Zoo Biology*, 28(6), 507-518. <https://doi.org/10.1002/zoo.20253>
- Fraser, D., Weary, D. M., Pajor, E. A., & Milligan, B. N. (1997). A scientific conception of animal welfare that reflects ethical concerns. *Animal Welfare*, 6(3), 187-205.
- Frewer, L. (2004). The public and effective risk communication. *Toxicology Letters*, 149(1), 391-397. <https://doi.org/10.1016/j.toxlet.2003.12.049>
- Fuchs, D., & Kalfagianni, A. (2010). The causes and consequences of private food governance. *Business and Politics*, 12(3), 1-34. <https://doi.org/10.2202/1469-3569.1319>
- Gilmore, H. L. (1990). Continuous incremental improvement: An operations strategy. *SAM Advanced Management Journal*, 55(1), 21.
- Green, T. C., & Mellor, D. J. (2011). Extending ideas about animal welfare assessment to include 'Quality of Life' and related concepts. *New Zealand Veterinary Journal*, 59(6), 263-271. <https://doi.org/10.1080/00480169.2011.610283>
- Hampton, J. O., Jones, B., & McGreevy, P. D. (2020). Social license and animal welfare: Developments from the past decade in Australia. *Animals*, 10(12).
<https://doi.org/10.3390/ani10122237>
- Hansen, B. G., & Østerås, O. (2019). Farmer welfare and animal welfare - Exploring the relationship between farmer's occupational well-being and stress, farm expansion and animal welfare. *Preventive Veterinary Medicine*, 170, 104741.
<https://doi.org/10.1016/j.prevetmed.2019.104741>
- Harvey, A. M., Beausoleil, N. J., Ramp, D., & Mellor, D. J. (2023). Mental experiences in wild animals: Scientifically validating measurable welfare indicators in free-roaming horses. *Animals*, 13(9). <https://doi.org/10.3390/ani13091507>
- Haskell, M. J. (2020). What to do with surplus dairy calves? Welfare, economic and ethical considerations. *Landbauforschung*, 70(1), 45-48.
<https://doi.org/10.3220/LBF1593617173000>

- Heise, H., & Theuvsen, L. (2017). The willingness of conventional farmers to participate in animal welfare programmes: An empirical study in Germany. *Animal Welfare*, 26(1), 67-81. <https://doi.org/10.7120/09627286.26.1.067>
- Hemsworth, P. H., Mellor, D. J., Cronin, G. M., & Tilbrook, A. J. (2015). Scientific assessment of animal welfare. *New Zealand Veterinary Journal*, 63(1), 24-30. <https://doi.org/10.1080/00480169.2014.966167>
- Hristov, S., Stanković, B., & Ostojić-Andrić, D. (2014, 23-25th September). *Different approaches to assess the welfare of dairy cows with some results in Serbia*. International Symposium on Animal Science, Belgrade, Serbia.
- IANZ. (2021). *Accreditation Council*. https://assets.website-files.com/5e447d8550a99c8326ee5ae6/61b12e6428dca498b12fd49a_IA2%20Accreditation%20Council.pdf
- Ingenbleek, P. T. M., & Krampe, C. (2022). The end of animal welfare labelling as we know it? Persisting problems at the consumer level and PLF-based solutions. *Frontiers in Animal Science*, 3. <https://doi.org/10.3389/fanim.2022.819893>
- Johnsen, J. F., Zipp, K. A., Kälber, T., Passillé, A. M. d., Knierim, U., Barth, K., & Mejdell, C. M. (2016). Is rearing calves with the dam a feasible option for dairy farms? - Current and future research. *Applied Animal Behaviour Science*, 181, 1-11. <https://doi.org/10.1016/j.applanim.2015.11.011>
- Johnson, A. K., Rault, J.-L., Marchant, J. N., Baxter, E. M., & O'Driscoll, K. (2022). Improving young pig welfare on-farm: The Five Domains Model. *Journal of Animal Science*, 100(6). <https://doi.org/10.1093/jas/skac164>
- Keeling, L., De Oliveira, D., & Rustas, B.-O. (2016, June). *Use of mechanical rotating brushes in dairy cows – a potential proxy for performance and welfare?* Precision Dairy Farming, Wageningen, The Netherlands.
- Kells, N. J. (2022). Review: The Five Domains Model and promoting positive welfare in pigs. *Animal*, 16. <https://doi.org/10.1016/j.animal.2021.100378>
- Kilbride, A. L., Mason, S. A., Honeyman, P. C., Pritchard, D. G., Hepple, S., & Green, L. E. (2012). Associations between membership of farm assurance and organic certification schemes and compliance with animal welfare legislation. *Veterinary Record*, 170(6), 152-152. <https://doi.org/10.1136/vr.100345>
- Latacz-Lohmann, U., & Schreiner, J. A. (2019). Assessing consumer and producer preferences for animal welfare using a common elicitation format. *Journal of Agricultural Economics*, 70(2), 293-315. <https://doi.org/10.1111/1477-9552.12297>

