# Beef & Biosecurity: Social and Cultural Attitudes to biosecurity in the Northern Australian Beef Industry

Regan Lynch, 2023 Scholar
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Scholar contact details

Name: Regan Lynch

Organisation: R Lynch Veterinary Contracting

Address: Alligator Creek, Queensland

Phone: 0411594532

Email: rlynchvet@gmail.com

Social media: https://www.linkedin.com/in/regan-lynch-673bb355/

In submitting this report, the Scholar has agreed to Nuffield Australia publishing this material in its edited form.

NUFFIELD AUSTRALIA Contact Details

Nuffield Australia
Telephone: 0456 916 506

Email: enquiries@nuffield.com.au

Address: PO Box 450, Bendigo, VIC 3550

# Executive Summary

"*Agricultural success depends on the people*" Nancy Crawshaw, 2024

The northern Australian beef industry is a vital contributor to Australia's economy, with its success heavily dependent on a robust biosecurity system to maintain access to international markets. However, this biosecurity framework is highly complex, involving multiple layers of responsibility across national, state, and local levels, often leading to confusion about what biosecurity entails and its practical implications for producers. Although Australia's biosecurity system is globally recognised as robust, it relies on individual actions to maintain its effectiveness.

A significant challenge facing the industry is the changing workforce on farms. With an ageing farm owner population and increased reliance on contracted workers or employees from non-agricultural backgrounds, there is a potential gap in disease surveillance. The question arises: Are these individuals, who are now on the front lines of biosecurity, adequately empowered and informed to take decisive action when necessary?

Biosecurity is often already built into the concept of 'good farming'. However, the concept of biosecurity is often not connected to reporting and surveillance, indicating a disconnect between understanding biosecurity as a whole and the practices that sustain it on farms. This gap is further complicated by the notion of shared responsibility, which, despite being promoted by government and industry, often leads to distrust and reluctance among cattle producers due to its vague definition. This is a critical issue, as post-border biosecurity increasingly relies on surveillance and reporting by cattle producers.

The potential economic impact of diseases like Foot-and-Mouth Disease (FMD) is severe, with an estimated cost of up to $80 billion over ten years if an outbreak occurs. Effective reporting and early detection are crucial to mitigating these risks, but barriers such as economic concerns, social implications, distrust in government, and a lack of transparent reporting processes hinder timely reporting by cattle producers. The decision to report often hinges on the potential costs to business, reputation, and finances, as well as moral obligations as responsible community members.

Keywords: Beef, Biosecurity, northern Australia, cattle, farming, livestock, disease surveillance, behaviour

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# Foreword

A time-honoured piece of advice passed from seasoned veterinary practitioners to new graduates in mixed animal practice - 'whatever you do, do not be the vet that misses the foot-and-mouth case'.

My pathway in the Australian beef industry is likely not considered typical by any means - my early years were spent in my family's domestic beef and pig abattoir in tropical North Queensland. School holidays were spent on friends' properties in the state's North-West, learning how it worked, chasing cows, and building friendships. While finishing my schooling, the question was raised, 'What next?' It was apparent to me - a career in the northern beef industry.

Early exposure to the career pathways veterinary school could provide heavily influenced my choice to attend James Cook University in the Bachelor of Veterinary Science program. After completing my degree and "the required" time down south in dairy practice - I returned to the north-west to pursue my passion. My veterinary career has exposed me to many aspects of the Australian beef industry - and with family members still owning and managing the family cattle property - I started to build a deeper understanding of what the industry is and how it is changing. It also became clear that I had more specific areas of passion - enhancing profitability for producers and biosecurity, providing me a way of combining my veterinary skill set and my background in the industry.

My Nuffield journey began with a simple yet profound question: How do we ensure the best response to an emerging animal disease incursion? This question lingered in my mind while I worked as a mixed-animal veterinarian in northwest Queensland. My role involved assisting primary producers with management decisions, addressing husbandry and welfare concerns, and conducting disease workups.

But what happens when the "red button" is not pressed? Our post-border biosecurity system's effectiveness hinges on one critical action: the first call. But who is pressing that button, and what happens if they do not?

With an ageing farm ownership and an increasing reliance on contracted staff or employees from non-agricultural backgrounds (such as gap-year ringers), is there a gap in disease surveillance information targeting? Who is on the front line of our biosecurity response, and are we empowering these individuals to "press the red button"?

In this report, I aim to explore the "who" of our agricultural post-border biosecurity rather than the "how." Like many aspects of our lives, our culture and social responsibilities shape our actions. Therefore, the question evolved from how individuals perceive and act on biosecurity to how team or workplace culture influences our actions within the agricultural industry.

The visits and conversations throughout the Nuffield experience made it clear that our northern beef producers felt strongly about biosecurity. There is a growing understanding of what it could mean to have an exotic disease incursion and a strong sense of wanting to do 'what is right' by their neighbours. However, it also became clear that the likelihood of the manager or owner of the operation being the first to identify an issue is reducing. More likely, workers, either day workers or contractors, are on the 'front line' of livestock interactions. There is a significant knowledge gap in

the literature regarding employee (permanent or contract) relationships and attitudes towards biosecurity or reporting issues to managers outside their immediate chain of employment.

There is also a strong relationship between workplace culture and the likelihood of prompt reporting in cases of disease concerns. While it is accepted that good culture leads to further success, it became clear that poor workplace culture and team cohesion are likely to lead to a significant delay in reporting disease—which may result in severe and significant impacts of disease spread, increasing the cost of recovery into the millions.

Through this Nuffield project, I have travelled worldwide, including various states in the United States of America, Singapore, Indonesia, Brazil, the Netherlands, Norway, New Zealand, Canada, and Australia. Not every visit focused on cattle or biosecurity, but small gifts of advice and information came together from each meeting to help form the insights gained for this report.

**Table 1. Travel itinerary**

| Travel date | Location | Visits/contacts |
|---|---|---|
| 1st December 2022 | Canberra | Australian Veterinary Association EAD Summit<br>Dr Mark Schipp (CVO)<br>Dr Alison Crook (QLD CVO)<br>Dr Chris Parker National Animal Disease Preparedness Coordinator |
| March 2023 | Vancouver, Canada | Pre-CSC |
| March 2023 | Vancouver, Canada | CSC |
| March-April 2023 | New Zealand | Nuffield Triennial inc. Rural Leaders Agribusiness Summit |
| May- June 2023 | Singapore, NT and WA - Australia, Delaware USA, Netherlands, Norway | GFP |
| 27-29 June 2023 | Ballarat, Aus | Minitube Producers and Veterinarians Reproductive Tech Days |
| 30 January - 15 February 2024 | Florida, USA | Attended Cattle Con, USA<br>University of Florida - Ona research Center<br>G7 Ranch, Lake Wales, FL<br>Phillips Ranch, Bunnell, FL<br>Quincey Cattle Co, Chiefland, FL<br>Usher Land and Timber Farm, Chiefland FL |

| | | |
|---|---|---|
| | | Blackbeard's Ranch, Myakka City, FL<br>Buck Island Ranch (Archbold Research facility) Lake Placid, Fl<br>Adam's Ranch, Fort Pierce, Fl |
| 17-21 March 2024 | Canberra, Aus | Animal Health Australia - Ian McDonald & team. Presentation on Journey so far.<br>CVO (Dr B Cookson)'s staff - Meeting sit in |
| 15-16 March 2024 | Darwin, Aus | Northern Australian Biosecurity Scheme Masterclass.<br>Presenting |
| 9-11 April 2024 | Cairns, Aus | International Wagyu Conference |
| 5-12 May 2024 | Rockhampton, Aus | Beef Week Australia<br>Attended as part of the AHA team. |
| 14-26 May 2024 | Brazil | CMA Feedlot, Barretos<br>CIA Do Sal, Barretos<br>Agropecuaria3i, Barretos<br>9th Regional Hub for Technological Development of Agribusiness, Colina |
| 11- 17 June 2024 | Indonesia | Key Contact Ihsan Rabbani (Kemin)<br>PT Lintas Nusa Pratama (feedlot), Bandung<br>Ultra Dairy Farm, Peternakan Bandung Selatan (Second largest Dairy in Indonesia)<br>Wet Market, Bandung<br>Government Abattoir, Bandung<br>Lauklauk Freshwater Fisheries<br>Local Flower producer, Ciberureum<br>Mixed operation, Feedlot, dairy, horticulture - Sarampad<br>Visits at Padjadjaran University (Jatinangor campus) with students hosting |
| 28-30 July 2024 | Gold Coast, Aus | 3rd Australian Biosecurity Symposium - Speaker |

# Acknowledgments

This entire journey would not have been possible without the efforts and support of so many people.

Firstly, to Nuffield Australia for making this opportunity possible, and to my investors Animal Health Australia and Plant Health Australia. I would especially like to thank Ian McDonald and his team from Animal Health Australia - for making me feel welcomed and valuable during this time.

To my family who picked up everything while I travelled around the world and Australia - often at short notice. I never could have imagined doing this without your support and help, and I could not have succeeded without you all.

To my global focus program group as pictured in Figure 1 - thank you for always being open, sharing ideas and perspectives and encouraging each other in our journeys.

To Alltech Lienert Australia, and Toby Doak & Rafael Rodrigues for their time in creating contacts and visits while travelling in Florida and Brazil.

To Kemin Animal Nutrition and Matt Bastian & Isalan Rabbani for their generous time and effort while I was travelling in Indonesia.

To those who supported me in applying - previous scholars Sonya Comiskey, Lucy Collins and Kara Knudsen and my mentor from the Australian Drought Resilience Program who encouraged me to look outside the veterinary world for my next step.

To the Northern Australian Biosecurity Network - who helped inspire, encourage and facilitate my continued passion for my role in the Northern Cattle Industry.

To everyone who hosted me on my visits, from scholars to producers, no Nuffield experience is possible without your generosity and care. The Nuffield program is built entirely on this experience - I hope to contribute just as those who have come before me have.