- Learmonth, M. J. (2019). Dilemmas for Natural Living Concepts of Zoo Animal Welfare. *Animals*, 9(6). <https://doi.org/10.3390/ani9060318>
- Littlewood, K. E., & Mellor, D. J. (2016). Changes in the welfare of an injured working farm dog assessed using the Five Domains Model. *Animals*, 6(9). <https://doi.org/10.3390/ani6090058>
- Longhurst, R., Miller, D., Williams, I., & Lambourne, A. (2006). *On-farm wintering systems - Issues to consider*. Proceedings of the New Zealand Grassland Association, Dunedin, New Zealand.
- Lorist, M. M., Klein, M., Nieuwenhuis, S., De Jong, R., Mulder, G., & Meijman, T. F. (2000). Mental fatigue and task control: Planning and preparation. *Psychophysiology*, 37(5), 614-625. <https://doi.org/10.1111/1469-8986.3750614>
- Louton, H., Keppler, C., Erhard, M., van Tuijl, O., Bachmeier, J., Damme, K., Reese, S., & Rauch, E. (2019). Animal-based welfare indicators of 4 slow-growing broiler genotypes for the approval in an animal welfare label program. *Poultry Science*, 98(6), 2326-2337. <https://doi.org/10.3382/ps/pez023>
- Lundmark, F., Berg, C., & Röcklinsberg, H. (2018). Private animal welfare standards - Opportunities and risks. *Animals*, 8(1), 4. <https://doi.org/10.3390/ani8010004>
- Lundmark, F., Berg, C., Schmid, O., Behdadi, D., & Röcklinsberg, H. (2014). Intentions and values in animal welfare legislation and standards. *Journal of Agricultural and Environmental Ethics*, 27, 991-1017. <https://doi.org/10.1007/s10806-014-9512-0>
- Lundmark, F., Röcklinsberg, H., Wahlberg, B., & Berg, C. (2016). Content and structure of Swedish animal welfare legislation and private standards for dairy cattle. *Acta Agriculturae Scandinavica, Section A—Animal Science*, 66(1), 35-42. <https://doi.org/10.1080/09064702.2016.1198417>
- Magd, H., & Curry, A. (2003). Benchmarking: Achieving best value in public-sector organisations. *Benchmarking: An International Journal*, 10(3), 261-286. <https://doi.org/10.1108/14635770310477780>
- Main, D. C. J., Mullan, S., Atkinson, C., Cooper, M., Wrathall, J. H. M., & Blokhuis, H. J. (2014). Best practice framework for animal welfare certification schemes. *Trends in Food Science and Technology*, 37(2), 127-136. <https://doi.org/10.1016/j.tifs.2014.03.009>
- Main, D. C. J., Webster, A. J. F., & Green, L. E. (2001). Animal welfare assessment in farm assurance schemes. *Acta Agriculturae Scandinavica, Section A — Animal Science*, 51(030, Suppl.), 108-113. <https://doi.org/10.1080/090647001316923171>

- Mason, G. J. (1991). Stereotypes: a critical review. *Animal Behaviour*, 41(6), 1015-1037.
[https://doi.org/10.1016/S0003-3472\(05\)80640-2](https://doi.org/10.1016/S0003-3472(05)80640-2)
- McBride, E. A., & Baugh, S. (2022). Animal welfare in context: Historical, scientific, ethical, moral and one welfare perspectives. In A. Vitale & P. Simone (Eds.), *Human/Animal Relationships in Transformation* (pp. 119-147). Springer International Publishing.
https://doi.org/10.1007/978-3-030-85277-1_7
- McCausland, C. (2014). The Five Freedoms of animal welfare are rights. *Journal of Agricultural and Environmental Ethics*, 27(4), 649-662.
<https://doi.org/10.1007/s10806-013-9483-6>
- McCulloch, S. P. (2013). A critique of FAWC's Five Freedoms as a framework for the analysis of animal welfare. *Journal of Agricultural and Environmental Ethics*, 26(5), 959-975.
<https://doi.org/10.1007/s10806-012-9434-7>
- Mee, J. F., & Boyle, L. A. (2020). Assessing whether dairy cow welfare is "better" in pasture-based than in confinement-based management systems. *New Zealand Veterinary Journal*, 68(3), 168-177. <https://doi.org/10.1080/00480169.2020.1721034>
- Mellor, D. J. (2016). Updating animal welfare thinking: Moving beyond the "Five Freedoms" towards "A Life Worth Living". *Animals*, 6(3), 21. <https://doi.org/10.3390/ani6030021>
- Mellor, D. J., & Bayvel, A. C. D. (2008). New Zealand's inclusive science-based system for setting animal welfare standards. *Applied Animal Behaviour Science*, 113(4), 313-329.
<https://doi.org/10.1016/j.applanim.2008.01.010>
- Mellor, D. J., & Beausoleil, N. J. (2015). Extending the 'Five Domains' Model for animal welfare assessment to incorporate positive welfare states. *Animal Welfare*, 24(3), 241-253. <https://doi.org/10.7120/09627286.24.3.241>
- Mellor, D. J., Beausoleil, N. J., Littlewood, K. E., McLean, A. N., McGreevy, P. D., Jones, B., & Wilkins, C. (2020). The 2020 Five Domains Model: Including human-animal interactions in assessments of animal welfare. *Animals*, 10(10), 1870.
<https://doi.org/10.3390/ani10101870>
- Mellor, D. J., Patterson-Kane, E., & Stafford, K. J. (2009). *The sciences of animal welfare*. John Wiley & Sons.
- Mendl, M., & Paul, E. S. (2020). Animal affect and decision-making. *Neuroscience & Biobehavioral Reviews*, 112, 144-163.
<https://doi.org/10.1016/j.neubiorev.2020.01.025>

- Ministry for Primary Industries. (2017). *Regulatory impact statement: Animal welfare regulations 2017*. <https://www.mpi.govt.nz/dmsdocument/28455-Regulatory-Impact-Statement-2017-Animal-Welfare-Regulations>
- Ministry for Primary Industries. (2019). *Code of Welfare: Dairy Cattle*. Retrieved from <https://www.mpi.govt.nz/dmsdocument/46024-Code-of-Welfare-Dairy-cattle>
- Ministry for Primary Industries. (2023). *Situation and outlook for primary industries*. <https://www.mpi.govt.nz/dmsdocument/57298-Situation-and-Outlook-for-Primary-Industries-SOPI-June-2023>
- Ministry for Primary Industries, & UMR Research. (2017). *New Zealanders' views of the primary sector*. <https://www.mpi.govt.nz/dmsdocument/27582-New-Zealanders-views-of-the-primary-sector>
- More, S. J., Hanlon, A., Marchewka, J., & Boyle, L. (2017). Private animal health and welfare standards in quality assurance programmes: A review and proposed framework for critical evaluation. *Veterinary Record*, 180(25), 612-612. <https://doi.org/10.1136/vr.104107>
- More, S. J., Marchewka, J., Hanlon, A., Balzani, A., & Boyle, L. (2021). An evaluation of four private animal health and welfare standards and associated quality assurance programmes for dairy cow production. *Food Policy*, 105, 102169. <https://doi.org/10.1016/j.foodpol.2021.102169>
- National Animal Welfare Advisory Committee. (2018a). *Code of Welfare: Deer*. Retrieved from <https://www.mpi.govt.nz/dmsdocument/46027-Code-of-Welfare-Deer>
- National Animal Welfare Advisory Committee. (2018b). *Code of Welfare: Layer Hens*. Retrieved from <https://www.mpi.govt.nz/dmsdocument/46036-Code-of-Welfare-Layer-hens>
- National Animal Welfare Advisory Committee. (2018c). *Code of Welfare: Meat Chickens*. Retrieved from <https://www.mpi.govt.nz/dmsdocument/46042-Code-of-Welfare-Meat-chickens>
- National Animal Welfare Advisory Committee. (2018d). *Code of Welfare: Sheep and Beef Cattle*. Retrieved from <https://www.mpi.govt.nz/dmsdocument/46051-Code-of-Welfare-Sheep-and-beef-cattle>
- National Animal Welfare Advisory Committee. (2018e). *Codes of Welfare: Pigs*. Retrieved from <https://www.mpi.govt.nz/dmsdocument/46048-Code-of-Welfare-Pigs>
- National Animal Welfare Advisory Committee. (2019). *Code of Welfare: Dairy Cattle* Retrieved from <https://www.mpi.govt.nz/dmsdocument/46024-Code-of-Welfare-Dairy-cattle>