**Figure 1: Team 'Norway' (L-R): Regan Lynch (author), Elder Bruno (Brazil), Robert Davis (Zimbabwe), Iain Field (Aust.), Qu Khumalo (Zimbabwe), Thiago Macitelli (Brazil), Thomas Murray (Ireland), Jodie Mitchell (Aust.), Dario Mujica (Chile) and Easton Kuboushek (USA) in Norway, 2023. (Own image, 2023)**

# Abbreviations

| | |
|---|---|
| ABARES | Australian Bureau of Agricultural and Resource Economics and Sciences |
| AHA | Animal Health Australia |
| AUD | Australian Dollar |
| BJD | Bovine Johne's Disease |
| BTEC | Brucellosis and Tuberculosis Eradication Campaign |
| COVID-19 | Coronavirus disease 2019 |
| CRCNA | Cooperative Research Centre for Developing Northern Australia |
| DAF | Department of Agriculture and Fisheries |
| DAFF | Department of Agriculture, Fisheries and Forestry |
| DPI | Department of Primary Industries |
| EAD | Emerging animal disease |
| EADRA | Emergency Animal Disease Response Agreement |
| FMD | Foot and Mouth Disease |
| IGAB | Intergovernmental Agreement on Biosecurity |
| LPA | Livestock Production Assurance |
| MLA | Meat & Livestock Australia |
| NLIS | National Livestock Identification System |
| NSW | New South Wales |
| PHA | Plant Health Australia |
| QDAFF | Queensland Department of Agriculture, Forestry and Fisheries |
| QLD | Queensland |
| TAFE | Technical and Further Education |
| TB | Bovine Tuberculosis |
| TPB | Theory of Planned Behaviour |
| UK | United Kingdom |

# Objectives

This report explores the cultural and social attitudes towards biosecurity within the northern Australian beef industry. While a seemingly concise objective - it became clear throughout the journey that this was in fact a much larger undertaking than expected. Given the complexities encountered, the following objectives are used to frame the report and findings:

- Identify current attitudes towards “biosecurity” as observed in the ground-level workforce in the northern Australian beef industry.
- Identify who is at the forefront of disease reporting within the northern Australian beef Industry.
- Identify the impact of a team approach to success in biosecurity reporting and identifying areas of concern and influence within ground-level workers.
- Observe the culture of change within the northern Australian beef industry and identify opportunities to potentially influence this.

# Introduction

Australia has a comparative advantage over many developed countries due to its diverse geography, extensive natural resources, and absence of significant global pests and diseases. This unique position allows producers to achieve higher yields with lower production costs and secure premium prices in international markets. Australia's mega-diverse natural environments also provide significant ecosystem services, such as clean air and water and pollination, which further support its agricultural success. These biophysical advantages contribute to Australia's strong economy and high standard of living, showcasing the critical interplay between a healthy environment and economic prosperity.

Australia is one of the few countries that remains free from the most invasive pests and diseases. The importance of biosecurity to Australia is reflected in the 2023-2024 federal budget, where it was announced that over $1 billion of additional funding would boost biosecurity and worker and market access for Australia's agricultural sector (Faster Horses, 2023). Australia's biosecurity framework is a complex collaboration aimed at mitigating risks and ensuring the integrity of our agricultural sector (Australian Government, 2024; Beale et al., 2008).

While Australia's island geography has long acted as a natural barrier to the movement of pests and diseases (McLoughlin, 2001), globalisation is increasing the movement of people and goods from areas where these pests and diseases are more prevalent (AHA, 2019; Beale et al., 2008; Craik et al., 2017). The goal of Australia's biosecurity system is to reduce the likelihood of these incursions and their adverse effects on human, animal, and plant health, as well as on the environment and the economy (Beale et al., 2008; Australian Government, 2024; Craik et al., 2017).

However, the concept of a biosecurity 'system' is only vaguely defined in academic and governmental literature. Government agencies typically describe biosecurity as a continuum of measures categorised by location: offshore (pre-border), at the border, and onshore (post-border) (Beale et al., 2008; Australian Government, 2024; Craik et al., 2017). Conversely, academic literature describes biosecurity measures based on timing relative to the invasion curve: prevention, eradication, containment, and asset-based protection (Chilcott et al., 2020; Heffernan et al., 2008). Neither approach articulates the specific actions that constitute these measures or how they are organised into a system designed to minimise impacts. The concept of 'shared responsibility' has been an essential component of Australia's biosecurity system for some time. However, there is a general lack of understanding about what it means and how it impacts roles and responsibilities for biosecurity (Hernández-Jover et al., 2016; Nunn, 2011; Palmer et al., 2009a).

On-farm biosecurity is crucial for post-border prevention of exotic and emerging disease transmission. Maintaining on-farm biosecurity standards without an active disease outbreak reduces the impact of new incursions before they can be detected (Bourn, 2002).

There has also been a change within the agricultural industry regarding who is working with our livestock. There is a known trend within agricultural operations for

an ageing farm ownership (ABARES, 2020) and an increased reliance on contracting staff or a less

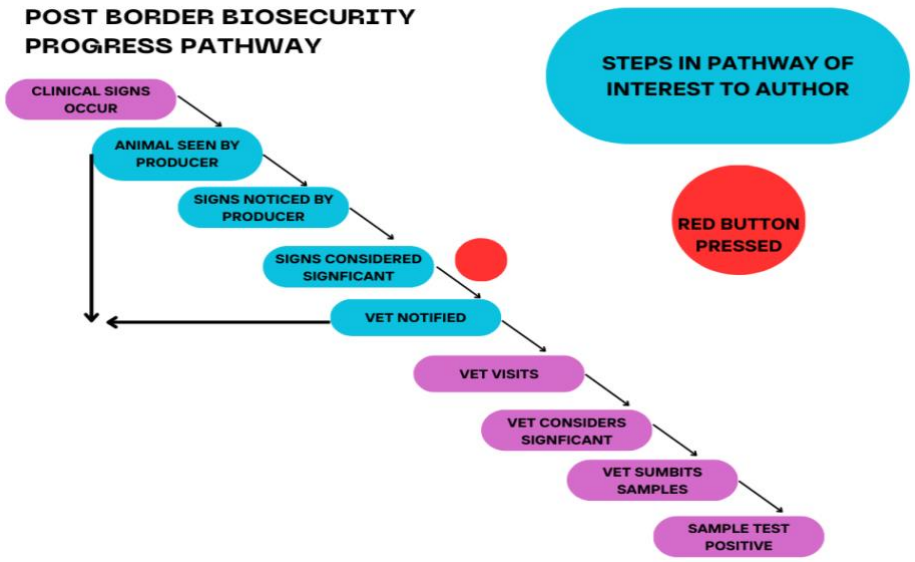



**Figure 2: Post border biosecurity progress pathway highlighting this report's focus area. (Adapted from NABSnet Workshop, 2024)**

experienced workforce. There is a change in who does the 'grunt' work in many farming operations - especially for the northern Australian beef industry. The people who have the most animal-human interaction are now often not in positions of managerial decisions and may not have agricultural backgrounds - or if they do, they are not within the beef sector.

Significant work has been done regarding the attitudes and influences on reporting of livestock disease events within Australia and globally. However, the research is limited in that it focuses on the 'decision makers' of the farm - owners, managers, etc. - and not the workers (Palmer et al., 2009a; Fisher, 2013).

This report is limited in its scope to the first step in our post-border biosecurity system: active reporting of potential disease concerns by those working with cattle as shown in Figure 2. It will first provide background to set the context of the northern Australian beef industry and the Australian biosecurity systems, then describe current attitudes towards biosecurity within the industry, and finally discuss factors of influence and how team culture can impact reporting. For this report, the exotic disease Foot-and-Mouth Disease (FMD) is used to provide context to the reader. FMD has been described as the single 'greatest threat of any disease to Australia's livestock industries' (Matthews, 2011). As such, significant data is compiled to provide dollar value to the reader and help give more context to the discussions.

## Northern Australian Beef Industry

The northern Australian beef industry encompasses Queensland, the Northern Territory, and the Pilbara and Kimberley regions in north Western Australia as shown

in Figure 3, covering over 40% of Australia's total land mass (Chilcott et al., 2020). Agriculture plays a crucial role in the north's economy, environment, and culture, with pastoral activities being the largest economic land use shown in Table one, occupying around 60% of the land area (Australian Government, 2015). The pastoral industry is the leading contributor, accounting for about 57% of the region's total agricultural output. The northern beef cattle herd represents approximately 64% of Australia's national beef cattle herd, which numbers nearly 23 million cattle (Bell and Sangster, 2022).

A recent assessment estimated the industry's economic value at approximately $5.03 billion, with $3.7 billion from farm gate products and $1.3 billion from first-stage processing (Chilcott et al., 2020). Production systems primarily involve extensive grazing of rangelands, relying heavily on seasonal rainfall. Property sizes and ownership structures vary, ranging from family-owned operations to larger multi-property corporations. These diverse systems support various production models, from breeding-only to breeding-fattening operations.

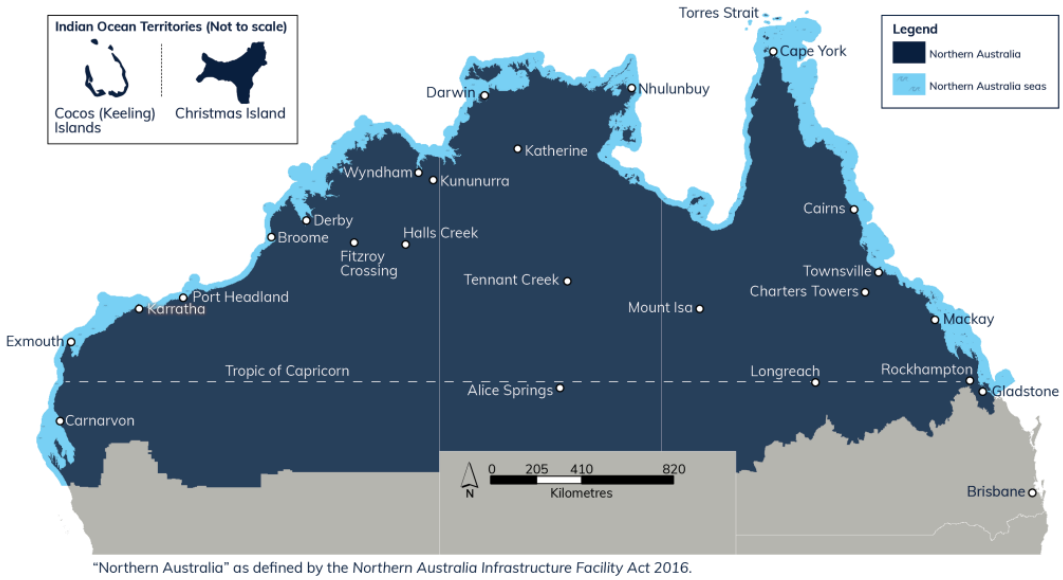



**Figure 3: Northern Australia as defined by the Northern Australia Infrastructure Facility Act 2016 (Source: Department of Infrastructure, Transport, Regional Development, Communications and the Arts, 2024)**

The industry is predominantly export-oriented, with about 1 million live animals (Chilcott et al., 2020) exported annually to Southeast Asia and over half to Indonesia. It also supplies domestic markets, including feedlots and processing facilities in southeast Queensland. Road transport is vital for the industry, with approximately 5.3 million cattle movements per year, mainly between properties and export depots (Chilcott et al., 2020). Most cattle operations are located far from major domestic markets and export ports.

**Table 2: Top 10 northern Australian Commodities by gross value of production (GVP), 2010-11 (Source: Australian Government, 2015)**

| RANK | COMMODITY | GVP ($ million) |
|---|---|---|
| 1 | Cattle | 2,897.1 |
| 2 | Sugar cane | 762.4 |
| 3 | Bananas | 286.5 |
| 4 | Mangoes | 89.9 |
| 5 | Tomatoes | 86.4 |
| 6 | Cotton | 79.7 |
| 7 | Melons | 78.5 |
| 8 | Wheat | 71.6 |
| 9 | Sorghum | 63.6 |
| 10 | Hay | 55.8 |

### Current Overview of the Northern Australian beef industry

Australia accounts for about 2.5% of global beef production and was the fourth-largest beef and bovine meat exporter in 2022. In 2023, live cattle exports reached 661,392 head, a 13% increase from 2022, with Indonesia (53.2%), Vietnam (18.8%), and China (11.6%) as the top markets (Red Meat Advisory Council, 2024). With the US cattle herd decreasing and demand for red meat growing in emerging markets, Australia is well-positioned to capitalise on these opportunities, particularly in Southeast Asia, where it already has strong market relationships (MLA, 2023).

The Australian red meat industry employed approximately 433,389 people in 2021-22, representing 66% of Australia's total direct employment in agricultural production (MLA, 2023).

## Biosecurity in Australia

### What is ‘Biosecurity’?

The term "biosecurity" was first used in the agricultural sector in the 1980s, referring to "the sum of risk management practices in defence against biological threats" (Renault et al., 2021). Over the last decade, the term has gained traction across various organisations and sectors, becoming widely recognised by the general public. In the context of animal health and production, *biosecurity* is defined as "a set of management and physical measures designed to reduce the risk of introduction, establishment, and spread of animal diseases, infections, or infestations to, from, and within an animal population" (Renault et al., 2021).

Definitions of biosecurity generally include broad statements about managing and containing risks on farms. However, in practice, on-farm biosecurity measures vary significantly and are implemented differently across social groups, geographical regions, and agricultural commodity chains (Maye and Chan, 2020).

In Australia, biosecurity is governed by several Acts, including the Biosecurity Act 2015, the Export Control Act 2020, and the Imported Food Control Act 1992, all overseen by the Department of Agriculture, Fisheries and Forestry (DAFF). The Australian Government allocates approximately $25 million annually to biosecurity, with an additional $1 billion package outlined in the 2023-2024 budget over the next four years (Australian Government, 2024; Dodd et al., 2020).

The Australian biosecurity system is built on the principle of ‘shared responsibility’ (Australian Government, 2024; Beale et al., 2008; Craik et al., 2017). It involves collaboration between the Government, industry, and the community to manage and mitigate biosecurity risks. This integrated approach ensures that all stakeholders play a role in protecting Australia's agricultural and environmental health from pests and diseases.

## Biosecurity in the Australian Context

Biosecurity has always been, and will continue to be, a vital aspect of the northern Australian beef industry. The industry has tackled significant biosecurity challenges in the past, such as the arrival of cattle ticks and the eradication of bovine tuberculosis (TB). Today, it faces threats from various fronts, including the re-emergence of existing threats, potential incursions of new threats, and the emergence of previously unknown threats. The development of Australia's north is likely to increase the movement of goods and people, escalating these biosecurity challenges (AHA, 2019; Australian Government, 2024).

Australia's biosecurity system is a science-based, risk-oriented framework designed to 'minimise the impact of pests and diseases on Australia's economy, environment, and community' while facilitating trade and the movement of animals, plants, people, goods, vectors, and vessels to, from, and within Australia (Australian Government, 2024).

As depicted in Figure 4, the biosecurity system outlines the key roles and functions of Government, industry, research institutions, and other stakeholders (including producers) in mitigating the risk of pests entering and establishing in Australia (Muller et al., 2023). The system is extensive, multi-layered, and complex, with measures implemented offshore, at the border, and onshore. It is based on shared responsibility, requiring collaboration to ensure it is well-resourced and robust; however, its complexity can lead to unintended expectations.

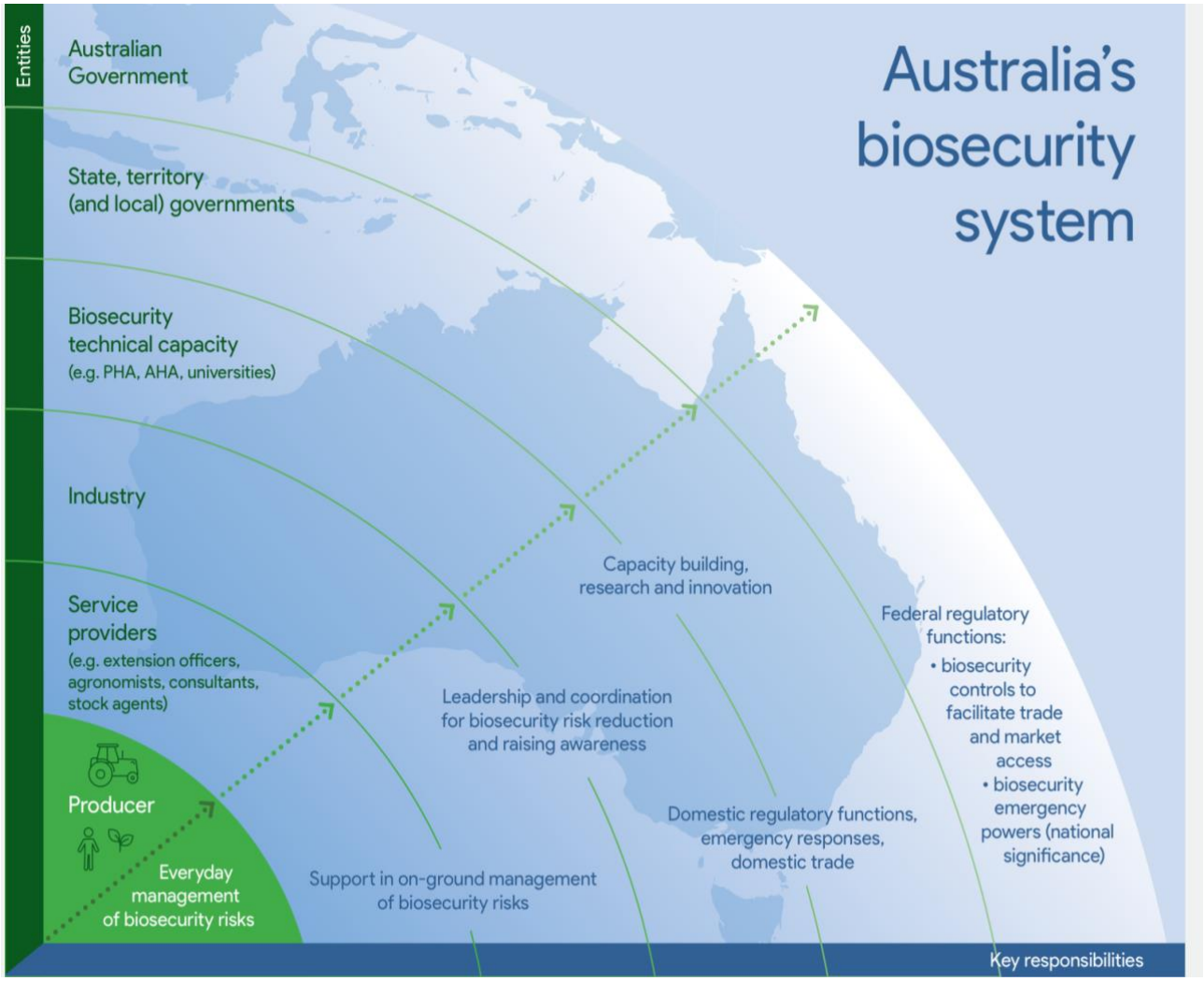



**Figure 4: Overview of Australia's Biosecurity System (Source: AgriFutures Australia, 2023)**

Several reviews of Australia's biosecurity system have been conducted over the years. The most recent, "One Biosecurity: A Working Partnership," also known as the Beale Review, concluded that while improvements are possible, Australia operates a highly regarded biosecurity system that is often envied by other countries due to its comprehensiveness, transparency, and scientific rigour. The review highlighted several strengths:

- The Emergency Animal Disease Response Agreement (EADRA), a world-first agreement between national and state governments and livestock industry sectors, sets out decision-making arrangements and cost-sharing terms for emergency animal disease responses (Australian Government, 2024).
- AUSVETPLAN, which includes a comprehensive range of up-to-date, disease-specific response manuals validated through numerous exercises.
- Livestock traceability systems, with Australia being a world leader through the National Livestock Identification System (NLIS).

### On-Farm Biosecurity

On-farm biosecurity, or the role of the individual in biosecurity, is loosely defined for producers within the Australian Biosecurity system. While there is a penalty for not notifying the appropriate authority within 24 hours of observing a suspect notifiable disease, the day-to-day aspects of biosecurity are primarily entrusted to the producer to define and act upon. The understanding of the term biosecurity by beef industry employees and producers is discussed later in this report. However, it is important to draw attention to the Biosecurity Plan, a Livestock Production Assurance (LPA) program requirement. Despite being a requirement, creating a biosecurity plan is generally voluntary across Australia.

The most recent LPA audit of 3,045 livestock properties across Australia indicated that 75.59% of Australian cattle properties have a documented biosecurity plan (Red Meat Advisory Council, 2024). In the author's experience, the comprehensiveness and thoroughness of these biosecurity plans vary greatly. Producers often apply ready-made templates to complete these plans, which can also reflect the value they place on biosecurity in their operations. A comment from a producer in the "Impacts of Biosecurity Incidents in Eastern Australia Report" (Faster Horses, 2023) sums up the author's experience when assessing producers' biosecurity plans:

"Lots of people think that a biosecurity plan is just a piece of paper that they tick and flick to get market access as opposed to how do we implement changes on our property to be biosecurity prepared."