- New Zealand Farm Assured. (2023). NZFAP. <https://www.nzfap.com>
- Nicks, B., & Vandenheede, M. (2014). Animal health and welfare: Equivalent or complementary. *Revue scientifique et technique (International Office of Epizootics)*, 33, 97-101.
- NZ Pork. (2020). *PigCare™ accredited pork*. <https://www.nzpork.co.nz/farmers/pigcare-tm>
- Organic Aotearoa New Zealand. (2018). *New Zealand organic sector market report*. https://drive.google.com/file/d/1Q41QSO2gUOfFrFdxI9Svf_JjSH-z72p/view
- Pandolfi, F., Stoddart, K., Wainwright, N., Kyriazakis, I., & Edwards, S. A. (2017). The 'Real Welfare' scheme: Benchmarking welfare outcomes for commercially farmed pigs. *Animal*, 11(10), 1816-1824. <https://doi.org/10.1017/s1751731117000246>
- Paul, E. S., Browne, W., Mendl, M. T., Caplen, G., Trevarthen, A., Held, S., & Nicol, C. J. (2022). Assessing animal welfare: A triangulation of preference, judgement bias and other candidate welfare indicators. *Animal Behaviour*, 186, 151-177. <https://doi.org/10.1016/j.anbehav.2022.02.003>
- Pinillos, R. G. (2021). One welfare impacts of COVID-19 – A summary of key highlights within the One Welfare framework. *Applied Animal Behaviour Science*, 236, 105262. <https://doi.org/10.1016/j.applanim.2021.105262>
- Pinillos, R. G., Appleby, M. C., Manteca, X., Scott-Park, F., Smith, C., & Velarde, A. (2016). One Welfare – A platform for improving human and animal welfare. *Veterinary Record*, 179(16), 412-413. <https://doi.org/10.1136/vr.i5470>
- Popescu, S., Lazar, E., Stefan, R., Borda, C., Spinu, M., & Sandru, C. (2010). The welfare of horses in a Transylvanian farm. *Lucrari Stiintifice Medicina Veterinara*, 43(2).
- Rodriguez Ferrere, M. B. (2018). Codes vs regulations: How best to enforce animal welfare in New Zealand? *Alternative Law Journal*, 43(4), 250-256. <https://doi.org/10.1177/1037969x18799791>
- Rowan, A. N., D'Silva, J. M., Duncan, I. J., & Palmer, N. (2021). Animal sentience: History, science, and politics. *Animal Sentience*, 6(31), 1. <https://doi.org/10.51291/2377-7478.1697>
- Rowe, E., Rix, J., & Mullan, S. (2021). Rationale for defining recognition of "Higher Animal Welfare" farm assurance schemes in a global food system: The GAWA alliance. *Frontiers in Animal Science*, 2. <https://doi.org/10.3389/fanim.2021.665706>