Appendix 1 (Australian Cattle Veterinarians BioCheck Plan) and Appendix 2 (LPA Biosecurity Plan) provide samples of biosecurity plans to demonstrate the range of templates available for producers.

There is a growing shift to rely more heavily on passive surveillance with the reduction in biosecurity active surveillance capacity (reduction in workforce, location of biosecurity officers, and state departmental extension services). Passive surveillance is considered a crucial aspect of our post-border biosecurity system (Martin et al., 2015; Kruger et al., 2020; Gates et al., 2021). However, more information needs to be provided about cattle producers' understanding of this role in disease surveillance and reporting outside the use of biosecurity plans.

## Identified threats to the Northern Australian Beef Industry

A number of reviews and research studies (AHA, 2019; Australian Government, 2015; CSIRO, 2017) have identified threats to the northern Australian beef industry. The Cooperative Research Centre for Developing Northern Australia's (CRCNA) Northern Australia beef situation analysis (2020) report highlighted several biosecurity-related threats, summarised below:

1. Disease Risks: Climate change is causing the spread of diseases and pests beyond their current extents.
2. Ineffective Surveillance and Management: Poor biosecurity surveillance, reporting, and management could increase the risk of disease spread.

3. High Risk of Invasion: Australia is classified as having a high risk of invasion and establishment of new pests, some of which could reduce market access.

The report noted that while there was little evidence of major problems with the form of Australia's biosecurity laws, resourcing issues were undermining the effectiveness of biosecurity arrangements. This underscores the importance of timely disease reporting to initiate responses and reduce the potential size of outbreaks. In summary, strengthening Australia's biosecurity systems requires effective disease surveillance by those on the ground in our livestock industries.

A review by Animal Health Australia (AHA) of the 2007 response to the equine influenza outbreak in Australia noted:

"…The experience provided by the Australian equine influenza response and comparison with other experiences of FMD indicate Australia may be **under-resourced to respond to even a moderate outbreak of FMD…"**

## Who is the front line in the Northern Australian Beef Industry for biosecurity?

With the general global shift away from smaller family-owned and operated farms towards larger commercial farms, there have been growing issues in the livestock sector with staff retention and turnover, particularly in more labour-intensive systems like dairy farms (ABARES, 2020; Palmer et al., 2009a). As a result, it is possible that many of the staff now employed to provide day-to-day care for animals may not come from farming backgrounds and may have less experience than other trained employees with recognising abnormal behaviours and clinical signs of animal disease. The relationship between farm workers and their managers may also influence the likelihood of information about animal health being communicated to key decision-makers on the farm (Gates et al., 2021).



**Figure 5: R & R White Contract Mustering crew 2020 – (Source: Author)**

## Who is on the ground?

Data surrounding workers in agriculture can be difficult to source and accurately interpret. Data from ABARES (2021) show that there is a reduction in owner/managers in the Australian agricultural workforce, with 33% of the agricultural workforce being female, but 25% of the female workforce in agriculture is between 15 and 24 years of age. The percentage of females in the beef industry is higher than that in any other agricultural industry in Australia. While data indicates that the majority (53%) of those working in the Australian beef industry are over 55 years of age, it is important also to note that owner/managers identify as employees in this data. Previous data from a 2008 Meat & Livestock Australia (MLA) workplace survey (MLA, 2008) indicated that of those who identified as employees only, 53% were under 30 years of age - indicating that the data cannot always be used to accurately portray the landscape of employment in the Australian agricultural industry.

A shift away from more permanent employees to day workers and contractors also means that it can be difficult to accurately determine workforce profiles for regions or even individual agricultural industries.

In the author's personal experience, working in cattle yards in both owner/manager operations and corporate operations in the North-West Queensland region (and travelling), there is a clear demographic of workers defined as below:

- Between 18 and 25 years old
- A majority of male workers over females, however, the author very rarely worked in male-only camps but had worked in female-only camps - as seen in Figure 5.
- Often, workers were from southern Australia (New South Wales, South Australia, or Victoria) over the northern states (Western Australia, Northern Territory, Queensland).
- Most workers would be 'green' or inexperienced in cattle work, agricultural work, or both. While a majority of those encountered would have had some exposure to farming, many had not worked with livestock.

Roles in agriculture, in particular, are marketed much more as 'lifestyle' rather than career choices. Young, entry-level employees are often sold on the job by television shows such as 'McLeod's Daughters' or 'Yellowstone' or TikTok videos of sunsets and cattle musters. As such, the social or cultural aspect of the team is highly valued for these employees to feel that they are 'getting the most' out of their temporary agricultural career.
It is also seen as a highly desirable role for backpackers looking to fulfil their 88-day rural/regional work requirements for their working tourist visas while in Australia. Again, this transient labour force may not be reflected in workforce data, with many backpackers exchanging labour for board, food, and the 'outback experience.'
Of course, there are a number of employees who enter the industry with much longer-term career aspirations. These employees are much more likely to have further education in an agriculture-related area (TAFE certificates or undergraduate degrees) and more likely to seek employment within corporation-style operations that provide clear career pathways.

This is a trend that was reflected globally in the author's travels - with many conversations with owners centring around labour shortages, the reliance on migratory labour and the struggles of retaining highly trained, motivated staff members on a longer-term basis. While European countries appeared to rely much more on 'migratory labour' within agriculture, that is, a labour force that follows more seasonal patterns 'chasing' work, countries such as the United States, New Zealand, and England seemed to have fewer 'transitional' workers and more contract workers in the industry. The 'gap year' labour force in the Australian livestock industry was rarely seen overseas.

## Summary

The northern Australian beef industry is crucial to Australia's economic health and is heavily reliant on robust biosecurity to maintain valuable international market access. However, the biosecurity system is highly complex, involving multiple layers, agents, and often poorly defined responsibilities across national, state, and local levels. This complexity can lead to a lack of understanding about what 'biosecurity' entails within the beef industry and what it practically means for producers. Despite being globally recognised as robust and world-leading, Australia's biosecurity system relies on individuals' responses to maintain it.

Several global and national trends pose threats to Australia's biosecurity, including climate change, ineffective surveillance and capacity, and increased movement of goods and livestock both globally and domestically. A particular concern highlighted in this report is that Australia may be under-resourced to respond to a moderate Foot-and-Mouth Disease (FMD) outbreak, with a heavy reliance on passive surveillance to maintain its disease-free status.

What does this mean for the industry? Several implications can be drawn from the author's experience and employment data from the industry. Animal husbandry tasks, such as processing, checking livestock in paddocks, and mustering, are increasingly performed by day workers or contract labourers due to changes in the demographics of beef industry owners, including increased corporate ownership and an ageing owner/manager population. Consequently, there is a higher reliance on contractors and day workers who are not involved in long-term operations to identify and report concerns or issues to owners. Additionally, there is greater dependence on less experienced employees to notice, identify, and report potential concerns to their supervisors or owners. This situation can be a 'double-edged sword': inexperience may prevent biases or overconfidence but can also mean significant issues or concerns may go unrecognised. When interpreting employment data in agriculture, it is essential to consider the limitations in data collection and how reflective it truly is of a constantly changing industry.

# Current attitudes and understanding of Biosecurity within the Northern Australian Beef Industry

## Understanding of biosecurity within the industry

Biosecurity has become almost a 'buzzword,' particularly after the global experience of COVID-19.

While it has been in the lexicon of agricultural workers for decades, getting producers to define biosecurity can be more complicated than expected.
For most producers, biosecurity is often discussed in terms of disease, prevention, and reaction. Many producers mention quarantine and isolation of new stock. Mentions of weed and pest management are also discussed, often concerning disease - and are more common in producers that run mixed agricultural operations (such as growing their own feed or silage). For most producers, biosecurity is almost defined by the impact it would have on their day-to-day tasks. MLA (2023) breaks farm biosecurity into measures to reduce the risk of introducing an infectious disease, pest, or weed into the property.

The author feels this reflects the current understanding of biosecurity within the northern beef industry in Australia.

For many producers, biosecurity responsibilities end at the boundary gate. There appears to be strong thinking about processes around animal disease practices (quarantine, disease testing, requiring health declarations for new stock), but this is




**Figure 6: How primary producers define biosecurity. (Department of regional NSW, 2022)**

not often related to human movements, e.g., neighbours visiting stock or friends,

workers bringing dogs or horses onto properties without documentation, family friends bringing animals onto the property for recreational purposes (such as pig hunting). Of course, regularly mentioned with biosecurity was paperwork. Biosecurity plans, vendor declarations, fodder declarations, health declarations, and waybills are often mentioned with a shake of the head and a sigh.

Interestingly, very few spoke of disease surveillance or reporting in relation to biosecurity. While there was a strong view that the federal government was responsible for biosecurity at our borders (Palmer et al., 2009a; Palmer et al., 2009b; Scutt, 2022; Fountain et al., 2023), there was a lack of trust in the state government and its responsibility for biosecurity post-border, or a mentality of dealing with 'on-farm' issues 'on the farm.' This is also reflected in a 2022 report by the NSW Department of Regional NSW (Biosecurity Attitudinal Research Report), as shown in Figure 6 (how primary producers define biosecurity).

Accurately measuring, or even quantifying, current attitudes towards biosecurity in the industry is nearly impossible. There is clearly a correct answer when someone asks about biosecurity, animal welfare, and disease monitoring for cattle producers - which can often result in cattle producers or employees reflecting more on what 'should be done' rather than what is actually in practice. Direct questionnaires rely entirely on a significant level of trust between researchers and respondents, and for many, this trust takes considerable time to develop. In the author's opinion, the only way to accurately assess attitudes towards biosecurity is the observation of routine tasks - mustering, processing cattle, and trucking. Questions and conversations framed around what is occurring, rather than what your biosecurity plan says, appear to provide more accurate information. No cattle producer, or anyone dealing with animals, wants to be accused of not doing the best they can to care for their livestock.

## Global understanding of biosecurity

Reflecting on the Australian experience, the author’s observations indicated that the global understanding of biosecurity within cattle industries is tied tightly to cultural and social expectations. For example, in Brazil and Indonesia, there was a much tighter relationship between biosecurity and hygiene compared to countries such as England and the United States, where disease and pests were more closely associated with biosecurity.

In countries such as Brazil and Indonesia, it was clear that day labourers, contract workers, and non-management staff had a lesser understanding of biosecurity. They understood their role and job requirements, but did not seem to relate it back to the concept of biosecurity for the operation. This may be a reflection of a few factors: a lower education level in agricultural workers in these countries, a significant cultural difference between Western countries where social hierarchy within the workplace is often reflected by a 'do as you're told' culture and a lower emphasis on shared responsibility within the culture.

That is not to say biosecurity practices and procedures are not apparent in various cattle operations within these countries.

From personal visits in Indonesia, a wide variety of levels of biosecurity controls were observed, including visits to feedlots, dairy farms, and research operations. It was also evident from the conversations that for those outside management or ownership, biosecurity controls were 'just the way it was done', with employees unable to explain why they provided benefits to the operation. For example, one feedlot operation required workers to change into coveralls before entering areas containing livestock as a biosecurity control to reduce the spread of FMD. The workers understood that the coveralls were the 'uniform' for the job and did not necessarily relate it back to stopping the spread of FMD in and out of the premises.

## Research versus Reality

Much work has been done to evaluate cattle producers' biosecurity knowledge and practices globally. Within Australia, many studies have suggested that cattle producers across livestock industries have poor and inconsistent implementation of on-farm biosecurity practices. As mentioned before, there is an apparent perception that there are 'correct' answers when discussing biosecurity practices, especially those around reporting suspicious diseases, which may not accurately reflect what would happen in real life.

However, we know that the more people understand a topic, the more confident they are in addressing it. There is limited literature exploring on-farm biosecurity from the cattle producer's perspective, but even less exploring the relationship between understanding and practice of biosecurity by those outside the manager/owner role within the agricultural industry.

## Summary

It appears from detailed observation that understandings of biosecurity within the beef industry are greatly influenced by the country's cultural and social values.
These can vary significantly from country to country - however, it was also clear that in Western countries, employees or those working within the operations at non-managerial levels showed a greater understanding of biosecurity within their operation and the reasoning behind biosecurity controls. This may be attributed to a higher level of education for these employees but also a significant difference in workplace cultures that have developed over the last few decades.

It is also clear from conversations and observation that within Australia, those working within the northern beef industry highly correlate biosecurity and disease but are less likely to mention reporting or surveillance in relation to biosecurity. There is also a disconnect between understanding biosecurity as a concept and the practices underpinning biosecurity on farms.

# Illustrative studies: historical lessons

## FMD – UK Experience

The 2001 Foot-and-Mouth Disease (FMD) outbreak in the UK, which began at an abattoir in Essex in February, resulted in the slaughter of over six million animals to contain the spread of the highly contagious disease. The outbreak had devastating economic effects, costing the UK economy an estimated £8 billion (CSIRO, 2017). It severely impacted the agricultural sector, with livestock producers bearing the brunt of the losses. Tourism and rural businesses suffered significantly due to movement restrictions and widespread farm closures.

The UK Government introduced a nationwide ban on livestock movements to curb the spread of the disease. By the summer of the year, the number of cases started to decline, and by January 2002, the UK was declared FMD-free (Anderson, 2008).

The outbreak led to significant policy changes to improve biosecurity and disease management. The UK government implemented stricter movement controls, enhanced surveillance and monitoring measures, and improved contingency planning to ensure a more rapid and effective response to future outbreaks (Anderson, 2008). These changes were designed to prevent the spread of similar diseases and mitigate the economic and social impacts on the agricultural sector and rural communities. It is now well accepted that the magnitude of the FMD outbreak in 2001 was primarily due to the delay in detection, with the first case of the disease not being recognised and reported for three weeks (Anderson, 2008). By the time veterinarians investigated suspected FMD cases, the virus was already incubating in more than 50 locations; at least 57 farms in 16 counties were infected when the first case was confirmed (Matthews, 2011). Multiple reviews and papers have been published regarding the lessons learned from this experience in the UK. Of particular interest to the author were:

- The need to maintain and improve surveillance at all levels (local, national and international)
- That contingency plans were in place for outbreaks of this size. However, it became clear that maintaining and updating these plans was not a priority for the government at the time.
- The breakdown of trust between cattle producers, the government, and the communities involved was significant.

Even now, more than twenty years after the 2001 outbreak, there are strong feelings among those involved with this outbreak. Perhaps more concerning is the lack of understanding of the impact of this outbreak by those entering the industry in more recent times—lessons that may be very hard to learn if allowed to be forgotten.

## FMD – Indonesia Experience

Indonesia was declared FMD-free in 1986. In May 2022, FMD was reported in East Java; by the beginning of August of that year, it had spread to 23 of Indonesia's 37 provinces (Beazley, 2022). Ninety per cent of Indonesia's cattle industry is considered smallholder farms (Agus and Widi, 2018), typically one to three head kept close to the owner's house (Soedjana, 1999). It was estimated that there were approximately 16.6 million head of cattle within Indonesia (Agus and Widi, 2018); however, in conversations with local dairy cattle producers, they suggested that this number was likely to be considered the 'low end of the scale' due to poor record collation of livestock.

Indonesia initially said there was only one province impacted as 'site zero'; however, it now appears to be well accepted that two provinces, East Java and Aceh, were concurrently reported as FMD cases (Chen, Gardiner and Quigley, 2022), suggesting that the disease had been present in the country much longer than expected.

By early August 2022, 7,702 animals had been slaughtered due to FMD, 992,000 animals had received an initial FMD vaccination, and 4,847 animals had died from FMD. A total of approximately 459,000 cases had been detected at the time (Beazley, 2022). Indonesia's Minister for Agriculture estimated that the outbreak could cost the country 9.9 trillion IDR per year, or roughly $900 million AUD (VOI, 2022).

Indonesia did and still does face significant barriers in vaccination and detection of active FMD cases. A lack of vaccine itself, trained personnel to administer it, and cold chain transport to remote parts of the country has resulted in an ineffective vaccination program. The manager of one of Indonesia's largest dairy farms in the Pangalengan region reflected that the vaccination program was unlikely to have provided any real benefit to smallholder operations due to the lack of repeat vaccinations required to provide immunity to the animals. The dairy had sourced its own vaccinations after finding the cold chain storage and transport of the vaccine to its location to be unreliable. The current outbreak is continuing, and the cattle producers the author spoke to in the region held little hope that it will be eradicated—management is the best they can hope for at this stage.

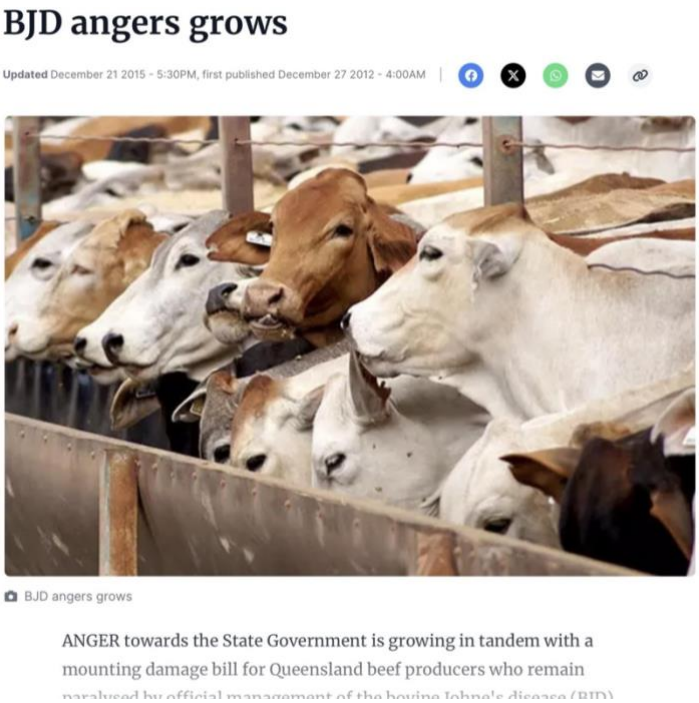


**Figure 7: Author with students from Padjadjaran University on the Jatinangor Campus research feedlot 2024 (Source: Author)**

## Bovine Johne's Disease – A Queensland Experience

In more recent times, Queensland's beef producers' experience during the Bovine Johne's Disease (BJD) outbreak in 2012 has been their first and potentially only encounter with a notifiable disease, disease reporting, and response. In October 2012, BJD was suspected in a homebred animal at a beef stud herd near Rockhampton (Finlay and Hill, 2013). Laboratory results confirmed the disease more quickly than anticipated, and by December, over 130 properties were placed under movement restrictions.

The cost of controlling the outbreak was estimated to be about $6-7 million (Finlay and Hill, 2013); however, had the outbreak expanded to a second location, the response cost would have been $23-25 million (Finlay and Hill, 2013). During this period, producers felt increasingly disconnected from the procedures being undertaken by DAFF/QDAFF. A lack of experienced staff to communicate effectively with producers was a significant cause of growing discontent.


BJD angers grows

Updated December 21 2015 - 5:30PM, first published December 27 2012 - 4:00AM

BJD angers grows

ANGER towards the State Government is growing in tandem with a mounting damage bill for Queensland beef producers who remain

**Figur: News article reflective of Queensland beef producer attitudes during the BJD outbreak of 2012-13 (Source: Queensland Country Life, 2015)**

Confusion among producers and government field staff regarding procedures required for testing and information about culling animals further contributed to a growing distrust between producers and the government. Unfortunately, this experience has shaped producers' expectations for future disease responses (Figure 8). There is a pervasive lack of confidence in the current structure, staffing profile, and staffing numbers to adequately cope with or lead responses to disease incidents.

## Bovine Tuberculosis – Northern Australia

Australia also underwent a successful disease eradication program with the Brucellosis and Tuberculosis Eradication Campaign (BTEC) in the 1970s. It involved

Australia's entire cattle herd at the time - over 180,000 herds of cattle (Chilcott et al., 2020). BTEC, one of Australia's most extensive and most expensive animal disease control programs, took twenty-seven years and cost an estimated $850 million by its completion in December 1997 ($730 million today) (More et al., 2015). At the time, there was no precedent for a program of such magnitude in Australia.