- Schmidt, K., Duffield, D., Ferrere, M., & Knight, A. (2021). *Farmed animal welfare law in New Zealand: Investigating the gap between the Animal Welfare Act 1999 and its delegated legislation*. New Zealand Animal Law Association.
<https://apo.org.au/node/311370>
- Schreiner, J. A., & Hess, S. (2017). The role of non-use values in dairy farmers' willingness to accept a farm animal welfare programme. *Journal of Agricultural Economics*, 68(2), 553-578. <https://doi.org/10.1111/1477-9552.12203>
- Sinner, J., Newton, M., Barclay, J., Baines, J., Farrelly, T., Edwards, P., & Tipa, G. (2020). Measuring social licence: What and who determines public acceptability of aquaculture in New Zealand? *Aquaculture*, 521, 734973.
<https://doi.org/10.1016/j.aquaculture.2020.734973>
- SPCA New Zealand. (2020a). *Drive change*. <https://www.spcacertified.nz/drive-change/farmed-animals>
- SPCA New Zealand. (2020b). *Farmed animals*.
<https://www.spcacertified.nz/standards/farmed-animals>
- SPCA New Zealand. (2020c). *Getting certified* <https://www.spcacertified.nz/getting-certified/why-join>
- SPCA New Zealand. (2022). *SPCA annual report 2021-2022*.
<https://www.spcanewzealand.org.nz/downloads/assets/720296/1/spca-annual-report-2021-2022.pdf>
- Stafford, K. J. (2013). *Animal welfare in New Zealand* (1 ed.). New Zealand Society of Animal Production.
- Stone, M. (2022). The importance of biosecurity and animal welfare to livestock industries in New Zealand. *New Zealand Economic Papers*, 57, 1-8.
<https://doi.org/10.1080/00779954.2022.2158121>
- Sumner, C. L., Von Keyserlingk, M. A. G., & Weary, D. M. (2018). How benchmarking motivates farmers to improve dairy calf management. *Journal of Dairy Science*, 101(4), 3323-3333. <https://doi.org/10.3168/jds.2017-13596>
- The A2 Milk Company. (2023). *Thriving Farms*. <https://thea2milkcompany.com/thriving-farms>
- The New Zealand Merino Company. (2021). *Discover ZQ*.
<https://www.discoverzq.com/discover-zq>

- The Schneider Group. (2022). The schneider group authentico integrity scheme brochure. <https://www.gschneider.com/wp-content/uploads/2022/09/2022-The-Schneider-Group-Authentico-Integrity-Scheme-Brochure.pdf>.
- Thompson, P., Harris, C., Holt, D., & Pajor, E. A. (2007). Livestock welfare product claims: The emerging social context. *Journal of Animal Science*, 85(9), 2354-2360. <https://doi.org/10.2527/jas.2006-832>
- Tremblay, M., Hess, J. P., Christenson, B. M., McIntyre, K. K., Smink, B., van der Kamp, A. J., de Jong, L. G., & Döpfer, D. (2016). Factors associated with increased milk production for automatic milking systems. *Journal of Dairy Science*, 99(5), 3824-3837. <https://doi.org/10.3168/jds.2015-10152>
- Vicic, V., Saliba, A. J., Campbell, M. A., Xie, G., & Quinn, J. C. (2022). Producer practices and attitudes: Non-replacement male calf management in the Australian dairy industry. *Frontiers in Veterinary Science*, 9. <https://doi.org/10.3389/fvets.2022.979035>
- Vince, J., & Haward, M. (2019). Hybrid governance in aquaculture: Certification schemes and third party accreditation. *Aquaculture*, 507, 322-328. <https://doi.org/10.1016/j.aquaculture.2019.04.041>
- Webster, J. (2016). Animal welfare: Freedoms, dominions and “A Life Worth Living”. *Animals*, 6(6), 35. <https://doi.org/10.3390/ani6060035>
- Webster, J., Schütz, K. E., Sutherland, M. A., Stewart, M., & Mellor, D. J. (2015). Different animal welfare orientations towards some key research areas of current relevance to pastoral dairy farming in New Zealand. *New Zealand Veterinary Journal*, 63(1), 31-36. <https://doi.org/10.1080/00480169.2014.958117>
- WelFarm. (2023). *WelFarm*. <https://www.welfarm.co.nz/>
- World Animal Protection. (2020). *Animal protection index (API) New Zealand* <https://api.worldanimalprotection.org/country/new-zealand#Legislation>

Appendix A. Table showing the mental experiences mentioned in the eligible 13 unique scheme standards, the frequency of the mental experiences, the number of scheme standards the mental experience was mentioned in, and the mental experiences associated valance.

All Mental Experiences Mentioned in NZ Farmed Animal Accreditation Schemes			
Mental Experience	Frequency	Number of Schemes	Valence
Comfort	5	4	Positive
Dehydration	1	1	Negative
Discomfort	6	4	Negative
Distress	30	9	Negative
Exhaustion	1	1	Negative
Fear	13	6	Negative
Hunger	1	1	Negative
Pain	20	12	Negative
Satisfied	1	1	Neutral
Stress	6	5	Negative
Suffering	8	4	Negative
Uncomfortable	1	1	Negative