Many of the challenges faced during this campaign, such as geography and distance, climate conditions, lack of infrastructure, large-scale mustering and testing, and reservoir infection within feral pests (like buffalo for TB or feral pigs for FMD), remain relevant to disease control and surveillance today. The campaign's success underscores the importance of coordinated efforts and robust biosecurity measures in managing animal health. BTEC remains a point of pride for those involved: producers, veterinarians, workers, and the government. This program's success was attributed to several factors, including a compelling rationale for eradication, an agreed final outcome, and industry commitment and financial support.

## Summary - Lessons

History strongly influences cattle producers' future behaviours and decisions, even when they have not been directly involved in past experiences. Cattle producers often learn from the experiences of their peers and the broader agricultural community, incorporating these lessons into their own practices. However, this historical knowledge can create entrenched attitudes that resist change, particularly if past experiences were negative.

Feelings of distrust between cattle producers and the government are especially difficult to undo. Many cattle producers may have experienced or heard of instances where government policies or interventions were perceived as ineffective, overly bureaucratic, or unfairly punitive. This distrust can lead to scepticism about new biosecurity measures, as cattle producers may fear that these initiatives are more about regulatory compliance than genuine assistance. Building trust requires consistent, transparent communication and policies that acknowledge and address cattle producers' concerns.

Hard-learned lessons tend to fade with time. As the shock and recovery from Exotic Animal Disease (EAD) events continue, desensitisation to these lessons occurs. Initially, there is a heightened awareness and adherence to biosecurity measures following an outbreak. However, as time passes and the immediate threat becomes less apparent, the urgency to maintain strict biosecurity protocols diminishes. This complacency can lead to a relaxation of practices, increasing the risk of future outbreaks. The adage "those who do not look to the past are bound to repeat it" holds true in this context.

# ‘Shared Responsibility’ and the team context

## Shared responsibility policy versus reality

The concept of 'shared responsibility' has been an essential component of Australia's biosecurity system for some time. However, there is a general lack of understanding about what it means and how it impacts roles and responsibilities for biosecurity (Matthews, 2011; Craik et al., 2017). Craik et al.'s review of the Capacity of the National Biosecurity System suggested the following definition to provide more clarity regarding 'shared responsibility':

> *"Shared responsibility means everyone takes responsibility for biosecurity matters under their control. Everyone has an obligation to take action to protect Australia from pests and diseases." (Intergovernmental Agreement on Biosecurity (IGAB) review - Craik et al., 2017).*

Significant progress has been made towards the 'shared responsibility' model in some areas of Australia's biosecurity systems, such as the roles of AHA and Plant Health Australia (PHA) in fostering industry engagement with biosecurity awareness and delivery (Australian Government, 2024). However, further improvements may be achieved by providing clearer definitions of shared responsibility and better-defined and agreed-upon roles and responsibilities of participants across the national biosecurity system. Industry and producers may also need improved legislation to effectively increase their roles in biosecurity management.

Additionally, the shared responsibility model is frequently seen as a euphemism for cost shifting or a devolving of responsibilities by the government sector onto industry and producers (Craik et al., 2017). This attitude may result in resentment and poor responses to biosecurity risks and incursions. It is increasingly recognised that early detection [of diseases] is highly dependent on the non-veterinary component of surveillance, and recent UK animal health policy also recognises that cattle producers are at the frontline in managing disease control (Palmer et al., 2009a; Brennan and Christley, 2013).

In practice, government and industry demonstrate shared responsibility through the funding they provide to Animal Health Australia (AHA), the national body that raises awareness of biosecurity. AHA has been positioned to close the gap between national and state governments and livestock industries that jointly fund the agency (Lishomwa, 2016).

For producers on the ground, shared responsibility remains a buzzword tossed around by government and industry stakeholders, and changing their view away from this will remain an uphill battle. The continued use of the term 'shared responsibility' in the context of cattle producers' passive disease surveillance and reporting may be doing more harm than good.

## Team culture in Success

The farm culture represents "the way things get done around here," and it can be positive or present a challenge for employees. The agricultural industry often faces challenges related to labour shortages and high turnover rates, a global trend the author found after visiting agricultural operations worldwide. It is also universally accepted throughout various industries that team culture and cohesion contribute significantly to the operation's success.

While large enterprises tend to have a structured vision and strategy for their organisational culture, from personal experience, the author found many family farming businesses or smaller operations automatically disregard workplace culture as something "exclusive" to larger operations.

With visits to multiple agricultural operations globally, it became clear that workplace culture determines staff retention and success, leading to operational success. It would hardly be argued otherwise by most business owners in this day and age. However, it is also well accepted that family-run livestock operations can often lack an understanding of this - which has been reflected in workplace retention surveys. MLA's 2008 survey presented data that nearly 38% of red meat employees had left their previous employer due to not feeling valued/lack of recognition and poor communication from management, which was reported more likely if you worked on a small or medium-sized operation.

A new generation of employees also has a greater awareness of workplace culture, with a more significant focus on workplace relationships, mentorship within workplaces, and a feeling of purpose being rated highly by employees on job retention surveys (MLA, 2008). There is a stronger understanding of workplace culture, work-life balance, and lifestyle by much younger employees than there was decades ago - a generational disconnect that places further pressure on a hard-to-balance relationship between young staff and an ageing management/owner relationship.

The impacts of workplace culture on disease surveillance and reporting are best described by the experience of a Tambo beef producer (personal communication, 2023):

*"…..I had employed a young girl with no previous farming experience…. We were undergoing a grader grass control program on the property, and as such, previously treated several roads and paddocks… This young girl approached me to say that she thought she had noticed some Grader grass in a previously treated road, but she was not 100% sure that was what it looked like… in response, I told her that the road in that paddock was treated, and therefore she was wrong and did not know what she was talking about. I did not go to check out her observations….Weeks later, I drove down the road she had mentioned as a concern - only to find a significant grader grass outbreak spreading along the roadside. Had I just acknowledged and investigated her report, I would have had a much smaller problem to deal with, however by dismissing her, I not only got her to doubt herself and reduce the chance she would report further findings of this pest species, but I also implied that I do not trust her judgment….I knocked her down from likely reporting other issues or concerns because she would think that I would not take them seriously…"*

## Summary

It has become clear, during this experience, that shared responsibility, while accepted and promoted by government and industry, often prompts feelings of distrust and reluctance among cattle producers to engage, due to a lack of definition. This will likely cause significant issues as there is an increasing acceptance that post-border biosecurity relies heavily on cattle producer surveillance and reporting. As such, the acknowledgement and engagement of cattle producers in this role must be improved, and trust between those reporting disease and the reporting agencies must be strengthened to ensure this relationship works.

It also needs to be recognised that in a changing employment landscape in agriculture, this is not limited to owner/manager persons but extends to all employees - including contract and day workers as they are increasingly becoming the 'front line' in animal husbandry. Workplace and team culture are integral to ensuring success in disease surveillance, reporting, and business operations.

# Preparing for the worst, hoping for the best

## Worst-case Exotic Disease Outbreak – Foot and Mouth in Australia

To set context around the significance of delays or failure to report disease incursions in northern Australia, foot-and-mouth disease (FMD) is often used to provide scale. While FMD is projected to have a lower probability of incursion into Australia over the next five years, as displayed in Figure 9, it remains one of the most well-known in terms of impact on the Australian economy.
Foot and Mouth Disease (FMD) is a highly contagious disease that affects cloven-hoofed animals such as cattle, buffalo, pigs, sheep, goats, deer, and camelids (CSIRO, 2017; Australian Government, 2022). The FMD virus can be transmitted through live animals, meat, dairy products, soil, bones, untreated hides, vehicles, and equipment used with these animals. It spreads via close contact between animals and through clothing and footwear. An incursion of FMD could cost the Australian economy up to $80 billion over ten years (ABARES, 2022).

The Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) has estimated that an FMD outbreak would lead to severe economic losses in the livestock and meat processing sectors. These losses range from $7.1 billion for a small, three-month outbreak to $16.0 billion for a large, twelve-month outbreak (CSIRO, 2017; Matthews, 2011). Control and compensation costs could range from $25 million for a small outbreak to $600 million for a large one (Matthews, 2011). Reflecting international experience, the economic impact of trade restrictions (export market closure) would be far greater than the cost of controlling the disease.

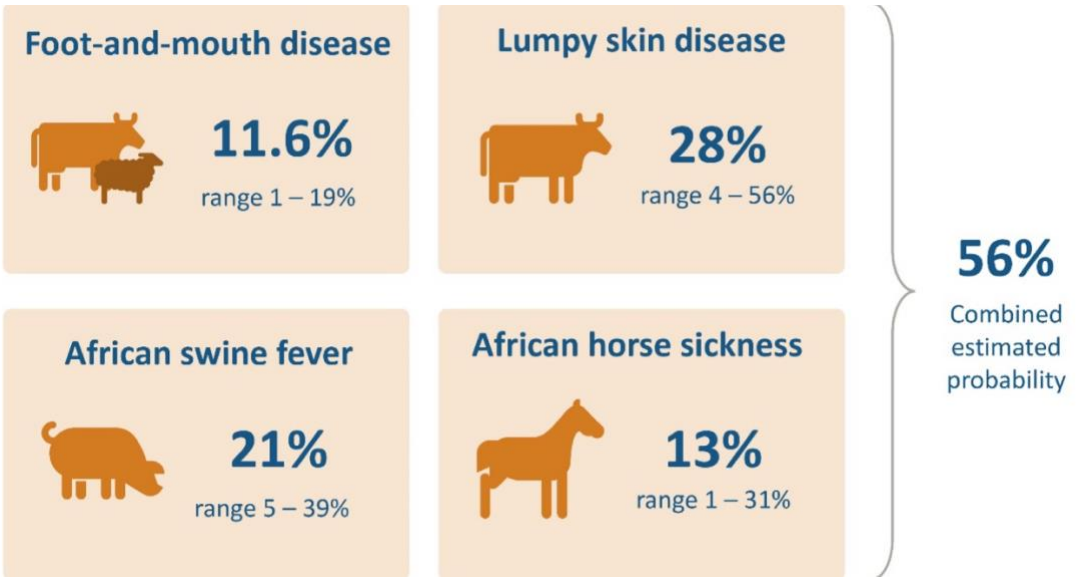



**Figure 7: Centre of Excellence for Biosecurity Risk Analysis (CEBRA) estimated probability of an internationally notifiable EAD incursion in the next five years from 2022 (Source: DAFF, 2022)**

### Models of potential impact

Multiple models have been created to assess the potential results of exotic disease outbreaks within Australia.

Currently, the best-case scenario modelling has a 21-day period from disease incursion (clinical signs) to the first report of FMD (Carpenter et al., 2011). This number is based on several factors, including previous FMD outbreak detection times in other countries, time for developing clinical signs, and routine animal observation. It should be noted that this particular number, the best case number, is based on an outbreak within a Victorian operation - which arguably is much more intensive and is likely to have an increased individual animal observation rate than in the northern Australian beef system (Matthews, 2011). A Californian model of FMD within dairy farms suggested that delaying diagnosis and implementation of appropriate control strategies by just 24 hours (from 21-day detection to 22 days) could result in an 22% increase in infected premises (in the study, from 610 to 745) (Carpenter et al., 2011).

It should also be noted that in the 2001 FMD outbreak in the UK, if the nationwide livestock movement ban had been put in place within 24 hours after the confirmation of the outbreak rather than 72 hours, the number of infected premises would have been reduced by 50%, from 2,026 to just 977 (Anderson, 2008).

## How likely is this?

### Barriers to reporting in Australian systems

There has been much research into barriers to reporting in on-farm surveillance for cattle producers within Australia, as it has been identified as a major threat to Australia's biosecurity system. As mentioned earlier, reporting suspected diseases is a question that, when asked of cattle producers, has a clear 'right' answer according to the legislation and policy.

However, there are a number of identifiable and understandable concerns that cattle producers may consider prior to reporting suspect diseases to required services (veterinarians, government, or industry bodies). These concerns can be broken down into two overarching themes:

- How might this affect me within my social group (farm, community, larger industry)?
- What might this cost me (economically) and my business?

In the author's experience as a veterinarian completing disease investigations for cattle producers, the economics of testing, treatment, and potential sale implications are always discussed within the first phone call. It is clear that the lessons learned from the UK's 2001 FMD outbreak remain fresh in the minds of many cattle producers.
After the 2022 FMD outbreak in Indonesia, many veterinarians and those working in associated reproductive fields received enquiries about compensation for cattle in the case of an FMD or Lumpy Skin Disease outbreak, again highlighting the influence of economics on cattle producers' mindsets around disease outbreaks.

Palmer, Fozdar and Sully (2009b) completed several surveys of sheep and cattle farms in Western Australia to identify why cattle producers do not engage with veterinary or industry advice for animal health. Of multiple findings, there was significant mention of a lack of trust in the government to "take responsibility in a disease outbreak" or that 'cattle producers affected by an emergency livestock disease outbreak will be dealt with fairly and equitably by the government'.

A report prepared for the Biosecurity Queensland Department of Agriculture and Fisheries (DAF), NSW Department of Primary Industries (DPI), and Agriculture Victoria, 'Impacts of biosecurity Incidents in Eastern Australia' (Faster Horses, 2023), interviewed cattle producers who had been involved with biosecurity incidents. As part of the report, cattle producers speculated on why someone may not report a disease concern (after their experience). From this report, several reasons were provided as to why a cattle producer may *not want* to report—the most frequently mentioned reasons centred on disruption to the business and the extra cost around this. However, confusion regarding the reporting process or the significance of the disease (or pests) was also mentioned frequently. There was also a general distrust and wariness of the government from past attempts to report something of concern - the example given was regarding unattended or discharged beehives and concerns around Varroa mite. This was also reflected in research by Hernández-Jover et al. (2016), who interviewed beef producers in NSW and QLD.

> *"Cattle producers do not like dealing with government." Oyster industry member QX disease NSW (Faster Horses, 2023)*

The Faster Horses report also echoes what has been heard in other research. A recent On-Farm Biosecurity Summit provided similar feedback: producers are worried about reputation and legislative risks regarding voluntary reporting. The 'fear of prosecution versus peer persecution' could almost be the more significant barrier to reporting than the fear of economic loss. This could also stem from the thinking that voluntarily reporting diseases does not align with the attitudes of the community that they are in.

In Australia, studies indicate that cattle producers do not report disease events or suspicious symptoms to animal health officials (private veterinarians or government agriculture departments) to the degree that those officials regard as necessary (Palmer et al., 2009a). Lack of reporting reduces the capacity for early detection and response to exotic and endemic diseases with potential negative impacts on production and export trade (Palmer, 2009; Fisher, 2013).

## Barriers to reporting in the international agricultural setting

It was the author's experience that barriers identified within the Australian agricultural system to reporting by cattle producers are shared globally. While it was noticed in different countries and regions that there may be differences attributed to the main barrier, there was nothing specific to each country. For example, for cattle producers in Florida, USA, there is a significant feeling of distrust in the government, which may also reflect the current political climate and a relatively cultural aspect of farming communities in the south.

The experiences in Indonesia and Brazil were also similar but for different reasons. There was a significant distrust of government involvement, but it seemed less due to political ideology and more around potential corruption and distrust. Overall, cattle producers seem to be cattle producers, no matter where they are.

## Summary

Despite a low probability of FMD (or other exotic diseases) incursion in the next five years, the disease poses significant economic threats, potentially costing up to $80 billion over ten years. Effective reporting and early detection are vital, as delays can dramatically increase the number of infected premises, as evidenced by past outbreaks in the UK and Indonesia. However, barriers such as economic concerns, social implications, distrust in government, and lack of transparent reporting processes hinder timely disease reporting by cattle producers.

A distinction is drawn between routine reporting, where trust in the government and expertise was critical, and reporting in suspicious circumstances, where moral obligation played a key role (Palmer, 2009b). For most cattle producers, the decision to report comes down to two aspects: what will this cost my business, reputation, and finances, and what should I do morally (as a good neighbour, cattle producer, and Australian). These themes appear to be global for cattle producers in these positions.

Delay or lack of reporting has the possibility of crippling not only Australia's beef cattle industry but significantly damaging Australia's total economy.

# Old dogs, new tricks: Observing change in the industry

The agricultural industry is perceived as highly traditional; as the saying goes, "That's how my daddy did it, and his daddy before him." While the beef industry, particularly in the northern part of Australia, is a very proud industry, steeped in history and cultural identity, the idea that it is resistant to change is outdated and incorrect. The burden of proof for change is much higher for owners and managers of these operations due to the size, scale, and proposed changes compared to the much more intensive, smaller-sized operations in the southern part of Australia. This means that the same principles cannot always be applied from the southern regions to the north when trying to influence change within this industry.

## How change occurs – behavioural theories

Behaviour change models have been widely applied in animal health to identify cattle producers' biosecurity attitudes and behaviours. The most common and best-known model is the Theory of Planned Behaviour (Maye and Chan, 2020; Rose et al., 2018; Richens et al., 2018). This model tries to understand how psychological factors, such as perceptions, individual values, and beliefs, influence biosecurity practices.

Ajzen's (1991) Theory of Planned Behaviour (TPB) is a psychological framework that explains how people can change their behaviour based on three key components: attitudes, subjective norms, and perceived behavioural control, as shown in Figure 10 (Rose et al., 2018). Understanding this theory can help address behavioural change in the agricultural industry, particularly in areas like biosecurity practices, environmental sustainability, and adopting new technologies.

1. Attitudes: This refers to the individual's positive or negative evaluation of performing a specific behaviour. In the agricultural industry, a cattle producer's attitude toward adopting biosecurity measures or sustainable farming practices is influenced by their beliefs about the benefits (e.g., protecting livestock health, improving yield) and costs (e.g., financial expense, time investment) of these actions. Educational programs and evidence-based demonstrations can help shape positive attitudes by highlighting the tangible benefits of these practices (Rose et al., 2018; Richens et al., 2018).
2. Subjective Norms: This component involves the perceived social pressure to perform or not perform a particular behaviour. Cattle producers are influenced by the opinions and practices of peers, industry leaders, community norms, and policies. If influential figures in the agricultural community advocate for and practice stringent biosecurity measures or sustainable farming, it creates a normative pressure for others to follow suit. Enhancing social support networks and creating communities of practice can strengthen these norms (Rose et al., 2018; Richens et al., 2018).

3. Perceived Behavioural Control: This relates to the perceived ease or difficulty of performing the behaviour, which is influenced by past experiences and anticipated obstacles. For cattle producers, perceived behavioural control might include access to resources, knowledge, and skills required to implement new practices. Training, technical support, and resources can enhance cattle producers' confidence in adopting and maintaining new behaviours (Rose et al., 2018; Richens et al., 2018).

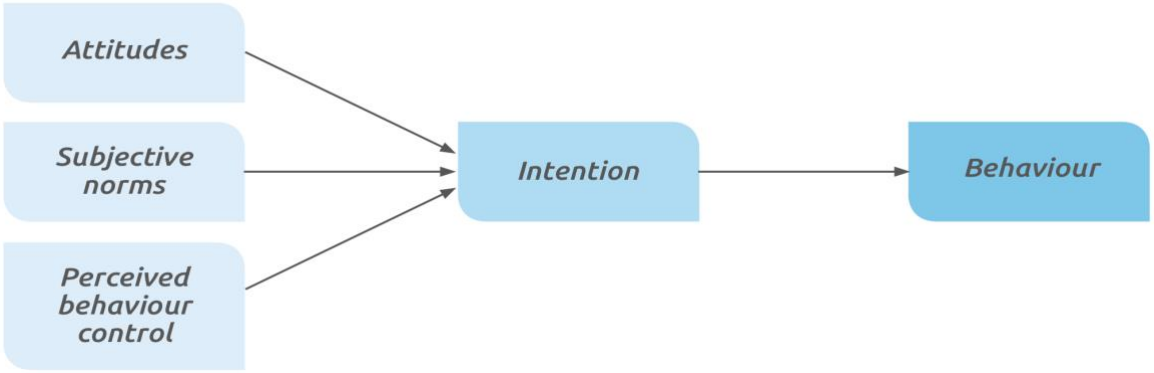



**Figure 8: Theory of Planned Behaviour adapted from Ajzen 1991 (Source: AHDB, 2018)**

While there are several models and theories regarding behavioural change across various industries and demographics, it remains clear that when trying to influence change within a group, there is no blanket theory that can be applied. For the Australian beef industry, it is clear that the northern beef industry cannot be approached in the same manner as the southern industry, even though they are part of the Australian beef industry, in the same way that models and theories for behaviour modification for smallholder operations could not be applied to corporate operations even working within the same industry.

## Factors influencing Australian cattle producer behaviours

Much research has been done to identify and address the factors influencing the decisions made by Australian producers (Richens et al., 2018; Maye and Chan, 2020; Heffernan et al., 2008; Palmer et al., 2009; Scutt, 2022). From this, a common list of factors that highly influence the behaviour of cattle producers within the Australian agricultural system can be generated. It was the author's experience that these are highly reflective of the northern Australian beef industry workforce, depending on the worker's role in the operation. The most commonly found factors are listed below and divided into common themes.

1. Personal factors: Age, gender, experience, attitudes, and beliefs were very common determinants of behaviour. Age was a commonly mentioned factor, particularly with regard to technology adoption.
2. Economic factors: Business factors, such as farm size, cash flow, staff numbers, succession plans, and profitability, were commonly highlighted as major influences on behaviour.
3. Socio-cultural factors: Family, peer, and advisor networks: the influence of other people on individual cattle producer behaviour was also very commonly

noted. Studies found that the opinions of family, friends, peers and trusted advisors were highly influential on cattle producer decision-making behaviour, also helping to delineate what 'normal' farm management looked like (social norms, derived from the theory of planned behaviour). The opinions of trusted people could affect cattle producer behaviour through the provision of formal or informal advice or the means of social pressure.

In conversations with cattle producers, economic and socio-cultural factors are very influential. However, cattle producers appear to be much more open about discussing economic factors over more personal factors. Palmer *et al.* (2009), in discussions with Western Australian sheep and beef farms, found this also to be their experience when discussing disease reporting.

'*To have a really good practice and actually be able to put it into motion is all well and good but financially you might not be able to afford to do it straight away' - Cattle producer #28 Palmer et al., 2009*

When discussing influencing behavioural changes within a group of people, there is more at play than just money. Particularly with cattle producers, feeling in control of the decision-making or perceived behavioural control is also important. If cattle producers feel that they are being told what to do rather than being in control or feel they do not have the skills, knowledge, or practical conditions to implement a management practice, it is unlikely that the action will be carried out (Rose et al., 2018).

This was particularly noticeable in conversations with Floridian cattle producers. Even amongst the more 'progressive' cattle producer groups, there was a strong feeling that the decision for change was most effective when it felt that it came from the cattle producer group versus 'enforced' change (often seen as coming from governmental bodies). While producers were much more likely to be influenced by those they felt were their peers in the industry, there was a strong negative impact when they felt that the government was infringing on their 'right to farm.' This would often then play out in conversations including phrases such as 'What do they (government) actually know about farming?' or 'They are just looking for another way to cost us money.'

While the anti-government sentiment was much less apparent in discussions with Australian producers - there was still a significant amount of suspicion regarding those in policy versus industry or extension workers who had been in the community or region for some time. Where information for change comes from is very important for influencing the value placed on it by the cattle producer and, therefore, the likelihood of it eventuating into changed behaviour.

## Personal reflections on behaviour changes within the Northern Beef Industry in Australia

The northern Australian beef industry has undergone significant change over the last 20 years, including market changes, increased demand for technology use within the

industry, and climatic changes. The industry has shown it has the capacity and inclination to undergo significant, widespread change.

Workers often feel that they have little input or influence within this region - being 'down the food chain'; however, it is very clear from interacting with contracting camps that when workers model certain desirable behaviours, the team is likely to have an increase in these behaviours. Leadership is vital in these circumstances, which can be appreciated in many ways, such as verbal feedback to staff/workers, social support of staff members within the team, increased interaction with workers by supervisors or management, and inclusion of workers in out-of-hours social events as a team.

Farm biosecurity is a unique aspect that can impact all aspects of a cattle producer's life due to the high personal, social, emotional, and financial investments cattle producers have within their businesses. Furthermore, for those with no strong financial investment, that is, employees or contract workers of the farm, there is a strong sense of identity tied in with the social and emotional aspects of working within the agricultural industry.

## Sustaining change

Motivating cattle producers to engage in and comply with biosecurity management practices is only part of the process—facilitating and encouraging cattle producers to adhere to their chosen risk management practices presents an additional challenge (Mankad, 2016). Limited research exists in this field, but behavioural changes that do not yield straightforward and short-term economic returns are often disregarded. For many cattle producers, this simply comes down to a cost-benefit ratio; with increasing demands on their time and finances, they may prioritise actions with immediate economic benefits.

Understanding what factors motivate individuals to persist with changes is essential, especially when discussing biosecurity practices that may not have immediately observable or quantifiable effects (Mankad, 2016). In the UK, it was observed that while there was significant drive to maintain desired behavioural changes within the cattle industry in the initial one to five years following an exotic animal disease (EAD) outbreak, these behaviours tend to diminish over time due to workforce changes and a reduction in perceived risk. It is likely that the same patterns of behaviour would occur within the Australian agricultural industry. This could be evaluated by assessing the public's post-COVID health-related behaviours as time passes.

## Summary

Reframing on-farm biosecurity as care becomes less about 'producers complying with specific measures and procedures and more about governing authorities nurturing cattle producers' care practices of skilled craftwork' (Maye and Chan, 2020). Values associated with biosecurity behaviours were found to align with values most important for social cohesion, suggesting that collaborative disease efforts between industry stakeholders and cattle producers are likely to succeed if designed

with these values in mind (Fountain et al., 2023). The importance of trust cannot be overstated in the influence of behaviour changes within this area.

Understanding what influences the behaviours of cattle producers is just as important as understanding how to influence cattle producers. The burden of proof for change is much higher for owners and managers of these northern operations due to the size, scale, and proposed changes compared to the much more intensive, smaller-sized operations in the southern part of Australia. This means that when trying to influence change within this part of the industry, the same principles cannot always be applied from the southern regions to the north, and identifying factors that influence change and sustain it must be tailored to the northern Australian beef industry rather than a 'blanket' view.

It is also clear that much more work needs to be done to examine and assess how long-term behavioural changes within the field of biosecurity practices are maintained within the Australian agricultural industry. From experiences of the UK, it is of concern that while positive or desired changes may be influenced in the short term within workplaces, these can be highly dependent on individual persons and not representative of systemic or industry-wide practices.

# Conclusion

The aim of this report was to further explore the ‘who’ of our agricultural post-border biosecurity. The people, the human aspect of our biosecurity system. To do this, I was able to draw on my experiences within the northern Australian beef industry, as well as visiting a variety of cattle operations across north-west Queensland. I was able to visit agricultural operations across the world, interview cattle producers and observe how workers and owners practice biosecurity within their operations.

It became clear from the visits undertaken, and conversations had, that our northern beef producers felt strongly about biosecurity. There is a growing understanding of what it could mean to have an exotic disease incursion, but also, a strong sense of wanting to do ‘what’s right’ by their neighbours. However, it also became clear that the likelihood of the manager or owner of the operation being the one to first identify an issue was reducing. The assumption about who would be pressing the ‘red button’ on a potential disease outbreak is changing. Animal husbandry tasks in the industry are increasingly performed by day workers and contract labourers due to shifts in ownership demographics. This reliance on contractors, who may not be involved in long-term operations, could complicate the detection and reporting of issues. Less experienced employees may struggle to identify and report concerns accurately, highlighting the importance of interpreting agricultural employment data with an understanding of its limitations.

There is also a strong relationship between workplace culture and the likelihood of prompt reporting in cases of disease concerns. While it is generally accepted that good culture leads to further success, it became clear that poor workplace culture and team cohesion are likely to lead to a significant delay in reporting of disease - which may result in severe and significant impacts of disease spread, increasing the cost of recovery into the millions.

History strongly influences cattle producers' future behaviours and decisions. Cattle producers learn from past experiences and peer practices, but negative past experiences can create resistant attitudes. Distrust between cattle producers and the government is difficult to overcome, as past policies may have been perceived as ineffective or unfair. Building trust requires transparent communication and policies addressing cattle producers' concerns. Lessons from past exotic animal disease (EAD) outbreaks tend to fade over time, leading to complacency and increased risk of future outbreaks.

Interestingly, many cattle producers' biosecurity practices align with government and industry recommendations more by coincidence than by deliberate planning. Disease management on farms is often a personal and multifaceted task, closely linked to the 'craft-work' of animal husbandry. Building a strong team culture within operations is essential for positive outcomes in disease management, animal welfare, productivity, and profit.

The northern Australian beef industry is crucial to Australia's economy, relying heavily on a robust biosecurity system to sustain international market access. However, this system is highly complex, involving multiple layers and often unclear responsibilities across national, state, and local levels, leading to potential misunderstandings about what biosecurity entails for producers.

Current biosecurity policies advocate a 'shared responsibility' approach, where everyone plays a role in managing threats. However, policies often overlook the human component of biosecurity actions, including motivation and adherence to practices.

Recognising the changing workforce profile and understanding what motivates front-line agricultural workers is crucial to bridging the gap between those performing daily tasks and those identifying and reporting concerns.

In conclusion, there was one clear point from this research and report:

“Agricultural success depends on the people” Nancy Crawshaw, 2024 Zanda McDonald Award winner (NZ).

# Recommendations

From this report, the following recommendations have been crafted:

1. Reframing Biosecurity: Emphasise bio-secure farming care as an integral part of good farming practices, rather than an additional checklist. Recognise and build upon cattle producers' existing knowledge and practices, integrating biosecurity into their daily routines, without adding to further paperwork fatigue. Consideration should be given to opportunities to combine biosecurity planning within other recording requirements such as workplace health and safety or chemical/poisons recording.

2. Targeting a Changing Workforce: Address the role of contract workers, who are crucial yet often overlooked. To understand who to target for further education and messaging, we need to make sure we are understanding the current realities of the workforce within the industry. Recognise their importance in disease surveillance and engage them through tailored policies and data collection efforts to better utilise their contributions.

3. Innovative Training Programs: Develop training initiatives targeting those who observe animals regularly, such as contract or day workers. Leverage community-based organisations, peak industry bodies and trusted service providers to deliver these programs, ensuring they resonate with and are trusted by producers. Consider the utilisation of current social events that may cause increased engagement with educational events.

4. Prove Value and Ease of Adoption: Demonstrate the tangible benefits and simplicity of adopting new biosecurity behaviours. Align recommended actions with cattle producers' existing workflows to facilitate easier integration and highlight the practical advantages.

5. Shift Communication Approaches: Move away from a top-down flow of information. Instead, adopt more collaborative and engaging communication strategies that resonate better with cattle producers and encourage active participation in biosecurity practices.

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# Appendices

Australian Cattle Veterinarian's BioCheck Biosecurity plan

LPA Biosecurity plan